



SỞ GIÁO DỤC VÀ ĐÀO TẠO HÀ NỘI

GIÁO TRÌNH

# TIẾNG ANH

## chuyên ngành điện

DÙNG TRONG CÁC TRƯỜNG TRUNG HỌC CHUYÊN NGHIỆP



NHÀ XUẤT BẢN HÀ NỘI

SỞ GIÁO DỤC VÀ ĐÀO TẠO HÀ NỘI

HÚA THỊ MAI HOA

**GIÁO TRÌNH**  
**TIẾNG ANH CHUYÊN NGÀNH ĐIỆN**  
**ENGLISH FOR ELECTRICAL ENGINEERING**

*(Dùng trong các trường THCN)*

NHÀ XUẤT BẢN HÀ NỘI - 2007

## Lời giới thiệu

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**N**ước ta đang bước vào thời kỳ công nghiệp hóa, hiện đại hóa nhằm đưa Việt Nam trở thành nước công nghiệp văn minh, hiện đại.

Trong sự nghiệp cách mạng to lớn đó, công tác đào tạo nhân lực luôn giữ vai trò quan trọng. Báo cáo Chính trị của Ban Chấp hành Trung ương Đảng Cộng sản Việt Nam tại Đại hội Đảng toàn quốc lần thứ IX đã chỉ rõ: “Phát triển giáo dục và đào tạo là một trong những động lực quan trọng thúc đẩy sự nghiệp công nghiệp hóa, hiện đại hóa, là điều kiện để phát triển nguồn lực con người - yếu tố cơ bản để phát triển xã hội, tăng trưởng kinh tế nhanh và bền vững”.

Quán triệt chủ trương, Nghị quyết của Đảng và Nhà nước và nhận thức đúng đắn về tầm quan trọng của chương trình, giáo trình đối với việc nâng cao chất lượng đào tạo, theo đề nghị của Sở Giáo dục và Đào tạo Hà Nội, ngày 23/9/2003, Ủy ban nhân dân thành phố Hà Nội đã ra Quyết định số 5620/QĐ-UB cho phép Sở Giáo dục và Đào tạo thực hiện đề án biên soạn chương trình, giáo trình trong các trường Trung học chuyên nghiệp (THCN) Hà Nội. Quyết định này thể hiện sự quan tâm sâu sắc của Thành ủy, UBND thành phố trong việc nâng cao chất lượng đào tạo và phát triển nguồn nhân lực Thủ đô.

Trên cơ sở chương trình khung của Bộ Giáo dục và Đào tạo ban hành và những kinh nghiệm rút ra từ thực tế đào tạo, Sở Giáo dục và Đào tạo đã chỉ đạo các trường THCN tổ chức biên soạn chương trình, giáo trình một cách khoa học, hệ

*thống và cập nhật những kiến thức thực tiễn phù hợp với đối tượng học sinh THCN Hà Nội.*

*Bộ giáo trình này là tài liệu giảng dạy và học tập trong các trường THCN ở Hà Nội, đồng thời là tài liệu tham khảo hữu ích cho các trường có đào tạo các ngành kỹ thuật - nghiệp vụ và đồng thời bạn đọc quan tâm đến vấn đề hướng nghiệp, dạy nghề.*

*Việc tổ chức biên soạn bộ chương trình, giáo trình này là một trong nhiều hoạt động thiết thực của ngành giáo dục và đào tạo Thủ đô để kỷ niệm “50 năm giải phóng Thủ đô”, “50 năm thành lập ngành” và hướng tới kỷ niệm “1000 năm Thăng Long - Hà Nội”.*

*Sở Giáo dục và Đào tạo Hà Nội chân thành cảm ơn Thành ủy, UBND, các sở, ban, ngành của Thành phố, Vụ Giáo dục chuyên nghiệp Bộ Giáo dục và Đào tạo, các nhà khoa học, các chuyên gia đầu ngành, các giảng viên, các nhà quản lý, các nhà doanh nghiệp đã tạo điều kiện giúp đỡ, đóng góp ý kiến, tham gia Hội đồng phản biện, Hội đồng thẩm định và Hội đồng nghiệm thu các chương trình, giáo trình.*

*Đây là lần đầu tiên Sở Giáo dục và Đào tạo Hà Nội tổ chức biên soạn chương trình, giáo trình. Dù đã hết sức cố gắng nhưng chắc chắn không tránh khỏi thiếu sót, bất cập. Chúng tôi mong nhận được những ý kiến đóng góp của bạn đọc để từng bước hoàn thiện bộ giáo trình trong các lần tái bản sau.*

**GIÁM ĐỐC SỞ GIÁO DỤC VÀ ĐÀO TẠO**

## Lời nói đầu

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Giáo trình “*English for electrical engineering*” dành cho học sinh và sinh viên chuyên ngành điện, được học tiếp sau khi đã học phần tiếng Anh giao tiếp. Vì lí do đó, nhiều phần ngữ pháp trong sách này đã không được nhắc lại.

Là sách dành cho chuyên ngành, nên các từ trong sách đã được lặp đi lặp lại nhiều lần để cho người học dễ nhớ từ hơn.

Cấu tạo của cuốn sách gồm:

1. Vocabulary

2. Grammar

3. Reading comprehension

4. Exercises

Phần từ vựng giúp người học nắm được từ trước khi vào các phần sau

Phần ngữ pháp giúp người học biết thêm được một số kiến thức ngữ pháp có trong bài và giúp người học làm bài tập.

Phần đọc hiểu củng cố lại các từ mới và giới thiệu cách dùng của các từ mới trong đoạn văn.

Phần bài tập có nhắc lại các từ có ở các phần trước giúp người học nhớ từ hơn.

Trong giáo trình này tôi có tham khảo rất nhiều giáo trình của chuyên môn ngành điện. Tôi xin chân thành cảm ơn các đồng nghiệp đã giúp đỡ tôi hoàn thành giáo trình này.

TÁC GIÀ

# Unit 1

## ELECTRIC TOOLS

### (Dụng cụ điện)

#### I. VOCABULARY

Electric tool	: dụng cụ điện
combination pliers	: kìm tổ hợp
switch	: công tắc
cable shears	: kìm/ kéo cắt cáp
correctly	: đúng cách thức, phù hợp
installation	: sự đặt (hệ thống máy móc, hệ thống sưởi...)
pincers	: cái kìm
bind	: 1. trói, buộc, bỏ lại 2. ràng buộc 3. kết lại với nhau
wire	: dây điện
overhead (adj)	: ở trên đầu, cao hơn mặt đất
nippers	: cái kìm , cái kẹp
terminal	: ở giai đoạn cuối cùng
core	: điểm trung tâm , nòng cốt , hạt nhân
flexible	: 1. dẻo, mềm dẻo, dễ uốn 2. linh hoạt, linh động
strip	: tước , lột, lấy đi
cord	: dây thừng nhỏ, dây
lead	: chì, bằng chì

long nose pliers	: kìm mũi tròn
apparatus	: đồ thiết bị; máy móc
blending	: trộn lẫn, pha trộn
screw driver	: tuốc nơ vít
strike	: 1. đánh, đập, 2. bật cháy, chiếu sáng, 3. xuyên qua, thấm qua
electrician	: thợ điện
cover	: phủ , bao phủ
sharpen	: mài sắc
confirm	: 1. thừa nhận, phê chuẩn; 2. làm vững chắc , củng cố
groove	: xoi rãnh, khía cạnh
sleeve	: ống ngoài, ống bọc ngoài, măng xông
according to	: tuỳ theo, theo, y theo
soldering iron	: sắt hàn
vise	: mỏ capse, ê tô
conduit	: ống dẫn (nước, dầu); cáp điện
threading	: ren (đinh ốc), xâu thành chuỗi
bench	: ghế băng
triangle	: hình tam giác
pipe	: cái ống
hickey; conduit -	
blending pincers	: kìm uốn dẻo
cable shears	: kìm / kéo cắt cáp
insulated handle	: tay cầm cách điện
threading apparatus	: dụng cụ xâu xỏ cáp
electric/ pocket torch	: đèn pin
friction / insulating tape	: băng dính cách điện
electric bulb	: đèn dây tóc

fluorescent lamp	: đèn huỳnh quang
lighting fixture	: bộ đèn chiếu sáng
pendant switch	: công tắc treo
knife switch	: cầu dao điện
fuse	: cầu trì
cartridge fuse	: cầu trì ống
socket	: ổ cắm
two way socket	: ổ cắm hai đường
plug	: phích cắm
three- way multiple plug	: phích cắm ba ngả
extension cord	: dây nối dài
junction box	: hộp đầu mối
circuit breaker	: áp tố mát, cái ngắt mạch
switch board	: bảng điện
Three phrase asynchronous	: động cơ không đồng bộ ba pha

## **II. GRAMMAR**

- What is this tool?
- It is a fuse.
- What are they?
- They are scissors

### **To call**

We call this tool an insulated handle

We call these tools pliers

### **To be called**

(+) This tool is called an electric bulb.

