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«НАЦІОНАЛЬНИЙ ГІРНИЧИЙ УНІВЕРСИТЕТ»

Англійська мова для навчання і роботи

Том 2

СТРАТЕГІЇ ПОШУКУ ІНФОРМАЦІЇ

В ІНШОМОВНИХ ДРУКОВАНИХ ТА ЕЛЕКТРОННИХ ПРОФЕСІЙНО-ОРІЄНТОВАНИХ ДЖЕРЕЛАХ ТА ДОСЛІДЖЕННЯ ІНШОМОВНИХ ДЖЕРЕЛ

Підручник для студентів вищих навчальних закладів

Дніпропетровськ

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А 64

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А 64 **Англійська** мова для навчання і роботи: підручник для студ. вищ. навч. закл.: у 4 т. Т. 2. Стратегії пошуку інформації в іншомовних друкованих та електронних професійно-орієнтованих джерелах та дослідження іншомовних джерел інформації. = English for Study and Work: Coursebook in 4 books. Book 2 Obtaining and Processing Information for Specific Purposes / С.І. Кострицька, І.І. Зуєнок, О.Д. Швець, Н.В. Поперечна ; М-во освіти і науки України, Нац. гірн. ун-т. – Дніпропетровськ : НГУ, 2015. – 192 с.

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Подано всі види діяльності студентів з вивчення англійської мови, спрямовані на розвиток мовної поведінки, необхідної для ефективного спілкування в академічному та професійному середовищах. Містить завдання і вправи, типові для різноманітних академічних та професійних сфер і ситуацій. Структура організації змісту – модульна, охоплює мовні знання і мовленнєві вміння залежно від мовної поведінки.

Даний модуль має на меті розвиток у студентів стратегій, умінь, навичок читання, пошуку та вилучення професійно-орієнтованої інформації, необхідної для ефективної професійної діяльності і навчання. Містить завдання і вправи, типові для академічних та професійних сфер, пов'язаних з гірництвом і розробкою родовищ корисних копалин. Зразки текстів – автентичні, різножанрові, взяті з реального життя, містять цікаву й актуальну інформацію про особливості видобутку мінеральних ресурсів в провідних країнах світу, сучасний підхід до розробки родовищ тощо. Ресурси для самостійної роботи (Частина ІІ) містять завдання та вправи для розширення словникового запасу та розвитку знань найуживанішої термінології з гірництва, що спрямовано на організацію самостійної роботи з розвитку мовленнєвих умінь, знань про корисні копалини, методи їх видобутку. За допомогою засобів діагностики студенти можуть самостійно перевірити засвоєння навчального матеріалу й оцінити свої досягнення.

Призначений для студентів вищих навчальних закладів, зокрема технічних університетів. Може використовуватися для самостійного вивчення англійської мови викладачами, фахівцями і науковцями різних галузей.

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CONTENTS

ПЕРЕДМОВА

«Англійська мова для навчання і роботи» − це підручник, який розроблено за результатами п'ятирічної апробації однойменного навчального посібника для бакалаврів галузі знань 0506 Розробка корисних копалин (2010), з урахуванням побажань і зауважень головних учасників навчального процесу: студентів, викладачів вищих навчальних закладів та інших сторін, зацікавлених у ефективному вивченні/ викладанні дисципліни «Іноземна (англійська) мова».

Підручник розроблено відповідно до державного та галузевого стандартів з урахуванням Загальноєвропейських рекомендацій щодо мовної освіти. Він цілком і повністю відтворює зміст навчальної та робочої програм нормативної навчальної дисципліни «Іноземна (англійська) мова».

Головна мета – формування у студентів *загальних* та *професійно-орієнтованих комунікативних мовленнєвих компетенцій*.

Зміст посібника розроблено таким чином, щоб допомогти студентам оволодіти англійською мовою на рівні B2, необхідному для освітньо-професійного рівня бакалавра. Він охоплює академічний і професійний зміст (галузь знань «Розробка корисних копалин»), ситуативний, який наближено до реального життя, та прагматичний – практичні вміння і навички, що включають уміння використовувати інформаційно-комунікаційні технології.

Підручник складається з чотирьох томів, розроблених колективом авторів, кожний з яких відповідав за навчально-методичні матеріали окремого тому або розділу:

Том 1 **'Socialising in Academic and Professional Environm**ent' (Спілкування в соціальному, академічному та професійному середовищах) – І.І. Зуєнок.

Том 2 **'Obtaining and Processing Information for Specific Purposes'** (Стратегії пошуку інформації в іншомовних

друкованих та електронних професійно-орієнтованих джерелах та дослідження іншомовних джерел) – І.І. Зуєнок.

Том 3 **‘Discussions and Presentations’** (Дискусії та презентації) – Н.В. Поперечна, О.Д. Швець.

Том 4 **‘Communicating in Writing’** (Професійне іншомовне письмо) – Н.В. Поперечна, О.Д. Швець.

Розділ Т. 1 - 4 **‘Grammar Reviewing and Practising’** (Практикум-довідник з граматики) – С.І. Кострицька.

Автори щиро вдячні рецензентам за цінні зауваження та Брайану Чангу (США), учаснику програми академічних обмінів ім. Фулбрайта, за надання допомоги у аудіозапису та редагуванні аудіоматеріалів. Ці зауваження та відгуки студентів значно сприяли удосконаленню змісту та структури підручника.

Кожний том містить дві частини, що відповідають основним видам навчальної діяльності: частина І ***‘In-class Activities’*** (Завдання та вправи для аудиторної роботи), частина ІІ ***‘Self-study Resources’*** (Ресурси для самостійної роботи), яка включає в себе ресурси для розвитку мовленнєвих вмінь і мовних знань, засоби діагностики навчального матеріалу: тестові завдання й оцінювання, включаючи самооцінювання). Це зумовлено тим, що навчальний посібник розглядається як система, що охоплює всі види діяльності студентів з вивчення англійської мови.

Структура змісту – модульна, тобто кожний том відповідає навчальним цілям окремих модулів, отже, кожну книгу можна використовувати окремо для вивчення відповідних дисциплін за вільним вибором студента.

Усі матеріали, що подані в навчальному посібнику, – автентичні, сучасні та відповідають інтересам та потребам студентів. Вони стануть у нагоді викладачам під час викладання вибіркових курсів з англійської мови, а також можуть використовуватися як додаткові навчально-методичні матеріали в межах програм вищих навчальних закладів.

ВСТУП

Том 2 «Стратегії пошуку інформації в іншомовних друкованих та електронних професійно-орієнтованих джерелах та дослідження іншомовних джерел» є складовою підручника «**Англійська мова для навчання і роботи»** та відповідає модулю навчальної та робочої програм нормативної дисципліни «Іноземна (англійська) мова».

Метою даного модуля є формування у студентів загальних та професійно-орієнтованих комунікативних мовленнєвих компетенцій (лінгвістичної, соціолінгвістичної та прагматичної) для забезпечення ефективного читання та вилучення необхідної інформації для її подальшого використання в академічному та/або професійному середовищах.

У цьому модулі мовленнєві вміння: читання, письмо, говоріння (монологічне, діалогічне, полілогічне) та аудіювання, розглядаються і розвиваються інтегровано зі знаннями щодо особливостей використання граматичних структур, типових для наукового і технічного стилю, лексичних одиниць – термінів за фахом і функціональних зразків для написання наукової і технічної інформації різної за жанром (статті, специфікації, інструкції, анотації тощо). Велика увага приділяється використанню оригінальних і автентичних текстів, що сприяє розвитку соціолінгвістичної і соціокультурної обізнаності про міжнародні, національні та інституційні особливості різних країн світу. Саме в такому контексті розвивається розуміння про різні культури та особливості взаємодії між професіоналами у типових академічних і професійних ситуаціях.

Відтворюючи загальну структуру навчального посібника, Том 2 «Стратегії пошуку інформації в іншомовних друкованих та електронних професійно-орієнтованих джерелах та дослідження іншомовних джерел» складається з двох частин: частина І “***In-class Activities***” (Завдання та

вправи для аудиторної роботи), частина II "***Self-study Resources***" (Ресурси для самостійної роботи).

Частина I "***In-class Activities***" складається з 7 розділів (Units), кожний з яких охоплює теми, типові для галузі знань «Розробка корисних копалин», з якими студенти-початківці вже обізнані рідною мовою і знання яких стане майбутнім інженерам у нагоді, та загальні вміння, визначені ОПП і ОКХ, серед яких вміння навчатися і опрацьовувати іншомовну літературу за фахом.

Кожний розділ спрямовано на розвиток певних загальних мовленнєвих вмінь, в першу чергу вмінь читання для спеціальних цілей, лексичного мінімуму за фахом та отримання знань про гірництво, видобуток вугілля і правил безпеки тощо. Останній розділ **'Check Your Progress'** має на меті перевірку засвоєння студентами навчального матеріалу і включає вихідний тест.

Структура кожного розділу – логічна, послідовна, чітко визначена і водночас гнучка. Завдання та вправи, що рекомендуються для практичних занять - різної складності, що допомагає організувати процес навчання/вивчення шляхом вибору видів діяльності, які відповідають потребам студентів. Як результат, студенти залучаються до виконання низки різних видів діяльності, серед яких читання текстів, складання нотаток, передача та обмін інформацією усно або письмово, участь у дискусіях і дебатах, виступи з міні-доповідями тощо. Завдання, які потребують більше часу на вивчення та засвоєння, помічено зірочкою (*), що дозволяє викладачам та студентам визначитися з вибором до якого виду роботи їх віднести: аудиторної чи самостійної роботи.

Кожний розділ, який розроблено за моделлю, запропонованою авторами, містить в собі 5 основних блоки: **Introduction** (*вступ*), **Lead-in** (*підготовчі види діяльності*), **Input** (*уведення інформації*), **Controlled Practice** (*контрольована практика*), **Follow-up** (*вихідний блок*).

Розділ починається зі *вступу*, в якому надається перелік ***навчальних цілей*** тобто *що саме студенти робитимуть протягом заняття* і ***очікуваних результатів навчання***, тобто *що саме студенти зможуть робити наприкінці практичного заняття*.

Вступний блок розділу містить ***підготовчі завдання*** **(Lead-in)**, що допомагають студентові налаштуватися до сприйняття нової інформації шляхом складання карти свого мислення за допомогою мозкового штурму щодо теми розділу або дискусії за темою заняття. Підготовчі завдання виконуються індивідуально, в парі/команді або всією групою. Мета цього етапу – виявити щó студенти вже знають за темою розділу, визначити прогалини в цих знаннях і організувати практичне заняття у відповідності до потреб конкретних студентів з використанням усіх частин книги. Такі завдання також дають можливість студентам продемонструвати свої знання, поділитися своїм особистим досвідом та ідеями, отриманими в ході навчання, й показати розуміння теми заняття та власний інтерес до неї.

Усі завдання блоку **Input** умовно підрозділяються на ***перед-завдання***, ***саме завдання*** та ***після-завдання***. Перед уведенням нової інформації пропонуються *перед-текстові завдання* у вигляді Карти передбачення (**Prediction Chart**), головна мета яких - налаштувати студентів на читання тексту, який буде використано як джерело нової інформації, і вилучення з нього специфічної інформації, залучити їх до виконання завдання шляхом читання тексту й водночас визначити рівень готовності студентів до сприйняття нового матеріалу (їх володіння вміннями та знаннями з теми, що вводиться).

Саме завдання спрямоване на розвиток у студентів певних вмінь, навичок або стратегій читання, розширення словникового запасу за темою тощо, що сприяє майбутньому використанню цих вмінь, навичок і знань в інших навчальних і життєвих ситуаціях. Мовленнєві вміння й

навички, що розвиваються під час виконання завдань в інтегрований спосіб, виділено жирним шрифтом.

Зміст текстів та/або лексичні одиниці, мовні структури, функціональні покажчики (**Content Focus** або **Language Focus**) відпрацьовуються під час мовної або мовленнєвої ***практики*** - низки завдань або видів діяльності, контрольованих викладачем і спрямованих на розвиток знань термінології та мови, необхідної для успішної комунікації в академічному або професійному середовищі за допомогою навичок мовлення, що розвиваються. Загалом, це види діяльності та завдання, які інтегрують всі чотири мовленнєві вміння (мовлення, аудіювання, читання, письмо). Для *контрольованої практики* пропонуються завдання, спрямовані на сортування, класифікацію, ранжування тощо та використання отриманої інформації для заповнення пробілів, таблиць, діаграм та інших засобів візуалізації інформації. На цьому етапі доцільно використовувати *парну*, *групову* та командну роботу студентів.

Вихідний блок **Follow-up** – це ***продуктивні завдання***, для виконання яких студенти повинні використовувати здобуті навички, вміння й знання, отримані протягом практичного заняття з вивчення розділу і під час самостійної роботи з вивчення матеріалів, наведених частині II '***Self-study Resources***'. Це можуть бути письмові завдання, які потребують багато часу на виконання і рекомендуються для самостійної роботи. У більшості випадках - це низка ***після-завдань***, що задають алгоритм самостійної роботи.

Завдяки модульності й циклічності запропонованої моделі, вивчення мови, вступний і вихідний блоки розглядаються як зв'язувальні елементи між розділами. Тому, результат виконання продуктивного завдання може слугувати підготовчим завданням у наступних розділах.

Граматичні структури, які використовуються під час занять з метою розвитку робочих знань їх застосування у певних ситуаціях, наведені

біля позначки **Grammar Reference**. Вони опрацьовуються студентами індивідуально за допомогою розділу ***'Grammar Reviewing and Practising'*** частини II ***'Self-study Resources'*** або можуть використовуватися викладачем для *мовної практики* в аудиторії.

Розділ **'Self-assessment'** (Самооцінювання) частини II використовується для самооцінки досягнень та виявлення прогалин у вивченні матеріалу модуля, використовуючи наведені в цьому розділі правильні відповіді – ключі.

Part I

In-class Activities

Unit 1 Mineral Resources

Focus on:

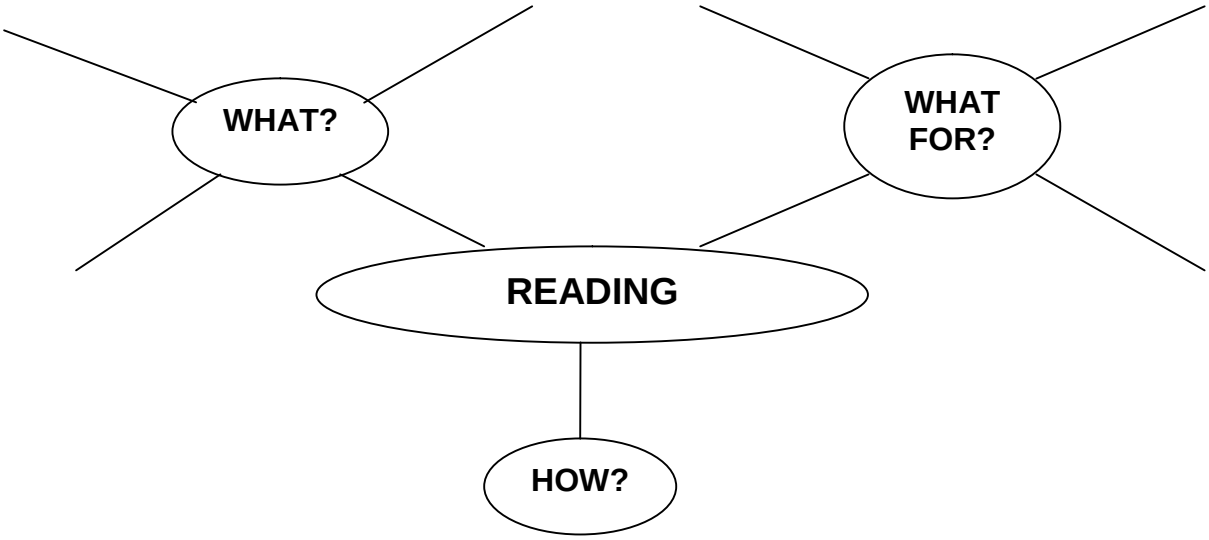
- needs analysis
- developing strategies for reading specialism-related texts
- predicting information using headings, sub-headings
- developing a range of terminology in the professional area using reference sources selectively
- taking notes while reading
- labeling diagrams

***By the end of the unit you will*:**

- be aware of the learning objectives of this module
- develop different reading strategies
- have practiced predicting information using various clues
- have practiced taking notes while reading
- develop your range of vocabulary in mining (mineral resources)
- be able to speak about mineral resources in Ukraine
- know different text-types and text genres

Lead-in  ***Focus on*** learning objectives for the module

1. *Group-work.* Think on ***what*** you usually read for study and work***. Why? What for*** and ***how?*** Being in groups of three complete the mind-map given below. Pay attention that ***how*** is already made for you. Share your ideas within the whole group.



- orienting yourself to the text
- reading titles and sub-headings
- skimming the text
- scanning the text
- reading paragraphs to understand
- identifying main and supporting ideas
- finding key ideas of every paragraph
- note-taking
- filling in the table
- labelling a diagram
- making a mental note of main ideas in each paragraph
- identifying argument, opinion/attitude and making inferences
- paragraph heading
- summarizing
-

2. *Pair-work.* Make a list of the main sources of information you know. Compare your list with your partner's. Make changes if necessary.

3.* Look through the list of text-types. Put ticks (√) against those which are necessary for your study and/or future work. If necessary add the list.

CHECKLIST

Text-types	**Tick (√)**
books, fiction and non-fiction, including literary journals	
magazines	
articles	
journals	
summaries	
dissertations	
textbooks	
newspapers	
instruction manuals, operating manuals	
references	
content page for journal issue/textbook	
abbreviations	
comic strips	
brochures	
prospectuses, leaflets	
advertising materials	
public signs and notices: supermarket, shop, market stall signs	
packaging and labeling on goods, tickets, etc.	
forms and questionnaires	
checklists	
table(s)	
applications	
structured interview	
planner (for the project timing)	

schedule	
form(s)	
request form(s)	
prescription(s)	
programme(s)	
specifications for device/equipment	
dictionaries (monolingual and bilingual)	
thesauri	
glossary	
reports	
notes and messages	
databases (news, literature, general information, etc.)	
diagrams, diagrammatic representation of...	
charts, flow charts, bar charts, pie charts	
activity flowcharts	
question formation flowcharts	
graphs	
business and professional letters, faxes, formal letters	
personal letters, informal letters	
contracts	
essays and exercises	
memoranda	
papers	
Others:	

4. Share the results of your work with your groupmates and the teacher.

Reading and Note-taking

5. Read the title and sub-headings of the text given below. Discuss with your partner the following questions:

- What is this article about?
- What do you expect to read about in the article?
- What do you expect to read in each part of the article?
- Why are some words printed in **bold**?

6. Read the text from *English Learner's Digest* 'Mineral Resources of Ukraine' and mark the names of minerals in any suitable way (mark, circle or underline).

MINERAL RESOURCES OF UKRAINE

Ukraine is very rich in mineral resources. It contains iron and manganese ores, natural gas, salt, sulphur, graphite, flux, limestone. Ukraine also has deposits of oil, bauxite, ilmenite as well as black coal.

Mineral resources can be classified into three main groups: fuels, metals and non-metals.

Fuels

Fuels include deposits of black and brown coal, oil, natural gas and peat. The reserves of black coal are concentrated in two basins: the Donetsk and Lviv Volynian Basins. Black coal is used for coke production. Coke is necessary for metallurgical industry and used while producing iron and steel. Deposits of brown coal or lignite are to be found in many places on the Right Bank of the river Dnieper. They form the large Dnieper Brown Coal Basin. The western oblasts of Ukraine contain small

deposits of brown coal. Brown coal is used as local fuel for power stations, factories and plants also in household.

Three oil and natural gas regions have been discovered in Ukraine: the Subcarpathian, Dnieper-Donets and Black Sea regions. The most promising deposit of oil in Western Ukraine is the Dolyna field. In the Dnieper-Donets Region the largest gas fields are in Kharkiv Oblast. Gas deposits have been discovered in Sumy, Poltava and Dnipropetrovsk Oblasts. The Black Sea Region encompasses the southern part of Zaporizhzhia and Kherson Oblasts as well as northern part of Crimea.

Peat has been used in Ukraine for a long time. Its extraction has been greatly increased. It is important local fuel in industry. It is also widely used as bedding for livestock and as an organic fertilizer. The greatest deposits of peat are in Polissia, but it is also to be found in marshy river valleys.

Metals

Metals can be classified in two sub-groups: ferrous and non-ferrous metals. Iron ore is used in manufacture of iron and steel considered to be ferrous metals. The deposits of iron ore are one of the largest in the world. They are concentrated in Kryvyy Rih, Kerch, Kremenchuk and Bilozerka.

Ukraine is also rich in deposits of other ores: manganese, mercury, titanium and others. Ukraine is considered to be one of the richest places in the world for reserves in manganese ore which is used in the manufacture of high quality steel. Several deposits are located in Dnipropetrovsk and Zaporizhzhia Oblasts.

Titanium is important in the space, chemical, atomic and other areas. It has been discovered in Dnipropetrovsk Oblast. Mercury is obtained from cinnabar, the largest deposits being the Mykytyvsky field in the Donetsk Oblast. Ukraine has inexhaustible reserves of raw material for production of metallic magnesium, which is obtained from rich brine of Syvash Bay. Ukraine also has deposits of bauxites, used for producing of alluminium, nickel, cadmium, arsenic and antimony.

Non-metallic Minerals

Ukraine's depths are in non-metallic minerals, which are widely used in the national economy. The important ones among them are rock and potassium salts, sulphur, fire clay and building materials. The largest deposits of rock salt are centered in Donbas (Artiomovsk) and in Solotvyno (Subcarpathian Region) and in Transcarpathia. Subcarpathia has also deposits of potassium salts (Kalush) and the largest deposit of native sulphur (Rozdolske). The main deposit of fire clay is in the Donbas (Chasovoyarsk). Large reserves of red and grey granite, chalk, marl are also found in Ukraine.

There are also many curative mineral waters in Ukraine.

6. **a** Using the information from the text complete the table below with appropriate minerals.

WORKSHEET 2.1

FUELS	METALS	NON-METALS

b Compare the results with your partner.

7. Using the information from the text complete the table below with the information on mineral resources in every mentioned region/oblast of Ukraine. If necessary add the names of Oblast/Regions.

WORKSHEET 2.2

Region/Oblast	**Mineral Resources**
Dnipropetrivsk Region/Oblast	
Zaporizhzhia Region / Oblast	
Donetsk Region/Oblast	
Kharkiv Oblast	
Western Ukraine	
Subcarpathia	
Transcarpathia	
The Black Sea Region	
Crimea	
Kherson Oblast	
Poltava Oblast	
Sumy Oblast	

Vocabulary

8. Match the names of minerals (**1** – **25**) in the left-hand column with their translation (**a** – **y**) on the right. Start with those which you can guess easily (they are associated with Ukrainian names). Use a dictionary when necessary.

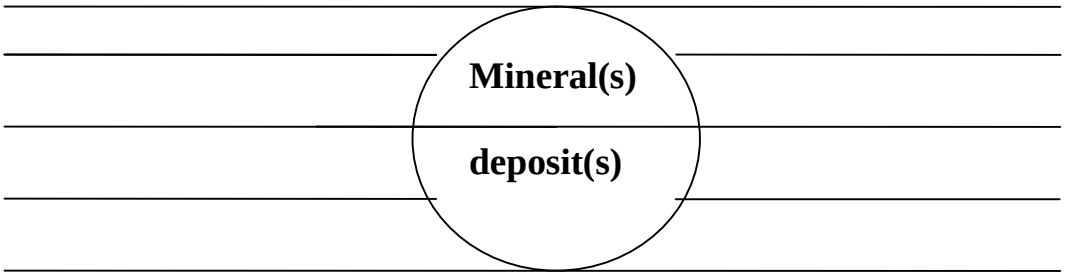
1.	potassium salt	a.	сірка
2.	marl	b.	торф
3.	iron ore	c.	природний газ
4.	mercury	d.	миш'як
5.	bauxite	e.	чорне вугілля
6.	titanium	f.	морська вода
7.	nickel	g.	ільменіт
8.	lignite	h.	вапняк
9.	oil	i.	цілюща вода
10.	natural gas	j.	кіновар
11.	black coal	k.	ртуть
12.	graphite	l.	кам'яна сіль
13.	peat	m.	боксит
14.	rock salt	n.	нафта
15.	ilmenite	o.	титан
16.	cinnabar	p.	магній
17.	arsenic	q.	нікель
18.	bismuth	r.	буре вугілля
19.	antimony	s.	калійна сіль
20.	fire clay	t.	вісмут
21.	limestone	u.	вапниста глина
22.	curative water	v.	залізна руда
23.	brine	w.	графіт
24.	sulphur	x.	вогнетривка глина
25.	magnesium	y.	сурьма

9. Check the list of minerals above with those marked by you while reading (see **6)**. If necessary add minerals and their translation into the list.

10. Find in the text English equivalents to the Ukrainian word ‘родовище’.

11. Find in the text the verbs used with mineral(s), their names or deposit(s). Put them on the lines.

Eg. Ukraine has **deposits** *of …(oil, bauxite, ilmenite as well as black coal).*



Grammar Reference:

Passive Constructions.

Follow-up

12. Sketch the map of Ukraine. Complete it with the symbols of minerals. Mark as many minerals as possible. If necessary use the text.

13. Be ready to describe the completed map to the group.

Unit 2 Types of Mineral Resources

Focus on

- developing a range of vocabulary relevant to mining and geology
- synthesizing ideas
- orienting yourself to the text
- reading paragraphs to understand
- identifying main and supporting ideas
- finding key ideas of every paragraph
- skimming the text
- scanning the text

***By the end of the unit you will*:**

- be able to orient yourself to the text using various strategies
- be able to distinguish between main and secondary points
- be able to understand text organisation
- be able to classify and sort the information
- have practiced reading for detail to obtain information (facts, data etc)
- develop your range of vocabulary in mining (mineral resources)

Warm-up

1. Write minerals you know on 16 separate little cards (a mineral on each card).

2. *Group-work.* Being in groups of three, in turn name the minerals one by one. In case your groupmates have the same mineral on their cards, leave only one card with a name of the mineral for your group. Using your group stockpile of cards, make a list of minerals you know all together. Compare your list with the other groups.

3. Using the stockpile of cards classify the minerals. Be ready to present your group classification and the principles it is based on to the whole group.

Reading

4. *Group-work.* Form 6 groups of two or three students. Each of the group (**1 – 6**) will read different paragraphs (***A, B, C, D, E, F***) from one text. Being in groups choose any of the paragraphs given below and start your group-work with a Prediction Chart.

Prediction Chart

Look at the paragraph you have chosen. Predict :

- What is it about?
- What do you expect to read about in the paragraph?
- What do you expect to read in the other paragraphs?

Share your predictions within your group, explaining what helped you to make the predictions. Put the predictions of all the groups on a poster, drafting a plan for the text to be read.

5. Read the chosen paragraph from the list below and check whether your predictions were right.

A. **Unsustainable resources** make up most of the subsurface materials that geologists are called on to assess. A widely used method for assessing their availability is the **McKelvey scheme.** In this, the **resource base** of a commodity is the total amount that exists on Earth. For most commodities this amount is of no practical interest, because much of it could never be economically exploited. The **resources** represent the part of the resource base that might conceivably be economic in the future. Within this amount, only the **reserves** are both economic now and identified with some geological certainty. A final fraction, previously part of the reserves, has been **already produced** and used by society.

B. Coal, oil and gas, minerals and rocks: these are typical geological resources. They are usually considered to be **non-renewable,** with society progressively depleting a fixed stock of each commodity. By contrast, water or air is usually termed **renewable,** because natural processes replenish and recondition the stock as it is used.

C. The criteria of the McKelvey scheme mean that estimates of reserves and resources vary with changes in economic conditions and geological knowledge (Fig. 5.2a). For instance, reserves appear to increase if the price of a commodity rises, making it attractive, to exploit lower-grade and less accessible resources. Conversely, increased costs of extraction and processing will lower the assessed reserves. Estimates of resources are dependent on geological assumptions about their formation and occurrence. Refinement of these geological models can either increase or decrease resource estimates.

D. However, renewability is not a simple measure. All resources are renewable on some timescale. For instance, oil and gas are forming now in the world's sedimentary basins, and mineral deposits beneath active volcanoes. On the other hand, water from rainfall may not be adequate to refill reservoirs or rock aquifers. A more helpful measure is the **sustainability** of a resource; whether or not its rate of use exceeds its rate of renewal. Most geological resources are **unsustainable,** because their formation processes are very slow on a human timescale. Oil is being used at least a million times faster than it is being recreated. Water and land are potentially **sustainable resources,** but only if managed correctly.

