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Our deepest gratitude and appreciation also go to our families, our colleagues and our friends. Their constant encouragement and support gave us a great deal of strength and determination during the completion of the book.

Ngo Thi Thanh, M.A

Hoang Thi Kim Lien, M.A

Nguyen Tien Hung, M.A

LỜI CẢM ƠN

Cuốn sách này đ- ợc hoàn thành nhờ sự giúp đỡ quý báu từ các tổ chức cũng nh- cá nhân.

Tr- ớc tiên, chúng tôi muốn gửi lời cảm ơn chân thành đến Tr- ờng Đại học S- phạm Kỹ thuật Nam Định, đã tạo điều kiện giúp đỡ chúng tôi nghiên cứu và hoàn thành cuốn sách này.

Chúng tôi cũng muốn gửi lời cảm ơn sâu sắc đến gia đình, đồng nghiệp và bạn bè, đã động viên, khích lệ và hỗ trợ chúng tôi rất nhiều trong quá trình hoàn thành cuốn sách.

Thạc sỹ Ngô Thị Thanh

Thạc sỹ Hoàng Thị Kim Liên

Thạc sỹ Nguyễn Tiến Hưng

INTRODUCTION

English for Electrical Engineering and Electronics is intended for students at the pre-intermediate level. The most important aim of this book is to help students develop the ability to deal with the concepts used in scientific discussion and writing in English. The book contains a number of features to aid students:

- ***The format is clear and flexible:*** There are 8 units with 8 corresponding topics in the book. Each unit is divided into four main sections:

- *Reading comprehension:* This part provides a reading passage of the topic mentioned in the unit. Thanks to this reading passage, students are able to broaden their knowledge about technical terms relating to the topic and enhance their reading skill in specific scientific field.

- *Use of language and practice:* This part is a source of grammar theory and exercises for students to reinforce their grammar knowledge.

- *Writing:* In this part, students stand a golden chance to have guided writing or free writing practice and apply their knowledge about technical terms and grammar to their own products.

- *Further reading:* This part of each unit supplies a further reading passage on the given topic, which enables students to understand more about the mentioned topic and widen their vocabulary on specific topic. This part also gives students a range of homework to work at home and self-study.

- ***Practice materials are numerous:*** Most of the skills are reinforced by activities and exercises

- ***Self-study is encouraged: Each unit provides students with many exercises and*** activities. Students are not expected to deal with all these exercises and activities in class. Hence, they are required to prepare for each lesson before class, and do the rest tasks at home after class. Only by this way can students get the best results.

For further information about the course description and requirements, please refer to the next page.

We do hope that students will enjoy this book. If you have any questions regarding to the course, please do not hesitate to contact us. We are always happy to share with you our experience of study English for Electrical Engineering and Electronics.

Compiled by Ngo Thi Thanh, M.A - Hoang Thi Kim Lien, M.A - Nguyen Tien Hung, M.A

April, 2011

LỜI GIỚI THIỆU

Tiếng Anh chuyên ngành Điện - Điện tử đ- ợc biên soạn cho sinh viên ở trình độ đại học và cao đẳng Khoa Điện - Điện tử Tr- ờng Đại học S- phạm Kỹ thuật Nam Định. Hiện nay đã có rất nhiều tài liệu về Tiếng Anh chuyên ngành Điện - Điện tử, tuy nhiên những tài liệu này ch- a phù hợp với sinh viên tr- ờng Đại học S- phạm Kỹ thuật Nam Định. Vì vậy, chúng tôi biên soạn cuốn sách này nhằm trang bị cho sinh viên những kiến thức về chuyên ngành Điện - Điện tử, giúp sinh viên vận dụng đọc và dịch các tài liệu cần thiết cho công việc.

Cuốn sách này đ- ợc chia thành 8 bài, mỗi bài t- ơng ứng với một chủ đề. Mỗi bài đ- ợc chia thành 4 phần chính sau:

- *Đọc hiểu:* Phần này cung cấp cho sinh viên các bài đọc t- ơng ứng với từng chủ đề trong mỗi bài. Thông qua những bài đọc này, sinh viên có khả năng mở rộng vốn từ kỹ thuật và nâng cao kỹ năng đọc tài liệu chuyên ngành.
- *Sử dụng ngôn ngữ và luyện tập:* Phần này cung cấp lý thuyết về ngữ phấp và các bài tập cho sinh viên luyện tập, nhằm củng cố kiến thức ngữ pháp.
- *Viết:* Trong phần này, sinh viên đ- ợc luyện viết theo các chủ đề t- ơng ứng với mỗi bài.
- *Đọc thêm:* Phần này cung cấp cho sinh viên các bài đọc thêm theo từng chủ đề. Phần này giúp sinh viên hiểu sâu hơn về chủ đề đã học và mở rộng vốn từ chuyên ngành.

Chúng tôi hy vọng rằng cuốn sách Tiếng Anh chuyên ngành Điện - Điện tử sẽ nhận đ- ợc sự h- ởng ứng và đóng góp từ phía đồng nghiệp cũng nh- sinh viên.

Ng- ời biên soạn: Thạc sỹ Ngô Thị Thanh – Thạc sỹ Hoàng Thị Kim Liên

– Thạc sỹ Nguyễn Tiến Hưng

Tháng 4/ 2011

COURSE DESCRIPTION

Number of credits: 2 credits

Time available:

- ***Theory:*** 29 periods
- ***Test:*** 1 period
- ***Self-study:*** 60 periods

Course description:

English for Electrical Engineering and Electronics is intended for students at the pre-intermediate level, aiming at providing students with technical terms and basic knowledge on Electrical Engineering in English.

Objectives:

By the end of the course, students are able to acquire and develop essential skills in:

- understanding and using technical terms relating to Electrical Engineering and Electronics
- reading in scientific field: including scanning and skimming skills
- remembering and applying grammar theory in each scientific topic
- practicing guided or free writing on specific scientific topic

Course requirements:

Preparation, attendance, and participation: Students are required to read book in advance to prepare for each lesson, attend class regularly and make contributions to lessons.

Homework:

Students are required to do homework to fulfill the exercises in the book and other tasks assigned by their teacher.

MÔ TẢ MÔN HỌC

(2 tín chỉ)

Thời gian:

- ***Lý thuyết:*** 29 giờ
- ***Kiểm tra:*** 1 giờ
- ***Tự học:*** 60 giờ

Mô tả môn học:

Tiếng Anh chuyên ngành Điện - Điện tử đ- ợc biên soạn cho sinh viên ở trình độ đại học và cao đẳng Khoa Điện - Điện tử Tr- ờng Đại học S- phạm Kỹ thuật Nam Định, nhằm trang bị cho sinh viên những kiến thức về chuyên ngành Điện - Điện tử, giúp sinh viên vận dụng đọc và dịch các tài liệu cần thiết cho công việc.

Mục tiêu:

Sau khi kết thúc môn học, sinh viên có khả năng tiếp thu và phát triển các kỹ năng sau:

- Hiểu và sử dụng đ- ợc các thuật ngữ kỹ thuật liên quan đến chuyên ngành Điện - Điện tử
- Đọc hiểu về lĩnh vực Tiếng Anh chuyên ngành Điện - Điện tử
- Nắm bắt và hiểu đ- ợc các thuật ngữ và các cấu trúc chuyên ngành để có thể sử dụng thành thạo
- Có kỹ năng viết theo các chủ đề đã học

Yêu cầu môn học:

Chuẩn bị bài và dự lớp: Sinh viên phải đọc sách tr- ớc để chuẩn bị bài tr- ớc khi đến lớp, dự lớp đầy đủ và đóng góp ý kiến xây dựng bài.

Bài tập về nhà:

Sinh viên phải làm bài tập về nhà đầy đủ và hoàn thành các nhiệm vụ giáo viên giao.

TABLE OF CONTENTS

UNIT 1: CONDUCTORS, INSULATORS AND SEMICONDUCTORS

If we connect a battery across a body, there is a movement of free electrons towards the positive end, this movement of electrons is an electric current. All materials can be classified into three groups according to how readily ***they*** permit an electric current to flow. These are: conductors, insulators and semiconductors.

In the first category are substances which provide an easy path for an electric current. All metals are conductors; however, some metals do not conduct well. Manganin, for example, is a poor conductor. Copper is a good conductor, therefore it is widely used for cables. A non-metal which conducts well is carbon. Salt water is an example of a liquid conductor.

A material which does not easily release electrons is called an insulator. Rubber nylon, porcelain and air are all insulators. There are no perfect insulators. All insulators will allow some flow of electrons; however, this can usually be ignored because the Flow they permit is so small.

Semiconductors are midway between conductors and insulators. Under certain conditions ***they*** allow a current to flow easily but under others they behave as insulators. Germanium and silicon are semiconductors. Mixtures of certain metallic oxides also act as semiconductors. ***These*** are known as thermistor. The resistance of thermistors falls rapidly as their temperature rises. ***They*** are therefore used in temperature-sensing devices.

1.1. READING COMPREHENSION

EXERCISE 1 ***Answer the questions.***

1. What are conductors, insulators and semiconductors?
2. What is an electric current?
3. What is copper usually used for?

4. Are all insulators perfect? Why?

5. What are thermistors?

EXERCISE 2 ***What do the pronouns in italics in these sentences refer to?***

1. All materials can be classified into three groups according to how readily *they* permit an electric current to flow. *(line 4)*

A. three groups B. all materials C. free electrons

2. Under certain conditions *they* allow a current to flow easily but under others *they* behave as insulators. *(line 16)*

A. conductors B. semiconductors C. insulators

3. *These* are known as thermistors *(line 18)*

A. metallic oxides B. semiconductors C. mixtures of certain metallic oxides

4. They are therefore used in temperature-sensing devices *(line 20)*

A. thermistors B. semiconductors C. metallic oxides

EXERCISE 3 ***Check the facts and ideas.***

Decide if these statements are True (T) or False (F). Quote from the passage to support your decisions.

1. Electrons flow from positive to negative

2. Copper provides an easy path for an electric current

3. All metals are good conductors

4. All good conductors are metals

5. Air is not a perfect insulator

6. Rubber readily releases electrons

7. The resistance of a thermistor is higher at low temperature than at high temperature.

EXERCISE 4 ***Rewrite the following sentences, replacing the words in italics with expressions from the passage which have similar meanings.***

Example: If we *link* a battery across a torch body.

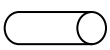
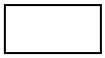
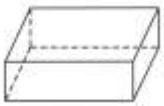
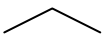
If we *connect* a battery across a torch body..

1. The *flow* of free electrons is an electric current.
2. Materials in the first *group,* are called conductors
3. *Materials* which provide a path for an electric current are conductors
4. All insulators *permit* some flow of electrons
5. Germanium sometimes *acts* as an insulator and sometimes as a conductor.

1.2. USE OF LANGUAGE

1.2.1. Describing shapes

Study these nouns and adjectives for describing the shapes of objects:

Shape	Noun	Adjective	Shape	Noun	Adjective
Two dimensional			Three dimensional		
	Circle	Circular		Sphere	Spherical
	Semi-circle	Semi-circular		Cylinder	Cylindrical
	Square	Square		Tube	Tubular
	Rectangle			Rectangle cubic	rectangular
Lines			Edges		Rounded
	Straight				
	Curved				pointed

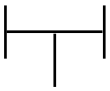
NOTE:

- ***When something has a regular geometric shape we can use one of the adjectives from the table to describe it.***

Example: 

A square wave

- ***When the object has no recognized geometric shape but does resemble a well known object or a letter of the alphabet, it may be described in one of the following ways:***



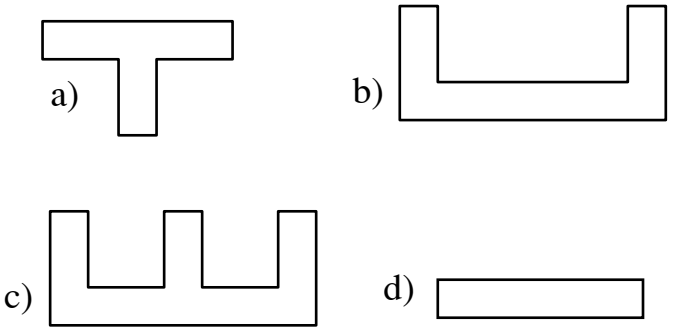
An H-shaped antenna

A saw-tooth wave

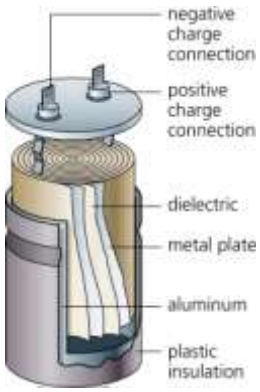
EXERCISE ***Describe the following shapes***

For example: 1. A circle capacitor

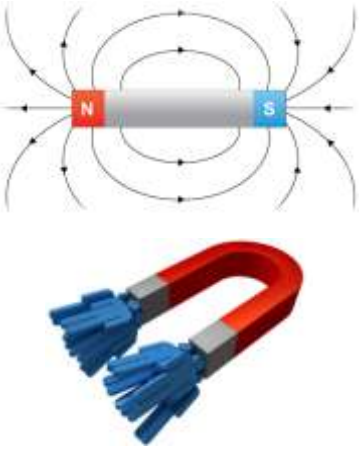
1. A ceramic capacitor



2. Transformer laminations



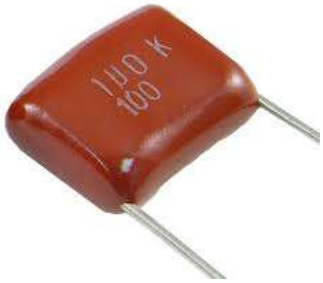
3. An electrolytic capacitor



4. A magnet

5. A cable conduct

6. A carbon brush



7. A capacitor

8. A resistor

1.2.2. Describing position and connection

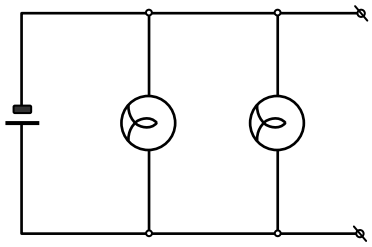
Be + past participle + preposition

Example:

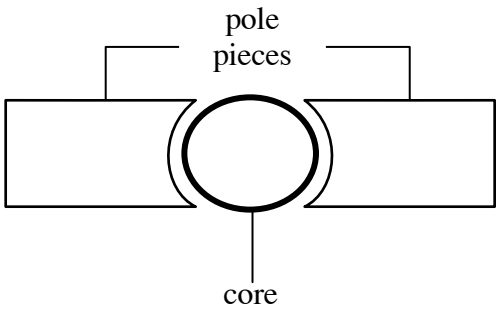
1. The tuning capacitor IS CONNECTED ACROSS the coil.
2. The semiconductor rectifier IS MOUNTED ON the heat sink.

EXERCISE ***Complete each sentence using an appropriate phrase from the below list***

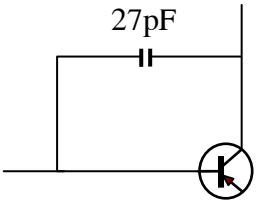
- *wound round*	- *mounted on*	- *located within*	- *connected to*
- *connected across*	- *wired to*	- *applied to*	- *connected between*



1. The bulbs are……the battery

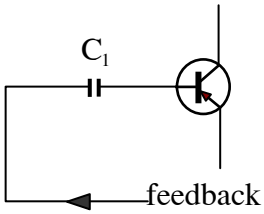


2. The core is…… the pole pieces



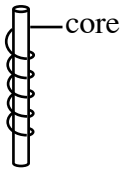
3. The 27pF capacitor is…….. the collector and the base

4.The antenna is……the coil

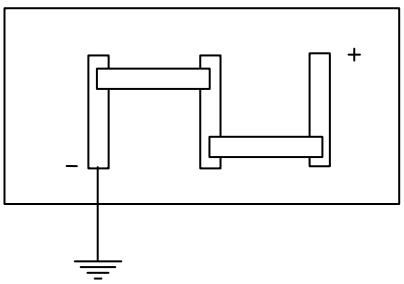


5. Feedback voltage is…….. the base of the transistor through C_1

6.The rotor is……. the shaft



7. The coil is……an iron core



8. The negative pole of the battery…… earth

1.2.3. Relative clause (Which, Where, Who)

In this part, we mention **defining relative clause**. Defining relative clause is used to define the noun before it. If we omit it, the noun will not be clear. Before the defining relative clause, there is no comma.

We can use relative pronouns "which, where, who" to initiate defining relative clauses.

- "which" is used for things/ objects
- "where" is used for places
- "who" is used for people

Example:

1. Starter motor brushes are made of carbon.
2. The carbon contains copper.

⇨ Starter motor brushes are made of carbon ***which*** contains copper. ("*which* contains copper" is a defining relative clause to define "carbon". "which" is the relative pronoun replacing "carbon".)

3. Consumers are supplied at higher voltages than domestic consumers.
4. These consumers use large quantities of energy.

⇨ Consumers ***who*** *use large quantities of energy* are supplied at higher voltages than domestic consumers.

5. 33kV lines are fed to intermediate substations.
6. In the intermediate substations the voltage is stepped down to 11kV

   33kV lines are fed to intermediate substations ***where*** *the voltage is stepped down to 11kV*.

EXERCISE ***Connect the following sentences using relative clauses***

1. The coil is connected in series with a resistor.

   The resistor has a value of 240 ohms.

For example: The coil is connected in series with a resistor **which** has a value of 240 ohms.

2. The supply is fed to a distribution substation.

The supply is reduced to 41V in the distribution substation.

3. Workers require a high degree of illumination.

   The workers assemble very small precision instruments.

4. Manganin is a metal.

   This metal has a comparatively high resistance.

5. The signal passes to the detector.

   The signal is rectified by the detector.

6. A milliammeter is an instrument.

   The instrument is used for measuring small currents.

7. Workers require illumination of 300 lux.

   The workers assemble heavy machinery.

8. Armoured cables are used in places.

   There is risk of mechanical damage in these places.

9. A simple circuit breaker consists of a solenoid and a switch with contacts.

   The contacts are held closed by a latch.

10. This latch releases the switch contacts.

    The switch contacts are pulled apart by a spring.

1.2.4. Reason and result connectives (because, because of, therefore)

Study these sentences:

1. Copper is used for cables
2. Copper is a good conductor.

Sentence 1 tells us what copper is used for. Sentence 2 tells us why it is used. Sentence 2 provides a reason for sentence 1. We can link a statement and a reason using **because**

→ 1+2. Copper is used for cables **because** it is a good conductor.

When the reason is a noun or a noun phrase, we use ***because of***

The motor overheated ***because of*** dirt in the air gap

Now study this pair:

3. The flow of electrons through an insulator is very small.

4. The flow can be ignored.

Sentence 4 is a result of sentence 3. We can link a statement and a result using ***therefore.***

→ 3+4: The flow of electrons through an insulator is very small. **Therefore** it can be ignored.

Note that a stop or a semi-colon is used before **therefore**.

EXERCISE ***Link these ideas using " because" or " therefore"***

1. Soft iron is used in electromagnets.
   Soft iron can be magnetized easily.

Example: Soft iron is used in electromagnets **because** it can be magnetized easily.

2. The voltage is 250V and the current 5A.
   The resistance is 50Ω
3. Pvc is used to cover cables.
   Pvc is a good insulator.
4. Transistors can be damaged by heat.
   Care must be taken when soldering transistors.
5. Capacitance is usually measured in microfarads or picofarads.
   The farad is a too large unit.
6. Output transistors are mounted on a heat sink.
   Output transistors generate heat.
7. It is to control the speed of Dc motors.
   Dc motors are used when variable speeds are required.
8. A cathode-ray tube screen glows when an electron beam strikes it.
   The screen is coated with a phosphor.

1.2.5. Pronoun links between sentences (it, they, them, this, that…)

- When we link sentences together, or into paragraphs, repeated nouns usually become pronouns.

Examples:

1. A short circuit occurs in a transformer.
2. The short circuit may cause overheating.
3. The overheating may further damage the insulation.

When a short circuit occurs in a transformer, **it** may cause overheating. **This** may further damage the insulation.

EXERCISE ***Replace the repeated nouns in this paragraph with suitable pronouns where there is no likelihood of confusion***

1. A transformer is a device which changes the magnitude of an ac voltage. The transformer consists of primary coils to which the input is applied, and a secondary coil from which the output is obtained.

Example: A transformer is a device which changes the magnitude of an ac voltage. **It** consists of primary coils to which the input is applied, and a secondary coil from which the output is obtained.

2. The transformer consists of primary coils and a secondary coil. The coils are insulated and wound round a former.

3. The coils are insulated and wound round a former. The coils have a core of soft iron on which the former is mounted.

4. The coils have a core of soft iron on which the former is mounted. The core is made from many thin sheets or laminations.

5. The sheets are oxidized so that the sheets are insulated from each other.

6. The sheets are oxidized. Oxidizing the sheets reduces eddy losses.

1.3. WRITING

1.3.1. Simple instructions use the infinitive.

Example:

1. Measure the collector current..
2. Switch off the supply
3. Do not solder transistors without a heat – shunt.

1.3.2. Simple instructions use the present passive.

Example:

1. The collector current is measured.
2. The supply is switched off.
3. Transistors are not soldered without a heat – shunt.

EXERCISE ***Study this description of how batteries are charged***

(1) The filler plugs are removed and the battery is connected to the charger. (2) It must be ensured that the correct polarity is observed and good connections are made. (3) The charger is then switched on. (4) The charger is switched off when the battery has been fully charged. (5) The specific gravity of a sample cell is checked. (6) The filler plugs are replaced and the battery is left to cool before use.

Now begin a list of instruction for how to charge a battery. Begin like this:

Example:

1. Remove the filler plugs.

1.4. FURTHER READING

EXERCISE 1 ***Comprehension***

Study this passage carefully and answer the questions which follow:

SUPERCONDUCTIVITY

The resistance of metals varies with their temperature. When they get hot, their resistance increases. When they cool, their resistance falls. The resistance of some metals and alloys steadily decreases as their temperature is lowered, then falls suddenly to a eligible value at temperatures a few degrees above absolute zero (-273^{o}C). In other words, these materials have almost no resistance to an electric current at very low temperatures. They became almost perfect conductors. This is called superconductivity. It occurs only with certain materials, for example lead, and only at very low temperatures.

The practical applications of superconductivity are limited because of the very low temperatures required. A number of uses, however, have been proposed. If a current is induced by a magnetic field in a ring of superconducting material, it will continue to circulate when the magnetic field is removed. In theory this could be made use of in the memory cells of computers. Memory cells made of superconducting materials could store information indefinitely. Because of the zero resistivity of the cells, the information could be retrieved very quickly, as fast as 10^{-6} seconds.

Ninety percent of the total losses in modern transformers is due to the resistance of the windings. Transformers could be made with windings cooled to the low temperatures at which superconductivity occurs. The resistance of the windings would be zero and the transformer would be almost ideal. Similarly a 100% efficient electric motor has been proposed using the magnetic field of superconductivity coils.

1. Name a superconducting material.
2. When do materials exhibit superconductivity?
3. Why are the practical applications limited?
4. What applications have been proposed?
5. What advantages would a memory cell made of a superconducting material have?
6. How efficient would transformers and motors be which used superconductivity?

EXERCISE 2 ***Summarizing***

Complete this summary of the passage using your answers to EXERCISE 1:

Some materials, for example (1)……., become almost perfect conductors at (2)……

The applications of superconductivity are limited because (3)…...

Possible uses are (4)……

A superconducting memory cell would allow information (5)…….

A transformer or motor using superconductivity would be (6)……

1.5. VOCABULARY

Act as (v)	Coi nh- , giống nh-
Antenna (n)	ăngten
Armoured cable (n)	Cáp bọc kim loại
Assemble (v)	Lắp ghép
Base (n), (v)	Chân đèn, dựa trên
Battery (n)	Pin, ắc quy
Behave (v)	Coi nh-
Breaker (n)	Bộ ngắt
Brush (n)	Chổi
Cable (n)	Cáp
Cable conduit (n)	Vỏ bọc cáp
Carbon (n)	Cácbon
Carbon brush (n)	Chổi than
Category (n)	Loại, mẫu
Cell (n)	Pin
Certain (adj)	Nhất định, chắc chắn, chính xác
Charge (v)	Nạp điện, pin
Charger (n)	Bộ nạp
Circle (n)	Hình tròn
Circuit breaker (n)	Bộ ngắt mạch
Circular (adj)	Dạng đ- ờng tròn
Classify (v)	Phân loại
Coil (n)	Cuộn dây
Collector (current) (n)	Dòng cực góp
Condition (n)	Điều kiện
Conduct (v)	Dẫn điện
Conductor (n)	Chất dẫn điện
Conduit (n)	Vỏ bọc
Consumer (n)	Ng- ời tiêu thụ (điện)

Contact (n), (v)	Công tắc, liên kết với
Contain (v)	Chứa, gồm có
Core (n)	Lõi
Curved (adj)	Dạng hình cung, cong
Cylinder (n)	Hình trụ
Cylindrical (adj)	Dạng hình trụ
Damage (v), (n)	H- hỏng, tàn phá, phá hủy
Degree (n)	Bằng cấp trình độ, độ
Dimension (a)	Chiều, kích th- ớc, khổ, cỡ
Dimensional (adj)	
Distribution substation (n)	Trạm phân phối trung gian, trạm cung cấp
Domestic (adj)	Thuộc gia đình
Domestic consumer (a)	Hộ tiêu thụ
Edge (n)	Mép, biên, bờ
Electric current (n)	Dòng điện
Electrolytic (adj)	Điện phân
Electrolytic capacitor (a)	Tụ hóa
Electron (n)	Hạt điện tử
Energy (n)	Năng l- ợng
Fall (v)	Giảm
Feed to (v)	Truyền tới, tải tới
Feedback (adj)	Hồi tiếp
Feedback voltage (n)	Điện áp hồi tiếp
Filler plug (a)	Nắn dòng
Flow (n), (v)	Chạy, truyền (dòng điện)
Free (adj)	Tự do
Free electron (a)	Hạt điện tự do
Full (adj)	đầy
Fully (adv)	

Germanium (a)	Gecmani (1 loại kim loại)
Gravity (n)	Lực hấp dẫn, lực hút
Group (n)	Nhóm
Heat shunt (n)	Mỏ hàn
Heat sink (n)	Tấm tản nhiệt
Ignore (v)	Bỏ qua
Illumination (n)	Độ sáng
Instruct (v)	Chỉ dẫn
Instruction (n)	Sự chỉ dẫn
Instrument (n)	Thiết bị, dụng cụ đo l- ờng
Insulate (v)	Cách điện
Insulator (n)	Chất cách điện
Intermediate substation (n)	Trạm biến áp trung gian
Iron (adj), (n)	thép
Iron core (n)	Lõi thép
Lamination (n)	Lá thép
Latch (n)	Cái chốt, then cài
Line (n)	Đ- ờng dây điện
Line (n)	Đ- ờng thẳng
Liquid (adj)	Chất lỏng thể lỏng
Lux (n)	Đơn vị đo ánh sáng
Machinery (n)	Máy móc, thiết bị , dụng cụ
Magnet (n)	Nam châm
Manganin (n)	Manganin, hợp kim đồng mangan+nicken
Measure *(v)*	đo
Material (n)	Chất liệu, vật liệu
Mechanic (n)	Thợ máy, công nhân cơ khí
Mechanical (adj)	Cơ khí
Metal (n)	Kimloại

Metallic (adj)	Thuộc kim loại
Metallic oxide (n)	Ôxit kim loại
Milliammeter (n)	Ampe kế
Mixture (n)	Sự hỗn hợp
Motor pole shoe (n)	Đầu cực môtơ
Move (v)	Di chuyển, rời
Movement (n)	Sự di chuyển, sự rời đi
Non-metal (a)	Phi kim
Nylon (n)	Nilông
Observe (v)	Kiểm tra, giám sát
Pass to (v)	Truyển tải, tải qua
Path (n)	Đ- ờng truyền
Perfect (adj)	Hoàn hảo
Permision (n)	Sự cho phép
Permit (v)	Cho phép, chấp nhận
Place (n), (v)	Nơi chốn; đặt, để (vị trí)
Pointed (adj)	Dạng hình chọn
Polarity (n)	Phân cực
Pole piece (a)	Đầu cực, bản cực
Pole shoe (a)	Đầu cực
Poor conductor (n)	Chất dẫn kém
Porcelain (a)	Sứ, đồ sứ
Precision (a)	Độ chính xác
Precision instrument (n)	Thiết bị đo độ chính xác cao
Pull (v)	Kéo
Push (v)	Đẩy
Quantity (a)	Số l- ợng
Rapidly (adv)	Nhanh
Readily (adv)	Hoàn toàn
Rectangle (a)	Tam giác

Rectify(v)	Chỉnh l- u
Release (v)	Giải phóng, giải thoát
Remove (v)	Tháo (ổ cắm)
Replace (v)	Rút bỏ, thay thế
Require (v)	Yêu cầu, đòi hỏi
Resistance (n)	Đơn vị điện trở
Rise (v)	Tăng
Risk (a)	Rủi ro, tổn hao, tổn thất
Rotor (a)	Rôto, phần động, phần quay
Rounded (adj)	Dạng hình tròn
Rubber (n)	Cao su
Salt water (n)	N- ớc muối
Sample (n)	Mẫu
Saw-tooth wave (n)	Sóng dạng răng c- a
Semi-circle (a)	Bán nguyệt
Semi -circular (adj)	Dạng hình bán nguyệt
Semiconductor (n)	Chất bán dẫn
Shaft (n)	Trục
Shape (n)	Hình , khối
Silicon (n)	Silic
Solder (v)	Hàn
Solenoid (n)	Cuộn sôlênoit *(cuộn dây K1 trở nên có từ tính khi có dòng điện chạyqua*
Specific gravity (n)	Khối l- ợng riêng
Sphere (n	Hình cầu
Spherical (adj)	Dạng hình cầu
Spring (n)	Lò xo
Square (n), (adj)	Hình vuông
Starter motor brush (n)	Chổi than khởi động (chổi vót)
Step down (v)	Giảm xuống

Straight (adj)	Có dạng đ- ờng thẳng
Substance (n)	Vật chất, chât liệu
Substation (n)	Trạm điện, nhà máy điện
Supply (n)	Nguồn cấp, cung cấp
Switch off (v)	Tắt
Switch on (v)	Bật
Temperature (n)	Nhiệt độ
Temperature-sensing device (n)	Thiết bị cảm ứng nhiệt
Therefore (adv)	Vì vậy, do vậy
Thermistore (n)	Nhiệt biến trở
Torch body (n)	đèn pin
Toward (adv)	Về phía
Transformer (n)	Máy biến áp
Transformer lamination (n)	Lá thép biến áp
Tube (n)	Hình ống
Tubular (adj)	Dạng hình ống
Tuning capacitor (n)	Tụ điều h- ởng
Value (a)	Giá trị
Variable capacitor (n)	Tụ xoay, tụ biến thiên
Wave (n)	Sóng
Widely (adj))	Một cách rộng rãi

UNIT 2: CIRCUIT ELEMENTS

Current moves from a point of high potential energy to ***one*** of low potential. It can only do so if there is a path for it to follow. This path is called an electric circuit. All circuits contain four elements: a source, a load, a transmission system and a control.

