



Học tiếng Anh online với BEA

Tiếng Anh chuyên ngành
KỸ THUẬT ĐIỆN

Tập
I

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**ENGLISH
FOR
ELECTRICAL ENGINEERING**

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INTRODUCTION

1. The authors

The course is designed by two teachers of English at Hanoi University of technology, Ms. Tran Huong Giang and Ms. Nguyen Thi Bac. They both have Masters Degree in English language. They have a lot of experience in teaching English in general and English for Specific Purposes (ESP) in particular. They also have experience in designing materials for different courses.

2. The course

English for Electrical Engineering is a course on English for Specific Purposes (ESP) designed to develop the English skills and basic knowledge in electronics for technical students and engineers who work in the field. This textbook is intended for learners who begin to take the course of English in electronics. The most important aim of the course is to help students develop the ability to deal with the concepts used in technical texts.

The book consists of ten units which can be completed in twenty 45 minute class hours. The units are organized around the various topics used in electronics field. The skills are introduced as they relate to the topic. Each unit in the book is divided into different sections:

Vocabulary and Pronunciation: This consists of three exercises which provide new terms related to the topic.

Reading: There are two or three exercises in this part which contain comprehension questions to help students understand the reading text better.

Language Focus: This sections introduces theory and practice on certain grammatical or vocabulary feature.

Listening: This part provides exercises to improve students' listening skills.

Although we hope that you will enjoy working through this textbook, we do not expect you find it easy. If you have any questions regarding the course, please do not be hesitating to contact us. We are always happy to share with you our expertise and experience of studying this subject.

Business English Academy

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UNIT 1

MAGNETISM

VOCABULARY AND PRONUNCIATION

Exercise 1 Match English terms and Vietnamese translations

English	Vietnamese
1. attractive or repulsive force	Hiện tượng từ tính
2. magnetic properties	Cực từ
3. lodestone	Nam châm
4. magnets	Các cực giống nhau
5. Magnetism	La bàn
6. magnetic field	Xoay
7. magnetic poles	Cuộn cảm
8. compass	Nam châm điện
9. turn	Đá nam châm
10. Like poles	Tính chất từ
11. Electromagnets	Từ trường
12. solenoids	Lực hút hoặc lực đẩy

Exercise 2 T.S 1 Listen and practise

1. attractive or repulsive force	5. Magnetism	9. turn
2. magnetic properties	6. magnetic field	10. Like poles
3. lodestone	7. magnetic poles	11. Electromagnets
4. magnets	8. compass	12. solenoids

Exercise 3 T.S 2 Listen and complete the sentences by selecting the correct word from the box to fill in the gap

attractive or repulsive force	magnets	solenoids
magnetic field	lodestone	turn
magnetic properties	Magnetism	magnetic poles
Electromagnets	compass	Like poles

1. Most common objects that are attracted tocontain iron or steel.
2. The ends of a magnet are called
3. The effect ofon global warming has not yet been researched.
4. Theof materials are in large part determined by the nature and magnitude of the atomic magnetic moments.
5. Acould be used to show the locations of the poles on the Earth.

LISTENING

Exercise 4 T.S 3 Listen and decide whether the following sentences are true(T) or false (F)

1. In fact all materials are affected by a magnetic field at the same degree.
2. Magnets attract all magnetic objects.
3. The area around a magnet is called a magnetic field.
4. Magnetic poles are the ends of a magnet.
5. All magnet bars have two poles, north and south.

Exercise 5: T.S 4 Listen and choose a correct word from the box the fill in the gap

magnetic field	toward	repel	two
electromagnets	voltage	compass	electricity

Like poles of two magnets always push away, or.....(1), each other. Different poles attract each other. For example, if the south pole of one magnet is put near the south pole of another magnet, the magnets will push away from each other. This will also happen with (2) north poles. But if a north pole is put near a south pole, the magnets will move (3) each other until they stick together.

Magnets have many uses. One use was discovered long ago when explorers found out a magnet could be used as a (4) to show the locations of the poles on the Earth.

Electromagnets are another kind of magnet that only work when(5) is running through them. Often, these magnets function using a coil of wire that creates a (6) when there is a current through it. In addition to this coil of wire, a large piece of metal, generally iron, is placed inside the coil to greatly strengthen the magnetic field produced. Though most large(7) employ many solenoids to lift heavy objects, smaller solenoids are used in everyday electronics, for example to change a (8) in a transformer.