These tools are called pincers

(-) This tool isn't called a screwdriver

These tools are not called conduit-blending pincers.

(?) - Is this tool called a knife?

- No, it isn't.

- Are these tools called pliers?

- Yes, they are.

- What is this tool called in English?

- It is called a switch.

- What are these tools called in English?

- They are called cable shears

### **III. READING COMPREHENSION KIND OF TOOL AND USING TOOLS**



#### **1. Pincers**

1. Using the tool as cut, joint and bind the wire.
2. Pincers are three types: 150mm, 175mm and 200mm.
  - 150mm: joint the small size
  - 175mm: for general electric work
  - 200mm: for overhead wire work.

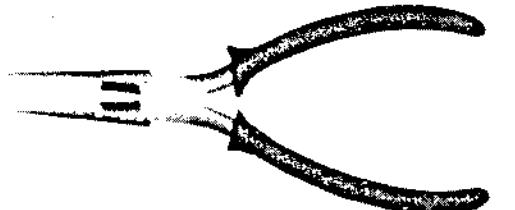
#### **2. Nippers**

1. As the wire jointed the terminal it is cutting wire core.
2. Cutting the flexible wire, fine solid wire and shield wire, stripping the insulation cord wire and lead wire.



### **3. Long nose pliers**

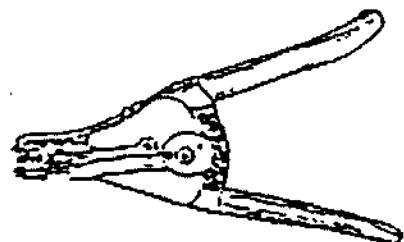
1. Holding the end of lead wire or stripping the insulation wire.



2. Making the terminal as joints the apparatus and blending the wire.

### **4. Wire strippers**

1. It is automatic stripping the covered wire.
2. Confirm the size of wire core stripper find the same size groove with stripper.



### **5. Pressing pincers**

1. Should be used to press ring sleeve and terminal, this should press on the metal, not on the insulation.
2. This should be pressed according to the wire sizes

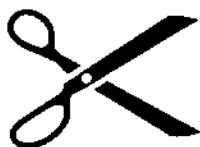


## **IV. EXERCISES**

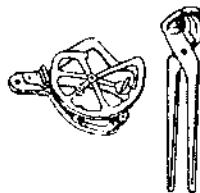
### **Do the exercise**

*Example:*

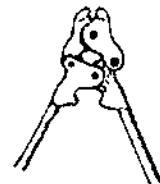
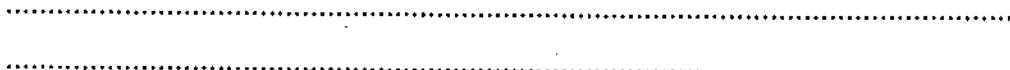
- What is this tool called in English?
- It is called a screwdriver.
- What are these tools called in English?
- They are called condui -blendingpincers



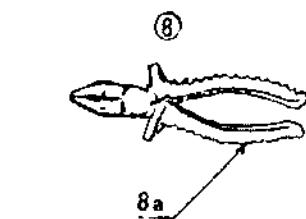
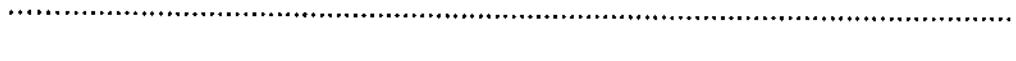
1. Scissors



3. Hickey; conduit- blending pincers

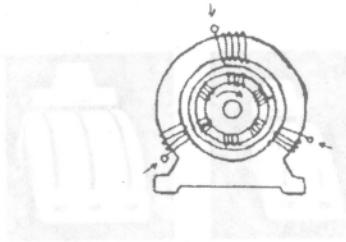


5. insulation- stripping pliers

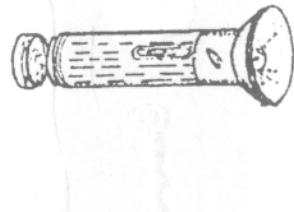


2. Screwdriver

7. Threading apparatus



8a. Combination pliers 8b. Insulated handle



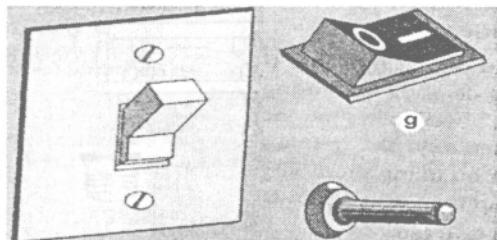
9. Three- phase asynchronous

10. Electric/ pocket torch

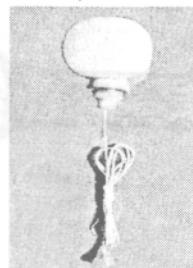


11. Blow- lamp

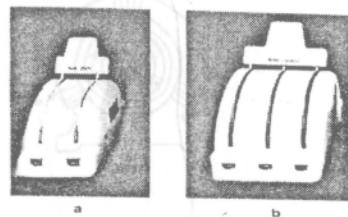
12. Friction/ insulating tape



13. Electric bulb; filament lamp

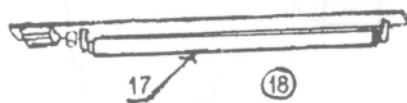


14. Switch



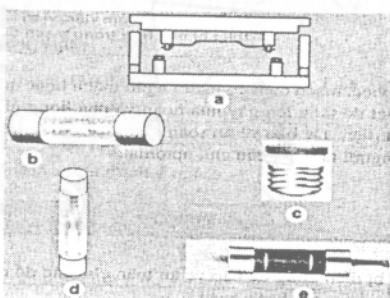
15. Pendant switch

16. knife switch

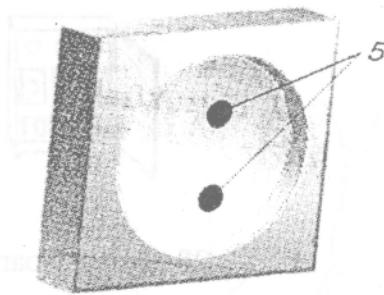


17. Fluorescent lamp

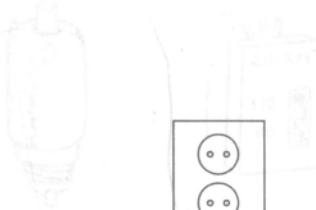
18. Lighting fixture



19. Fuse

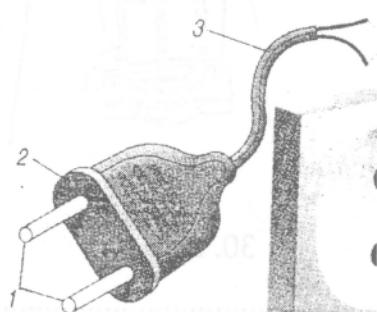


20. Cartridge fuse

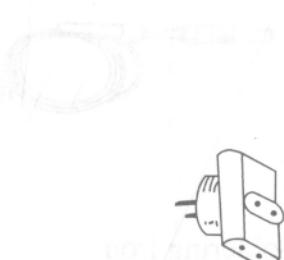


21. Socket

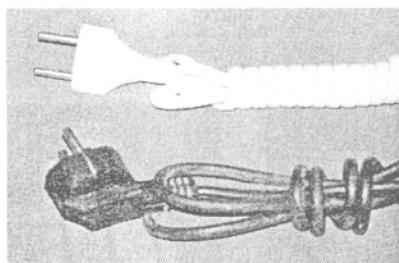
22. Two-way socket



23. Plug



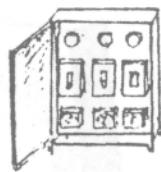
24. Three-way multiple



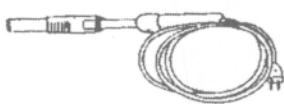
25. Extension cord



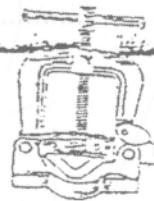
26. Junction box



27. Circuit breaker



28. Switch board



29. Soldering iron



30. Pipe vise



## Unit 2

### DESCRIBING SHAPES

(Miêu tả hình dạng)