The source provides the electromotive force. This establishes the difference in potential which makes current flow possible. The source can be any device which supplies electrical energy. For example, ***it*** may be a generator or a battery.

The load converts the electrical energy from the source into some other form of energy. For instance, a lamp changes electrical energy into light and heat. The load can be any electrical device.

The transmission system conducts the current round the circuit. Any conductor can be part of a transmission system. Most systems consist of wires. It is often possible, however, for the metal frame of a unit to be one section of ***its*** transmission system. For example, the metal chassis of many electrical devices are used to conduct current. Similarly, the body of a car is part of its electrical transmission system.

The control regulates the current flow in the circuit. It may control the current by limiting it, as does a rheostat, or by interrupting it, as does a switch.

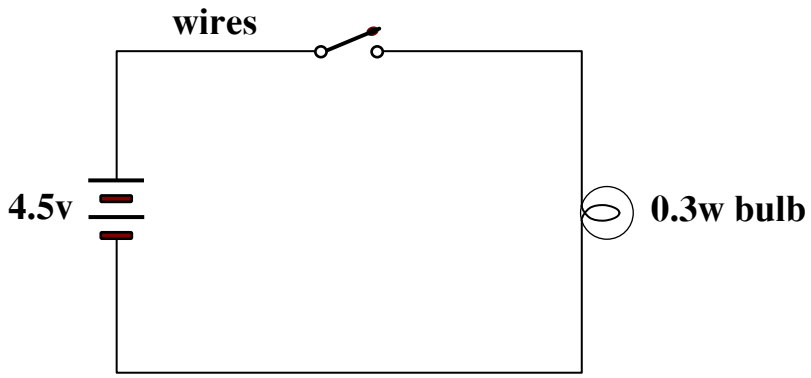


FIGURE 2.1: Torch body

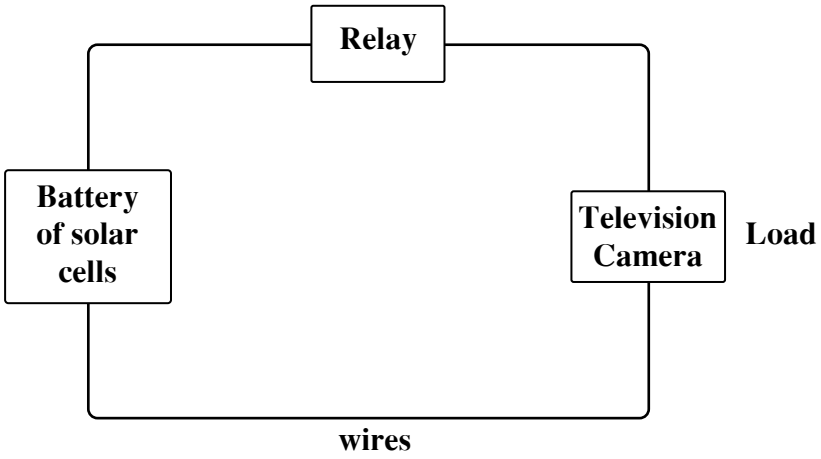


FIGURE 2.2: Transmission system

Study Fig. 2.1. In this simple flashlight circuit, the source comprises three 1.5V cells in series. The load is a 0.3 W bulb. Part of the transmission system is the metal body of the flashlight, and the control is a sliding switch.

Compare Fig. 2.2. The function of this circuit is to operate a television camera aboard a space satellite. Here the source is a battery of solar cells. A solar cell is an electric cell which converts sunlight into electrical energy. The load is the television camera. The transmission system is the connecting wires. The control is a relay actuated by transmissions from ground control. Although the function of this circuit is much more complex than that of the flashlight, ***it*** too consists of the four basic elements.

2.1. READING COMPREHENSION

EXERCISE 1 ***Answer the questions***

1. What is an electric circuit?
2. How many elements does a circuit contain? What are they?
3. How does the load convert the electrical energy?
4. What is a solar cell?

EXERCISE 2 ***What do the pronouns in italics in these sentences refer to?***

1. Current moves from a point of high potential energy to *one* of low potential. *(line 1+2)*

A. current B. energy C. a point

2. For example, *it* may be a generator or a battery *(line* 7+8)

A. the source B. a device C. electromotive force

3. It is often possible, however, for the metal frame of a unit to be one section of *its* transmission system. *(line 14+15)*

A. the metal frame's B. the unit's C. the circuit's

4. Although the function of this circuit is much more complex than that of the flashlight, *it* too consists of the four basic elements. *(line 28+29)*

A. the satellite circuit B. the function C. the flashlight

EXERCISE 3 ***Decide if these statements are True (T) or False (F)***

1. A difference in potential is required before current can flow in a circuit.
2. A generator is a source of electromotive force.
3. Loads convert electrical energy into light and heat
4. Transmission systems must consist of wires.
5. A rheostat may be used as a control.
6. The load in the flashlight circuit is a bulb.
7. The source in the satellite circuit is a solar cell.
8. The current flow in the satellite circuit is regulated by a relay.
9. The flashlight circuit differs basically from the satellite circuit.

EXERCISE 4 ***Rewrite the following sentences, replacing the words in italics with expressions from the passage which have a similar meaning***

1. A lamp *converts* electrical energy into light.
2. The generator *provides* the circuit with electromotive force.
3. The metal *frame* of the oscilloscope is part of its transmission system.
4. The rheostat *controls* the current flow in the circuit.
5. A battery of solar cells *supplies* power to the circuit.

2.2. USE OF LANGUAGE

2.2.1. Describing function

When we answer the question " What does X do?" , we describe the function of X.

We can use the following structures:

- *S + V + O*

Example:

What does a fuse do? It protects a circuit.

- *The function of + N +is + to V*

Example:

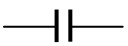
The function of a fuse is to protect a circuit.

EXERCISE ***Match a component in column A with a function in column B and write complete sentences using the patterns to describe the function***

Column A

1) 

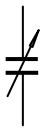
Resistor

2) 

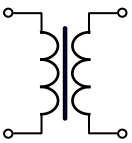
Capacitor

3) 

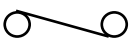
Variable resistor

4) 

Variable capacitor

5) 

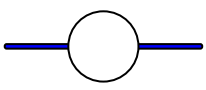
Transformer

6) 

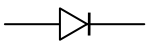
Fuse

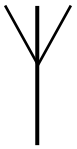
7) 

Switch

8) 

Milliammeter

9)  Diode

10)  Antenna

Column B

(a) adds capacitance to a circuit
(b) rectifies alternating currents
(c) adds resistance to a circuit
(d) measures very small currents
(e) breaks a circuit
(f) protects a circuit
(g) varies the current in a circuit
(h) transforms ac voltages
(i) receives rf signals
(j) selects a frequency

For example: 1-c: A resistor adds resistance to a circuit

2.2.2. Describing purpose

When we answer the question " What is Xfor?" , we describe the purpose of X.

We can use the following structure:

- *It is used for + Ving*

Example:

What is an ammeter for? It is for measuring current.

- *It is used + to V*

Example:

It is used to measure current.

- *S + V + with + N*

Example:

We measure current with an ammeter.

- *S + V +O + Ving + N*

Example:

We measure current using an ammeter.

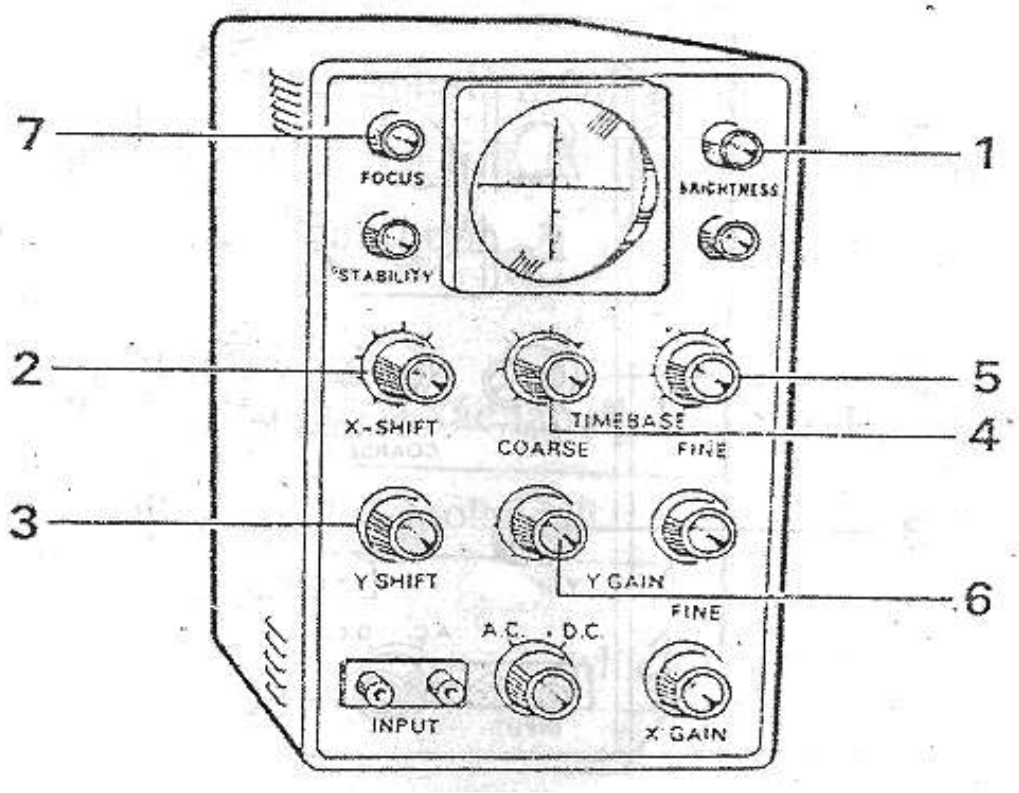
EXERCISE 1 ***Match an instrument or a tool in column A with a purpose in column B and write complex sentences using any of the structures to describe purpose***

	Column A	Column B
1.	a voltmeter	a. measure very small current
2.	a soldering iron	b. cut wires
3.	a milliammeter	c. reduce heat
4.	an oscilloscope	d. measure resistance
5.	a heat sink	e. show variations in an electric current
6.	wire – clippers	f. generate signals
7.	a megohmmeter	g. measure voltage
8.	an ohmmeter	h. charge batteries
9.	a signal generator	i. solder connections
10.	a battery charger	j. measure very high resistance

For example: 1 – g: A voltmeter is used to measure voltage.

EXERCISE 2 ***Describing means***

Study this diagram. It shows the controls of an oscilloscope. Some of them have been numbered.



Study this information about the focus control:

Control	Function	Means
7 FOCUS	Focuses the electron lens	Varies the potential on anode $_{2-}$

Using this information, we can answer three questions:

1. What does the focus control do?
2. What is the focus control for?
3. How does the focus control work?

Question 1 is about function. As you have seen, we can answer it like this:

The focus control focuses the electron lens.

Question 2 is about purpose. We can answer it like this:

The focus control is for focusing the electron lens.

Question 3 is about means. It asks for an explanation of how the focus control works. We can answer it in this way:

The focus control focuses the electron lens by varying the potential on anode$_{2-}$

Or we can say:

The focus control varies the potential on anode $_{2-}$, there by focusing the electron lens.

Now ask and answer questions about the function, purpose and means of operation of the controls listed in this table.

	Control	Function	Means
1	FOCUS	Focus the electric lens	Alters the biasing of the X amplifier
2	BRIGHTNESS	Varies the intensity of the beam	Varies a resistor in the timebase oscillator
3	X SHIFT	Moves the trace along the X axis	Alters the gain of the Y amplifier
4	Y SHIFT	Moves the trace along the Y axis	Alters the biasing of the Y amplifier
5	COARSE FREQUENCY	Selects the approximate time base frequency	Varies the potential on anode
6	FINE FREQUENCY	Adjust the timebase frequency	Varies the negative potential on the grid
7	Y GAIN	Control the signal amplification	Selects a capacitor in the timebase oscillator.

1. What does…….. do?
2. How does……. work?
3. What is……. for?

2.2.3. Qualification (however, but, although)

Study these sentences:

1. All metals are conductors.
2. Some metals do not conduct well.

Sentences 2 qualifies sentence 1. We can link a statement and a qualification using *however, but* or *although*.

Examples

1. All metals are conductors; **however** some metals do not conduct well.
2. All metals are conductors **but** some do not conduct well.
3. **Although** all metals are conductors, some do not conduct well.

EXERCISE 1 ***Link each of the statements in the left-hand column with a suitable qualification (however, but, although) and statements from the right – hand column.***

Example: (1 – c) → The unit of capacitance is the farad**; however**, capitance is usually measured in microfarads or picofarads.

1. The unit of capacitance is the farad.	a. Valves are still used in large transmitters
2. In an ideal transformer there would be no loss.	b. For professional work a tolerance of 1 or 2% is required
3. Moving – iron meters can measure a voltages without a rectifier	c. Capitance is usually measured in microfarads or picofarads
4. Resistors usually have a tolerance of or 10%	d. In practice there is always some loss
5. Semiconductors have replaced valves in most applications	e. Moving – coil meters with rectifiers are preferred

EXERCISE 2 ***Qualification***

When we qualify a statement, it is common to give a reason for the qualification.

Example:

Mica is an excellent dielectric. *Statement*

It is not used for making large capacitors. *Qualification*

The cost would be excessive *Reason*

→ Mica is an excellent dielectric but it is not used for making large capacitors because the cost would be excessive.

Match the complete sentences in EXERCISE 1 with one of the sentence in this exercise and write full sentences using "because, because of"

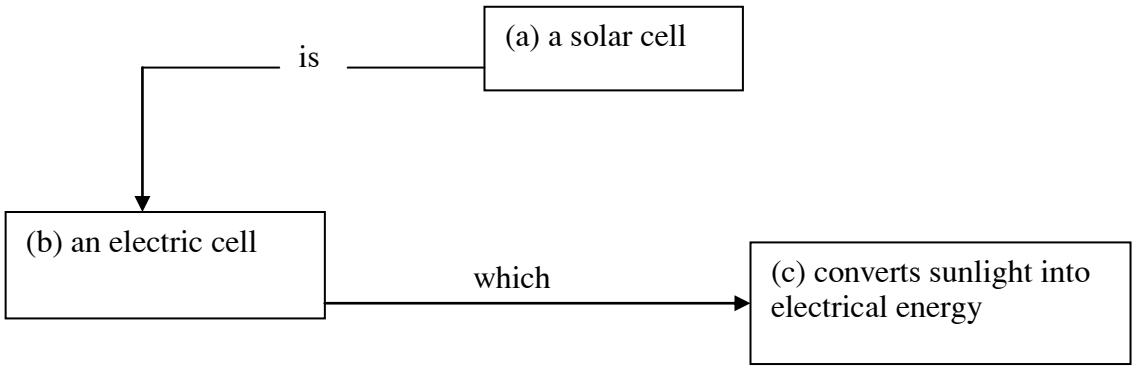
Example: (1 – c – 2) → The unit of capacitance is the farad**; however**, capitance is usually measured in microfarads or picofarads **because** the farad is too large a unit

1. the resistance of the windings
2. the farad is too large a unit
3. higher standards of accuracy are needed
4. the very high powers required
5. they do not absorb so much power from the circuit

2.3. WRITING

EXERCISE 1

One use of defining relative clause is to make definitions. Study this diagram:



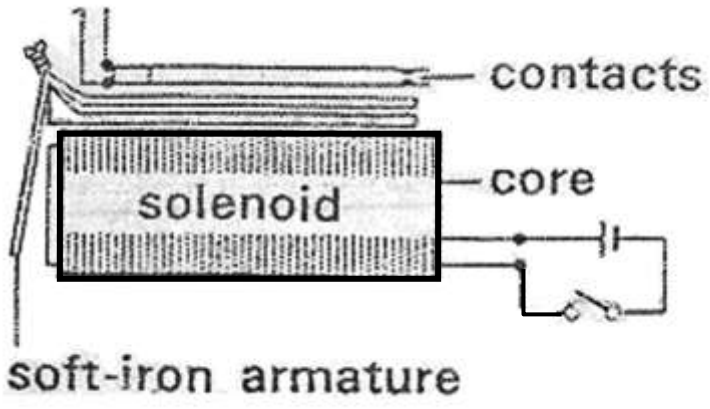
We can make a definition of a solar cell by joining (a), (b) and (c)

A solar cell is an electric cell which converts sunlight into electrical energy.

a)	b)	c)
A generator	A material	Measures light
An insulator		Readily releases electrons
An alternating current	An instrument	Flows first in one direction, then in the other
A direct current		Does not readily release electrons
A resistor	A current	Impedes the flow of current in a circuit
A conductor		Measures current
A light meter	A device	Converts mechanical energy into electrical energy
An ammeter		Flows in one direction only

EXERCISE 2 ***Relative clauses : Adding information to a passage***

Use non- defining relative clauses to add extra information to this paragraph about a relay. This extra information is given below the paragraph.



Electric relays (1) ……. utilize the magnetic effect of a current in a solenoid. One of the most common types (2) ….. consists of a solenoid with a soft-iron core. When energized by a suitable Dc current, the solenoid attracts an armature (3) …….. The armature is pivoted in such a way that it pushes together or pulls

apart a set of contacts (4) ….. These contacts (5) ….. control one or more circuits. Normally these circuits draw a much heavier current than the relay coil itself.

1. Electric relays are widely used in telecommunications.
2. The most common type of relay is known as the hinged armature relay.
3. The armature is also made of soft iron.
4. The sets of contacts are mounted on the body of the relay.
5. The contacts are often made of platinum.

Example: 1. which are widely used in telecommunications

EXERCISE 3 ***Join the following groups of sentences to make ten longer sentences. Use the words printed in italics above each group. You may omit words and make whatever changes you think are necessary in the word order and punctuation of the sentences***

1. Which

A resistor is a device.

A resistor is used to add resistance to a circuit.

2. both

Many types of resistors are made.

Fixed and variable resistors are made.

3. either…or…

Most resistors are made from two materials.

Resistance wire and compressed graphite are used.

4. such as, which

Wire sound resistors consist of a coil of resistance wire.

Nichrome is a resistance wire.

The resistance wire is wound on a former.

5. to

A ceramic coating is applied over the winding.

The ceramic coating insulates the winding.

6. for example

For small currents, carbon resistors are used.

Small currents are usual in radio work.

7. which

Carbon resistors are made of compressed graphite.

The graphite is formed into small tubes.

8. which

Connections are made with wires.

The wires are attached to the end of the resistor.

9. either…or…

Variable resistors may have a coil of resistance wire.

Variable resistors may have a carbon track.

10. so that

The wire or track is mounted.

A sliding contact can rub over it to select the resistance required.

2.4. FURTHER READING

EXERCISE 1 *Comprehension*

Study this passage carefully and answer the questions which follow:

MAGNETOHYDRODYNAMIC (MHD) GENERATION

In conventional power generation, fuel such as oil or coal is burned. The burning fuel heats boilers to produce steam. The steam is used to drive turbo- alternators. The MHD process generates electricity without requiring a boiler or a turbine.

MHD generation works on the principle that when a conductor cuts a magnetic field, a current flows through the conductor. In MHD generation the conductor is an ionized gas. Small amounts of metal are added to the gas to improve its conductivity. This is called seeding the gas. The seeded gas is then pumped at a

high temperature and pressure through a strong magnetic field. The electrons in the gas are collected at an electrode. This movement of electrons constitutes a current flow.

Two methods of MHD generation can be used: the open-cycle and the closed-cycle. In the open-cycle method the hot gas is discharged. In the closed-cycle method it is recirculated.

The open-cycle method uses gas from burning coal or oil. The gas is seeded and then passed through a magnetic field to generate current. The seeding elements are recovered and the gas can then be used to drive a turbine before being allowed to escape.

The closed-cycle method uses an inert gas, such as helium, which is heated indirectly. The gas is circulated continually through the MHD generator.

MHD generation is still in its early stages but already an efficiency rate of 60% has been reached. This compares with a maximum of 40% from conventional power stations.

1. How does the MHD process differ from conventional systems?
2. What principle does MHD generation make use of?
3. What form does the conductor take in the MHD process?
4. What happens to the gas?
5. What methods of MHD generation are in use?
6. How do the two methods differ?
7. How does the efficiency of this process compare with conventional system?

EXERCISE 2 ***Summarizing***

Complete this summary of the passage using your answers to Exercise 1:

Unlike conventional power generation, the MHD process does not require (1)…….

It operates on the principle that (2)…….

The conductor is an ionized gas seeded with (3)…….

It is pumped at a high temperature and pressure (4)……

Two methods can be used: (5)…….

In the open-cycle method gas from oil or coal is passed through a magnetic field and then used to drive a turbine before (6)…….., whereas in the closed-cycle method (7)……

The MHD process has an efficiency rate of (8)……. compared with (9)…….. for conventional stations.

2.5. VOCABULARY

Actuate (v)	Khởi động, kích thích hoat động
Adjust (v)	Điều chỉnh
Alter (v)	Biến đổi, thay đổi
Ammeter (n)	Ampe kế
Amplification (n)	Sự khuếch đại
Anode (n)	Anốt, cực +
Axis (n)	Trục
Basic (adj)	Cơ bản
Beam (n)	Chùm tia (điện tử)
Biasing (n).	Độ dốc, độ nghiêng, độ tr- ợt
Brightness (n)	Độ sáng
Capacitance (n)	Điện dung
Capacitor (n)	Tụ
Carbon resistor (n)	Điện trở cacbon
Carbon track (n)	Sự tạo vết các bon, vệt than
Cathode (n)	Catốt, cực –
Ceramic (adj)	Sứ
Ceramic coating (ri)	Lớp, cụm bọc sứ
Change (v)	Thay đổi
Chassis (n)	Khung
Coarse frequency (n)	Chỉnh thô tần số
Complex (adj)	Phức tạp
Compressed graphite (n)	Graphít nén, than ép
Comprise (v)	Gồm, chứa đựng
Connecting wire (n)	Dây nối
Convert (v)	Chuyển đổi thành, biến thành
Current source (n)	Nguồn dòng điện
Direction (n)	H- ớng, ph- ơng h- ớng
Electric circuit (n)	Mạch điện

Electric component (n)	Linh kiện điện
Electrical energy (n)	Điện năng
Electromotive force (n)	Sức điện động
Electron beam (n)	Chùm điện tử, tia điện tử
Electron lens (n)	Thấu kính electron
Element (n)	Thành phần, thành tố
Energy source (n)	Nguồn năng l- ợng
Establish (v)	Lập thành, tạo thành
Fine frequency (n)	Tinh chỉnh tần số
Fixed resistor (n)	điện trở cố định
Flashlight (n)	Đèn chớp, đèn nháy
Flashlight circuit (n)	Mạch nháy chớp
Focus (n)	Tiêu điểm
follow (v)	Theo
Force (n)	Lực
Form (n)	Dạng, hình dạng, kiểu
Former (n)	Khuôn
Frame (n)	Khung
Function (n)	Chức năng
Gain (n)	Hệ số khuyếch đại
Generate (v)	Phát điện
Generator (n)	Máy phát
Grid (n)	L- ới, mạng l- ới
Ground control (n)	Tiếp đất
Ideal transformer (n)	Máy biến áp lý t- ởng
In practice (n)	Thực tế
Intensity (n)	C- ờng độ
Interrupt (v)	Ngắt, làm gián đoạn
Lamp (n)	Đèn bàn
Lens (n)	Thấu kính

Light (n)	ánh sáng
Light meter (n)	Đồng hồ đo ánh sáng
Limit (v)	Hạn chế, ngăn chặn
Load (n), (v)	Phụ tải
Loss (n)	Tổn hao, tổn thất
Means (n)	Ph- ơng tiện, ý nghĩa
Mechanical energy (n)	Cơ năng
Meter (n)	Đồng hồ đo
Metal oxide semiconductor (n)	Chất bán dẫn kim loại ô xít
Moving-iron meter (n)	Thiết bị đo kiểu
Nichrome (n)	Hợp chất nicken
Operate (v)	Vận hành, hoạt động
Oscillator (n)	Máy dao động sóng
Point (n)	Điểm
Possible (adj)	Có thể
Potential (adj)	Thuộc điện thế
Potential energy (n)	Điện thế
Professional (adj)	Thuộc chuyên môn
Professiona1 work (n)	Công việc chuyên môn
Resistance ratio (n)	Tỷ lệ điện trở
Regulate (v)	Điều chỉnh
Relay (n)	Rơ le
Rheostat (n)	Biến trở
Satellite (n)	Vệ tinh
Select (v)	Chọn lựa, chọn
Selection (n)	Sự lựa chọn
Shift (n)	Nút
Signal (n)	Tín hiệu
Sliding switch (n)	Cầu dao tr- ợt
Solar cell (n)	Pin mặt trời

Source (n)	Nguồn
Space satellite (n)	Vệ tinh không gian
Sunlight (n)	ánh sáng mặt trời
Switch (n)	Công tắc
Television camera (n)	Máy quay hình
Time base frequency (n)	Tần số quét
Timebase oscillator (n)	Máy tạo quét
Tolerance (n)	Dung sai, sai số
Trace (n)	Vệt
Track (n)	Vệt, vết, rãnh
Transmission (n)	Sự truyền tải
Transmission system (n)	Hệ thống truyền tải
Transmit (v)	Truyền tải
Transmitter (n)	Bộ truyền, máy truyền
Type (n)	Loại, kiểu loại
Valve (n)	Van, đèn điện tử
Variable resistor (n)	Biến trở
Voltage source (n)	Nguồn điện áp
Wirewound resistor (n)	Điện trở dây quấn

UNIT 3: THE DC MOTOR

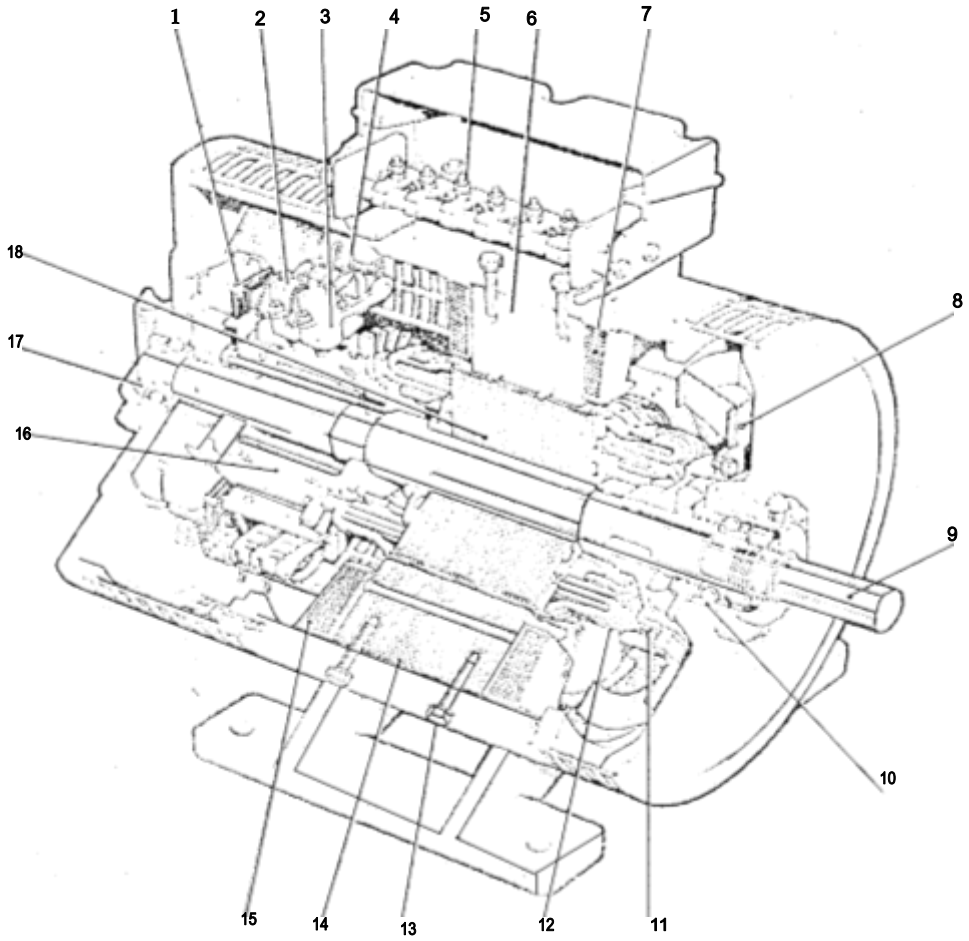
An electric motor is a machine for converting electrical energy into mechanical energy. Motors can be designed to run on direct (DC) or alternating current (AC). Its most important parts are the rotor, the stator and the brush gear.