E. **Sustainable resources** are part of a cycle where the rate of use does not exceed the rate of natural replenishment. However, this balance involves quality as well as quantity. A geological resource such as groundwater is used and returned to nature in a dirtier, more degraded state than it was extracted. Natural reconditioning systems such as rivers, plants, evaporation and rainfall must be able to clean water fast enough. These systems are easily damaged by pollution, or even by the over-use of water itself. So excessive pumping can lower underground water levels, dry up natural springs, and starve the rivers which would have helped to purify the pumped water after use.

F. Estimates are further complicated because changes in the reserves can themselves affect economic and social activity, forming feedback loops that slow the potential changes. So, apparent shortages in reserves raise the price of a commodity and therefore the pace of geological exploration, both factors that tend to increase the reserves again. Low estimates of reserves also stimulate recycling of some commodities such as metals, slowing the rate of depletion of the natural stock. Finally, the use of some geological resources may be restrained not by the shortage of reserves but the shortage of safe places to dump the effluents from their production and use. The carbon dioxide derived from burning fossil fuels is the most serious example of this constraint.

6. Being in the same groups (**1** – **6**), decide on the main idea of the paragraph you have read.

7. Arrange 2 or 3 groups of six with the representatives from each of the groups (**1** – **6**) who read paragraph ***A***, ***B***, ***C***, ***D***, ***E***, ***F***. Being in groups of six, share the main ideas of the paragraphs you have read and make a draft plan of the whole text.

8. Being in the same groups of six, arrange the text in the correct order and give the title to it.

9. Come back to your original groups (**1** – **6**) and compare the order of the text and its title done by each of you while being in groups of six. Come to the common decision. Compare the results of your work with the other groups.

10.* Check the results of your work with the authentic text given in ***Part II Self-study Resources.*** Make any changes if necessary.

Follow-up

11. Using the text 'Types of Geological Resources' from Chapter RESOURCES of the textbook *Geology and Environment in Britain and Ireland* by Woodcock, N. (1994), make a diagram of the classification of minerals proposed by the author. Re-read the whole text if necessary.

Unit 3 Internet Databases and Electronic Libraries

Focus on

- exchanging information on different sources of information, electronic ones, in particular
- locating information
- understanding details in instructions
- filling in forms for academic and professional purposes
- writing detailed instructions

***By the end of the unit you will*:**

- be able to orient yourself to the text using various strategies
- be able to understand text organisation
- be able to locate information by filling in library forms, using library catalogues etc.
- have practiced exchanging information obtained from various sources including the Internet
- have practiced reading and writing instructions
- develop a range of vocabulary in IT and Computing

Lead-in

1. *Group-work.* Being in groups of three, discuss the following questions:
   - Where do you usually find information in your specialist subjects? How?
   - When using the Internet what search systems do you usually use? Why?
   - What are their advantages and disadvantages if any?
   - Have you ever used electronic libraries? University local net?

2. *Group-work.* Being in the same groups, think on the main stages of searching information using catalogues of electronic libraries. Share your ideas with the other groups.

Reading and Writing instructions

*Step 1**

3. Look at the leaflets A and B below. Answer the following questions:

- What is the organisation they are from?
- What are they for?

4. Share your ideas with a partner. Explain what helped you to find the answers.

Leaflet A

Options 1-9 are all access points for **all** Short Loan material, but 1-2 and 6 are most likely to produce the most effective methods for finding what you are looking for.

NB: ALL SHORT LOANS ARE KEPT IN THE SHORT LOAN SECTION (CURRENTLY LOCATED ADJACENT TO THE ENQUIRY DESK), APART FROM MA, MEd THESES WHICH ARE KEPT IN THE STACK.

If you choose to search by **Lecturer's Name**, please remember to type in the **surname** first. This will produce a summary list with the name and the number of Short Loan titles linked to that person. By choosing the appropriate entry, a full list of all the books will be displayed. You can then choose to look at the full record of any of these items by entering its line number for more detail.

Reserving Short Loans
Once you have selected your record you will see various options on a line at the bottom of the screen. To see whether the book is out or on the shelf, press **C** for **Copy Status.** (Figure 3)

```
13 JUN 01        College of St Mark & St John                    02:31pm
                 Public Access Catalogue

   Call Number   SHORT LOAN                Status : checked In
        001.6443

   TITLE  Dictionary of computer graphics / John Vince
   PUBLISHER   Pinter

   SUBJECTS   Computer graphics/Dictionaries.
   ISBN/ISSN   0861876237 (pbk)
   NOTES   1) xii, 132 p., [8] p. of plates : ill. (some col.), 1 map ; 23

SO=Start Over, B=Back, RW=Related Works, ?=Help, C=Copy status
```

Figure 3

To place a reservation on this item, press **R** for **Reserve**. (Figure 4)

```
13 JUN 01        College of St Mark & St John                    02:32pm
                 Public Access Catalogue

 Author  Vince, John
 Title  Dictionary of computer graphics / John Vince ...   Holds:  0

   CALL NUMBER              STATUS       LIBRARY
 1. SHORT LOAN              checked In   College of St Mark and St
    001.6443

 Choose a command :
SO=Start Over, B=Back, R=Reserve, ?=Help
Enter your selection(s) and press <enter> :
S=Shortcut on, BB=Bulletin Board, ?=Help
```

Figure 4

Reserve short loan on catalogue Aug 2001 2
U/ARichman./library leaflets

The College of St Mark & St John
Library

HOW TO PLACE RESERVATIONS ON THE CATALOGUE

If you require an item e.g. Book, Video, etc. which has been Checked Out to another borrower you may place a Reservation on it.

[Please note that Reservations are also known as Holds]

Placing A Reservation

- Start a search at the PAC menu
- Select method of search e.g. Title, Author or Subject and search in the usual way
  (see leaflet – How to search the library catalogue).
- When the required title has been found enter **C** for **Copy status**
- At the command line enter **R** for **Reserve**
- The system will ask you to enter your library barcode
- Enter the library barcode that is on the front of your Campus Card
- The system will now inform you that you have placed a Reservation (Figure 1). Notification will be sent to your pigeon-hole once the item has been returned

HOLDS/RECALLS

Borrower BLOGGS, JOE

Copies: 2
Holds: 0

Author Singer, Peter
Title Companion to ethics / edited by Peter Singer

HOLD (First available copy)
Library will notify you by MAIL

Your pickup location will be at College of St Mark and St John Library.
A hold on this title will be effective until...

[A date will be supplied by the system. This will normally be 6 weeks from when the reservation is placed]

Press <enter> :

Figure 1

- Press <enter> this will return you to the **Copy status** screen
- Type **SO** to **Start Over.** This will return you to the main menu

Reserving items that are 'Checked In'

- If an item is not on loan the system will tell you to check the shelves
- If you cannot find the item tell a member of staff who will place a **Trace** on it
- When the item has been traced it will appear on your record as a normal **Reservation**

What happens when your Reservation has been returned?

- When a Reservation is returned a notice will automatically be sent to your pigeon- hole informing you that the item is ready for collection
- A message is also placed on your record which will appear next time you use your Campus Card at the issue counter, or can be read through your borrower record either in the library or through the inter/intra nets.
- Ask at the issue counter for your Reservation
- The item will be issued to you on your Campus Card

5. *Group-work.* Arrange two groups. Each group will read only one leaflet (A or B). While reading, decide:

- What text-type is it?
- What is the role of figures?
- Why are some words printed in CAPITALS and the others in **bold**?

Discuss the answers within your groups.

6. *Pair-work.* Arrange the pairs of representatives of both groups. In pairs share the answers of your group. Find out:

- What is different in both leaflets?
- What is common in them?
- What are they for?

Compare the results of your pair-work with the other pair.

7. Fill in the forms given in figures of the leaflet you have read. If you have any problems with it, raise the question for the whole group.

Follow-up

8. Make a book loan form typical for Ukrainian libraries. If necessary, go to your University or city library.

Step 2

9. Below are the instructions for using the Internet when searching the materials in your specialism area made by last year students. Unfortunately, they are scrambled.

9.1 Being in pairs unscramble the instructions by putting the sentences below in the correct order. Put your answers into the **ANSWER SHEET**.

1. Decide on the topic of your interest.

2. Decide which one you want to download.

3. Repeat this operation as many times as necessary.

4. Switch on to the Internet.

5. Type in the key-words of the topic you are exploring.

6. Choose any search engine you know.

7. Click on Search or Go.

8. Look through the abstracts appeared.

9. Click on the right button of a mouse and select Save as...

ANSWER SHEET				
Sentence Number	Your pair decision	The other pair decision	Whole-group decision	After checking at home

9.2 Compare the results of your work with the other pairs. Come to the whole group decision.

Follow-up

10. Use the instructions for information search in the Internet to obtain information on a topic of your study and/or interest.

11. Put the correct answer into column **5** after practising the unscrambled instructions. If necessary make any changes in the instructions of last year students or write your own ones.

12. Make your own instructions on information search in the Internet.

13. Find any electronic text in your specialism area through the Internet using the instructions you have developed.

Unit 4 Coal Mining

Focus on

- understanding details in instructions
- sharing experience of writing instructions
- indicating specific study- and subject-related information using Internet wikipedia
- orienting yourself to the text
- reading headings and sub-headings
- skimming the text
- scanning the text
- reading and taking notes
- developing a range of vocabulary relevant to mining

***By the end of the unit you will*:**

- be able to orient yourself to the text using various strategies
- be able to understand text organisation
- be able to locate specific information using Contents and References
- be able to skim and scan authentic texts
- have practiced exchanging information obtained from various sources including the Internet
- have practiced reading and taking notes
- develop a range of vocabulary relevant to coal mining

Warm-up

1. *Pair-work.* In pairs compare your instructions on using the Internet when searching the specialist information.
2. If necessary, make any changes in the instructions you have written.
3. Design the whole-group version of the Instructions.

Lead-in

4. Brainstorm the following questions:

- What is a Wiki and what wikis do you know?
- What are advantages and disadvantages of using Wikis?

4.1 Give the definition to Wiki, using the following structure:

A Wiki is (*what?)*_____ that *(do what?)*_____.

It is often used *(what for?)*_____.

5. Read the definition of a Wiki given on the site: http://www. Wiki - Wikipedia, the free encyclopedia.htm and compare it with your answers.

A **wiki** is software that allows users to create, edit, and link web pages easily. Wikis are often used to create collaborative websites and to power community websites. They are being installed by businesses to provide affordable and effective Intranets and for Knowledge Management. Ward Cunningham, developer of the first wiki, WikiWikiWeb, originally described it as "the simplest online database that could possibly work".[1] One of the best known wikis is Wikipedia.[2]

Reading and Taking notes

6. Below is a *wikipedia, the free encyclopedia.htm* found using Google search system (http://www. google.com) with the help of key words 'Coal Mining'.

Group-work. Before reading the text, predict what it will be about by answering the questions from Prediction Chart.

Prediction Chart

- What information can you find in this text?
- What rubrics will it propose to a reader?
- How will the whole text be arranged?
- What information would you like to find in this text?
- If you have an access to computer now, will you find more details on the topic?

Share your predictions within your group, explaining what helped you to make the predictions.

7. Look through the text and decide on its structure. Pay attention to the pictures and think of their roles. Exchange your ideas with a partner.

8. *Group-work.* Arrange three groups **A**, **B** and **C**. Being in your groups, do the following:

8.1 **Group A:** Scan the text and find out what *types of coal* are mentioned in the article.

8.2 **Group B:** Scan the text to find out what *types of coal mining* are mentioned in the article.

8.3 **Group C:** Skim the text paying attention to headings and sub-headings and make a plan of the text. Compare your plan with Contents given at the beginning of the text. Be ready to answer the following questions:

- Were all the rubrics mentioned? If not, which ones were missed?
- Would you like to make any changes in the Contents of the text? If yes, why?

Coal mining

From Wikipedia, the free encyclopedia

Jump to: navigation, search

This article or section deals primarily with the United States and does not represent a **worldwide view** of the subject.

Please improve this article or discuss the issue on the talk page.

Wyoming coal mine

Coal mining is the extraction of coal from the earth for use as fuel. A coal mine and its accompanying structures are collectively known as a **colliery**. For the world history see History of coal mining. See also world coal reserves and major coal exporters

Contents

[hide]

[edit] Methods of extraction

The most economical method of coal extraction from coal seams depends on the depth and quality of the seams, and also the geology and environmental factors of the area being mined. Coal mining processes are generally differentiated by whether they operate on the surface or underground. Many coals extracted from both surface and underground mines require washing in a coal preparation plant.

[edit] Surface and mountaintop mining

If the coal seams are near the surface, the coal is extracted by strip mining. Strip mining exposes the coal by the advancement of an open pit or strip. As the coal is exposed and extracted, the overburden from the still covered coal fills the former pit, and the strip progresses. Most open cast mines in the United States extract bituminous coal. In South Wales open casting for steam coal and anthracite is practiced.

Mountaintop removal is a form of surface mining that takes place at the topmost portion of a mountain, and is a technique that is commonly applied in Appalachia. Utilized for the past 30 years, mountaintop mining involves removing the highest part of the mountain for the maximum recovery of coal. The process is notorious for destruction of entire ranges. So is the practice of ***hollow fills***, or filling in valleys with mining debris, covering streams and disrupting ecosystems. [1]

[edit] Underground mining

Most coal seams are too deep underground for open cast mining and thus this type of mining is called underground mining. In deep mining, the room and pillar or bord and pillar method progresses along the ***Mammoth coal vein*** seam, while pillars and timber are left standing to support the coal mine roof. A most dangerous method of operation in deep mining and is known as ***robbing the pillars***. This is where miners attempt to remove and/or retreat between the timbers in order to get coal out of the main coal seam, allowing the roof to cave in. This method of mining is used principally in the United States and has contributed to many fatalities in the industry of coal mining.

There are four major underground mining methods:

- Longwall mining – accounts for about 50% of underground production. The longwall shearer has a face of 1000 feet or more. It is a sophisticated machine with a rotating drum that moves mechanically back-and-forth across a wide coal seam. The loosened coal falls onto a pan line that takes the coal to the conveyor belt for removal from the work area. Longwall systems have their own hydraulic roof supports for overlying rock that advance with the machine as mining progresses. As the longwall mining equipment moves forward, overlying rock that is no longer supported by the coal that has been removed is allowed to fall behind the operation in a controlled manner. The supports make possible high levels of production and safety. Sensors detect how much coal remains in the seam while robotic controls enhance efficiency. Longwall systems allow a 60-to-80% coal recovery rate where the surrounding geology allows their use.

- Continuous mining– Utilizes a machine with a large rotating steel drum equipped with tungsten carbide teeth that scrape coal from the seam. Operating in a “room and pillar” system – where the mine is divided into a series of 20-to-30 foot “rooms” or work areas cut into the coalbed – it can mine as much as five tons of coal a minute – more than a miner of the 1920s would produce in an entire day. Continuous miners account for about 45% of underground coal production, and also utilize conveyors to transport the removed coal from the seam. Remote controlled continuous miners are used to work in a variety of difficult

seams and conditions and robotic versions controlled by computers are becoming increasingly common.

- Conventional mining – An older practice that uses explosives to break up the coal seam, after which the coal is gathered and loaded onto shuttle cars or conveyors for removal to a central loading area. This process consists of a series of operations that begins with "cutting" the coalbed so it will break easily when blasted with explosives. This type of mining accounts for less than 5% of total underground production in the U.S. today.

- Shortwall mining– A method that accounts for less than 1% of deep coal production, shortwall involves the use of a continuous mining machine with moveable roof supports, similar to longwall. The continuous miner shears coal panels 150-200 feet wide and more than a half-mile long, depending on other things like the strata of the Earth and the transverse waves.

[edit] History

Main article: History of coal mining

The oldest continuously worked deep-mine in the UK and possibly the world is Tower Colliery at the northern end of the south Wales valleys. This colliery was started in 1805 and at the end of the 20th century it was bought out by its miners rather than being allowed to be closed.

The World Championships in coal-carrying take place every Easter Monday, at Ossett in West Yorkshire, UK The race starts from the site of the old Savile & Shaw Cross colliery.

The first commercial coal mines in the United States were started in 1748 in Midlothian, Virginia, near Richmond, Virginia.[2]

In the 1880s, Coal-cutting machines became available (prior to that, coal was mined underground by hand.)

By 1912, surface mining was underway with steam shovels specifically designed for coal mining.

[edit] Modern Mining in America

Technological advancements have made coal mining today more productive than it has ever been. To keep up with technology and to extract coal as efficiently as possible modern mining personnel must be highly skilled and well trained in the use of complex, state-of-the-art instruments and equipment. Future coal miners have to be highly educated and many jobs require four-year college

degrees. Computer knowledge has also become greatly valued within the industry as most of the machines and safety monitors are computerized.

The increase in technology has significantly decreased the mining workforce from 335,000 coal miners working at 7,200 mines fifty years ago to 104,824 miners working in fewer than 2,000 mines today. As some might see this as a sign that coal is a declining industry its advances has reported an 83% increase of production from 1970 to 2004. These statistics are provided by the National Mining Association.

[edit] Dangers to miners

Historically, coal mining has been a very dangerous activity. Open cut hazards are principally slope failure, underground mining roof collapse and gas explosions. Most of these risks can be greatly reduced in modern mines, and multiple fatality incidents are now rare in the developed world. [3]

However, in lesser developed countries, thousands continue to die annually in coal mines. China, in particular, has the highest number of coal mining related deaths in the world, with official statistic 6,027 deaths in 2004[4]. To compare, the USA reported 28 deaths in the same year[5]. Coal production in China (highest in the world) is only double compared with USA[6].

Chronic lung diseases, such as pneumoconiosis (black lung) were once common in miners, leading to reduced life expectancy.

Build-ups of a hazardous gas are known as damps, possibly from the German word "Dampf" which means steam or vapor:

- Black damp: a mixture of carbon dioxide and nitrogen in a mine can cause suffocation
- After damp: similar to black damp, an after damp consists of carbon dioxide and nitrogen and forms after a mine explosion
- Fire damp: consists of mostly methane, a flammable gas
- Stink damp: so named for the rotten egg smell of the sulfur, a stink damp can explode
- White damp: mainly carbon monoxide, suffocates like black damp [*also, Carbon monoxide is very toxic, even in concentrations as low as 5 ppm*]

There have been many deaths related to the safety conditions that exist in coal mines around the world. (See: Mining accidents)

Mildred, PA coal sludge

[edit] Safer times in modern mining

Improvements in mining methods (e.g. longwall mining), hazardous gas monitoring (such as safety-lamps or more modern electronic gas monitors), gas drainage, and ventilation have reduced many of the risks of rock falls, explosions, and unhealthy air quality. Statistical analyses performed by the U.S. Department of Labor's Mine Safety and Health Administration (MSHA) show that between 1990 and 2004, the industry cut the rate of injuries (a measure comparing the rate of incidents to overall number of employees or hours worked) by more than half and fatalities by two-thirds following three prior decades of steady improvement.

According to the Bureau of Labor Statistics, coal mining is not even among the top 10 most dangerous occupations in America per capita. Pilots, truck and taxi drivers, loggers, fishermen, roofers and other occupations face greater on the job risks than coal miners.

[edit] Environmental impacts and mitigation

Coal mining causes adverse environmental impacts. These include:

1. Release of methane, a dangerous greenhouse gas
2. Interference with groundwater and water table levels
3. Impact of water use on flows of rivers and consequential impact on other landuses
4. Dust
5. Subsidence above tunnels, sometimes damaging infrastructure eg roads in the Lake Macquarie area in NSW, Australia
6. Rendering land unfit for the common usage of the area.

In addition, burning of coal, mainly for power generation, is a leading contributor to greenhouse gas emissions, climate change and global warming.

Strip mining severely alters the landscape, which has damages environmental value in the surrounding land. Mountaintop removal to remove coal is a large negative change to the environment. While there are sometimes requirements for remediation of the strip mined area, the remediation is often delayed for decades. One of the legacies of coal mining is the low coal content waste forming boney piles.

In response to negative land effects of coal mining and the abundance of abandoned mines in the USA, the federal government enacted the Surface Mining Control and Reclamation Act of 1977 (SMCRA), which requires reclamation plans for future coal mining sites. Reclamation plans must be approved and permitted by federal or state authorities before mining begins. As of 2003, over 2 million acres (8000 km²) of previously mined lands have been reclaimed in the United States.

All forms of mining are likely to generate areas where coal is stacked and where the coal has significant sulphur content, such coal heaps generate highly acidic, metal-laden drainage when exposed to rainfall. These liquors can cause severe environmental damage to receiving water-courses. Coal mining releases approximately twenty toxic release chemicals, of which 85% is said to be managed on site. In modern mining, operations must, under federal and state law, meet standards for protecting surface and ground waters from contamination, including acid mine drainage (AMD). To mitigate these problems, water is continuously monitored at coal mines. The five principal technologies used to control water flow at mine sites are: diversion systems, containment ponds, groundwater pumping systems, subsurface drainage systems, and subsurface barriers. In the case of AMD, contaminated water is generally pumped to a treatment facility that neutralizes the contaminants. Still, AMD remains a large problem, emanating from coal mines abandoned in the United States prior to SMCRA.

It is also thought that coal mining is harmful to the quality of air in the surrounding regions. While burning of coal in power plants is most harmful to air quality, the process of mining can release pockets of hazardous gases. These gases may pose a threat to coal miners as well as a minor source of air pollution. In recent years, there has also been concern for the safety of miners who work in subsurface coal mines.

[edit] References

- Daniel Burns. *The modern practice of coal mining* (1907)
- Hughes. Herbert W, *A Text-Book of Mining: For the Use of Colliery Managers and Others* (London, many editions 1892-1917), the standard British textbook for its era.
- James Tonge. *The principles and practice of coal mining* (1906)
- Charles V. Nielsen and George F. Richardson. *1982 Keystone Coal Industry Manual* (1982)
- Hayes, Geoffrey. *Coal Mining* (2004), 32 pp

- A.K. Srivastava. *Coal Mining Industry in India* (198) (ISBN 81-7100-076-2)
- Chirons, Nicholas P. *Coal Age Handbook of Coal Surface Mining* (ISBN 0-07-011458-7)
- Saleem H. Ali. Minding our Minerals, 2006. [1]

[edit] External links

Wikimedia Commons has media related to:

Coal mining

9. Come back to your original groups. Compare and discuss the results of your group-work. Share your experience focusing on your difficulties and 'know-hows' of reading developed.

10. *Pair-work.* In pairs decide on what changes you will make in the content of the web-site text, if you were designers of a web-site page 'Coal Mining'.

Vocabulary

11. Using the text match the types of underground mining on the left with their descriptions on the right.

1. Longwall mining	A) This type uses explosives to break up the coal seam, after which the coal is gathered and loaded onto shuttle cars or conveyors for removal to a central loading area. This process consists of a series of operations that begins with "cutting" the coal bed so it will break easily when blasted with explosives.

2. Continuous mining	B) A method that accounts for less than 1% of deep coal production, it involves the use of a continuous mining machine with moveable roof supports, similar to longwall. The continuous miner shears coal panels 150-200 feet wide and more than a half-mile long, depending on other things like the strata of the Earth and the transverse waves.
3. Conventional mining	C) This method utilizes a machine with a large rotating steel drum equipped with tungsten carbide teeth that scrape coal from the seam. Operating in a "room and pillar" system – where the mine is divided into a series of 20-to-30 foot "rooms" or work areas cut into the coal bed.
4. Shortwall mining	D) The longwall shearer has a face of 1000 feet or more. It is a sophisticated machine with a rotating drum that moves mechanically back-and-forth across a wide coal seam.

12. Match the **words** (1 – 12) with their definitions (A – L) given in the box.

1. **bed**	3. **bituminous coal**
2. **coal**	4. **coal mine**
A) A stratum of coal or other sedimentary deposit.	B) A middle rank coal (between subbituminous and anthracite) formed by additional pressure and heat on lignite. Usually has a high Btu value and may be referred to as 'soft coal'.

C) An area of land and all structures, facilities, machinery, tools, equipment, shafts, slopes, tunnels, excavations, and other property, real or personal, placed upon, under, or above the surface of such land by any person, used in extracting coal from its natural deposits in the earth by any means or method, and the work of preparing the coal so extracted, including coal preparation facilities. British term is "colliery".	D) A solid, brittle, more or less distinctly stratified combustible carbonaceous, formed by partial to complete decomposition of vegetation; varies in color from dark brown to black; not fusible without decomposition and very insoluble.
5. coal reserves	**7. coke**
6. conventional mining	**8. crop coal**
E) Measured tonnages of coal that have been calculated to occur in a coal seam within a particular property.	F) Coal at the outcrop of the seam. It is usually considered of inferior quality due to partial oxidation, although this is not always the case.
G) A hard, dry carbon substance produced by heating coal to a very high temperature in the absence of air.	H) The first fully-mechanized underground mining method involving the insertion of explosives in a coal seam, the blasting of the seam, and the removal of the coal onto a conveyor or shuttle car by a loading machine.

9. deposit	**11. drift mine**
10. development mining	**12. fossil fuel**
I) An underground coal mine in which the entry or access is above water level and generally on the slope of a hill, driven horizontally into a coal seam.	J) Work undertaken to open up coal reserves as distinguished from the work of actual coal extraction.
K) Any naturally occurring fuel of an organic nature, such as coal, crude oil and natural gas.	L) Mineral deposit or ore deposit is used to designate a natural occurrence of a useful mineral, or an ore, in sufficient extent and degree of concentration to invite exploitation.

Follow-up

13. Choose any of the articles on the site you are interested in. You can access any of them on the site http://en.wikipedia.org. Be ready to explain your choice for the whole group.

14. Prepare a mini-presentation on the information you have obtained from the article.

15. Read the article you have chosen and be ready to talk about your personal interpretation of it fulfilling the series of Preparation Tasks:

- Do a quick reading – skim rapidly, or read the beginning and the end of the article. Jot down what you think the article is about.
- Read and note the main points raised in each of the paragraphs.
- Try to make a diagram reflecting the main ideas of the article.

- Write a very brief ‘record card’ length summary of your own to remind you what the article is about. You may use this card when speaking about the article.
- Choose a quotation(s) from the text to use it as support in discussion.

For writing ‘record card’ see **Section 5.1** in ***Part II Self-study Resources***.

Unit 5 Coal Extraction

Focus on

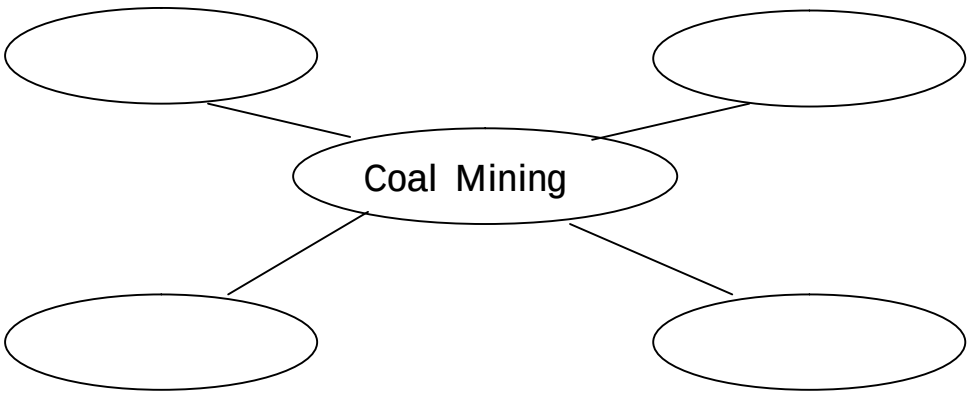
- developing a range of vocabulary relevant to coal mining
- describing charts and diagrams
- labelling diagrams
- reading and describing figures
- reading for detail

***By the end of the unit you will*:**

- be able to read and interpret figures, charts, diagrams etc.
- be able to locate information using various clues
- be able to understand details in authentic texts related to mining
- have practised exchanging information obtained from various sources
- have practised reading and describing figures, charts, diagrams etc., instructions
- develop a range of vocabulary relevant to coal mining

Lead-in

1. Draw your mind-map (a spider gram) for coal mining. Think of methods, equipment etc. used while mining.



2. *Pair-work.* Describe your mind-map to a partner.

3. Listen to your partner's mind-map description. Make any changes in your mind-map if appropriate.

Reading and Speaking

4. You are going to read the text. Look at the figures from the text given below and try to predict:

- What will the text be about?
- What is the title of the text?
- What will sub-headings of the text be?