#### I. VOCABULARY

Shape	: hình dạng
a rectangle (n)	: hình chữ nhật
Circle (n)	: hình tròn
Rectangular (adj)	: hình chữ nhật
Circular (adj)	: hình tròn
Describe (v)	: miêu tả
Object (n)	: đồ vật, vật thể
Dimensional (adj)	: chiều, kích thước, cỡ
Triangle (n)	: hình tam giác
Triangular (adj)	: hình tam giác
Sphere (n)	: hình cầu
Spherical (adj)	: hình cầu
Semi-circle (n)	: hình bán nguyệt
Semi-circular (adj)	: hình bán nguyệt
Cylinder (n)	: khối trụ
Cylindrical (adj)	: khối trụ
Square(n) (adj)	: hình vuông

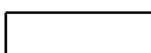
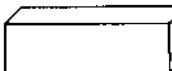
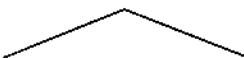
Tube (n)	: hình ống, ống, tuýp
Tubular (adj)	: hình ống, ống, tuýp
Line (n)	: đường , dòng kẻ
Edge (n)	: bờ , gờ, cạnh
Straight	: đường thẳng
Curved	: đường cong, đường vòng
Rounded	: đường tròn
Pointed	: điểm nhọn
regular	: thông thường
geometric shape	: hình dạng số học
adjective	: tính từ
wave	: sóng
recognize	: nhận ra
resemble	: giống với
well known	: nổi tiếng
antenna	: ăng ten
a saw - tooth wave	: sóng dạng răng cưa
position	: vị trí
component	: thành phần, phần hợp thành
circuit	: mạch
phrase	: đoạn từ
pattern	: mẫu, khuôn mẫu
tuning	: điều chỉnh
capacitor	: tụ điện
coil	: cuộn dây
semiconductor	: chất bán dẫn
rectifier	: mạch chỉnh lưu
heat (n)	: sức nóng, độ nóng

sink	: bồn, thùng
ceramic	: bằng gốm
transformer	: máy biến áp
laminations	: sự dát mỏng, sự cán mỏng
electrolytic	: thuộc điện phân
a magnet	: nam châm
a cable	: dây cáp
conduit	: ống cách điện
a carbon brush	: chổi carbon
a motor	: động cơ
pole	: cực, điểm cực
shoe	: miếng bịt, vật hình giầy
a resistor	: cái điện trở
Wound round	: cuộn quanh
Locate	: nằm, đặt vị trí
Connect	: nối, kết nối
Apply	: áp vào
Mount	: leo, trèo, lắp ráp, kéo lên
Wire	: mắc dây điện, bắt điện
core	: lõi
piece	: mẫu, miếng
the collector	: cái thu, thu nhặt
the base	: 1. cơ sở, nền tảng, 2. đường đáy , mặt đáy
feedback	: sự hoàn ngược
voltage	: điện áp
the shaft	: trục
an iron core	: lõi sắt
Earth	: đất, quả đất

## II. GRAMMAR

- What is this shape?
- It is a rectangle.
- What are these shapes?
- They are circles
- What shape is this door?
- It is rectangular
- What shape are these windows?
- They are circular

**Describe the shapes of the objects:**

Shape	Noun	Adjective	Shape	Noun	Adjective
2 dimensional			3 dimensional		
	circle	circular		sphere	spherical
	semi-circle	semi-circular		Cylinder	cylindrical
	square	square		tube	tubular
	rectangle	rectangular			rectangular
<b>lines</b>			<b>Edges</b>		
		straight			
		curved			

When sometimes has a regular geometric shape we can use one of the adjective from the table to describe it .

*Example :*



A square wave

When the object has no recognized geometric shape but does not resemble a well known object or a letter of the alphabet , it may be describe in one of the following ways.

*Example:*



an H - shaped antenna



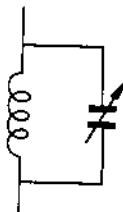
a saw - tooth wave

### **Describing position and connection**

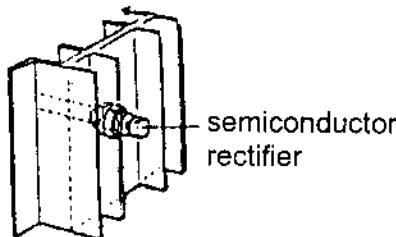
When describing the position of a component or how it is connected in a circuit, phrases of this pattern are used:

**Be + past participle + preposition**

*Examples*



1. The tuning capacitor IS CONNECTED ACROSS the coil.



2. The semiconductor rectifier IS MOUNTED ON the heat sink.

### III. READING COMPREHENSION

#### HOW BATTERY ARE CHARGED

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

### IV. EXERCISES

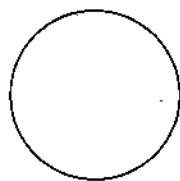
#### Exercise 1

What are these shapes?

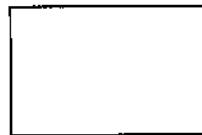
*Example:*

1. - What is this shape?

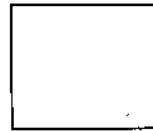
- It is a circle



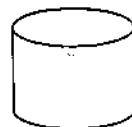
1



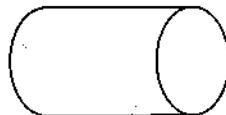
2



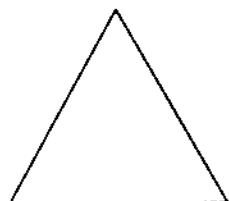
3



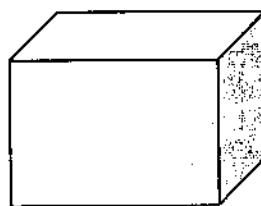
4



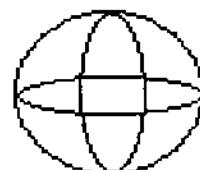
5



6



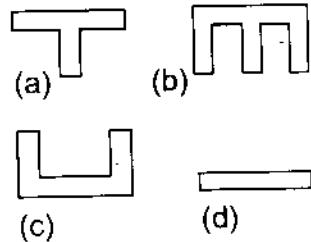
7



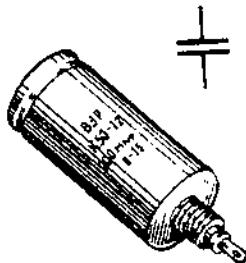
8



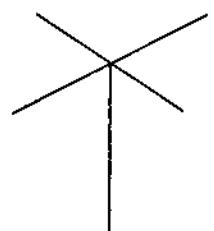
1. a ceramic capacitor



## 2. transformer laminations



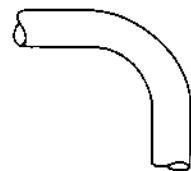
### 3. an electrolytic capacitor



#### 4. an antenna



5. a magnet



6. a cable conduit



7. a carbon brush



8. a capacitor



9. a motor pole shoe



10. a resistor

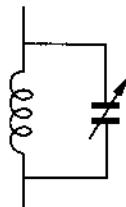
### **Exercise 3**

#### ***Describing position and connection***

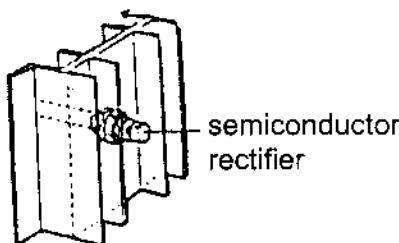
When describing the position of a component or how it is connected in a circuit, phrases of this pattern are used:

**Be + past participle + preposition**

#### ***Examples***



1. The tuning capacitor IS CONNECTED ACROSS the coil.



2. The semiconductor rectifier IS MOUNTED ON the heat sink.

*Now complete each sentence using an appropriate phrase from this list:*

Wound round

located within

Connected across

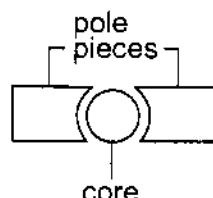
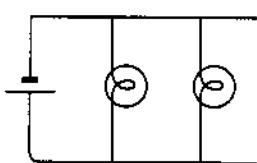
applied to

Mounted on

connected to

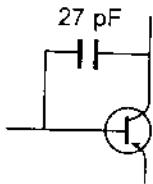
Wired to

connected between

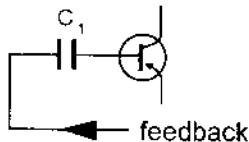


1. The bulbs are ..... the battery

2. The core is ..... the pole piece



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

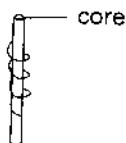


4. Feedback voltage is ..... the base of the transistor through C1

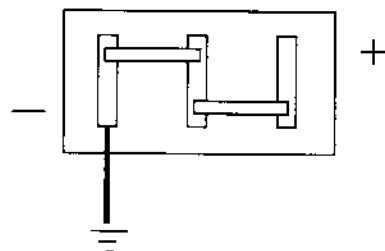


5. The antenna is ..... the coil

6. The rotor is ..... the shaft



7. The coil is ..... an iron core



8. The negative pole of the battery ..... earth.

## Unit 3

### MEASURING INSTRUMENTS

(Đồng hồ đo)