The rotor is the moving part. It contains an armature, which is a set of wire loops wound on a steel core. When current is fed to the armature, these windings produce a magnetic field. The armature and core are mounted on a shaft which runs on bearings. It ***provides*** a means of transmitting power from the motor.

The rotor also contains a commutator. This consists of a number of copper segments insulated from one another. The armature windings are connected to these ***segments***. Carbon brushes are held in contact with the commutator by springs. These brushes allow current to pass to the armature windings. As the rotor turns, the commutator acts as a switch making the currents in the armature ***alternate***.

The stator does not move. It consists of magnetic and electrical conductors. The magnetic circuit is made up of the frames and the poles. Wound round the poles are the field coils. These form of the stator's electrical circuit. When current is fed to them, a magnetic field is set up in the stator.

The motor operates on the principle that when a current-carrying conductor is placed in a magnetic field, a force is produced on the conductor. The ***interaction*** of the forces produced by the magnetic field of the rotor and the stator makes the rotor spin.



1. brush bar
2. brushes
3. brush holder
4. brush pressure
5. terminals (main)
6. interpole
7. interpole coil winding
8. fan
9. driving shaft
10. driving end bearing
11. fan hub
12. armature coils (commutator winding)
13. main pole bolt
14. main pole
15. main pole coil winding
16. commutator segments
17. commutator end bearing
18. armature core

FIGURE 3.1: DC Motor

3.1. READING COMPREHENSION

EXERCISE 1 ***Answer the questions***

1. What is an electric motor used for?
2. What are the most important parts of a motor?
3. What does a rotor contain? What are the features of these parts?
4. What does a stator consist of? What are the features of these parts?
5. What is the main difference between a rotor and a stator?
6. What is the operation principle of a motor?

EXERCISE 2 ***Choose the word with the closest meaning to the italic word***

1. *provides* (line 7)

A. produces

B. supplies

C. allows

2. *segments* (line 10)

A. sections

B. pieces

C. wires

3. *alternate* (line 13)

A. reverse

B. change

C. flow in one direction then in another

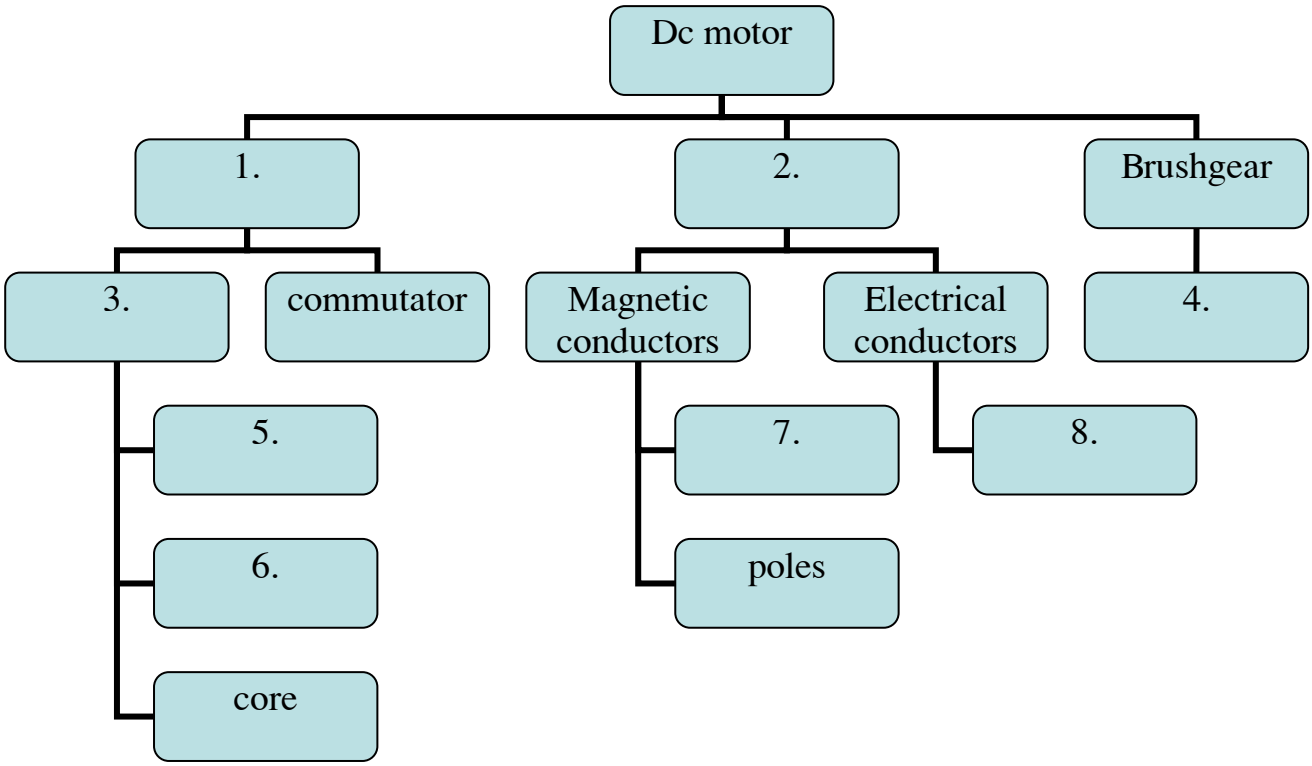
4. *interaction* (line 20)

A. acting together

B. operation

C. result

EXERCISE 3 ***Basing on the above passage, complete the following diagram***



3.2. USE OF LANGUAGE

3.2.1. Describing the parts

The following verbs can be used to break down a piece of equipment into its component parts. Note how they are used.

- "to consist of, to comprise, to be composed of, to be made up of" are used to show that there are only part B and part C in the device A.
- "to contain, to include" are used to show that there are not only part B and part C in the device A, but there are also other parts.

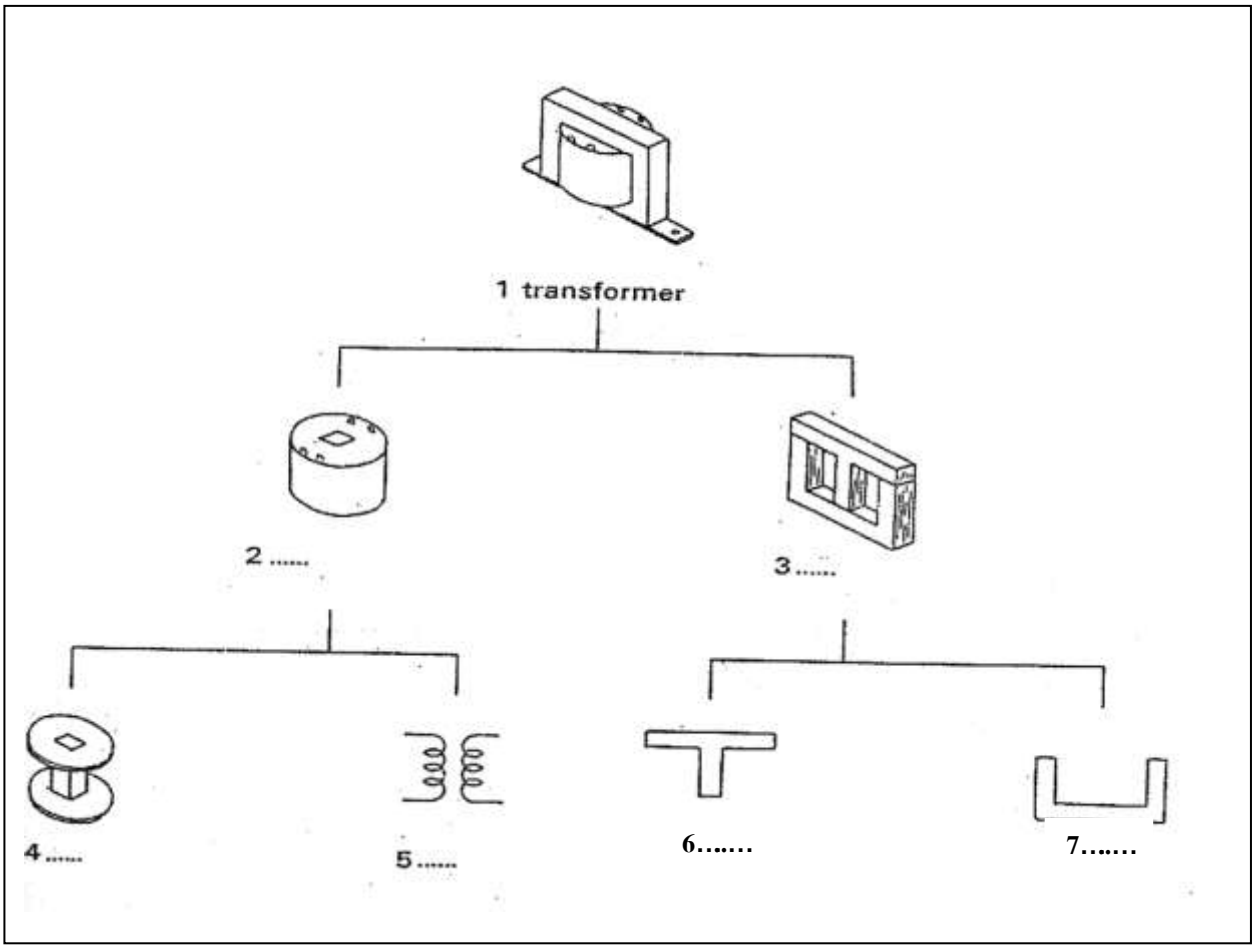
Example:

- A variable wirewound resistor **consists of** tags, a sliding contact, a rotating shaft and a wirewound track.
- A lamp circuit **contains** a source and a lamp.

EXERCISE 1 ***According to the following passage, complete the diagram***

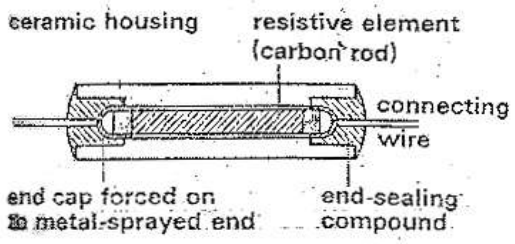
TRANSFORMER

A simple transformer consists of two coils, a primary and a secondary, wound on a former which is mounted on a soft-iron core. The coils are made up of a number of turns of insulated wire: The core is composed of thin laminations. Either E- and I- or U- and T-shaped laminations are used. The former is mounted on the centre limb of the E or T.

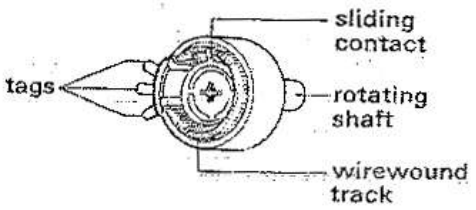


EXERCISE 2 D*escribing the parts*

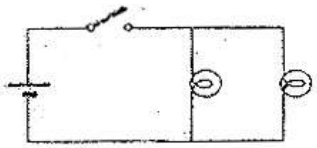
Describe the parts of the following devices using diagrams.



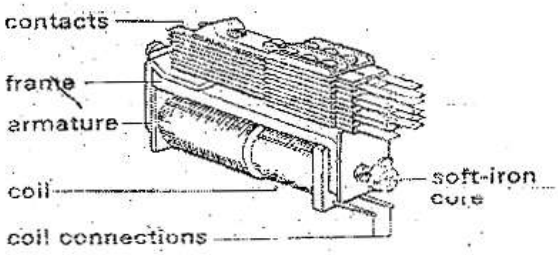
1. a carbon resistor



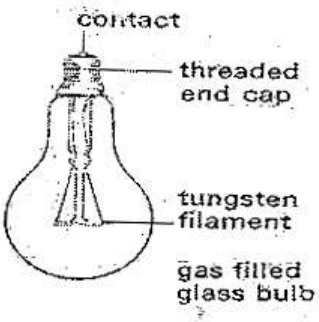
2. a variable wirewound resistor



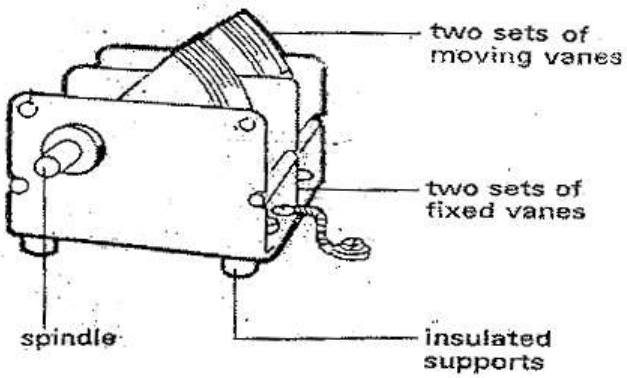
3 a lamp circuit



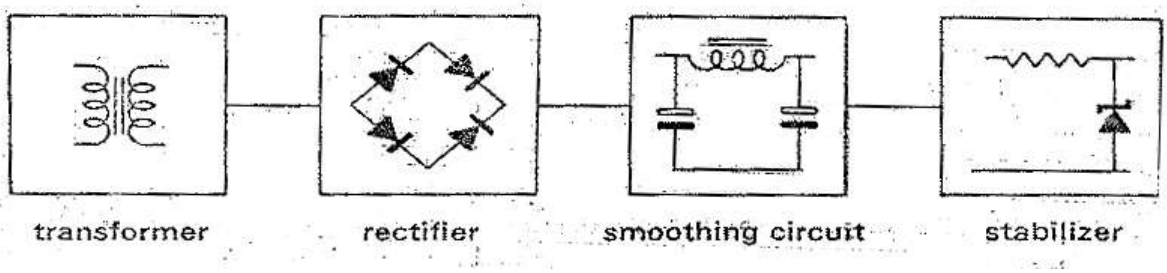
4. a relay



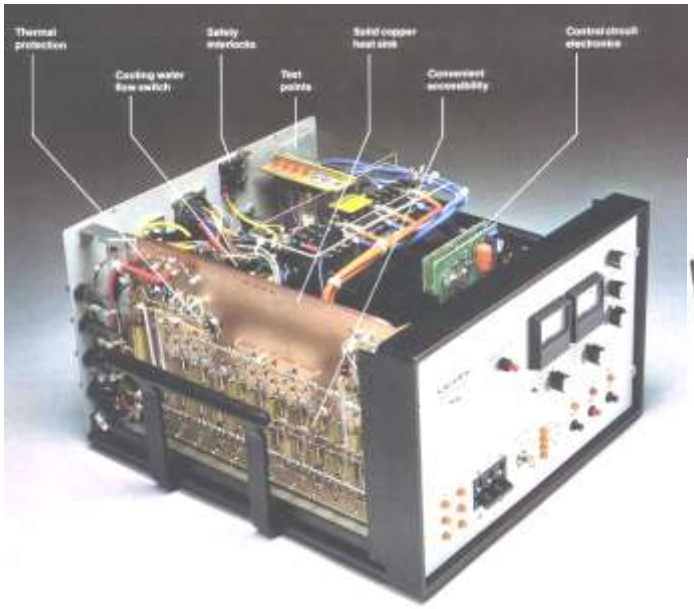
5. a filament bulb



6. a variable capacitor



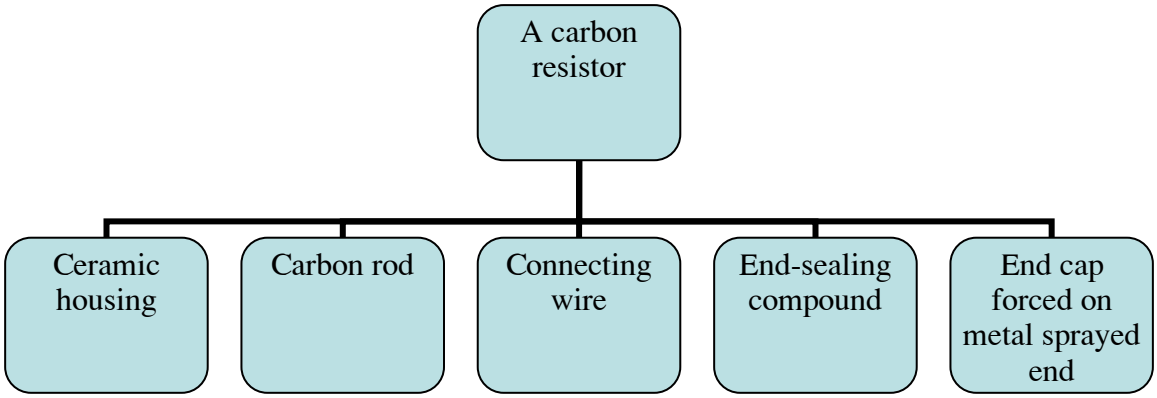
7. A power supply



8. A choke

Example:

1.



3.2.2. Expressing an advice and an emphasis

We can use the following structures:

- "should + be + Ved" to express an advice
- "must + be + Ved" to express an emphasis

Read the following directions

1. Use a high-resistance voltmeter.

2. Do not insert a fuse in an earth conductor

They can be transformed into: "should + be + Ved" to express an advice:

1. A high-resistance voltmeter should be used.
2. A fuse should not be inserted in an earth conductor.

They can also be transformed into: "must + be + Ved" to express an emphasis:

1. A high-resistance voltmeter must be used.
2. A fuse must not be inserted in an earth conductor.

EXERCISE ***Read the following directions and transform them into "should be Ved" or "must be Ved"***

1. Use heat shunts when soldering.

Example:

- Heat shunts should be used when soldering.
- Heat shunts must be used when soldering.

2. Do not connect or disconnect transistors with the power on.
3. Do not use an ohmmeter for checking transistors unless a safe voltage or current range is used.
4. Keep sharp bends in the leads at least 1-5 mm away from the transistor body.
5. Do not exceed the reverse breakdown voltage.

3.2.3. Relative clause with prepositions

When there is a preposition in the relative clause it is obliged to keep the preposition at a right preposition. We can put the preposition at its original position or put it before relative pronoun.

Read the following sentences

1. The resistor has a value of 33000 ohms.
2. The capacitor is connected across the resistor.

These are the ways to link the two sentences using relative clause:

1+2: The resistor **which the capacitor is connected across** has a value of 33000 ohms. (The preposition "across" is kept in its original position, after the verb "connected")

Or 1+2: The resistor **across which the capacitor is connected** has a value of 33000 ohms. (The preposition 'across' must be kept in the relative clause and it is put before the relative pronoun 'which')

EXERCISE ***Link the following sentences using relative clauses***

1. The range is 0-1000 volts.

The meter can operate over the range.

Example: The range is 0-1000 volts **over which** the meter can operate.

2. A battery is a device.

The device changes chemical energy into electrical energy.

3. Power supplies are used to drive DC motors.

The power supplies use thyristor rectifiers.

4. The capacitor has a value of 27pF.

The signal is passed through the capacitor.

5. The telephone is a device.

The device uses the magnetic effect of a current.

6. The receiver can only be used with headphones.

The headphones have a high impedence.

7. The plates are known as X and Y plates.

The beam passes between the plates.

8. The rotor contains a commutator.

The commutator acts as a switch.

3.2.4. Linking words of cause and result

- Statement + reason: since, as, for the reason that
- Statement + result: hence, consequently, for this reason

If linking words consist of more than one syllable, use comma before them.

Example:

- Dc motors are used for cranes, for the reason that their speed can be finely controlled.

- The current rose above the maximum. Consequently the circuit breaker opened.
- Copper is often used for cables since it is a good conductor.

EXERCISE ***Link the following sentences using linking words (because, since, as, but, for this reason, for the reason that, hence, consequently…)***

1. Conventional current flow is from positive to negative.

In fact electrons flow from negative to positive.

Example: Conventional current flow is from positive to negative, because in fact electrons flow from negative to positive.

2. Alternators are preferred to dynamos for cars.

Alternators give higher outputs at low speeds.

3. Dirt and dust reduce effective light.

Lamps must be kept clean.

4. Squirrel cage motors are simple, cheap and strong.

Squirrel cage motors are used for many general duties.

5. It is convenient to describe magnetic lines of force.

In reality magnetic lines of force do not exist.

6. Transistorized equipment is easily portable.

Transistors can operate from battery voltages.

7. Ultrasonic welding is better than heat welding.

The materials are not distorted.

8. Watchmakers work with very small parts.

Watchmakers require a lot of light.

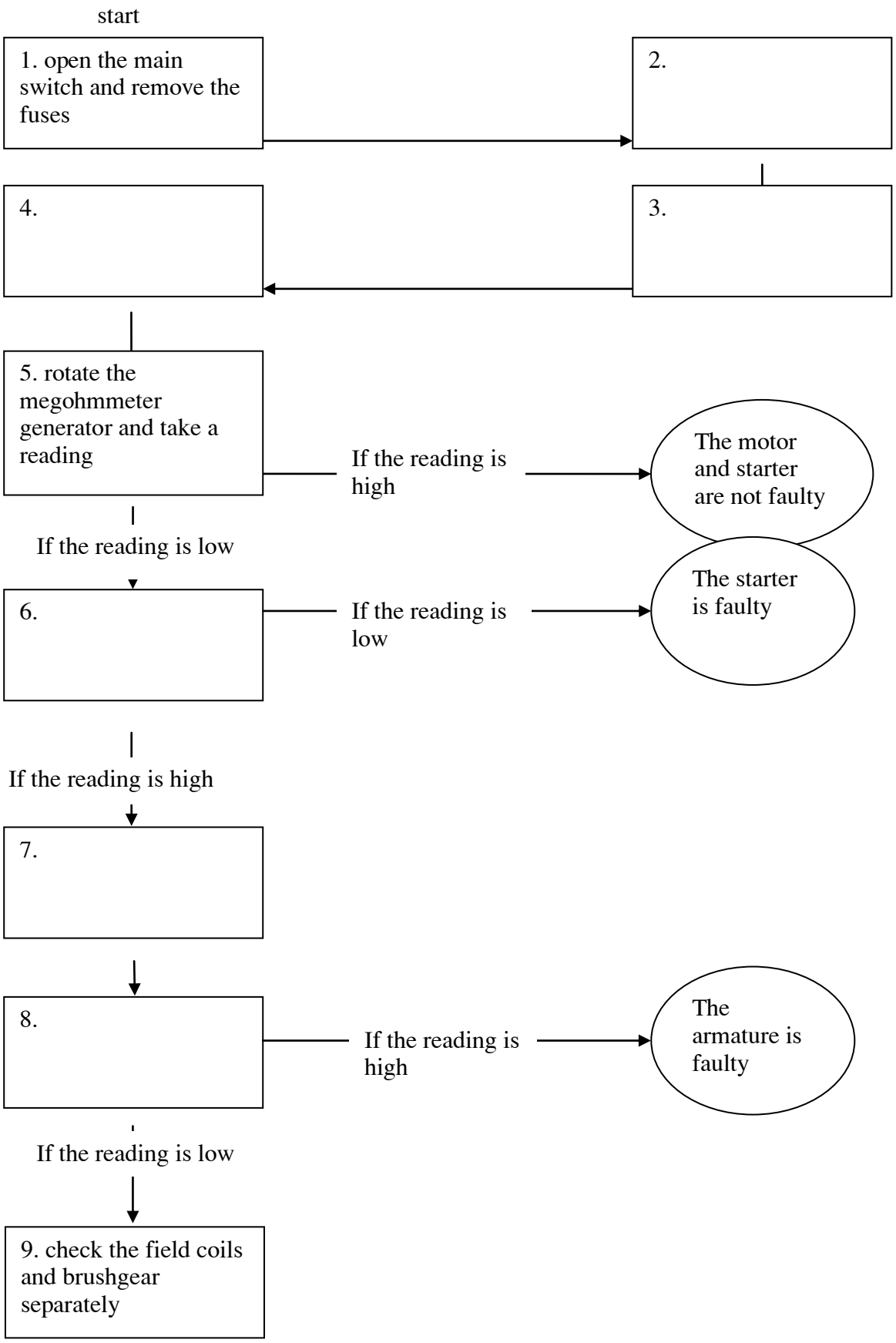
3.3. WRITING

EXERCISE 1 ***Read the following passage and complete the diagram.***

TESTING A DC MOTOR

The supply should be disconnected by opening the main switch and removing the fuses. Both starter input terminals are joined together and connected to one terminal of the megohmmeter. The other lead of the megohmmeter is connected to the motor frame. The megohmeter generator should be rotated at about 160 rpm and a reading taken.

If the resistance is found to be low, then the starter should be isolated and the test repeated on the starter alone. If the resistance is still low, then the starter coils should be checked individually until the fault is located. If the resistance of the starter is high, then the fault must lie in the motor and not in the starter. The brushes should be lifted off the commutator and the field windings and brushgear tested. If the resistance is satisfactory, then the armature only should be tested. If the resistance is low, then the field windings and brushgear should be tested separately until the fault is located.


start
1. open the main switch and remove the fuses
2.
3.
4.
5. rotate the megohmmeter generator and take a reading
If the reading is high
The motor and starter are not faulty
If the reading is low
6.
If the reading is low
The starter is faulty
If the reading is high
7.
8.
If the reading is high
The armature is faulty
If the reading is low
9. check the field coils and brushgear separately

EXERCISE 2 ***Link the following sentences. You can add, remove words, change the word position or use punctuations if necessary***

1. A zinc case is used as a container for the cell.

The zinc case is used as the negative electrode.

Example: A zinc case is used as both a container for the cell and the negative electrode.

2. A carbon rod forms the positive electrode.

The carbon rod is in the centre of the cell.

3. The space between the zinc case and the carbon rod is filled with a paste of ammonium chloride.

The paste also is used as an electrolyte.

4. The electrolyte is a paste and not a liquid.

This type of cell is called a dry cell.

5. The paste also contains manganese dioxide.

The manganese dioxide prevents gas being formed.

6. The cell is sealed with a cap.

The cap is made of metal or plastic.

The cap is to prevent the paste coming out.

7. A small space is left below the cap.

Gas formed by the cell can collect in the space.

8. Dry cells are usually enclosed in a cardboard case.

An additional metal jacket may be added.

The jacket makes the cell leakproof.

9. Leakproof cells are often prefered.

The electrolyte cannot leak out.

The cell ages.

10. Leaking electrolyte may damage the equipment.

The cells are installed in the equipment.

3.4. FURTHER READING

EXERCISE 1 *Guess the meaning*

Read the title and the first sentence of each paragraph and decide what the passage is about.

THE EFFECTS OF AN ELECTRIC CURRENT

The effects of an electric current are thermal, luminous, chemical and magnetic. When a current flows through a conductor it may heat the conductor. This heat is sometimes undesirable and has to be reduced. For this reason many electric motors and generators contain a fan. However, domestic appliances, such as electric cookers and many industrial processes depend on the heating effect of an electric current.

The passage of a current may produce light. This can happen in a number of ways. The heat generated by the current may be so great that the conductor becomes incandescent. For example, the filament of a light bulb emits intense white light when heated by a current. Light is also produced when a current ionizes a gas. The colour of the light will vary according to the gas used. Mercury vapour lamps give a greenish-blue light.

An electric current can separate a chemical compound into its components. This is called electrolysis. Chlorine is generated by the electrolysis of salt water. Electrolysis can also be used to break down water into hydrogen and oxygen. Because pure water does not conduct well, sulphuric acid has to be added before the electrolysis takes place.

A current flowing through a conductor creates a magnetic field around it. This field has three applications. It can magnetize magnetic materials and attract them to conductor. The electric relay works on this principle. If the magnetic field is cut by another conductor, an electromotive force will be induced in that conductor. For instance, the change in current flowing through the primary of the transformer will induce a current in the secondary. This principle is also used in generators. Thirdly, if a current - carrying conductor is placed in the magnetic field, a force will be exerted on it. This effect is utilized in the electric motor.

EXERCISE 2 ***Note-taking***

Read the above passage carefully and complete the following notes.