5. *Pair-work.* Share your predictions with your partner.

6. Sign the figures. *Example: Fig. 1.* *Surface Mining.*

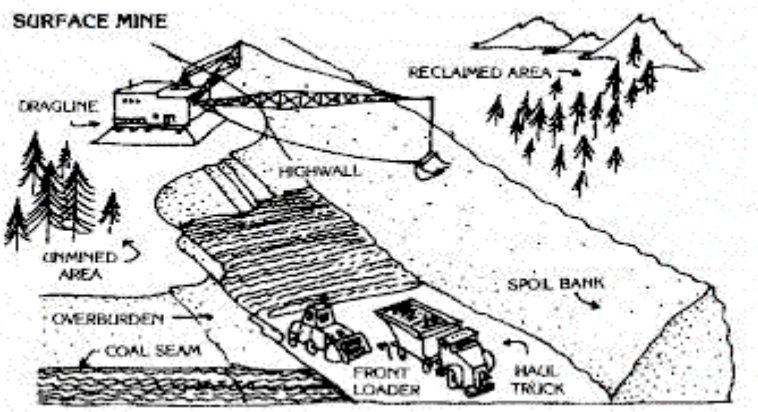


Fig. 1._____

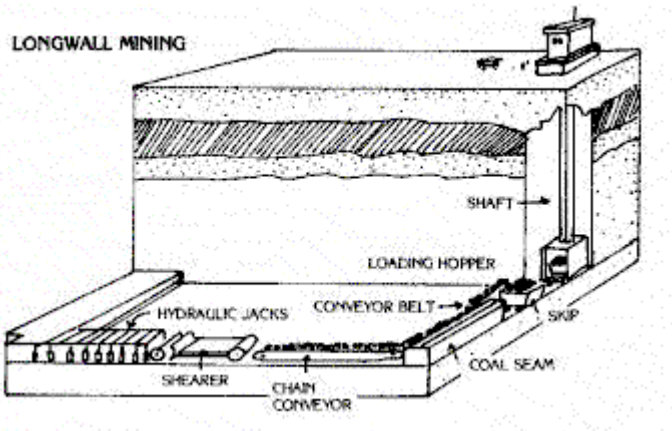


Fig. 2._____

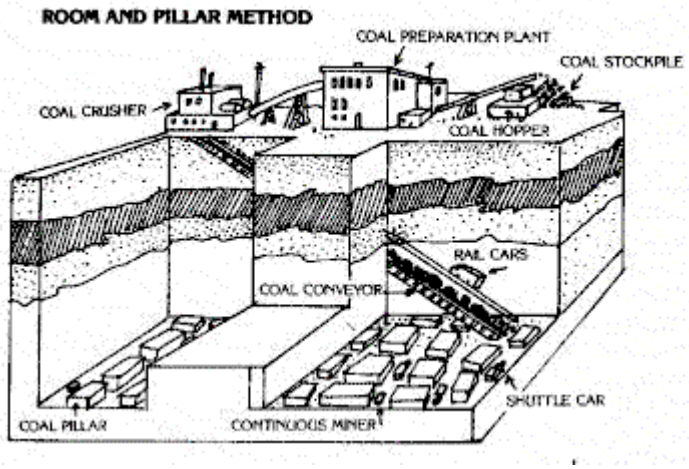


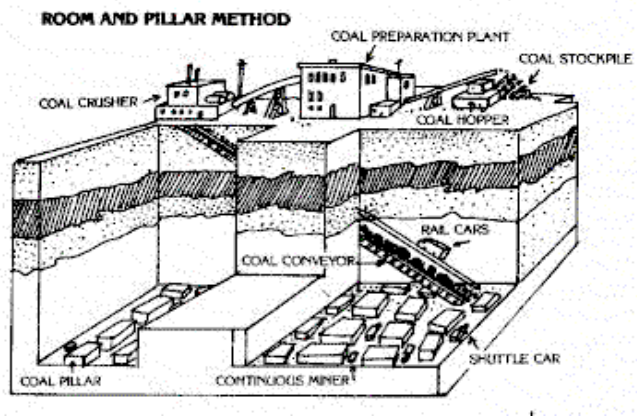
Fig. 3._____

7. Read the text downloaded from Internet site '*Kentucky Coal Education*' (http://www.coaleducation.org). Pay attention to the figures which illustrate the paragraphs of the text. Check the order of figures (Fig. 1 – Fig. 3) given in the previous task with those given in the text. Put them in the correct order and make any changes in signatures when necessary.

Background Information – How is coal mined?

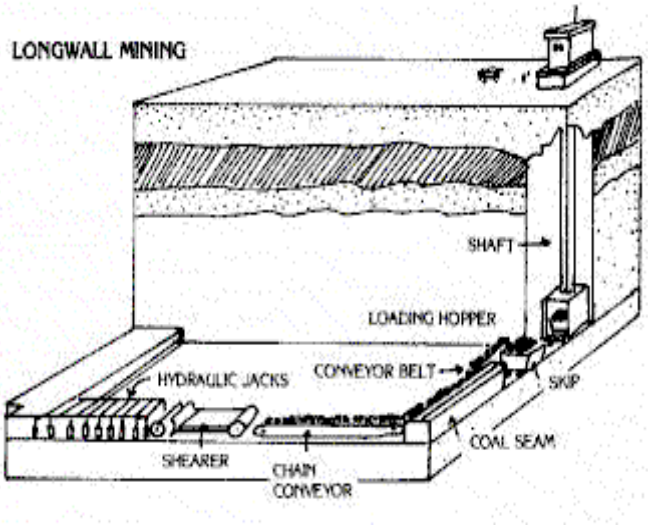
As was the case 50 years ago, most coal is produced from two major types of mines – underground and surface. But the methods for recovering coal from the earth have undergone drastic changes in the past 25 years, as a consequence of technological advances.

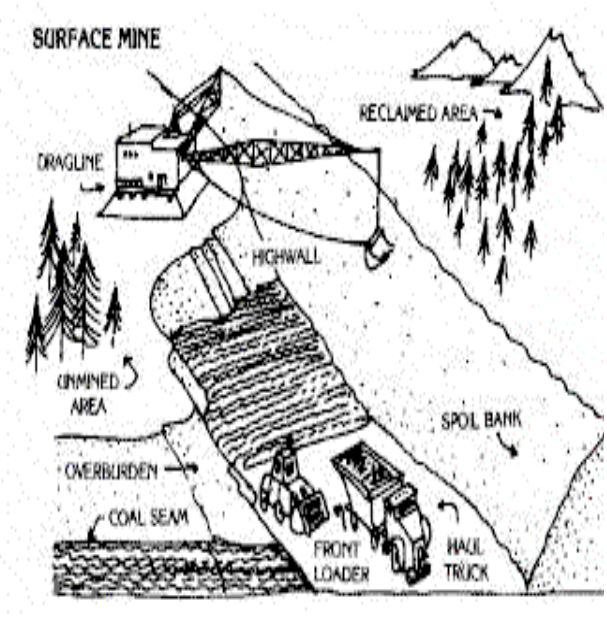
Fifty years ago when most coal mining was done manually, underground mines accounted for 96 percent of the coal produced each year. Today, almost 60 percent is produced from surface mines. Most underground mines in the United States are located east of the Mississippi River, although there are some in the West, particularly in Utah and Colorado.



More than two-thirds of the coal produced underground is extracted by continuous mining machines in the room-and-pillar method. The continuous mining machine contains tungsten bits on a revolving cylinder. The continuous miner breaks the coal from the face and then conveys it to a waiting shuttle car which transports it to the conveyor belt to be moved to the surface. No blasting is needed. After advancing a specified distance, the continuous miner is backed out and roof bolts are put in place. The process is repeated until the coal seam is mined.

Another method, called longwall mining, accounts for about 20 percent of production. This method involves pulling a cutting machine across a 400 to 600 foot long face (longwall) of the coal seam. This machine has a revolving cylinder with tungsten bits that shear off the coal. The coal falls into a conveyor system which carries it out of the mine. The roof is supported by large steel supports, attached to the longwall machine. As the machine moves forward, the roof supports are advanced. The roof behind the supports is allowed to fall. Nearly 80 percent of the coal can be removed using this method. The remaining 11 percent of underground production is produced by conventional mining which uses explosives to break up the coal for removal.





Half of the minable surface coal in the United States is located in the West, but significant amounts are also present in Appalachia and Midwestern states. Surface mining is used when the coal seam is located relatively close to the surface, making underground mining impractical.

Before a company can surface mine, it must gather information about the site regarding growing conditions, climate, soil composition, vegetation, wildlife, etc. With this information, the company then applies to the state or federal government for a permit to mine. The company must post a bond for each acre of land it mines to assure that it will be properly reclaimed.

Most surface mines follow the same basic steps to produce coal. First, bulldozers clear and level the mining area. The topsoil is removed and stored for later use in the reclamation process. Many small holes are drilled through the overburden (dirt and rock above the coal seam) to the coal seam. Each is loaded with explosives which are discharged, shattering the rock and overburden. Giant power shovels or draglines clear away the overburden until the coal is exposed. Smaller shovels then scoop up the coal and load it onto trucks, which carry the coal to the preparation plant.

Once the coal is removed, the land is returned to the desired contour and the topsoil is replaced. Native vegetation and/or trees are planted. Coal companies operating surface

mines must comply with strict requirements and regulations of the Federal Surface Mining Control and Reclamation Act. A crucial part of the surface mining process is restoring a mined site to acceptable ecological conditions, which means it must be made as productive as it was prior to mining. There are farms, parks, wilderness and recreation areas on what was once surface mines.

The major stigma associated with the coal industry today is the abandoned or "orphan" mines of the early coal mining years. These orphan mines are systematically being reclaimed under the Surface Mining Act taxes coal producers at the rate of 35 cents a ton for surface mined coal, 10 cents a ton for lignite mined coal, and 15 cents a ton for underground mined coal. The tax is paid to the government and is used to reclaim the orphaned mines.

Provided by ***National Energy Foundation.***

http://www.coaleducation.org

8.* Match the terms (1 - 8) with their definitions (a - h).

1.	room and pillar mining	a)	A coal mine cave-in especially in permanent areas such as entries.
2.	roof bolt	b)	An underground mine in which the main entry or access is by means of a vertical shaft.
3.	roof fall	c)	A mine in which the coal lies near the surface and can be extracted by removing the covering layers of rock and soil.
4.	roof support	d)	A method of underground mining in which approximately half of the coal is left in place to support the roof of the active mining area. Large ‘pillars’ are left until ‘rooms’ of coal are extracted.
5.	shaft mine	e)	Layers of soil and rock covering a coal seam. Overburden is removed prior to surface mining and replaced after the coal is taken from the seam.
6.	shortwall	f)	Posts, jacks, roof bolts and beams used to support the rock overlying a coal seam in an underground mine. A good roof support plan is part of mine safety and coal extraction.

7.	surface mine	g)	A long steel bolt driven into the roof of underground excavations to support the roof, preventing and limiting the extent of roof falls. The unit consists of the bolt (up to 4 feet long), steel plate, expansion shell, and pal nut. The use of roof bolts eliminates the need for timbering by fastening together, or "laminating," several weaker layers of roof strata to build a "beam."
8.	overburden	h)	An underground mining method in which small areas are worked (15 to 150 feet) by a continuous miner in conjunction with the use of hydraulic roof supports.

9.* *Pair-work.* Describe any of the figures above to your partner. While listening to your partner, sketch the mining method being described. Compare the sketch with the original drawing given in the text.

Follow-up

10. Sketch a mining method typical for your region.

11. Write the description of the figure. Be ready to give mini-presentation on mining methods used in your region. Use ***Part II Self-study Resources*** when necessary.

Unit 6 Resource Extraction

Focus on

- giving mini-presentations on topics within academic and/or professional field
- reading and understanding rubrics for testing
- following test instructions
- orienting yourself to the text
- finding key ideas
- identifying main and supporting ideas of each paragraph
- skimming the text
- scanning the text
- reading for detail
- reading figures and charts

***By the end of the unit you will*:**

- be able to read and understand rubrics for testing
- be able to understand and follow test instructions
- be able to read for detail
- be able to make mini-presentations on mining methods using the information obtained from specialism-related texts
- be able to read and understand figures illustrating texts
- be aware of various mining methods and share the information got on them from various sources

Lead-in

1. *Pair-work.* In pairs, share the mining methods you are aware of. Describe the mining method used in your region as an example.

2. Group-work. Give mini-presentations of the mining methods used in your regions. Decide on what mining methods are typical for Ukraine.

3. Check your progress according to the Quiz proposed by the Internet site getinfo@osmre.gov. Before doing this Quiz read carefully the instructions given below. Instead of 'clicking red button next to each answer', put tick (on the left) against right answer. When you finish compare the results with your groupmates.

If possible use this site to check yourself. Compare the score with your group-mates.

Coal mining

Home Page | Directory | Index | Search | Ask a question | Help

Test Instructions:

1. Read the short paragraph below (green text)
2. Click the red button next to each answer you think is most correct.
3. If you do not know the answer, ***do not guess***, since wrong answers are penalized.
4. If you check the wrong red button, simply click the correct one to change it.
5. If you have checked a red button with a guess and wish to deselect all red buttons for that question, just click the lit red button.
6. When finished, click the "Click When Finished Button" at the end of the test. Your score will appear below it, and all correct answers will be lit with a green button. Check the "green lit" answers you didn't know to correct your mistakes.

Last year 57% of the coal was produced from surface mines and 44% from underground mines. Current mining methods require large equipment and specialized technical skills. In the last 20 years mines have become larger; but, fewer in number.

Todays mine workers need what skills?	
	Mining engineering
	Heavy equipment operation
	Blasting
	Environmental problem solving
	All of the above
Most mines are operated by?	
	Small businessmen
	Colleges and universities
	Land owners who have the coal resources
	Large mining companies
	None of the above
The mining type that produces the most coal?	
	Underground mining
	Auger mining
	Surface mining
	Contour mining
	None of the above
Coal can be surfaced mined if it's?	
	Less than 600 feet deep
	Not more than 2,000 feet deep
	20 to 40 feet deep
	On the surface of the ground
	None of the above

In 1977 we had more than 4,000 coal mines, today there are about?	
	2,308
	Just under 4,000
	270
	Almost 8,000
	None of the above
Office of Surface Mining 1951 Constitution Ave. N.W. Washington, D.C. 20240 202-208-2719 getinfo@osmre.gov	

Reading for detail

4. Look through the text from the textbook *Geology and Environment in Britain and Ireland* by Woodcock, N. (1994), pay attention to the words printed differently (in **bold**, *italics*) and predict what information you will find in the text. Share your predictions within groups of three.

5. Read the text and check whether your predictions were right.

Underground mining

Longwall mining is the main method of extracting coal in Britain; it can be used for any laterally continuous rock body with a uniform thickness and a gentle dip. Coal is removed by a track-mounted cutter moving along a face several hundred metres long. The cutter operates beneath a roof supported by hydraulic jacks, which are slid forwards after the cutter has passed. The roof behind the jacks collapses onto the former floor of the coal seam, the **goaf.** The face can advance by

up to a kilometre each year. Access to it is maintained by tunnels joining each end of the face to the mine haulage roadways.

The roof collapse behind a longwall face propagates upwards and outwards through the overlying rock with a geometry measured by the **angle of draw**.

This varies with the rock strength but is roughly 30°, resulting in a **subsidence bowl** at the ground surface considerably wider than the **extracted panel** of coal. The maximum depth of the subsidence bowl is always less than the seam thickness, because of the volume increase as cracks open up within the subsiding rocks. Also damaging to built structures is the ground tilt as the subsidence wave passes, and the related cycle of surface extension and shortening. However, these effects were more severe with older shallow mining than during modern mining of deep seams. Moreover, the pattern and timing of subsidence over longwall faces is predictable, so that structures at risk can be strengthened before mining begins.

Pillar-and-stall working is also suited to gently dipping beds. The deposit is only partially removed, leaving intervening pillars to support the roof. The pillars are elongate or American coal mines the pillars are removed on retreat from the seam, allowing roof collapse similar to that of a longwall face.

However, pillars have been left in place in most mines in the British Isles. These include modern gypsum mines, and old mines for coal, building stone, ironstone and clays.

The old mines present a serious hazard to development in old mining areas. An example from Suffolk involved **roof collapse** into the passages of underlying chalk mines at 10-12m depth. Collapse was triggered by changes in groundwater flow induced by building development in the late 1960s. Other types of failure can include **multiple pillar failure,** and **pillar punching** into weak roof or floor rocks.

Bell pits are a yet older form of mining, mostly dating from before 1700. Shafts were sunk to extract unsupported circular areas in an underlying seam, the shape of the pit depending on the strength of the roof rock. Bell pits are rarely

more than 10m deep, so that they represent a localized and distinctive subsidence hazard.

Deep caved mining is used to extract steeply dipping and irregular mineral deposits, typically metallic ores. One common method is to mine the ore body from below, through a vertical **shaft** and horizontal levels. The first ore is removed to form a void or **stope.** Later ore is either allowed to remain as a working floor to the stope, eventually to be tapped off from below, or is replaced by **waste fill** from the surface processing plant. Shallow ore can be accessed without a shaft through an **adit,** and mined upwards or downwards. Any deep caved technique may produce a subsidence bowl at the ground surface as abandoned stopes collapse by caving of their roofs. Only thorough backfilling can prevent this, a rare practice in old mines unless necessary for the mining strategy.

Brining is the pumping of dissolved salt from underground evaporate beds. Extracted water is replaced in **wild brining** by natural groundwater and in **controlled brining** by injected freshwater. Controlled brining can produce stable cavities that cause ground subsidence only if allowed to coalesce. Wild brining is less predictable and has produced large subsidence zones in the Cheshire saltfield, often elongated over subsurface water streams. Even more damaging methods, before they were banned about 1930, were pillar-and-stall mining with excessive extraction ratios and **bastard brining** – pumping of water from the abandoned mines. Sinkholes about 100 m wide and 10 m deep formed catastrophically as remaining pillars dissolved and collapsed, causing major property damage.

---

*Woodcock, N. (1994) *Geology and Environment in Britain and Ireland*

6. Using the information from the text fill in the gaps choosing one of the options.

1. The pumping of dissolved salt is _____

A longwall mining.

B open-pit mining.

C brining.

D deep caved mining.

2. To extract unsupported circular areas in an underlying seam _____ is used.

A open pit

B longwall mining

C bell pit

D deep caved mining

3. _____ is used for gently dipping beds.

A longwall mining

B pillar- and stall working

C deep caved mining

D bell pits

4. In _____ coal is removed by a track-mounted cutter moving along a face several hundred metres long.

A bell pits

B deep caved mining

C longwall mining

D pillar - and stock working

5. The maximum depth of the subsidence bowl is always _____ the seam thickness.

A the same as

B more than

C equal to

D less than

6. Common method to mine the ore body from below is to use _____

A pillars.

B a vertical shaft.

C cutters.

D adit.

7. Shallow ore can be accessed through _____

A shaft.

B pillar.

C adit.

D waste fill.

Follow-up

7. Think on the methods of underground mining in Ukraine. Be ready to describe them to a partner following the structure of the text read.

8. Make figures to illustrate your talk.

9. Write a text on underground mining in Ukraine following the model of the text you have read and the information you have got.

10. Make accompanying drawings to your text. You may use figures designed by you for illustrating your mini-presentation on methods of underground mining in Ukraine.

Unit 7 Safety of Mining Operations

Focus on

- giving clear arguments
- sharing information obtained from various sources
- identifying text genres and text-types
- identifying and using language forms appropriate to formal and colloquial academic and professional registers
- understanding different corporate cultures within specific professional contexts
- reading and understanding instructions for operation of devices, equipment etc.
- following instructions

***By the end of the unit you will be able to*:**

- use various strategies to obtain information from the texts related to study and specialism area
- understand safety instructions
- identify text-genres and writer's purpose
- share the information obtained from the texts referred to your study and specialism area
- use figures, drawings etc. to illustrate your talk

Start-up

1. *Pair-work.* Brainstorm in pairs the following questions and be ready to give your arguments for making your decision:
   - Are problems of mine safety typical for all the countries? If yes, why?

- Is it possible to avoid accidents and catastrophes while underground mining in Ukraine? If yes, how?
- What are the main reasons of accidents while mining?

2. *Whole-group discussion.* Share the results of your work within your group-mates.

Reading and Discussing

3. Below are three texts on mine safety. Working in groups of three or four, decide on the text genre and text-type of each. Be ready to explain how you have guessed.

Text One

Rescue workers found 23 miners missing underground after a gas explosion at a Ukrainian colliery and were bringing them to safety today through a narrow ventilation shaft.

They were still searching for another 13 still missing hundreds of metres underground after yesterday's explosion.

Officials overseeing rescue efforts in the Donbass coalfield initially announced that two miners had been brought to the surface more than 24 hours after the blast caused widespread damage to the Karl Marx pit. One man was found dead.

Rescue teams later located 21 more miners and began the laborious process of evacuating them through the ventilation shaft after the main shafts were badly damaged.

By mid-afternoon, officials quoted by Ukrainian media said six miners had been lifted to the surface at the pit in Yenakiyevo, northeast of the regional centre Donetsk. One was in serious condition.

"This is a narrow shaft and the process is going to take a long time, several hours," Marina Nikitina, spokeswoman for the regional mine safety inspectorate, told Reuters. "We hadn't even dared hope for this number."

First Deputy Prime Minister Oleksander Turchynov, the most senior government official at the site, said rescuers using the ventilation shaft had now pushed down to the 1,000 metres level underground, where the explosion had occurred.

"We will talk about people being saved only once they are safe on the surface," he told reporters.

Gas explosions are a frequent occurrence in Ukraine's mines, many of which are unprofitable and date from the 19th century. Many coal deposits are at a depth of one kilometre or more, making mining operations more difficult.

(the Independent world accessed at http://www.independent.co.uk/news)

Text Two

Mine Health and Safety Act, 1996

The Act has been updated up to and including the regulations published in Government Gazette No. 29458 dated 15 December 2006

To provide for protection of the health and safety of employees and other persons at mines and, for that purpose:

- **to promote a culture of health and safety;**
- **to provide for the enforcement of health and safety measures;**
- **to provide for appropriate systems of employee, employer and State participation in health and safety matters;**
- **to establish representative tripartite institutions to review legislation, promote health and enhance properly targeted research;**
- **to provide for effective monitoring systems and inspections, investigations and inquiries to improve health and safety;**
- **to promote training and human resources development;**
- **to regulate employers' and employees' duties to identify hazards and eliminate, control and minimise the risk to health and safety;**
- **to entrench the right to refuse to work in dangerous conditions; and**
- **to give effect to the public international law obligations of the Republic relating to mining health and safety;**
- **and to provide for matters connected therewith.**

Mine Health and Safety Act, 1996
Chapter 2 Health and Safety at Mines
22. Employees' duties for health and safety

(available at http://www.acts.co.za/mhs/index.htm) – Acts online

Text Three

ALL NINE ALIVE

Chapter One

The Miners

For thousands of years, sinuous stripes of bituminous coal have lain beneath the surface of the wooded hills and valleys of what is now Somerset County. Its extraction fueled an industrial revolution, lured our immigrant ancestors, and contributed to Western Pennsylvania's reputation for hard work and hard living.

As a piece of our history, coal mining has seemed herculean, monumental, even romantic.

But on the afternoon of July 24, it was just a job.

Eighteen miners left their homes in small towns dotting the Laurel Highlands and drove to Quecreek Mine, which lay beneath a dairy farm in Lincoln Township just off Somerset Pike. They gathered at its entry portal at 2:30 p.m., just as most of them had for five or six days a week since March.

There they split into two crews of nine, one to enter and head straight south, the other to bear left and begin chipping the east face.

With clouds rolling in and out, it was an agreeable day. But soon they would leave it behind, riding a motorized cart on a dug-out ramp a mile-and-a-half long, which would take them into the cool darkness 245 feet below the surface as far down as a 25-story building is up.

At 31, Harry Blaine Mayhugh Jr. was the youngest on his crew of nine. They rarely called him by his given names. He was "Stinky." He called them by equally affectionate nicknames.

Mayhugh was one of the guys. The husky 6-footer played football and baseball at Meyersdale High School. Just after he graduated in 1989, he started dating Leslie Foy, who was entering her junior year. They became engaged while he was in the U.S. Navy, and after his two years were up in 1992, they got married and had a son and a daughter.

Mayhugh worked in a factory and then for a lawn-care company before becoming a deep miner in 1997. Despite having to contort his big frame for eight hours in the 4- to-4 1/2-foot-high mine shafts, he enjoyed the work or more precisely, those he worked with. He relished the friendship formed with men who were down-to-earth, family-oriented and God-fearing. Separated from the world above, they had to rely on each other every day.

Leslie understood both the job's draw and its dangers. Her father, Thomas Foy, had been a coal miner since before she was born, and he and her husband now worked for the same outfit: Black Wolf Coal Co. Since March 10, they'd been working on the same crew.

Every day before leaving for the mine, Mayhugh would give his wife a goodbye kiss.

Thomas Foy, Mayhugh's 52-year-old father-in-law, had 29 years of experience in the mines. Foy lived near his native Berlin, where he had dropped out of high school. He served in the U.S. Army in Vietnam and worked laying brick before going into coal. He'd been a miner practically the entire time he'd been married to Denise.

The nine members of the crew converged at Quecreek Mine around 2:30 p.m.

In the trailer where they would shower at the end of their shift, they changed into their mining gear: Thermal underwear, flannel shirts, blue overalls, rubber

steel-toed boots, maybe a rain coat or rain pants or both as an extra layer against the dampness. The last things they pulled on were their knee pads and their miners' helmets, which had detachable lights that they could hook on their belts.

At about 2:45, the nine went outside and exchanged news with the departing day shift -- the usual chitchat about mine conditions and machinery.

One of the day-shift guys tossed in the usual see-you-later: "Have a good one, man."

Then, right at 3 p.m., the nine climbed onto the mantrip, a low battery-powered rail cart, for the half-hour ride to the coal seam they were working. It was 8,000 feet, or about 1 1/2 miles, from the mine's portal.

It didn't take the 4-foot-high mine shafts to make these guys feel close. After all, they sometimes saw more of each other than they did their own families. But inside the mine, they didn't work shoulder to shoulder. Sometimes they only passed each other as they worked different parts of the coal cuts.

On this day, Hileman and Unger worked together as one team, bolting the newly created mine roof to secure it so it wouldn't collapse. Fogle and Foy were the other bolting team. Pugh and Hall were car men, cleaning up debris. Mayhugh operated the scooper, a motorized vehicle with a bucket for picking up the mined coal and dumping it on a conveyor belt for transport out of the mine.

(Adapted from *United States Mine Rescue Association*.)

4. Being in groups of three or four choose any text from the above and read it for details.

5. Make a mini-presentation of the text you have read following the instructions given below. You may give a team-presentation if appropriate.

- Explain why you have chosen this text.
- Focus on the text-type and genre.
- Identify the peculiarities of the text genre, if there are any.
- Retell the text in brief.
- Describe your impressions on the text (Was it of any interest for you? Was it useful for you and why?).
- Give recommendations to the class whether the text is worth reading.

- Make a conclusion on the main elements of the genre of the text.
- Share the reading strategies you have used.

6. Read the instructions and warnings (1 – 12). Underline any new words and check their meaning in a dictionary. Then match the sentences with the signs (a – l) given below.

1. Risk of death here.
2. Be careful.
3. Beware of industrial vehicles/forklifts.
4. Beware of the material falling from conveyor belt.
5. Don’t smoke here.
6. Don’t walk here.
7. This material is flammable.
8. This material is corrosive.
9. This material is explosive.
10. Wear ear defenders.
11. Wear goggles to protect your eyes.
12. Wear a hard hat.
13. _____
14. _____
15. _____
16. _____
17. _____

WARNING AND INSTRUCTION SIGNS

a) 

b) 

c) 

d) 

e) 

f) 

g) 

h) 

i) 

j) 

k) 

l) 

7. *Pair-work.* Work in pairs. Write warning instruction(s) for your area of study and/or work. Design and draw warning sign(s) for each of the instruction.

*Example: You **must** wear a miner's helmet in a mine.*

8. Show your signs to another pair. Discover whether they can follow your instructions.

9. Complete the list of warnings and instructions with the instructions to the signs designed by your group.

Grammar Reference: Modals, Imperatives.

Follow-up:  **Check Your Reading Fluency**

10. You will be given not more than 5 minutes to read the text given below and answer the following comprehension questions:

- What is coal?
- How is coal often called? Why?
- When was coal first discovered?
- How was coal formed?
- Why is coal considered the most important fuel?

