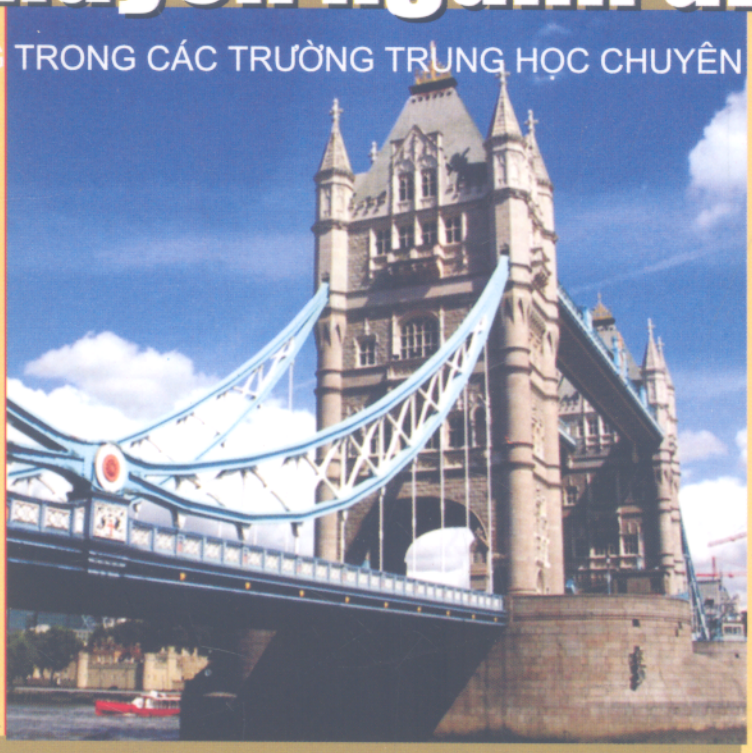
SỞ GIÁO DỤC VÀ ĐÀO TẠO HÀ NỘI

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

HỨA 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

Nước 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 đông đảo 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

*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 cám ơn các đồng nghiệp đã giúp đỡ tôi hoàn thành giáo trình này.

TÁC GIẢ

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 dặt (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 cặp, 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 dây

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 tô 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

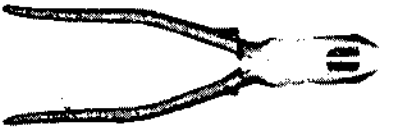
- 175mm: for general electric work

- 200mm: for overhead wire work.

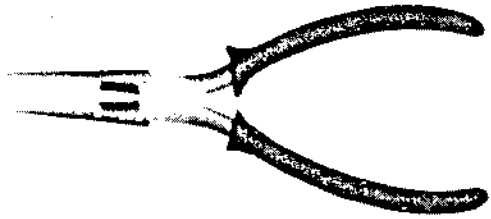
2. Nippers

1. As the wire jointed the terminal it is cutting wire core.

2. Cutting the flexible wire, fine solied wire and shild wire, stripping the insulation cord wire and lead wire.



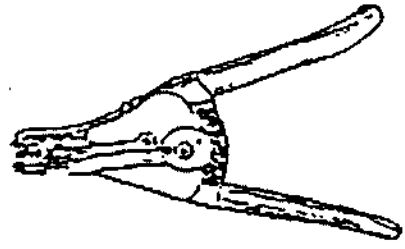
3. Long nose pliers



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.

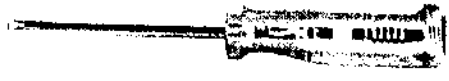
2. This should be pressed according to the wire sizes

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

2. Screwdriver

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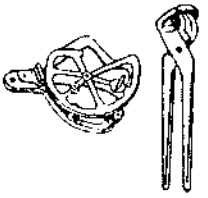

3. Hickey; conduit- blending pincers

4. Knife for electrician

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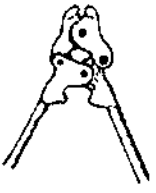

5. insulation- stripping pliers

6. Cable shears

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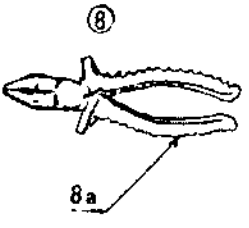

7. Threading apparatus

8a. Combination pliers 8b. Insulated handle

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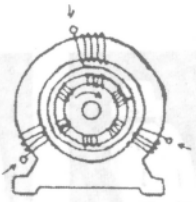

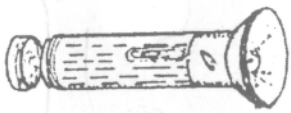

9. Three- phase asynchronous

10. Electric/ pocket torch

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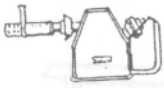

11. Blow- lamp

12. Friction/ insulating tape

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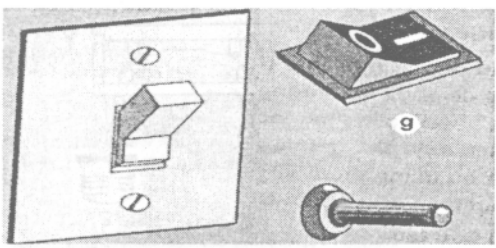

13. Electric bulb; filament lamp

14. Switch

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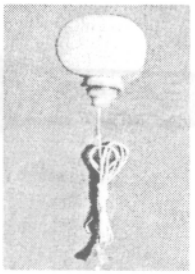

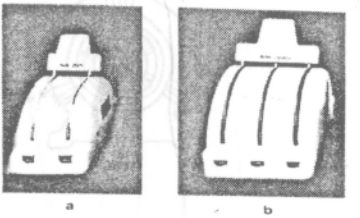

15. Pendant switch

16. knife switch

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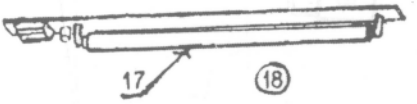

17. Fluorescent lamp

18. Lighting fixture

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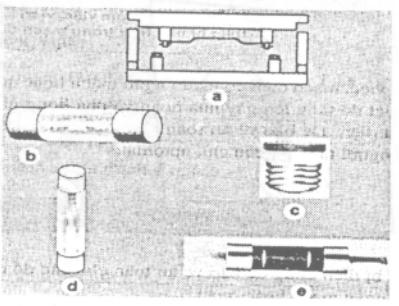

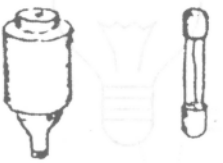

19. Fuse

20. Cartridge fuse

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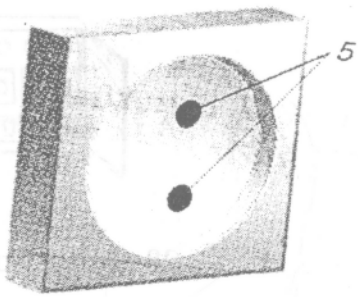

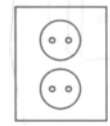

21. Socket

22. Two- way socket

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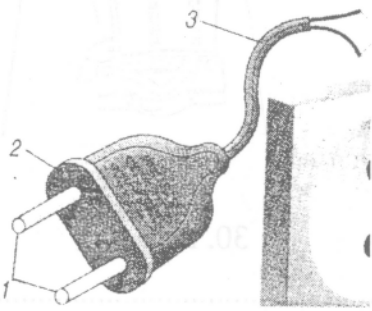

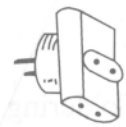

23. Plug

24. Three-way multiple

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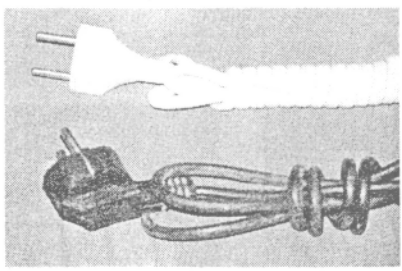
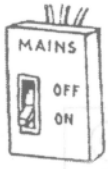
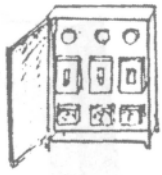


25. Extension cord

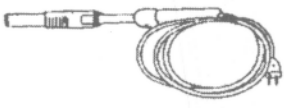
26. Junction box

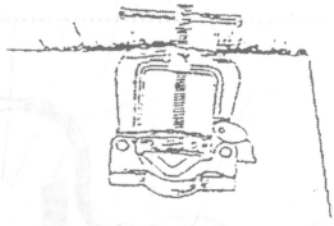




27. Circuit breaker

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

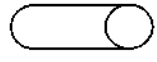
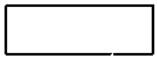
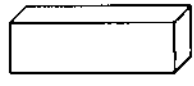
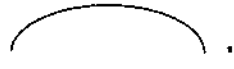
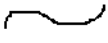
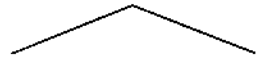
Tube (n)	: hình ống, ống, tuýp
Tubular (adj)	: hình ống, ống, tuýp
Line (n)	: đường , dòng kẻ
Edge (n)	: bờ , gờ, cạnh
Straight	: đường thẳng
Curved	: đường cong, đường vòng
Rounded	: đường tròn
Pointed	: điểm nhọn
regular	: thông thường
geometric shape	: hình dạng số học
adjective	: tính từ
wave	: sóng
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, khuân 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	: cuốn 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	: mẩu, 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

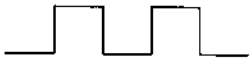
- What is this shape?
- It is a rectangle.
- What are these shapes?
- They are circles
- What shape is this door?
- It is rectangular
- What shape are these windows?
- They are circular

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
lines			**Edges**		
		straight			rounded
		curved			pointed

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

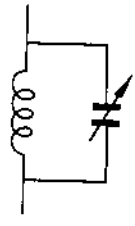
a saw - tooth wave

Describing position and connection

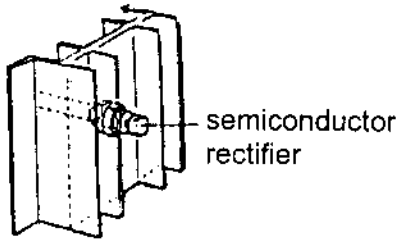
When describing the position of a component or how it is connected in a circuit, phrases of this pattern are used:

Be + past participle + preposition

*Example*s



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

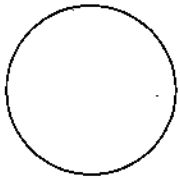
Exercise1

What are these shapes?