Effects of electric current:

- thermal
- (1)……
- (2)……
- magnetic

Heat can be

- undesirable e.g. motor
- (3) ……..e.g. cooker

Light

- from incandescent conductor e.g (4)……
- from (5)…… e.g. vapour lamp

(6) ……= breakdown of chemical compound e.g. salt water into chlorine

Current flowing in conductor (7)…….round it.

Magnetic field has 3 applications:

- (8)……..e.g relay
- induce emf in another conductor e.g (9)……..
- (10) ……..e.g motor

3.5. VOCABULARY

Application (n)	ứng dụng
Armature (n)	Cuộn ứng
Bearing (n)	ổ , vòng bi
Bolt (n)	Cái ốc
Brush (v)	Cái chổi
Commutator (n)	Cổ góp
Compound (n)	Hợp chất
Depend (v)	Phụ thuộc vào
Domestic appliance (n)	Điện gia dụng
Effect (n)	Tác dụng
Electrolysis (n)	Điện phân
Exert (v)	Tác dụng
Fault (n)	Lỗi
Feed (v) (fed - fed)	Nạp
Fuse (n)	Cầu chì
Heat (n)	Làm nóng
Incandescent (adj)	Chói sáng
Induce (v)	Cảm ứng
Intense (adj)	Cực mạnh
Interaction (n)	T- ơng tác
Ionize (v)	Ion hoá
Lie(v)	Nằm
Locate(v)	Định vị
Loop (n)	Vòng
Megohmmeter (n)	Mê ôm kế
Mercury (n)	Thuỷ ngân
Pole (n)	Cực
Principle (n)	Nguyên tắc
Relay (n)	Rơ le

Segment (n)	Séc măng, thanh
Shaft (n)	Trục
Spring (n)	Lò xo
Starter (n)	Bộ khởi động
Switch (n)	Công tắc
Terminal (n)	Cổng
Utilize (v)	Sử dụng
Vary (v)	Thay đổi
Winding (n)	Cuộn dây

UNIT 4: THE CATHODE RAY TUBE

The cathode ray tube (crt) is used in oscilloscopes, radar receivers and television sets. The type described here is that used in oscilloscopes. By means of a crt, an oscilloscope not only shows the size of a signal, but also how the signal varies with time. In other words it shows the waveform of the signal.

The crt operates as follows. First electrons are ***emitted*** from a heated cathode. Then these electrons are formed accelerated to give them velocity. Next they are formed into a beam which can be ***deflected*** vertically and horizontally. Finally, they are made to strike a screen coated on its inner surface with a phosphor.

The crt comprises an electron gun and deflection system enclosed in a glass tube with a phosphor coated screen. The electron gun forms the electrons into a beam. It contains a cathode which is heated to produce a stream of electrons. On the same axis as the cathode is a cylinder known as the grid. By varying the negative potential on the grid, the ***intensity*** of the beam can be varied. A system of three anodes follows. These accelerate the beam and also operate as a lens to focus the beam on the screen as a small dot. Varying the potential on the central anode, allows the focus to be ***adjusted***.

On leaving the electron gun, the beam passes through two sets of plates which are at right angles to each other. The first set of plates is the Y plates. As these are nearer the anodes, they have a greater effect on the beam. Therefore the signal is applied to this set. They control the vertical deflection of the beam. The second set is the X plates. On an oscilloscope the output from a timebase oscillator is applied across these plates as a means of moving the beam horizontally at ***regular*** intervals. Hence the horizontal axis of an oscilloscope is the time axis by means of the deflection system. Then, the beam can be made to traverse the screen both horizontally and vertically.

The final element is the phosphor-coated screen. When the electron beam strikes the screen, the phosphor coating ***fluoresces***. Various colours of light are produced depending on the phosphor used.

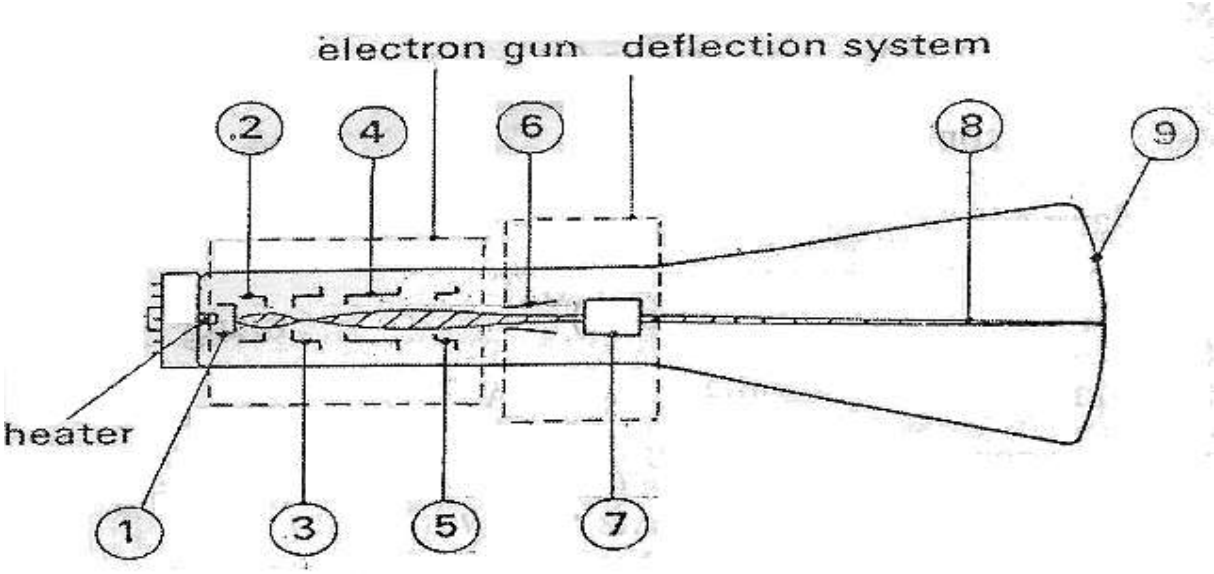


FIGURE 4.1: Cathode ray tube

4.1. READING COMPREHENSION

EXERCISE 1 ***Answer the questions***

1. Why is an oscilloscope better than a meter?
2. What is the source of electrons for the electron beam?
3. What is the function of the electron gun?
4. How is the intensity of the beam controlled?
5. In what way is the system of anodes like a lens?
6. Why is the signal applied to the Y plates?
7. What does the timebase do?
8. Why is the horizontal axis of an oscilloscope the time axis?

EXERCISE 2 ***What do the pronouns in italics in these sentences refer to?***

1. In other words *it* shows the waveform of the signal.

A. an oscilloscope B. a signal C. a cathode ray tube

2. Next, *they* are formed into a beam which can be deflected vertically and

horizontally.

A. signals B. electrons C. heated cathodes

3. *It* contains a cathode which is heated to produce a stream of electrons.

A. the crt B. a deflection system C. an electron gun

4. As these are nearer the anodes, *they* have a greater effect on the beam.

A. the Y plates B. the X plates C. the beams

EXERCISE 3 ***Check the facts and ideas. Decide if these statements are True (T) or False (F).***

1. …..The cathode ray tube shows the waveform of the signal.

2. .....Electrons are formed into a beam which can be deflected vertically and horizontally.

3. .....The electron gun contains a cathode which is heated to produce a stream of electrons.

4. ….On an oscilloscope the output from a timebase oscillator is applied across the Y plates as a means of moving the beam horiontally at regular intervals

5. ….When the electron beam strikes the screen, the phosphor coating fluoresces.

EXERCISE 4 ***Choose the word with the closest meaning to the italic word***

1. *emitted* (line 5)

A. scattered

B. given off

C. absorbed

2. *deflected* (line 7)

A. moved

B. bent

C. changed

3. *intensity* (line 14)

A. focus

B. brightness

C. shape

4. *adjusted* (line 17)

A. reduced

B. varied

C. increased

5. *regular* (line 24)

A. frequent

B. equally timed

C. varying

6. *fluoresces* (line 28)

A. lights

B. emits electrons

C. turns green

4.2. USE OF LANGUAGE

4.2.1. Writing instructions as explanations

We can use the following structures to express instructions as explanations:

- Imperative (mệnh lệnh thức) + by + Ving
- To V, + imperative

Study these instructions. They explain how to disconnect the supply to the motor in the circuit.

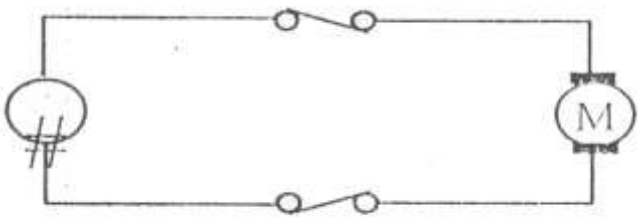


FIGURE 4.2

1. Disconnect the supply BY WITHDRAWING THE FUSES.
2. TO DISCONNECT the supply, WITHDRAW the fuses.

EXERCISE ***Describing a process***

Study these instructions for soldering a resistor into a printed circuit board (pcb):

1. Bend the leads and insert them through the correct holes in the pcb.
2. Pull the resistor flat against the board and bend back the leads.
3. Heat the first lead with a soldering iron and apply solder to the heated lead.
4. Heat and apply solder to the second lead.
5. Allow the soldered joints to cool.

6. Trim the leads using wire clippers.

Write a description of this process by rewriting each instruction in the present passive

Example;

The leads are bent and inserted though the correct holes in the pcb.

4.2.2. Describing sequence: sequence- words

To make the correct sequence of a number of events clear, we often use sequence words like these:

(a) first

(b) then

(c) next

(d) after that

(e) finally

(a) and (e) must come first and last respectively, but the others can be used in any order and can be repeated.

EXERCISE 1 ***Replace each number in your description of soldering a resistor into a pcb with a sequence word to make the order of events clear***

Example;

First the leads are bent are and inserted though the correct holes in the pcb.

EXERCISE 2 ***Describing the distribution of power***

The following diagram shows the distribution of power from the power station to the consumer. The sentences which follow it describe this distribution. Put the sentences in the correct order and mark this order using sequence words.

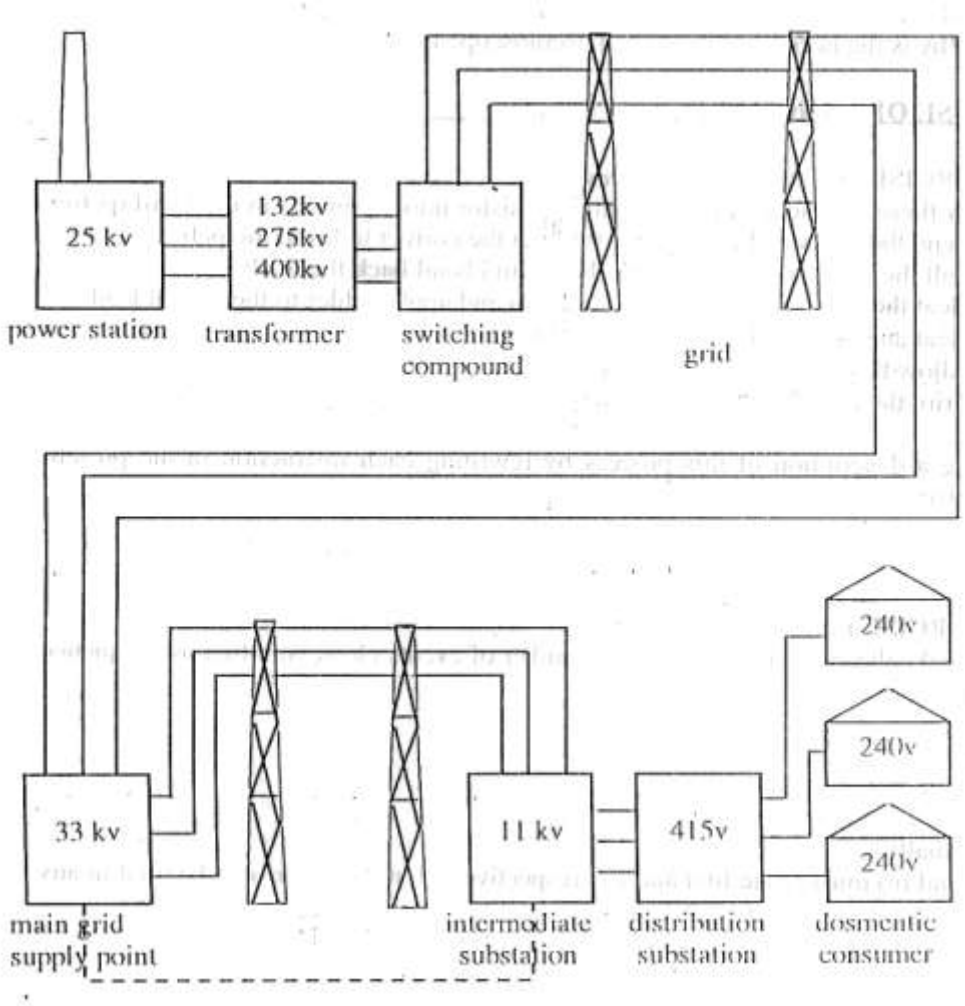


FIGURE 4.3: The distribution of power

(a) It is fed to distribution substation where it is reduced to 415V,3 phrase and 240V,1 phrase.

(b) It is stepped up by a transformer to 132, 275 or 400KV for long-distance distribution.

(c) It is distributed via the grid system to main grid supply points where it is stepped down to 33KV for distribution to heavy industry.

(d) It is distributed to the domestic consumer.

(e) In the UK, electrical energy is generated at power stations at 25KV

(f) It passes via the switching compound to the grid.

(g) It is distributed via overhead or underground cables to intermediate substations where it is further reduced to 11KV for light industry.

4.2.3. Short relative clause

1. The lines are arranged in two groups.

2. The lines carry the supply.

1 + 2. *The lines* ***which carry the supply*** *are arranges in two groups.*

Relative clauses with certain active verbs can be shortened by omitting the relative word and changing the verb to its-ing form. These verbs include:

Carry, contain, consist of, form, hold, measure…

We can shorten the relative clause like this:

The lines ***carrying*** *the supply are arranged in two groups.*

Note how these two sentences are joined by a relative clause.

3. The lines are suspended from insulators

4. The insulators are made of porcelain.

3+4. *The lines are suspended from insulators* ***which are made of porcelain****.*

Relative clauses like this with passive verbs can be shortened by omitting the relative word and the verb *to be*:

The lines are suspended from insulators ***made of porcelain****.*

EXERCISE ***Link each group of sentences into one sentence. Use short relative clause where possible***

1. In Britain electrical energy is fed to the National Grid.
   The energy is generated in power stations.
2. The energy passes through a transformer.
   The transformer steps up the voltage to 123,275 or 400kV.
3. The transmission lines are usually arranged in groups of three overhead conductors.
   The lines carry the supply.
   The overhead conductors are suspended from porcelain insulators.
4. Energy from power stations may be fed to the Grid by underground cables.
   The power stations are located in built-up areas.
5. For voltages up to 400kV cables are used.

The cables contain oil under low pressure.

4.2.4. Reinforcement connectives

Study these sentences:

1. Steel-cored aluminum is used for high-voltage lines.

2. Steel-cored aluminum lines are cheaper than copper.

Sentence 2 provides a reason for sentence 1. We can link the ideas in these sentences with *because*.

1+2. Steel-cored aluminum is used for high-voltage lines ***because*** *it is cheaper than copper.*

3. Steel-cored aluminum lines are 50% stronger than copper.

Sentence 3 provides an additional reason for Sentence 1. It reinforces sentence 2. We can link a reinforcing idea using *in addition, moreover, or furthermore.*

1+2+3. Steel-cored aluminum is used for high-voltage lines ***because*** *it is cheaper than copper.* ***In addition****, steel-cored aluminum lines are 50% stronger than copper.*

EXERCISE ***Each group of sentences which follow contains one statement and two supporting ideas. Identify them, then link them with appropriate connectives. Make sure repeated nouns are changed into pronouns.***

1. (a) Semiconductors are cheaper than valves.
   (b) Semiconductors are much smaller and lighter.
   (c) Semiconductors are used in preference to valves.

Example: Semiconductors are used in preference to valves **because** they are cheaper, smaller and lighter than valves.

2. (a) Dc motors permit powerful dynamic barking.
   (b) Dc motors are preferred for cranes.
   (c) Dc motors allow a wide range of speed variation.
3. (a) Dielectric heating is even.
   (b) Dielectric heating is faster and cheaper.

(c) Dielectric heating rather than conduction heating is used in plywood production.

4. (a) Fluorescent lamps are better than filament lamps.

(b) The light is closer to daylight.

(c) The heat from fluorescent lamp is much less than from filament lamps.

4.3. WRITING

EXERCISE 1 ***Reinforcing ideas in a passage***

Fill the spaces in this paragraph with suitable reinforcing ideas from the table.

A number of instruments can be employed to measure voltage. The moving coil multimeter is often used because it is cheap and reasonably accurate.

Moreover (1) *it is more robust and versatile*. However if the impedance of the instrument is low, the meter will draw too much current from the circuit. In addition, (2)……. The electronic voltmeter is almost ideal since the circuit is not loaded. Furthermore, (3)…… However, it is a relatively expensive instrument. The electrostatic meter is the simplest instrument for every high voltages. It responds to both ac and dc. However, it is insensitive and (4)……. The cathode ray oscilloscope gives more information than any other instrument. It not only measures the voltage but it also (5)……However oscilloscopes are usually large. In addition, (6)……

Instrument for voltage measurement

Instrument	Advantages	Disadvantages
Moving-coil multimeter	Reasonably accurate, robust, versatile	Frequency range limited on ac
Electronic voltmeter	Draws no current from the circuit, wide frequency range	Expensive
Electrostatic meter	Simple, can be used with ac or dc without a rectifier	Insensitive, has a non-linear scale

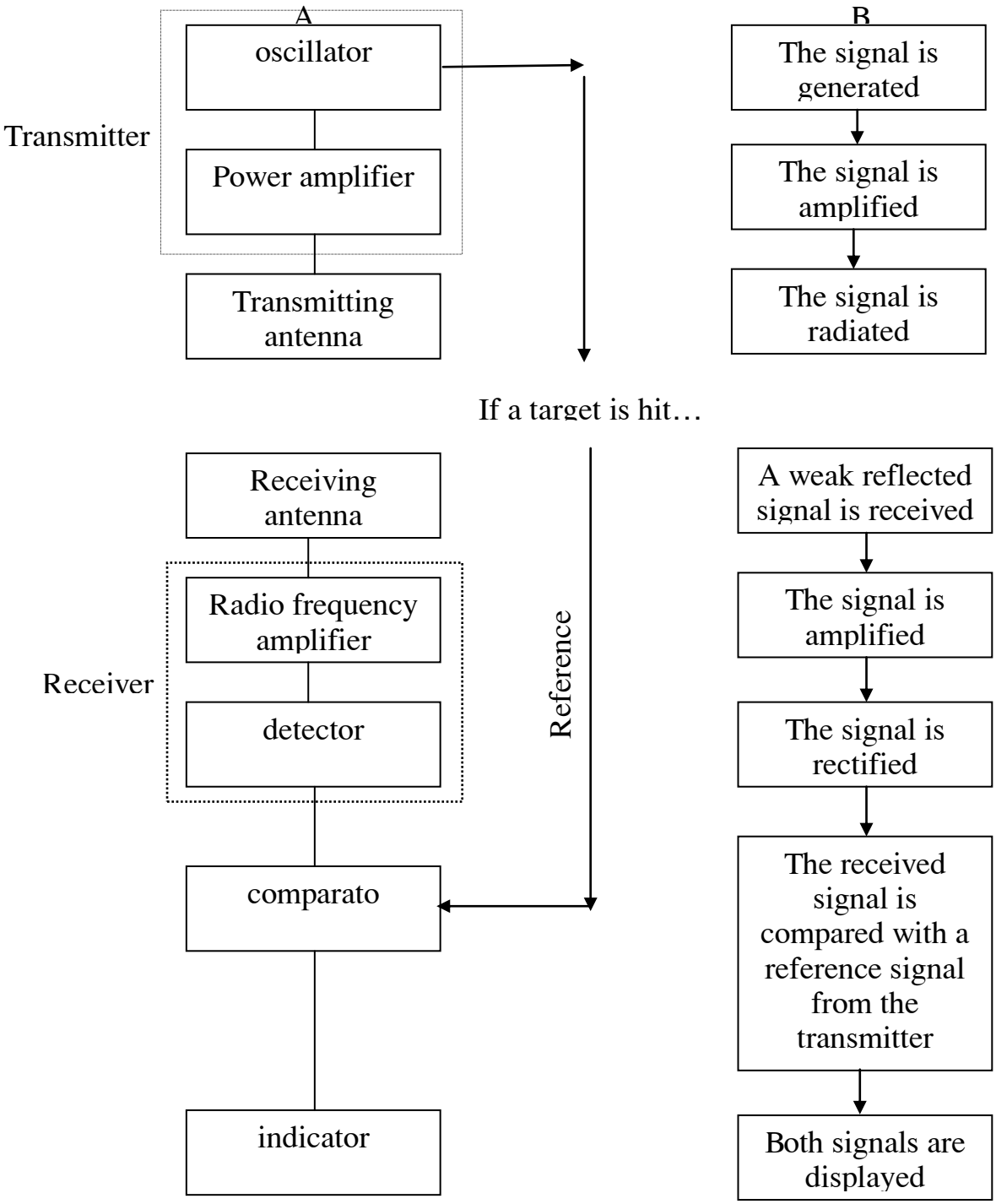
Oscilloscope	Also gives information about wave form and frequency	Large, expensive

EXERCISE 2 ***Interpreting a diagram***

Study this diagram of a simple radar system. Column A describes the components and how they are related. Column B lists the stages in the operation of the system in sequence.

Answer these questions about the diagram:

1. What does a simple radar system consist of?
2. What does the transmitter comprise?
3. What does the receiver include?
4. Where is the signal generated?
5. What happens to the signal next?
6. How is the transmitted signal radiated?
7. If a target is hit, what receives the reflected signal?
8. Where is the signal then fed to?
9. What happens to the signal in the receiver?
10. Where is the signal fed to next?
11. What happens in the comparator?
12. What happens to both signals finally?


A
B
Transmitter
oscillator
Power amplifier
Transmitting antenna
The signal is generated
The signal is amplified
The signal is radiated
If a target is hit…
Receiving antenna
Radio frequency amplifier
detector
Receiver
comparato
indicator
Reference
A weak reflected signal is received
The signal is amplified
The signal is rectified
The received signal is compared with a reference signal from the transmitter
Both signals are displayed

EXERCISE 3 ***Describing a diagram***

Use your own answers to the questions in Exercise 2 to write.

4.4. FURTHER READING

EXERCISE 1 ***Pre-read***

Read the title and the first sentence of each paragraph of the following passage. Write the main ideas of the passage.

DIELECTRIC HEATING

Dielectric heating is a method of heating a non-conducting material, a dielectric, by high-frequency voltages. The material is placed between metal plates across which a high-frequency supply is connected. The dielectric and the plates then form a capacitor and an electrostatic field is set up in the dielectric. As very high frequencies are used, up to 200MHz, the movement of electrons in the dielectric becomes rapid. This causes considerable-heat in the substance.

Dielectric heating has two great advantages over other forms of heating: it provides rapid heat, and the heat is produced uniformly throughout the material. In other words, the inside of the material gets hot at the same time as the surface. In addition, dielectric heating can be easily controlled and it is predictable. Accurate heating times can be calculated knowing the dielectric properties of the materials to be heated.

Dielectric heating has many different uses, from the manufacture of plastic raincoats to baking biscuits. It is especially used in plastics, woodworking and food industries.

A typical use is the manufacture of plywood. In the past the layers of wood and glue were steam-heated under pressure until the glue melted and the wood was firmly bonded. The heat took a long time to penetrate the wood, the glue did not melt uniformly and it dried unevenly. With dielectric heating, because of the difference in dielectric properties, the glue melts before the wood heats. It heats uniformly and it dries evenly. Using the dielectric process, a

single press can prepare 100 3-ply, 1cm thick sheets of plywood in about 30 minutes.

EXERCISE 2 ***Guess the main ideas***

Read the passage carefully and complete the following main ideas.

Dielectric heating

Dielectric heating = hf heating of (1)……..

Operation

Materials and electrodes form a capacitor

Hf voltage applied to electrodes → rapid electron movement → (2)……

Advantages

Heat is

- (3)……
- (4)……
- controllable and predictable

Applications

- Plastic e.g. raincoats
- (5)……
- (6)……

Example-plywood

Old, steam heat BUT

- lengthy
- (7) ……..
- (8)……

New, dielectric

- glue melts before wood heats
- (9)……
- (10)……

4.5. VOCABULARY

Ac-alternating current (n)	Dòng điện xoay chiều
Accelerate (v)	Tăng tốc
***Ac* motor**	Mô tơ xoay chiều
Arrange (v)	Sắp xếp
Bond (v)	Gắn chặt
Built-up area (n)	Vùng, nơi kiên cố
Carry (v)	Mang, tải
Comparator (n)	Bộ so sánh
Cathode ray tube (crt)	ống tia âm cực
Crane (n)	Cần trục, cần cẩu
Dc - direct current (n)	Dòng một chiều
Dc motor (n)	Môtơ một chiều
Deflect (v)	Làm chệch h- ớng. đổi h- ớng
Deflection system (n)	Hệ thống đổi h- ớng
Dielectric (n)	Chất điện môi
Dielectric heating (n)	Sự gia nhiệt điện môi
Display (v)	Hiển thị
Dot (n)	Dấu chấm
Effect (n)	ảnh h- ởng, hiệu dụng
Electron gun (n)	Súng điện tử
Emit (v)	Thoát ra, phát ra
Enclose (v)	Bao bọc, bao phủ
Filament lamp (n)	Đèn sợi đốt
Fluorescent lamp (n)	Đèn huỳnh quang
Fluoresce (v)	Phát sáng
Fluorescent (adj)	Thuộc huỳnh quang
Glass tube (n)	ống thủy tinh
Gun(p)	Súng
Heated cathode (n)	Catốt đ- ợc nung nóng

High-frequency (n)	Cao tần
Horizontal (adj)	Có h- ớng ngang
Horizontally (aclv)	Chiều h- ớng ngang
Indicator (n)	Bộ chỉ báo, bộ hiển thị
Lighter (n)	đèn
Locate (v)	định vị
National Grid (n)	Mạng l- ới điện quốc gia
Oscilloscope (n)	ôsilô, máy hiển thị sóng
Overhead (adj)	Trên không
Penetrate (v)	Xuyên qua
Phosphor (n)	Phốt pho
Phosphor coaled screen (n)	Màn hình phốt pho bao phủ
Plate (n)	Bản, lá (kim loại)
Plywood (n)	Gỗ dán, ván ép
Plywood production (n)	Sản xuất ván ép
Power station (n)	Trạm điện
Powerful dynamic barking (n)	Hãm động năng
Predictable (adj)	đoán tr- ớc đ- ợc
Pressure (n)	nén, áp lực
Property (n)	tính chất
Radar (n)	rađa
radiate (v)	phát xạ
Rapid (adj)	nhanh
Receiver (n)	bộ thu
Reference signal (n)	thanh chiếu
Screen (n)	màn hình
Set of plates (n)	tấm kim loại
Size (n)	kích cỡ
Steel-core aluminum (n)	nhôm lõi thép
Step up (v)	tăng dần

Stream (n)	dòng
Strike (v)	va vào, trạm vào
Surface (n)	bề mặt
Suspend (v)	treo lơ lửng
Television set (n)	kênh, hệ thu hình
Transmission line (n)	đ- ờng truyền, đ- ờng tải
Transmitter (n)	Máy phát tín hiệu
Traverse (v)	Chạy ngang qua, l- ớt qua
Underground (adj)	Ngầm, d- ới mặt đất
Underground cable (n)	Cáp ngầm
Unevenly (adj)	Không đều
Uniform (adj)	đồng nhất
Velocity (n)	Vận tốc
Vertical (adj)	Có h- ớng thẳng đứng
Waveform (a)	Dạng sóng

UNIT5: ELECTRONICS IN THE HOME

Electronics began at the start of the twentieth century with the invention of the vacuum tube. The first devices for everyday use were radios followed by televisions, record players, and tape recorders. These devices were large and used a lot of power.

The invention of the transistor in 1948 meant that much smaller, low-powered devices could be developed. A wide variety of electronic, devices such as hi-fi units and portable radios became common in the home.

It was, not until 1958 that microelectronics began with the development of ICs (integrated circuits) on a silicon chips. This led to a great increase in the use of electronics in everyday items. The introduction of the microprocessor allowed electronics to be used for the control of many common processes.

Microprocessors are now used to control many household items such as automatic washing-machines, dishwashers, central heating systems, sewing machines, and food processors. Electronic timers are found in digital alarm clocks, water heaters, electric cookers, and microwave ovens. Telephones use electronics to provide automatic dialing and answer phone facilities. New entertainment devices have been developed, such as video recorders and CD (compact disc) players.

In the future, electronics are likely to become even more common in the home as multimedia entertainment systems and computer-controlled robots are developed.

5.1. READING COMPREHENSION

EXERCISE 1 ***Answer the questions***

1. List three electronic devices for everyday use from the passage.
2. What devices became common in the home in 1948?
3. What was developed in 1958?
4. Where are electronic timers found?
5. What kinds of electronics are developed in the future?