#### I. VOCABULARY

measure	: đo lường
resistance (n)	: điện trở
resistors (n)	: cái điện trở
voltmeter	: vôn kế
ammeter	: ampe kế
connect	: kết nối
adjust	: điều chỉnh
rheostat	: cái biến trở
scale	: cái cân
deflection	: sự lệch, sự chêch hướng, độ lệch
simultaneous	: đồng thời, xảy ra cùng một lúc, làm cùng một lúc
readings	: sự đọc, sự xem
current	: (diện học) dòng điện
calculate	: tính toán
formula	: công thức
repeat	: nhắc lại
tabulate	: xếp thành bảng, trình bày thành bảng,

result	: kết quả
object	: đồ vật, vật thể
ohmmeter	: ôm kế
positive	: dương tính
charge	: điện tích (nạp vào ác quy), sự nạp điện, sự tích điện
electrostatics	: tĩnh điện học
conductor	: (vật lý) chất dẫn (điện , nhiệt)
dielectric	: (điện) chất điện môi
piezoelectric	: áp điện
effect	: (vật lý) hiệu ứng
parallel connection:	cách mắc song song
series connection :	cách mắc nối tiếp
imperative mood	: thúc mệnh lệnh
solder	: hàn, hàn gắn
transistors	: bóng bán dẫn (dụng cụ điện tử nhỏ)
heat	: hơi nóng, sức nóng; sự nóng; (vật lý) nhiệt
shunt	: (điện học) mắc sơn; mạch mắc rẽ
instruction	: chỉ thị, lời chỉ dẫn
infinitive	: nguyên thể
apparatus	: đồ thiết bị , máy móc
description	: miêu tả
present passive	: thì hiện tại giản đơn
report	: bản báo cáo; bản tường thuật; biên bản
experiment	: cuộc thí nghiệm, cuộc thử nghiệm
past passive	: thì quá khứ giản đơn

## II. GRAMMAR

### Imperative mood

Do this !

Do not ( Don't) do that!

*Example:*

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

### Simple instruction use the infinitive

Write the instructions to measure the total resistance of resistors in parallel, using the circuit in figure 1.

Connect up the apparatus as shown in figure 1.

### Describing an experiment

Make a description of *the first experiment* by rewriting each instruction in the *present passive*.

*Example:*

1. Use a high - resistance voltmeter and a low - resistance ammeter.

→ A HIGH - RESISTANCE VOLTMETER AND A LOW - RESISTANCE AMMETER IS USED

Make a report of *the second experiment* by rewriting each of your instruction in the *past passive*

2. Connect up the apparatus as shown in figure 1.

→ THE APPARATUS WAS CONNECTED UP AS SHOWN IN FIGURE 1.

### III. READING COMPREHENSION

#### MEASURE THE TOTAL RESISTANCE OF RESISTORS

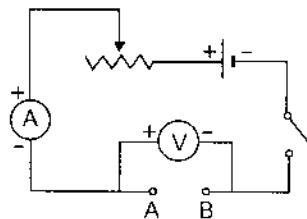


FIGURE I

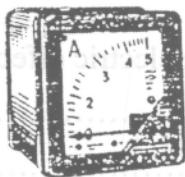
1. Use a high - resistance voltmeter and a low - resistance ammeter
2. Connect  $R_1$  across AB
3. Close the switch and adjust the rheostat until both meters show almost full scale deflection.
4. Take simultaneous readings of both voltage and current.
5. Calculate  $R_1$  by the formula  $R = \frac{V}{I}$
6. Repeat this for  $R_2$
7. Connect  $R_1$  and  $R_2$  in series across AB .
8. Calculate the total resistance using the same formula as before.
9. Tabulate the results

## IV. EXERCISES

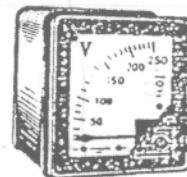
### Exercise 1

*Example:*

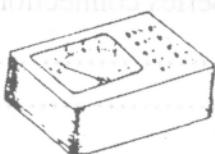
- What is this object called in English?
- It is called an ammeter.



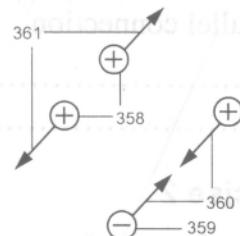
1. an ammeter



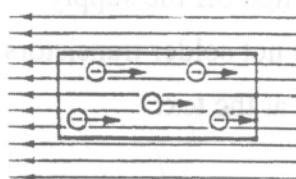
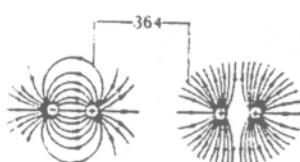
2. a voltmeter



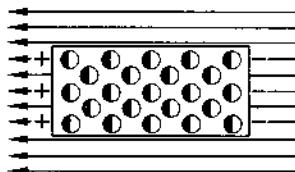
3. an ohmmeter



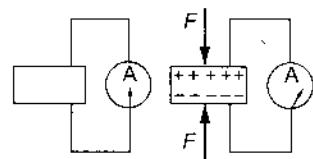
4. positive charge



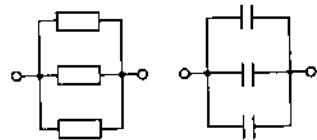
## 5. Electrostatic field



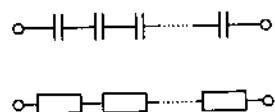
## 6. conductor



## 7. dielectric



## 8. piezoelectric effect



## 8. parallel connection

## 10. Series connection

### Exercise 2

*Imperative mood*

Do this !

Do not (Don't) do that!

*Example:*

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

Look at the text

### *Simple instruction use the infinitive*

Write the instructions to measure the total resistance of resistors in parallel, using the circuit in figure 1.

1. Connect up the apparatus as shown in figure 1.

2 .....

3 .....

4 .....

5 .....

6 .....

7 .....

8 .....

9 .....

### **Exercise 3**

#### *Describing an experiment*

Make a description of the first experiment in exercise 2 by rewriting each instruction in the present passive.

*Example:*

1. Use a high - resistance voltmeter and a low - resistance ammeter.

→ A HIGH - RESISTANCE VOLTMETER AND A LOW - RESISTANCE AMMETER IS USED

1 .....

2 .....

3 .....

4 .....

5 .....

6 .....

7 .....

8 .....

9 .....

## **Exercise 4**

### *Reporting an experiment*

Make a report of the second experiment in exercise 2 by rewriting each of your instruction in the past passive

1. Connect up the apparatus as shown in figure 1.

→ THE APPARATUS WAS CONNECTED UP AS SHOWN IN FIGURE 1

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

## Unit 4

# ELECTRIC MATERIALS: CONDUCTORS, INSULATORS AND SEMICONDUCTORS

(Vật liệu điện: Vật liệu dẫn điện, Vật liệu cách điện,  
Vật liệu bán dẫn)

### I. VOCABULARY

conductor	: vật liệu dẫn điện
insulator	: vật liệu cách điện
semiconductor	: vật liệu bán dẫn
across	: qua, ngang qua
body	: cơ thể
movement	: chuyển động
free	: tự do
electron	: điện tử
towards	: về phía
be classified	: được chia ra, phân loại
group	: nhóm
according to	: theo, dựa theo, đi theo
readily	: dễ dàng
permit	: cho phép
category	: phạm trù, lĩnh vực

substances	: chất
path	: đường dẫn
margarin	: măng gan
copper	: đồng
therefore	: bởi vậy, cho nên, vì thế, vậy thì
widely	: rộng rãi
non- metal	: không chứa kim loại
liquid	: chất lỏng
release	: thả lỏng
rubber	: cao su
nylon	: ni lon
porcelain	: chất sứ
however	: dù đến đâu, tuy thế, tuy nhiên
be ignored	: lờ đi
midway	: ở giữa
conditions	: điều kiện
behave	: cư xử
germanium	: tên một chất bán dẫn
silicon	: si li côn
mixtures	: hỗn hợp
metallic (adj)	: kim loại
oxides	: ô xít
act	: hoạt động
thermistors	: chất cảm ứng nhiệt, chất nhạy nhiệt
temperature - sensing devices	: thiết bị cảm ứng nhiệt
rephrase	: tập hợp lại từ
rewrite	: viết lại

replace	: đặt lại
italic	: viết nghiêng
expressions	: biểu hiện, diễn đạt
passage	: đoạn văn
similar	: giống thế
meaning	: ý nghĩa
contextual reference	: dựa theo ngữ cảnh
pronouns	: đại từ
refer to	: nói đến, dẫn đến, đưa đến
fact	: hiện tượng
idea	: ý tưởng
decide	: quyết định
statements	: câu, câu nói
true	: đúng
false	: sai
quote	: lời trích dẫn, dấu ngoặc kép
relative clause	: mệnh đề quan hệ
capitals	: chữ viết hoa
consumers	: người tiêu dùng, người tiêu thụ
domestic	: (thuộc) gia đình, việc nhà, nội trợ
quantities	: lượng, số lượng, khối lượng
intermediate	: giữa, trung gian
substations	: trạm nhỏ
value	: giá trị
distribution	: phân phối
reduce	: giảm đi, giảm bớt, hạ
require	: đòi hỏi, yêu cầu
illumination	: sự chiếu sáng, sự rọi sáng (vật lý) độ rọi

assemble	: (kỹ thuật) lắp ráp
precision	: sự đúng đắn, rõ ràng, tính chính xác, độ chính xác
comparatively	: tương đối
detector	: (radio) bộ tách sóng
rectify	: (vật lý) chỉnh lưu (dòng điện xoay chiều) (radio) tách sóng
armoured	: bọc sắt
rick	: đống, đụm
damage	: hỏng hóc