LANGUAGE WORK

Exercise 6 Complete the sentences by finding the missing letters

1. Many magnetic properties of materials are expressed in terms of the magnetic field s.....h.
2. L.....e refers to A piece of intensely magnetic magnetite that was used as an early form of magnetic compass.
3. Until 1821, only one kind of m.....m was known, the one produced by iron magnets.
4. The two ends, which are the regions of concentrated lines of force, are called the p.....s of the magnet.
5. A c.....s is a navigational instrument for finding directions on the Earth.
6. AC e.....s can be used to demagnetize objects (like TV screens, audio tapes, VCR tapes) or to hold objects.
7. In physics, the term s.....d refers to a loop of wire, often wrapped around a metallic core, which produces a magnetic field when an electric current is passed through it.

UNIT 2

ELECTROMAGNETIC FIELD

VOCABULARY AND PRONUNCIATION

Exercise 1 Match English terms and Vietnamese translations

English	Vietnamese
1. electromagnetic field	Vùng lân cận
2. electrically charged object	Vật thể tích điện
3. vicinity	Trường điện từ
4. electromagnetic interaction	Tương tác điện từ
5. stationary charges	điện tích chuyển động
6. moving charges	Bức xạ
7. wavelike	điện tích tĩnh
8. quantum mechanical	Giống sóng
9. radiation	Thuật chụp Rơn ghen, chụp X quang
10. radio astronomy	Cơ lượng tử
11. radiography	Phép đo phóng xạ
12. radiometry	Bộ đọc mã vạch
13. laser therapy	Thiên văn học vô tuyến
14. laser-guided bomb	Kết nối/ tách rời
15. barcode reader	Bom dẫn đường bằng la de
16. engage / disengage	Liệu pháp la de

Exercise 2 T.S 1 Listen and practise

1. electromagnetic field	7. wavelike	13. laser therapy
2. electrically charged object	8. quantum mechanical	14. photomedicine
3. vicinity	9. radiation	15. laser-guided bomb
4. electromagnetic interaction	10. radio astronomy	16. barcode reader
5. stationary charges	11. radiography	17. engage / disengage
6. moving charges	12. radiometry	

Exercise 3 T.S 2 Listen and complete the sentences by selecting the correct word from the box to fill in the gap

electromagnetic field	charges	radiography
electrically charged object	wavelike	radiometry
vicinity	quantum	Laser therapy
electromagnetic interaction	radiation	photomedicine
barcode reader	laser-guided bomb	

1. The potential effects ofon human health vary widely depending on the frequency and intensity of the fields.
2. In the photoelectric effect - the emission of electrons from metallic surfaces by electromagnetic radiation - it is found that increasing the intensity of the incident radiation has no effect, and that only the frequency of theis relevant in ejecting electrons.
3. Thispicture of the electromagnetic field has proved very successful.
4. The electromagnetic field may be viewed as a dynamic entity that causes other and currents to move.
5. Oscillating charges produce electric and magnetic fields that may be viewed in a 'smooth', continuous,manner.

LISTENING

Exercise 4 T.S 3 Listen and decide whether the statements are true (T) or false (F)

1. The electromagnetic field is produced by electrically charged objects.
2. The electromagnetic field has a very limited field.
3. The electromagnetic field is made up of electric field and magnetic field.
4. The magnetic field is produced by currents.
5. Traditionally, the electromagnetic field is considered as a smooth, continuous field, propagated in a wavelike manner.

READING

Applications of electromagnetic field

Exercise 5: Choose a correct word from the box to fill in the gap

laser-guided bombs	simple	example	electromagnetic field
disengage	applied	created	electromagnetic radiation

Properties of the(1) are exploited in many areas of industry. The use of electromagnetic radiation is seen in various disciplines. For example, X-rays are high frequency(2) and are used in radio astronomy, radiography in medicine and radiometry in telecommunications. Other medical applications include laser therapy, which is an(3) of photomedicine. Applications of lasers are found in military devices such as(4) , as well as more down to earth devices such as barcode readers and CD players. Something as(5) as a relay in any electrical device uses an electromagnetic field to engage or to(6) the two different states of output (ie, when electricity is not.....(7) , the metal strip will connect output A and B, but if electricity is applied, an electromagnetic field will be(8) and the metal strip will connect output A and C).