EXERCISE 2 ***Decide if these statements are true (T) or false (F)***

1. ☐ Electronics started in late 20^{th} century.
2. ☐ The first devices were small and used little power.
3. ☐ The transistor was not useful to the development of much smaller, low-powered devices
4. ☐ Integrated circuits were invented in 1958.
5. ☐ Electronics timers are found in clocks, fridges, cookers and ovens.

EXERCISE 3 ***Fill in the gaps in this table with the help of the text***

Date	Invention	Applications in the home
Early 20th century	(1)_____	(2)_____
(3)_____	Transistor	(4)_____
1958	(5)_____	Automatic washing machine
Future	(6)_____	(7)_____

5.2. USE OF LANGUAGE

Passive voice

Study the following sentences

- *Microprocessors are now used to control many household items.*
- *Electronic timers are found in digital alarm clocks.*
- *New entertainment devices have been developed.*

Form:

Be + PII

EXERCISE 1 ***Change the following sentences into Passive voice***

1. They made one hundred fridges last year.

For example: One hundred fridges were made last year.

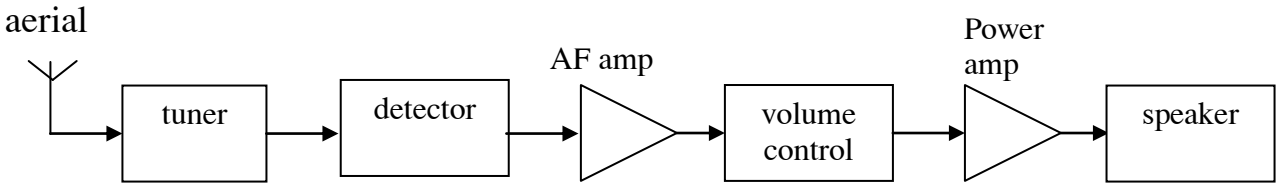
2. Telephones use electronics to provide automatic dialing and answer phone facilites.

3. She cleans cookers twice a week.

4. They have produced a lot of dishwashers since 1995.

5. He is going to design a robot next year.

EXERCISE 2 ***Describing ' block diagrams' and circuits.***



We can describe the links between each building block using these expressions:

The tuner ***is connected to*** *the detector.*

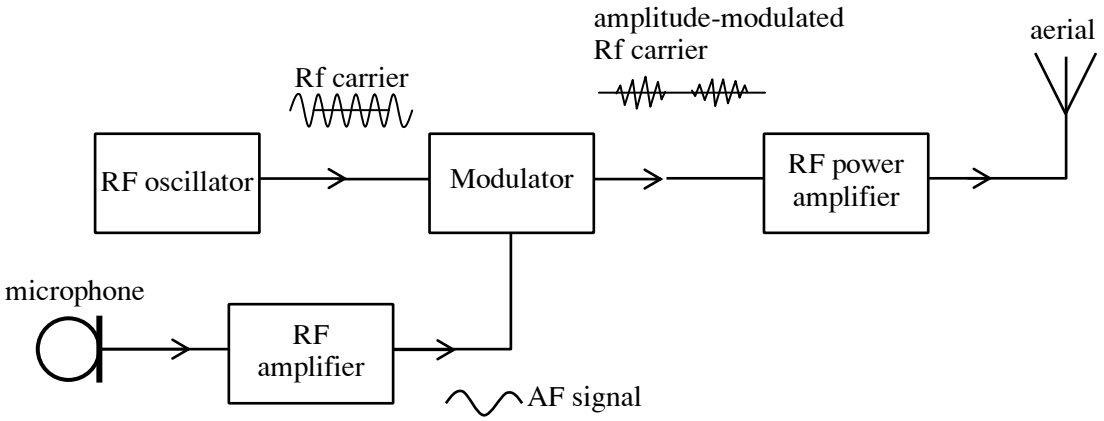
is linked to

5.3. WRITING

EXERCISE ***Describing diagrams***

With the help of the diagram, fill in the gaps in the description. Each gap represents one word. The description should answer these questions:

1. What does the diagram consist of?
2. What does it consist of in terms of blocks?
3. How are the blocks connected?
4. What is the function of each block?



The above figure shows the block diagram of an amplitude-moduled (AM) radio transmitter. It [1] _____ of a radio frequency (RF) oscillator, a [2] _____, an audio frequency (AF) amplifier, and an RF power amplifier. The RF [3] _____ generates an RF [4] _____ wave which is fed into the modulator.

The microphone converts sounds into audio frequency signals which are amplified by the AF [5] _____. The modulator then uses the amplified AF [6] _____ to modulate the RF carrier wave.

The power of the modulated carrier wave is increased by the RF [7] _____ amplifier. The strong modulated output signals are fed to the [8] _____ which enables them to be transmitted over long distances.

5.4. FURTHER READING

EXERCISE 1 ***Reading and guessing the main ideas***

BATTERY

Everyone knows what a battery is: it is one of those little tubes that you put in your Walkman or your torch so that you can have music or light wherever you go. It is portable electricity.

In fact, batteries come in many shapes and sizes, not simply tubes, and we should really call them cells, because a battery is a number of cells linked together. They range from the button-sized cells to the heavy batteries which can power submarines.

There are two different types of cells: one is called a primary cell, and the other is known as secondary cell. Both kinds change chemical energy into electricity. Primary cells are thrown away when the chemicals they contain are used up. Secondary cells can be recharged and used again and again.

The commonest and cheapest kind of primary cell is the Zinc-carbon cell. It consists of a zinc can which contains two chemicals. The zinc is the negative electrode. One of the chemicals, manganese dioxide, forms the positive electrode. Millions of cells like this are used every year in radios, torches and tape recorders.

EXERCISE 2 ***Answer the questions***

1. Why are batteries called cells?

A. because we can have music or light wherever you go.

B. because batteries come in many shapes and sizes.

C. because batteries rang from the button-sized cells.

D. because a battery is a number of cells linked together.

2. What does the Zinc-carbon cell contain?

A. a chemical B. zinc

C. manganese dioxide D. both B and C

3. Which batteries cannot be charged?

A. heavy batteries B. primary batteries C. tape recorders D. secondary cells

4. There are two different *types* of cells.

A. tubes B. torches C. kinds D. chemicals

5. Which sentence is wrong?

A. Batteries change chemical energy into electricity.

B. Cells have many shapes and sizes.

C. The Zinc-carbon cell cannot be recharged.

D. Primary cells can be used again and again.

5.5. VOCABULARY

Aerial (n)	ăngten
AF: audio frequency	âm tần
Alarm clock (n)	Đồng hồ báo thức
Allow (v)	Cho phép
Amp (amplifier) (n)	Bộ khuyếch đại
Amplifier (n)	Bộ khuyếch đại
Amplify (v)	Khuyếch đại
Answer phone facility (ii)	Thiết bị trả lời điện thoại
Application (n)	ứng dụng
Automatic (adj)	Tự động
Automatic dialing facility (n)	Thiết bị quay số tự động
Automatically (adv)	Một cách tự động
Become (v)	Trở thành
Block (n)	Khối, hình khối
Bottom (n)	D- ới cùng
Capacitor (n)	Tụ điện
CD: Compact disc (n)	Đĩa CD
CD player (n)	Đầu đĩa CD
Central (adj)	Trung tâm
Central heating system (n)	Hệ thống lò s- ởi trung tâm
Centre (n)	Trung tâm
Century (n)	Thế kỷ
Check (v)	Kiểm tra
Chip (n)	Con chíp điện tử/ Vi mạch
Common (adj)	Phổ biến, chung chung
Component (n)	Linh kiện
Computer (n)	Máy tính
Computer-controlled robot (n)	Rôbốt điều khiển bằng máy tính
Connect (v)	Nối, kết nối

Connection (n)	Sự kết nối
Control (n)	Bộ, nút điều khiển (điều chỉnh)
Control (v)	Điều chỉnh, điều khiển
Db - decibel	Đơn vị đo độ lớn của âm thanh
Decide (v)	Quyết định
Decision (n)	Sự quyết định
Describe *(v)*	Mô tả, miêu tả
Description (n)	Sự miêu tả
Design (v)	Thiết kế
Detector (n)	Bộ tách sóng
Develop (v)	Phát triển
Development (n)	Sự phát triển
Device (n)	Thiết bị
Diagram (n)	Sơ đồ
Dial (v)	Quay số (điện thoại)
Digital (adj)	Kỹ thuật số
Dishwasher (n)	Máy rửa bát đĩa
Electric (n)	Điện
Electric cooker (n)	Bếp điện
Electronic timer (n)	Đồng hồ điện tử
Electronics (n)	Điện tử học
End (n)	Đoạn cuối
Entertain (v)	Giải trí
Entertainment (n)	Giải trí
F -farad	Fara, đơn vị đo điện dung
Facility (n)	Thiết bị, đồ dùng
False (adj)	Sai
Figure (n)	Hình vẽ
Find (v)	Tìm kiếm
G-Giga	1G=1000M

Gap (n)	Khoảng trống, chỗ trống
GHz - *Gigahertz*	Đơn vị đo tần số (1GHz=10^3 MHz=10^6 KHz=10^9Hz)
H - henry	Đơn vị đo độ tự cảm
heat (n)	Nhiệt, sợi đốt
heater (n)	Thiết bị gia nhiệt
Hi-fi (high fidelity)	Độ trung thực cao
hi-fi unit (n)	Khối, máy có độ trung thực cao
Household (n)	Gia dụng
Hz-hertz	Đơn vị đo tần số
Idea *(n)*	ý kiến
Inductor (n)	Cuộn cảm, phần cảm
lntegrated circuits (ics) (n)	Mạch tổ hợp
Introduce (v)	Giới thiệu
Introduction (n)	Sự giới thiệu
Invent (v)	Phát minh
Invention (n)	Sự phát minh
Item (n)	Mặt hàng, thiết bị
K —Kilo	1KHz=1000Hz
Kind (n)	Loại, kiểu loại
KV —Kilovolts	1Kv=1000V (Đơn vị đo điện áp, điện thế)
Link (v, n)	Nối, liên kết
Little (adj)	Nhỏ, một chút, hơi hơi
M-Mega	1M=1000Kilo
Media (n)	Ph- ơng tiện truyền thông
Microelectronics (n)	Vi điện tử
Microhenry	Đơn vị đo độ tự cảm
Microprocessor (n)	Bộ vi xử lý
Microwave oven (n)	Lò vi sóng

Multimedia (n)	Đa ph- ơng tiện
Multimedia entertainment system (n)	Hệ thống giải trí đa ph- ơng tiện
Multiple (n)	Bội số, tích số
mW - milliwatts	Đơn vị đo công suất
N - Nano	1 nano=10^{-9}
Negative (adj)	Mang tính âm
Negative terminal (n)	Đầu cực âm
Nf – Nanofarad	1 nanofarad = 10^{-9} farads
Ohm	đơn vị đo điện trở
Parallel (adj)	Song song
Passage (n)	Sự chuyển qua, trôi qua
pF - picofarad	1pF = 10^{12} farads
Portable (adj)	Có thể xách tay, mang theo
Portable radio (n)	Radio xách tay
Positive (adj)	Mang tính d- ơng
Positive terminal (n)	Đầu cực d- ơng
Power (n)	Nguồn, công suất
Power amplifier (n)	Bộ khuyếch đại công suất
Prefix (n)	Tiếp đầu ngữ
Process (n)	Qui trình, quá trình xử lý
Processor (n)	Bộ xử lý
Provide (v)	Cung cấp
Quote (v)	Đ- a ra, trích dẫn
Rail (n)	Tay vịn, chấn song, cái giá xoay
record player (n)	máy quay đĩa, máy hát
Resister (n)	Điện trở
Robot (n)	Rôbốt
Sewing machine (n)	Máy khâu
Silicon (n, adj)	Chất silic
Silicon chip (n)	Chíp silic

Speaker (n)	Loa
Statement (n)	Trình bày, câu
Support (v)	ủng hộ
Symbol (n)	Ký hiệu
System (n)	Hệ thống
Tape recorder (n)	Máy ghi âm trên băng từ
Telephone (n, v)	Điện thoại, gọi điện thoại
Terminal (n)	Đầu cực
Top (n)	Trên cùng
Transistor (n)	Transito, bóng bán dẫn
True (adj)	đúng
Tuner (n)	Bộ dò kênh
Unit (n)	Khối, máy
Use (v)	Sử dụng
V-Volt	1 đơn vị đo điện áp
Vacuum tube (n)	Đèn điện tử
Variable (adj)	Biến
Variety (n)	Nhiều, đa dạng
Vary (v)	Biến đổi
Via (pre)	Thông qua, qua
Video recorder (n)	Đầu ghi hình
Voltage (n)	Điện áp
Volume (n)	Âm l- ợng
Volume control	Bộ điều khiển âm l- ợng
W-watt	Đơn vị đo công suất
Washing-machine (n)	Máy giặt
Water heater (n)	Máy đun n- ớc
Zero (n)	0

UNIT 6: SEMICONDUCTORS DIODES

If two crystals of a semiconductor material, one of p-type and one of n-type, are joined together, a pn junction is formed. This junction can be used as a rectifier and is known as a pn junction diode.

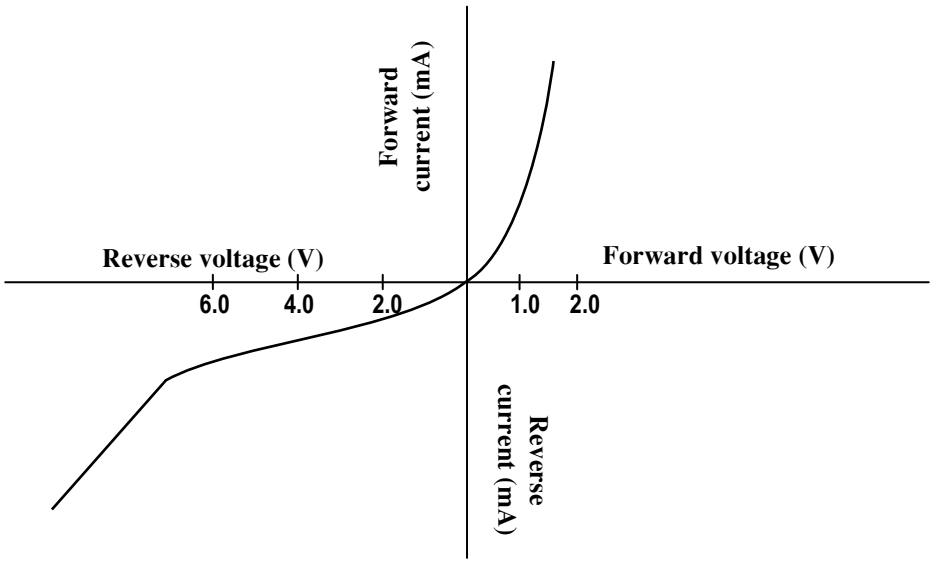


FIGURE 6.1

Fig. 6.1 illustrates what happens when a voltage is applied across a silicon pn junction diode. The first quadrant of the graph shows the characteristics of the diode when the source is connected with the positive to the p-side of the junction and the negative to the n-side. In other words, the diode is forward biased. With forward bias, the current at first increases slowly. When the applied voltage reaches about 600 mV, the current rises rapidly. The diode is then a good conductor. The current will continue to rise with increased voltage but eventually a point will be reached where the diode is destroyed by heat.

The third quadrant shows the ***characteristics*** when the source is connected with the positive to the n-side and the negative to the p-side. When the diode is reverse biased, there is almost no current flow. The junction is therefore a good rectifier: it conducts well in one direction and almost not at all in the other.

However there is a small reverse leakage current. This leakage current remains ***substantially*** constant until what is known as breakdown.

Voltage (Vb) is reached. At this point there is a ***sharp*** increase in the reverse current. This sudden increase in current is called the Zener effect.

Normal diodes are never operated in the breakdown region but Zener diodes are designed to make use of the breakdown ***phenomenon***. Because any slight increase in voltage beyond the breakdown point causes a large increase in current. Zener diodes are often used as a kind of overspill to protect sensitive circuits ***fluctuations*** in the power supply.

6.1. READING COMPREHENSION

EXERCISE 1 ***Meaning from context***

Select a word from the three alternatives give which is most similar in meaning to the word in italics as it is used in the passage:

1. *characteristics* (line 12)

A. typical behaviour B. voltage figures C. graph

2. *substantially* (line 16)

A. almost B. greatly C. hardly

3. sharp (line 17)

A. slight B. steep C. cutting

4. *phenomenon* (line 20)

A. voltage B. effect C. result

5. *fluctuations* (line 22)

A. rises and falls B. increases C. failures

EXERCISE 2 ***Recognizing rephrasing***

Find the sentence in the passage which is similar in meaning to each of these sentences:

1. The positive of the source is connected to the p-side of the diodes and the negative to the n-side.

2. When a forward voltage is applied across the diode, there is. at first, only a slow rise in current.

3. The diode allows current to flow freely.

4. If a reverse voltage is applied to the diode, it conducts badly.

5. There is almost no change in leakage current until the reverse voltage reaches breakdown point.

EXERCISE 3 ***Describing diode characteristics***

Complete this description of the current-voltage characteristics of a silicon diode. Use the passage and Figure 6.1 to help you.

At first, a forward voltage is applied (1) ……. When the forward voltage has reached about 600mV, (2)……If the forward voltage is further increased, (3)……There is only a very small leakage current flows. When the break down voltage is reached, (4)…… After the breakdown point, any further increase in reverse voltage causes (5)……

EXERCISE 4 ***Checking facts and ideas***

Decide if these statements are true (T) or false (F). Quote from the passage to support your decisions.

1. The first quadrant of the graph shows the characteristics of the diode in forward bias.
2. For forward voltages over 600mV, the diode conducts well.
3. When the source is connected with the negative to the n-side an the positive to the p-side, the diode is reverse biased.
4. When a reverse voltage is first applied, a diode conducts badly.
5. Zener diodes are never used beyond breakdown point.

6.2. USE OF LANGUAGE

Time clauses

Time clauses relate two actions in time. In this section we will study clauses relating:

1. Simultaneous actions

EXAMPLE: As the voltage increases, the current rises.

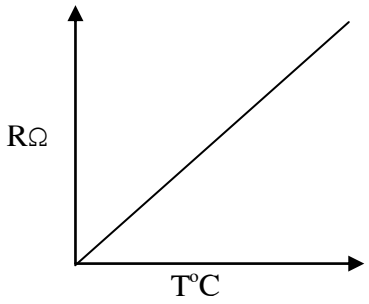
2. Actions in immediate succession

EXAMPLE: When the switch is pressed, the light goes on.

3. An action and its limit

EXAMPLE: The current increases until the diode is destroyed by heat.

1. Simultaneous actions



Study this graph. It represents two actions which happen at the same time, i.e. two simultaneous actions.

Action (i) the temperature rises

Action (ii) the resistance rises

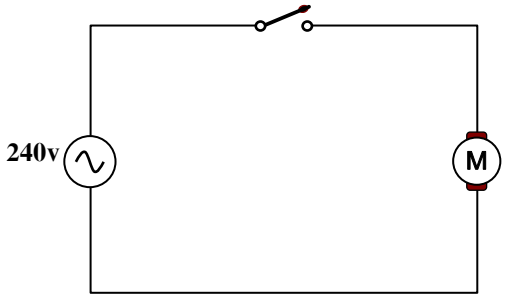
We can link two simultaneous actions using "as"

EXAMPLE: As the temperature rises, the resistance rises.

We will represent simultaneous actions like this:

action (i)
action (ii)

2. Actions in immediate succession



Study this circuit and note how action (i) is followed immediately by action (ii).

Action (i) the switch is closed

Action (ii) the motor starts

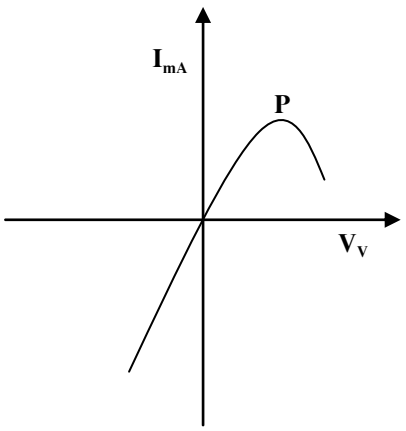
We can link actions in immediate succession using when or as soon as.

EXAMPLE: WHEN the switch is closed, the motor starts.

We will represent actions in immediate succession like this:

action (i)	action (ii)

3. Action and limit



This graph shows an action and its limit.

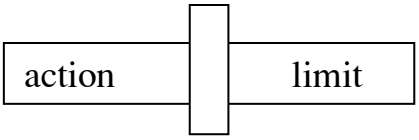
Action the current rises steadily

Limit point P is reached

We can link an action and its limit using until.

EXAMPLE: The current rises steadily UNTIL point P is reached.

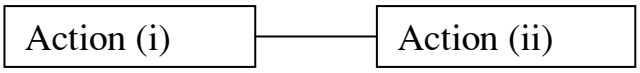
We will represent this relationship like this:



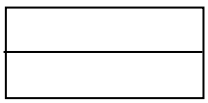
You have already studied ways to relate actions in sequence in Unit 5.

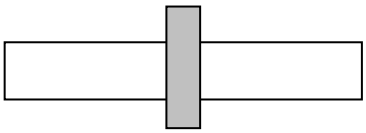
EXAMPLE: AFTER the signal has been detected, it is amplified.

Remember that we represent actions in sequence like this:

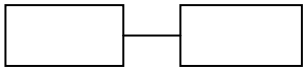


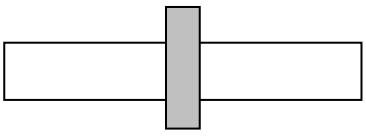
EXERCISE ***Link these pairs of actions using time clauses. The diagrams indicate the relationship between each pair***

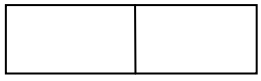
1. the voltage increases  the current increases

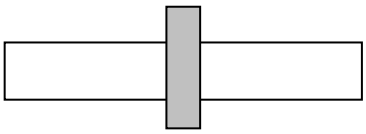
2. the current continues to rise  the diode is destroyed by heat

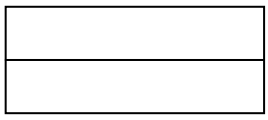
3. a reverse voltage is applied  very little current flows

4. the signal is rectified  the signal is amplified

5. The leakage current remains constant  The breakdown voltage is reached.

6. The applied voltage reaches about 600mV  The current rises rapidly.

7. The magnetizing current is increased  Saturation point is reached.

8. The current drawn by the load increases  The current in the Zener decreases.

6.3. WRITING

Writing explanations

A good explanation allows the reader to link his knowledge with that of the writer. A bad explanation either over – estimates the reader's knowledge with the result that he cannot understand it, or under-estimate the reader's knowledge so that he is bored.

Study the following explanations. They all try to explain why conductors are coated with plastic.

EX: *Conductors are coated with plastic because plastic is an insulator.*

Explanation 1 is effective if the reader knows what an insulator is.

Conductors are coated with plastic because plastic is an insulator. An insulator does not readily release electrons.

Explanations often involve answering *how* and *why* questions.

1. Copper is a good conductor. (*Why?*) BECAUSE it readily release electrons.

2. Use a heat shunt when soldering sensitive components. (*Why?*) SO THAT they are not damaged by heat.

3. The current flowing through a resistor can be calculated. (*how?*) BY DIVIDING the voltage by the resistance.

4. The rf section of a receiver is sometimes screened. (*why?*) TO PREVENT interference from other parts of the receiver.

EXERCISE ***Match the column A with B***

1. Soldering wire contains flux (why?) to…	a) The pole shoes help form a radial magnetic field.
2. When a current flows through the filament of a light bulb, it gives off light (why?) because…	b) The filament becomes incandescent.
3. The value of a resistor can be calculated from the color bands on the body (how?) by…	c) The equipment is not damaged by excess current.
4. Manganin wire is used for the elements of an electric wire (why?) because of…	d) The gases prevent the filament burning up.
5. Sensitive equipment is protected by fuses (why?) so that…	e) The flux prevents the surfaces being joined from oxidizing.
6. Light bulbs may contain rare gases (why?) to…	f) A relay contains a moving armature which controls the contacts.
7. Curved bulbs may contain rare gases (why?) to…	g) Manganin has a higher resistance than most metals.
8. When a relay is energized, sets of contacts are pushed together or apart (how?) by means of…	h) The color code is used to determine the value of a resistor.

Example: 1-e. Soldering wire contains flux to prevent the surfaces being joined from oxidizing.

6.4. FURTHER READING

EXERCISE 1 ***Reading for specific information***

Find all the answers to these questions in the passage which follows. Work as quickly as you can. Try to ignore information which will not help you to answer the questions.

1. What is modulation?
2. Which three quantities of a wave can be modulated?
3. Why is the frequency modulation better than amplitude modulation?

MODULATION

We can only communicate information by radio waves by changing the wave in some way. This change is known as modulation. The simplest way form of modulation is to turn the wave on and off. This method was used in the early days of radio for telegraphic signals. The wave was stopped and started to represent the dots and dashes of the Morse code by means of a telegraph key.

Speech and music produce audio frequencies which cannot be transmitted directly. But they can be used to modulate radio waves. The modulated radio is then transmitted. When it is received, the wave is demodulated and the original audio-frequency signal is recovered. The high frequency radio wave acts only to carry the audio-frequency signal and is called the carrier wave. The audio-frequency signal is termed the modulating signal.

A wave has three quantities: amplitude, frequency and phase. Any of these quantities can be modulated. The two most common methods of modulation are amplitude modulation, am, and frequency modulation, fm.

In amplitude modulation, the amplitude of the carrier wave is changed according to the amplitude of the modulating signal. The frequency of the carrier is kept constant. Fig. 6.2 represents part of an audio-frequency signal, which might be generated by a microphone. Fig. 6.3 represents a radio wave of much higher frequency. Fig. 6.4 shows the same radio frequency wave after it has been modulated by the audio-frequency signal in Fig. 6.2.

FIGURE 6.2: Audio frequency signal

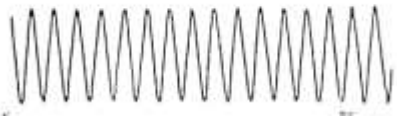


FIGURE 6.3: Higher frequency radio wave

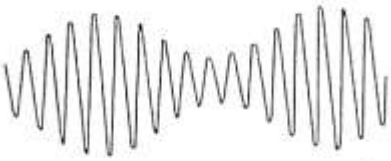


FIGURE 6.4: Modulated audio frequency signal

In frequency modulation, the amplitude of the carrier wave is kept constant, but the frequency is varied in proportion to the amplitude of the modulating signal. Frequency modulation has several advantages over amplitude modulation. The most notable is that reception is less likely to be disturbed. This is because atmosphere disturbances and noise generated in the receiver itself result in a change in the amplitude of the received signal. However, changes in only the frequency would distort the modulated information.

In fm sound broadcasting, the limit of modulation is usually 75kHz above and below the frequency of the unmodulated carrier wave. In other words, fm broadcasts spread 75kHz either side of the carrier frequency. This is the reason why fm stations broadcast in the vhf band (30-300MHz) where stations can be spaced more than several hundred kilohertz apart unlike the medium frequency bands where spacing of only 9 to 10kHz are common.

EXERCISE 2 ***Recognizing rephrasing***

Now read the whole passage carefully. Each of these sentences summarizes part of the passage. Identify the lines summarized:

1. In fm frequency of the carrier wave is modulated according to the amplitude of the modulating signal. (lines……)
2. Audio frequencies cannot be transmitted. (lines……)
3. The amplitude, frequency and phase of a wave can be modulated. (lines……)
4. Fm broadcasts are in the vhf band partly because fm stations require greater spacing. (lines……)
5. The carrier wave is demodulated by the receiver and the audio-frequency signal recovered. (lines……)
6. No information can be communicated by radio waves without modulating them. (lines……..)
7. In am the amplitude of the carrier wave is modulated according to the amplitude of the modulating signals. (lines……)
8. Stopping and starting the wave is the simplest method of modulation. (lines……)
9. Fm is better than am because there is less interference. (lines……)
10. Audio frequencies can be used to modulate high frequency radio waves which can then act as carriers of the audio-frequency signals. (lines……)

EXERCISE 3 ***Summarizing***

Put the sentences in Exercise H in the correct order and use them to make a paragraph summarizing the passage. You may add words of your own to make a good paragraph. Make sure no information is repeated unnecessarily.