While reading you can choose a suitable strategy from the list given below:

Strategy A	**Strategy B**	**Strategy C**	**Strategy D**
1. Read the text.	1. Read the questions.	1. Skim the text.	1. Read the questions.
2. Read the questions.	2. Read the text carefully to find the answers.	2. Read the questions.	2. Skim the text for the answers.
3. Go back and skim the answers.	3. Go back and check the answers against the questions.	3. Scan the answers to the questions.	

COAL

Mining today is generally much safer, and has become highly mechanized work. Small crews with sophisticated machinery have replaced the hordes of men valued for their muscle and stamina.

Coal was one of humanity's earliest sources of heat and light. The Chinese were known to have dug it more than 3,000 years ago.

But coal's origins go back much further.

Coal is the remnant of vegetation that grew 400 million years ago in large swamps that no longer exist. The fossil fuel is often called "buried sunshine" because the trees and plants that formed coal captured the sun's energy through photosynthesis.

As layers of flora and trees accumulated, they formed a soggy dense material called peat. Over time, as the earth's crust shifted, deposits of sand, clay and other mineral matter buried the peat. Pressure squeezed water from the peat and the earth's heat forged chemical elements together that resulted in the black combustible mineral known as coal. It's estimated that about 3 feet to 7 feet of compacted plant matter were required to form 1 foot of bituminous coal.

Carbon is what gives coal most of its energy, and it's the reason that coal was the country's most important fuel.

11. *Whole-group discussion.* Share your experience with your groupmates by answering the following questions:

- How did you read the text?
- What strategy did you use?
- Why have you chosen it?
- Do you think if you had chosen the other strategy would you be a success and read faster?
- Which strategy is the fastest? Why?

12. You may try all the strategies with different texts of the same size and choose the most appropriate strategy to be within time limits.

Unit 8 CHECK YOUR PROGRESS

***By the end of the section you will*:**

- understand assessment requirements
- read and understand rubrics necessary for taking end-of-module tests
- have practiced taking tests and manage time effectively.

Task 1. Look at notices (1-5). For each notice which sentence is correct? Circle only one letter (**A**, **B** or **C**).

1. **DO NOT OPERATE THIS MACHINE WITHOUT SUPERVISION**

A You are not allowed to operate this machine at any time.

B You must have someone with you who can use the machine.

C You can only use this machine if you know how to operate it.

2. PLEASE NOTE:

THIS WEEK'S FACULTY MEETING WILL BE HELD AT 11. 45 A.M.

INSTEAD OF 11. 15 A.M.

The Faculty meeting this week will take place at:

A quarter to eleven

B quarter past eleven

C quarter to twelve

3. ***24/11/2006***

Message for Natalie

Reminder – Call Kate Shevchenko 4.50 p.m

Natalie should phone Kate

A on 24 March.

B at ten to five.

C at ten past four.

4. Reproduction in whole or part of any photograph, text or illustration without written permission from the publisher is prohibited.

A The publisher must write and allow you to use photos, texts and drawings from the magazine.

B You must write to the publisher if you want to buy the photos, texts and drawings.

C You can copy any photos, text or drawings from the magazine without asking.

5. **IN THE EVENT OF FIRE ASSEMBLE IN THE YARD.**

A If there is an assembly problem, meet in the yard.

B If there is a fire in the yard, gather together here.

C If there is a fire, everyone should meet in the yard.

Task 2. Read the text that follows.

Do the following statements agree with the information given in the article?

Choose ' **A**' for '**Yes**' if the statement agrees with the information,

‘**B**' for '**No**' if the statement contradicts information.

If there is not enough information to answer "Yes” or "No" choose

‘**C**’- ‘**Not given**'.

Circle the appropriate letters.

The Spectacular Eruption of Mountain St Helen

A The eruption in May 1980 of Mount St. Helens, Washington State, astounded the world with its violence. A gigantic explosion tore much of the volcano's summit to fragments; the energy released was equal to that of 500 of the nuclear bombs that destroyed Hiroshima in 1945.

B The event occurred along the boundary of two of the moving plates that make up the Earth's crust. They meet at the junction of the North American continent and the Pacific Ocean. One edge of the continental North American plate over-rides the oceanic Juan de Fuca micro-plate, producing the volcanic Cascade range that includes Mounts Baker, Rainier and Hood, and Lassen Peak as well as Mount St. Helens.

C Until Mount St. Helens began to stir, only Mount Baker and Lassen Peak had shown signs of life during the 20th century. According to geological evidence found by the United States Geological Survey, there had been two major eruptions of Mount St. Helens in the recent (geologically speaking) past: around 1900 B.C, and about A.D.1500. Since the arrival of Europeans in the region, it had experienced a single period of spasmodic activity, between 1831 and 1857. Then, for more than a century. Mount St. Helens lay dormant.

D By 1979, the Geological Survey, alerted by signs of renewed activity, had been monitoring the volcano for 18 months. It warned the local population against being deceived by the mountain's outward calm, and forecast that an eruption would take place before the end of the century. The inhabitants of the area did not have to wait that long. On March 27, 1980, a few clouds of smoke formed above the summit, and slight tremors were felt. On the 28th, larger and darker clouds, consisting of gas and ashes, emerged and climbed as high as 20,000 feet. In April a slight lull ensued, but the volcanologists remained pessimistic. Then, in early May, the northern flank of the mountain bulged, and the summit rose by 500 feet.

E Steps were taken to evacuate the population. Most - campers, hikers, timber-cutters - left the slopes of the mountain. Eighty-four-year-old Harry Truman, a holiday lodge owner who had lived there for more than 50 years, refused to be evacuated, in spite of official and private urging. Many members of the public, including an entire class of school children, wrote to him, begging him to leave. He never did.

F On May 18, at 8.32 in the morning, Mount St. Helens blew its top, literally. Suddenly, it was 1300 feet shorter than it had been before its growth had begun. Over half a cubic mile of rock had disintegrated. At the same moment, an earthquake with an intensity of 5 on the Richter scale was recorded. It triggered an avalanche of snow and ice, mixed with hot rock - the entire north face of the mountain had fallen away. A wave of scorching volcanic gas and rock fragments shot horizontally from the volcano's riven flank, at an inescapable 200 miles per hour. As the sliding ice and snow melted, it touched off devastating torrents of mud and debris, which destroyed all life in their path. Pulverised rock climbed as a dust cloud into the atmosphere. Finally, viscous lava, accompanied by burning clouds of ash and gas, welled out of the volcano's new crater, and from lesser vents and cracks in its flanks.

G Afterwards, scientists were able to analyse the sequence of events. First, magma - molten rock - at temperatures above 2000°F had surged into the volcano from the Earth's mantle. The build-up was accompanied by an accumulation of gas, which increased as the mass of magma grew. It was the pressure inside the mountain that made it swell. Next, the rise in gas pressure caused a violent decompression, which ejected the shattered summit like a cork from a shaken soda bottle. With the summit gone, the molten rock within was released in a jet of gas and fragmented magma, and lava welled from the crater.

H The effects of the Mount St. Helens eruption were catastrophic. Study of atmospheric particles formed as a result of explosion showed that droplets of sulphuric acid, acting as a screen between the Sun and the Earth's surface, caused a distinct drop in temperature. Almost all the trees of the surrounding forest were flattered. Ash and mud spread over 250 square miles of country. All the towns and settlements in the area were smothered in an even coating of ash. It has been calculated that the quantity of dust ejected by Mount St. Helen – a quarter of a cubic mile – was negligible in comparison with that thrown by the earlier eruptions.	

6. The eruption was caused by the boundary of two moving plates of the Earth.

7. There had been three major eruptions of Mount St. Helen.

8. Nothing was made to evacuate people from the region close to the mountain.

9. There was an earthquake in the region caused by the growth of the mountain.

10. Scientists were able to analyse the sequence of the events.

11. The Geological Survey started its activity in 1979.

Task 3. Complete the table below using the information from the text above.

Item	Equivalent to
Example The energy released by the explosion of Mount St. Helens	*Answer* ***500 nuclear bombs***
The area of land covered in mud or ash	**12**
The quantity of dust ejected	**13**

Magma molten rocks were at temperatures	**14**
The intensity of an earthquake was recorded on the Richter scale	**15**

Choose the appropriate letter **A – D** and underline the whole statement.

16. According to the text the eruption of Mount St. Helens and other volcanoes has influenced our climate by

A increasing the amount of rainfall.
B heating the atmosphere.
C cooling the air temperature.
D causing atmospheric storms.

17. By 1979 the volcano had been monitored

A for 18 years.
B for 18 days.
C for 18 weeks.
D for 18 months.

Task 4. Read the memo and catalogue list below.

Complete the order form on the next page.

Write a word or phrase (in CAPITAL LETTERS) or a number on lines **18 – 22.**

Memorandum

To *Lucy Scrivener*

From *Bill Hammer*

Lucy,

Can you please order some extra stationery for the reps' conference next week? Have a look at the Pens and More catalogue - they seem to be the best. We need enough for 10 reps. I suggest you get some A4 notepads, ballpoint pens, and ring binder files - one for each of the reps. Can you please also order 6 black marker pens and 50 OHP transparencies for me? Thanks.

Pens and More

Catalogue

Code	Item	Unit value
ST 2367	A4 notepad - lined	2.75
ST 2589	A5 Memo pad	2.50
ST 0256	Ring binder file	2.25
ST0148	Plastic folders - pack of 50	3.50
ST 0524	Plastic document folder	2.60
ST5217	Roller ball pens - pack of 6 black	3.99
ST 5796	Ballpoint pens - pack of 10 blue	0.99
ST 5876	Board marker pens - pack of 6 black	3.25
ST 5899	Pencils-pack of 10 HB	0.36
ST1764	OHP transparencies - pack of 50	6.99
ST 1551	OHP pens - pack of 6	3.49

Office Supplies Order Form

Please fill in the order code, item description, quantity and unit value ONLY. Total amounts and the Grand Total will be completed by the Accounts Department.

Order code	**Item description**		**Quantity**	**Unit value £**	**Total amount £**
ST 2367	**(18).....**		**10**	2.75	
ST 5796	BALLPOINT PENS - PACK OF 10 BLUE		**1**	**(19) .....**	
(20).....	RING BINDER FILE		**10**	2.25	
ST 5876	BOARD MARKER PENS -PACK OF 6		**(21) .....**	3.25	
ST 1764	**(22)**...: ..... - PACK OF 50		**1**	6.99	
			GRAND TOTAL		

Task 5. Read the article below. Choose the correct word to fill each gap from **A**, **B**, **C** on the next page. For each question (**23**-**35**), mark one letter (**A**, **B**, **C**). You may fill in the gaps with the appropriate word against the letter.

Top woman chemist's "CRUSADE"

By Roger Highfield, Science Editor

A new $10,000 award has been won (23)_____ a professor who plans to spend her prize money (24)_____ an inspirational nationwide tour by a team of elite women chemists.

The first winner of the Rosalind Franklin Award, (25)_____ aims to promote women in science, is Professor Susan Gibson of King's College, London, it (26)_____ announced yesterday.

The award commemorates Rosalind Franklin, (27)_____ work at King's contributed to the discovery of DNA half a century (28)_____, and rewards excellence in science, engineering (29)_____ technology.

Professor Gibson plans to use (30)_____ prize money to bring a group of leading women chemists (31)_____ around the world tour British universities (32)_____ careers to female undergraduates.

She (33)_____ donate the remainder of the money to enable a young woman postgraduate at her department to (34)_____ much-needed chemicals (35)_____ continue her research.

23	**A**	for	**B**	by	**C**	with
24	**A**	to	**B**	for	**C**	on
25	**A**	who	**B**	which	**C**	where
26	**A**	was	**B**	has been	**C**	is
27	**A**	whose	**B**	who	**C**	which
28	**A**	since	**B**	before	**C**	ago
29	**A**	and	**B**	but	**C**	also
30	**A**	a	**B**	the	**C**	any
31	**A**	in	**B**	from	**C**	for
32	**A**	promoting	**B**	promoted	**C**	promotion
33	**A**	going to	**B**	do	**C**	will
34	**A**	buy	**B**	buying	**C**	bought
35	**A**	for	**B**	to	**C**	which

Self-assessment

Task 6. Assess yourself using the keys given in ***Part II Self-study Resources.***

Indicative Reading

1. *Kentucky Coal Education*. [online]. Available from: http://www.miningusa.com/kmi. Accessed 17 Febr. 2007.
2. Kitto, M. and West, R. (1984) *Engineering information: Reading Practice for Engineers.* London: Edward Arnold.
3. Neville, J. M. (2002) *IELTS Practice Tests 1.* Newbury: Express Publishing. – 128 p.
4. White, L. (2003) *Engineering Workshop.* Oxford: Oxford University Press. – 39 p
5. *Mining Magazine* [online]. Available from: http://www.mining-journal.com/ mining_magazine/mining_mag_home.aspx
6. *Engineering & Mining Journal* [online]. Available from: http:// www.e-mj.com

Useful Links

1. African Mining Magazine http://www.mondotimes.com/2/topics/ 335/business/all/13186
2. *Canadian Mining Journal* http://www.canadianminingjournal.com/default.asp
3. *Global Infomine* http://www.infomine.com/publications/
4. *Mining & Aggregate Industry* Magazines & Publishings http://www.uee.com/links_mag.htm
5. *Mining Magazines* http://www.macandmurray.com/mining-magazines.html
6. *Oregon Mining Magazine Gold Prospecting in Oregon* http://www.martini-man.com/gold/index.htm
7. World Mining Equipment http://www.wme.com/
8. http://www.mining.com/

Part II

Self-study Resources

By the end of this module you can:

- preview a magazine/journal article in engineering and/or mining by reading rapidly using various reading strategies
- obtain general and detailed information from the subject-related sources to use them in academic discussions, seminars, formal talks, etc.

Section 1 Text-Types

By the end of this section you will:

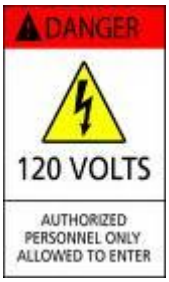
- be able to identify and classify information from subject-related sources
- be able to preview subject-related texts focusing on headings, first lines of paragraphs, etc.
- be able to scan through different texts locating relevant details
- be able to identify different text-types and text genres
- be able to locate specific information

Tasks to do.

1. Identify the text-types of the samples given below and fill in the gaps in **A - M**. You may consult the ***Checklist*** given in Unit 1. **Part *I In-Class Activities.***

2. Write down the name of the author or organization of the text, date of its publication, where possible. Be ready to explain your decision.

Example: 0____Warning and Safety Instruction_____



A _____

WHAT TO DO IF THE FIRE ALARM SOUNDS

If you hear the fire alarm (this is a long, loud, continuous ringing tone), please leave the mine immediately following the **GREEN FIRE EXIT** signs. Make your way around the outside of the main building to **ASSEMBLY POINT 1**

(see the attached map)

Once at ASSEMBLY POINT 1, please wait for further instructions

DO NOT RE-ENTER THE MINE UNTIL YOU ARE TOLD IT IS SAFE TO DO SO BY A MINE FIRE OFFICIAL

B_____

References

NSW Legislation

- Occupational Health and Safety Act 2000, General Duty of Care.
- Clause 46 of the Mines Inspection Act 1901, General Rule 2000 requires the general manager to ensure that any foreseeable risks to the health and safety of persons at the mine are identified and assessed and that such risks are eliminated or minimised to the fullest extent that is reasonably practicable.
- Clause 9 of the Mines Inspection Act 1901, General Rule 2000 requires the general manager to prepare, communicate and regularly review a Mine Safety Management Plan.
- Clause 11 of the Mines Inspection Act 1901, General Rule 2000 requires the contractor to comply with a Mine Safety Management Plan which is approved by the general manager.
- Clause 19 of the Mines Inspection Act 1901, General Rule 2000 requires the general manager to deal with risk by eliminating the risk, controlling the risk at the source or minimise the risk and with the remaining risk provide personal protective equipment.
- Clause 37 Coal Mines Regulation Act 1982, requires the manager to have full charge and control of operations at a mine.
- Note: The Mines Inspection Act 1901 and the Coal Mines Regulation Act 1982 will be replaced by new legislation in NSW soon after printing. However, similar clauses to those mentioned above will be in force.

NSW Department of Primary Industries publications

- MDG 1010 *Risk Management Handbook*
- *Minerals Industry Safety Handbook* – July 2002
- *Mine Safety Management Plan Workbook*

Other references

• Australian Centre for Geomechanics. December 2004. *Monitoring cave-related seismicity at Ridgeway Gold Mine*, ACG Newsletter, Vol. 23.
• Brown, E.T. 2003. *Block Caving Geomechanics*, Brisbane: Julius Kruttschnitt Mineral Research Centre.
• Duplancic, P. 2001. *Characterisation of caving mechanisms through analysis of stress and seismicity.* Unpublished PhD Thesis, Department of Civil and Resource Engineering, University of Western Australia. 227 pages.
• Fowler JCW and Hebblewhite BK. November 2003. *Managing the hazard of wind blast / airblast in caving operations in Australian underground mines*. UNSW presentation papers for 1st AGCM Conference 10-13.
• Logan A. 2004. *Air Inrush Risk Assessment for Caving Mines,* Paper Presented at MassMin 2004 Santaigo. Newcrest Mining Ltd, Melbourne, Australia.
• Potvin, Y, Thomas, E. and Fourie, A. 2005. *Handbook on Mine Fill*. Australian Centre for Geomechanics,
Nedlands, Western Australia, Australia.
• Ross, I and van As, A. 2005. *Northparkes Mines —Design, Sudden Failure, Air-Blast and Hazard Management*
at the E26 Block Cave Paper Presented at 9th AusIMM Underground Operator's Conference 2005, Perth, Western Australia.

C

CONTENTS

D

Purpose and scope

This Guideline is intended to assist mine managers and contractors in the management of the risk of an airblast occurring in an underground mine.

The scope of this Guideline includes:

- an outline of the factors or elements that are necessary for an airblast to occur
- the safety considerations surrounding those factors
- matters for consideration that could assist in effectively eliminating or minimising the risk of an airblast occurring
- matters for consideration to mitigate the effects of an airblast are also provided.

An airblast is a major hazard. Should it occur it could cause many fatalities within a mine and extensive damage to equipment and infrastructure. For this reason it is very important to investigate the most appropriate means to prevent an airblast from occurring and possibly also plan to mitigate the consequences should an airblast still occur.

To assist in this process an example of a TARP (trigger action response plan) is provided in the appendix of this Guideline. This TARP itemises examples of issues that could be monitored to prevent or mitigate the effects of an airblast in a caving mine.
Note that:
• Adherence to Guidelines does not of itself assure compliance with the general Duty of Care.
• Mine operators deviating from Guidelines should document a risk assessment supporting the alternative arrangements. However, the risk assessment should always be current, relevant and be regularly reviewed.

E

Guideline for Managing the Risk of an Airblast in an Underground Mine

MDG 1031

NSW DEPARTMENT OF
PRIMARY INDUSTRIES

Produced by
Mine Safety Operations Division
New South Wales
Department of Primary Industries
September 2006

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FIRST PUBLISHED: SEPTEMBER 2006

FOREWORD

The NSW Department of Primary Industries document MDG 1031 TR – *Technical Reference Material for Managing the Risk of an Airblast* is attached to this Guideline. It provides supporting reference material.

This is a Published Guideline. Further information on the status of a Published Guideline in the range of OHS instruments is available through the NSW Department of Primary Industries Legislation Update
Number 2/2001 which is included in this Guideline.

The range of instruments includes:

- Acts of Parliament
- Regulations made under the Act
- Conditions of Exemption or Approval *(Coal Mines)*
- Standards (AS, ISO, IEC)
- Approved Industry Codes of Practice (under the OHS Act)
- Applied Codes, Applied Guidelines or Standards (under clause 14 of the Coal Mines (General) Regulation 1999)
- Published Guidelines
- Guidance Notes
- Technical Reference documents
- Safety Alerts

The principles stated in this document are intended as general guidelines only for the assistance of owners and managers in devising safety standards for the working of mines. Owners and managers should rely upon their own advice, skills and experience in applying safety standards to be observed in individual workplaces.

The State of New South Wales and its officers or agents including individual authors or editors will not be held liable for any loss or damage whatsoever (including liability for negligence and consequential losses) suffered by any person acting in reliance or purported reliance upon this Guideline.

The MDG 1031 *Guideline for Managing the Risk of an Airblast in an Underground Mine,* has been distributed to industry for consultation and comment through a representative working group, the Metalliferous Industry Safety Advisory Committee and the Coal Safety Advisory Committee.

The NSW Department of Primary Industries has a review time set for each Guideline that it publishes. This can be brought forward if required. Input and comment from industry representatives would be much appreciated. The Feedback Sheet at the end of this document can be used to provide input and comment.

ROB REGAN
Director, Mine Safety Operations
Chief Inspector of Mines
Chief Inspector of Coal Mines____

F _____

Glossary of terms and abbreviations

For the purpose of this document the following terms and abbreviations apply:

Airblast
An airblast is a rapid displacement of large quantities of air, often under pressure, in a constrained underground environment caused by a fall of ground or other material. The extent of the consequences of such an airblast depends on the amount of air that is compressed and the rate of that compression. Note: An airblast in coal mines is called a windblast.

Bulkhead
A bulkhead is usually a solid structure built across a drive or opening that would seal the drive or opening from the effects of an airblast or mitigate the effects of such an airblast from the rest of the mine. A bulkhead can also be known as a stopping or plug.

CMS
Cavity monitoring systems

Drive
A drive is a tunnel or long excavation underground. Also known as a drift, especially in coal mines.

LEL
Lower explosives limit

MSMP
Mine Safety Management Plan

Seismogenic zone
The seismogenic zone is an active seismic front caused by failure of the rockmass primarily through shearing and intact rock fracturing (Duplancic, 2001).

TARP
Trigger Action Response Plan (see an example in Appendix 1).

TDR
Time domain reflectometer

G _____

Fig. 1, below shows an illustration of a Open Pit Surface Mine. The definition of a open pit mine is "an excavation or cut made at the surface of the ground

for the purpose of extracting ore and which is open to the surface for the duration of the mine's life." To expose and mine the ore, it is generally necessary to excavate and relocate large quantities of waste rock. The main objective in any commercial mining operation is the exploitation of the mineral deposit at the lowest possible cost with a view of maximizing profits. The selection of physical design parameters and the scheduling of the ore and waste extraction program are complex engineering decisions of enormous economic significance. The planning of an open pit mine is, therefore, basically an exercise in economics, constrained by certain geologic and mining engineering aspects.

A bench may be defined as a ledge that forms a single level of operation above which mineral or waste materials are mined back to a bench face. The mineral or waste is removed in successive layers, each of which is a bench. Several benches may be in operation simultaneously in different parts of, and at different elevations in the open pit mine.

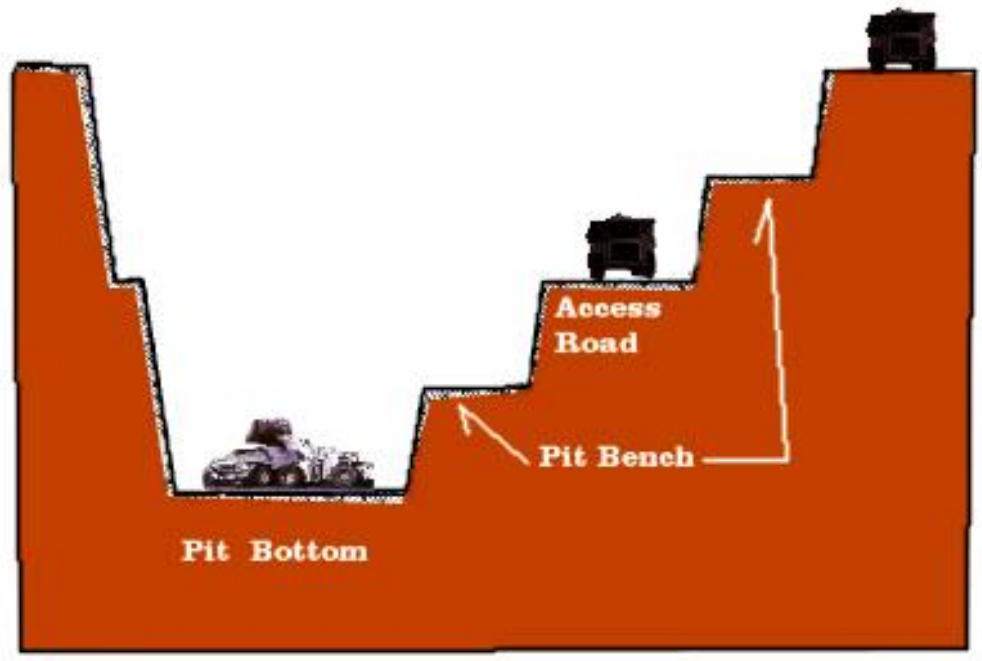
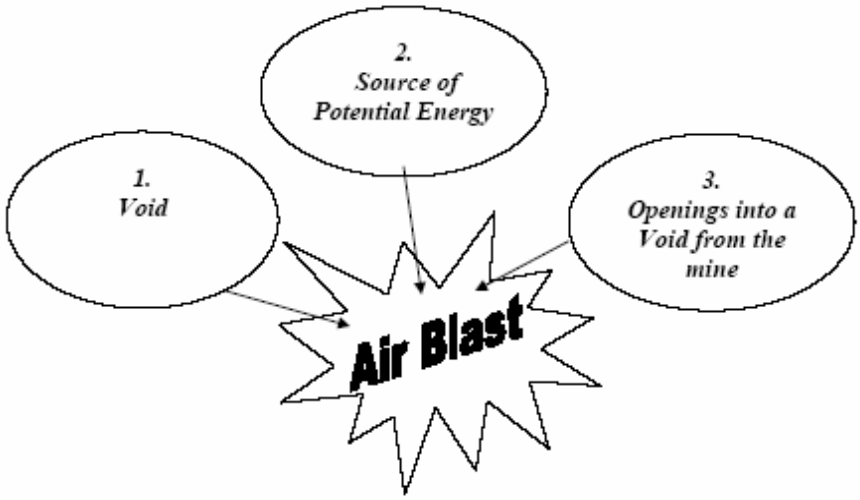


Fig. 1

Guideline Content

Part A

The three headings considered in part A to manage the risk of an airblast are: *Void, Source of Potential Energy, and Openings into a Void from the Mine*.



These three elements are contributing factors thatneed to exist for an airblast to occur.

Part B

The one element considered in part B is mitigating the effects of an airblast under the heading: *Mitigating the potential effects of an airblast.*

Airblast – elements and considerations

Part A

1. Void or underground Opening

Required outcomes

 Plan and manage the shape and dimensions of a void or underground opening so as not to contribute to an increased risk of releasing potential energy above the opening or in providing a potential linkage to the rest of the mine and then lead to an airblast occurring. A second outcome is to control the content of the air within the void to minimise any risk of an explosion should an airblast occur. It is recommended that management consider using Trigger Action Response Plans to systematically manage the monitoring and control of all elements that could otherwise gradually lead to an unacceptable level of risk of an airblast occurring.

Main risks

 The dimensions of a void can affect potential energy and linkage to mine workings that can combine to lead to an airblast occurring

 A void's dimensions can inadvertently change, thereby creating an unacceptable risk of an airblast occurring.

 The content of the air within voids or in a goaf may be conducive to causing an explosion after an airblast occurs, creating an even worse incident.

Main risk considerations

 When seeking to fulfil the required outcomes, consider carrying out documented risk assessments and communicate the results and resultant controls to all persons involved.

 Plan to minimise the size and dimensions of a void.

 Investigate and assess the risk of an airblast by determining the dimensions and volume of any voids underground.

 It is difficult to obtain accurate dimensions of a void due to restrictions of access

 Regularly monitor the size and dimensions of a void to detect any changes that may alter the risk of an airblast occurring or its consequences if one did occur

2. Source of potential energy

Required outcomes

Rock or material above a void or underground opening is a source of potential energy. The main outcome is to understand the risk level of this energy being released and to control this risk.

Main risks

 Potentially unstable rock or material that could result in a mass failure into a void or any underground opening causing a piston effect compressing the air which then travels through a mine as an airblast.

 Larger than necessary spans of openings can expose more joints and geological structures than necessary creating unacceptable levels of risk of unstable ground. This would not apply to caving operations which deliberately aim for unstable spans to cave.

 Voids or openings in close proximity to the surface or close to other underground openings may have the potential for the surrounding rock to become unstable. The proximity of voids or openings to inherently weaker layers of rock can create
unstable ground.