Example:

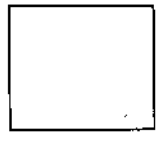
1. - What is this shape?

   - It is a circle



1

2



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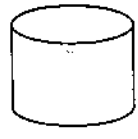

4

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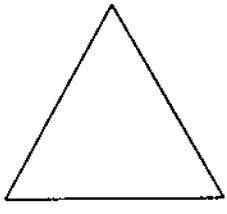

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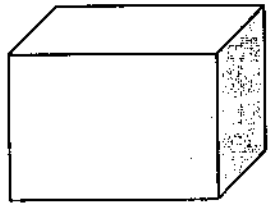

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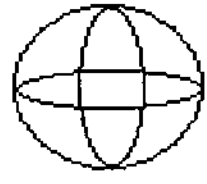

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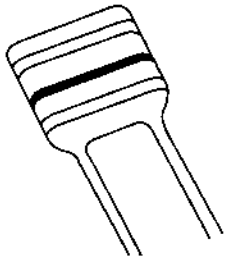
Exercise 2

Describe the shapes of the following objects as completely as possible

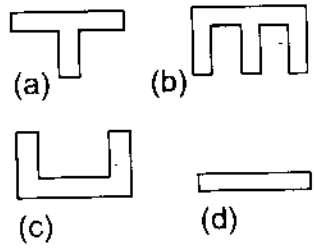
Example:

1. - What shape is a ceramic capacitor?

   - It is square



1. a ceramic capacitor



2. transformer laminations

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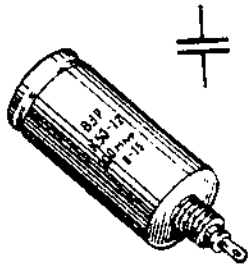
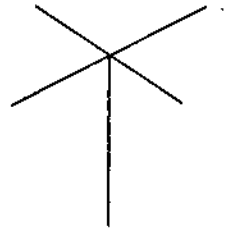


3. an electrolytic capacitor



4. an antenna

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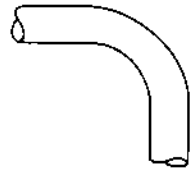

5. a magnet

6. a cable conduit

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7. a carbon brush

8. a capacitor

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9. a motor pole shoe

10. a resistor

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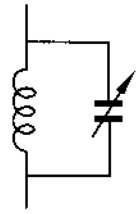
Exercise 3

Describing position and connection

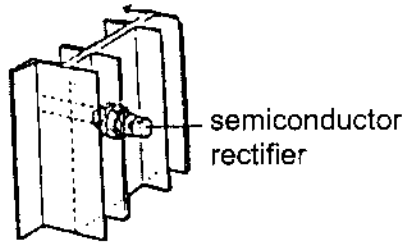
When describing the position of a component or how it is connected in a circuit, phrases of this pattern are used:

Be + past participle + preposition

Examples



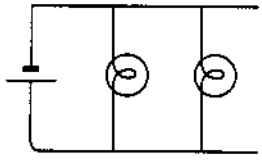
1. The tuning capacitor IS CONNECTED ACROSS the coil.

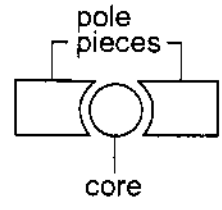


2. The semiconductor rectifier IS MOUNTED ON the heat sink.

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

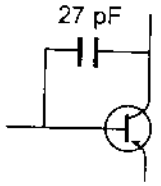
Wound round	located within
Connected across	applied to
Mounted on	connected to
Wired to	connected between



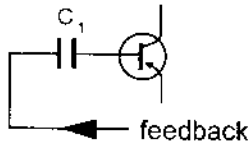


1. The bulbs are ..... the battery

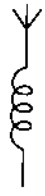
2. The core is ..... the pole piece

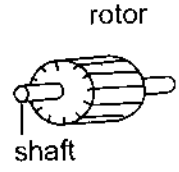


3. The 27 pF capacitor is.....the collector and the base.



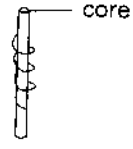
4. Feedback voltage is ..... the base of the transistor through C1



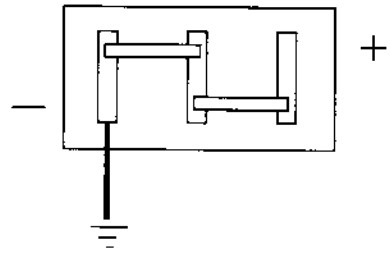


5. The antenna is ..... the coil

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	: am pe kế
connect	: kết nối
adjust	: điều chỉnh
rheostat	: cái biến trở
scale	: cái cân
deflection	: sự lệch, sự chệch hướng, độ lệch
simultaneous	: đồng thời, xảy ra cùng một lúc, làm cùng một lúc
readings	: sự đọc, sự xem
current	: (điện học) dòng điện
carculate	: 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 ắc 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 : thức 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

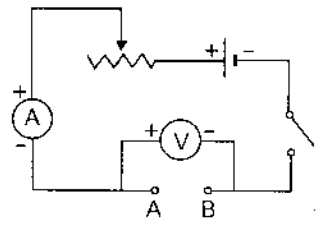


FIGURE 1

1. Use a high - resistance voltmeter and a low - resistance ammeter
2. Connect R1 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 R1 by the formula R
6. Repeat this for R2
7. Connect R1 and R2 in series across AB .
8. Calculate the total resistance using the same formula as before.
9. Tabulate the results

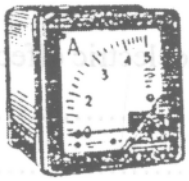
IV. EXERCISES

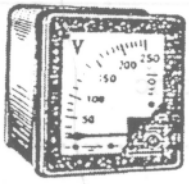
Exercise 1

Example:

- What is this object called in English?

- It is called an ammeter.





1. an ammeter

2. a voltmeter

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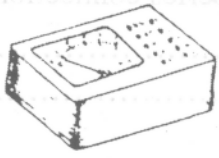

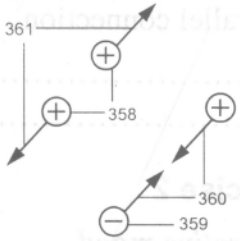

3. an ohmmeter

4. positive charge

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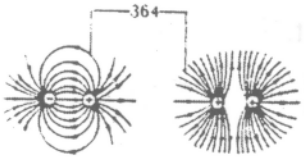
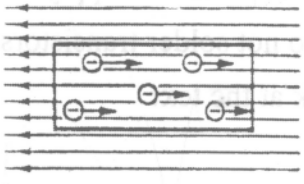
.....

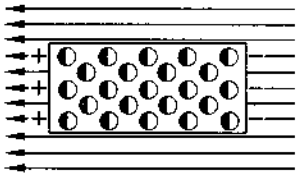


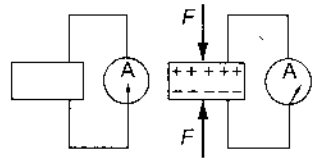


5. Electrostatic field 6. conductor

.....

.....

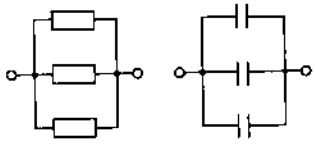


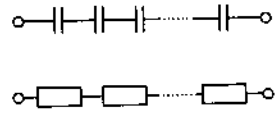


7. dielectric 8. piezoelectric effect

.....

.....





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
mangarin	: 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 xit
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 **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.

⟶ 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 milliameter 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, đềuđều
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. (điện 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 vênh
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 hoá
cover	: bao phủ
care	: chú ý đến, để ý đến
solder	: hàn
capacitance	: (điện 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 resistively 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 sat 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 Ω

.....

.....

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	: (điện học) cái biến trở, hộp số
interrupt	: (điện 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. (điện 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 : dất, mặt đất
although : dẫu cho, mặc dù
complex : phức tạp
oscilloscope : (điện 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.

