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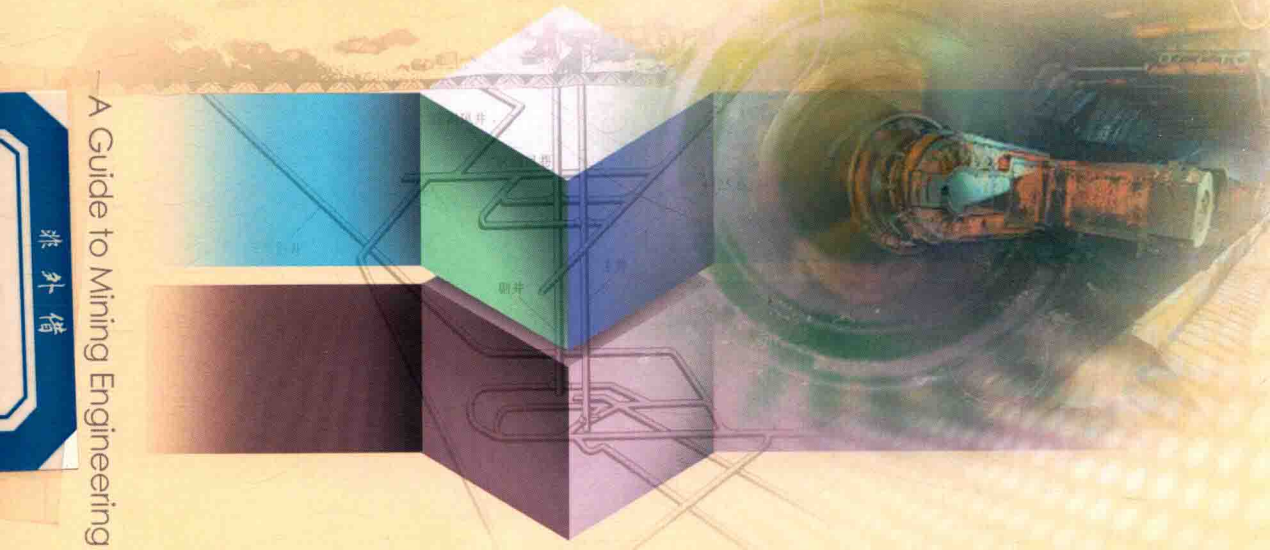
中国矿业大学教学名师培育工程资助项目
大学英语ESP系列教材

矿业工程概况

A Guide to Mining Engineering

朱哲　沈丛　主编



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A Guide to Mining Engineering

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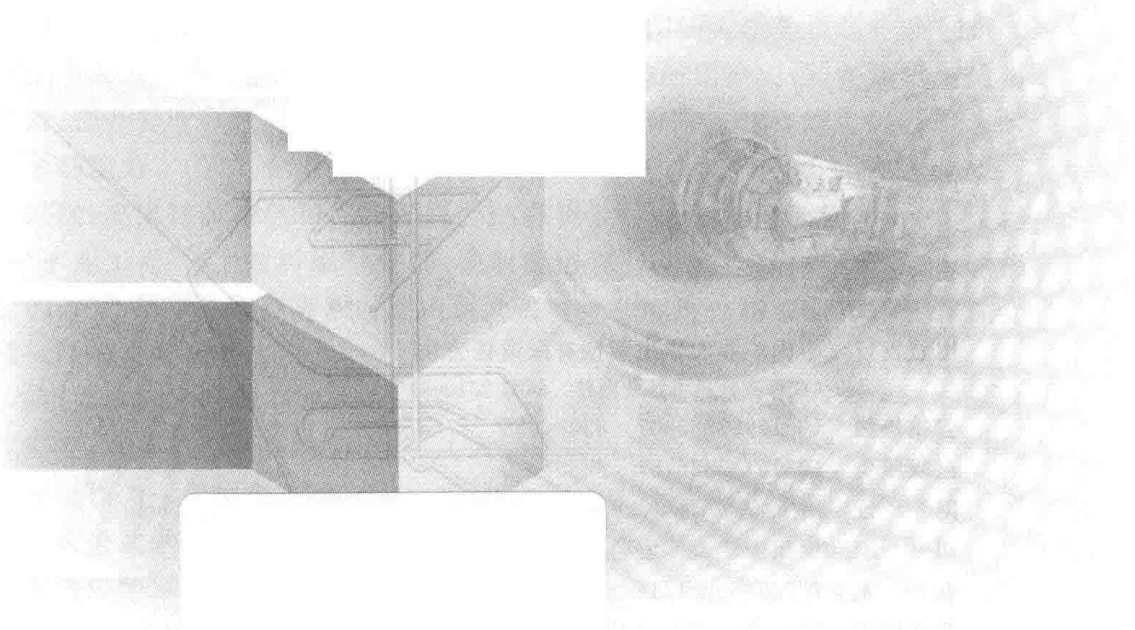