## II. GRAMMAR

If we connect a battery across a body, there is a movement of free electrons towards the positive end.

All materials can be classified into three groups according to how readily they permit an electric current to flow.

### Relative clause 1

Study these sentences :

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

Both these sentences refer to carbon. We can link them by making sentence 2 a relative clause.

*Example:*

→ Starter motor brushed are made of carbon WHICH CONTAINS COPPER.

The *relative clause* is in **capital**s. Note that the carbon in sentence 2 becomes WHICH.

Study these other pairs of sentences and note how they are linked:

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. 33 kV lines are fed to intermediate substations.

6. In the intermediate substations the voltage is stepped down to 11 kV.

→ 33 kV lines fed to intermediate substations WHERE THE VOLTAGE IS STEPPED DOWN TO 11 kV.

### III. READING COMPREHENSION

#### 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. Mangarin, 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 electron 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 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 thermistors. The resistance of thermistors falls rapidly as they temperature rises. They are therefore used in temperature - sensing devices.

## IV. EXERCISES

### Exercise 1

#### *Rephrasing*

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

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.

.....

### Exercise 2

#### *Contextual reference*

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.

- 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.

- a. conductors
- b. semiconductors
- c. insulators

3. *These* are known as thermistors.

- a. metallic oxides
- b. semiconductors
- c. mixtures of certain metallic oxides

4. *They* are therefore used in temperature-sensing devices

- a. thermistors
- b. semiconductors
- c. metallic oxides

### **Exercise 3**

#### ***Checking facts and ideas***

Decide if these statements are true or false. Quote from the passage to support your decisions. Correct the false statements

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 temperatures than at high temperatures.

.....

## **Exercise 4**

### ***Relative clause 1.***

Study these sentences :

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

Both these sentences refer to carbon. We can link them by making sentence 2 a relative clause.

*Example:*

→ Starter motor brushed are made of carbon WHICH CONTAINS COPPER.

The *relative clause* is in capitals. Note that the carbon in sentence 2 becomes WHICH.

Study these other pairs of sentences and note how they are linked:

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

*Example:*

→ Consumers WHO USE LARGE QUANTITIES OF ENERGY  
are supplied at higher voltages than domestic consumers.

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

*Example:*

→ 33 kV lines fed to intermediate substations WHERE THE VOLTAGE  
IS STEPPED DOWN TO 11 kV.

Now link these sentences. Make the second sentence in each pair a relative clause:

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

The resistor has a value of 240 ohms.

.....  
.....

2. The supply is fed to a distribution substation.

The supply is reduced to 415 V 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 current

.....  
.....

7. Workers require illumination of 300 lux.

The workers assemble heavy machinery.

.....  
.....

8. Armoured cables are used in places.

There is a risk of mechanical damage in these places.

.....  
.....

## Unit 5

# ELECTRIC MATERIALS: SUPERCONDUCTORS (Vật liệu điện: Vật liệu siêu dẫn)

### I. VOCABULARY

overheat	: quá nóng
dirt	: bụi, bẩn
gap	: lỗ hổng, khe hở
therefore	: bởi vậy, vì thế, cho nên
comma	: dấu phẩy
alloys	: hợp kim
steadily	: 1. vững, vững chắc; 2. đều đặn, đều đẽo
decrease	: giảm bớt, làm suy giảm
negligible	: không đáng kể
absolute	: tuyệt đối, hoàn toàn; thuần tuý, nguyên chất
propose	: đề nghị; đề xuất, đưa ra
induce	: 1. gây ra, đem lại; 2. (diện học) cảm
circulate	: lưu thông, luân chuyển, tuần hoàn
theory	: lý thuyết, lý luận, nguyên lý
memory	: 1. trí nhớ, ký ức; 2. (tin học) bộ nhớ máy tính.
store	: 1. tích trữ, để dành; 2. chứa, đựng, tích
information	: thông tin

indefinitely	: vô hạn định, không biết đến bao giờ
retrieve	: lấy, gọi ra (thông tin được lưu trữ)
due to	: vì, nhờ có, do bởi, tại
windings	: 1. sự cuộn, sự cuốn; 2. (kỹ thuật) sự vénh
occur	: xuất hiện
ideal	: quan niệm, tư tưởng
Similarly	: tương tự, giống nhau
efficient	: có hiệu lực, có hiệu quả
exhibit	: trưng bày, triển lãm
advantage	: sự thuận lợi, hoàn cảnh thuận lợi, mối lợi
summarize	: tóm tắt, tổng kết
summary	: tóm tắt, tổng kết
soft iron	: sắt mềm
electromagnet	: (vật lý) nam châm điện
magnetize	: từ hóa
cover	: bao phủ
care	: chú ý đến, để ý đến
solder	: hàn
capacitance	: (diện học) điện dung
microfarad	: micrô phara

## II. GRAMMAR

### Reason and result connectives 1.

How to use because, because of and 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*.

*Example*

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 the result of sentence 3. We can link a statement and the result using therefore.

→ 3 + 4 The flow of electrons through an insulator is very small, THEREFORE it can be ignored.

Note that a comma is used before *therefore*.

### III. READING COMPREHENSION

#### SUPERCONDUCTIVITY

The resistance of metals varies with their temperature. When they get hot, their resistance increases. When they are cool, their resistance falls. The resistance of some metals and alloys steadily decreases as their temperature is lowered, then falls suddenly to a negligible value at temperatures a few degrees above absolute zero (- 273°C). In other words, these materials have almost no resistance to an electric current at very low temperatures. They become 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 zero resistivity of the cells, the information could be retrieved very quickly, as fast as  $10^{-8}$  seconds.

Ninety per cent of the total losses in modern transformers is due to the resistance of windings. Transformers could be made with windings cooled to the low temperature 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 superconducting coils.

#### **IV. EXERCISES**

##### **Exercise 1**

Answer the following questions:

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 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.

1. Some metals, for example....., become almost perfect conductors at .....
2. The applications of superconductivity are limited because .....
- Possible uses are .....
3. A superconducting memory cell would allow information .....
4. A transformer or motor using superconductivity would be.....

## **Exercise 3.**

### ***Reason and result connectives 1.***

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.

### ***Example***

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 the result of sentence 3. We can link a statement and the result using therefore.

→ 3 + 4 The flow of electrons through an insulator is very small, THEREFORE it can be ignored.

Note that a comma is used before *therefore*.

Now link these ideas using *because* or *therefore*

1. Soft iron is used in electromagnets.

Soft iron can be magnetized easily.

.....  
.....

2. The voltage is 250 V and the current 5 A.

The resistance is  $50 \Omega$

.....  
.....

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 too large a unit.

.....  
.....

6. Output transistors are mounted on a heat sink.

Output transistors generate heat.

.....  
.....