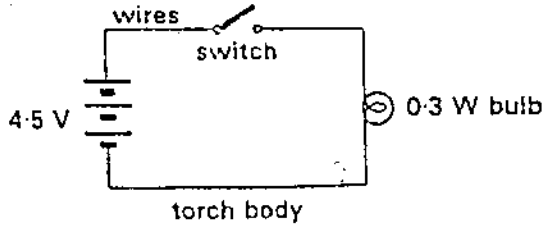
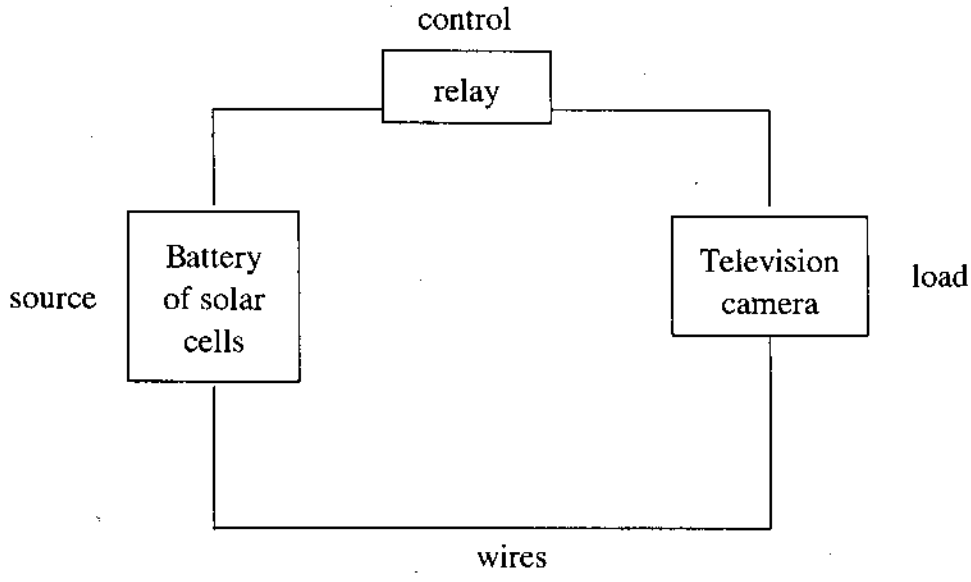


FIGURE 1

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.



Transmission system

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 generates 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 a alternating currents

c. adds resistance to a circuit

d. measures very small currents

e. breaks a circuit

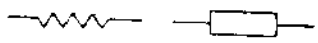
f. protects a circuit

g. varies the current in a circuit

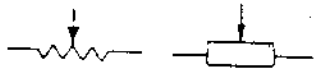
h. transforms AC voltages

i. receives RF signals

j. selects a frequency

1. 

2. 

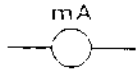
3. 

4. 

5. 

6. 

7. 

8. 

9. 

10. 

.....

.....

.....

.....

.....

.....

.....

.....

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 hoạ
direct current (dc)	: dòng điện một chiều
alternating current (ac).	: dòng điện xoay chiều
armature	:1. (kỹ thuật) lõi, cốt lõi; 2. (điện học) phần ứng
loops	: (điện học) cuộn, mạch
core	: (kỹ thuật) lõi, nòng, ruột
segment	: (toán học) hình viên phân, phần, 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	: (điện học) cái ngắt điện, cái công tắc
brush bar	: (điện 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, moayơ
holder	: (kỹ thuật) mâm cặp, vòng kẹp
commutator	: (điện học) cái đảo mạch, cái chuyển mạch
pressure	: (điện học) ứng xuất
spring	: lò so, nhíp xe
pole	: (vật lý) cực (nam châm, ắc quy)
bolt	: (kỹ thuật) bu lông
terminal	: (điện 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	: (điện 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	: (điện 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 : (điện học) sự rò, sự lạc

reset : vặn 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:

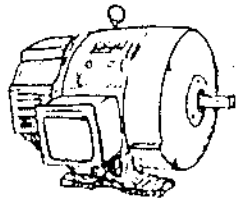
1. Circuits can be protected from excessive current by a fuse.

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.

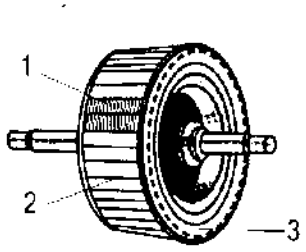
III. READING COMPREHENSION

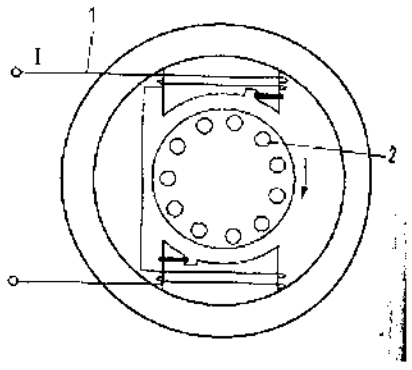
THE DC MOTOR



DC motor

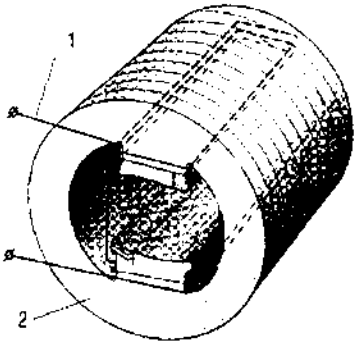
An electric motor is a machine for converting electrical energy into mechanical energy. Motor can be designed to run on direct (DC) or alternating current (AC). The motor shown in Figure 1 is a dc motor. Its most important parts are the rotor, the stator and the brushgear.

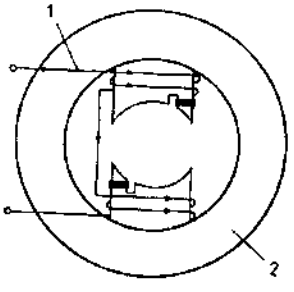




The rotor is the moving part. It contains an armature, which is a set of wire loops wound on a steel core. When current is fed to the armature, these winding s produce a magnetic field. The armature and core are mounted on a shaft which runs on bearings. It provides a means of transmitting power from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

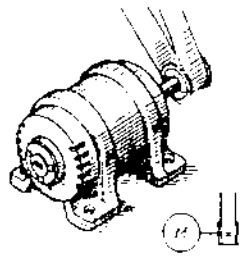
The rotor also contains a commutator. This consists of a number of copper segments insulated from one another. The armature windings are connected to these segments. Carbon brushes are held in contact with the commutator by springs. These brushes allow current to pass to the armature windings. As the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

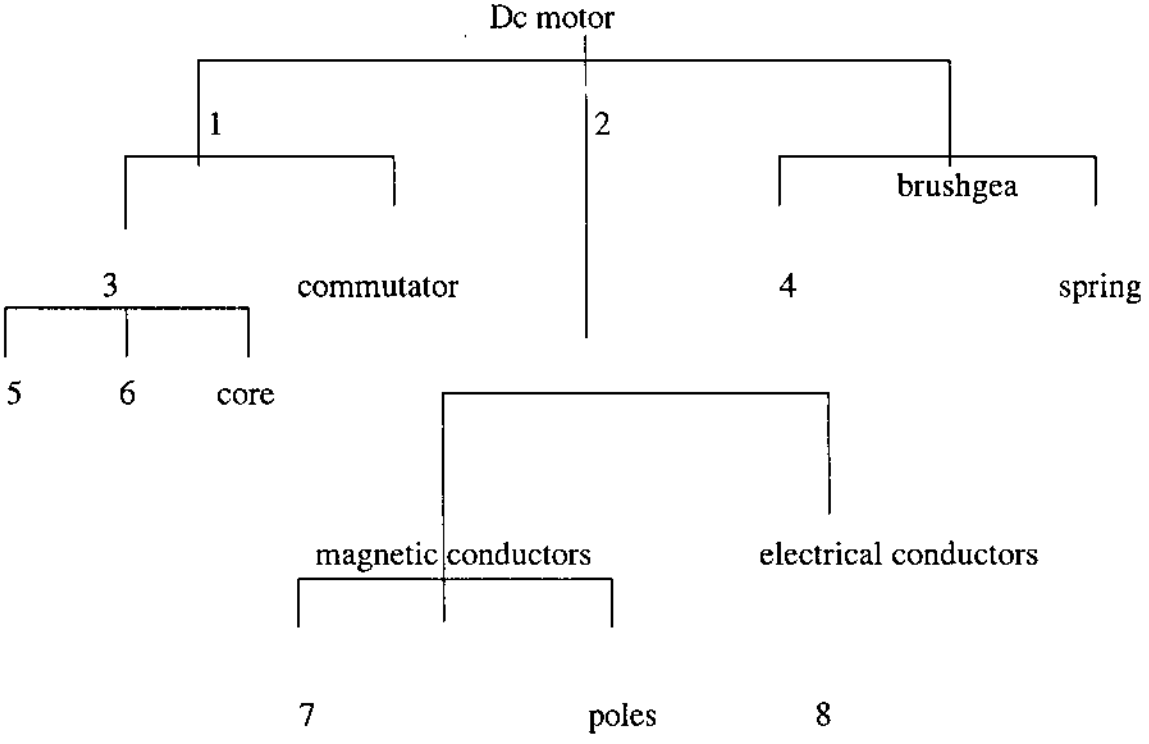
b. operation

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 : mê 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 cuốn, 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	: lấp đầy, đổ đầy
missing	: mất đi, bỏ quên
preceeding	: có trước
range	: vùng
operate	: hoạt động
baterry	: ắc 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