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前　言

2007 年教育部正式发布了《大学英语课程教学要求》，对大学英语教学的目标进行了清楚的界定：大学英语的教学目标是培养学生的英语综合应用能力，特别是听说能力，使他们在今后学习、工作和社会交往中能用英语有效地进行交际，同时增强其自主学习能力，提高综合文化素养，以适应我国社会发展和国际交流的需要。《大学英语课程教学要求》对英语综合应用能力进行了清楚地阐释，即学生在学习、工作和社会交往中用英语进行交际的能力，由此可见大学公共英语教学的方向最终还是朝着实用性迈进。

如何结合中国矿业大学的优势学科，为社会培养具备扎实外语功底的复合型人才，不仅是学生学习的需求，也是高校在竞争中获胜的需求。为此，我们组织教师编写了大学英语 ESP 系列教材之《矿业工程概况》，以期为推动大学英语课程教学改革进行实践探索。本教材的指导思想和特点主要体现在以下几点：

首先，在探索语言知识与专业学科结合的语言教学过程中，强调内容与语言整合型的语言教学方法，希望将目前通用英语导向的大学英语教学转变为培养学生用英语从事专业学习或是应对未来职业的专门用途英语，拓展学生的国际视野，提升专业领域内的跨文化交流能力、学术沟通和合作能力以及参与国际竞争的能力。

其次，突出行业特色和优势学科。结合我校行业特色和优势学科，本教材选取“矿业工程”作为教材编写主题，采取英语与行业特色、优势学科和专业相结合的方式，使学生能在有限时间内最大限度地获取胜任将来工作需要和综合素质提高的专业相关知识。

第三，本教材以实用为导向，与学生专业紧密结合，提出整个英语教学要以学生需要，尤其是专业需求为中心，认为要把英语作为手段或工具来学习运用，而不仅仅作为一门语言课程。因此在设计 ESP 系列教材时，我们并未强调由低到高的渐进式学习模式，而是首先分析不同学习者的需要，充分考虑与目标达成度相适应的不同能力水平，并以此为依据，结合学习者的基础，确立相应的教学目标、选材内容以及测试方法等，以培养学生在有限时间内最大限度获取胜任将来工作所需的英语能力。

第四，以学习者为中心的编写理念。本教材编写基于高校国际化办学目

标、助力优势学科发展、满足学生需求的“以学生为中心”的理念之上，强调把学习和技能的提高放在首位，充分考虑高校的行业和专业特色、学生本身的英语能力及其差异化的语言学习需求。

第五，本教材主题内容的确定充分吸纳了我校矿业工程专业老师的建议，涵盖了矿业工程的基本概念和基础知识，内容专业性较强，权威性较高。本教材中，专业术语的出现是建立在高频统计基础之上的，强调以实证为依据，而非以往以直觉为基础来安排教学内容。