 The higher the potential fall the greater the potential energy and its consequences, even within a small area.

Main risk considerations

 When seeking to fulfil the required outcomes, consider carrying out documented risk assessments and communicate the results and resultant controls to all persons involved.

 The risk of an airblast should be understood and controlled.

 Have sufficient geological, geotechnical and hydrological information to accurately assess the potential instability of ground around voids and to develop predictive models.

 Excavate underground openings to inherently stable shapes in situations that may apply and that require this stability.

 Understand and monitor static loads above and alongside voids or openings.

 Investigate caveability of roof strata and pillar failures in coal mines.

 Assess caveability of ground taking into account varied rock types and occurrences of dominant structures.

□ Determine the amount of broken material and its swell factor which may impact on the size of the void and the resultant risks associated with the void.	□ To minimise massive failure, induced caving could be an option at certain stages so failure is controlled.

I _____

Date 01/09/2008

From Prof. Brown *To: Prof. Bondarenko*

Topic: Meeting with the first-year students.

Reminder: The meeting will held in the Students' Club at 10 a.m.

J _____

Chapter Eight

Breakthrough!

The breakthrough came Saturday at 10:15 p.m.

After days of effort and a broken bit, the rescue drill punched through into the trapped miners' dank quarters. The drill rig operator pumped his fist in the air, then jumped up and started yelling. The escape shaft, through which the capsule carrying the miners to safety would travel, was finally in place.

The moment of breakthrough -- the instant people above ground had waited for like 1969 America waited for the astronauts' first steps on the moon -- initially wasn't noticed by the miners, 24 stories underground.
They had been taking turns every 10 or 15 minutes walking 250 feet down the passageway to pound nine times on the 6-inch air pipe and check the area where the drilling sounds were coming from.

Saturday at 10:15 p.m., Hileman and Foy made the trek. Their cap lamps were dim and just about out of juice.

That's when they found the drill opening.

Back on high ground, the other miners were lying down, trying to stave off the cold, when Hileman came bounding back.

"We found the hole!" he screamed. "Everyone get down there!"

No one needed a second invitation. They bolted toward Entry No. 4 with energy they never knew they had.

Hileman then found Unger, who was separated from the rest of the group. "You want to go home tonight, John?" he asked casually.

"Yes, I wouldn't mind going," Unger replied.

"Well, grab your stuff," Hileman yelled. "We found the hole!"

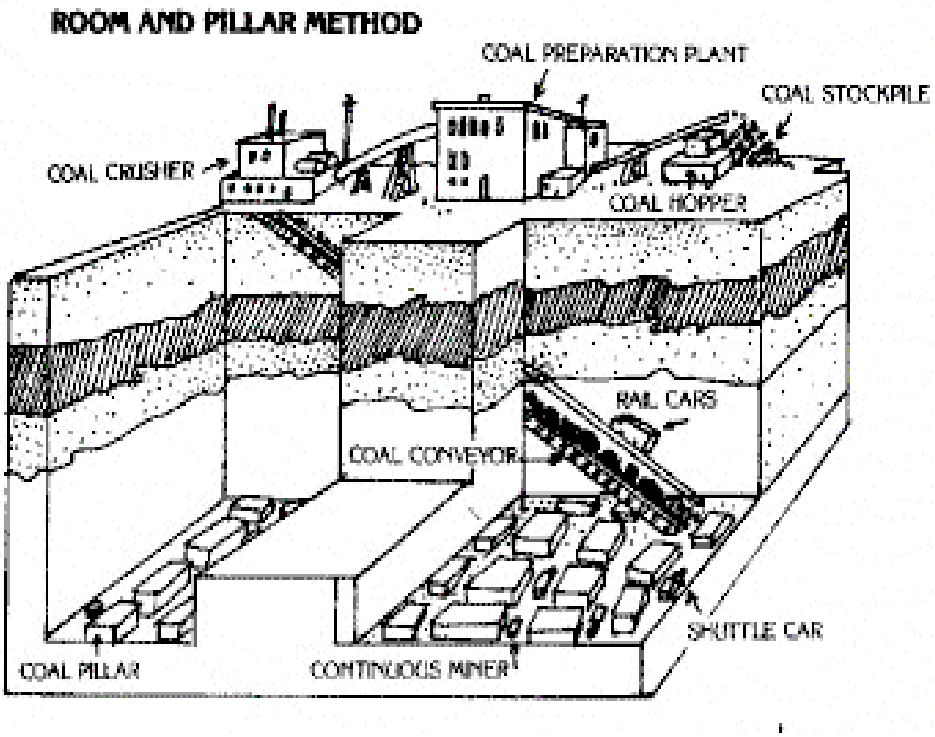
Mayhugh unbuckled his mining belt as he ran toward the hole. He knew he'd never use it again.

The drill had touched down about 300 feet away, across two crosscuts.

When the miners got there, they began yelling, "Get us out! Help us! Please get us out."

K_____

L_____


ROOM AND PILLAR METHOD
COAL PREPARATION PLANT
COAL STOCKPILE
COAL CRUSHER
COAL HOPPER
RAIL CARS
COAL CONVEYOR
SHUTTLE CAR
COAL PILLAR
CONTINUOUS MINER

M_____

UNIVERSITY ENGLISH LANGUAGE CENTRE

CLASS TIMES

9.00am – 10.30am 11.00am – 12.30pm 5.00pm – 6.30pm

The Language Centre is open Monday to Friday. Each class has one afternoon free per week. On the first day go to the University Hall to check your timetable.

ATTENDANCE

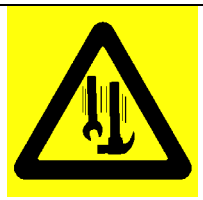
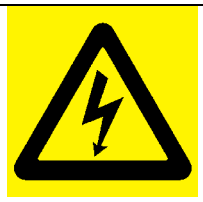
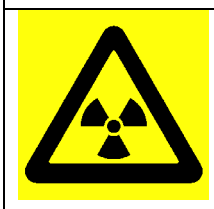
All students are expected to attend classes regularly. Students who do not attend classes will be reported to the Faculty Administration. Eighty percent attendance is required for students to receive their certificates on completion of their course.

Section 2 Reading Warning and Instruction Signs

By the end of this section you will be able to:

- understand and follow safety and security regulations and instructions within the subject area
- read and understand warning signs and instructions used in the academic environment and in the field of study, including details on conditions and warnings provided they can reread difficult sections
- write simple safety and warning instructions to be used in the academic environment and in the field of study

Task 1. Read the warning and instructions signs given below. Write instructions to them using **Unit 7 Safety of Mining Operations** (6 – 9) and **Section 6 Grammar Reviewing and Practising** (Modals, Imperatives).

 A_____	 B _____	 C _____	 D_____
 E_____	 F_____	 G_____	 H_____
 I_____	 J_____	 K_____	 L_____
 M_____	 N_____	 O_____	 P_____
 Q_____	 R_____	 S_____	 T_____

Section 3 Reading for Information

By the end of this section you will be able to:

- identify and classify information from specialized in engineering and/ or mining sources and to use it for making notes to participate effectively in seminars/presentations/debates, etc.
- interpret, compare and contrast tables, charts and diagrams, etc.
- make usable notes from variety of information sources
- identify writer's purpose and viewpoints in authentic texts in academic and professional area

3.1 History of Coal Mining in Britain

Task 1. Read the text about history of coal mining in Great Britain. Find out what is common and what is different if compared with history of coal mining in Ukraine and fill in the table that follows the text. If necessary, make a mini-research on the topic.

Coal

The rapid growth of steam power relied directly on large supplies of its only fuel: coal. There was a great increase in the amount of coal mined in Britain.

Coal was still cut by hand and the pits introduced few really new techniques. The increased demand was met by employing more miners and by making them dig deeper. This was made possible by more efficient steam pumps and steam-driven winding engines which used wire ropes to raise the coal to the surface, by better ventilation and by the miner's safety lamp which detected some dangerous gases. By the 1830s seams well below 1000 feet were being worked in south Durham and the inland coalfields of Lancashire and Staffordshire. Central Scotland and south Wales

were mined more intensively later. By the end of the nineteenth century the best and most accessible seams were worked out. As the miners followed the eastern seams of the south Yorkshire-north Midlands area, which dipped further below the surface, shafts of 3,000 feet were not uncommon.

Some of the work in mines was done by women and children. Boys and girls were often put in charge of the winding engines or of opening and shutting the trap doors which controlled the ventilation of the mines. Then they had to crouch all day in the same spot by themselves in the dark. When these evils were at last publicized in 1842 by a Royal Commission, many mines no longer employed women, but Parliament made it illegal for them all. It also forbade them to employ boys under the age of ten. The limit, which was very difficult to enforce, was increased to twelve in the 1870s. Subsequently it rose with the school leaving age.

Mining was very dangerous. Loose rocks were easily dislodged and the risk of being killed or injured by one was always greater in the tall scams where they had further to fall. In the north of England fatal accidents were not even followed by inquests to discover why they had happened until after 1815. Few safety precautions were taken before the mid-nineteenth century. The mine owners insisted that they were not responsible. The men were most reluctant to put up enough props to prevent the roof from falling in and to inspect the winding gem: and other machinery on which their lives depended. If they did, they spent less time mining and so earned less money because the miners' pay was based not on how long they worked but on how much coal they extracted. They preferred to take risks.

The deeper seams contained a dangerous gas called 'fire-damp' which could be exploded by the miners' candles. The safety lamp, which was invented in the early nineteenth century, did not really solve this problem, but it was often used to detect gas and so made the mining of deeper seams possible. There the air was more foul, the temperature higher (one pit paid the men an extra 6d a day for working in 130°F) and the risk of fire-damp even greater. In the 1840s a series of terrible explosions in

the deeper mines led to stricter regulations, which inspectors helped enforce. The inspectors were particularly keen on proper ventilating machines and, although deeper shafts were sunk, they did not become more dangerous. However, many serious accidents still occurred.

(From *Britain Transformed*, Penguin Books)

Table 2.1

Similarities	**Differences**

3.2 Types of Geological Resources

Task 1. Read the text that follows and make a diagram of the classification of minerals proposed by the author. You may use this text for self-assessing the results of your work on Unit 2. Types of Mineral Resources (4 – 9)

5.1 Types of geological resources

Coal, oil and gas, minerals and rocks: these are typical geological resources. They are usually considered to be **non-renewable,** with society progressively depleting a fixed stock of each commodity. By contrast, water or air is usually termed **renewable,** because natural processes replenish and recondition the stock as it is used.

However, renewability is not a simple measure. All resources are renewable on some timescale. For instance, oil and gas are forming now in the world's sedimentary basins, and mineral deposits beneath active volcanoes. On the other hand, water from rainfall may not be adequate to refill reservoirs or rock aquifers. A more helpful measure is the **sustainability** of a resource; whether or not its rate of use exceeds its rate of renewal. Most geological resources are **unsustainable,** because their formation processes are very slow on a human timescale. Oil is being used at least a million times faster than it is being recreated. Water and land are potentially **sustainable resources,** but only if managed correctly.

Unsustainable resources make up most of the subsurface materials that geologists are called on to assess. A widely used method for assessing their availability is the **McKelvey scheme.** In this, the **resource base** of a commodity is the total amount that exists on Earth. For most commodities this amount is of no practical interest, because much of it could never be economically exploited. The **resources** represent the part of the resource base that might conceivably be economic in the future. Within this amount, only the **reserves** are both economic now and identified with some geological certainty. A final fraction, previously part of the reserves, has been **already produced** and used by society.

The criteria of the McKelvey scheme mean that estimates of reserves and resources vary with changes in economic conditions and geological knowledge. For instance, reserves appear to increase if the price of a commodity rises, making it attractive, to exploit lower-grade and less accessible resources. Conversely, increased costs of extraction and processing will lower the assessed reserves. Estimates of resources are dependent on geological assumptions about their formation and occurrence. Refinement of these geological models can either increase or decrease resource estimates.

Estimates are further complicated because changes in the reserves can themselves affect economic and social activity, forming feedback loops that slow the potential changes. So, apparent shortages in reserves raise the price of a commodity and therefore the pace of geological exploration, both factors that tend to increase the reserves again. Low estimates of reserves also stimulate recycling of some commodities such as metals, slowing the rate of depletion of the natural stock. Finally, the use of some geological resources may be restrained not by the shortage of reserves but the shortage of safe places to dump the effluents from m their production and use. The carbon dioxide derived from burning fossil fuels is the most serious example of this constraint.

Woodcock, N. (1994) *Geology and Environment in Britain and Ireland*

3.3 Resource Extraction

Tasks to do.

1. Read the text given below. Make figures to illustrate the text.

2. Be ready to share the information got from the text with your groupmates using the figures drawn by you.

RESOURCE EXTRACTION

14.3 Underground mining

Longwall mining is the main method of extracting coal in Britain (Fig. 14.3a); it can be used for any laterally continuous rock body with a uniform thickness and a gentle dip. Coal is removed by a track-mounted cutter moving along a face several hundred metres long. The cutter operates beneath a roof supported by hydraulic jacks, which are slid forwards after the cutter has passed. The roof behind the jacks collapses onto the former floor of the coal seam, the **goaf.** The face can advance by up to a kilometre each year. Access to it is maintained by tunnels joining each end of the face to the mine haulage roadways.

The roof collapse behind a longwall face propagates upwards and outwards through the overlying rock with a geometry measured by the **angle of draw** (Fig. 14.3a). This varies with the rock strength but is roughly 30°, resulting in a **subsidence bowl** at the ground surface considerably wider than the **extracted panel** of coal. The maximum depth of the subsidence bowl is always less than the seam thickness, because of the volume increase as cracks open up within the subsiding rocks.

Also damaging to built structures is the ground tilt as the subsidence wave passes, and the related cycle of surface extension and shortening. However, these effects were more severe with older shallow mining than during modern mining of deep seams. Moreover, the pattern and timing of subsidence over longwall faces is predictable, so that structures at risk can be strengthened before mining begins.

Pillar-and-stall working is also suited to gently dipping beds. The deposit is only partially removed, leaving intervening pillars to support the roof. The pillars are elongate or square, and are spaced to allow extraction of between 50% and 85% of the bed. In North American coal mines the pillars are removed on retreat from the seam, allowing roof collapse similar to that of a longwall face. However, pillars have been left in place in most mines in the British Isles. These include modern gypsum mines, and old mines for coal, building stone, ironstone and clays. The old mines present a serious hazard to development.

Woodcock, N. (1994) *Geology and Environment in Britain and Ireland*

Section 4 Language to Work and Study

By the end of this section you will:

- be able to develop and organize your vocabulary (including terminology in mining) needed for your communication in academic and professional environments
- be able to locate specific study and/or subject-related information using dictionaries and various reference sources including Internet

Task 1. Read *Glossary of Mining Terms* made by Kentucky Mining University (USA) given in **Appendix A**. Use it as basis for English-Ukrainian Glossary of Mining Terms of your own by putting Ukrainian equivalents in the right-hand column to the English terms given on the left.

Task 2. Fill in the Glossary as soon as you meet the terms in the texts you are reading. You may use English-Ukrainian Dictionary when necessary.

Task 3. Fill in the spare cells with the terms you have found by your own while reading texts in the area of your study and/or specialism.

You may also organize new words in maps by choosing any appropriate for you Vocabulary Map Graphic Organizer Printout given at: http://www.enchantedlearning.com/ graphicorganizers/vocab/

Section 5 Writing 

5.1 Writing a Record Card and Making Notes

By the end of this section you will be able to:

- make usable notes from information sources in your area of study and/or specialism
- summarise, paraphrase, synthesise ideas from different text types (eg. articles, textbooks, surveys, etc.)
- quote correctly

Task 1. Do 'a quick reading' of **Text 3.3 Resource Extraction** given in **Section 3 Reading for Information** without making any notes. When you have finished note down points which have caught your attention.

Task 2. Now go systematically through the text and find the answers to the questions:

- What does the title of the article tell you?
- What do you think the author wants you to learn, and think about as the result of the text?
- How many sections are there in the text? What does each section tell you? Try to summarise each section in your own words. Try to make a couple of phrases.
- What are the author's conclusions and/or recommendations? Jot these down in your own words.

Task 3. Write a very brief summary of the text to be put into a record card. The summary should identify the main points of the text in terms of mining

methods. Identify one or two key-words or phrases which ‘capture’ idea of the text. Choose one quotation from the text which you could use to support a discussion on coal mining methods.

RECORD CARD
References: (see below how to make references)
Brief summary:
(+) Supportive quotation.
(-) Quotation which you do not agree, share or support.
(?) Idea (quotation) worth thinking about.

5.2 Writing References

By the end of this section you will:

- have a working knowledge of rules how to write references in English to be within International standards of academic writing
- be able to construct bibliography and write references with high degree of accuracy

Task 1. Read two abstracts from ‘*Conventions for the Presentation of Written Assignments for Postgraduate Students’* of the University of Exeter (Great Britain) and be ready to answer the following questions:

- What is bibliography?
- What differs bibliography from references?
- How bibliography is arranged? (What order in?)
- What should be included in bibliography?
- When do we refer to sources?
- What is plagiarism?
- How to avoid plagiarism?

6. REFERENCES

In professional writing, we invariably have to refer to the work of fellow professionals either to bring new ideas into our work, or to demonstrate that we know the source of an idea or to use another person's writing to support what we are saying. This also guards against accusations of plagiarism.

7. BIBLIOGRAPHY

At the end of the assignment, you must provide a section headed **Bibliography**, which gives full details of every book, article or other document that was mentioned in the text. The bibliography is arranged in alphabetical order according to the author's surname. The information included varies according to the type of reference: a book, a journal article, or in an article in a book etc. DO NOT INCLUDE WORKS WHICH YOU MAY HAVE READ BUT WHICH YOU HAVE NOT CITED IN YOUR PAPER.

6.1 Plagiarism

Plagiarism is taking author's thoughts and ideas and presenting them as if they were your own, in a form that is identical or very close to the original. This is a serious offence in academic writing, and must be avoided. Of course, you will frequently want to include other people's views and findings in your own writing, either directly (i.e. quotations) or indirectly (i.e. a summary in your own words). That is standard practice, and is perfectly acceptable. But in all cases, you ***must*** acknowledge the original authors, by referring to them in the text and including full bibliographical details at the end of the assignment...

When you are writing an assignment paper, it is unwise to have the books or articles you are using open in front of you. This often leads to plagiarism, as it is easy to be influenced, perhaps unconsciously, by the language of these texts. It is safer to make notes from the books or articles, and then write your assignment paper from the notes. This will ensure that you use your own words to express the ideas.

*School of International Education Conventions for the Presentation of Written Assignments. Postgraduate Courses (2004: 8, 10).

Task 2. Make notes of the key ideas of the texts. Use them and/or information given above while writing assignments, course papers, reports etc. in English.

Task 3. Write references to the information sources processed by you following the rules given below:

Reference for a (text)book

Author's surname, Initial(s) of the author's name. (Date of publication: year) *Title of the book.* Place of publication: Name of publisher.

Eg. Woodcock, N. (1994) *Geology and Environment in Britain and Ireland.* London: University College London Press Limited.

Reference for a journal article

Author's surname, Initial(s) of the author's name (& Initial(s) of the coauthor) (Date of publication: year) Title of the article. *Title of Journal,* Journal Vol. #/ Issue number.

Eg. Chadwick, M. (2004) Gold Mining in Russia. *Mining Magazine*, No. 2, February.

Task 4. Compare the Ukrainian rules of writing bibliography and references. Find differences and similarities. Share the ideas with your groupmate(s).

5.3 Conventions for Presentation Portfolio Tasks, Results of Self-study and Individual Work

By the end of this section you will:

- be aware of the requirements to presentation Portfolio Tasks and results of your self-study
- be able to organise your study resources effectively
- be able to keep record of reading, and of important references and quotations
- understand assessment requirements and marking criteria used for assessing your self-study.

 By the end of each module you should present a report of the work done at home. This report is considered to be your Portfolio, which should follow the structure of a typical report including:

1) **Title** page;
2) **Contents** page;
3) **English-Ukrainian Glossary of Terms** made by your own as the result of extensive reading at home. The terms have been found in the texts and processed in class are also included. Number of terms per module is not less than **100 words** and **word phrases**.
4) **Dossier** which contains all the information that can confirm that you were working hard during module. All the work done by you (articles, abstracts, record cards, translations, projects, letters, tests etc.) should be gathered in a file folder. Special attention should be paid to *File of the Resources Processed*, i.e. *List of texts* (magazine and journal articles, chapters from various textbooks, Internet sites etc.)
5) **References**.

To present your **Portfolio** file folder adequately and effectively you should follow the samples given in **Appendix B**.

Section 6 Grammar Reviewing and Practising

By the end of this section you will:

have a working knowledge of grammatical structures to express notions and to understand and produce a wide range of texts in academic and professional areas

Unit 1 Mineral Resources

Passive Constructions

Refresh Your Memory: The ***Passive Voice*** serves to show that ***the person*** or ***thing*** denoted by the subject of the sentence ***is not the agent*** (the doer) of the action expressed by the predicate verb but is ***the object of this action***.

The Passive Voice is formed by means of the auxiliary verb ***to be*** in the *required form* and ***Past Participle*** *of the notional verb*. For the irregular verbs consult the dictionary.

The subject of a passive verb does not act but is acted upon, it undergoes an action: The articles ***are read*** by the students.

The lectures ***are delivered*** by the professor.

On the contrary, the ***Active Voice*** shows that ***the person*** or ***thing*** denoted by the subject of the sentence ***is the agent*** (the doer) ***of the ac***tion expressed by the predicate verb.

The subject acts: The students ***read*** the articles.

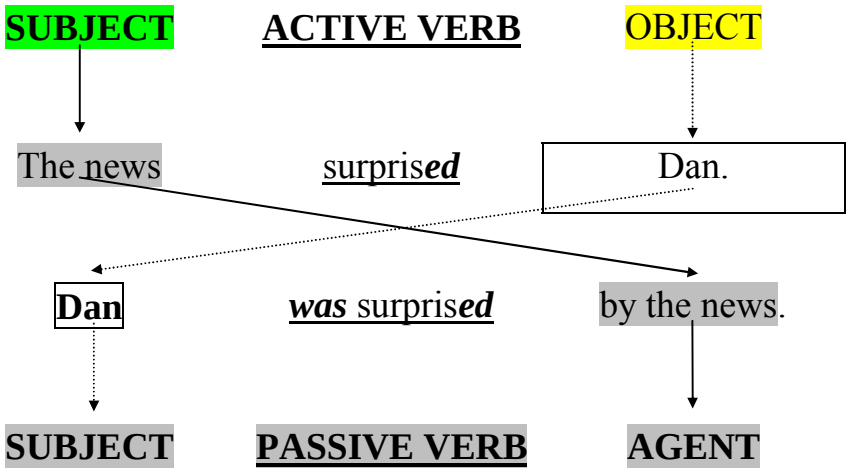
The professor ***delivers*** lectures.

Memorize active tenses and their passive equivalents.

Tense / Verb Form	Active Voice	Passive Voice*
Simple Present	ask***s***	***is*** ask***ed***
Simple Past	ask***ed***	***was*** ask***ed***
Future Indefinite	***will*** ask	***will*** *be* ask***ed***
Present Progressive	***is*** ask***ing***	***is being*** ask***ed***
Past Progressive	***was*** ask***ing***	***was being*** ask***ed***
Present Perfect	***has*** ask***ed***	***has been*** ask***ed***
Past Perfect	***had*** ask***ed***	***had been*** ask***ed***
Future Perfect	***will have*** ask***ed***	***will have been*** ask***ed***

To change active construction into a passive construction

- replace the active verb phrase by the matching passive one;
- make the object of the active construction the subject of the passive construction;
- make the subject of the active construction the agent of the passive construction (**by** + **noun** phrase). See the scheme that follows.



 Don't miss the verb *to be* or the part of it in the passive constructions.

Correct: The experiments **<u>are conducted</u>** in the laboratory.
Wrong: The experiments <u>conducted</u> in the laboratory.

Correct: Mineral resources **<u>are classified</u>** into three main groups.
Wrong: Mineral resources <u>classified</u> into three main groups.

 *By* - phrase is only required when the speaker or writer needs to mention the agent. It is not necessary to mention the agent in the following examples:

This book *was* first *published* in 1990.

This house *was built* two years ago.

The problem *was discussed* at the conference.

We can only make sentences "active" by imagining a subject:

Someone first published this book in 1990.

Somebody built this house two years ago.

 The negative form is built up by placing the particle *not* after the (first) auxiliary verb:

The letter **<u>has</u> not <u>been received</u>** yet.

 The interrogative form is built up by placing the (first) auxiliary verb before the subject of the sentence:

Has the letter **been received**?

Demonstration Sentences:

1. Mineral resources are classified into three main groups: fuels, metals and non-metals.
2. Coal is usually used as fuel.
3. Roof supports are used to keep the working safe.
4. Measures are taken to avoid the error.
5. A variety of mining problems were discussed at the seminar.
6. The International Students' Forum was held last April.
7. A new instrument has been put into laboratory practice.
8. Much attention is drawn to the development of better research techniques.
9. These conclusions were arrived at independently.

Test yourself

Part A: Sentence Completion

Choose the correct answer.

Usually outstanding scientists _____ to give review papers.

(A) are being invited

(B) are invited

(C) invited

(D) were being invited

Explanatory answer : (B). It should be ***are invited***. The form of the Simple Present Passive Voice is used for usual activities. The rest of the forms are ungrammatical.

Part B: Error Identification

Choose the incorrect word or phrase and correct it.

The electrons were pictured (A) as very small charged (B) bodies, which generated (C) the field in free space and conversely was acted upon (D) by forces due to the field.

Explanatory answer: (D). It should be *were acted upon*. The plural form of the verb *to be* is used for the plural subject *the electrons*.

Practice Exercises

Exercise 1. Identify and underline the passive forms of the verbs in the following sentences.

1. The exhibition have been attended by one hundred thousand people.
2. When an experiment is carried out we'll study the results obtained.
3. By the end of June the project will have been realized.
4. How many users were served via the communication system?
5. Underground mines and opencasts are equipped with new machines.
6. The title of the article has been changed.
7. The investigation is being carried out under the supervision of Professor Petrov.
8. A brief account will be given of the available data and interpretations concerning the mechanism.
9. A new cutter-loader has been recently designed for thick seams.
10. Powerful excavators are widely used in open-cast mining now.
11. No work has yet been done in this area.
12. A few experiments have been carried out this week.
13. They have recently put forward a new idea.
14. A new research program is being discussed by the scientists.

Exercise 2. Make the following sentences negative with *not* or *no.*

1. This formula is readily deduced from the equation.
2. Some verification of these findings is required.
3. Some consideration of other phenomena is provided here.
4. This deviation is associated with the energy loss.
5. Some additional information is reported in this paper.

6. These defects are readily detected by X-ray analysis.
7. Some justification of this approach will be needed.
8. Some other observations were usually conducted.
9. These requirements are justified in this case.

Exercise 3. Change the following sentences into the Passive Voice and rewrite them, leaving out the doer of the action.

1. We heard nothing from him for several days.
2. The scientists sent the article to the scientific journal.
3. They usually finish the work in time.
4. They will finish the experiment in three hours.
5. They will describe the experiment in their next paper.
6. The researchers spend much time on experimenting.
7. They will meet him at the laboratory.
8. They published this book abroad.
9. We shall hold the seminar next week.
10. I finish my work at 6 o'clock.
11. They publish many interesting articles in this journal.
12. People observe tiny objects with the help of microscopes.
13. My assistant and I analyse the samples in the laboratory.
14. We regularly keep a record of the experiments.

Exercise 4. Transform the following sentences using the proper tense form.

1. The defects are being eliminated now. (before you came)
2. The questions are being answered by the lecturer. (just)
3. The Proceedings of the Institute are being read now. (by the end of the week)
4. The experiments have been carried out. (by tomorrow)

5. All the changes were detected. (before the experiment was finished)
6. All of these methods are widely used in research. (by next year)
7. The conception has been put forward. (by the end of the month)
8. The classification is being made now. (just)
9. The conclusions were drawn. (already)

REVIEW EXERCISE: Testing Points on Verbs

Part A : Sentence Completion

Choose the correct answer.