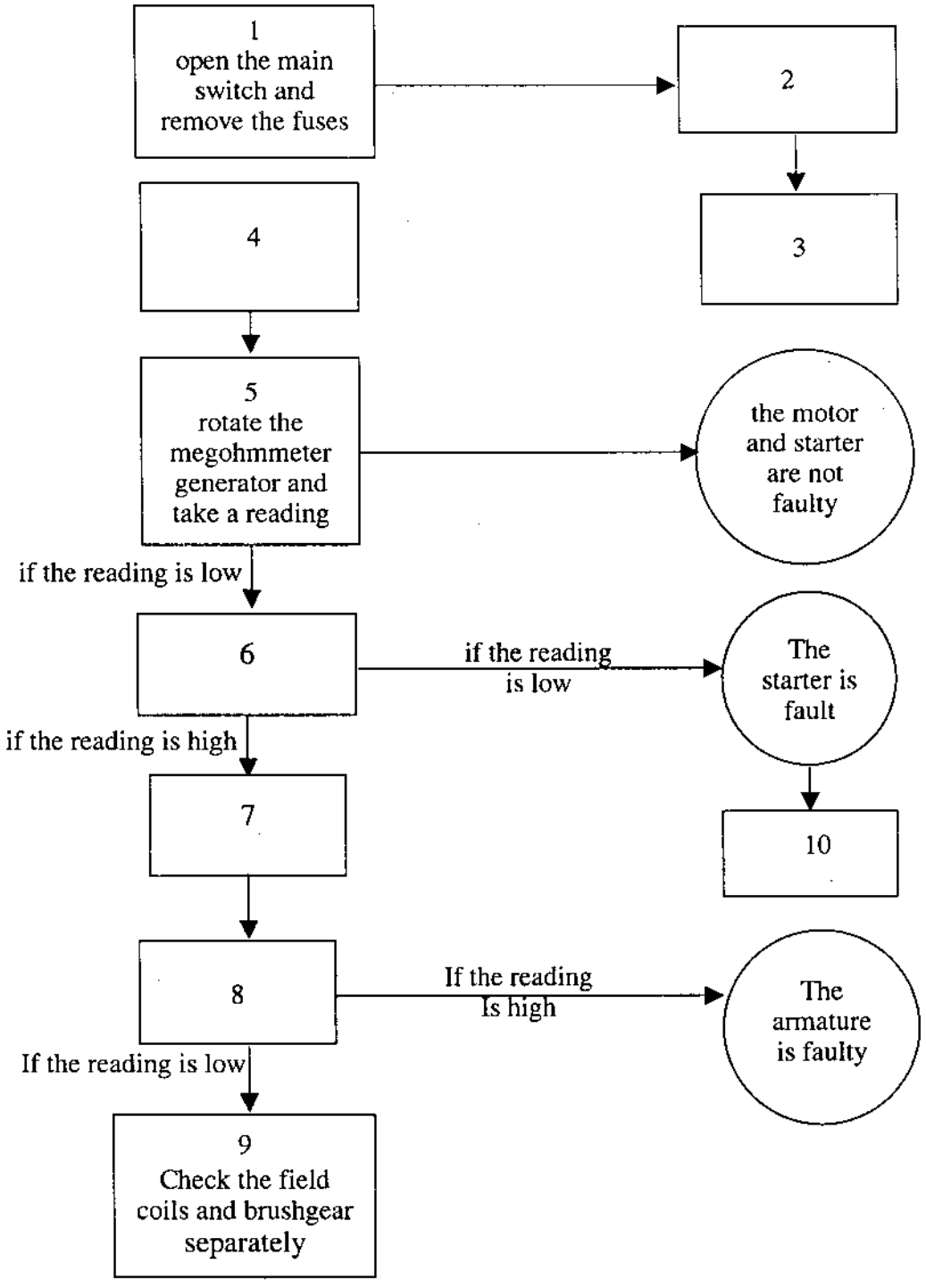
TESTING THE ELECTRIC MOTOR

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


1
open the main switch and remove the fuses
2
3
4
5
rotate the megohmmeter generator and take a reading
the motor and starter are not faulty
if the reading is low
6
if the reading is low
The starter is fault
10
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

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.

.....

.....

2. A baterry is a device.

The device changes chemical energy into electrical energy.

.....

.....

3. Power suplies are used to drive DC motor

The power suplies use thyristor rectifiers.

.....

.....

4. The capacitor has a value of 27 pF.

.....

.....

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 impedance.

.....

.....

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.

.....

.....

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 ppower 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. .....

Unit 9

TRANSFORMERS

(Máy biến áp)

I. VOCABULARY

wound	: quấn (quanh)
voltage	: điện thế
amplitude	: biên độ
turn	: vòng, quay, xoay
increase	: tăng
decrease	: giảm
winding	: khúc quanh, 1 vòng quay
illustrate	: minh họa
presence	: sự hiện diện, sự có mặt
virtually	: thật sự, thực sự
similar	: tương tự
basically	: cơ bản là
piece	: mảnh, mẩu, viên, khúc, cục
equipment	: trang bị
magnitude	: cường độ, âm lượng
primary	: sơ cấp
input	: đầu vào

secondary : thứ cấp
output : đầu ra
obtain : đạt được, giành được, thu được
insulate : cô lập, cách ly
former : cái trước, vấn đề trước
mount : đặt, sắp đặt, đóng vào
sheet : lá, tấm, phiến, tờ
lamination : sự cán mỏng, sự dát mỏng
oxidize : bị gỉ sét, ô xi hoá
so that : để, để cho, đặng
reduce : giảm, giảm bớt, hạ
eddy : làm xoáy lốc
loss : sự mất, sự thua, sự thất bại
centre : trung tâm
limb : bờ, rìa
own : của chính mình, của riêng mình
description : miêu tả
diagram : sơ đồ
items : khoản, món, tin tức
component : thành phần, phần hợp thành
possible : có thể
draw : vẽ
a carbon resistor : điện trở các bon
variable : có thể thay đổi được, có thể thay biến đổi được
filament bulb : bóng đèn có dây tóc
choke : (điện học) cuộn cảm kháng

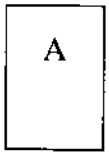
II. GRAMMAR

A transformer basically ***consists of two coils*** wound on a single iron core.

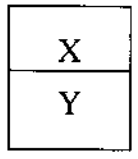
A transformer may be used ***either*** to increase ***or*** descrease an applied voltage ***or*** to increase ***or*** descrease a current.

Describing component

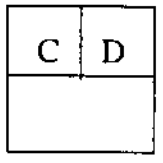
The following verbs can be used to break down a piece of equipment into its component parts. Note how they are used:



A Consists of .
Comprises
is composed of X and Y
is made up of

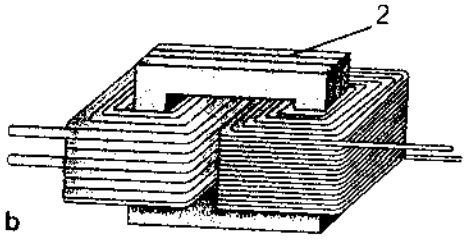


A contains C and D
Incluses



III. READING COMPREHENSION

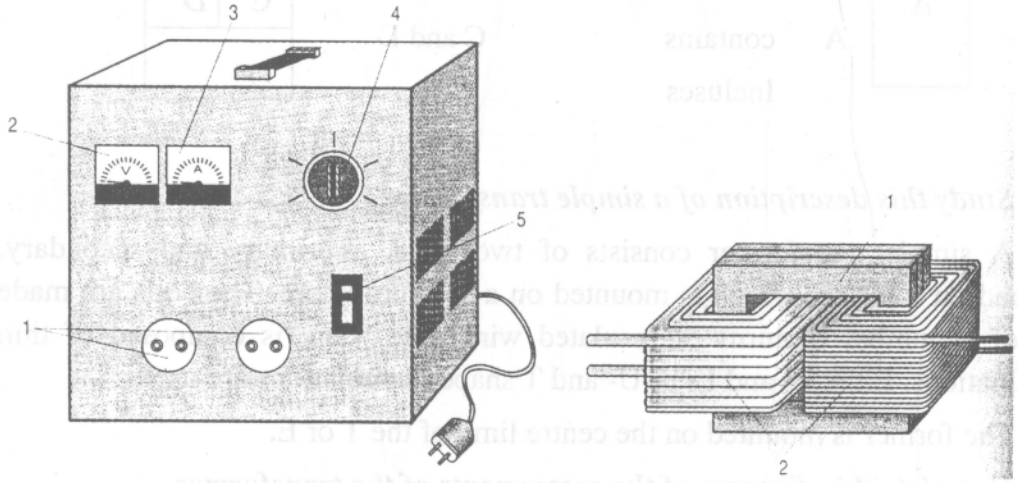
TRANSFORMER



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

The coils are insulated and wound round a former. The coils have a core of soft iron on which the former is mounted. The core is made from many thin sheets or laminations.

The sheets are oxidized so that the sheets are insulated from each other. Oxidizing the sheets reduces eddy losses.

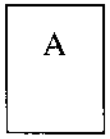


IV. EXERCISES

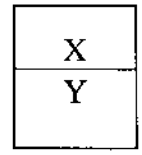
Exercise 1

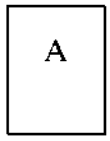
Describing component

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

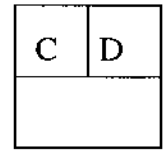


A Consists of / Comprises / is composed of / is made up of X and Y





A contains / Incluses C and D

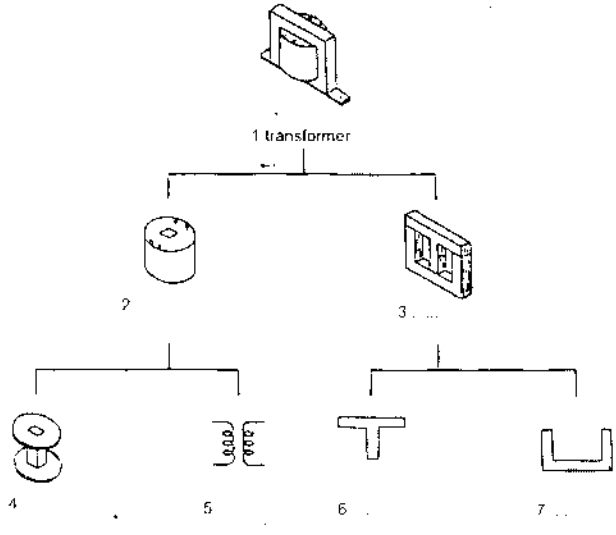


Study this description of a simple transformer

A simple transformer consists of two coils, a primary and 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. Eithe E- and I - or U- and T shaped laminations are used.