本教材的使用对象是高等院校的非英语专业学生，共 8 个单元，每个单元包括 3 个部分，第一部分为主课文及练习。主课文内容主要涵盖我国煤炭矿业发展现状及面临的挑战，习题设计紧扣课文内容，让学生能够学练结合，举一反三，达到语言学习、专业知识学习和文化学习的目的；第二部分为副课文，选取的素材主要围绕我国和世界煤炭开采的基本情况，难度介于专业和普通英语之间，习题的设计主要以理解关键信息为主；第三部分为知识拓展和延伸，提供了一篇篇幅较长的文章供学生阅读，以期了解煤炭矿业的发展前景，并配有拓展词汇供学习者参考。

本教材受中国矿业大学教学名师培育工程资助，并得到了 2013 年江苏省高等教育教改课题“基于煤炭矿业特色的大学英语 ESP 系列教材建设研究”部分资助，由中国矿业大学外文学院朱哲和沈丛负责组织编写，具体编写分工如下：第 1 单元由黄敏和徐文东负责编写，第 2 单元由赵君负责编写，第 3、4 单元由何暄负责编写，第 5、6 单元由温力亚负责编写，第 7 单元由朱哲和沈丛负责编写，第 8 单元由杜光明负责编写。另外，赵虹教授在材料审定和全书审校方面提供了诸多帮助，在此一并表示感谢。

鉴于编者水平有限，错误和不足之处在所难免，欢迎教材使用者提出批评、意见和建议。

朱 哲

2017 年 5 月

目　录

Unit 1 Formation of Coal

Foreword

In this unit, you will learn about the process of coal formation. As we all know, coal has meant "mineral of fossilized carbon" since the 13th century. It is a combustible black or brownish-black sedimentary rock usually occurring in rock strata in layers or veins called coal beds or coal seams. The harder forms, such as anthracite coal, can be regarded as metamorphic rock because of later exposure to elevated temperature and pressure. Coal is composed primarily of carbon along with variable quantities of other elements, chiefly hydrogen, sulfur, oxygen, and nitrogen.

Section One

Preview

Text A tells us that the formation of coal undergoes quite a long time. The text begins with the development of plant life, which unfolds in front of us an amazing picture of a tree turning into coal. Through the story, we know what conditions are necessary for the formation of coal, and how plants become coal through different geological evolution.

Text A

How Coal Was Formed?

Many of the problems facing the miner and the mining engineer arise from the way coal was formed. It is not uncommon to find **imprint** of a **ferny** leaf or the stem of a plant in a large **lump** of coal. Such sights are a commonplace to the miner working underground with coal in the mass. They provided the first clues as to how this hard, black substance came to be buried deep under the

surface of the earth.

Plant life developed on the land surfaces of the world before animal life. First **mosses** and then ferns began to cover the **barren** surface. Later came forests of trees. The vegetation flourished, died and was renewed. Great icecaps advanced towards the **equator** and retreated in a rhythm measured by millions of years. As the outer crust of the earth cooled, vast earthquakes threw up mountain ranges or submerged land under the sea. **Landslips** cut off areas of the sea to form lakes or turned existing lakes into oceans. Amid this world-wide **turmoil**, coal was being formed.

The wood in trees is largely made up of a compound, called **cellulose**, which is manufactured by the tree as it grows. The action of sunlight on the substance which gives leaves their green color (**chlorophyll**) enables the plant to absorb water and a gas called carbon dioxide from the air, and to combine them together. This process is so complicated that our finest scientists cannot yet copy it in the best of their laboratories, nor even fully understand how it works.

All matter throughout the whole of our universe is made up of one or more of about ninety elements. These elements are all different from each other. The smallest particle of each element is called an atom. These are so small that there are more than a million, million, million atoms of iron in the head of an ordinary pin. Atoms of different elements can combine to form compounds. The smallest particle of a compound, which always contains atoms of different elements, is called a molecule. The carbon dioxide and water absorbed by plants from the air are both simple compounds. The molecule of water contains two atoms of hydrogen and one of oxygen. We cannot get a smaller particle of water than this molecule. If we attempted to do so, by splitting the molecule, we should have hydrogen and oxygen, not water. The molecule of carbon dioxide contains one atom of carbon and two of oxygen. Plants are able to combine these two simple molecules to form cellulose molecules which have 12,000 carbon atoms, 20,000 hydrogen atoms and 10,000 oxygen atoms!