6.5. VOCABULARY

Band (n)	Dải, băng
Breakdown (adj)	đánh thủng
Breakdown voltage (n)	điện áp đánh thủng
Burn up (v)	Cháy
Calculate (v)	tính toán
Characterstic (n)	đặc tính
Code (n)	Mã
Colour band (n)	Dải màu
Colour code (n)	Mã màu
Component (n)	Thành phần
Crystal (n)	Tinh thể
Determine (v)	Xác định
Diode (n)	Di ốt
Divide (v)	Chia thành
energize (v)	Cấp năng l- ợng
Equipment (n)	Dụng cụ
Fit to (v)	Lắp đặt, đ- a vào
Fluctuation (n)	Sự dao động
Flux (n)	Chất gây cháy, đơn vị chiếu sáng
Forward/ reverse biased	Chệch về phía tr- ớc/ phía ng- ợc lại
Forward current (n)	Dòng thuận
Forward voltage (n)	điện áp thuận
Fuse (n)	Cầu chì
Gas (n)	khí
Heatshunt (n)	mỏ hàn
Interference (n)	sự nhiễu
Join (v)	tiếp xúc
Leakage (n)	rò rỉ
Leakage current (n)	dòng điện rò

Light bulb (n)	bóng đèn
Light-emitting diode (n)	Đi ốt phát quang
Magnet (n)	nam châm
Overspill (n)	tràn ra
Oxidize (v)	ôxi hóa
Phenomenon (n)	Hiện t- ợng
Photo-diode (n)	Đi ốt quang
Plastic (n)	Nhựa
P-N junction (n)	Chỗ nối âm - d- ơng/ Liên kết P-N
Radial (adj)	Thuộc tia
Radial magnetic field (n)	Tr- ờng điện từ
Region (n)	Vùng
Remain (v)	Còn lại
Reverse current (n)	Dòng ng- ợc
Reverse voltage (n)	điện áp ng- ợc
Semiconductor diode (n)	Di ốt bán dẫn
Sensitive circuit (a)	Mạch không ổn định
Sensitive circuit fluctuation (n)	Sự dao động mạch
Side (n)	Miền, cạnh, mặt
Zener diode (n)	Đi ốt Zener
Zener effect (n)	Hiệu ứng Zener

UNIT 7: HIGH DEFINITION TELEVISION

In Europe, the USA and Japan, the race is on to produce a new generation of television sets. These new sets will be larger than today's models, possibly with 100 centimetre flat screens. Picture quality will be excellent, crisp, and without flicker, as good as those we are used to seeing in the cinema. Sound quality too will be superb, thanks to digital multitrack transmissions. By the turn of the century such sets may be offering programmes in a choice of languages as they will be equipped with eight sound tracks.

In Europe, the term HDTV is used. In the USA, the more generic term were the first to start work on the new technology, in 1974, called their system Hi-Vision. Whatever name is used, these new sets share certain features.

The picture is displayed using more lines per frame. This means that they provide clearer, more detailed, high quality images. The picture can be displayed on large, wide screens which are flicker-free. They also provide very high quality three-dimensional sound output.

A wider range of frequencies can be used to transmit each HDTV channel. This is because they can be transmitted at high frequencies which are virtually unused at present. These wide frequency ranges make it possible to transmit digital, rather than analogue signals. Digital processing can then be used in the

receivers to provide almost perfect pictures even when the strength of the input signal is low. A computer could also be used to produce special effects.

Since not everyone is convinced of the need for such high quality TV systems, the move towards HDTV is likely to be very gradual. The first HDTV receivers will need to be able to process both the old and the new transmissions and, throughout the world, agreement will have to be reached on new transmission standards.

7.1. READING COMPREHENSION

EXERCISE 1 ***Carrying out a survey to find out the viewing habits of your class and their ideas on future developments in television. You may add extra questions of your own***

1. How many hours of television do you watch each week?
2. When do you watch television?
3. What sort of programs do you watch?
4. Which television station do you watch most/ least often?
5. How do you think television will change in the future?

EXERCISE 2 ***Study these graphics. Note ways in which high definition television will be different from existing sets. Compare your answers with your partner. For example:***

Feature	Existing	High definition
No. of lines	625	1.250
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

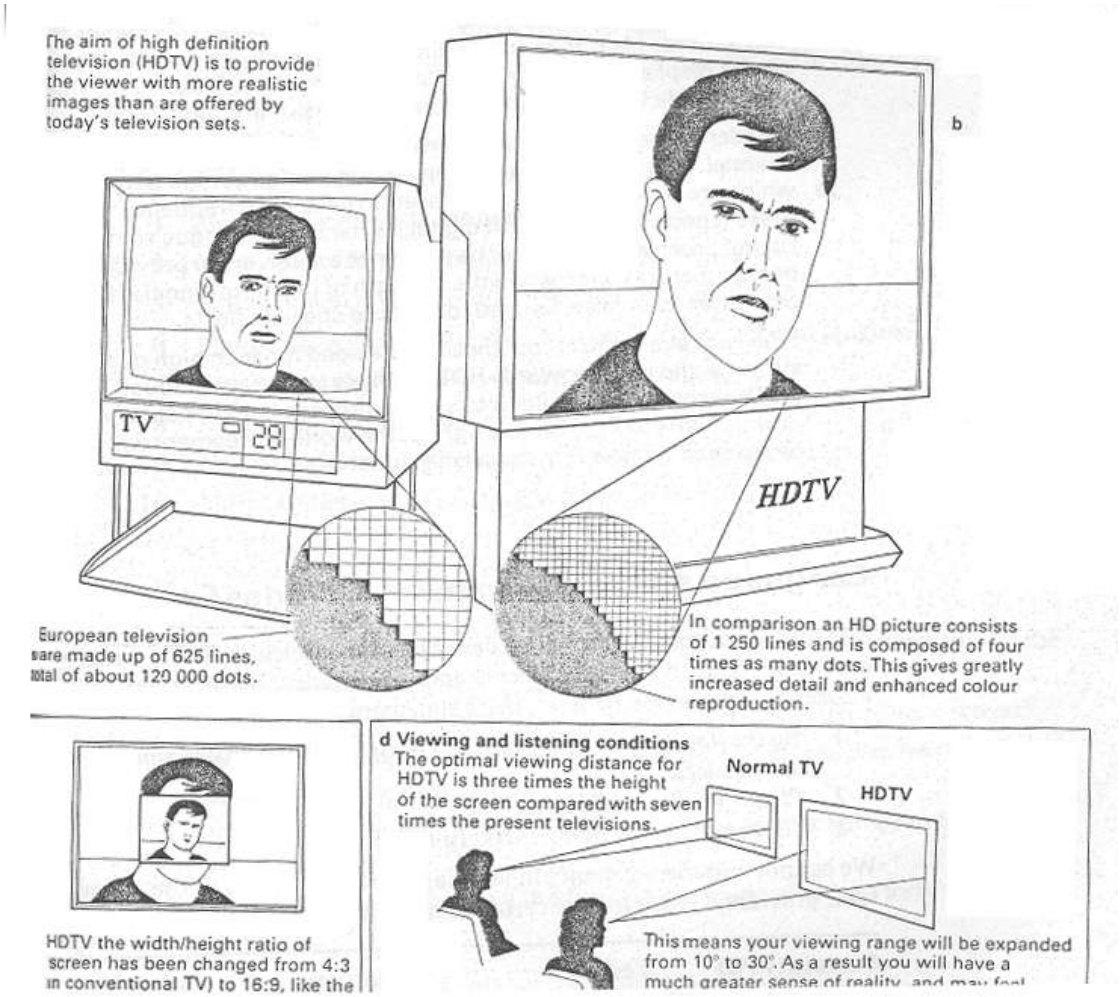


FIGURE 7.1

EXERCISE 3 ***Decide whether the following statements are true (T) or false (F).***

1. The new generation of television sets in Japan is called Hi-Vision.
2. The American were the first to start work on this new technology.
3. New television sets in Europe are completely different from those in the USA.
4. The wide range of frequencies can transmit digital signals.
5. Many people are going to use such high quality TV systems.

EXERCISE 4 ***Answer the following questions.***

1. How is the picture and sound quality of the new generation of television sets?
2. What are the names of the new generation of television sets in Europe and the USA?
3. Why are images of new television sets clearer and more detailed?
4. What can also be used to produce special effects?
5. Why is the move towards new generation of television sets gradual?

7.2. USE OF LANGUAGE

Certainty

The text describes possible future developments in television. The writer is confident about some developments and less confident about others. What difference can you see between these statements?

1. *By the turn of the century such sets* ***may*** *be offering programmes in choice of languages.*
2. *Picture quality* ***will*** *be excellent.*
3. *The move towards HDTV is* ***likely*** *to be very gradual.*

We cannot measure certainty in language with precision, but the following table provides a guide to how certain a writer is about a future development.

Certainty (%)	**Verb**	**Adjective**	**Adverb**
100	Will	Certain	Certainly
85		Likely	Unlikely
75		Probable	Probably
		Improbable	
50	Could/ may	Possible	Possibly

EXERCISE *How likely are these developments in the next five years? Make statements about each development using the certainty expressions in the above table. Compare your answers. For example:*

Most houses in your country will be cleaned by electronic robots.

I think it's unlikely that most houses in my country will be cleaned by electronic robots. It's possible that some houses will use them.

1. Vinyl records will not be made.
2. Ordinary audio cassettes will not be made.
3. Most families in your country will have CD player.
4. Most families in your country will have MD player.
5. Most families in your country will have DCC player.
6. Computers will understand and respond to your spoken language.
7. Cars will be electronically guided through cities.
8. Most teaching will be done by computer.
9. No manual labour will be done in factories in your country.
10. Most families in your country will have HDTVs.

7.3. WRITING *Linking facts and ideas*

EXERCISE ***Link each set of statements, using words or phrases of your own to make an explanation of how a television picture is composed. Omit necessary words and make any other changes required***

1. A television picture is built up gradually.

This is done by a moving spot.

Example: A television picture is built up gradually by a moving spot.

2. The spot strikes the television screen.

The phosphor coating on the screen emits light.

The light varies in brightness according to the intensity of the original image.

3. The spot reaches the right side of the screen.

The spot is blanked.

The spot is moved rapidly back to the left side in a movement called flyback.

4. The present European system sweeps the screen in a series of lines.

There are 625 closely-spaced lines.

Using 625 lines ensures a good quality picture.

5. The movement across the screen is controlled by the line scan signal.

The movement down the screen is controlled by the field scan signal.

6. The scan rate must be greater than 40Hz.

A lower scan rate would cause the screen to flicker.

7. Sync pulses are added to the video signal.

The sync pulses ensure that the TV camera and TV receiver start a new line and frame at the same time.

8. The build-up of the screen happens so quickly.

The eye sees only a complete picture.

7.4. FURTHER READING

Reading

TELEVISION PICTURES

A television picture is built up gradually by moving a spot of light across and down a screen in a raster pattern (see Fig. 7.2).

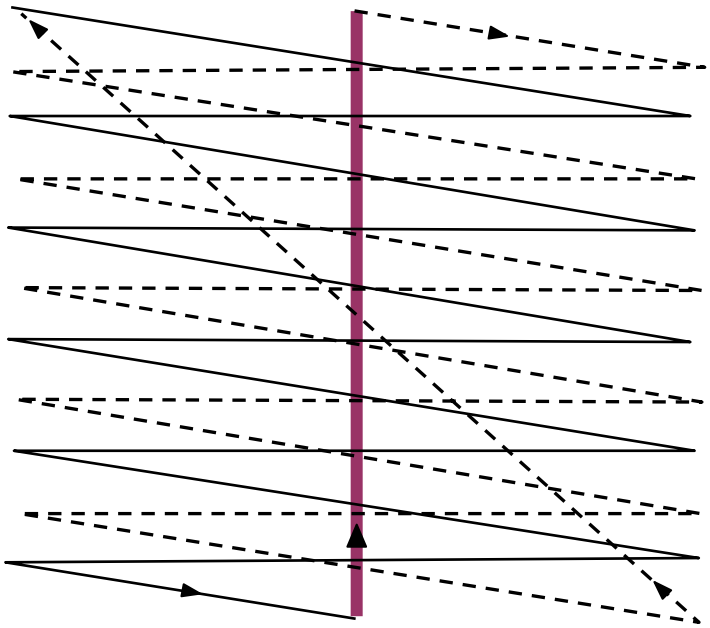


FIGURE 7.2: The moving way of a spot

The video signal causes the brightness of the spot to vary in proportion to the intensity of light in the original image. The movement of the spot across the screen is controlled by the line scan signal. Each time the spot reaches the right side of the screen, it is blanked and moved rapidly back to the left side ready to start the next line. This rapid movement back to a starting position is known as flyback. Each complete image or frame requires a minimum of 500 lines to give a picture of acceptable quality. The present European TV system uses 625 lines per frame.

The movement of the spot down the screen is controlled by the field scan signal. When the spot reaches the bottom of the screen, it is blanked and moved rapidly back to the top of the screen. The frame must be scanned at least forty times per

second to prevent the screen from flickering. The present European TV system has a frame scan rate of 50Hz.

The video signal contains line and field sync pulses to make sure that the TV receiver starts a new line and a new frame at the same time as the TV camera (see Fig. 7.3).

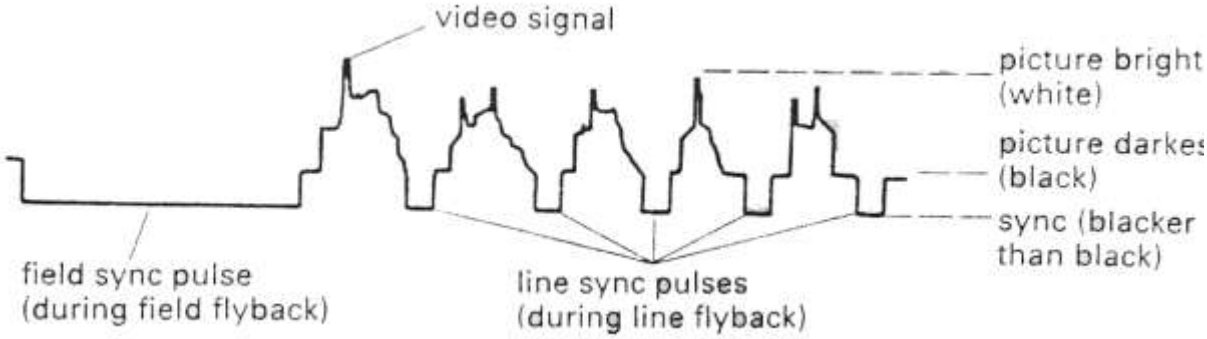


FIGURE 7.3

To allow the video signal to be transmitted using a smaller range of frequencies, each frame is transmitted in two separate halves, known as fields. The first time the spot travels down the screen it displays the first field, which consists of the odd-numbered frame lines. The second time the spot travels down the screen it displays the second field, which consists of the even-numbered frame lines. Combining two fields in this way is known as interlacing. Although the fields are displayed one after the other, it happens so quickly that the human eye sees them as one complete picture.

EXERCISE ***Find the answers to these questions***

1. What controls the movement of the spot of light across a television screen?
2. What name is given to the rapid movement of the spot back across the screen to the start of the next lines?
3. How many lines are used to build up a frame in present European television systems?

4. What happens to a screen if the frame is not scanned at least forty times per second?

7.5. VOCABULARY

Acceptable (adj)	Có thể chấp nhận đ- ợc
Analogue (adj)	T- ơng tự, t- ơng đồng
Audio cassette (n)	Băng đài
Audio-signal (n)	Tín hiệu âm thanh
Channel (n)	Kênh
Complete (adj)	Hoàn chỉnh
Convince (v)	Thuyết phục
Crisp (adj)	Sinh động
Digital (adj)	Kỹ thuật số
Display (v)	Hiển thị
DTV (Digital Television)	Truyền hình kỹ thuật số
Effect (n)	Hiệu ứng
Electronic (adj)	điện tử, thuộc về điện tử
Electronically (adv)	
Emit (v)	Phát ra, tỏa ra
Even (n)	Số chẵn
Feature (n)	đặc điểm
Field (n)	Tr- ờng
Flicker (v,n)	Rung
Flicker-free (adj)	Chống rung
Frame (n)	Khung
Frequency (n)	Tần số
Generic (n)	Chung chung
Gradual (adj)	Dần dần
HDTV (High Definition Television)	Truyền hình có độ rõ nét cao
Hi-fi (adj)	Có độ trung thực cao

Image (n)	Hình ảnh
Input (n)	Chiều vào, đầu vào
Intensity (n)	C- ờng độ
Multitrack (n)	đa kênh
Odd (n)	Số lẻ
Ordinary (adj)	Bình th- ờng, thông th- ờng
Output (n)	Chiều ra, đầu ra
Picture (n)	Hình ảnh
Prevent (v)	Tránh khỏi, ngăn cản
Proportion (n)	Tỉ lệ
Receiver (n)	Máy thu
Respond (v)	Trả lời
Scanning line (n)	Đ- ờng quét hình
Screen (n)	Màn hình
Signal (n)	Tín hiệu
Sound (n)	Âm thanh
Sound track (n)	Đ- ờng ghi âm
Standard (adj)	Chuẩn mực
Superb (adj)	Tuyệt vời, chất l- ợng cao
Television set (n)	Ti vi
Three-dimensional (adj)	3 chiều
Track (n)	Rãnh, kênh
Transmission (n)	Sự chuyển đổi
Transmit (v)	Chuyển đổi
Vary (v)	Thay đổi, biến thiên
Video-signal (n)	Tín hiệu hình ảnh
Vinyl (n)	Chất nhựa dẻo (nhựa vinyl)
Vinyl record (n)	Đĩa ghi âm bằng nhựa
Virtually (adv)	Thực tế, thực sự
Vision (n)	Tầm nhìn

UNIT 8: DATA TRANSMISSION

FIGURE 8.1: Facsimile transmission

FAX

Facsimile machines only came into widespread use in the late 1970s when international standards were set by the Comite Consultatif International Telegraphique et Telephonique (CCITT), a ***body*** based in France. Before this, machines could only communicate with ***those*** made by the same manufacturer.

Since then, facsimile technology has become increasingly sophisticated. The latest ***machines***, which must be linked to a special digital phone line, can send a document to several places at once for the price of one phone call.

Facsimile transmission involves sending a document along a telephone line and converting the received signals into a reproduction of the original. 'Fax' machines can now send an A4 document, containing images as well as words, in less than a minute.

When you feed a document into the machine, a fluorescent lamp reflects the image on to a series of mirrors which reduce its size so that the whole document can be reflected on to a camera lens. The lens can only read the image in black and white. This ***information*** is converted, via microprocessor, into binary information. The machine records black as 0 and white as 1.

Another microprocessor then converts the ***binary data*** into digital information, which allows more data to be stored on the microchip. But, because most telephone systems cannot read digital information, this is again changed, via another microprocessor (modem), into analogue tones, or pitches of noise. The first machine transmits ***these tones*** to the second.

The receiving machine converts the analogue tones back into digital and then binary information. ***It*** sends a signal (in binary code) to the thermal head, or printer. This turns heated elements on or off according to the pattern of 0s and 1s contained in the signal. The pattern of black and white is then printed on to heat sensitive paper.

Fax machine sends information at the rate of 9,600 baud, or bits of information per second. A few seconds' interference on the phone line can make several lines of a document illegible. If ***the line*** is noisy, the sending machine will slow down to reduce the amount of information lost.

8.1. READING COMPREHENSION

EXERCISE 1 ***Study this diagram which shows how a document can be sent from one fax machine to another and read the text to answer these questions***

1. How are fax machines link?
2. How is the image transferred from the document to a microprocessor within the fax?
3. In what form is information sent down the telephone lines?
4. In what form is information fed to the thermal head in the receiving fax?
5. How does the thermal head create images on paper?

EXERCISE 2 ***Find the reference in the text for each of the following***

1. A *body* based in France *(line 3)*
2. *Those* made by the same manufacturer *(line 4)*
3. The latest *machines (line 6)*
4. *This information* is converted *(line 15)*
5. Converts the *binary data* into digital information *(line 17)*
6. The first machine transmit *these tone (line 21)*
7. *IT* sends a signal (in binary code) *(line 23)*
8. If *the line* is noisy *(line 29)*

8.2. USE OF LANGUAGE

8.2.1. Reduced relative clauses

In relative clauses, we can reduce them by omitting the relative pronouns and change the verbs into Ving (in active sentences) or into Ved (in passive sentences).

Example 1

1. the thermal head is a mechanism

2. the head contains a line of dots

⇒ The thermal head is a mechanism which contains a line of dots

⇒ The thermal head is a mechanism **containing** a line of dots.

Example 2

1. The microprocessor converts the information into signals
2. The signals are called analogue tones.
3. The signals are suitable for telephone transmission

⇒ The microprocessor converts the information into signals, which are called analogue tones, which are suitable for telephone transmission.

⇒ The microprocessor converts the information into signals, **called** analogue tones, **suitable** for telephone transmission

EXERCISE 1 ***Shorten this summary of the technical reading passage by reducing the relative clauses where possible***

TRANSMISSION LINES

The lines which connect telephones within a building are the simplest types of transmission line, which consists of parallel wires. Those which link telephones to a local exchange may be twisted pairs, although these are being replaced. Coaxial cable, which is formed from a copper core which is surrounded by a copper braid, is used to carry a large number of signals over long distances. The cables which provide connections between telephone exchanges are often coaxial. Waveguides, which are made of copper, are used to carry microwave signals between dish aerials and receivers. They are suitable for frequencies which are between 1GHz and 300GHz. Optical fibres, which are made from very pure silicon fibre, are the forms of transmission line which is most often used these days.

Example: The lines **connecting** telephones within a building are the simplest types of transmission line

8.2.2. Short forms

Some technical words have common short forms. In some cases the short form is used much more frequently than the full form. For example

Full form	Short form
A facsimile message	*A fax*

EXERCISE 1 ***What are the short forms of these terms?***

1. amplifier
2. video recorder
3. television
4. coaxial cable

EXERCISE 2 ***What terms are presented by these short forms?***

1. phones
2. mike
3. phone

8.3. WRITING *Describing transmission processes*

EXERCISE

- Flowchart 1 describes in note form what happens when a document is fed into a fax machine.
- Complete Flowchart 2 to describe how the data is received by the receiving machine.

Flowchart 1
Sending

1. Document fed into machine
2. Passes over fluorescent
3. Image reflected to a lens
4. Lens passes image to microprocessor
5. Microprocessor 1 breaks image into series of horizontal
6. Microprocessor 2 converts each line into series of binary-coded dots.
7. Dots converts into digital information
8. Modem converts digital information into analogue tones for transmission

Flowchart 2
Receiving

1.
2.
3.
4.
5.

8.4. FURTHER READING

Reading

Communications services

Telephones, connected by a network of cables, are commonly used for the two-way transmission of speech. The signals are switched from one line to another at switching centres known as telephone exchanges. Lines in a small area are switched by local exchanges, local exchanges are connected through trunk exchanges, and trunk exchanges are connected to other countries by international exchanges. Such a system is called a Public Switching Telephone Network (PSTN) (see Fig.8.2).

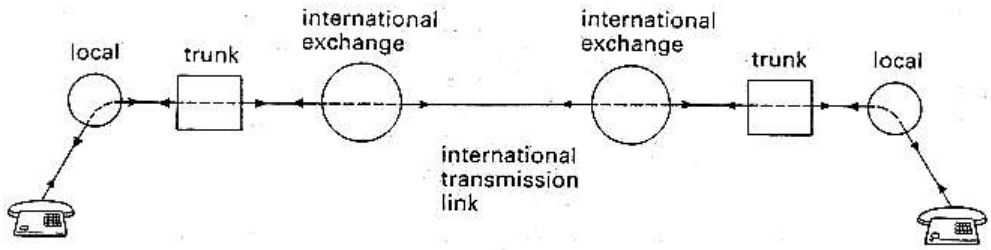


FIGURE 8.2: Public Switching Telephone Network

Modern digital telephone networks can use videophones to transmit video images as well as speech. The telephone network is used by video-conferencing services to interconnect small television studios. In this way, business people can hold conferences at a distance.

Public telephone networks are used by many other data communications services. One of the oldest is the telex system. This enables messages, typed on teletype terminals, to be automatically printed by distant teleprinters. Telex can only transmit simple text containing capital letters and punctuation marks. It is also slow- about 100 words per minute (see Fig. 8.3).

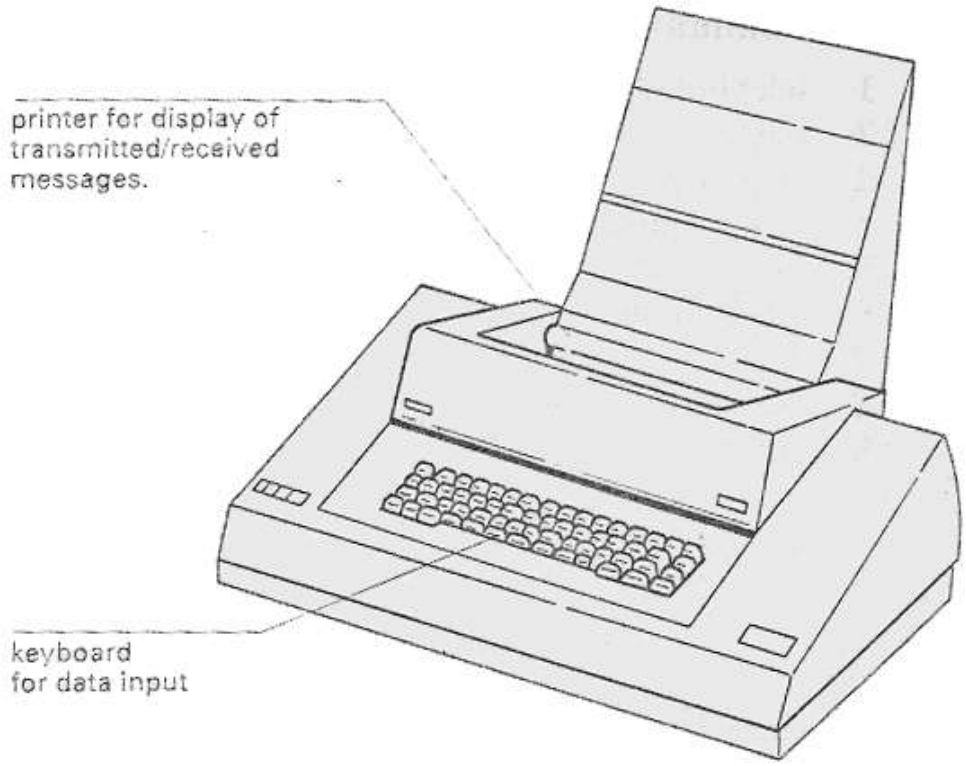


FIGURE 8.3: Example of a teleprinter or teletype terminal

A newer, more advanced telex system, known as teletex, is also available. This uses VDU terminals to transmit a variety of text and graphics characters. High quality formats can be used and it is much faster than telex, operating at speeds up to 2,600 words per minute(see Fig. 8.4)

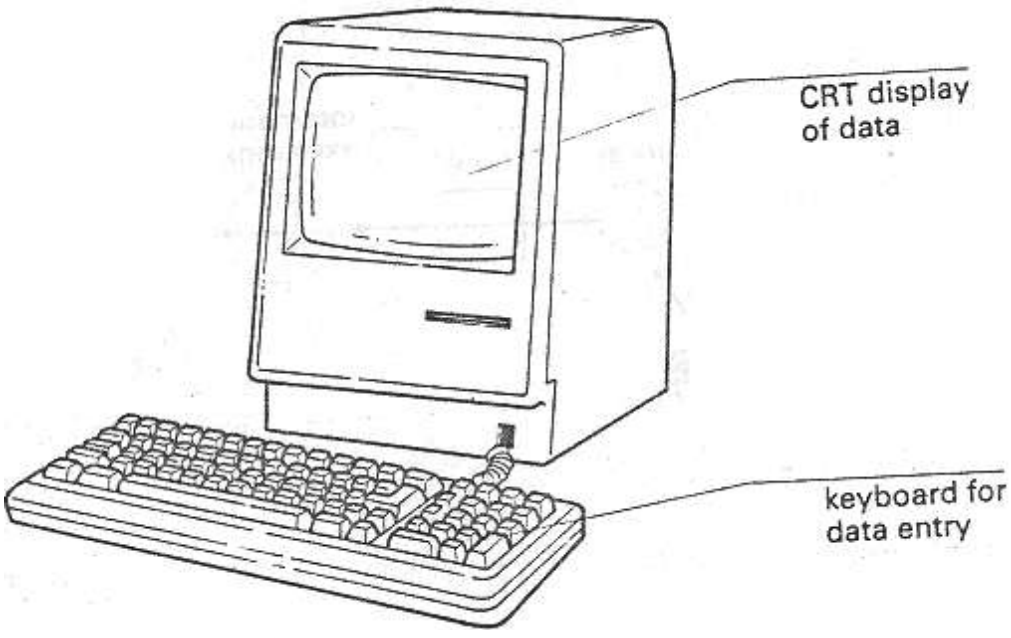


FIGURE 8.4: Example of a teletex

A facsimile (FAX) system allows the transmission of text, graphics and photographic images.

Contacting people on the move is possible using a radiopaging service. By carrying a small radio receiver called a radiopager, people can be contacted wherever they are. Keying their number in on a telephone causes the paper to beep. The person then goes to the nearest telephone to get in touch with the caller.

A telephone network can be used to connect personal computers to an electronic mail (email) system. Messages sent from a personal computer are stored on a central computer. Users can read and reply to these messages using their own computer.

Videotex or viewdata systems transmit pages of text and graphics through the PSTN to be displayed on a viewdata terminal or television screen. The date comes from a central computer. It is an interactive system, allowing the user to send messages back to the computer using a keyboard. The user can perform various tasks from home such as ordering goods and controlling bank accounts.