LANGUAGE WORK

Exercise 6 Complete the sentences by finding the missing letters

1. An electromagnetic field, sometimes referred to as an EM field, is generated when charged particles, such as electrons, are a.....d.
2. The rotating s.....y charge distribution creates a magnetic field.
3. Process of transmitting energy through space is known as r.....n.
4. A branch of astronomy which studies c.....l objects and astrophysical phenomena is known as radio astronomy.
5. In optics, r.....y is the field that studies the measurement of electromagnetic radiation, including visible light.
6. R.....y is the use of X-rays to view unseen or hard-to-image objects.
7. P.....e is an interdisciplinary branch of medicine that involves the study and application of light with respect to health and disease
8. A l.....r-guided bomb (LGB) is a precision-guided munition (PGM) that uses semi-active laser homing to strike a designated target with greater accuracy than a free-fall bomb.

UNIT 3

ELECTROMAGNETIC INDUCTION

VOCABULARY AND PRONUNCIATION

Exercise 1 Match English terms and Vietnamese translations

English	Vietnamese
1. Electromagnetic induction	Cảm ứng điện từ
2. permanent magnet	Nam châm vĩnh cửu
3. induced electromotive force	Suất điện động cảm ứng
4. self-induction	Hiện tượng tự cảm
5. mutual induction.	Hiện tượng hổ cảm
6. closed circuit	Mạch kín
7. magnetic flux	Từ thông
8. strength	Cường độ
9. induction motor	Động cơ cảm ứng
10.generator	Máy phát
11.stationary magnetic field	Từ trường tĩnh
12.rate	Tốc độ
13.turns of wire	Vòng dây

Exercise 2 T.S 1 Listen and practise

1. permanent magnet	6. Electromagnetic induction	10. strength
2. self-induction	7. mutual induction	11. closed circuit
3. magnetic flux	8. induced electromotive force	12. induction motor
4. generator	9. stationary magnetic field	13. rate
5. turns of wire		

Exercise 3 T.S 2 Listen and complete the sentences by selecting the correct word from the box to fill in the gap

Electromagnetic induction	self-induction	magnetic flux
induced electromotive force	mutual induction	induction motor
stationary magnetic field	closed circuit	generator
permanent magnet	turns of wire	strength

1. An electromotive force is induced in a circuit by varying the linked with the circuit.
2. The most common use of is in the electric generator.
3. The induced electromotive force or EMF in any is equal to the time rate of change of the magnetic flux through the circuit.
4. When a is moved relative to a conductor, or vice versa, an electromotive force is created.
5. Lenz's law, formulated by Estonian physicist Heinrich Lenz in 1834, gives the direction of the and current resulting from electromagnetic induction.

READING

Exercise 4 Fill in each gap with one suitable word

Electromagnetic induction is the production of voltage across a conductor situated in a(1) magnetic field or a conductor moving through a stationary magnetic field.

Joseph Henry and Michael Faraday discovered that when the magnetic field around an electromagnet was increased or decreased, an electric current could be detected in a separate nearby conductor. A(2) can also be induced by constantly moving a permanent magnet in and out of a coil of wire, or by constantly moving a conductor near a stationary permanent magnet. The induced electromotive force is(3) to the rate of change of the magnetic flux cutting across the circuit. Faraday found that the electromotive force (EMF) produced around a closed path is proportional to the rate of change of the magnetic flux through any surface bounded by that path. If

the flux threading a coil is produced by a current in the coil, any change in that current will cause a change in flux, and thus there will be an induced emf while the current is changing. This process is called(4). The emf of self-induction is proportional to the rate of change of current.

The process by which an emf is induced in one circuit by a change of current in a neighboring circuit is called mutual induction. Flux produced by a current in a circuit *A* threads or links circuit *B*. When there is a change of current in circuit *A*, there is a change in the flux linking coil *B*, and an emf is induced in circuit *B* while the change is taking place. Transformers operate on the principle of mutual induction.

In practice, this means that an electrical current will be induced in any closed circuit when the magnetic flux through a surface bounded by the conductor changes. This applies whether the field itself changes in strength or the conductor is moved through it.(5) induction underlies the operation of generators, induction motors, transformers, and most other electrical machines.

Exercise 5 Read the text in Exercise 4 again and decide whether the statements are true (T) or false (F)

1. Electromagnetic induction is produced only when there is a current in the conductor.
2. Joseph Henry and Michael Faraday found that an electric current could be induced in a separate conductor if it is placed in a changing magnetic field.
3. Mutual induction happens when a circuit is placed in changing electric field of another circuit.
4. The operation principle of a transformer is based on self-induction.
5. Faraday discovered that the electromotive force induced in a closed circuit is inversely proportional to the magnetic flux through the circuit.