Dead vegetation left exposed to the air will slowly rot. In the end, the action of wind, rain and sunshine will turn it into a dusty powder. Yet it was from the woody part of dead vegetation that our coal was formed.

In the vast **upheavals** of millions of years ago some of the dead and decaying forests were trapped underground and held there under enormous pressure from the rocks above. Buried with this vegetation were minute living organisms called bacteria. There are many different kinds of bacteria. These particular ones do not live by breathing oxygen from the air as we do, but can absorb it from compounds like cellulose.

The large and complicated molecules forming the cellulose were broken up under this double attack from the bacteria and the heavy pressure underground. New molecules were formed and these in turn were robbed of more oxygen by the bacteria.

While this change was going on underground new forests were growing on the surface of the earth and some of these decayed and were **engulfed** in the same way. Sometimes the new forests had been growing for a comparatively short time when they were destroyed. The layer of vegetation buried under the rocks would then be shallow and, when compressed underground, would form a very thin layer of coal. Elsewhere, the forests would flourish for many thousands of years before some new disaster buried them. The resulting coal is sometimes more than a thousand feet thick.

The crust of the earth had not yet settled down when the original beds of coal were formed. New shifts and stresses in the rocks cracked some layers of coal and threw them up towards the surface. Others were buried more deeply under deposits of volcanic lava which afterwards cooled to form another layer of rock. Thus coal has been found at all levels. Some has been thrown above ground as "**outcrops**", while some is buried many thousands of feet underground.

The coal found on the surface was used in ancient times as a stone to be carved into beads and ornaments. There are signs that the Romans used it occasionally as a fuel but little interest was shown in the idea. Outcrop coal was comparatively rare and there was abundant fuel to be found from forest trees.

Vocabulary

combustible / kəmˈbʌstəbl / ***adj.*** capable of igniting and burning 易燃的，可燃的

sedimentary / sedɪˈmentərɪˈ / ***adj.*** resembling or containing or formed by the accumulation of sediment 沉淀的，沉积的

anthracite / ˈænθrəsaɪt / ***n.*** a hard natural coal that burns slowly and gives intense heat and very little smoke 无烟煤；硬煤

imprint / ɪmˈprɪnt / ***n.*** a concavity in a surface produced by pressing 盖印；痕迹 a distinctive influence 特征 an identification of a publisher; a publisher's name along with the date and address and edition that is printed at the bottom of the title page 版权标记 ***v.*** mark or stamp with or as if with pressure 盖(印)；刻上(记号) establish or impress firmly in the mind 使铭记

ferny / fəːnɪ / ***adj.*** resembling ferns especially in leaf shape 蕨类的

lump / lʌmp / ***n.*** a large piece of something without definite shape 块，团 abnormal protuberance or localized enlargement 肿块 an awkward stupid person 笨拙的人 ***v.*** put together indiscriminately 结成块；成团；笨重地行走 ***v.*** group or chunk together in a certain order or place side by side 使成团，使成块；使团结在一起；把……混在一起

moss / mɔs / ***n.*** tiny leafy-stemmed flowerless plants 苔藓

barren / ˈbærən / ***adj.*** not bearing offspring 不孕的；incapable of maintaining life 贫脊的，荒芜的

equator / ɪˈkweɪtə(r) / ***n.*** an imaginary line around the Earth forming the great circle that is equidistant from the northern and southern POLE 赤道 a circle dividing a sphere or other surface into two usually equal and symmetrical parts(平分球形物体表面的)圆，(任何)大圆

landslip. / ˈlændslɪp / ***n.*** a slide of a large mass of dirt and rock down a mountain or cliff 山崩，塌方