A similar data communications service, known as teletext, uses the television broadcasting system rather than the PSTN. Text and graphics are transmitted as part of the television video signal. The user can switch between pages on the screen using special keys on a remote control unit. Unlike viewdata, teletext is not interactive but does provide a similarly wide variety of useful information, such as news and travel information. Fig.4 shows a teletext screen.

An Integrated Services Digital Network (ISDN) is gradually being developed which uses telephone networks with microwave links and satellite communications to interconnect all types of data communications services throughout the world.

EXERCISE 1 ***Match these services with the given types of signals***

Communications service	Type of signal transmitted
1. telephone	**a.** high quality text, graphics characters
2. teletex	**b.** video, speech
3. viewdata	**c.** simple text, punctuation
4. radiopaging	**d.** messages
5. fax	**e.** radio signal, beep
6. videophone	**f.** text, graphics, photographic images
7. email	**g.** speech
8. teletext	**h.** interactive information, e.g. travel, shopping, banking
9. telex	**i.** general information, e.g. news, sports results

EXERCISE 2 ***Which type of communications service would best meet these needs?***

1. A travelling salesman whose office needs to contact him from time to time.
2. A company which wishes to hold a nationwide sales conference without bringing all its sales people to their headquarters.
3. Scientists in different universities who want to exchange ideas about their research.
4. A company which wishes to monitor and control its bank accounts without having to go to the bank every day.
5. Someone who wants instant access to sports results.
6. A reporter who wants to send a story to her newspaper from a remote location.
7. A police officer who wants to send a picture of a suspect as fast as possible to a police station at a distance.

8.5. VOCABULARY

Amount (n)	L- ợng
Analogue tone (n)	Tín hiệu t- ơng tự
Baud (n)	Đơn vị baud đo tốc độ truyền
Binary code (n)	Mã nhị phân
Bit (n)	Đơn vị bit/ giây
Body (n)	Tổ chức, trụ sở
Camera information (n)	Thấu kính camera
CCITT – Comite Consultatif International Telegraphique et Telephonique	ủy ban t- vấn điện thoại và điện toán quốc tế
Coaxial cable (n)	Cáp đồng trục
Copper braid (n)	Vỏ đồng
Data transmission (n)	Truyền tải dữ liệu
Document (n)	T- liệu, văn bản
Facsimile machine (FAX) Fax machine (n)	Máy fax
Heat sensitive paper (n)	Giấy cảm nhiệt
Image (n)	Hình ảnh
International exchange (n)	Tổng đài quốc tế
Local exchange (n)	Tổng đài địa ph- ơng
Manufacture (v)	Sản xuất, chế tạo
Manufacturer (n)	Nhà sản xuất
Microchip (n)	Vi mạch
Mike (n)	Microphone
Mirror (n)	Kính, g- ơng
Modem (n)	Bộ điều giải, modem
National exchange (n)	Tổng đài trong n- ớc, quốc gia
Original (n)	Sản phẩm gốc, ban đầu
Parallel wire (n)	Dây mắc song song

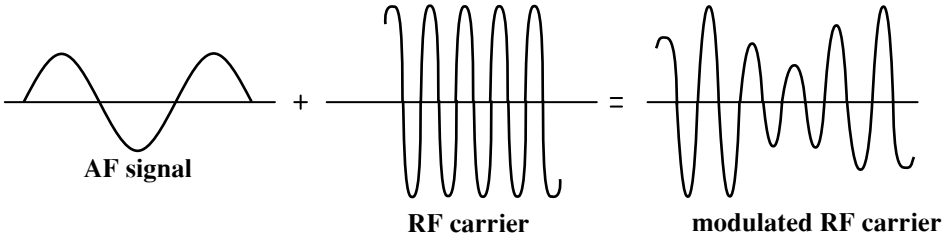
Phone call (n)	Cuộc gọi (điện thoại)
Pitch (n)	B- ớc sóng
Potentiometer (n)	Điện kế
Printer (n)	Máy in
Puff (n)	Viết tắt của Picofarad
Pure silicon fibre (n)	Sợi silic nguyên chất
Reduce (v)	Giảm, hạ xuống
Send (v)	Gửi
Standard (n)	Tiêu chuẩn
Technology (n)	Công nghệ
Telephone exchange (n)	Tổng đài điện thoại
Telephone line (n)	Đ- ờng dây điện thoại
Thermal head (n)	Đầu từ nhiệt
Waveguide (n)	Đ- ờng dẫn sóng
Widespread (adj)	Lan rộng, phổ biến, rộng rãi

SOME RELATED READING TEXTS

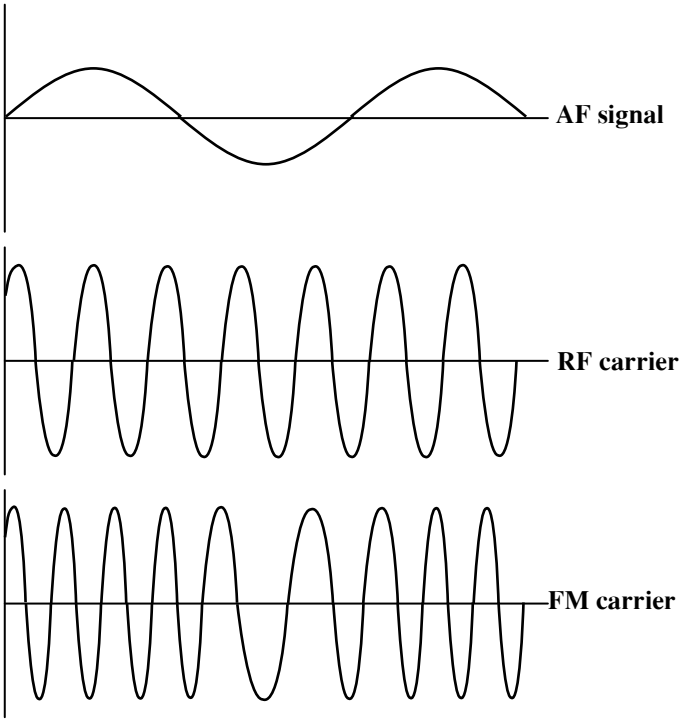
TEXT 1

RADIO

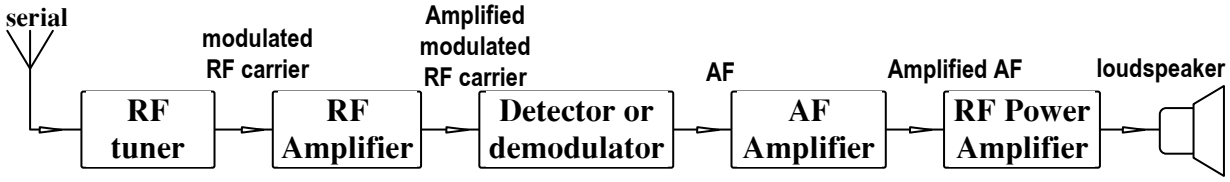
Radio frequency (RF) waves are used to carry audio frequency (AF) waves over long distances through the air. The audio signals can be combined with the RF carrier wave in such a way that it varies the amplitude of the carrier. This gives an amplitude-modulated (AM) carrier wave.



In a frequency - modulated (FM) *wave,* the audio signal is combined with the RF carrier wave to vary the frequency of the carrier.,

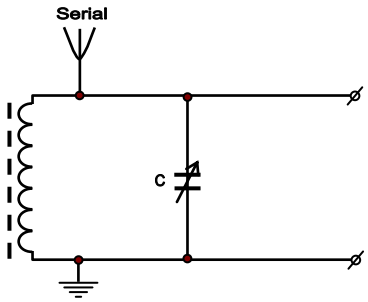


The block diagram of a radio is shown in Fig. 3 below. The tuner selects the required RF wave from those picked up by the aerial. The selected RF wave is amplified and passed to the detector, which separates. The audio modulation from the RF carrier wave. The audio frequency amplifier then amplifies the audio signal to make it strong enough to drive the loudspeaker.



Tuner

A typical radio tuner circuit consists of an inductor and capacitor connected in parallel. The size of the aerial inductance coil can be kept small by winding it on a ferrite rod core.



The RF Waves fed to the tuner cause the circuit to oscillate. The impedance of the circuit is smallest and the oscillator is greatest at a particular frequency known as the resonant frequency. This frequency is determined by the values of the inductance and the capacitance. By using a variable capacitor, the circuit can be tuned to the required radio frequency, and the selected RF wave passed on to the RF amplifier.

Exercise: Check the facts and ideas (True or False)

1. Audio frequency (AF) waves are carried over short distances through the air by radio frequency (RF) waves .

2. When the audio signal is combined with the RF carrier ,the frequency of the carrier is varied.

3. The detector separates the audio modulation from the AF carrier wave.

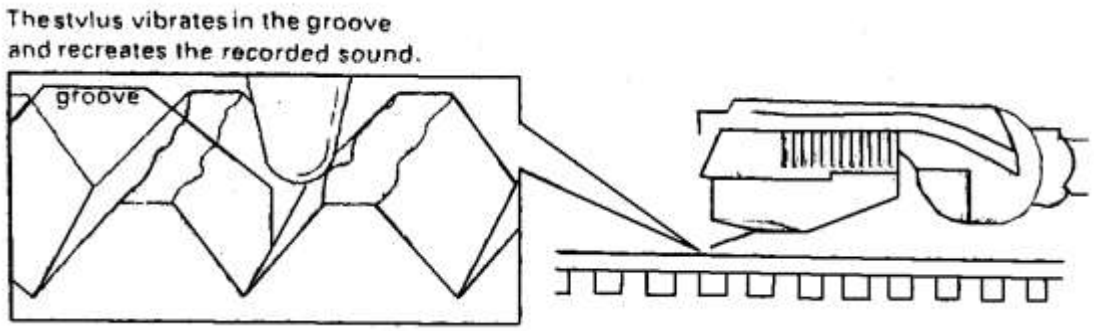
4. An inductor and capacitor in a typical radio tuner connected in parallel.

5. At a particular frequency ,the impedance of the circuit is greatest and the oscillator is smallest.

TEXT 2

AUDIO RECORDING SYSTEMS

For a long time hi-fi recordings have been produced on vinyl gramophone records. Records use an analogue recording system, which stores patterns by cutting a continuous groove in a vinyl disk. The shape of the sides of the groove represents the audio pattern. The sound can be reproduced by spinning the record and using the movement of a metal needle in the groove to produce varying magnetic fields (see the below Fig.). These magnetic Fields arc then processed to produce the sound. A typical LP (long-playing record) has a recording capacity of about 45 minutes.



A digital recording system, known as a compact disc (CD) system, was introduced in 1978. This uses a laser optical mechanism in which a laser beam reads marks on the surface of a specially prepared perspex disc.. It *gives* near-perfect reproduction of sound and the sound quality does riot deteriorate with use. Sonic of the problems associated with vinyl records are eliminated such as 'crackle' caused by dust and static, and 'jumping's due to scratches off the recording surface.

In a CD system, a recording is made by electronically sampling the sound 44,100 limes every second. The electronic samples are used to control a laser beam, which makes a pattern of very small pits in the surface of the perspex disc.

The audio pattern is represented by he length of the pits and he distance between them. The pits are arranged in circular tracks. A typical CD has about 20,000 circular tracks and a maximum recording capacity of 74 minutes.

To play back the recording, the disc is made to revolve at a constant speed and a laser beam is directed at its surface. The varying reflection of the laser beam is fed into a digital-to-analogue converter (DAC). This produces the electronic signals, which are amplified to drive a loudspeaker.

Exercise: Use the text above to complete this table of differences between LPs and CDs.

	LPs ----------	CDs----------
1. Recording system	Analogue	----------
2. Sound quality	poorer than the original	----------
3. Access	Serial	random
4. Audio pattern	----------	pits
5. Material	----------	Perspex
6. Playing mechanism	Mechanical	----------
7. Durability	easily damaged	----------
8. Size	12 inches	12 cm
9. Playing time	----------	----------

TEXT 3

VIDEO CASSETTE RECORDER

The step from recording sound on magnetic tape to doing the same with video signals is one of increased band width, early reel-to-reel machines used one-inch wide ipc and made the most of the available hand width by moving the tape pass the head at high speed. Unfortunately, this meant that the transport mechanism had to be built to a high specification.

Improvements in magnetic tape and the USC of helical scanning meant that far more data could be crammed into a smaller area. By spinning thc1head at a high speed, the rate a which the data could be stored or retrieved was increased. Aligning the head at an angle to the tape laid down the information as

a series of slaiicd tracks. This allowed the cassettes tape to be narrower and move at a slower speed, giving rise to the modern video cassette recorder.

Early VCRs were playback-only, but by building iii a full-colour TV tuner, programmes could be recorded from the air while another channel was being viewed on a normal TV. The inclusion of a tipier meant that recordings could be made and viewed at a later dale. Early timers only switched the (ape on at a certain time, leaving the VCR running until the tape finished. The latest machines allow a large number of on / ocr programmed times to be set so that viewers can go on holiday and not miss a single episode of their favourite soap opera.

Exercise: Checking the facts and ideas (True or False)

1. One-inch wide tape is used in early reel-to-reel machines.
2. The most of the available bandwidth was made by moving the tape pass the head at slow speed.
3. As a result of the improvements in magnetic tape and the use of helical scanning, far more data could be crammed into a smaller area.
4. As a result of. aligning the head at an angle to the tape, the cassette tape is narrower and moves at a higher speed.
5. Early timers turned the tape on at any time, leaving the VCR running until the tape finished.

TEXT 4

PROCESS CONTROL SYSTEMS

Control systems provide a means of replacing human operators in many industrial processes. They are widely used to monitor and control pressure, temperature, motor speed, the flow of liquid, or any other physical variable to be controlled, such as the air temperature in a factory or the pressure of a hydraulic system, must be measured. Then its vale must be compared with the desired value. Next, action has to be taken to reduce to zero the difference between the actual and desired value.

The basic components of a control system are an input transducer, an error sensor, a controller and an output transducer. The input transducer converts

changes in the physical variable into electrical signals. The transducer converts changes in pressure to frequency changes. Pressure changes move the diaphragm in or out, thus altering the position of the ferrite core which forms part of a tuned circuit. This causes the frequency of the circuit to change, thus altering the output frequency of the oscillator. The output is then fed to an error sensor.

The error sensor measures the deviation between the actual and desired values for the variable. The controller receives the error sensor output and uses it to control the variable either directly or indirectly. A simple controller is an electromagnetic relay which uses a small signal to control a much larger signal such as a power supply output.

The output transducer converts the electrical output from the controller into whatever form of energy is required to change the physical variable. It may be a valve, a heater, a motor or any electrically operated of equipment. An example is a motor-operated valve which controls the flow of fluid in a pipeline.
Let us take as an example a process system for controlling the speed of a DC motor. The input transducer measures the speed and converts it into a voltage. The error sensor compares this voltage with the voltage across a speed-setting potentionmeter. The error sensor output is fed to the controller which sends a signal to the power supply of the motor. This increases or reduces the supply of current to the motor, thus controlling its speed.

The operation of a process control system is a closed-loop system. In such a system the result of the action of the controller are constantly fed back to it.

Exercise: Answer the questions

1. What must a process control system be capable of doing?
2. Compare and input transducer with an output transducer.
3. What is the function of an error sensor?
4. What is a closed-loop system?
5. How does a control system provide a means of replacing human operators?

TEXT 5

PROPAGATION

A signal from a transmitter may be propagated in three ways; by ground waves, by space waves and by sky waves. Ground waves travel round the surface of the earth for short distances. As they travel, they lose energy. This loss of power, or attenuation, depends on the nature of the surface. Attenuation also varies with the frequency of the signal: the higher the frequency, the greater the ground wave attenuation. At frequencies above 20MHz the range is reduced to line of sight.

Propagation by space waves applies mainly to very high frequencies. Part of the transmitted signal travels in a direct line from transmitting antenna to receiving antenna. Partly the signal is reflected from the ground. The higher the frequency, the greater the possible ground wave reflection. The range of space wave propagation is restricted to approximately twice the direct optical path.

The range covered by ground waves and space waves is limited. Greater distances can be achieved using sky waves. Sky waves propagation depends on the ionosphere.

A signal transmitted from a point on the earth would not be received at another one because of the curvature of the earth if it were not for the ionosphere. This consists of a number of layers of ionized gas in the upper atmosphere. If a transmission is directed towards these layers it will be reflected back to earth.

Then wave may then be reflected back from the earth to the ionosphere. Indeed it may be carried right round the earth by successive reflections although it will lose power both in the earth and in the ionosphere at each bounce.

The bending effect of the ionosphere depends on the frequency of the signal and the angle of radiation. The higher the frequency, the less the bending. At a certain frequency, signals will pass straight through the layers and be lost in space. The smaller the angle of radiation, the greater the distance which can be covered in one reflection.

At any time there is a maximum usable frequency for transmissions from a given site over a particular path. This frequency depends on the state of the ionosphere which varies according to many factors including the time of day and the season of the year. The lower the frequency of a transmission, the greater the number of reflections needed to cover the required distance and hence the weaker the signal will be. For this reason, it is best to use a frequency as high as possible without exceeding the maximum usable frequency as this will cover the required distance with the smallest number of reflection and hence the least attenuation.

Exercise: Answer the following questions

1. List three types of propagation.
2. How do ground waves travel?
3. What is attenuation?
4. Name two factors which affect the attenuation of ground waves.
5. What frequencies are propagated by space waves?
6. Name two ways in which space ways travel.
7. What range has space waves?
8. What controls sky wave propagation?
9. What is the ionosphere?
10. How do sky waves cover great distances?
11. Name two factors which determine the bending effect of the ionosphere.
12. What is the maximum usable frequency?

TEXT 6

FROM CAMERA TO SCREEN

A television camera contains a lens system which is used to focus an image of the object on to the face of the camera tube. This tube contains a photo-cathode which emits electrons in response to light. The brighter the light from the image, the more electrons are emitted by the photo-cathode. In a black and white camera, the photo-cathode responds only to brightness, hence it is at this point that information on the color of the image is lost. The electrons from the cathode are now made to strike a target electrode causing some of its atoms to become positively charged.

The target electrode is scanned by an electron beam. The beam sweeps the target electrode in a series of closely spaced lines. There are 405 and 625 of these lines depending on the system used.

When the beam reaches the end of the top scan line, it is brought quickly back to the beginning of the next line which is slightly lower. This return is called fly back an is much quicker than a line scan.

The scanning beam loses electrons to the positively charged atoms on the target electrode and is thus changed or modulated. Its density is thus proportional to the light intensity of the original image. In this way the camera produces a continuous waveform which contains information on the brightness of the original image. This video waveform information added to it, sync pulses, to synchronize the start of each scanning line and frame.

The video signal is transmitted and received in a similar fashion to sound transmissions. After detection and amplification it is fed to the cathode of the crt in the television receiver thus controlling the intensity of the electron beam. The sync pulses ensure that the beam in the crt is in exactly the same position as the beam in the television camera. The beam is made to move sideways and progressively downwards matching line by line the scanning of the television camera. As the electron beam strikes the television screen, the phosphor coating on the screen emits light. This light varies in whiteness according to the

brightness of the original image. Because the line by line built up the picture takes place so quickly, the eye sees only a complete picture of the object in front of the television camera.

Exercise: Answer the questions

1. What part of the camera tube is scanned?
2. Why is the color information lost?
3. What two type of information does the video waveform carry?
4. What is the function of the sync pulses?

TEXT 7

CAREERS IN ELECTRONICS

1. Manufacturing

Manufacturing includes making anything from individual components or printed circuit boards to complete pieces of equipment such as televisions. In the case of the latter, it is usual to break down the equipment into modules and manufacturing these separately. For example, television sets are manufactured in this way with each set consist of up to seven individual modules. When the modules come off the assembly, they are passed to groups of testers and troubleshooters to check for faults. The various modules are then assembled to produce the complete unit. The disadvantage of this kind of work is the monotony and the time pressure of assembly line work.

2. Planning

Firms with large communications networks require planners. For example, telecommunications network providers need to know where to place exchanges for maximum switching capability, and microwave towers for minimum interference. They also need to know the sizes of cables to handle traffic growth.

Rapidly springing up everywhere from a number of different suppliers are the radio mobile, cellular, and paging networks. All these require careful planning and field surveys to prevent mutual interference. Job opportunities will grow in this sector.

3. Installation

There is a wide range of installation work required, for example, installing exchanges, LANs, and medical equipment. Such work involves cabling and may require some knowledge of mechanical engineering if special racks and even entire rooms have to be constructed to accommodate equipment. Installation work usually involves travel which can be overseas depending on the product involved.

4. Commissioning

Once equipment is installed, it needs to be commissioned, i.e. put into operation. Problems often emerge at this stage which have to be ironed out. This work is usually done by engineers with long experience in the type of equipment being commissioned.

5. Maintenance

As electronic equipment has become more complex, so maintenance technicians have become more specialized. For instance, technicians who used to service both radio and television may now specialize in either radio and audio equipment or television sets and video recorders. Similarly, technicians now specialize in servicing computers, telecommunications equipment, industrial robots, and so on. Testing and fault-finding equipment has become more sophisticated. Oscilloscopes are commonplace on workbenches, and programmable analysers are available for carrying out a full rage of diagnostic tests on particular types of equipment. Although these save a great deal of time, they can make the work of the service technician less challenging. Service men and women are always in demand.

6. Sales

Sales staff too requires specialist knowledge – not so much of how the equipment works, but what it is capable of the differences between similar types of equipment. They also have to know the advantages of their company's products over those of their rivals. Although selling ability is more important

than technical expertise, it is not unusual for service technicians to transfer to sales.

Most salespeople work on a commission basis. In addition, they usually have use for a company car. They can earn high salaries and are crucial to the success of a company. Selling usually involves a great deal of travel and can be stressful.

7. Teaching

Colleges and universities employ substantial numbers of graduates in electronics. Colleges prefer teaching staff who also has experience in industry or business. Universities look for teaching staff with research experience. Salaries in education tend to be lower than in industry.

Technicians are also employed in educational institutes in laboratories and workshops to assist with research and to provide maintenance.

8. Research and development

Large companies run their own R&D departments. Exciting opportunities exist for creative engineers in the design and testing of new products. Such opportunities are limited. Most R&D work is carried out at the company's headquarters. Many electronic companies are multinational, so the R&D work may not be done in the country where the product is assembled.

Exercise: Answer the questions

1. What does manufacturing include?
2. Why do different suppliers require careful planning and field surveys?
3. What does installation work usually involve?
4. When maintenance technicians have become more specialized?
5. Why can most salespeople earn high salaries?
6. What do colleges prefer teaching staff?
7. Where is most R&D work carried out?

KEY TO EXERCISES

UNIT 1 : Conductors, insulators and semiconductors

1.1. READING COMPREHENSION

EXERCISE 1

1. - Conductors are substances which provide an easy path for an electric current.

- Insulators are materials which does not easily release electrons.

- Semiconductors are midway between conductors and insulators.

2. It is the movement of free electrons towards the positive end.

3. It is used for cables.

4. No, they aren't. Because some insulators will allow some flow of electrons but the flow they permit is so small.

5. They are mixtures of metallic oxides.

EXERCISE 2

1. B 2. B 3. C 4. A

EXERCISE 3

1. F 4. T 6. F

2. T 5. T 7. T

3. F

EXERCISE 4

1. The movement of free electrons is an electric current.

2. Materials in the first category are called conductors.

3. Substances which provide a path for an electric current are conductors.

4. All insulators allow some flow of electrons.

5. Germanium sometimes behaves as an insulator and sometimes as a conductor.

1.2. USE OF LANGUAGE

1.2.1. Describing shapes

EXERCISE

1. a circle capacitor
2. a T-shaped/ U-shaped/ E-shaped/ I-shaped transformer laminations
3. a tube capacitor
4. a U-shaped magnet
5. a tube cable conduct
6. a rectangle carbon brush
7. a rectangle capacitor
8. a tube resistor

1.2.2. Describing position and connection

EXERCISE

1. The bulbs are *connected across* the battery.
2. The core is *located within* the pole pieces.
3. The 27pF capacitor is *connected between* the collector and the base.
4. The antenna is *connected to* the coil.
5. Feedback voltage is *applied to* the base of the transistor through C_1.
6. The rotor is *mounted on* the shaft.
7. The coil is *wound round* an iron core.
8. The negative pole of the battery is *wired to* earth.

1.2.3. Relative clause

EXERCISE

1. The coil is connected in series with a resistor which has a value of 240 ohms.
2. The supply is fed to a distribution substation where the supply is reduced to 41V.
3. Workers who assemble very small precision instruments require a high degree of illumination.
4. Mangarin is a metal which has a comparatively high resistance.
5. The signal which is rectified by the detector passes to the detector.
6. A milliammeter is an instrument which is used for measuring small currents.
7. Workers who assemble heavy machinery require illumination of 300 lux.
8. Armoured cables are used in places where there is risk of mechanical damage.
9. A simple circuit breaker consists of a solenoid and a switch with contacts which are held closed by a latch.

10. This latch releases the switch contacts which are pulled apart by a spring.

1.2.4. Reason and result connectives (because, because of, therefore)

EXERCISE

1. Soft iron is used in electromagnets because iron can be magnetized easily.
2. The voltage is 250V and the current 5A, therefore the resistance is 50Ω.
3. Pvc is used to cover cables because pvc is a good insulator.
4.Transistors can be damaged by heat, therefore care must be taken when soldering transistors.
5. Capacitance is usually measured in microfarads or picofarads because the farad is too large a unit.
6.Output transistors are mounted on a heat sink because output transistors generate heat.
7. It is to control the speed of Dc motors because Dc motors are used when variable speeds are required.
8.A cathode-ray tube screen glows when an electron beam strikes it because the screen is coated with a phosphor.

1.2.5. Pronoun links between sentences (it, they, them, this, that…)

EXERCISE

2. The transformer consists of primary coils and a secondary coil. They are insulated and wound round a former.
3. The coils are insulated and wound round a former. They have a core of soft iron on which the former is mounted.
4. The coils have a core of soft iron on which the former is mounted. It is made from many thin sheets or laminations.
5. The sheets are oxidized so that they are insulated from each other.
6. The sheets are oxidized. Oxidizing them reduces eddy losses.

1.3. WRITING

EXERCISE

2. Ensure that the correct polarity is observed and good connections are made.

3. Then switched on the charger.

4. Switch off the charger when the battery has been fully charged.

5. Check the specific gravity of a sample cell .

6. Replace the filler plugs and leave the battery to cool before use.

1.4. FURTHER READING

EXERCISE 1

1. Lead at very low temperatures

2. When they are at very low temperatures

3. They are limited because of very low temperatures required.

4. Applications of the memory cells of computers

5. They could store information indefinitely..

6. The resistance of the windings would be zero and they would be almost ideal

EXERCISE 2

1. lead
2. very low temperatures
3. very low temperatures required
4. in the memory cells of computers
5. indefinitely
6. almost ideal

UNIT 2: Circuit elements

2.1. READING COMPREHENSION

EXERCISE 1

1. It is a path for current to follow.

2. It contains 4 elements: a source, a load, a transmission system and a control

3. It converts the electrical energy from the source into some other form of energy

4. It is an electric cell which converts sunlight into electrical energy

EXERCISE 2

1. C 2. A 3. A 4. A

EXERCISE 3

1. T
2. T
3. T
4. F
5. T
6. T
7. F
8. T
9. F

EXERCISE 4

1. A lamp *changes* electrical energy into light.
2. The generator *supplies* the circuit with electromotive force.
3. The metal *chassis* of the oscilloscope is part of its transmission system.
4. The rheostat *regulates* the current flow in the circuit.
5. A battery of solar cells *provides* power to the circuit.

2.2. USE OF LANGUAGE AND PRACTICE

2.2.1. Describing function

EXERCISE

2-a: A capacitor adds capacitance to a circuit.

3-h: A variable resistor transforms ac voltages.

4-j: A variable capacitor selects a frequency.

5-g: A transformer varies the current in a circuit.

6-f: A fuse protects a circuit.

7-e: A switch breaks a circuit.

8-d: A milliammeter measures very small currents.

9-b: A diode rectifies alternating currents.

10-i: An antenna receives rf signals.

2.2.2. Describing purpose

EXERCISE 1

2. A soldering iron is for soldering connections.
3. A milliammeter is used for measuring very small current.
4. An oscilloscope is used for showing variations in electrical current.
5. A heat sink is used to reduce heat.
6. We cut wires with wire-clippers.
7. We measure very high resistance using a megohmmeter.
8. We measure resistance with a ohmmeter.
9. A signal generator is used to generate signals.
10. We charge batteries using a battery charger.

EXERCISE 2

1. The focus focuses the electric lens by altering the biasing of the X amplifier.
2. The brightness varies the intensity of the beam by varying a resistor in the timebase oscillator.
3. The X shift alters the gain of the Y amplifier, thereby moving the trace along the X axis.
4. The Y shift alters the biasing of the Y amplifier, thereby moving the trace along the Y axis.
5. The coarse frequency selects the appoximate time base frequency by varying the potential on anode.
6. The fine frequency adjust the timebase frequency by varying the negative potential on the grid.
7. The Y ganin selects a capacitor in the timebase oscillator, thereby controlling the signal amplification.

2.2.3. Qualification (however, but, although)

EXERCISE 1

2 - d. In an ideal transformer there would be no loss, but in practice there is always some loss.