The former is mounted on the centre limb of the T or E.

Complete this diagram of the components of the transformer.



Now write your own description of a transformer using the diagram

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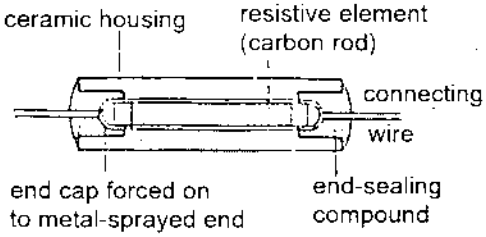
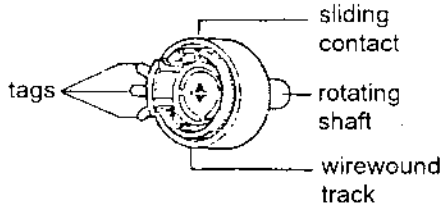
Exercise 2

Describing component

Break down each of these items into its components using the verbs you have learned. Where possible, draw a diagram to illustrate the break down





1. a carbon resistor

2. a variable wirewound resistor

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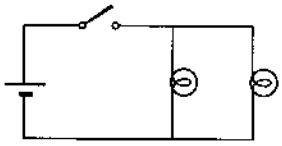

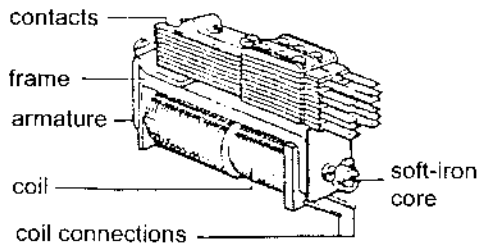

3. a lamp circuit

4. a relay

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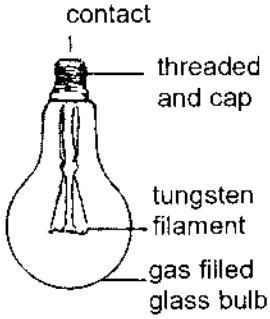

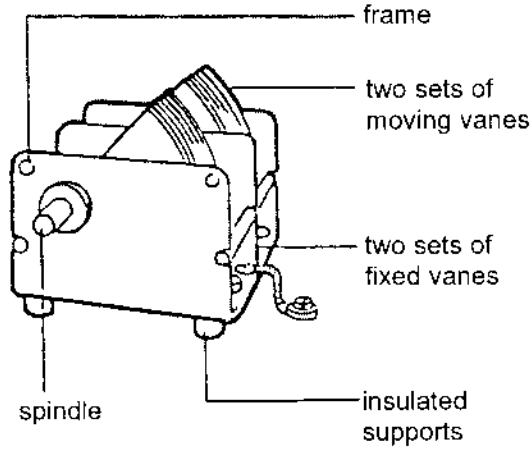

5. a filament bulb

6. a variable capacitor

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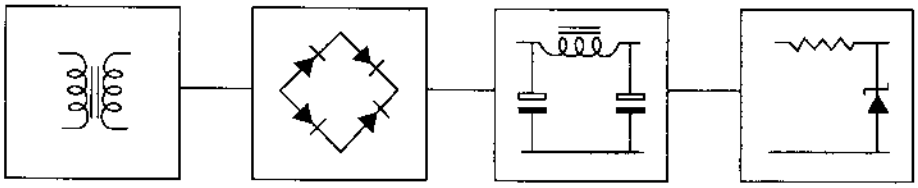

7. a power supply

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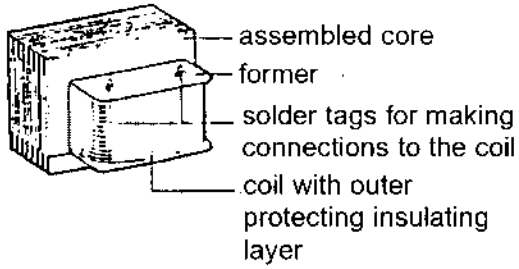

8. a choke

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Unit 10

INSTALLATION OF LIGHTING SYSTEMS

(Lắp đặt hệ thống đèn chiếu sáng)

I. VOCABULARY

install	: đặt (hệ thống máy móc)
recess	: lỗ thủng, rãnh, chỗ lõm
channel	: máng, rãnh
mark	: đánh dấu
plaster	: vữa, vôi vữa
hammer	: búa
chisel.	: đục
brickwork	: việc về gạch
drilling	: khoan
excessive	: quá mức, thừa, quá thể , quá đáng
breaker	: cái ngắt điện , cái công tắc
protection	: vật che chở, vật bảo vệ
accurate	: chính xác
repetitive operation	: hành động lặp lại
solenoid	: sô lê nôit (cuộn dây kim loại trở nên có từ tính khi có dòng điện đi qua cuộn dây đó)
latch	: chốt cửa, then cửa

overcome	: thắng, chiến thắng, tìm cáchvượt qua, khắc phục
tension	: sự căng, tình trạng căng
spring	: lo xo
dangerous level	: mức nguy hiểm

II. GRAMMAR

Consider first a very simple plan, ***covering*** a small 3- room cottage with two circuits, ***involving*** one ceiling outlet controlled ***by a wall switch*** for each of the 3- room, with 3 receptacle outlets for a ***larger*** room and 1 for each of the ***smaller*** room.

Superative comparision

A fuse is ***the simplest and cheapest*** protection

Sentence building

Use the following groups of sentences to make ten longer sentences

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

The zinc case is used as the negative electrode.

⟶ A zinc case, WHICH IS USED AS THE NEGATIVE ELECTRODE, is used as a container for the cell.

III. READING COMPREHENSION

PLANNING AN INSTALLATION

TYPICAL PLANS

Consider first a very simple plan, covering a small 3- room cottage with two circuits, involving one ceiling outlet controlled by a wall switch for each of the 3- room, with 3 receptacle outlets for a larger room and 1 for each of the smaller room.

The service entrance is 2 - wire 115- volt only. The plan for this installation is shown in Figure 1-3.

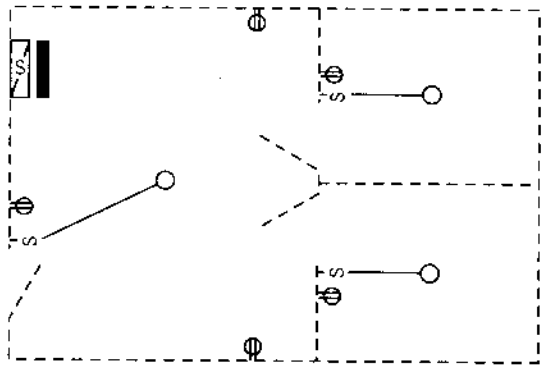

Fig 1-3 Layout a simple 3-room project

Note that this does not provide adequate wiring , nor does it meet all code requirements; it is shown merely as an exercise solving problems.

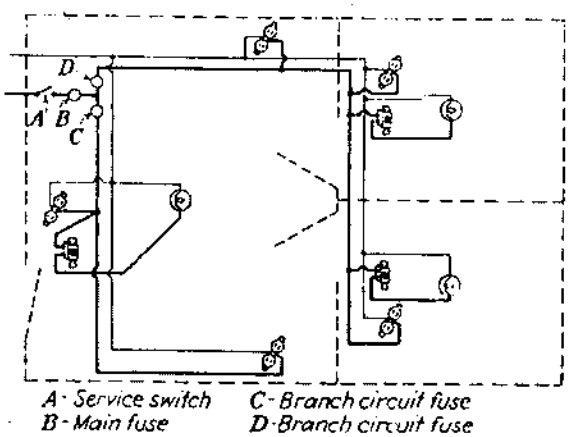

Fig 1-4 The lay-out of Fig 1-3

To make it easier to interpret this plan, Figure 1-4 shows the same lay-out in pictorial fashion, with all the wires shown in detail.

The neutral wire is shown as a light line; the 'hot' wire as heavy lines. Note how the neutral wire runs without interruption from the point where it enters

the building to each device where current is to be used. The black wire run from their fuses direct to each receptacle outlet and to each switch; an additional length runs from each switch to the light it controls, and that completes the wiring.

A represents the main switch. B represents the main fuse. C and D represent the 2 fuses, 1 for each branch circuit. The first branch circuit comprises all the wiring served by the current that flows through fuse C; the second circuit comprises all wiring served by the current that flows through fuse D.

The wiring plans for a larger house are Fig. 1-5 and 1-6. These diagram may at first sight seem rather formidable, but with study they become simple. Such plans are supplemented by detailed written specifications which give such information as size and type of service entrance, number of circuits type of materials to be used, and similar data.