1. All of the problems _____ from both theoretical and experimental viewpoints.

(A) will deal

(B) will deal with

(C) will be dealt with

(D) deal with

2. The detailed study of palaeontology _____ in our knowledge concerning the origin of the Earth.

(A) won't filled gaps

(B) will fill gaps

(C) not fill gaps

(D) fill gaps

3. Every retreating tide _____ along the beach.

(A) shall leave marks

(B) leave mark

(C) leave marks

(D) leaves marks

4. The idea of direct probing of the universe _____a popular one lately.

(A) become

(B) has become

(C) becomes

(D) became

5. In this paper the question _____ in detail.

(A) deals

(B) is dealt with

(C) will deal

(D) will deal with

6. Some new measuring instruments _____ in our laboratory.

(A) have recently been received

(B) have yet been received

(C) had received

(D) have received

7. At present intensive research _____ on the improvement of spaceflight conditions.

(A) is done

(B) is doing

(C) is being done

(D) has been done

8. In the last two decades much of the data in various areas of physics _____ quite well in terms of the quantum theory.

(A) have been analysed

(B) has been analysed

(C) has analysed

(D) been analysed

9. The problem of training college and university students for laboratory research _____ in numerous articles.

(A) is being discussed

(B) being discussed

(C) were discussed

(D) were being discussed

Part B: Error Identification

Choose the incorrect word or phrase and correct it.

1. When the experiment is started , the readings are taken constantly and the process
(A) (B) (C)
followed with various measuring instruments.
(D)

2. Coal will not only continue to play an important part in the next century , it also
(A) (B) (C) (D)
act as a bridge in the energy systems of the future.

3. The present knowledge of possible carbon dioxide effects on climate do not justify
(A) (B) (C)
delaying the expansion of coal use.
(D)

4. The geologist tries to interpret the present earth as the result of processes which
(A) (B)
has been acting through long ages of time.
(C) (D)

5. Before the experiment all the necessary preparations are made :the instruments
(A)
were checked , samples are chosen.
(B) (C) (D)

6. The theoretical aspects of the problem will be considered in depth and the paper
(A) (B)
will intend for theoretical physicists.
(C) (D)

7. Much attention is being given at present to the development of international
(A) (B)
scientific contacts and the idea of conducting research on an international
(C)
scale being widely discussed at scientific meetings.
(D)
8. Valuable information been obtained in recent years on the age and composition of
(A)
the moon , various ideas have been proposed to explain the origin of this planet.
(B) (C) (D)

Unit 7 Safety of Mining Operations

Modals

Refresh Your Memory: The modals do not express the action, but the attitude expressed by a speaker or hearer to the action. They cannot be used as full verbs. That is why they are traditionally called "*defective*". They lack many forms characteristic of regular verbs. The modals do not have the following forms: **-s** forms, **-ing** forms, or **-ed** participle.

Modals cannot be the only verb in a sentence. Any modal must be used with another verb:

Engineers ***can*** **solve** any technical problems.
Coal ***can*** **be used** as fuel.

The meanings of modal verbs can be divided into two groups.

1) Modals of this group (***must***, ***need***, ***ought***, ***may***, ***can***, ***could***, ***will***) deal with **obligation** and **freedom to act** or similar ideas.

They are used to say that somebody is **obliged** to do something, that s/he is **able to do** something, that there is nothing to stop something happening, that it would be better if something happened or did not, or that is something **is permitted** or **forbidden**.

Strong obligation is expressed by ***must, will, need.***
E.g. Students ***must*** register in the first week of term.
All teaching staff ***will*** arrive for work by 8 o'clock.
Need I get a visa for Poland?

 **Prohibition** is expressed by ***must not***, ***may not***, ***cannot***.

E.g. You ***must not*** take this way. It's slippery there.
Books ***may not*** be taken from the library.
You ***can't come*** in there.

 **Weak obligation, recommendations** are usually expressed by *should*, *ought to*, *might, shall* (in questions).

E.g. You ***should*** try to work harder.
She really ***ought to*** wash her hands.
You ***might*** see what your groupmate thinks.
What ***shall*** we do next?

 **Permission** could be expressed by *can*, *could*, *may*, *might.*

E.g. You ***can*** take my pen if you need.
Could I ask a question?
May I come in?
Do you think I ***might*** take a break now?

 **Ability (physical or mental)** is expressed by ***can, could.***

E.g. She ***can*** speak Russian, Ukrainian, English, German and Polish.
Anybody who wants ***can*** join English Speaking Club.
You ***could*** take TOEFL exam last autumn.

2) Modals of this group express degree of certainty. These modal verbs can be used to say that a situation is ***certain***, ***probable***, ***possible*** or ***impossible***.

 **Complete certainty** (positive or negative): *shall*, *will*, *must, can't*.

E.g. I ***shall*** be away tomorrow.
I ***shan't*** be late on Tuesday.
It ***won't*** rain tonight.
Things ***will*** be all right.
You ***must*** be tired.

 **Probability** (deduction, saying that something is logical or normal): ***should, ought to.***

E.g. Professor Kovalevska ***should/ought to*** deliver a lecture on underground mining techniques.

It ***shouldn't/oughtn't to*** be difficult to get there.

 **Possibility** (talking about chances that something is true or will happen): ***may***.

E.g. The water in the Dnieper ***may*** not be warm enough to swim.

We ***may*** be changing a coursebook for a new one.

Demonstration Sentences :

1. I can name all the recent contributors to this field.
2. The course work may require a lot of time.
3. The error must be in his reasoning.
4. I have to make measurements and calculations.
5. We are to finish our experiments in a week.
6. According to the author this theory should hold in all cases.
7. This view ought to be accepted.
8. You needn't do it now.

Mini - Test

Test yourself by a sample.

Part A: Sentence Completion

Choose the correct answer.

The experiment _____ new data.

(A) might giving
(B) might give
(C) might to give
(D) doesn't might give.

Explanatory answer : (B). It should be *might give*; **ing-**form and the infinitive with *to* are never used after *might*. The negative form is built without the auxiliary verb.

Part B: Error Identification

Choose the incorrect word or phrase and correct it.

There will inevitably be components that cannot (A) being reduced (B) entirely to physically measurable quantities and so will have to (C) be evaluated (D) subjectively.

Explanatory answer (B). It should be *cannot be reduced*. The **ing** -form is not used after modals.

Practice Exercises

Exercise 1. Identify and underline modals in the following sentences. Find two examples with errors.

1. The rate of flow can be measured by a number of measuring devices.
2. The work of mountain glaciers can best to be seen after the ice has melted.
3. It may take you twelve hours' reading to produce an intellectually honest article of a thousand words.
4. Various methods may be used to remove coal from the working face in an underground mine.
5. Various improvements should be introduced in the research process.
6. The following check list of planning considerations should being used to ensure optimum design.
7. Very specialized machinery must be designed to mine manganese deposits located on the floor of the Pacific Ocean.
8. In order to remain successful, these companies must have strong management ability, highly skilled crews and competent supervisors.

Memorize the forms of the modal verb ***can*** and its equivalent for the missing or alternative parts of the verb:

Present	Past	Future
can	**could***	
am/is/ are able (to)	**was/were able (to)**	**shall/will be able (to)**

Remember the following meanings of the modal verb ***can:***

a) *ability*, *capability*

I ***can*** see it = I *am able to* see it = I *have the ability to* see it.

I ***can*** type = I *am able to* type = I *am capable of* typing = I *know how to* type.

For inability use *can't / be unable to / be incapable of*: I ***can't*** speak German.

Could expresses *past ability* and has the meaning "*knew how to*". It refers to a permanent or habitual ability:

I ***could*** read when I was five.

I never ***could*** play the piano.

To refer to the ***future ability***, we should use ***to be able (to):***

I'***ll be able to*** take shorthand soon.

Can/Could = ***ability*** can be used in *requests*: ***Could*** you give me your pen?

b) *theoretical possibility*

Lightning can be dangerous = Lightning is sometimes dangerous.

For ***impossibility*** *can not* ***(can't)*** is used : He ***can't be*** in the lab now = It is *impossible* that he is in the lab now.

c) *permission*

I ***can*** = I *am able (to)* = I *am allowed (to)* = I *am permitted (to)*.

Permission has been granted. We can go now. (The verb *may* is more common here; *can* is less formal than *may* in this sense.)

Can I ...? **asks for permission** : ***Can*** we work here? -Yes, you can.

Practice Exercises

Exercise 1. Express ability or capability with the help of *can*.

1. Some elements are capable of emitting particles.
2. Some materials are capable of absorbing light well.
3. Some substances are capable of dissolving metals.
4. Some materials are capable of being good insulators.
5. Some elements are capable of giving off their electrons easily.
6. Some substances are capable of conducting electricity well.
7. Some substances are capable of reacting without heating.
8. Some substances are capable of accelerating reactions.
9. Some elements are capable of exhibiting metallic properties.
10. Some substances are capable of slowing down reactions.

Exercise 2. Express the similar idea with *can* or *cannot*.

1. Such transformations are unobservable.
2. Such changes are predictable.
3. This device is unacceptable in our case.
4. Such a complicated experiment is unrealizable.
5. These phenomena are explainable.
6. These results are easily obtainable.
7. Those problems are insoluble.
8. This method is acceptable.
9. These processes are uncontrollable.

Exercise 3. Open the brackets by using the perfect infinitive form after ***could.***

1 These data could (to use) in our work but they lacked precision.

2. It is believed that these rocks could (not to be) more than 5000 years old.

3. They could (to reorganize) the department of electronics long ago.

4. I could (to write) an article for the scientific journal.

5. This definition lacked clarity, otherwise it could (to take) for general use.

6. You could (to introduce) me to your supervisor.

7. He could (to become) a specialist in economy and management.

8. He could (to come) to participate in the discussion.

Memorize the forms of the modal verb ***may*** and its equivalent for the missing or alternative parts of the verb :

Present	**Past**	**Future**
may	**might***	
am/is/are allowed (to)	**was/were allowed (to)**	**will be allowed (to)**

Remember the following meanings of the modal verb *may*:

a) ***permission***

You ***may*** do it = You *are allowed to do* it = You *have permission to do* it (giving permission).

May I come in ? - Yes, please **do** (asking for permission = request).

*In **negative sentences** it denotes **prohibition***:	You ***may not*** work here.

Might is used as a milder and more polite form of permission than *may:*

Might I speak to you now ? (very polite)

b) ***supposition implying uncertainty***

May in this meaning occurs in the affirmative and negative sentences:

They *may* be in the lab. They *may* not be there.

Might implies a greater degree of uncertainty:

He *may* visit us.

He *might* visit us (less certain).

c) ***possibility due to circumstances***

May in this meaning occurs only in affirmative sentences:

You *may* order your ticket by phone.

There is no important difference between *may* and *might* when you want to say that something is possible.

Remember that *may / might* + perfect infinitive construction is used to say what was possible in the past. It is used like *could* + perfect infinitive:

He *may* have forgotten about our meeting.

He *might* have met his supervisor.

d) ***reproach*** or ***disapproval*** - Only the form might in the affirmative sentences is used here:

You ***might*** be more attentive in class.

You ***might*** have helped your colleague.

Remember that there can also be a continuous form of the infinitive after *may/ might*:

He *might* be making an experiment now.

He *may / might* have been waiting for me for a long time.

Demonstration Sentences:

1. The operation and maintenance of a mine may involve high and unavoidable fixed costs.
2. Explosives may be used to break up any rock in the area.
3. They were allowed to use the equipment.
4. He was not allowed to carry out the experiment.
5. The less progressive firms have been allowed to exist.
6. He might take up some other subjects next year.
7. He might publish his article soon.

8. The requirements may have been met in the previous experiment.
9. They might have neglected smaller errors.

Mini - Test
Test yourself by a sample.

Part A: Sentence Completion
Choose the correct answer.

The research group _____ good results.
(A) might getting
(B) might got
(C) might get
(D) might not got

Explanatory answer: (C). It should be *might get*. It expresses certainty and is equivalent to the sentence. *It is possible that the research group will get good results*. Choices (A), (B) and (D) are ungrammatical. The bare infinitive is used after *might*.

Part B : Error Identification
Choose the incorrect word or phrase and correct it.

The results of their investigation might have been easily overlook as they were
(A) (B) (C) (D)
published in one of the issues of a popular science magazine.

Explanatory answer: (D). It should be *overlooked*. The perfect infinitive used after *might* is in the passive form here.

Practice Exercises

Exercise 1. Every sentence in this exercise contains an error. Give the correct versions of the compound predicates with *may (might)* modal.

1. It may or may be not possible to correct the input information on the spot at once.
2. Very severe storms may causing the sea to rise and move forward.
3. This theorem may have be proved centuries ago.
4. They may have disregard smaller defects.

5. The results of the experiments carried out by the research group may well been in order.
6. His name might have add to the list.
7. The experiment might given new data.
8. It might taking me a month to complete my work.

Memorize the forms of the modal verb *must* and its equivalent *to have (to)*:

Present	Past	Future
must		
have/has (to)	**had (to)**	**will have (to)**

Remember that ***have to***, ***have got to***, and ***must*** express the idea that something is ***necessary***.

COMPARE

must	**have to**
expresses *necessity, obligation* ***from the speaker's point of view***	expresses *necessity, obligation* ***imposed by circumstances***

E.g. I ***must*** finish this work. (*The speaker personally thinks that he must do it*.)
I ***have to*** do it. (*The speaker gives facts, not his own feelings*.)

Must in affirmative sentences can also express *supposition implying strong probability*:

You *must* be tired.

 Remember that ***do not have to*** expresses ***the lack of necessity***; ***must not*** expresses ***prohibition***:

You ***don't have to*** use this device.

You ***mustn't*** use t his d evice.

 Remember that *must* followed by different forms of the infinitive expresses *a logical conclusion based on evidence*.

 **Compare:**

1. He ***must*** deliver the lectures very often; he is a professor at the University. (the conclusion about an event that happens repeatedly - *must* + the bare infinitive)
2. He is not in his office. He ***must*** be delivering a lecture now. (the conclusion is about an event that is happening now = *must* + the continuous infinitive).
3. Do you see him there? He ***mus***t have delivered the lecture. (the conclusion is about an event that happened in the past = *must* + the perfect infinitive).

 *Must* in combination with the perfect infinitive always refers the action to the past:

This possibility ***must*** have been overlooked.

Remember that ***to be (to)*** as modal verb means *a previously arranged plan or obligation resulting from the arrangement.*

E.g. I **am to** go tomorrow.

He **is to** return from his business trip tomorrow.

The past tense of the verb *to be* in combination with the perfect infinitive denotes *an unfulfilled plan.*

E.g. We ***were to*** have met him in his office.

Demonstration Sentences :

1. There must be an answer to this question.
2. What conditions must be observed in your experiments?
3. Some errors must have been made in the program.
4. They must have overestimated the potentialities of this technique.
5. He has to check the laboratory devices very often.
6. You do not have to answer all questions.
7. He had to work day and night at his thesis.
8. Last month we were to carry out a series of experiments.
9. Various methods are to be used in our investigation.

Mini - Test

Test yourself by a sample.

Part A: Sentence Completion

Choose the correct answer.

Observation of the sun and the planet _____ long before our civilization, as evidenced by recent archaeological findings.

(A) must be made
(B) must be making
(C) must have been made
(D) must have made

Explanatory answer : (C). It should be ***must have been made***. It expresses a logical conclusion based on evidence about an event that happened in the past.

Past B: Error Identification

Choose the incorrect word or phrase and correct it.

If we are to recognize different minerals, and to discriminate one from another,
(A) (B)
we must be defining their real nature precisely.
(C) (D)

Explanatory answer : (D). It should be ***must define***. It is not the conclusion about the event that is happening now, at this moment.

Practice Exercise

Exercise 1. Analyse the sentences with *to be (to)* as a modal verb. Find one sentence with an error.

1. The principal method of exploitation of coal seam in this mine is to be the longwall system of working.
2. Operational aspects and manpower organization were to be integrated into the existing system.
3. Most part of this work is to be done this year.
4. Within this time the maximum change in conductivity was to be observed.
5. For thousands of years man has been attracted by the beautiful rare and therefore valuable minerals which is to be found in certain places.
6. Two mines and the concentration plant are to be connected by tunnels.
7. These problems were to be considered together.
8. These problems are to be studied by the laboratory in the near future.
9. According to the program their investigation was to take three years.

REVIEW EXERCISE: Testing Points on Modals

Part A: Sentence Completion
Choose the correct answer.

1. Much information _____ recorded with the help of this device.
   (A) cannot
   (B) is able to
   (C) is not able to
   (D) cannot be

2. Simplification as a method of understanding can and must _____ the method of understanding of any science.
   (A) have been
   (B) be
   (C) been
   (D) having been

3. You _____ such a long essay. Three-five short paragraphs should be enough to demonstrate your writing ability. You have written much more than that.

(A) need have written
(B) needn't have written
(C) need write
(D) need writing

4. But for the lack of precise measuring instruments these data might _____ much earlier.

(A) have received
(B) been received
(C) have been received
(D) had been received

5. No conclusions _____ from this chapter.

(A) can be drawn
(B) can't be drawn
(C) cannot be drawn
(D) can be not drawn

6. The material _____ excessively wet or excessively dry for this purpose.

(A) must be not
(B) must not be
(C) have not be
(D) has not be

7. The problems that exist with your experiments today should _____ a month or two ago.

(A) have been solved
(B) be solved
(C) have solved
(D) had been solved

8. They are often confronted with difficult problems which they have to _____.

(A) have solved
(B) solve
(C) be solving
(D) have been solving

9. Nearly all the streams _____ carry some sediments down their entire courses and out of their mouths.

(A) will be not able to

(B) are able to

(C) was able to

(D) cannot to

Part B: Error Identification

Choose the incorrect word or phrase and correct it.

1. Although you may see twenty or thirty items that you would really like to buy,
(A) (B) (C)
you know that you will have limit your selection to one or two.
(D)

2. He must can identify the particular error that has occurred in the input.
(A) (B) (C) (D)

3. However useful it may be, it can be not employed to advantage unless it can
(A) (B) (C)
be obtained in adequate quantities and at reasonable price.
(D)

4. They have supply judgement to cover those aspects of the problem which
(A) (B)
could not be covered by their research.
(C) (D)

5. Three things may happen to rain that falls on the ground: it may evaporate and return
(A) (B)
to the atmosphere, it may run off down the slope, or it may sunk into the ground.
(C) (D)

6. Cooling coils need to have a large surface area to achieve reasonable
(A) (B)
reductions in air temperature and refrigerating power required have to be of a
(C) (D)
high order.

7. To optimize equipment selection all possible alternatives must been examined and
(A) (B)
all direct and indirect costs must be identified.
(C) (D)

8. These studies should had been resumed, when it became clear that the original
(A) (B) (C) (D)
assumption had been correct.

9. If computers are ever to gain wide acceptance for process control they must be
(A) (B)
understood by the people who have operate them. .For this reason they should be
(C) (D)
kept as simple as possible.

Section 7 Self-assessment

By the end of this section you will be able to:

- understand marking criteria used for tests and assignments
- read and understand rubrics for tests etc.
- manage time in tests and self-assess appropriately

7.1 Answer Keys to the End-of-Module Test

Assess yourself by doing the following tasks on self-assessment.

Task 1. Check your answers to the test given in **Unit 8 CHECK YOUR PROGRESS** by using keys and explanations given below.

The clues to correct answers are marked in grey.

If the number of your correct answers more than 49%, your results are satisfactory. If less your proficiency level is still low.

Task 1. Look at notices (1-5). For each notice which sentence is correct? Circle only one letter (**A**, **B** or **C**).

1. **DO NOT OPERATE THIS MACHINE WITHOUT SUPERVISION**

A You are not allowed to operate this machine at any time.
B You must have someone with you who can use the machine.
C You can only use this machine if you know how to operate it.

2. PLEASE NOTE:

THIS WEEK'S FACULTY MEETING WILL BE HELD AT 11. 45 P.M.

INSTEAD OF 11. 15 A.M.

The Faculty meeting this week will take place at:
A quarter to eleven
B quarter past eleven
C quarter to twelve

3. ***24/11/2006***

Message for Natalie

Reminder – Call Kate Shevchenko 4.50 p.m

Natalie should phone Kate

A on 24 March.

B at ten to five.

C at ten past four.

4. Reproduction in whole or part of any photograph, text or illustration without written permission from the publisher is prohibited.

A The publisher must write and allow you to use photos, texts and drawings from the magazine.

B You must write to the publisher if you want to buy the photos, texts and drawings.

C You can copy any photos, text or drawings from the magazine without asking.

5. **IN THE EVENT OF FIRE ASSEMBLE IN THE YARD.**

A If there is an assembly problem, meet in the yard.

B If there is a fire in the yard, gather together here.

C If there is a fire, everyone should meet in the yard.

Task 2. Read the text that follows.

The Spectacular Eruption of Mountain St Helen

A The eruption in May 1980 of Mount St. Helens, Washington State, astounded the world with its violence. A gigantic explosion tore much of the volcano's summit to fragments; the energy released was equal to that of 500 of the nuclear bombs that destroyed Hiroshima in 1945.

B The event occurred along the boundary of two of the moving plates that make up the Earth's crust. They meet at the junction of the North American continent and the Pacific Ocean. One edge of the continental North American plate over-rides the oceanic Juan de Fuca micro-plate, producing the volcanic Cascade range that includes Mounts Baker, Rainier and Hood, and Lassen Peak as well as Mount St. Helens. **(6)**

C Until Mount St. Helens began to stir, only Mount Baker and Lassen Peak had shown signs of life during the 20th century. According to geological evidence found by the United States Geological Survey, there had been two major eruptions of Mount St. Helens in the recent (geologically speaking) past: around 1900B.C, and about A.D.1500. Since the arrival of Europeans in the region, it had experienced a single period of spasmodic activity, between 1831 and 1857. Then, for more than a century. Mount St. Helens lay dormant. **(7)**

D By 1979, the Geological Survey, alerted

E Steps were taken to evacuate the population. **(8)** Most - campers, hikers, timber-cutters - left the slopes of the mountain. Eighty-four-year-old Harry Truman, a holiday lodge owner who had lived there for more than 50 years, refused to be evacuated, in spite of official and private urging. Many members of the public, including an entire class of school children, wrote to him, begging him to leave. He never did.

F On May 18, at 8.32 in the morning, Mount St. Helens blew its top, literally. Suddenly, it was 1300 feet shorter than it had been before its growth had begun. Over half a cubic mile of rock had disintegrated. At the same moment, an earthquake with an intensity of 5 on the Richter scale was recorded.**(9)** **(15)** It triggered an avalanche of snow and ice, mixed with hot rock - the entire north face of the mountain had fallen away. A wave of scorching volcanic gas and rock fragments shot horizontally from the volcano's riven flank, at an inescapable 200 miles per hour. As the sliding ice and snow melted, it touched off devastating torrents of mud and debris, which destroyed all life in their path. Pulverised rock climbed as a dust cloud into the atmosphere. Finally, viscous lava, accompanied by burning clouds of ash and gas, welled out of the volcano's new crater, and from lesser vents and cracks in its

by signs of renewed activity, had been monitoring the volcano for 18 months.**(11)** It warned the local population against being deceived by the mountain's outward calm, and forecast that an eruption would take place before the end of the century. The inhabitants of the area did not have to wait that long. On March 27, 1980, a few clouds of smoke formed above the summit, and slight tremors were felt. On the 28th, larger and darker clouds, consisting of gas and ashes, emerged and climbed as high as 20,000 feet. In April a slight full ensued, but the volcanologists remained pessimistic. Then, in early May, the northern flank of the mountain bulged, and the summit rose by 500 feet.

flanks.

G Afterwards, scientists were able to analyse the sequence of events. **(10)** First, magma - molten rock - at temperatures above 2000°F **(14)** had surged into the volcano from the Earth's mantle. The build-up was accompanied by an accumulation of gas, which increased as the mass of magma grew. It was the pressure inside the mountain that made it swell. Next, the rise in gas pressure caused a violent decompression, which ejected the shattered summit like a cork from a shaken soda bottle. With the summit gone, the molten rock within was released in a jet of gas and fragmented magma, and lava welled from the crater.

H The effects of the Mount St. Helens eruption were catastrophic. Study of atmospheric particles formed as a result of explosion showed that droplets of sulphuric acid, acting as a screen between the Sun and the Earth's surface, caused a distinct drop in temperature. (**16)** Almost all the trees of the surrounding forest were flattered. Ash and mud spread over 250 square miles of country.**(12)** All the towns and settlements in the area were smothered in an even coating of ash. It has been calculated that the quantity of dust ejected by Mount St. Helen – a quarter of a cubic mile **(13)** – was negligible in comparison with that thrown by the earlier eruptions.

Do the following statements agree with the information given in the article?

Choose ' **A**' for **'Yes'** if the statement agrees with the information,

‘**B**' for '**No**' if the statement contradicts information.

If there is not enough information to answer "Yes" or "No" choose

‘**C’- ‘Not given'.**

Circle the appropriate letters.

6. The eruption was caused by the boundary of two moving plates of the Earth. - A

7. There had been three major eruptions of Mount St. Helen. – B (see the text)

8. Nothing was made to evacuate people from the region close to the mountain. – C (see the text)

9. There was an earthquake in the region caused by the growth of the mountain. – A (see the text)

10. Scientists were able to analyse the sequence of the events. – A (see in the text)

11. The Geological Survey started its activity in 1979. – B (see the text)

Task 3. Complete the table below using the information from the text above.

Item	**Equivalent to**
Example The energy released by the explosion of Mount St. Helens	*Answer* ***500 nuclear bombs***
The area of land covered in mud or ash	**12** 250 square miles

The quantity of dust ejected	**13** a quarter of a cubic mile
Magma molten rocks were at temperatures	**14** 2000°F
The intensity of an earthquake was recorded on the Richter scale	**15** 5

Choose the appropriate letter **A – D** and underline the whole statement.

16. According to the text the eruption of Mount St. Helens and other volcanoes has influenced our climate by

A increasing the amount of rainfall.

B heating the atmosphere.

C cooling the air temperature. (See the text (**16**))

D causing atmospheric storms.

17. By 1979 the volcano had been monitored

A for 18 years.

B for 18 days.

C for 18 weeks.

D for 18 months. (See the text (11))

Task 4. Read the memo and catalogue list below.

Complete the order form on the next page.

Write a word or phrase (in CAPITAL LETTERS) or a number on lines **18 – 22.**

Memorandum

To *Lucy Scrivener*

From *Bill Hammer*

Lucy,

Can you please order some extra stationery for the reps' conference next week? Have a look at the Pens and More catalogue - they seem to be the best. We need enough for 10 reps. I suggest you get some A4 notepads, ballpoint pens, and ring binder files - one for each of the reps. Can you please also order 6 black marker pens and 50 OHP transparencies for me?

Thanks.

Pens and More

Catalogue

Stationery supplies

Code	Item	Unit value £
ST 2367	A4 notepad – lined	2.75
ST 2589	A5 Memo pad	2.50
ST 0256	Ring binder file	2.25
ST0148	Plastic folders - pack of 50	3.50
ST 0524	Plastic document folder	2.60
ST5217	Roller ball pens - pack of 6 black	3.99
ST 5796	Ballpoint pens - pack of 10 blue	0.99
ST 5876	Board marker pens - pack of 6 black	3.25
ST 5899	Pencils-pack of 10 HB	0.36
ST1764	OHP transparencies - pack of 50	6.99
ST 1551	OHP pens - pack of 6	3.49

Office Supplies Order Form

Please fill in the order code, item description, quantity and unit value ONLY. Total amounts and the Grand Total will be completed by the Accounts Department.

Order code	**Item description**		**Quantity**	**Unit value £**	**Total amount £**
ST 2367	**(18)** A4 notepad - lined		**10**	2.75	
ST 5796	BALLPOINT PENS - PACK OF 10 BLUE		**1**	**(19) 0.99**	
(20) ST 0256	RING BINDER FILE		**10**	2.25	
ST 5876	BOARD MARKER PENS -PACK OF 6		**(21)** pack of 6 black	3.25	
ST 1764	**(22) OHP transparencies** PACK OF 50		**1**	6.99	
			GRAND TOTAL		

Task 5. Read the article below. Choose the correct word to fill each gap from **A**, **B**, **C** on the next page. For each question (**23**-**35**), mark one letter (**A**, **B**, **C**). You may fill in the gaps with the appropriate word against the letter.

23	**A**	for	**B**	by	**C**	with
24	**A**	to	**B**	for	**C**	on
25	**A**	who	**B**	which	**C**	where
26	**A**	was	**B**	has been	**C**	is
27	**A**	whose	**B**	who	**C**	which
28	**A**	since	**B**	before	**C**	ago
29	**A**	and	**B**	but	**C**	also
30	**A**	a	**B**	the	**C**	any
31	**A**	in	**B**	from	**C**	for
32	**A**	promoting	**B**	promoted	**C**	promotion
33	**A**	going to	**B**	do	**C**	will
34	**A**	buy	**B**	buying	**C**	bought
35	**A**	for	**B**	to	**C**	which

Top woman chemist's "CRUSADE"

By Roger Highfield, Science Editor

A new $10,000 award has been won (23)_____ a professor who plans to spend her prize money (24)_____ an inspirational nationwide tour by a team of elite women chemists.