## Unit 6

### CIRCUIT ELEMENTS

(Những phần tử mạch điện)

#### I. VOCABULARY

potential	: (vật lý) (thuộc) điện thế
path	: đường dẫn
source	: nguồn
device	: thiết bị
control	: điều khiển
limit	: giới hạn
rheostat	: (diện học) cái biến trở, hộp số
interrupt	: (diện học) ngắt
describe	: miêu tả
function	: chức năng
fuse	: cầu chì
protect	: bảo vệ
emphasize	: nhấn mạnh
pattern	: mẫu, khuôn mẫu
purpose	: mục đích, ý định
element	: 1. yếu tố, 2. nguyên tố; 3. (diện học) pin
a load	: tải
a transmission system	: hệ thống truyền

provide	: cung cấp
the electromotive force	: lực điện động
establish	: thành lập, thiết lập
the difference	: sự khác nhau
flow	: chảy
supply	: cung cấp, tiếp tế
convert	: đổi, biến đổi
for instance	: ví dụ như
section	: 1. đoạn, khúc, phần; 2. mục (của tài liệu)
chassis	: khung gầm (ôtô, máy bay)
conduct	: (vật lý) dẫn
regulate	: điều chỉnh, sửa lại cho đúng
flashlight	: đèn pin
comprise	: gồm có, bao gồm
slide	: trượt
compare	: so sánh
operate	: hoạt động
aboard	: trên tàu, trên máy bay
space	: khoảng trống, không trung
satellite	: vệ tinh
solar cells	: tế bào năng lượng mặt trời
relay	: cái ngắt mạch, rơ le
actuate	: thúc đẩy, kích thích
ground	: đất, mặt đất
although	: dẫu cho, mặc dù
complex	: phức tạp
oscilloscope	: (diễn học) máy điện dao động, máy hiện sóng
pronoun	: đại từ
a soldering iron	: sắt hàn
wire- clippers	: kéo xén dây điện

## II. GRAMMAR

Current moves *from* a point of high potential energy *to* one of low potential.

This path *is called* an electric circuit.

The source can be *any device which* supplies electrical energy.

It may control the current *by limiting it, as does a rheostat,* or *by interrupting it, as does a switch.*

### Describing function

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

*Example*

- What does the fuse do?
- It protects a circuit.

We can emphasize function by using this pattern:

- The function of a fuse is to protect a circuit.

### Describing purpose

When we answer the question *What is X for?*, we describe the purpose of X .

*Example*

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

Other ways we can describe the purposes of an ammeter are

1. It is used for measuring current
2. It is used to measure current
3. We measure current with an ammeter
4. We measure current using an ammeter

### III. READING COMPREHENSION

#### 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 a 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.

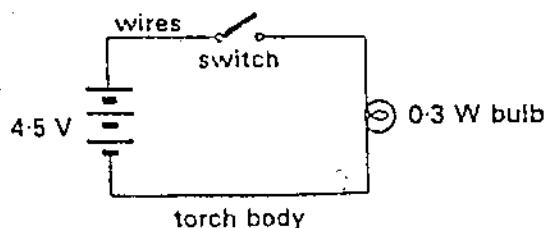


FIGURE 1

Study Figure 1. In this simple flashlight circuit, the source comprises three 1.5 V cell 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.

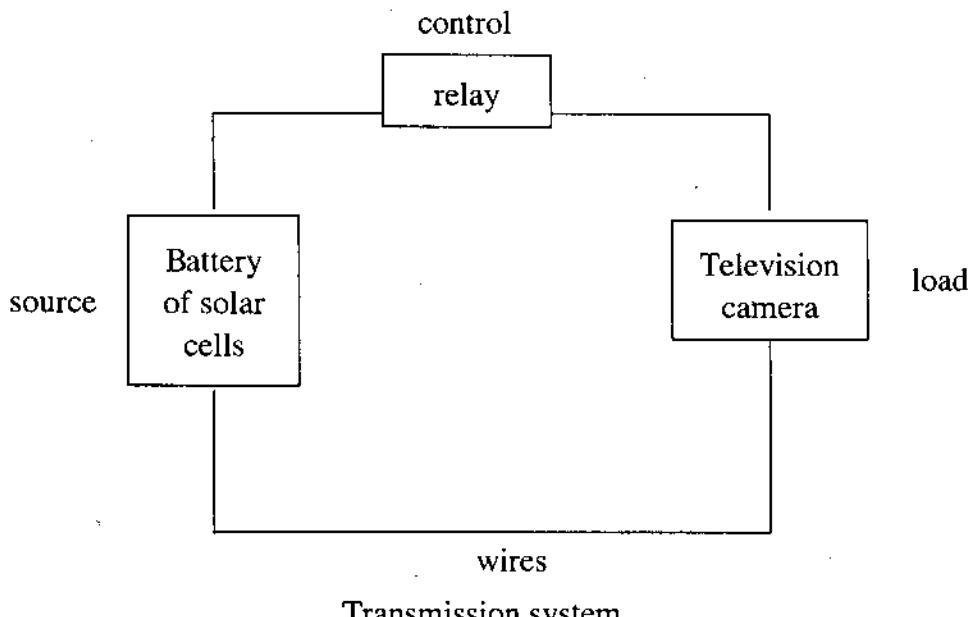


FIGURE 2

Compare figure 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.

#### IV. EXERCISES

##### **Exercise 1**

###### *Rephrasing*

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.

.....

## Exercise 2

### *Contextual reference*

What do the pronouns in *italics* refer to?

1. Current moves from a point of high potential energy to **one** of low potential.
  - a. current
  - b. energy
  - c. a point
2. For example, **it** may be a generator or a battery.
  - 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.
  - 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.

- a. this circuit
- b. the function
- c. flashlight

### **Exercise 3**

#### *Checking facts and ideas*

Decide if these statements are true or false. Quote from the passage to support your decisions. Correct the false sentences.

1. A difference in potentials required before current can flow in a circuit.

.....

2. A generator is a source of electromotive force.

.....

3. Loads convert electric 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 generated by a relay.

.....

9. The flashlight circuit differs basically from the satellite circuit.

.....

## **Exercise 4**

### ***Describing function***

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

#### ***Example***

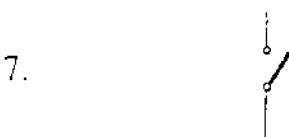
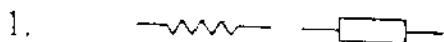
- What does the fuse do?
- It protects a circuit.

We can emphasize function by using this pattern:

- The function of a fuse is to protect a circuit.

Now identify these components. Explain the function of each component with the help of this list.

- a. adds capacitance to a circuit
- b. rectifiers 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



### **Exercise 5**

### *Describing purpose*

When we answer the question ***What is X for?***, we describe the purpose of X.

### *Example*

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

Other ways we can describe the purposes of an ammeter are

1. It is used for measuring current
2. It is used to measure current
3. We measure current with an ammeter
4. We measure current using an ammeter

Now describe the purposes of these instruments and tools using any of the structures presented above

1. a voltmeter

.....  
.....

2. a soldering iron

.....  
.....

3. a milliammeter

.....  
.....

4. an oscilloscope

.....  
.....

5. a heat sink

.....  
.....

6. wire- clippers

.....  
.....

7. a megohmmeter

.....  
.....

8. an ohmmeter

.....  
.....

9. a signal generator

.....  
.....

10. a battery charger.

.....  
.....

# Unit 7

## THE DC MOTOR

### (Động cơ một chiều)

#### I. VOCABULARY

design	: thiết kế, phác họa
direct current (dc)	: dòng điện một chiều
alternating current (ac).	: dòng điện xoay chiều
armature	: 1. (kỹ thuật) lõi, cốt lõi; 2. (diện học) phần ứng
loops	: (diện học) cuộn, mạch
core	: (kỹ thuật) lõi, nòng, ruột
segment	: (toán học) hình viên phân, phân, mảng
interaction	: sự ảnh hưởng đến nhau, sự tương tác
spin	: làm quay tròn
sentence building	: dựng câu, đặt câu
protect	: bảo vệ, bảo hộ, che chở
excessive	: 1. quá mức, thừa; 2. quá thể, quá đáng
breaker	: (diện học) cái ngắt điện, cái công tắc
brush bar	: (diện học) cái chổi
driving	: truyền, truyền động
end	: giới hạn, đoạn cuối
bearing	: (kỹ thuật) cái giá, cái trụ, cái đệm, cutxinê

hub	: trục bánh xe, moayσ
holder	: (kỹ thuật) mâm cắp, vòng kẹp
commutator	: (diện học) cái đảo mạch, cái chuyển mạch
pressure	: (diện học) ứng suất
spring	: lò so, nhíp xe
pole	: (vật lý) cực (nam châm, ắc quy)
bolt	: (kỹ thuật) bu lông
terminal	: (diện học) cực, đầu (điểm nối trong mỗi mạch điện)
shaft	: trục
typical	: đặc thù đặc trưng
fed to	: dẫn đến
a means	: phương tiện
alternate	: xen kẽ, luân phiên
form	: làm thành, tạo thành
set up	: sắp đặt
principle	: nguyên lý , nguyên tắc
a force	: năng lượng
reverse	: đảo, nghịch, ngược lại, trái lại
necessary	: cần thiết
punctuation	: phép chấm câu
accurate	: chính xác
repetitive	: lặp đi, lặp lại
solenoid	: (diện học) sôlênoit (cuộn dây kim loại trở nên có từ tính khi có dòng điện chạy qua)
latch	: chốt cửa, then cửa
overcome	: 1. tìm cách vượt qua, 2. đánh bại, khắc phục
tension	: (diện học) điện thế, thế hiệu, sức điện động
remains	: đồ thừa, cái còn lại

towards	: về phía
release	: tha, thả, phóng thích
apart	: về một bên, qua một bên, riêng ra, xa ra
fault	: (diện học) sự rò, sự lạc
reset	: văn lại, lắp lại.