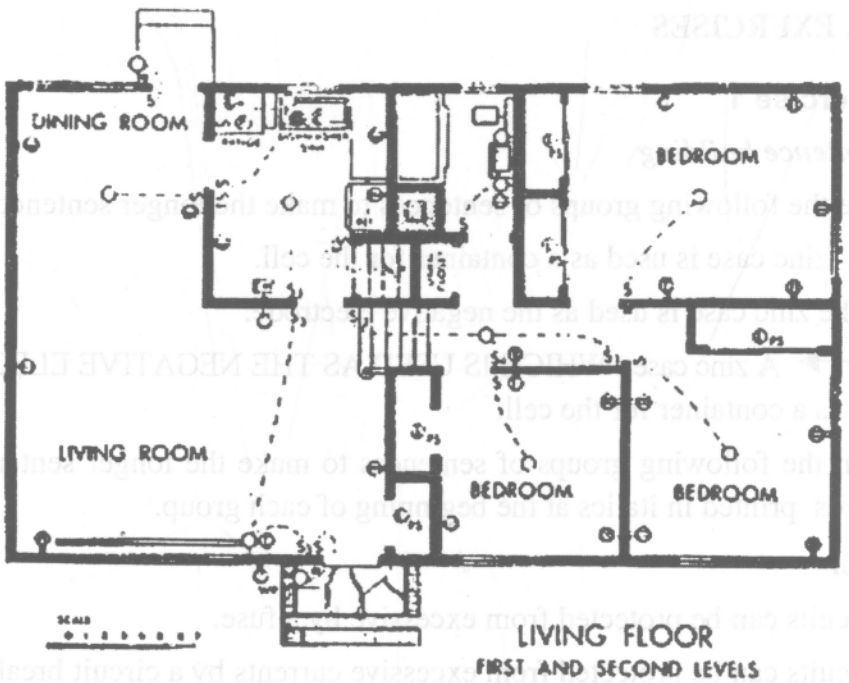

Fig 1-5 Wiring diagram for first and second levels of split-level house

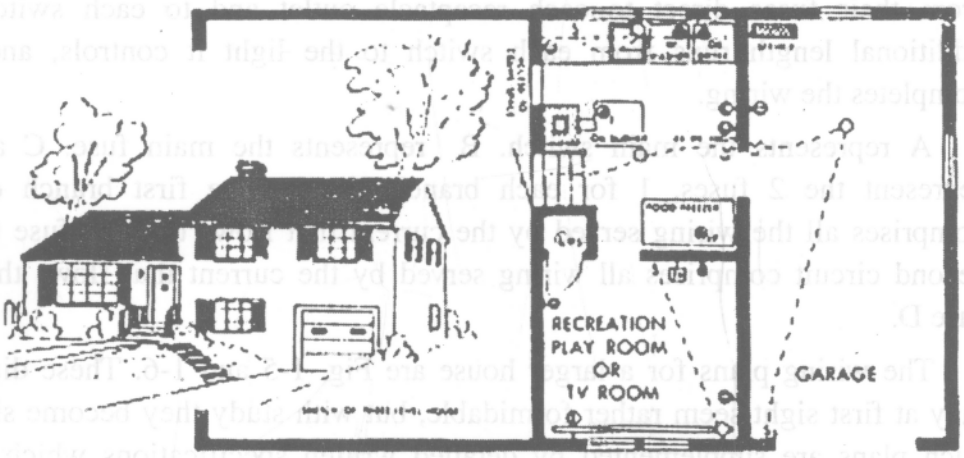

Fig 1-6 Wiring diagram for besement of house shown in Fig 1-5

IV. EXERCISES

Exercise 1

Sentence building

Use the following groups of sentences to make the longer sentences

- A zinc case is used as a container for the cell.
- The zinc case is used as the negative electrode.

⟶ A zinc case, WHICH IS USED AS THE NEGATIVE ELECTRODE, is used as a container for the cell.

Join the following groups of sentences to make the longer sentences. Use the words printed in italics at the beginning of each group.

1. or

Circuits can be protected from excessive by a fuse.

Circuits can be protected from excessive currents by a circuit breaker

.....

.....

2. however

A fuse is the simplest and cheapest protection

For accurate repetitiveoperation a circuit breaker is used.

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3. which

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

The contacts are held closed by a latch

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4. which , therefore

As 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.

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5. if

The current rises to a dangerous level.

The pull of the solanoide on the latch increases

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6. Which

Dry cells are usually enclosed in a cardboard case.

An additional metal jacket may be added.

The jacket makes the cell leakproof.

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7. Which

Leakproof cells are often preferred.

The electrolyte cannot leak out.

The cell ages.

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8. Which

Leaking electrolyte may damage the equipment.

The cells are installed in the equipment.

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Exercise 2

Label this diagram with following words

1. electrolyte
2. carbon rod
3. negetive electrode
4. zinc case
5. positive electrode

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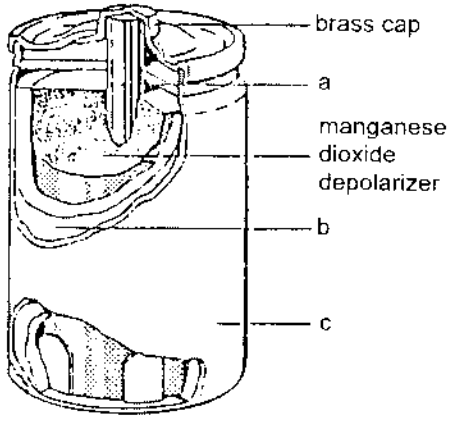

brass cap
a
manganese
dioxide
depolarizer
b
c

Unit 11

THE DISTRIBUTION OF POWER

(Phân phối năng lượng)

I. VOCABULARY

process	: quá trình
bend	: cong, bẻ cong
leads	: chì
insert	: chèn vào, lồng vào
events	: sự việc, sự kiện, trường hợp
sequence	: sự nối tiếp, sự liên tiếp, sự liên tục
finally	: cuối cùng
respectively	: lần lượt là
explain	: giải thích
withdrawing	: rút lui, rút
arrange	: sắp xếp, sắp đặt, sửa soạn
omit	: bỏ sót, bỏ quên, bỏ qua
include	: bao gồm
suspend.	: treo, treo lên, đình chỉ, hoãn, tạm thời ngưng.
diagram	: sơ đồ, biểu đồ
consumer.	: người tiêu dùng
distribution	: sự phân phối, sự phân bổ, sự phân phát

power stations : trạm phân phối điện

via : qua, theo đường

grid : hệ thống đường dây (điện phân bố trong1 khu vực)

substation : ga xép

is fed : được cung cấp, cung ứng

phase : pha

domestic consumer : tiêu dùng trong gia đình

printed circuit boad (pcb): bảng mạch điện

trim : cắt, loại bỏ làm nhỏ

dim : làm mờ

emitter voltage : điện thế tỏa ra.

mercury relay : cái ngắt mạch bằng thủy ngân

transmission : sự truyền

overhead : ở trên đầu, cao hơn mặt đất

underground cables : cáp dưới lòng đất

built- up area : khu vực xây dựng

II. GRAMMAR

Describing the process.

1. Bend the leads and insert them through the correct holes in pcb.

Write the descriptions of this process by rewriting each instruction in the **present passive.**

Example:

1. The leads ***are bent and inserted*** through the correct holes in the pcb.

Describing sequence: sequence words

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

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.

Example:

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

Writing instructions as explanations

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

1. Disconnect the supply ***by withdrawing the fuses.***

2. ***To disconnect*** the supply, ***withdraw*** the fuses.

Short relative clause

We can join these sentences by using a relative clause

1. The lines are arranged in two groups.

2. The lines carry the supply

⟶ The lines ***which carry the supply*** are rearranged in two groups.

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

Carry	form
Contain	hold
Consist of	measure

We can shorten the relative clause like this:

The lines ***carrying the supply*** are rearranged 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.

⟶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.***

Reinforcement connectives.

Study these sentences:

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

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

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

⟶ Steel - core aluminum is used for high - voltage lines ***because*** it is cheaper than copper.

Now consider this sentence:

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

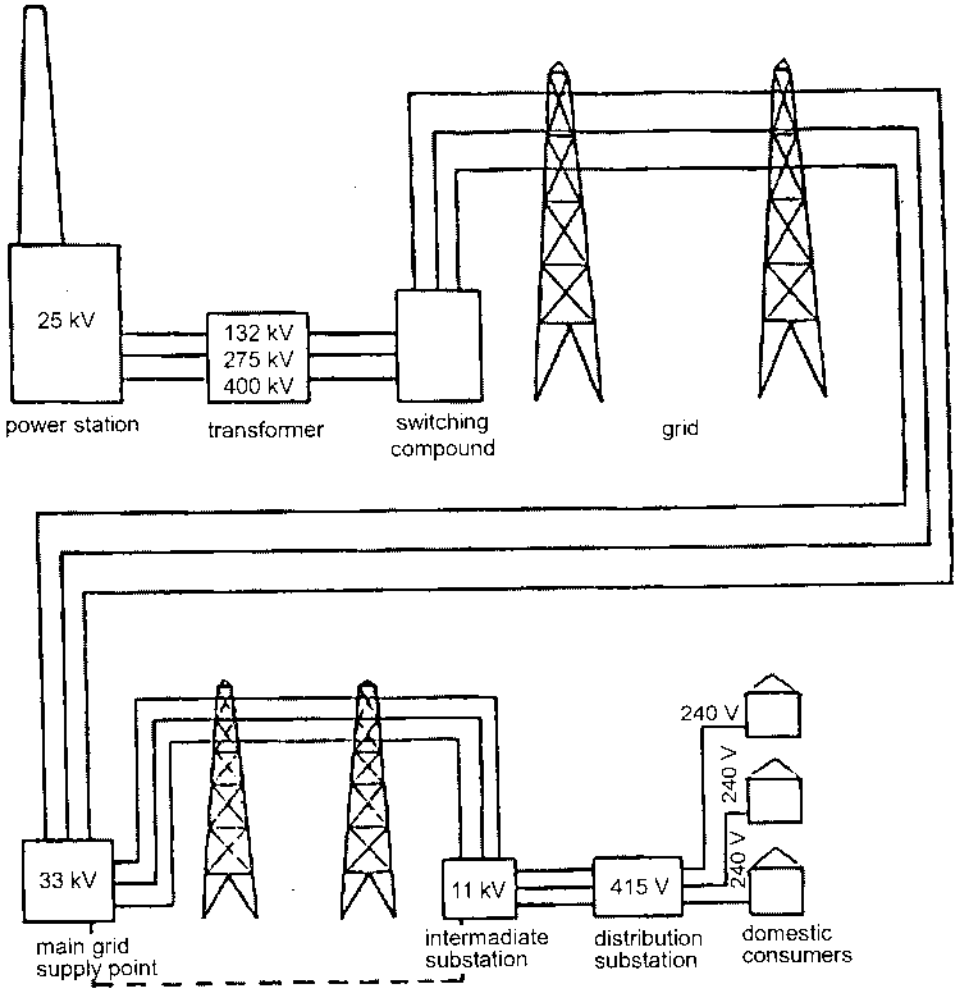
Sentence 3 provides an additional reason for sentence 1. It reinforces sentence 2. We can link a reinforcing idea using ***in addition, moreover or furthermore.***

⟶ 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.