turmoil / ˈtəːmɔɪl / ***n.*** a violent disturbance 动乱，混乱

cellulose / ˈseljʊləʊz / ***n.*** a polysaccharide (多糖) that is the chief constituent of all plant tissues and fibers 细胞膜质，纤维素；(用于制作涂料、漆等的)纤维素化合物

chlorophyll / ˈklɔːrəfɪl / ***n.*** any of a group of green pigments found in photosynthetic organisms 叶绿素

upheaval / ʌpˈhi:v(ə)l / ***n.*** a state of violent disturbance and disorder (as in politics or social conditions generally) 激变;剧变;动乱 (geology) a rise of land to a higher elevation (as in the process of mountain building) 隆起;举起,抬起
engulf / ɪnˈgʌlf / ***v.*** engross (oneself) fully 吸引,使全神贯注 flow over or cover completely 吞没,淹没,沉没
outcrop / ˈaʊtkrɒp / ***n.*** the part of a rock formation that appears above the surface of the surrounding land 露出地面的岩层 ***v.*** appear on the surface, come to the surface on the ground 露出

Phrases and Expressions

coal seam: 煤层
metamorphic rock: 变质岩
arise from: 由……引起,起因于
a large lump of: 一大块……
in the mass: 总体上,总的来说
cut off: 切断;中断
break up: 打碎,破碎;结束;解散;衰落
be robbed of: 被打劫;被剥夺;失去
settle down: 定居;安定下来;专心于
throw up: 抛起;举起;把……迅速往上推;呕吐;吐出;产生

Exercises

Ⅰ. Comprehension of the Text

Directions: Please answer the following questions according to the text.

1. What do many of the problems facing the miner and the mining engineer arise from?
2. What does the author tell us in paragraph 2?
3. Which process is too complicated for scientists to copy in the best of their laboratories, nor even fully understand how it works?
4. What is the smallest particle of each element?
5. What is the smallest particle of a compound?
6. What does the molecule of carbon dioxide contain?
7. Why has coal been found at all levels?

8. What was the function of the coal found on the surface in ancient times and who used it occasionally as a fuel?

Ⅱ. Group Discussion

Directions: Discuss the following questions with your partners, using as much text information as possible in your discussion.

1. What's the significance of coal in social development and its development prospect?
2. What's the main impact of coal mining on the environment? Can you put up some useful suggestions and measures to minimize the impact?
3. Which kind of energy resources do you think will be the alternative ones?

Ⅲ. Word Bank

Directions: Fill the blanks with the words on the right side of the text. For each word, you can use only once.

Coal was formed from plants and imprint of a 1. _____ leaf in a large sum of coal that can be found by miners. The earth was primarily covered with 2. _____ and then ferns. Later came forests. Dead 3. _____ exposed to the air rotted and turned into 4. _____ which formed coal. In the vast 5. _____ of the earth, some decaying forests were trapped underground and buried with 6. _____ which absorb oxygen from compounds like 7. _____. With new forests growing on the earth's surface, some of these decayed and were 8. _____ in the same way. The movement of the earth 9. _____ cracked some layers of coal and threw them up towards the surface as 10. "_____"; others were buried underground.

a) bacteria
b) crust
c) upheavals
d) outcrops
e) ferny
f) cellulose
g) vegetation
h) dusty powder
i) engulfed
j) mosses
k) lump
l) mass
m) vegetarian
n) element
o) imprint

Ⅳ. Translation Practice

Directions: Translate the following sentences from English to Chinese.

1. Almost 40% of the children had been exposed to second-hand tobacco smoke at some point in their life.
2. He was knocked to the ground and robbed of his wallet.

3. One day, I'll want to settle down and have a family.
4. As to the matter you brought up, I think it should be settled as soon as possible.
5. Accidents often arise from carelessness.
6. The waves impinged on the rocks, throwing up pearl-like drops of spray.

Ⅴ. Writing Practice

Directions: Write a 3-paragraph passage of about 120 words with the title "A Long Journey to Coal" based on the following outline.