LANGUAGE WORK

Exercise 6 Complete the sentences by finding the missing letters

1. The term electromagnetic i.....n refers to the generation of an electric current by passing a metal wire through a magnetic field.
2. The purpose of a p.....t magnet is to produce flux in the working gap of a device.
3. Magnetic flux is the product of the average magnetic field times the p.....r area that it penetrates.

4. Mutual induction is the production of an electromotive force in one circuit by a change in current in another circuit.
5. An induction motor (IM) is a type of asynchronous AC motor where power is supplied to the rotating device by means of electromagnetic induction.
6. The number of turns of wire directly relates to the strength of the magnetic field.

UNIT 4
TRANSFORMERS
VOCABULARY AND PRONUNCIATION
Exercise 1 Match English terms and Vietnamese translations

English	Vietnamese
1. electromagnetism	Hiện tượng từ giảo
2. electromagnetic induction	Hiện tượng điện từ
3. induce	Độ thẩm thấu từ
4. magnetic permeability	Cảm ứng điện từ
5. leakage flux	Cảm ứng, sinh ra
6. Winding resistance	Sự nóng lên (nhiệt) do điện trở
7. resistive heating	Từ thông rò rỉ
8. skin effect	Hiệu ứng gần
9. proximity effect	Điện trở của cuộn dây
10.Hysteresis	hiện tượng từ trễ
11.reverse	Đảo chiều
12.Stray losses	Tổn hao do tạp tán
13.peak flux density	Dòng phụ cô
14.Eddy currents	Hiệu ứng thoáng qua, nhẹ
15.Ferromagnetic material	Vật liệu sắt từ
16.short-circuited	Mật độ từ thông cao nhất
17.frictional heating	Sự nóng (lên nhiệt) do ma sát
18.inverse square	Đoản mạch
19.Magnetostriction	Bình phương nghịch đảo

Exercise 2 T.S 1 Listen and practise

1. inductively coupled	2. electromagnetism	3. Stray losses
4. magnetic permeability	5. induce	6. leakage flux
7. Winding resistance	8. resistive heating	9. skin effect
10. proximity effect	11. Hysteresis	12. reverse
13. electromagnetic induction	14. peak flux density	15. Eddy currents
16. Ferromagnetic material	17. short-circuited	18. frictional heating
19. inverse square	20. Magnetostriction	

Exercise 3 T.S 2 Listen and complete the sentences by selecting the correct word from the box to fill in the gap

T.S 2

1. The EMF of a transformer at a given flux density increases with frequency.
2. Winding resistance dominates load losses, whereas hysteresis and eddy currents losses contribute to over 99% of the no-load loss.
3. Iron losses are caused mostly by hysteresis and eddy current effects in the core.
4. The transformer principle was demonstrated in 1831 by Michael Faraday, although he used it only to demonstrate the principle of electromagnetic induction and did not foresee its practical uses.
5. Any leakage flux that intercepts nearby conductive materials such as the transformer's support structure will give rise to eddy currents and be converted to heat.

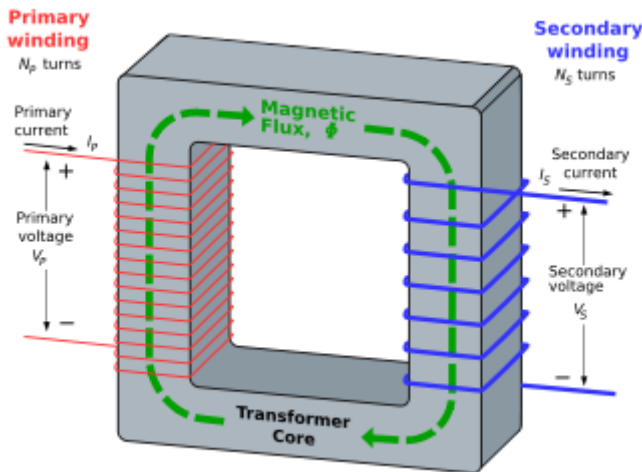
LISTENING

Exercise 4 T.S 3 Listen and decide whether the following sentences are true (T) or false (F)

1. A transformer is a device that transfers electrical energy from one circuit to another through inductively coupled electrical conductors.
2. The transformer is based on two principles: firstly that an electric current can produce a electric field (electromagnetism) and secondly that a

changing magnetic field within a coil of wire induces a voltage across the ends of the coil (electromagnetic induction).