The first winner of the Rosalind Franklin Award, (25)_____ aims to promote women in science, is Professor Susan Gibson of King's College, London, it (26)_____ announced yesterday.

The award commemorates Rosalind Franklin, (27)_____ work at King's contributed to the discovery of DNA half a century (28)_____, and rewards excellence in science, engineering (29)_____ technology.

Professor Gibson plans to use (30)_____ prize money to bring a group of leading women chemists (31)_____ around the world tour British universities (32)_____ careers to female undergraduates.

She (33)_____ donate the remainder of the money to enable a young woman postgraduate at her department to (34)_____ much-needed chemicals (35)_____ continue her research.

7.2 Answer Keys to Units

Unit 1 Mineral Resources

Vocabulary

8.

1.	s potassium salt	a.	сірка
2.	u marl	b.	торф
3.	v iron ore	c.	природний газ
4.	k mercury	d.	миш'як
5.	m bauxite	e.	чорне вугілля
6.	o titanium	f.	морська вода
7.	q nickel	g.	ільменіт
8.	r lignite	h.	вапняк
9.	n oil	i.	цілюща вода
10.	c natural gas	j.	кіновар
11.	e black coal	k.	ртуть
12.	w graphite	l.	кам'яна сіль
13.	b peat	m.	боксит
14.	l rock salt	n.	нафта
15.	g ilmenite	o.	титан
16.	j cinnabar	p.	магній
17.	d arsenic	q.	нікель
18.	t bismuth	r.	буре вугілля
19.	y antimony	s.	калійна сіль
20.	x fire clay	t.	вісмут
21.	h limestone	u.	вапниста глина
22.	I curative water	v.	залізна руда
23.	f brine	w.	графіт
24.	a sulphur	x.	вогнетривка глина
25.	p magnesium	y.	сурьма

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Appendix A

English Glossary of Mining Terms

English Term - Definition	Ukrainian/Russian Term or Equivalent
A	
Abutment – In coal mining, (1) the weight of the rocks above a narrow roadway is transferred to the solid coal along the sides, which act as abutments of the arch of strata spanning the roadway; and (2) the weight of the rocks over a longwall face is transferred to the front abutment, that is, the solid coal ahead of the face and the back abutment, that is, the settled packs behind the face.	
Acid mine water – Mine water that contains free sulfuric acid, mainly due to the weathering of iron pyrites.	
Active workings – Any place in a mine where miners are normally required to work or travel and which are ventilated and inspected regularly.	
Adit – A nearly horizontal passage from the surface by which a mine is entered and dewatered. A blind horizontal opening into a mountain with only one entrance.	
Advance – Mining in the same direction, or order of sequence; first mining as distinguished from retreat.	
Air split – The division of a current of air into two or more parts.	
Airway – Any passage through which air is carried. Also known as an air course.	
Anemometer – Instrument for measuring air velocity.	
Angle of dip – The angle at which strata or mineral deposits are inclined to the horizontal plane.	
Angle of draw – In coal mine subsidence, this angle is assumed to bisect the angle between the vertical and the angle of repose of the material and is 20° for flat seams. For dipping	

seams, the angle of break increases, being 35.8° from the vertical for a 40° dip. The main break occurs over the seam at an angle from the vertical equal to half the dip.	
Angle of repose – The maximum angle from horizontal at which a given material will rest on a given surface without sliding or rolling.	
Anticline – An upward fold or arch of rock strata.	
Aquifer – A water-bearing bed of porous rock, often sandstone.	
Arching – Fracture processes around a mine opening, leading to stabilization by an arching effect.	
Area (of an airway) – Average width multiplied by average height of airway, expressed in square feet.	
Auger – A rotary drill that uses a screw device to penetrate, break, and then transport the drilled material (coal).	
Auxiliary operations – All activities supportive of but not contributing directly to mining.	
Auxiliary ventilation – Portion of main ventilating current directed to face of dead end entry by means of an auxiliary fan and tubing.	
Azimuth – A surveying term that references the angle measured clockwise from any meridian (the established line of reference). The bearing is used to designate direction. The bearing of a line is the acute horizontal angle between the meridian and the line.	

B	
Back – The roof or upper part in any underground mining cavity.	
Backfill – Mine waste or rock used to support the roof after coal removal.	
Barren – Said of rock or vein material containing no minerals of value, and of strata without coal, or containing coal in seams too thin to be workable.	
Barricading – Enclosing part of a mine to prevent inflow of toxious gasses from a mine fire or an explosion.	
Barrier – Something that bars or keeps out. Barrier pillars are solid blocks of coal left between two mines or sections of a mine to prevent accidents due to inrushes of water, gas, or from explosions or a mine fire.	
Beam – A bar or straight girder used to support a span of roof between two support props or walls.	
Beam building – The creation of a strong, inflexible beam by bolting or otherwise fastening together several weaker layers. In coal mining this is the intended basis for roof bolting.	
Bearing – A surveying term used to designate direction. The bearing of a line is the acute horizontal angle between the meridian and the line. The meridian is an established line of reference. Azimuths are angles measured clockwise from any meridian.	
Bearing plate – A plate used to distribute a given load. In roof bolting, the plate used between the bolt head and the roof.	
Bed – A stratum of coal or other sedimentary deposit.	
Belt conveyor – A looped belt on which coal or other materials can be carried and which is generally constructed of flame-resistant material or of reinforced rubber or rubber-like substance.	
Belt idler – A roller, usually of cylindrical shape, which is supported on a frame and which, in turn, supports or guides a conveyor	

belt. Idlers are not powered but turn by contact with the moving belt.	
Belt take-up – A belt pulley, generally under a conveyor belt and inby the drive pulley, kept under strong tension parallel to the belt line. Its purpose is to automatically compensate for any slack in the belting created by start-up, etc.	
Bench – One of to or more divisions of a coal seam separated by slate or formed by the process of cutting the coal.	
Beneficiation – The treatment of mined material, making it more concentrated or richer.	
Berm – A pile or mound of material capable of restraining a vehicle.	
Binder – A streak of impurity in a coal seam.	
Bit – The hardened and strengthened device at the end of a drill rod that transmits the energy of breakage to the rock. The size of the bit determines the size of the hole. A bit may be either detachable from or integral with its supporting drill rod.	
Bituminous coal – A middle rank coal (between subbituminous and anthracite) formed by additional pressure and heat on lignite. Usually has a high Btu value and may be referred to as "soft coal."	
Black damp – A term generally applied to carbon dioxide. Strictly speaking, it is a mixture of carbon dioxide and nitrogen. It is also applied to an atmosphere depleted of oxygen, rather than having an excess of carbon dioxide.	
Blasting agent – Any material consisting of a mixture of a fuel and an oxidizer.	
Blasting cap – A detonator containing a charge of detonating compound, which is ignited by electric current or the spark of a fuse. Used for detonating explosives.	
Blasting circuit – Electric circuits used to fire electric detonators or to ignite an igniter cord by means of an electric starter.	
Bleeder or bleeder entries – Special air	

courses developed and maintained as part of the mine ventilation system and designed to continuously move air-methane mixtures emitted by the gob or at the active face away from the active workings and into mine-return air courses. Alt: Exhaust ventilation lateral.	
Bolt torque – The turning force in foot-pounds applied to a roof bolt to achieve an installed tension.	
Borehole – Any deep or long drill-hole, usually associated with a diamond drill.	
Bottom – Floor or underlying surface of an underground excavation.	
Boss – Any member of the managerial ranks who is directly in charge of miners (e.g., "shift-boss", "face-boss", "fire-boss", etc.).	
Box-type magazine – A small, portable magazine used to store limited quantities of explosives or detonators for short periods of time at locations in the mine which are convenient to the blasting sites at which they will be used.	
Brattice or brattice cloth – Fire-resistant fabric or plastic partition used in a mine passage to confine the air and force it into the working place. Also termed "line brattice," "line canvas," or "line curtain."	
Break line – The line that roughly follows the rear edges of coal pillars that are being mined. The line along which the roof of a coal mine is expected to break.	
Breakthrough – A passage for ventilation that is cut through the pillars between rooms.	
Bridge carrier – A rubber-tire-mounted mobile conveyor, about 10 meters long, used as an intermediate unit to create a system of articulated conveyors between a mining machine and a room or entry conveyor.	
Bridge conveyor – A short conveyor hung from the boom of mining or lading machine or haulage system with the other end attached to a receiving bin that dollies along a frame supported by the room or entry conveyor, tailpiece. Thus, as the machine boom moves,	

the bridge conveyor keeps it in constant connection with the tailpiece.	
Brow – A low place in the roof of a mine, giving insufficient headroom.	
Brushing – Digging up the bottom or taking down the top to give more headroom in roadways.	
Btu – British thermal unit. A measure of the energy required to raise the temperature of one pound of water one degree Fahrenheit.	
Bug dust – The fine particles of coal or other material resulting form the boring or cutting of the coal face by drill or machine.	
Bump (or burst) – A violent dislocation of the mine workings which is attributed to severe stresses in the rock surrounding the workings.	
Butt cleat – A short, poorly defined vertical cleavage plane in a coal seam, usually at right angles to the long face cleat.	
Butt entry – A coal mining term that has different meanings in different locations. It can be synonymous with panel entry, submain entry, or in its older sense it refers to an entry that is "butt" onto the coal cleavage (that is, at right angles to the face).	
C	
Cage – In a mine shaft, the device, similar to an elevator car, that is used for hoisting personnel and materials.	
Calorific value – The quantity of heat that can be liberated from one pound of coal or oil measured in BTU's.	
Cannel coal – A massive, non-caking block coal with a fine, even grain and a conchoidal fracture which has a high percentage of hydrogen, burns with a long, yellow flame, and is extremely easy to ignite.	
Canopy – A protective covering of a cab on a mining machine.	

Cap – A miner's safety helmet. Also, a highly sensitive, encapsulated explosive that is used to detonate larger but less sensitive explosives.	
Cap block – A flat piece of wood inserted between the top of the prop and the roof to provide bearing support.	
Car – A railway wagon, especially any of the wagons adapted to carrying coal, ore, and waste underground.	
Car-dump – The mechanism for unloading a loaded car.	
Carbide bit – More correctly, cemented tungsten carbide. A cutting or drilling bit for rock or coal, made by fusing an insert of molded tungsten carbide to the cutting edge of a steel bit shank.	
Cast – A directed throw; in strip-mining, the overburden is cast from the coal to the previously mined area.	
Certified – Describes a person who has passed an examination to do a required job.	
Chain conveyor – A conveyor on which the material is moved along solid pans (troughs) by the action of scraper crossbars attached to powered chains.	
Chain pillar – The pillar of coal left to protect the gangway or entry and the parallel airways.	
Check curtain – Sheet of brattice cloth hung across an airway to control the passage of the air current.	
Chock – Large hydraulic jacks used to support roof in longwall and shortwall mining systems.	
Clay vein – A body of clay-like material that fills a void in a coal bed.	
Cleat – The vertical cleavage of coal seams. The main set of joints along which coal breaks when mined.	
Clean Air Act Amendments of 1990 – A comprehensive set of amendments to the federal law governing the nation's air quality. The Clean Air Act was originally passed in	

1970 to address significant air pollution problems in our cities. The 1990 amendments broadened and strengthened the original law to address specific problems such as acid deposition, urban smog, hazardous air pollutants and stratospheric ozone depletion.	
Clean Coal Technologies – A number of innovative, new technologies designed to use coal in a more efficient and cost-effective manner while enhancing environmental protection. Several promising technologies include: fluidized-bed combustion, integrated gasification combined cycle, limestone injection multi-stage burner, enhanced flue gas desulfurization (or "scrubbing"), coal liquefaction and coal gasification.	
Coal – A solid, brittle, more or less distinctly stratified combustible carbonaceous rock, formed by partial to complete decomposition of vegetation; varies in color from dark brown to black; not fusible without decomposition and very insoluble.	
Coal dust – Particles of coal that can pass a No. 20 sieve.	
Coal Gasification – The conversion of coal into a gaseous fuel.	
Coal mine – An area of land and all structures, facilities, machinery, tools, equipment, shafts, slopes, tunnels, excavations, and other property, real or personal, placed upon, under, or above the surface of such land by any person, used in extracting coal from its natural deposits in the earth by any means or method, and the work of preparing the coal so extracted, including coal preparation facilities. British term is "colliery".	
Coal reserves – Measured tonnages of coal that have been calculated to occur in a coal seam within a particular property.	
Coal washing – The process of separating undesirable materials from coal based on differences in densities. Pyritic sulfur, or sulfur combined with iron, is heavier and	

sinks in water; coal is lighter and floats.	
Coke – A hard, dry carbon substance produced by heating coal to a very high temperature in the absence of air.	
Collar – The term applied to the timbering or concrete around the mouth or top of a shaft. The beginning point of a shaft or drill hole at the surface.	
Colliery - British name for coal mine.	
Column flotation – A precombustion coal cleaning technology in which coal particles attach to air bubbles rising in a vertical column. The coal is then removed at the top of the column.	
Comminution – The breaking, crushing, or grinding of coal, ore, or rock.	
Competent rock – Rock which, because of its physical and geological characteristics, is capable of sustaining openings without any structural support except pillars and walls left during mining (stalls, light props, and roof bolts are not considered structural support).	
Contact – The place or surface where two different kinds of rocks meet. Applies to sedimentary rocks, as the contact between a limestone and a sandstone, for example, and to metamorphic rocks; and it is especially applicable between igneous intrusions and their walls.	
Continuous miner – A machine that constantly extracts coal while it loads it. This is to be distinguished from a conventional, or cyclic, unit which must stop the extraction process in order for loading to commence.	
Contour – An imaginary line that connects all points on a surface having the same elevation.	
Conventional mining – The first fully-mechanized underground mining method involving the insertion of explosives in a coal seam, the blasting of the seam, and the removal of the coal onto a conveyor or shuttle car by a loading machine.	
Conveyor – An apparatus for moving material from one point to another in a continuous	

fashion. This is accomplished with an endless (that is, looped) procession of hooks, buckets, wide rubber belt, etc.	
Core sample – A cylinder sample generally 1-5" in diameter drilled out of an area to determine the geologic and chemical analysis of the overburden and coal.	
Cover – The overburden of any deposit.	
Creep – The forcing of pillars into soft bottom by the weight of a strong roof. In surface mining, a very slow movement of slopes downhill.	
Crib – A roof support of prop timbers or ties, laid in alternate cross-layers, log-cabin style. It may or may not be filled with debris. Also may be called a chock or cog.	
Cribbing – The construction of cribs or timbers laid at right angles to each other, sometimes filled with earth, as a roof support or as a support for machinery.	
Crop coal – Coal at the outcrop of the seam. It is usually considered of inferior quality due to partial oxidation, although this is not always the case.	
Crossbar – The horizontal member of a roof timber set supported by props located either on roadways or at the face.	
Crosscut – A passageway driven between the entry and its parallel air course or air courses for ventilation purposes. Also, a tunnel driven from one seam to another through or across the intervening measures; sometimes called "crosscut tunnel", or "breakthrough". In vein mining, an entry perpendicular to the vein.	
Cross entry – An entry running at an angle with the main entry.	
Crusher – A machine for crushing rock or other materials. Among the various types of crushers are the ball mill, gyratory crusher, Handsel mill, hammer mill, jaw crusher, rod mill, rolls, stamp mill, and tube mill.	
Cutter; Cutting machine – A machine, usually used in coal, that will cut a 10- to 15-cm slot. The slot allows room for expansion of	

the broken coal. Also applies to the man who operates the machine and to workers engaged in the cutting of coal by prick or drill.	
Cycle mining – A system of mining in more than one working place at a time, that is, a miner takes a lift from the face and moves to another face while permanent roof support is established in the previous working face.	
D	
Demonstrated reserves – A collective term for the sum of coal in both measured and indicated resources and reserves.	
Deposit – Mineral deposit or ore deposit is used to designate a natural occurrence of a useful mineral, or an ore, in sufficient extent and degree of concentration to invite exploitation.	
Depth – The word alone generally denotes vertical depth below the surface. In the case of incline shafts and boreholes it may mean the distance reached from the beginning of the shaft or hole, the borehole depth, or the inclined depth.	
Detectors – Specialized chemical or electronic instruments used to detect mine gases.	
Detonator – A device containing a small detonating charge that is used for detonating an explosive, including, but not limited to, blasting caps, exploders, electric detonators, and delay electric blasting caps.	
Development mining – Work undertaken to open up coal reserves as distinguished from the work of actual coal extraction.	
Diffusion – Blending of a gas and air, resulting in a homogeneous mixture. Blending of two or more gases.	
Diffuser fan – A fan mounted on a continuous miner to assist and direct air delivery from the machine to the face.	
Dilute – To lower the concentration of a mixture; in this case the concentration of any hazardous gas in mine air by addition of fresh intake air.	

Dilution – The contamination of ore with barren wall rock in stopping.	
Dip – The inclination of a geologic structure (bed, vein, fault, etc.) from the horizontal; dip is always measured downwards at right angles to the strike.	
Dragline – A large excavation machine used in surface mining to remove overburden (layers of rock and soil) covering a coal seam. The dragline casts a wire rope-hung bucket a considerable distance, collects the dug material by pulling the bucket toward itself on the ground with a second wire rope (or chain), elevates the bucket, and dumps the material on a spoil bank, in a hopper, or on a pile.	
Drainage – The process of removing surplus ground or surface water either by artificial means or by gravity flow.	
Draw slate – A soft slate, shale, or rock from approximately 1 cm to 10 cm thick and located immediately above certain coal seams, which falls quite easily when the coal support is withdrawn.	
Drift – A horizontal passage underground. A drift follows the vein, as distinguished from a crosscut that intersects it, or a level or gallery, which may do either.	
Drift mine – An underground coal mine in which the entry or access is above water level and generally on the slope of a hill, driven horizontally into a coal seam.	
Drill – A machine utilizing rotation, percussion (hammering), or a combination of both to make holes. If the hole is much over 0.4m in diameter, the machine is called a borer.	
Drilling – The use of such a machine to create holes for exploration or for loading with explosives.	
Dummy – A bag filled with sand, clay, etc., used for stemming a charged hole.	
Dump – To unload; specifically, a load of coal or waste; the mechanism for unloading, e.g. a car dump (sometimes called tipple); or,	

the pile created by such unloading, e.g. a waste dump (also called heap, pile, tip, spoil pike, etc.).	
E	
Electrical grounding – To connect with the ground to make the earth part of the circuit.	
Entry – An underground horizontal or near-horizontal passage used for haulage, ventilation, or as a mainway; a coal heading; a working place where the coal is extracted from the seam in the initial mining; same as "gate" and "roadway," both British terms.	
Evaluation – The work involved in gaining a knowledge of the size, shape, position and value of coal.	
Exploration – The search for mineral deposits and the work done to prove or establish the extent of a mineral deposit. Alt: Prospecting and subsequent evaluation.	
Explosive – Any rapidly combustive or expanding substance. The energy released during this rapid combustion or expansion can be used to break rock.	
Extraction – The process of mining and removal of cal or ore from a mine.	
F	
Face – The exposed area of a coal bed from which coal is being extracted.	
Face cleat – The principal cleavage plane or joint at right angles to the stratification of the coal seam.	
Face conveyor – Any conveyor used parallel to a working face which delivers coal into another conveyor or into a car.	
Factor of safety – The ratio of the ultimate breaking strength of the material to the force exerted against it. If a rope will break under a load of 6000 lbs., and it is carrying a load of 2000 lbs., its factor of safety is 6000 divided by 2000 which equals 3.	

Fall – A mass of roof rock or coal which has fallen in any part of a mine.	
Fan, auxiliary – A small, portable fan used to supplement the ventilation of an individual working place.	
Fan, booster – A large fan installed in the main air current, and thus in tandem with the main fan.	
Fan signal – Automation device designed to give alarm if the main fan slows down or stops.	
Fault – A slip-surface between two portions of the earth's surface that have moved relative to each other. A fault is a failure surface and is evidence of severe earth stresses.	
Fault zone – A fault, instead of being a single clean fracture, may be a zone hundreds or thousands of feet wide. The fault zone consists of numerous interlacing small faults or a confused zone of gouge, breccia, or mylonite.	
Feeder – A machine that feeds coal onto a conveyor belt evenly.	
Fill – Any material that is put back in place of the extracted ore to provide ground support.	
Fire damp – The combustible gas, methane, CH4. Also, the explosive methane-air mixtures with between 5% and 15% methane. A combustible gas formed in mines by decomposition of coal or other carbonaceous matter, and that consists chiefly of methane.	
Fissure – An extensive crack, break, or fracture in the rocks.	
Fixed carbon – The part of the carbon that remains behind when coal is heated in a closed vessel until all of the volatile matter is driven off.	
Flat-lying – Said of deposits and coal seams with a dip up to 5 degrees.	
Flight – The metal strap or crossbar attached to the drag chain-and-flight conveyor.	
Float dust – Fine coal-dust particles carried in suspension by air currents and eventually deposited in return entries. Dust consisting of particles of coal that can pass through a No.	

200 sieve.	
Floor – That part of any underground working upon which a person walks or upon which haulage equipment travels; simply the bottom or underlying surface of an underground excavation.	
Flue Gas Desulfurization – Any of several forms of chemical/physical processes that remove sulfur compounds formed during coal combustion. The devices, commonly called "scrubbers," combine the sulfur in gaseous emissions with another chemical medium to form inert "sludge" which must then be removed for disposal.	
Fluidized Bed Combustion – A process with a high degree of ability to remove sulfur from coal during combustion. Crushed coal and limestone are suspended in the bottom of a boiler by an upward stream of hot air. The coal is burned in this bubbling, liquid-like (or "fluidized") mixture. Rather than released as emissions, sulfur from combustion gases combines with the limestone to form a solid compound recovered with the ash.	
Fly ash – The finely divided particles of ash suspended in gases resulting from the combustion of fuel. Electrostatic precipitators are used to remove fly ash from the gases prior to the release from a power plant's smokestack.	
Formation – Any assemblage of rocks which have some character in common, whether of origin, age, or composition. Often, the word is loosely used to indicate anything that has been formed or brought into its present shape.	
Fossil fuel – Any naturally occurring fuel of an organic nature, such as coal, crude oil and natural gas.	
Fracture – A general term to include any kind of discontinuity in a body of rock if produced by mechanical failure, whether by shear stress or tensile stress. Fractures include faults, shears, joints, and planes of fracture cleavage.	

Friable – Easy to break, or crumbling naturally. Descriptive of certain rocks and minerals.	
Fuse – A cord-like substance used in the ignition of explosives. Black powder is entrained in the cord and, when lit, burns along the cord at a set rate. A fuse can be safely used to ignite a cap, which is the primer for an explosive.	
G	
Gallery - A horizontal or a nearly horizontal underground passage, either natural or artificial.	
Gasification – Any of various processes by which coal is turned into low, medium, or high Btu gases.	
Gathering conveyor; gathering belt – Any conveyor which is used to gather coal from other conveyors and deliver it either into mine cars or onto another conveyor. The term is frequently used with belt conveyors placed in entries where a number of room conveyors deliver coal onto the belt.	
Geologist – One who studies the constitution, structure, and history of the earth's crust, conducting research into the formation and dissolution of rock layers, analyzing fossil and mineral content of layers, and endeavoring to fix historical sequence of development by relating characteristics to known geological influences (historical geology).	
Gob – The term applied to that part of the mine from which the coal has been removed and the space more or less filled up with waste. Also, the loose waste in a mine. Also called goaf.	
Global climate change – This term usually refers to the gradual warming of the earth caused by the greenhouse effect. Many scientists believe this is the result of man-made emissions of greenhouse gases such as	

carbon dioxide, chlorofluorocarbons (CFC) and methane, although there is no agreement among the scientific community on this controversial issue.	
Grain – In petrology, that factor of the texture of a rock composed of distinct particles or crystals which depend upon their absolute size.	
Grizzly – Course screening or scalping device that prevents oversized bulk material form entering a material transfer system; constructed of rails, bars, beams, etc.	
Ground control – The regulation and final arresting of the closure of the walls of a mined area. The term generally refers to measures taken to prevent roof falls or coal bursts.	
Ground pressure – The pressure to which a rock formation is subjected by the weight of the superimposed rock and rock material or by diastrophic forces created by movements in the rocks forming the earth's crust. Such pressures may be great enough to cause rocks having a low compressional strength to deform and be squeezed into and close a borehole or other underground opening not adequately strengthened by an artificial support, such as casing or timber.	
Gunite – A cement applied by spraying to the roof and sides of a mine passage.	
H	
Haulage – The horizontal transport of ore, coal, supplies, and waste. The vertical transport of the same is called hoisting.	
Haulageway – Any underground entry or passageway that is designed for transport of mined material, personnel, or equipment, usually by the installation of track or belt conveyor.	
Headframe – The structure surmounting the shaft which supports the hoist rope pulley, and often the hoist itself.	

Heading – A vein above a drift. An interior level or airway driven in a mine. In longwall workings, a narrow passage driven upward from a gangway in starting a working in order to give a loose end.	
Head section – A term used in both belt and chain conveyor work to designate that portion of the conveyor used for discharging material.	
Heaving – Applied to the rising of the bottom after removal of the coal; a sharp rise in the floor is called a "hogsback".	
Highwall – The unexcavated face of exposed overburden and coal in a surface mine or in a face or bank on the uphill side of a contour mine excavation.	
Highwall miner – A highwall mining system consists of a remotely controlled continuous miner which extracts coal and conveys it via augers, belt or chain conveyors to the outside. The cut is typically a rectangular, horizontal cut from a highwall bench, reaching depths of several hundred feet or deeper.	
Hogsback – A sharp rise in the floor of a seam.	
Hoist – A drum on which hoisting rope is wound in the engine house, as the cage or skip is raised in the hoisting shaft.	
Hoisting – The vertical transport coal or material.	
Horizon – In geology, any given definite position or interval in the stratigraphic column or the scheme of stratigraphic classification; generally used in a relative sense.	
Horseback – A mass of material with a slippery surface in the roof; shaped like a horse's back.	
Hydraulic – Of or pertaining to fluids in motion. Hydraulic cement has a composition which permits it to set quickly under water. Hydraulic jacks lift through the force transmitted to the movable part of the jack by a liquid. Hydraulic control refers to the mechanical control of various parts of machines, such as coal cutters, loaders, etc.,	

through the operation or action of hydraulic cylinders.	
Hydrocarbon – A family of chemical compounds containing carbon and hydrogen atoms in various combinations, found especially in fossil fuels.	
I	
Inby – In the direction of the working face.	
Incline – Any entry to a mine that is not vertical (shaft) or horizontal (adit). Often incline is reserved for those entries that are too steep for a belt conveyor (+17 degrees -18 degrees), in which case a hoist and guide rails are employed. A belt conveyor incline is termed a slope. Alt: Secondary inclined opening, driven upward to connect levels, sometimes on the dip of a deposit; also called "inclined shaft".	
Incompetent – Applied to strata, a formation, a rock, or a rock structure not combining sufficient firmness and flexibility to transmit a thrust and to lift a load by bending.	
Indicated coal resources – Coal for which estimates of the rank, quality, and quantity have been computed partly from sample analyses and measurements and partly from reasonable geologic projections. The points of observation are ½ to 1 ½ miles apart. Indicated coal is projected to extend as an ½ mile wide belt that lies more than ¼ mile from the outcrop or points of observation or measurement.	
Inferred coal resources – Coal in unexplored extensions of the demonstrated resources for which estimates of the quality and size are based on geologic evidence and projection. Quantitative estimates are based largely on broad knowledge of the geologic character of the deposit and for which there are few, if any, samples or measurements. The estimates are based on an assumed continuity or repletion of	

which there is geologic evidence; this evidence may include comparison with deposits of similar type. Bodies that are completely concealed may be included if there is specific geologic evidence of their presence. The points of observation are 1 ½ to 6 miles apart.	
In situ – In the natural or original position. Applied to a rock, soil, or fossil when occurring in the situation in which it was originally formed or deposited.	
Intake –The passage through which fresh air is drawn or forced into a mine or to a section of a mine.	
Intermediate section – A term used in belt and chain conveyor network to designate a section of the conveyor frame occupying a position between the head and foot sections.	
Immediate roof – The roof strata immediately above the coalbed, requiring support during the excavation of coal.	
Isopach – A line, on a map, drawn through points of equal thickness of a designated unit. Synonym for isopachous line; isopachyte.	
J	
Jackleg – A percussion drill used for drifting or stopping that is mounted on a telescopic leg which has an extension of about 2.5 m. The leg and machine are hinged so that the drill need not be in the same direction as the leg.	
Jackrock – A caltrop or other object manufactured with one or more rounded or sharpened points, which when placed or thrown present at least one point at such an angle that it is peculiar to and designed for use in puncturing or damaging vehicle tires. Jackrocks are commonly used during labor disputes.	
Job Safety Analysis (J.S.A.) – A job breakdown that gives a safe, efficient job procedure.	