Outline:

1. It takes a plant millions of years to turn into coal.
2. During this long journey, what conditions are indispensable for the formation of coal?
3. Do you think the journey ends where human beings begin to excavate and use coal?

Section Two

Preview

What coal operation is adopted depends on where coal is found. Till now, many coal mining techniques are worked out in coal operation. Text B introduces three coal mining methods which are existent and popular in nowadays' coal mining field. Maybe in the future, new coal mining methods would be adopted when new coal fields are found in places different from where we've already known.

Text B

The Coal Mining Methods

Surface Mining

Coal found close to the surface can be uncovered and removed by large machines in a process that is called surface mining. Surface mining techniques account for 60 percent of coal produced in the United States — 75 percent in Western states, where some deposits are up to 100 feet thick.

Only recently has surface mining played an important role in the U. S. coal industry. The development and use of large power equipment provided the **impetus** that moved surface mining into prominence, and during the 1970s it became the leading method of coal mining.

Today's surface mines are large, intensively engineered, and highly efficient mechanized operations. When an area is to be mined, **topsoil** and **subsoil** are removed first and set aside to be used later in reclaiming the land. Then specially designed machines — **draglines**, **wheel excavators**, or large **shovels** — remove the rock and other material, called **overburden**, to expose the bed of coal. Smaller shovels load the coal into large trucks that remove the coal from the pit.

Once the coal is removed, the area is reclaimed. First the overburden and then the soils are replaced and the area is restored as nearly as possible to its original **contour**. Vegetation currently suitable to the area is planted to anchor the soil and return the land to a natural, productive state. Reclaimed lands are a valuable resource that can support farm crops, provide new wildlife habitats, enhance recreational opportunities, and even serve as sites for commercial development.

The complete mining operation is scheduled so that as one area is being mined, another is being reclaimed where the coal was removed. Thus, even at the largest surface mines only a relatively small area is disturbed by active mining at any one time. Since 1977 an estimated 2 million acres of coal mine lands have been reclaimed in this manner.

Underground Mining

Underground mining methods are used where the coal seam is too deep or the land too hilly for surface mining. Most underground mining takes place east of the Mississippi, especially in the Appalachian mountain states. Coal production was once dominated by underground mining methods, but the growth of coal mining in the West changed that. Now, only 40 percent of coal produced in the U. S. comes from underground mines.

Underground mines differ according to how the coal seam is situated with respect to the surface. If the coal deposit outcrops (appears at the surface) on a hillside, a drift mine can be driven horizontally into the seam. Where the bed of coal is relatively close to the surface, yet too deep to be recovered by surface

mining, a slope mine can be constructed, with the mine shaft **slanting** down from the surface to the coal seam. The most common type is the **shaft** mine. To reach the coal, which may be as deep as 2,000 feet, vertical shafts are cut through the overburden to the coal bed, which is excavated by machines.

In deep mines, the seam is mined in carefully engineered patterns that keep as much as half of the coal in place to help support the roof of the active mining area. This "room and pillar" method requires that large columns of coal remain between mined-out areas, or rooms, which are created when the coal is mined, either by continuous mining machines or conventional methods.

The largest amount of coal taken from underground mines is produced using continuous miners. This machine has a large, rotating, drum-shaped cutting head **studded** with **carbide**-tipped teeth that break up the seam of coal. Large gathering arms on the machines **scoop** the coal directly onto a built-in **conveyor** for loading into waiting shuttle cars.

In conventional mining, a machine resembling an oversized chain saw cuts into the coal. This gives the coal an area to expand into during blasting. Holes are drilled for explosives, which blast loose large chunks of coal. Machines called loaders scoop the coal onto conveyors which dump it into shuttle cars that haul the coal out through the shaft. This traditional method of mining accounts for about 11 percent of total production.

In both continuous and conventional mining, the roof over the mined-out area is supported for safety. The most important development in roof support — both in terms of safety and cost — has been the "roof bolt". Roof bolts are long rods driven into the roof to bind several layers of weak strata into a layer strong enough to support its own weight. Roof bolts also can anchor a weak immediate roof to a strong, firm structure above. Machines are used to drill holes, position the bolts and tighten them.