- By changing the current in the primary coil, it changes the strength of its magnetic field; since the changing magnetic field extends into the secondary coil, a voltage is induced across the primary.



- A current passing through the primary coil creates a magnetic field.

- The primary and secondary coils are wrapped around a core of very high magnetic permeability, such as copper.

- This ensures that most of the magnetic field lines produced by the primary current are within the iron and pass through the secondary coil as well as the primary coil.

An ideal step-down transformer showing magnetic flux in the core

READING Energy losses

Exercise 5 Read the following passage carefully and choose the right kind of energy loss in a transformer according to the description.



Transformers are among the most efficient of machines, but all exhibit losses. Transformer losses are divided into losses as follows:

- Eddy currents**
- Winding resistance**
- Hysteresis losses**
- Magnetostriction**
- Stray losses**
- Mechanical losses**

1.

Current flowing through the windings causes resistive heating of the conductors. At higher frequencies, skin effect and proximity effect create additional winding resistance and losses.

2.

Each time the magnetic field is reversed, a small amount of energy is lost due to hysteresis within the core. For a given core material, the loss is proportional to the frequency, and is a function of the peak flux density to which it is subjected.

3.

Ferromagnetic materials are also good conductors, and a solid core made from such a material also constitutes a single short-circuited turn throughout its entire length. Eddy currents therefore circulate within the core in a plane normal to the flux, and are responsible for resistive heating of the core material. The eddy current loss is a complex function of the square of supply frequency and inverse square of the material thickness.

4.

Magnetic flux in a ferromagnetic material, such as the core, causes it to physically expand and contract slightly with each cycle of the magnetic field, an effect known as magnetostriction. This produces the buzzing sound commonly associated with transformers, and in turn causes losses due to frictional heating in susceptible cores.

5.

In addition to magnetostriction, the alternating magnetic field causes fluctuating electromagnetic forces between the primary and secondary windings. These incite vibrations within nearby metalwork, adding to the buzzing noise, and consuming a small amount of power.

6.

Leakage inductance is by itself lossless, since energy supplied to its magnetic fields is returned to the supply with the next half-cycle. However, any leakage flux that intercepts nearby conductive materials such as the transformer's support structure will give rise to eddy currents and be converted to heat.

LANGUAGE WORK

Exercise 6 Complete the sentences by finding the missing letters

1. E.....m is the physics of the electromagnetic field: a field which exerts a force on particles that possess the property of electric charge.
2. In electromagnetism, p.....y is the degree of magnetization of a material that responds linearly to an applied magnetic field.

3. Magnetic flux leakage (MFL) is a magnetic method of nondestructive testing that is used to detect corrosion and pitting in steel structures.
4. Winding resistance and motor current produce power loss in the form of heat and motor temperature rise (TPR).
5. Resistive heating has possible advantages compared with other active warming systems because it can heat several fields independently.
6. If an alternating magnetic field is applied to the material, its magnetization will trace out a loop called a hysteresis loop.
7. The goal of placing electromagnetic shields in the distribution transformer tank walls is to reduce the stray losses.
8. Although eddy currents can be induced in any electrical conductor, the effect is most pronounced in solid metallic conductors.
9. Ferromagnetic materials have a large and positive susceptibility to an external magnetic field.
10. Magnetostriction is the changing of a material's physical dimensions in response to changing its magnetization.

UNIT 5

ELECTRICITY GENERATION

VOCABULARY AND PRONUNCIATION

Exercise 1 Match English terms and Vietnamese translations

English	Vietnamese
1. Electricity generation	Sự đốt cháy
2. power station	Nhà máy điện
3. electromechanical generator	Sự phát điện
4. heat engines	Máy phát điện cơ
5. combustion	Sự phân hạt nhân
6. nuclear fission	Động năng
7. kinetic energy	Pin quang điện mặt trời
8. solar photovoltaics	Hơi nóng, hơi nước
9. turbines	Động cơ nhiệt
10. Steam	Nhiên liệu hóa thạch
11. fossil fuel	Đập thủy điện
12. biomass	Tuốc bin
13. Geothermal power	Lực của thủy triều
14. hydroelectric dam	Năng lượng địa nhiệt
15. tidal force	Dầu mỏ
16. chimney	Sinh chất, sinh khối
17. petroleum	ống khói