## II. GRAMMAR

Motor can be designed to run on direct (dc) or alternating current (ac).

It contains an armature, which is a set of wire loops wound on a steel core.

This consists of a number of copper segments insulated from one another.

The interaction of the forces produced by the magnetic field of the rotor and the stator makes the rotor spin.

### Sentence building

Join the following groups of sentences to make the longer sentence

*Example:*

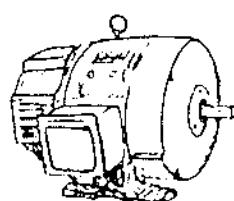
1. Circuits can be protected from excessive current by a fuse.

2. Circuit can be protected from excessive current by a circuit breaker.

————→(1+2) Circuits can be protected from excessive current by a fuse or by a circuit breaker.

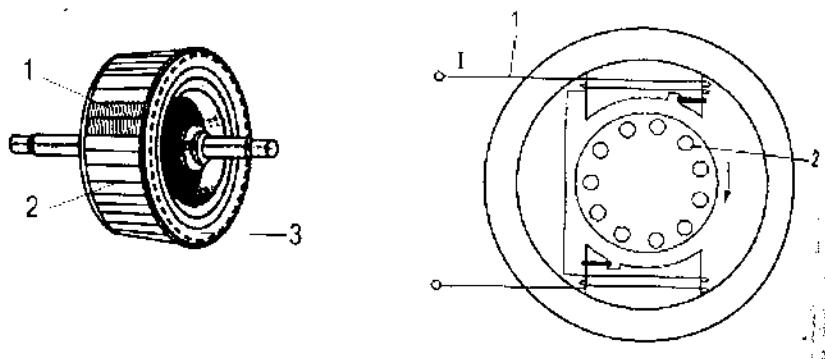
## III. READING COMPREHENSION

### THE DC MOTOR



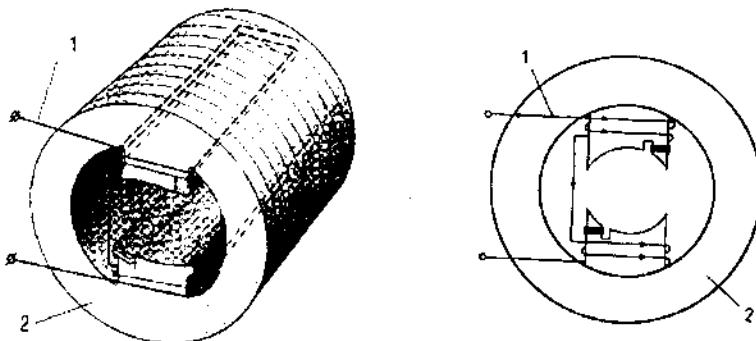
DC motor

An electric motor is a machine for converting electrical energy into mechanical energy. Motor can be designed to run on direct (DC) or alternating current (AC). The motor shown in Figure 1 is a dc motor. Its most important parts are the rotor, the stator and the brushgear.



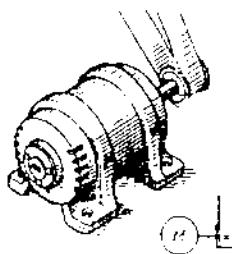
The rotor is the moving part. It contains an armature, which is a set of wire loops wound on a steel core. When current is fed to the armature, these windings produce a magnetic field. The armature and core are mounted on a shaft which runs on bearings. It provides a means of transmitting power from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



The stator does not move. It consists of magnetic and electrical conductors. The magnetic circuit is made up of the frame and the pole. Wound round the poles are the field coils. These form 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.



*electric motor*

## IV. EXERCISES

### **Exercise 1**

#### ***Meaning from context***

Select the word from the three alternative given which is most similar in meaning to the word in *italics* as it is used in the passage:

1. provide
  - a. produces
  - b. supplies
  - c. allows
2. segments
  - a. sections
  - b. pieces
  - c. wires

3. alternate

- a. reverse
- b. change
- c. flow in one direction then in another

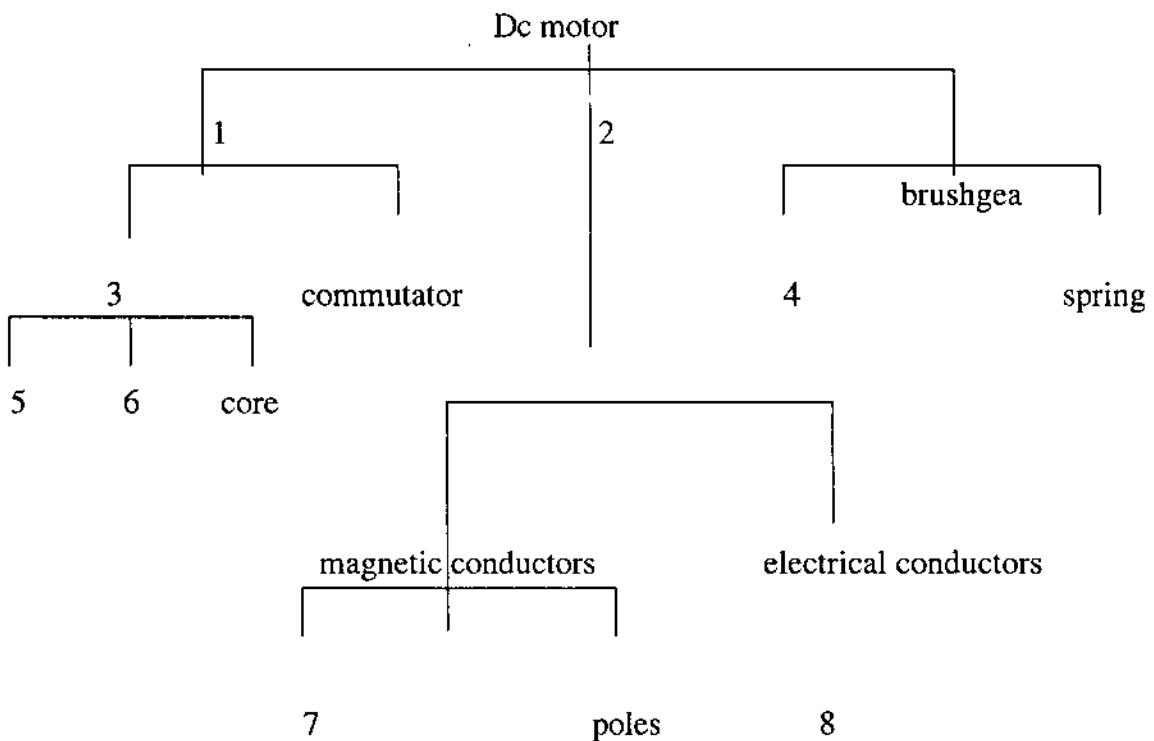
4. interaction

- a. acting together
- b. operation
- c. result

## Exercise 2

### *Completing a diagram*

Complete the following diagram of the components of a dc motor using the information in the passage and Figure 1



### **Exercise 3**

#### *Describing position*

Describe where the following components are located using the information in the passage and Figure1.

*Example:*

- Where are the armature windings?
- They are on a steel core
- 1. the armature windings

.....  
.....

2. the core

.....  
.....

3. the fan

.....  
.....

4. the field coils

.....  
.....

5. the poles

.....  
.....

### **Exercise 4**

#### *Sentence building*

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

**1. or**

Circuits can be protected from excessive current by a fuse.

Circuit can be protected from excessive current by a circuit breaker.

.....  
.....

**2. however**

A fuse is the simplest and cheapest protection.

For accurate and repetitive operation a circuit breaker is used.

.....  
.....

**3. which**

The simplest circuit breaker consists of a solenoid and a switch with contacts.

The contacts are held closed by a latch.

.....  
.....

**4. which, therefore**

At normal currents the pull of the solenoid on the latch will not overcome the tension of the spring.

The spring holds the latch in place.

The switch remains closed.

.....  
.....

**5. if**

The current rises to a dangerous level.

The pull of the solenoid on the latch increases.

.....  
.....

**6. and**

The increased pull overcomes the latch spring tension.

The increased pull pulls the latch towards the solenoid.

.....  
.....

**7. which**

This releases the switch contacts.

The switch contacts are pulled apart by a spring.