III. READING COMPREHENSION

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

1. In the UK, electrical energy is generated at power stations at 25 kV

2. It is stepped by a transformer to 132,275 or 400 kV for long - distance distribution

3. It passes via the switching compound to the grid.

4. It is distributed via the grid system to main grid supply points where it is stepped down to 33 kV for distribution to heavy industry.

5. It is distributed via overheat or underground cables to intermediate substations where it is further reduced to 11 kV for light industry.

6. It is fed to distribution substations where it is reduced to 450 V, 3 phase and 240 V, 1 phase

7. It is distributed to the domestic consumer.

IV. EXERCISES

Exercise 1

Describing the 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 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 the descriptions of this process by rewriting each instruction in the ***present passive.***

Example:

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

2. .....

3. .....

4. .....

5. .....

6. .....

Exercise 2

Describing sequence: sequence words

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

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.

Now 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 and inserted through the correct holes in the pcb.

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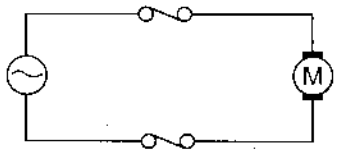
Exercise 3

Writing instructions as explanations

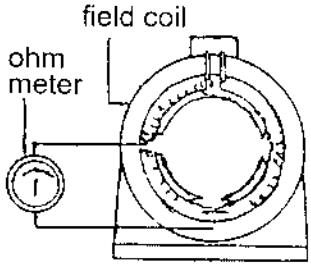
Study these instructions. They explain how to disconnect the supply to the motor in the circuit.

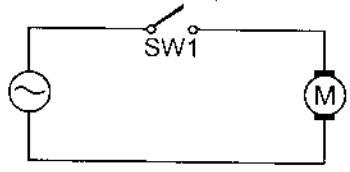


1. Disconnect the supply BY WITHDRAWING THE FUSES.

2. TO DISCONNECT the supply, withdraw the fuses

Now write instructions like the examples above to explain how to do the following:





1. Check the field coils

2. Start the motor

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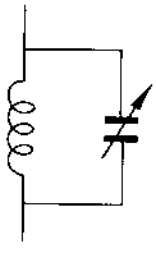

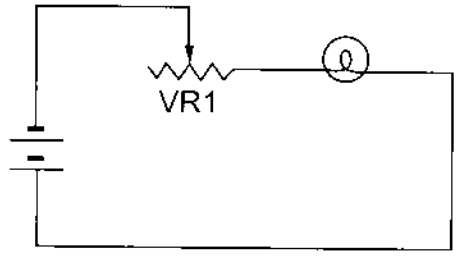

3. Change the frequency of the tuned circuit

4. Dim the light

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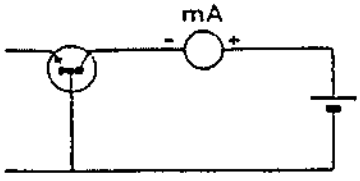

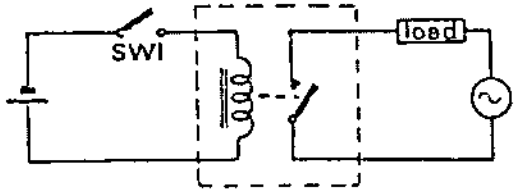

5. Measure the collector current.

6. Supply power to the load.

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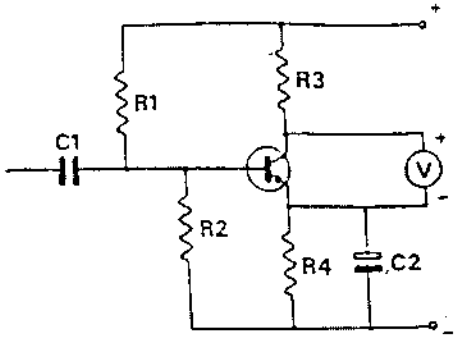
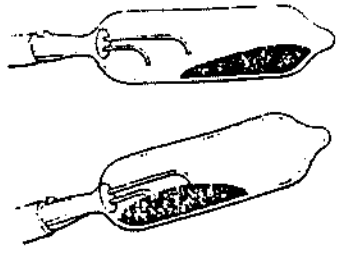
.....





Measure the collector- emitter voltage.

8. Operate the mercury relay.

.....

.....

Exercise 4

Short relative clause

We can join these sentences by using a relative clause

1. The lines are arranged in two groups.

2. The lines carry the supply

⟶ The lines WHICH CARRY THE SUPPLY are rearranged in two groups.

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

Carry	form
Contain	hold
Consist of	measure

We can shorten the relative clause like this:

The lines CARRYING THE SUPPLY are rearranged 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.

⟶ 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.

Now link each group of sentences into one sentence. Using short relative clause where possible. Number 2 cannot be shortened.

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 132, 275, or 400 kV.

.....

.....

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 stations may be fed to the Grid by underground cables.

The power stations are located in built- up area.

.....

.....

5. For voltages up to 400 kV cables are used.

These cables contain oil under low pressure.

.....

.....

Exercise 5

Do the following sentences the same. Using ***because, in addition, moreover, furthermore*** to connect them.

1. a. Semiconductors are cheaper than valves.

   b. Semiconductors are much smaller and lighter

   c. Semiconductors are used in preference to valves

.....

.....

.....

2. a. Dc motors permit powerful dynamic braking
   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 heat in 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 lamps is much less than from filament lamps

.....

.....

.....

Unit 12

EFFECT OF ELECTRIC CURRENT

(Tác dụng của dòng điện)

I. VOCABULARY

effects	: kết quả, hiệu lực, hiệu quả, tác dụng
thermal	: nhiệt, nóng
luminous	: tỏa sáng trong bóng tối, dạ quang
chemical	: thuộc hóa học
magnetic	: nam châm, có từ tính
undesirable	: có thể gây rắc rối, gây phiền phức
be reduced	: được giảm
however	: tuy nhiên
domestic appliances	: ứng dụng trong gia đình
such as	: ví dụ như
electric cookers	: bếp điện
industrial processes	: quá trình sản xuất công nghiệp
depend on	: phụ thuộc vào
passage	: đoạn trích, đoạn văn
produce light	: sản xuất ánh sáng
generate	: phát điện
incandescent	: nóng sáng, sáng chói, sáng rực

emit(v) : tỏa ra, phát ra

intense : mạnh, có cường độ lớn

ionize : i ôn hoá

according to : dựa theo

mercury : thủy ngân

vapour : bốc hơi, bốc hơi nước

compound into : pha trộn

components : hợp thành , cấu thành

electrolysis : sự điện phân, hiện tượng điện phân

chlorine : (hóa học) clo

pure water : nước tinh khiết

take place : chiếm vị trí

create : sáng tạo, tạo ra

magnetic field : từ trường

magnetize : từ hóa

attract : cuốn hút, thu hút, lôi cuốn, hấp dẫn, hút

principle : nguyên tắc

electromotive force : lực điện động

induce : xui khiến, xui, thuyết phục

for instance : ví dụ như

exert : dùng, sử dụng (sức mạnh, ảnh hưởng)

zinc : kẽm, tráng kẽm

container : công ten nơ, thùng đựng hàng

negative electrode : cực âm

carbon rod : thanh kéo, tay đòn

form : dạng, dạng thức

positive electrode. : cực dương

paste : dán, làm ma- két

ammonium	: (hóa học) A mo ni
chloride	: clo
liquid.	: chất lỏng
manganese dioxide	: di ô xit măng gan
prevent	: ngăn ngừa, ngăn cản
seat	: chỗ ngồi
cap	: chòm, chóp, đỉnh
enclose	: bọc quanh
additional	: thêm vào
leak	: lọt ra, rỉ ra, rò ra
proof	: chống lại được
damage	: mối hại , điều bất lợi
equipment	: sự trang bị, thiết bị

II. GRAMMAR

When a current flows though a conductor it may heat the conductor.

The heat ***generated by*** the current may be so great that the conductor becomes incandescent.

Chlorine ***is generated by the electrolysis*** of salt water.

Because pure water does not conduct well, sulphuric acid **has to be added** before the electrolysis takes place.

Sentence building

Use the following groups of sentences to make ten longer sentences

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

The zinc case is used as the negative electrode.

⟶ A zinc case, WHICH IS USED AS THE NEGATIVE ELECTRODE, is used as a container for the cell.