Longwall Mining

An increasingly popular and more efficient means of underground mining—introduced from Europe in the early 1950s—is longwall mining technology. Longwall today accounts for about one-third of total underground coal tonnage in the U. S. In a continuous, smooth motion, a rotating shear on the mining machines moves back and forth along the face—or wall—of a block of coal, cutting the coal, which drops onto a **conveyor** and is removed from the

mine. The block of coal being mined is several hundred feet wide, thus the name longwall.

Where longwall mining machines are used, room-and-pillar arrangements are not created throughout the entire mine (although pillars of coal are left to support the roof in haulage ways used by people and machines moving about the mine). The longwall miner itself has a **hydraulically** operated steel canopy which holds up the roof and protects miners working at the face. As the miner cuts progressively deeper into the block of coal, the shield advances with it, allowing the unsupported roof in the mined-out area behind it to collapse in a controlled and safe manner.

Vocabulary

impetus / ˈɪmpɪtəs / ***n.*** the force or energy with which a body moves 动力;促进;势头;声势

topsoil / ˈtɒpsɔɪl / ***n.*** the top layer of soil 表土(层),耕作(层);耕层

subsoil / ˈsʌbsɔɪl / ***n.*** the soil lying immediately under the surface soil(土壤的)底土,心土

dragline / ˈdræglaɪn / ***n.*** a large excavator with a bucket pulled in by a wire cable 牵引绳索,索斗铲;拉索,拉铲挖掘机

wheel excavator / (h)wiːlˈekskəˌveɪtə / ***n.*** a large machine for removing soil from the ground, especially on a building site 轮式(斗轮式)挖土机

shovel / ˈʃʌvl / ***n.*** a long-handled tool for lifting and moving loose material; a part like this on a digging or earth-moving machine 铲子;挖土机或推土机的铲形部分

overburden / əʊvəˈbɜːdn / ***v.*** load (someone) with too many things to carry 装载过多,负担过多,使过劳; ***n.*** the surface soil that must be moved away to get at coal seams and mineral 表土,履盖层

contour / ˈkɒntʊə(r) / ***n.*** an outline, especially one representing or bounding the shape or form of something 外形,轮廓;(地图上表示相同海拔各点的)等高线;概要;电路

slant / slɑːnt / ***v.*** slope or lean in a particular direction;diverge from a vertical or horizontal line(使)倾斜,歪斜

shaft / ʃɑːft / ***n.*** a vertical passage into a mine 竖井

stud / stʌd / ***v.*** provide with or construct with studs 用螺栓支撑
carbide / ˈkɑːbaɪd / ***n.*** a binary compound of carbon with a more electropositive element 碳化物，硬质合金
scoop / skuːp / ***vt.*** take out or up with or as if with a scoop 掘，挖，铲
conveyor / kənˈveɪə / ***n.*** a moving belt that transports objects 传送带，输送机
hydraulically / haɪˈdrɔːlɪkəlɪ / ***adv.*** (by a liquid) moving in a confined space under pressure 液压地

Phrases and Expressions

play an important role in：在……中起重要作用
set aside：把……放在一旁，不理会
with respect to：关于，至于，谈到
drift mine：砂矿
slope mine：斜井
shuttle car：穿梭式机动矿车，梭车
chain saw：链锯，小型机器锯
account for：说明，解释
hold up：举起，抬起，支撑

Exercises

Ⅰ. Comprehension of the Text

Directions: Choose the right answer to each question according to the text.

1. Which statement is true about surface mining?
   A. Surface mining techniques account for 75% of coal produced in America.
   B. Surface mining technique plays an important role in coal producing in America today.
   C. During the 1970s, surface mining technique began to develop.
   D. Surface mining results in no environmental problems.
2. Which are commonly used machines in surface mining mentioned in the text?
   A. draglines, wheel excavators
   B. large shovels, cranes