.....  
.....

**8. as**

The circuit is now broken.

The unit is protected

.....  
.....

**9. when**

The fault in the supply or unit is put right.

The latch can be reset.

.....  
.....

## Unit 8

### TESTING THE ELECTRIC MOTOR

(Kiểm tra động cơ điện)

#### I. VOCABULARY

supply	: sự cung cấp
disconnect	: ngắt, cắt (dòng điện)
fuse	: cầu trì
starter	: bộ khởi động, tắc te đèn ống
terminal	: ở vào cuối, chót tận cùng
megohmmeter	: mē ga oat
lead	: chì, tấm chì
motor frame	: khung động cơ
generator	: máy phát , máy phát điện
rotate	: làm quay, làm xoay quanh
rpm (revolution per minute)	: vòng trên phút
reading	: số ghi (trên đồng hồ điện)
isolate	: cô lập, cách, cách ly, tách ra.
starter coil	: cuộn khởi động
individually	: riêng , riêng lẻ, cá nhân
fault	: lỗi
brush	: chổi

lift off	: phóng vụt lên
commutator	: cái chuyển mạch, cái đảo mạch
field	: trường, điện trường
winding	: sự cuộn, sự cuộn
gear	: bánh răng, sự chuyển động
satisfactory	: vừa lòng, vừa ý, thỏa mãn
armature	: cốt lõi, phần ứng
separately	: riêng biệt
locate	: xác định vị trí, định vị
flow	: trôi nổi, chảy
chart	: đồ thị, biểu đồ
fill	: lắp đầy, đổ đầy
missing	: mất đi, bỏ quên
preceding	: có trước
range	: vùng
operate	: hoạt động
battery	: ác quy
device	: thiết bị
chemical energy	: năng lượng hóa học
rectifier	: máy chỉnh lưu
magnetic effect	: tác động từ trường
receiver	: máy thu, ống nghe
headphone	: tai nghe
impedance	: trở kháng
plate	: tấm, bản kim loại
beam	: tia, chùm
act	: hành động

## II. GRAMMAR

The supply **should be disconnected** by opening the main switch and removing the fuses.

The megohmmeter generator **should be rotated** at about 60 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 satisfactory, **then** the armature only should be tested.

### Relative clauses

### Clauses with prepositions

*Examples:*

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

We can be linked using a relative clause:

→ The resistor ACROSS WHICH THE CAPACITOR IS CONNECTED has a value of 33000 ohms

Preposition ‘across’ is must be included in the relative clause

### Writing impersonal instructions

Study these instructions:

1. Use a high - resistance voltmeter.
2. Do not insert a fuse in an earth conductor.

In writing, instructions are often made impersonal using **should**.

*Examples*

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

We can emphasize an instruction by using **must**.

*Examples*

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

### III. READING COMPREHENSION

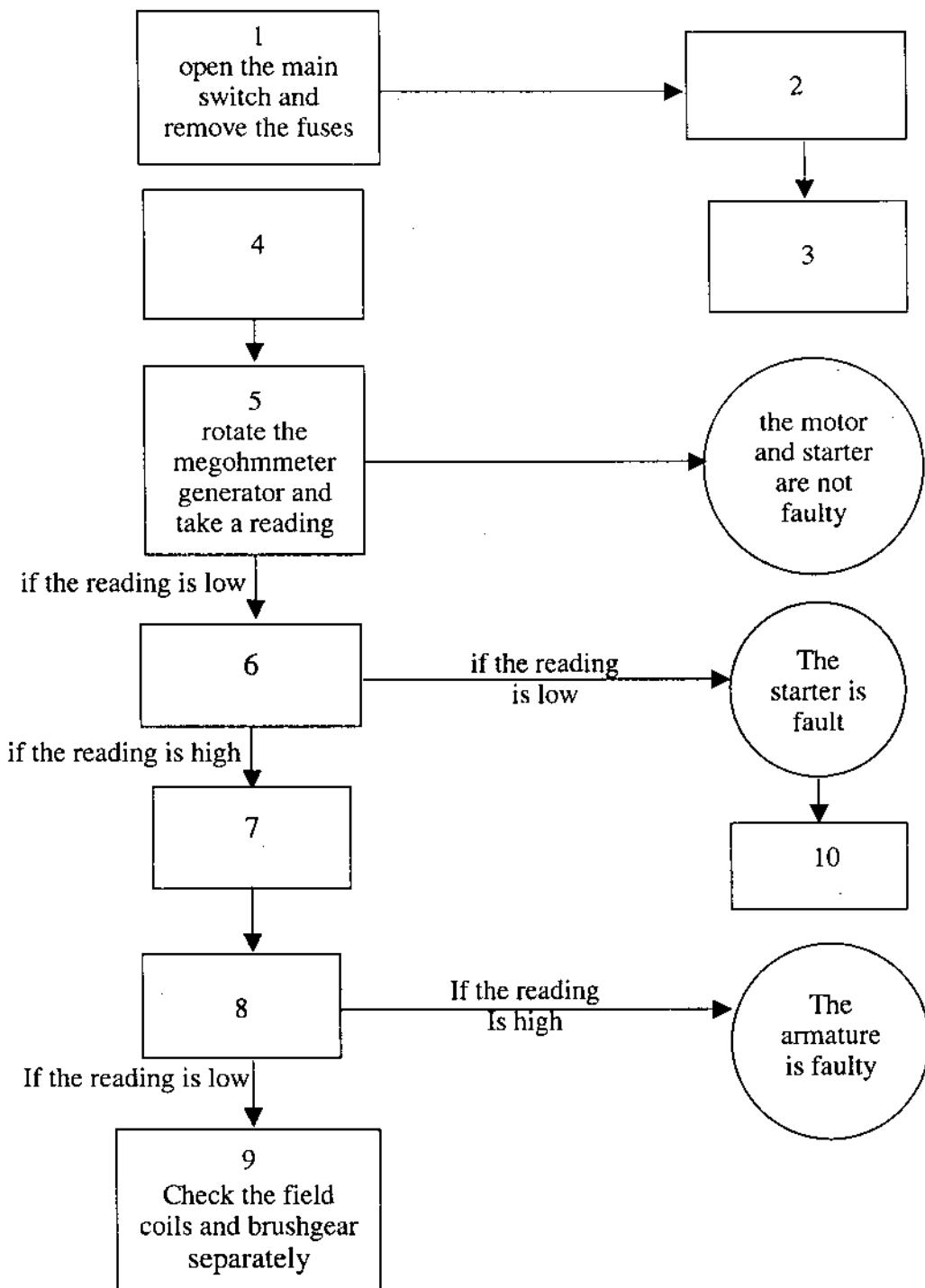
#### TESTING THE ELECTRIC MOTOR

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 megohmmeter 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 coil 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.

This flow chart provides instructions for how to test a DC motor. Fill in the missing instructions with the help of the preceding description

Start



## IV. EXERCISES

### Exercise1

*Relative clauses*

*Clauses with prepositions*

*Example:*

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

We can be linked using a relative clause:

→The resistor across which the capacitor is connected has a value of 33000 ohms

Now link these sentences

1. The range is 0 - 1000 volts.

The meter can operate over the range.

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.....

2. A battery is a device.

The device changes chemical energy into electrical energy.

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.....

3. Power supplies are used to drive DC motor

The power supplies use thyristor rectifiers.

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.....

4. The capacitor has a value of 27 pF.

5. The telephone is a device.

The device uses the magnetic effect of a current.

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.....  
.....  
.....  
.....

6. The receiver can only be used with headphones.

The headphones have a high impedance.

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

The beam passes between the plates.

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.....  
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8. The rotor contains a commutator.

The commutator acts as a switch.

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.....  
.....

## Exercise 2

### *Writing impersonal instructions*

Study these instructions:

1. Use a high - resistance voltmeter.
2. Do not insert a fuse in an earth conductor.

In writing, instructions are often made impersonal using ***should***.

### *Examples*

3. A high - resistance voltmeter ***should*** be used.
4. A fuse ***should*** not be inserted in an earth conductor.

We can emphasize an instruction by using ***must***.

### *Examples*

5. A high - resistance voltmeter ***must*** be used.
6. A fuse ***must*** not be inserted in an earth conductor.

Here are some points to remember when using transistors .

Study them:

1. Use heat shunts 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.

Rewrite each instruction to make it impersonal using **should** .

*Example:*

→ The heat shunts **should** be used when soldering.

Now you do the same:

- 1 .....
- 2 .....
- 3 .....
- 4 .....
- 5 .....

Then emphasize each instruction using **must**.

*Example*

→ The heat shunts **must** be used when soldering.

Now you do the same:

- 1 .....
- 2 .....
- 3 .....
- 4 .....
- 5 .....