Joint – A divisional plane or surface that divides a rock and along which there has been no visible movement parallel to the plane or surface.	
K	
Kettle bottom – A smooth, rounded piece of rock, cylindrical in shape, which may drop out of the roof of a mine without warning. The origin of this feature is thought to be the remains of the stump of a tree that has been replaced by sediments so that the original form has been rather well preserved.	
Kerf – The undercut of a coal face.	
L	
Lamp – The electric cap lamp worn for visibility. Also, the flame safety lamp used in coal mines to detect methane gas concentrations and oxygen deficiency.	
Layout – The design or pattern of the main roadways and workings. The proper layout of mine workings is the responsibility of the manager aided by the planning department.	
Lift – The amount of coal obtained from a continuous miner in one mining cycle.	
Liquefaction – The process of converting coal into a synthetic fuel, similar in nature to crude oil and/or refined products, such as gasoline.	
Lithology – The character of a rock described in terms of its structure, color, mineral composition, grain size, and arrangement of its component parts; all those visible features that in the aggregate impart individuality of the rock. Lithology is the basis of correlation in coal mines and commonly is reliable over a distance of a few miles.	
Load – To place explosives in a drill hole. Also, to transfer broken material into a haulage device.	

Loading machine – Any device for transferring excavated coal into the haulage equipment.	
Loading pocket – Transfer point at a shaft where bulk material is loaded by bin, hopper, and chute into a skip.	
Longwall Mining – One of three major underground coal mining methods currently in use. Employs a steal plow, or rotation drum, which is pulled mechanically back and forth across a face of coal that is usually several hundred feet long. The loosened coal falls onto a conveyor for removal from the mine.	
Loose coal – Coal fragments larger in size than coal dust.	
Low voltage – Up to and including 660 volts by federal standards.	
M	
Main entry – A main haulage road. Where the coal has cleats, main entries are driven at right angles to the face cleats.	
Main fan – A mechanical ventilator installed at the surface; operates by either exhausting or blowing to induce airflow through the mine roadways and workings.	
Manhole – A safety hole constructed in the side of a gangway, tunnel, or slope in which miner can be safe from passing locomotives and car. Also called a refuge hole.	
Man trip – A carrier of mine personnel, by rail or rubber tire, to and from the work area.	
Manway – An entry used exclusively for personnel to travel form the shaft bottom or drift mouth to the working section; it is always on the intake air side in gassy mines. Also, a small passage at one side or both sides of a breast, used as a traveling way for the miner, and sometimes, as an airway, or chute, or both.	

Measured coal resources – Coal for which estimates of the rank, quality, and quantity have been computed from sample analyses and measurements from closely spaced and geologically well-known sample sites, such as outcrops, trenches, mine workings, and drill holes. The points of observation and measurement are so closely spaced and the thickness and extent of coals are so well defined that the tonnage is judged to be accurate within 20 percent of true tonnage. Although the spacing of the points of observation necessary to demonstrate continuity of the coal differs from region to region according to the character of the coal beds, the points of observation are no greater than ½ mile apart. Measured coal is projected to extend as a ¼-mile wide belt from the outcrop or points of observation or measurement.	
Meridian – A surveying term that establishes a line of reference. The bearing is used to designate direction. The bearing of a line is the acute horizontal angle between the meridian and the line. Azimuths are angles measured clockwise from any meridian.	
Methane – A potentially explosive gas formed naturally from the decay of vegetative matter, similar to that which formed coal. Methane, which is the principal component of natural gas, is frequently encountered in underground coal mining operations and is kept within safe limits through the use of extensive mine ventilation systems.	
Methane monitor – An electronic instrument often mounted on a piece of mining equipment, that detects and measures the methane content of mine air.	
Mine development – The term employed to designate the operations involved in preparing a mine for ore extraction. These operations include tunneling, sinking, cross-cutting, drifting, and raising.	
Mine mouth electric plant – A coal burning electric-generating plant built near a coal	

mine.	
Miner – One who is engaged in the business or occupation of extracting ore, coal, precious substances, or other natural materials from the earth's crust.	
Mineral – An inorganic compound occurring naturally in the earth's crust, with a distinctive set of physical properties, and a definite chemical composition.	
Mining Engineer – A person qualified by education, training, and experience in mining engineering. A trained engineer with knowledge of the science, economics, and arts of mineral location, extraction, concentration and sale, and the administrative and financial problems of practical importance in connection with the profitable conduct of mining.	
Misfire – The complete or partial failure of a blasting charge to explode as planned.	
MSHA – Mine Safety and Health Administration; the federal agency which regulates coal mine health and safety.	
Mud cap – A charge of high explosive fired in contact with the surface of a rock after being covered with a quantity of wet mud, wet earth, or sand, without any borehole being used. Also termed adobe, dobie, and sandblast (illegal in coal mining).	
N	
Natural ventilation – Ventilation of a mine without the aid of fans or furnaces.	
Nip – Device at the end of the trailing cable of a mining machine used for connecting the trailing cable to the trolley wire and ground.	

O	
Open end pillaring – A method of mining pillars in which no stump is left; the pockets driven are open on the gob side and the roof is supported by timber.	
Outby; outbye – Nearer to the shaft, and hence farther from the working face. Toward the mine entrance. The opposite of inby.	
Outcrop – Coal that appears at or near the surface.	
Overburden – Layers of soil and rock covering a coal seam. Overburden is removed prior to surface mining and replaced after the coal is taken from the seam.	
Overcast (undercast) – Enclosed airway which permits one air current to pass over (under) another without interruption.	
P	
Panel – A coal mining block that generally comprises one operating unit.	
Panic bar – A switch, in the shape of a bar, used to cut off power at the machine in case of an emergency.	
Parting – (1) A small joint in coal or rock; (2) a layer of rock in a coal seam; (3) a side track or turnout in a haulage road.	
Peat – The partially decayed plant matter found in swamps and bogs, one of the earliest stages of coal formation.	
Percentage extraction – The proportion of a coal seam which is removed from the mine. The remainder may represent coal in pillars or coal which is too thin or inferior to mine or lost in mining. Shallow coal mines working under townships, reservoirs, etc., may extract 50%, or less, of the entire seam, the remainder being left as pillars to protect the surface. Under favorable conditions, longwall mining may extract from 80 to 95% of the entire	

seam. With pillar methods of working, the extraction ranges from 50 to 90% depending on local conditions.	
Percussion drill – A drill, usually air powered, that delivers its energy through a pounding or hammering action.	
Permissible – That which is allowable or permitted. It is most widely applied to mine equipment and explosives of all kinds which are similar in all respects to samples that have passed certain tests of the MSHA and can be used with safety in accordance with specified conditions where hazards from explosive gas or coal dust exist.	
Permit – As it pertains to mining, a document issued by a regulatory agency that gives approval for mining operations to take place.	
Piggy-back – A bridge conveyor.	
Pillar – An area of coal left to support the overlying strata in a mine; sometimes left permanently to support surface structures.	
Pillar robbing – The systematic removal of the coal pillars between rooms or chambers to regulate the subsidence of the roof. Also termed "bridging back" the pillar, "drawing" the pillar, or "pulling" the pillar.	
Pinch – A compression of the walls of a vein or the roof and floor of a coal seam so as to "squeeze" out the coal.	
Pinning – Roof bolting.	
Pitch – The inclination of a seam; the rise of a seam.	
Plan – A map showing features such as mine workings or geological structures on a horizontal plane.	
Pneumoconiosis – A chronic disease of the lung arising from breathing coal dust.	
Portal – The structure surrounding the immediate entrance to a mine; the mouth of an adit or tunnel.	
Portal bus – Track-mounted, self-propelled personnel carrier that holds 8 to 12 people.	

Post - The vertical member of a timber set.	
Preparation plant – A place where coal is cleaned, sized, and prepared for market.	
Primary roof – The main roof above the immediate top. Its thickness may vary from a few to several thousand feet.	
Primer (booster) – A package or cartridge of explosive which is designed specifically to transmit detonation to other explosives and which does not contain a detonator.	
Prop – Coal mining term for any single post used as roof support. Props may be timber or steel; if steel-screwed, yieldable, or hydraulic.	
Proximate analysis – A physical, or non-chemical, test of the constitution of coal. Not precise, but very useful for determining the commercial value. Using the same sample (1 gram) under controlled heating at fixed temperatures and time periods, moisture, volatile matter, fixed carbon and ash content are successfully determined. Sulfur and Btu content are also generally reported with a proximate analysis.	
Pyrite – A hard, heavy, shiny, yellow mineral, FeS2 or iron disulfide, generally in cubic crystals. Also called iron pyrites, fool's gold, sulfur balls. Iron pyrite is the most common sulfide found in coal mines.	
R	
Raise – A secondary or tertiary inclined opening, vertical or near-vertical opening driven upward form a level to connect with the level above, or to explore the ground for a limited distance above one level.	
Ramp – A secondary or tertiary inclined opening, driven to connect levels, usually driven in a downward direction, and used for haulage.	
Ranks of coal – The classification of coal by degree of hardness, moisture and heat content. "Anthracite" is hard coal, almost pure carbon, used mainly for heating homes. "Bituminous"	

is soft coal. It is the most common coal found in the United States and is used to generate electricity and to make coke for the steel industry. "Subbituminous" is a coal with a heating value between bituminous and lignite. It has low fixed carbon and high percentages of volatile matter and moisture. "Lignite" is the softest coal and has the highest moisture content. It is used for generating electricity and for conversion into synthetic gas. In terms of Btu or "heating" content, anthracite has the highest value, followed by bituminous, subbituminous and lignite.	
Reclamation – The restoration of land and environmental values to a surface mine site after the coal is extracted. Reclamation operations are usually underway as soon as the coal has been removed from a mine site. The process includes restoring the land to its approximate original appearance by restoring topsoil and planting native grasses and ground covers.	
Recovery – The proportion or percentage of coal or ore mined from the original seam or deposit.	
Red dog – A nonvolatile combustion product of the oxidation of coal or coal refuse. Most commonly applied to material resulting from in situ, uncontrolled burning of coal or coal refuse piles. It is similar to coal ash.	
Regulator – Device (wall, door) used to control the volume of air in an air split.	
Reserve – That portion of the identified coal resource that can be economically mined at the time of determination. The reserve is derived by applying a recovery factor to that component of the identified coal resource designated as the reserve base.	
Resin bolting – A method of permanent roof support in which steel rods are grouted with resin.	
Resources – Concentrations of coal in such forms that economic extraction is currently or may become feasible. Coal resources broken down by identified and undiscovered resources.	

Identified coal resources are classified as demonstrated and inferred. Demonstrated resources are further broken down as measured and indicated. Undiscovered resources are broken down as hypothetical and speculative.	
Respirable dust – Dust particles 5 microns or less in size.	
Respirable dust sample – A sample collected with an approved coal mine dust sampler unit attached to a miner, or so positioned as to measure the concentration of respirable dust to which the miner is exposed, and operated continuously over an entire work shift of such miner.	
Retreat mining – A system of robbing pillars in which the robbing line, or line through the faces of the pillars being extracted, retreats from the boundary toward the shaft or mine mouth.	
Return – The air or ventilation that has passed through all the working faces of a split.	
Return idler – The idler or roller underneath the cover or cover plates on which the conveyor belt rides after the load which it was carrying has been dumped at the head section and starts the return trip toward the foot section.	
Rib – The side of a pillar or the wall of an entry. The solid coal on the side of any underground passage. Same as rib pillar.	
Rider – A thin seam of coal overlying a thicker one.	
Ripper – A coal extraction machine that works by tearing the coal from the face.	
Rob – To extract pillars of coal previously left for support.	
Robbed out area – Describes that part of a mine from which the pillars have been removed.	
Roll – (1) A high place in the bottom or a low place in the top of a mine passage, (2) a local thickening of roof or floor strata, causing thinning of a coal seam.	
Roll protection – A framework, safety canopy, or similar protection for the operator when equipment overturns.	

Roof – The stratum of rock or other material above a coal seam; the overhead surface of a coal working place. Same as "back" or "top."	
Roof bolt – A long steel bolt driven into the roof of underground excavations to support the roof, preventing and limiting the extent of roof falls. The unit consists of the bolt (up to 4 feet long), steel plate, expansion shell, and pal nut. The use of roof bolts eliminates the need for timbering by fastening together, or "laminating," several weaker layers of roof strata to build a "beam."	
Roof fall – A coal mine cave-in especially in permanent areas such as entries.	
Roof jack – A screw- or pump-type hydraulic extension post made of steel and used as temporary roof support.	
Roof sag – The sinking, bending, or curving of the roof, especially in the middle, from weight or pressure.	
Roof stress – Unbalanced internal forces in the roof or sides, created when coal is extracted.	
Roof support – Posts, jacks, roof bolts and beams used to support the rock overlying a coal seam in an underground mine. A good roof support plan is part of mine safety and coal extraction.	
Roof trusses – A combination of steel rods anchored into the roof to create zones of compression and tension forces and provide better support for weak roof and roof over wide areas.	
Room and pillar mining – A method of underground mining in which approximately half of the coal is left in place to support the roof of the active mining area. Large "pillars" are left while "rooms" of coal are extracted.	
Room neck – The short passage from the entry into a room.	
Round – Planned pattern of drill holes fired in sequence in tunneling, shaft sinking, or stopping. First the cut holes are fired, followed by relief, lifter, and rib holes.	
Royalty – The payment of a certain stipulated	

sum on the mineral produced.	
Rubbing surface – The total area (top, bottom, and sides) of an airway.	
Run-of-mine – Raw material as it exists in the mine; average grade or quality.	
S	
Safety fuse – A train of powder enclosed in cotton, jute yarn, or waterproofing compounds, which burns at a uniform rate; used for firing a cap containing the detonation compound which in turn sets off the explosive charge.	
Safety lamp – A lamp with steel wire gauze covering every opening from the inside to the outside so as to prevent the passage of flame should explosive gas be encountered.	
Sampling – Cutting a representative part of an ore (or coal) deposit, which should truly represent its average value.	
Sandstone – A sedimentary rock consisting of quartz sand united by some cementing material, such as iron oxide or calcium carbonate.	
Scaling – Removal of loose rock from the roof or walls. This work is dangerous and a long bar (called a scaling bar)is often used.	
Scoop – A rubber tired-, battery- or diesel-powered piece of equipment designed for cleaning runways and hauling supplies.	
Scrubber – Any of several forms of chemical/physical devices that remove sulfur compounds formed during coal combustion. These devices, technically know as flue gas desulfurization systems, combine the sulfur in gaseous emissions with another chemical medium to form inert "sludge," which must then be removed for disposal.	
Seam - A stratum or bed of coal.	
Secondary roof – The roof strata immediately above the coalbed, requiring support during the excavating of coal.	
Section – A portion of the working area of a mine.	

Selective mining – The object of selective mining is to obtain a relatively high-grade mine product; this usually entails the use of a much more expensive stopping system and high exploration and development costs in searching for and developing the separate bunches, stringers, lenses, and bands of ore.	
Self-contained breathing apparatus – A self-contained supply of oxygen used during rescue work from coal mine fires and explosions; same as SCSR (self-contained self rescuer).	
Self-rescuer – A small filtering device carried by a coal miner underground, either on his belt or in his pocket, to provide him with immediate protection against carbon monoxide and smoke in case of a mine fire or explosion. It is a small canister with a mouthpiece directly attached to it. The wearer breathes through the mouth, the nose being closed by a clip. The canister contains a layer of fused calcium chloride that absorbs water vapor from the mine air. The device is used for escape purposes only because it does not sustain life in atmospheres containing deficient oxygen. The length of time a self-rescuer can be used is governed mainly by the humidity in the mine air, usually between 30 minutes and one hour.	
Severance – The separation of a mineral interest from other interests in the land by grant or reservation. A mineral dead or grant of the land reserving a mineral interest, by the landowner before leasing, accomplishes a severance as does his execution of a mineral lease.	
Shaft – A primary vertical or non-vertical opening through mine strata used for ventilation or drainage and/or for hoisting of personnel or materials; connects the surface with underground workings.	
Shaft mine – An underground mine in which the main entry or access is by means of a vertical shaft.	
Shale – A rock formed by consolidation of clay, mud, or silt, having a laminated structure and composed of minerals essentially unaltered since deposition.	

Shearer – A mining machine for longwall faces that uses a rotating action to "shear" the material from the face as it progresses along the face.	
Shift – The number of hours or the part of any day worked.	
Shortwall – An underground mining method in which small areas are worked (15 to 150 feet) by a continuous miner in conjunction with the use of hydraulic roof supports.	
Shuttle car – A self-discharging truck, generally with rubber tires or caterpillar-type treads, used for receiving coal from the loading or mining machine and transferring it to an underground loading point, mine railway or belt conveyor system.	
Sinking – The process by which a shaft is driven.	
Skid – A track-mounted vehicle used to hold trips or cars from running out of control. Also it is a flat-bottom personnel or equipment carrier used in low coal.	
Skip – A car being hoisted from a slope or shaft.	
Slack – Small coal; the finest-sized soft coal, usually less than one inch in diameter.	
Slag – The waste product of the process of smelting.	
Slate – A miner's term for any shale or slate accompanying coal. Geologically, it is a dense, fine-textured, metamorphic rock, which has excellent parallel cleavage so that it breaks into thin plates or pencil-like shapes.	
Slate bar – The proper long-handled tool used to pry down loose and hazardous material from roof, face, and ribs.	
Slickenside – A smooth, striated, polished surface produced on rock by friction.	
Slip – A fault. A smooth joint or crack where the strata have moved on each other.	
Slope – Primary inclined opening, connection the surface with the underground workings.	
Slope mine – An underground mine with an opening that slopes upward or downward to	

the coal seam.	
Sloughing – The slow crumbling and falling away of material from roof, rib, and face.	
Solid – Mineral that has not been undermined, sheared out, or otherwise prepared for blasting.	
Sounding – Knocking on a roof to see whether it is sound and safe to work under.	
Spad – A spad is a flat spike hammered into a wooden plug anchored in a hole drilled into the mine ceiling from which is threaded a plumbline. The spad is an underground survey station similar to the use of stakes in marking survey points on the surface. A pointer spad, or sight spad, is a station that allows a mine foreman to visually align entries or breaks from the main spad.	
Span – The horizontal distance between the side supports or solid abutments along sides of a roadway.	
Specific gravity – The weight of a substance compared with the weight of an equal volume of pure water at 4 degrees Celsius.	
Split – Any division or branch of the ventilating current. Also, the workings ventilated by one branch. Also, to divide a pillar by driving one or more roads through it.	
Squeeze – The settling, without breaking, of the roof and the gradual upheaval of the floor of a mine due to the weight of the overlying strata.	
Steeply inclined – Said of deposits and coal seams with a dip of from 0.7 to 1 rad (40 degrees to 60 degrees).	
Stemming – The noncombustible material used on top or in front of a charge or explosive.	
Strike – The direction of the line of intersection of a bed or vein with the horizontal plane. The strike of a bed is the direction of a straight line that connects two points of equal elevation on the bed.	
Stripping ratio – The unit amount of overburden that must be removed to gain access to a similar unit amount of coal or	

mineral material.	
Stump – Any small pillar.	
Subbituminous – Coal of a rank intermediate between lignite and bituminous.	
Subsidence – The gradual sinking, or sometimes abrupt collapse, of the rock and soil layers into an underground mine. Structures and surface features above the subsidence area can be affected.	
Sump – The bottom of a shaft, or any other place in a mine, that is used as a collecting point for drainage water.	
Sumping – To force the cutter bar of a machine into or under the coal. Also called a sumping cut, or sumping in.	
Support – The all-important function of keeping the mine workings open. As a verb, it refers to this function; as a noun it refers to all the equipment and materials--timber, roof bolts, concrete, steel, etc.--that are used to carry out this function.	
Surface mine – A mine in which the coal lies near the surface and can be extracted by removing the covering layers of rock and soil.	
Suspension – Weaker strata hanging from stronger, overlying strata by means of roof bolts.	
Syncline – A fold in rock in which the strata dip inward from both sides toward the axis. The opposite of anticline.	
T	
Tailgate – A subsidiary gate road to a conveyor face as opposed to a main gate. The tailgate commonly acts as the return airway and supplies road to the face.	
Tailpiece – Also known as foot section pulley. The pulley or roller in the tail or foot section of a belt conveyor around which the belt runs.	

Tail section – A term used in both belt and chain conveyor work to designate that portion of the conveyor at the extreme opposite end from the delivery point. In either type of conveyor it consists of a frame and either a sprocket or a drum on which the chain or belt travels, plus such other devices as may be required for adjusting belt or chain tension.	
Tension – The act of stretching.	
Tertiary – Lateral or panel openings (e.g., ramp, crosscut).	
Through-steel – A system of dust collection from rock or roof drilling. The drill steel is hollow, and a vacuum is applied at the base, pulling the dust through the steel and into a receptacle on the machine.	
Timber – A collective term for underground wooden supports.	
Timbering – The setting of timber supports in mine workings or shafts for protection against falls from roof, face, or rib.	
Timber set – A timber frame to support the roof, sides, and sometimes the floor of mine roadways or shafts.	
Tipple – Originally the place where the mine cars were tipped and emptied of their coal, and still used in that same sense, although now more generally applied to the surface structures of a mine, including the preparation plant and loading tracks.	
Ton – A short or net ton is equal to 2,000 pounds; a long or British ton is 2,240 pounds; a metric ton is approximately 2,205 pounds.	
Top – A mine roof; same as "back."	
Torque wrench – A wrench that indicates, as on a dial, the amount of torque (in units of foot-pounds) exerted in tightening a roof bolt.	
Tractor – A battery-operated piece of equipment that pulls trailers, skids, or personnel carriers. Also used for supplies.	
Tram – Used in connection with moving self-propelled mining equipment. A tramming motor may refer to an electric locomotive used for hauling loaded trips or it may refer to the	

motor in a cutting machine that supplies the power for moving or tramming the machine.	
Transfer – A vertical or inclined connection between two or more levels and used as an ore pass.	
Transfer point – Location in the materials handling system, either haulage or hoisting, where bulk material is transferred between conveyances.	
Trip – A train of mine cars.	
Troughing idlers - The idlers, located on the upper framework of a belt conveyor, which support the loaded belt. They are so mounted that the loaded belt forms a trough in the direction of travel, which reduces spillage and increases the carrying capacity of a belt for a given width.	
Tunnel – A horizontal, or near-horizontal, underground passage, entry, or haulageway, that is open to the surface at both ends. A tunnel (as opposed to an adit) must pass completely through a hill or mountain.	
U	
Ultimate analysis - Precise determination, by chemical means, of the elements and compounds in coal.	
Undercut – To cut below or undermine the coal face by chipping away the coal by pick or mining machine. In some localities the terms "undermine" or "underhole" are used.	
Underground mine – Also known as a "deep" mine. Usually located several hundred feet below the earth's surface, an underground mine's coal is removed mechanically and transferred by shuttle car or conveyor to the surface.	
Underground station - An enlargement of an entry, drift, or level at a shaft at which cages stop to receive and discharge cars, personnel, and material. An underground station is any location where stationary electrical equipment is installed. This includes pump rooms,	

compressor rooms, hoist rooms, battery-charging rooms, etc.	
Unit train – A long train of between 60 and 150 or more hopper cars, carrying only coal between a single mine and destination.	
Universal coal cutter – A type of coal cutting machine which is designed to make horizontal cuts in a coal face at any point between the bottom and top or to make shearing cuts at any point between the two ribs of the place. The cutter bar can be twisted to make cuts at any angle to the horizontal or vertical.	
Upcast shaft – A shaft through which air leaves the mine.	
V	
Valuation – The act or process of valuing or of estimating the value or worth; appraisal.	
Velocity – Rate of airflow in lineal feet per minute.	
Ventilation – The provision of a directed flow of fresh and return air along all underground roadways, traveling roads, workings, and service parts.	
Violation – The breaking of any state or federal mining law.	
Virgin – Unworked; untouched; often said of areas where there has been no coal mining.	
Void – A general term for pore space or other reopenings in rock. In addition to pore space, the term includes vesicles, solution cavities, or any openings either primary or secondary.	
Volatile matter – The gaseous part, mostly hydrocarbons, of coal.	
W	
Waste – That rock or mineral which must be removed from a mine to keep the mining scheme practical, but which has no value.	

Water Gauge (standard U-tube) – Instrument that measures differential pressures in inches of water.	
Wedge – A piece of wood tapering to a thin edge and used for tightening in conventional timbering.	
Weight – Fracturing and lowering of the roof strata at the face as a result of mining operations, as in "taking weight".	
White damp – Carbon monoxide, CO. A gas that may be present in the afterdamp of a gas- or coal-dust explosion, or in the gases given off by a mine fire; also one of the constituents of the gases produced by blasting. Rarely found in mines under other circumstances. It is absorbed by the hemoglobin of the blood to the exclusion of oxygen. One-tenth of 1% (.001) may be fatal in 10 minutes.	
Width – The thickness of a lode measured at right angles to the dip.	
Winning – The excavation, loading, and removal of coal or ore from the ground; winning follows development.	
Winze – Secondary or tertiary vertical or near-vertical opening sunk from a point inside a mine for the purpose of connecting with a lower level or of exploring the ground for a limited depth below a level.	
Wire rope – A steel wire rope used for winding in shafts and underground haulages. Wire ropes are made from medium carbon steels. Various constructions of wire rope are designated by the number of strands in the rope and the number of wires in each strand. The following are some common terms encountered: airplane strand; cablelaid rope; cane rope; elevator rope; extra-flexible hoisting rope; flat rope; flattened-strand rope; guy rope; guy strand; hand rope; haulage rope; hawser; hoisting rope; lang lay rope; lay; left lay rope; left twist; nonspinning rope; regular lay; reverse-laid rope; rheostat rope; right lay; right twist; running rope; special flexible hoisting rope; standing rope; towing hawser;	

transmission rope.	
Working – When a coal seam is being squeezed by pressure from roof and floor, it emits creaking noises and is said to be "working". This often serves as a warning to the miners that additional support is needed.	
Working face – Any place in a mine where material is extracted during a mining cycle.	
Working place – From the outby side of the last open crosscut to the face.	
Workings – The entire system of openings in a mine for the purpose of exploitation.	
Working section – From the faces to the point where coal is loaded onto belts or rail cars to begin its trip to the outside.	

Appendix B

Samples of Portfolio Presentation

Sample Title Page

Міністерство освіти і науки України
Державний вищий навчальний заклад
«Національний гірничий університет»

Кафедра іноземних мов

ЗВІТ

про виконану самостійну роботу з дисципліни
«Іноземна (англійська) мова»

Виконав: Приходько Ю.П.
ст гр. ГРГ – 15 – 3
Перевірив: доц. Зуєнок І.І.

Дніпропетровськ – 2016

НГУ

Sample Contents Page

ЗМІСТ

List of Texts Sample

Nos	Date	Author's Surname, Name (Year of publication)	Title of Text (Text-type)	Source of Information	Abstract or Summary of the Text	Volume
1.	12/12/14	Gates, B. (2002)	Computers	*PC Magazine*, Vol. 2, June, 2002	The text is about main components of computer: software and hardware. The detailed description of these components is given in the text.	3,000
2.	23/12/14	Unknown (2006)	Coal Mining	http://www.miningusa.com/kmi Accessed 15 Dec. 2007	The detailed information about various types of coal mining operations is given. Coal mining in different countries is described with the focus on the local peculiarities of coal deposits. Conclusions are drawn about the fact that the miners in different countries face the same problems connected with security and environmental protection.	6,000

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Навчальне видання

Кострицька Світлана Іванівна

Зуєнок Ірина Іванівна

Швець Олена Дмитрівна

Поперечна Неллі Василівна

Англійська мова для навчання і роботи

Том 2

СТРАТЕГІЇ ПОШУКУ ІНФОРМАЦІЇ в іншомовних друкованих та електронних професійно-орієнтованих джерелах та ДОСЛІДЖЕННЯ ІНШОМОВНИХ ДЖЕРЕЛ

Підручник для студентів вищих навчальних закладів

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