Exercise 2 T.S 1 Listen and practise

1. Electricity generation	6. nuclear fission	11. fossil fuel	16. tidal force
2. power station	7. kinetic energy	12. biomass	17. Solar updraft tower
3. electromechanical generator	8. solar photovoltaics	13. solar parabolic trough	18. chimney
4. heat engines	9. turbines	14. Geothermal power	19. solar thermal energy
5. combustion	10. Steam	15. hydroelectric dam	20. petroleum

Exercise 3 T.S 2 Listen and complete the sentences by selecting the correct word from the box to fill in the gap

Electricity generation	nuclear fission	fossil fuel	tidal force
power station	kinetic energy	biomass	Solar updraft tower
electromechanical generator	solar photovoltaics	solar parabolic trough	chimney
heat engines	turbines	Geothermal power	solar thermal energy
combustion	Steam	hydroelectric dam	petroleum

1. Combined cycle gas plants are driven by both steam and gas.
2. Fluid-based magnetohydrodynamic (MHD) power generation has been studied as a method for extracting electrical power from nuclear reactors and also from more conventional fuel systems.
3. Sources of electricity in the U.S. in 2006; generation (mainly coal) was the largest source.
4. Electrochemical is also important in portable and mobile applications.

5. Until recently,were most commonly used in remote sites where there is no access to a commercial power grid, or as a supplemental electricity source for individual homes and businesses.

LISTENING

Exercise 4 T.S 3 Listen to the following passage and write down the missing words

Electricity generation is the process of (1) non-electrical energy to electricity. For electric utilities, it is the first process in the delivery of (2) consumers. The other processes, electric power transmission and electricity distribution, are normally carried out by the electrical (3) industry. Electricity is most often generated at a power station by electromechanical (4) , primarily driven by heat engines fueled by chemical combustion or nuclear fission but also by other means such as the kinetic energy of flowing water and wind. There are many other (5) that can be and are used to generate electricity such as solar photovoltaics.

READING

Exercise 5 Read the following passage and choose a suitable word from the box to fill in the gap.

Water	Hot gas	turbines	heating
drive	Steam	Wind	heat engines

Methods of generating electricity

Most electric generation is driven by (1). The combustion of fossil fuels supplies most of the heat to these engines, with a significant fraction from nuclear fission. Virtually all of the heat engines just mentioned are (2) . Other types of turbines can be driven by wind or falling water. All turbines are driven by a fluid acting as an intermediate energy carrier. These fluids can be:

- (3) - Water is boiled by nuclear fission, the burning of fossil fuels (coal, natural gas, or petroleum) or biomass. Some power plants use the sun as the heat source: solar parabolic troughs and solar power towers concentrate sunlight to heat a heat transfer fluid,

which is then used to produce steam. Another renewable source of heat used to (4) a turbine is Geothermal power. Either steam under pressure emerges from the ground and drives a turbine or hot water evaporates a low boiling liquid to create vapour to drive a turbine.

- (5) (hydroelectric) - Turbine blades are acted upon by flowing water, produced by hydroelectric dams or tidal forces.
- (6) - Most wind turbines generate electricity from naturally occurring wind. Solar updraft towers use wind that is artificially produced inside the chimney by (7) it with sunlight, and are more properly seen as forms of solar thermal energy.
- (8) (gas turbine) - Turbines are driven directly by gases produced by the combustion of natural gas or oil.

Exercise 6 Complete the sentences by finding the missing letters

1. P.....m engineering refers to the subsurface engineering activities related to the production of hydrocarbons, which can be either crude oil or gas.
2. Electricity g.....n is the process of converting non-electrical energy to electricity.
3. A power s.....n (also referred to as power plant) is an industrial facility for the generation of electric power.
4. The steam t.....e is a very important engine, used in powerplants to produce current.
5. An e.....l generator converts mechanical vibrational energy into electrical energy.
6. A heat e.....e typically uses energy provided in the form of heat to do work and then exhausts the heat which cannot be used to do work.
7. C.....n or burning is a complex sequence of exothermic chemical reactions between a fuel and an oxidant accompanied by the production of heat or both heat and light in the form of either a glow or flames.
8. P.....c technology makes use of the abundant energy in the sun, and it has little impact on our environment.
9. Formed from plants and animals that lived up to 300 million years ago, f.....l fuels are found in deposits beneath the earth.
10. There are three g.....l power plant technologies being used to convert hydrothermal fluids to electricity.