3 - e. Although moving – iron meters can measure a voltages without a rectifier, moving – coil meters with rectifiers are preferred.

4 - b. Resistors usually have a tolerance of or 10%; however, for professional work a tolerance of 1 or 2% is required.

5 - a. Semiconductors have replaced valves in most applications, but valves are still used in large transmitters.

EXERCISE 2

2-d-1. In an ideal transformer there would be no loss, but in practice there is always some loss because of the resistance of the windings.

3-e-4. Although moving – iron meters can measure a voltages without a rectifier, moving – coil meters with rectifiers are preferred because of the very high powers required.

4-b-3. Resistors usually have a tolerance of or 10%; however, for professional work a tolerance of 1 or 2% is required because higher standards of accuracy are needed.

5-a-5. Semiconductors have replaced valves in most applications, but valves are still used in large transmitters because they do not absorb so much power from the circuit.

2.3. WRITING

EXERCISE 1

1. A generator is a device which converts mechanical energy into electrical energy.
2. An insulator is a material which does not readily release electrons.
3. An alternating current is a current which flows first in one direction, then in the other.
4. A direct current is a current which flows in one direction only.
5. A resistor is a device which impedes the flow of current in a circuit.
6. A conductor is a material which readily releases electrons.
7. A light meter is an instrument which measures light.
8. An ammeter is an instrument which measures current.

EXERCISE 2

2. which is known as the hinged armature relay
3. which is also made of soft iron.
4.which are mounted on the body of the relay.
5. which are often made of platinum

EXERCISE 3

1. A resistor is a device which is used to add resistance to a circuit.
2. Both fixed and variable resistors are made.
3. Most resistors are made from either resistance wire or compressed graphite.
4. Wire sound resistors consist of a coil of resistance wire such as nichrome which is wound on a former.
5. A ceramic coating is applied over the winding to insulate the winding.

6. For small currents, carbon resistors are used, for example, in radio work.
7. Carbon resistors are made of compressed graphite which is formed into small tubes.
8. Connections are made with wires which are attached to the end of the resistor.
9. Variable resistors may have either a coil of resistance wire or a carbon track.
10. The wire or track is mounted so that a sliding contact can rub over it to select the resistance required.

2.4. FURTHER READING

EXERCISE 1

1. It does not require burning fuel.
2. It makes use of the principle that when a conductor cuts a magnetic field, a current flows through the conductor.
3. The conductor is an ionized gas.
4. The gas is seeded, then pumped at a high temperature and pressure through a strong magnetic field.
5. The open-cycle and the closed-cycle.
6. In the open-cycle method the hot gas is discharged. In the closed-cycle method it is recirculated.
7. The efficiency rate of MHD generation is 60% compared with a maximum of 40% from conventional power stations.

EXERCISE 2

1. fuel
2. when a conductor cuts a magnetic field, a current flows through the conductor
3. small amounts of metal
4. through a strong magnetic field
5. the open-cycle and the closed-system
6. being allowed to escape
7. the gas is circulated continually through the MHD generator
8. 60%
9. maximum of 40%

UNIT 3: The DC motor

3.1. READING COMPREHENSION

EXERCISE 1

1. It is used for converting electrical energy into mechanical energy.
2. Its most important parts are the rotor, the stator and the brush gear.
3. It contains an armature and a commutator. An armature is a set of wire loops wound on a steel core. A commutator consists a number of copper segments insulated from one another.
4. It consists of magnetic and electrical conductors. The magnetic circuit is made up of the frames and the poles. Wound round the poles are the field coils. These form of the stator's electrical circuit.
5. The rotor is the moving part, but the stator does not move.
6. The motor operates on the principle that when a current-carrying conductor is placed in a magnetic field, a force is produced on the conductor.

EXERCISE 2

1. B 2. B 3. A 4. A

EXERCISE 3

1. rotor
2. stator
3. armature
4. windings
5. wire loops
6. shaft
7. frames
8. field coils

3. 2. USE OF LANGUAGE AND PRACTICE

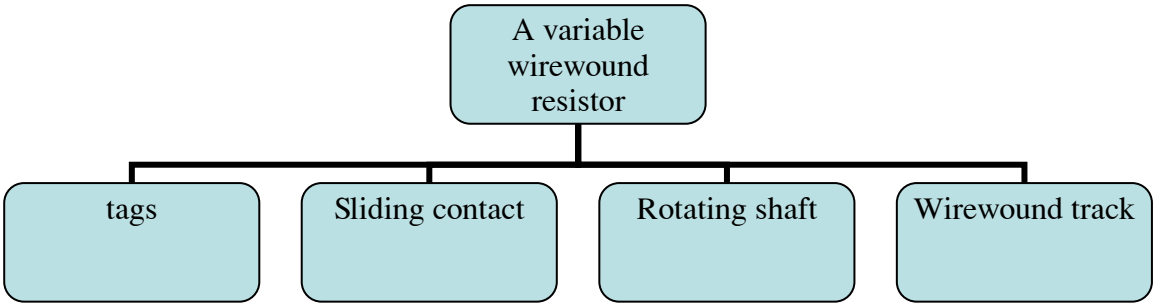
3.2.1. Describing the parts

EXERCISE 1

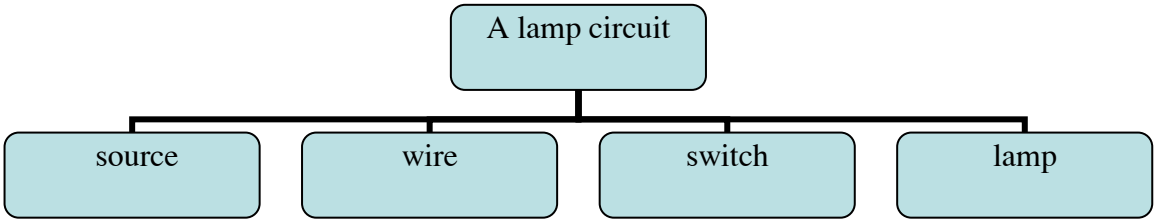
2. primary coil
3. secondary coil
4. I-shaped laminations
5. E-shaped laminations
6. T-shaped laminations
7. U-shaped laminations

EXERCISE 2

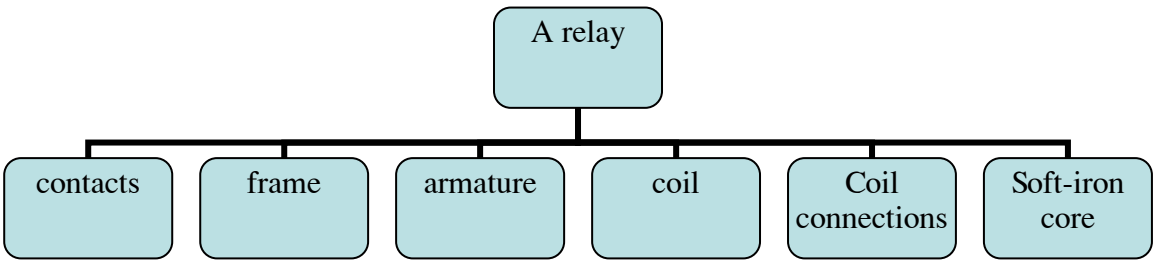
1.



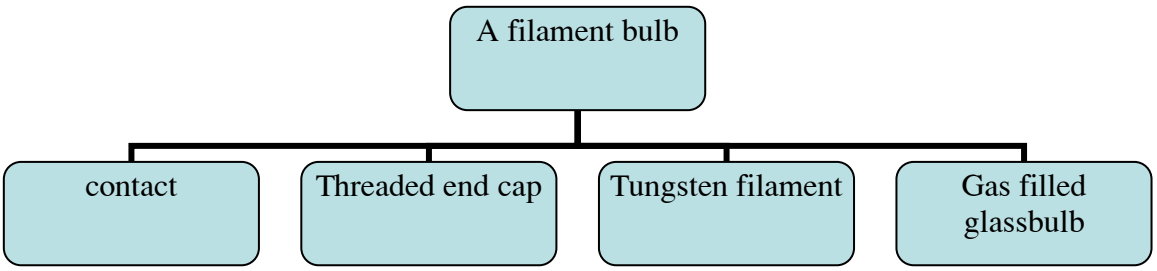
2.



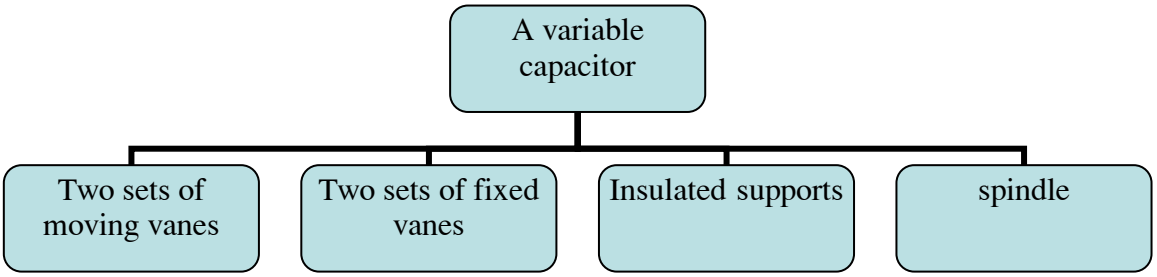
3.



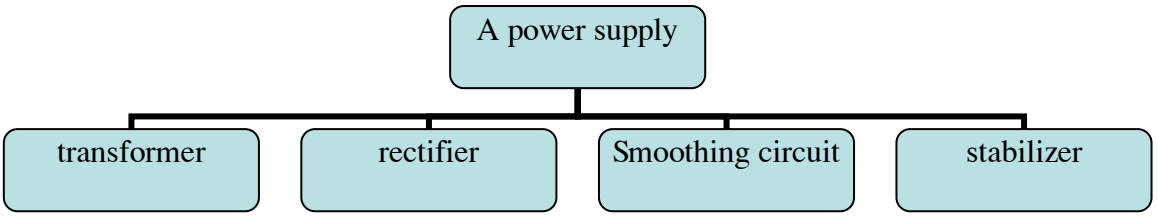
4.


A filament bulb
contact
Threaded end cap
Tungsten filament
Gas filled glassbulb

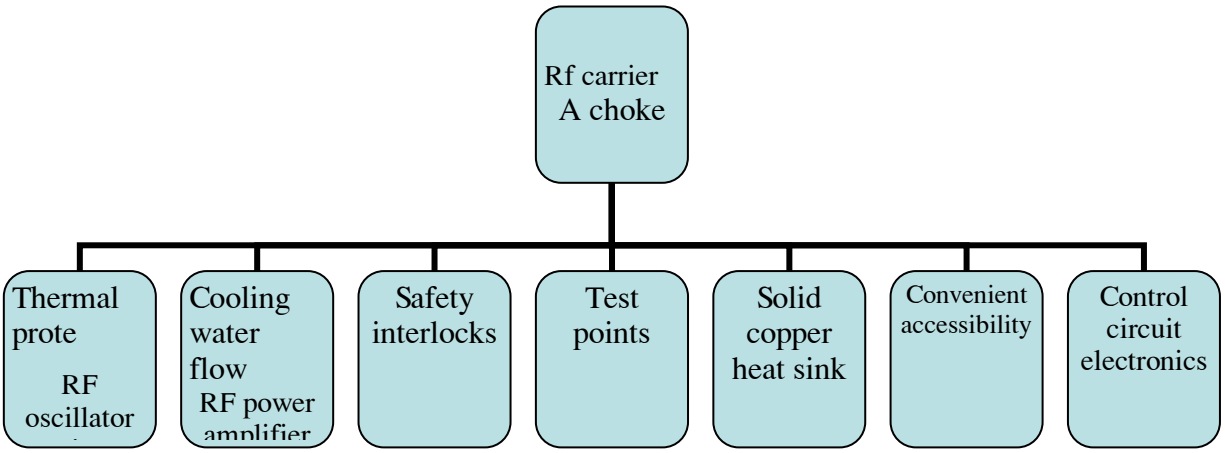
5.


A variable capacitor
Two sets of moving vanes
Two sets of fixed vanes
Insulated supports
spindle

6.


A power supply
transformer
rectifier
Smoothing circuit
stabilizer

7.


Rf carrier
A choke
Thermal prote
RF oscillator
Cooling water flow
RF power amplifier
Safety interlocks
Test points
Solid copper heat sink
Convenient accessibility
Control circuit electronics

3.2.2. Expressing an advice and an emphasis

EXERCISE

1. Heat shunts must be used when soldering.
2. Transistors shouldn't be connected or disconnected with the power on.
3. An ohmmeter mustn't be used for checking transistors unless a safe voltage or current range is used.
4. Sharp bends must be kept in the leads at least 1-5 mm away from the transistor body.
5. The reverse breakdown voltage shouldn't be exceeded.

3.2.3. Relative clause with preposition

EXERCISE

1. The range over which the meter can operate is 0-1000 volts.
2. A battery is a device which changes chemical energy into electrical energy.
3. Power supplies which use thyristor rectifiers are used to drive DC motors.
4. The capacitor through which the signal is passed has a value of 27pF.
5. The telephone is a device which uses the magnetic effect of a current.
6. The headphones with which the receiver can only be used have a high impedence.
7. The plates between which the beam passes are known as X and Y plates.
8. The rotor contains a commutator which acts as a switch.

3.2.4. Linking words of cause and result

EXERCISE

2. Alternators are preferred to dynamos for cars since alternators give higher outputs at low speeds.
3. Dirt and dust reduce effective light, for this reason lamps must be kept clean.
4. Squirrel cage motors are simple, cheap and strong, consequently, squirrel cage motors are used for many general duties.
5. It is convenient to describe magnetic lines of force, but in reality magnetic lines of force do not exist.

6. Transistorized equipment is easily portable as transistors can operate from battery voltages.

7. Ultrasonic welding is better than heat welding for the reason that the materials are not distorted.

8. Watchmakers work with very small parts, hence, watchmakers require a lot of light.

3.3. WRITING

EXERCISE 1

2. join input terminals together

3. connect to one terminal of the megohmmeter

4. connect the other lead of the megohmmeter to the motor frame

6. test the starter

7. test the motor

8. test the brushgear

EXERCISE 2

2. A carbon rod which is in the centre of the cell forms the positive electrode.

3. The space between the zinc case and the carbon rod is filled with a paste of ammonium chloride which is used as an electrolyte.

4. The electrolyte is called a dry cell, because it is a paste and not a liquid.

5. The paste also contains manganese dioxide which prevents gas being formed.

6. The cell is sealed with a cap made of metal or plastic to prevent the paste coming out.

7. A small space is left below the cap so that gas formed by the cell can collect there.

8. Dry cells are usually enclosed in a cardboard case with an additional metal jacket to make the cell leakproof.

9. Leakproof cells are often prefered because the electrolyte cannot leak out and the cell ages.

10. Leaking electrolyte may damage the equipment in which the cells are installed.

3.4. FURTHER READING

EXERCISE 1

The effects of an electric current

EXERCISE 2

1. luminous
2. chemical
3. essential
4. filament bulb
5. ionized gas
6. electronlysis
7. added
8. magnetize magnetic materials
9. transformer
10. exert a force

UNIT 4: The cathode ray tube

4.1. READING COMPREHENSION

EXERCISE 1

1. Because it shows the wave form of the signal
2. A cathode
3. It forms the electron gun into a beam
4. By varying the negative potential on the grid
5. It focuses the beam on the screen as a small dot
6. Because they are nearer the anodes and have greater effect on the beam
7. It controls the time
8. Because the output from a timebase oscillator is applied across X plates as a means of moving the beam horizontally at regular intervals

EXERCISE 2

1. A	2. B	3. C	4. A

EXERCISE 3

1. F	3. T	5. T
2. T	4. F	

EXERCISE 4

1. B	3. A	5. A
2. C	4. B	6. A

4.2. USE OF LANGUAGE

4.2.1. Writing instructions as explanations

EXERCISE

2. The resistor flat is pulled against the board and the leads are bended back.
3. The first lead is heated with a soldering iron and solder is applied to the heated lead.
4. Solder is heated and applied to the second lead.
5. The soldered joints are allowed to cool.
6. The leads are trimmed using wire clippers.

4.2.2. Describing sequence: sequence - words

EXERCISE 1

Next, the resistor flat is pulled against the board and the leads are bended back. Then, the first lead is heated with a soldering iron and solder is applied to the heated lead. After that, solder is heated and applied to the second lead. Then, the soldered joints are allowed to cool. Finally, the leads are trimmed using wire clippers.

EXERCISE 2

In the UK, electrical energy is generated at power stations at 25KV. First, it is stepped up by a transformer to 132, 275 or 400KV for long-distance distribution. Then, it passes via the switching compound to the grid. Next, it is distributed via the grid system to main grid supply points where it is stepped down to 33KV for distribution to heavy industry. After that, it is distributed via overhead or underground cables to intermediate substations where it is further reduced to 11KV for light industry. Then, it is fed to distribution substation where it is reduced to 415V,3 phrase and 240V,1 phrase. Finally, it is distributed to the domestic consumer.

4.2.3. Short relative clause

EXERCISE

1. In Britain electrical energy generated in power stations is fed to the National Grid.
2. The energy passes through a transformer which steps up the voltage to 123,275 or 400kV.
3. The transmission lines carrying the supply are usually arranged in groups of three overhead conductors suspended from porcelain insulators.
4. Energy from power stations located in built-up areas may be fed to the Grid by underground cables.
5. For voltages up to 400kV cables which contain oil under low pressure are used.

4.2.4. Reinforcement connectives

EXERCISE

1. Semiconductors are used in preference to valves because they are cheaper than valves. In addition, they are much smaller and lighter.

2. Dc motors are preferred for cranes because they permit powerful dynamic barking. In addtion, they allow a wide range of speed variation.

3. Dielectric heating rather than conduction heating is used in plywood production because it is even. In addtion, it is faster and cheaper.

4. (a) Fluorescent lamps are better than filament lamps because the light is closer to daylight. In addtion, the heat from fluorescent lamp is much less than from filament lamps.

4.3. WRITING

EXERCISE 1

1. it is robust and versatile
2. the frequency range is limited on ac
3. the frequency range is wide
4. has a non-linear scale
5. gives information about wave form and frequency
6. they are expensive

EXERCISE 2

1. It consists of a transmitter and a receiver.
2. It comprises an oscillator, a power amplifier and a transmitting antenna.
3. It includes a receiving antenna, a radio frequency amplifier, a detector, a comparator and an indicator.
4. It is generated in the oscillator.
5. It is amplified.
6. It is radiated through the transmitting antenna.
7. The receiving antenna.
8. It is then fed to the radio frequency amplifier.
9. The signal is amplified.
10. It is fed to the detector.
11. The received signal is compared with a reference signal from the transmitter.

12. They are displayed.

EXERCISE 3

A simple radar consists of a transmitter and a receiver. A transmitter comprises an oscillator, a power amplifier and a transmitting antenna. A receiver includes a receiving antenna, a radio frequency amplifier, a detector, a comparator and an indicator. The signal is generated in the oscillator, then it is amplified and radiated through the transmitting antenna. If the target is hit, a weak reflected signal is received by the receiving antenna. Then the signal is amplified in the radio frequency and rectified by the detector. In the comparator, the received signal is compared with a reference signal from the transmitter. Finally, both signals are displayed.

4.4. FURTHER READING

EXERCISE 1

The method of dielectric heating

EXERCISE 2

1. a non-conducting material
2. considerable heat
3. rapid
4. uniform
5. woodworking
6. food industries
7. not uniform
8. unevenly dry
9. it heats uniformly
10. it dries evenly

UNIT 5: Electronics in the home

5.1. READING COMPREHENSION

EXERCISE 1

1. radios, televisions and record players
2. Hi-fi units and portable radios did.
3. ICs on silicon chips were.
4. They are found in digital alarm clocks, water heaters, electric cookers and microwave oven.
5. Multimedia entertainment systems and computer-controlled robots are.

EXERCISE 2

1. F 2. F 3. F 4. F 5. F

EXERCISE 3

1. electronics
2. vacuum tube
3. 1948
4. hi-fi units
5. development of ICs on silicon chips
6. automatic machines
7. computer-controlled robots

5.2. USE OF LANGUAGE

EXERCISE 1

2. Electronics is used by telephones to provide automatic dialing and answer phone facilites.
3. Cookers are cleaned twice a week.
4. A lot of dishwashers have been produced since 1995.
5. A robot is going to be designed next year.

EXERCISE 2

1. The detector is connected to the AF amplifier.
2. The AF amplifier is linked to the volume control.
3. The volume control is connected to the power amplifier.
4. The power amplifier is connected to the speaker.

5.3. WRITING

EXERCISE

1. consists
2. modulator
3. oscillator
4. carrier
5. amplifier
6. signal
7. power
8. microphone

5.4. FURTHER READING

EXERCISE 1

Battery and types of battery

EXERCISE 2

1. D 2. D 3. B 4. C 5. D

UNIT 6: Semiconductor diodes

6.1. READING COMPREHENSION

EXERCISE 1

1. A 2. B 3. B 4. B 5. A

EXERCISE 2

1. The source is connected with the positive to the p-side and the negative to the n-side.
2. With forward bias, the current at first increases slowly.
3. The diode is then a good conductor.
4. When the diode is reverse biased, there is almost no current flow.
5. This leakage current remains substantially constant until what is known as breakdown.

EXERCISE 3

1. across a silicon pn junction diode
2. the current rises rapidly
3. a point will be reached where the diode is destroyed by heat
4. this leakage current changes
5. a large increase in current

EXERCISE 4

1. T 2. T 3. F 4. T 5. T

6.2. USE OF LANGUAGE

EXERCISE

1. As the voltage increases, the current increases.
2. The current continues to rise until the diode is destroyed by heat.
3. When a reserved voltage is applied, very little current flows.
4. After the signal is rectified, the signal is amplified.
5. The leakage current remains constant until the breakdown voltage is reached.
6. When the applied voltage reaches about 600mV, the current rises rapidly.
7. The magnetizing current is increased until saturation point is reached.
8. As the current drawn by the load increases, the current in the Zener decreases.

6.3. WRITING

EXERCISE

2-b. When a current flows through the filament of a light bulb, it gives off light because the filament becomes incandescent.

3-h. The value of a resistor can be calculated from the color bands on the body by determining the value of a resistor.

4-g. Manganin wire is used for the elements of an electric wire because of a higher resistance than most metals.

5-c. Sensitive equipment is protected by fuses so that the equipment is not damaged by excess current.

6-d. Light bulbs may contain rare gases to prevent the filament burning up.

7-a. Curved bulbs may contain rare gases to help form a radial magnetic field.

8-e. When a relay is energized, sets of contacts are pushed together or apart by means of a moving armature which controls the contacts.

6.4. FURTHER READING

EXERCISE 1

1. Modulation is changing radio waves.
2. Amplitude, frequency and phase can.
3. Because in frequency modulation, the amplitude of the carrier wave is kept constant.

EXERCISE 2

1. lines 21 – 22
2. lines 4 – 7
3. lines 12 – 14
4. lines 28 – 33
5. lines 8 – 9
6. lines 1 – 2
7. lines 15 - 16
8. lines 2 - 5
9. lines 23 – 26
10. lines 9 - 11

EXERCISE 3

No information can be communicated by radio waves without modulating them. Stopping and starting the wave is the simplest method of modulation. Audio frequencies cannot be transmitted. The carrier wave is demodulated by the receiver and the audio-frequency signal recovered. Audio frequencies can be used to modulate high frequency radio waves which can then act as carriers of the audio-frequency signals. The amplitude, frequency and phase of a wave can be modulated. In am the amplitude of the carrier wave is modulated according to the amplitude of the modulating signals. In fm frequency of the carrier wave is modulated according to the amplitude of the modulating signal. Fm is better than am because there is less interference. Fm broadcasts are in the vhf band partly because fm stations require greater spacing.

UNIT 7: High definition television

7.1. READING COMPREHENSION

EXERCISE 1 (suggestions)

1. I watch TV 7 hours each week.
2. I watch TV in the evening.
3. I watch films.
4. I watch HBO the most and TV5 the least.
5. I think the quality of TV will be better in the future.

EXERCISE 2

Feature	Existing	High definition
No. of lines	625	1.250
Images	less realistic	more realistic
number of dots	120,000	480,000
width/ height ratio	4:3	16:9
optimal viewing distance	7 times the height of the screen	3 times the height of the screen
viewing range	10^o	30^o

EXERCISE 3

1. F 2. T 3. F 4. T 5. T

EXERCISE 4

1. Picture quality is excellent, crisp, and without flicker, as good as those we are used to seeing in the cinema. Sound quality is too superb, thanks to digital multitrack transmissions.

2. In Europe, it is called HDTV. In the USA, it is call Hi-Vision.

3. Because the picture is displayed using more lines per frame.

4. A computer can.

5. Since not everyone is convinced of the need for such high quality TV systems.

7.2. USE OF LANGUAGE

EXERCISE

1. It is unlikely that vinyl records will not be made.

2. It is unlikely that ordinary audio cassettes will not be made.

3. It is certain that most families in my country will have CD player.

4. It is unlikely that most families in my country will have MD player. It is possible that some families will have it.

5. It is unlikely that most families in my country will have DCC player. It is possible that some families will have it.

6. It is improbable that computers will understand and respond to my spoken language.

7. It is possible that cars will be electronically guided through cities.

8. It is possible that most teaching will be done by computer.

9. It is unlikely that no manual labour will be done in factories in my country.

10. It is unlikely that most families in my country will have HDTVs. It is possible that some families will have them.

7.3. WRITING

EXERCISE

2.The spot strikes the television screen and the phosphor coating on the screen emits light which varies in brightness according to the intensity of the original image.

3.When the spot reaches the right side of the screen, it is blanked and moved rapidly back to the left side in a movement called flyback.

4.The present European system sweeps the screen in a series of lines where there are 625 closely-spaced lines to ensure a good quality picture.

5.The movement across the screen is controlled by the line scan signal and the movement down the screen is controlled by the field scan signal.

6.The scan rate must be greater than 40Hz because a lower scan rate would cause the screen to flicker.

7. Sync pulses are added to the video signal to ensure that the TV camera and TV receiver start a new line and frame at the same time.

8.The build-up of the screen happens so quickly that the eye sees only a complete picture.

7.4. FURTHER READING

EXERCISE

1. The line scan signal does.

2. Flyback is.

3. 625 lines are.

4. The screen flickers.

UNIT 8: Data transmission

8.1. READING COMPREHENSION

EXERCISE 1

1. Fax machines are linked to a telephone line.
2. A fluorescent lamp reflects the image on to a series of mirrors which reduce its size so that the whole document can be reflected on to a camera lens.
3. Information in form of analogue tones is.
4. Information in form of binary code.
5. It turns heated elements on or off according to the pattern of 0s and 1s contained in the signal and the pattern of black and white is then printed on to heat sensitive paper.

EXERCISE 2

1. the Comite Consultatif International Telegraphique et Telephonique (CCITT)
2. machines
3. facsimile machines
4. the image in black and white
5. binary information
6. analogue tones
7. the receiving machine
8. the phone line

8.2. USE OF LANGUAGE

8.2.1. Reduced relative clauses

EXERCISE

TRANSMISSION LINES

The lines **connecting** telephones within a building are the simplest types of transmission line **consisting** of parallel wires. Those **linking** telephones to a local exchange may be twisted pairs, although these are being replaced. Coaxial cable **formed** from a copper core **surrounded** by a copper braid, is used to carry a large number of signals over long distances. The cables **providing** connections between telephone exchanges are often coaxial. Waveguides **made** of copper are

used to carry microwave signals between dish aerials and receivers. They are suitable for frequencies between 1GHz and 300GHz. Optical fibres **made** from very pure silicon fibre are the forms of transmission line most often **used** these days.

8.2.2. Short forms

EXERCISE 1

1. amp 2. VCR 3. TV 4. COAX

EXERCISE 2

1. telephones 2. microphone 3. telephone

8.3. WRITING

EXERCISE

1. converts the analogue tones back into digital information
2. converts digital information into binary information
3. sends a signal (in binary code) to the thermal head, or printer
4. turns heated elements on or off according to the pattern of 0s and 1s
5. prints the pattern of black and white on to heat sensitive paper.

8.4. FURTHER READING

EXERCISE 1

1. g 2. a 3. h 4. e 5. f 6. b 7. d 8. i 9.c

EXERCISE 2

1. email
2. video phone
3. viewdata
4. viewdata
5. teletext
6. telex
7. fax

SOME COMMON SHORT FORMS
IN ELECTRICAL ENGINEERING AND ELECTRONICS

AC	Alternating current
	Dòng điện xoay chiều
AF	Audio frequency
	Tần số âm thanh
AM	Amplitude modulation
	Sự điều biến biên độ xung
AMP	Amplifier
	Bộ khuếch đại
COAX	Coaxial cable
	Dây cáp đồng trục
DC	Direct current
	Dòng điện một chiều
G	Giga
	Giga
IC	Integrated circuit
	Vi mạch
LED	Light-emitting diode
	Điôt phát quang
MB	Megabit
	Mêgabai
RF	Radio frequency
	Tần số radio
RFA	Radio frequency amplifier
	Bộ khuếch đại tần số radio
RW	Read/ write

Đọc/ viết

SW Short wave

Sóng ngắn

UHF Ultrahigh frequency

Tần số siêu cao

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