III. READING COMPREHENSION

The effects of an electric current are thermal, luminous, chemical and magnetic. When a current flows though 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 use 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 the 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 a transformer will induce a current in the secondary. This principle is also used in generators. Thirdly, if a current - carrying conductor is replaced in the magnetic field, a force will be exerted on it. This effect is utilized in the electric motor.

IV. EXERCISE

Exercise 1

Now study the passage carefully and complete this framework of notes:

Effects of an electric current:

1. thermal

2 .....

3 .....

4 magnetic

1 heat can be

a. undersirable e.g motor

b. .....e.g cooker

2. light

a. from incandescent conductor e.g. .....

b. from ..... e.g. vapour lamp

3. ..... = break down of chemical compound e.g salt water into chlorine

4. current flowing in conductor ⟶ ..... round it. Magnetic field has 3 applications:

a. ..... e.g relay

b. induce emf in another conductor e.g .....

c ..... e.g motor

Exercise 2

Sentence building

Use the following groups of sentences to make ten longer sentences

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

- The zinc case is used as the negative electrode.

⟶ A zinc case, WHICH IS USED AS THE NEGATIVE ELECTRODE, is used as a container for the cell.

Use the following groups of sentences to make the longer sentences

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

- The zinc case is used as 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 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 seated 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 correct in the space.

.....

.....

Unit 13

GENERAL INSTRUCTION OF PROGRAMMABLE LOGIC CONTROL (PLC)

(Giới thiệu chung về bộ điều khiển lập trình điện)

I. VOCABULARY

program	: chương trình
compiled	: biên soạn, sưu tập tài liệu
manager	: người quản lý, giám đốc, người chỉ đạo
version	: phiên bản
model	: kiểu, mẫu, mô hình
modify	: sửa đổi, thay đổi
accordingly	: phù hợp với điều đã được nhắc đến
via	: qua, theo đường (gì)
paralleled	: (điện học) được mắc song song
driver	: (kỹ thuật) bánh xe phát động
real	: thực, thực tế, có thực
assembly	: (kỹ thuật) sự lắp ráp, bộ phận lắp ráp
present	: có mặt, hiện diện, hiện tại
ensure	: bảo đảm
induction	: (điện học) sự cảm ứng, cảm ứng
squirrel - cage	: cái lồng có trục trụ tròn quay, rôto lồng sóc

horsepower	: (kỹ thuật) sức ngựa, mã lực
indicate	: 1. chỉ, cho biết, 2. biểu lộ, biểu thị
contrast	: sự tương phản, sự trái ngược
whereas	: nhưng ngược lại, trong khi
comparative	: 1. so sánh; 2. tương đối
difference	: sự khác nhau
valves	: (kỹ thuật) van

II. GRAMMAR

Reading motor rating plates

Study these rating plates from two electric motors:

Motor A is an induction motor of the squirrel - cage type.

HP 1/6 RPM 2850 INS CLASS	 E	VOLTS 240 AMPS 0.5	PH 1 RATING	HZ 50 Continuous

Motor B is a dc motor which is compounds - wound

HP 15 RPM 1400 INS CLASS	 E	VOLTS 240 AMPS 12	cycle RATING	dc Continuous

Making comparision and contrasts

We can compare two similar features using ***both***

Example

- ***Both*** motors are insulation class E.

We can contrast features which are different using ***whereas.***

Example:

Motor A has a horse power of 1/6, ***whereas*** motor B has a horse power of 15.

Other words we can use for contrast are: ***while, but, in contrast***. Often we can use ***a comparative form of an adjective to describe a difference.***

Examples

- Motor A rotates ***faster than*** motor B
- Motor B is ***more powerful than*** motor A.

III. READING COMPREHENSION

The programming examples for the PLC have been compiled with the help of the LUCAS-NULLE PC-PLC Manager, version 2.0.

The equipment required, is listed in each exercise.

The different types of PLC system are used, then the input and output addresses at the model, must be modified, accordingly. When programming via the LUCAS-NULLE PC-PLC Manager, with a correctly paralled driver, the addresses given in the typical result can be used. The control driversoftware accepts the programmed addresses and converts these to the real addresses of the control.

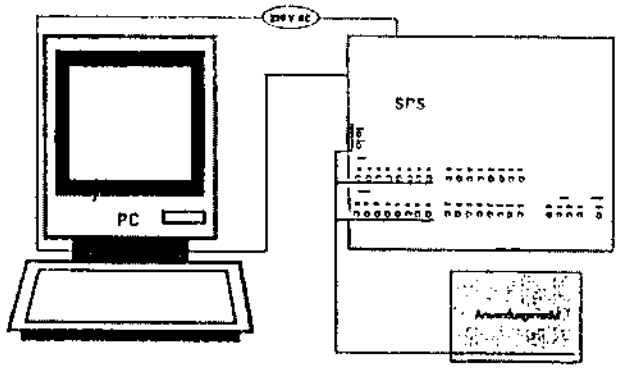
Example:

Program address	Is converted in	To control address
10	S5-95 U	132.0
	S5 - 100	10.0
	S7 - 200	10.0
11	S5-95 U	132.0
	S5 - 100	10.1
	S7 - 200	10.1
110	S5-95 U	133.0
	S5 - 100	11.0
	S7 - 200	11.0
Q 0	S5-95 U	Q 32.0
	S5 - 100	Q 2.0
	S7 - 200	Q 0.0

Q 1	S5-95 U	Q 32.1
	S5 - 100	Q 0.1
	S7 - 200	Q 0.1
Q 10	S5-95 U	Q 33.0
	S5 - 100	Q 3.0
	S7 - 200	Q 1.0

By converting the addresses within the device driver, the same program can be used for different control systems, without modification.

In principle, the following connections apply to all exercises.



PLC exercise assembly.

Danger!

In all exercises with mains power supplies, dangerously high voltage are present. Therefore, use only safety- protected connection cables and ensure that no short- circuits are produced. Carefully check all wiring to the application model

IV. EXERCISES

Exercise 1

Reading motor rating plates

Study these rating plates from two electric motors:

Motor A is an induction motor of the squirrel - cage type.

HP 1/6		VOLTS 240	PH 1	HZ 50
RPM 2850		AMPS 0.5	RATING	Continuous
INS CLASS	E			

Motor B is a dc motor which is compounds - wound

HP 15		VOLTS 240	cycle	dc
RPM 1400		AMPS 12	RATING	Continuous
INS CLASS	E			

Fill in the spaces in this table using the information given on the two motors. In the third column indicate if the features listed are the same or different. Numbers 2 and 8 have been done for you

	Feature	Motor A	Motor B	Same or different
1	Type			
2	Horsepower	1/6	15	Different
3	Volts			
4	Cycle			
5	Amps			
6	Rating			
7	Rpm			
8	Insulation class	E	E	Same

Exercise2

Making comparision and contrasts 1

We can compare two similar features using ***both***

Example

Both motors are insulation class E.

We can contrast features which are different using ***whereas.***

Example:

Motor A has a horsepower of 1/6, ***whereas*** motor B has a horsepower of 15.

Other words we can use for contrast are: ***while, but, in contrast.*** Often we can use ***a comparative form of an adjective to describe a difference.***

Examples

Motor A rotates faster than motor B

Motor B is more powerful than motor A.

Now write sentences like the examples to compare and contrast the motors

.....

.....

.....

.....

.....

.....

.....

.....

Exercise 3

Making comparisions and contrast 2

Compare and contrast the following:

1. Valves and transistors.

.....

2. alternating and direct current

.....

3. transmitters and receivers.

.....

4. filament lamps and fluorescent tubes

.....

5. ideal and practical transformers

.....

Unit 14

APPLICATION OF PLC A WASHING MACHINE
(Ứng dụng của PLC: PLC với máy giặt)

I. VOCABULARY

washing machine	: máy giặt
PLC system	: hệ thống điều khiển lập trình điện
model	: kiểu, mẫu
incorporate	: sát nhập, kết hợp chặt chẽ
various	: khác nhau, không giống nhau.
average	: trung bình
domestic	: gia đình, việc nhà, nội trợ
delicate	: nhạy cảm, thính, nhạy
state	: trạng thái
degree	: độ
sensor	: (kỹ thuật) (vật lý) phần tử nhạy, cái cảm biến
activated	: 1. đã hoạt hoá, 2. đã làm phóng xạ
indicate	: 1. chỉ , cho biết, 2. biểu thị, biểu lộ
delay	: sự chậm trễ, sự trì hoãn
undamaged	: không bị hư hại, còn nguyên, còn tốt
armour	: bọc sắt
essential	: 1. bản chất, thực chất;2. cần thiết, thiết yếu

information	: thông tin
extra	: thêm, phụ, ngoại
decide	: quyết định
correct	: sửa lỗi
combinations	: sự kết hợp, sự phối hợp
non- defining	: không hạn chế nội dung của từ hay ngữ
paragraph	: đoạn văn
utilize	: dùng, sử dụng, tận dụng
solenoid	: (điện học) sôlênôit (cuộn dây kim loại trở nên có từ tính khi có dòng điện đi qua cuộn dây đó)
pivoted	: trục đứng
telecommunications	: viễn thông
hinge	: xoay quanh
platinum	: platin, bạch kim
LED	: đèn phát sáng, phô tô quang

II. GRAMMAR

Relative clause:

Making definitions

Study these two sentences

- The cables were undamaged
- The cables were armoured.

We can link them in two ways using a relative clause:

1. The cables which were armoured were undamaged.
2. The cables, which were armoured, were undamaged.

Sentence 1 means that only the armoured cables were undamaged. Other cables , for example pvc coated cables, were damaged. The relative clause is a defining one. It defines the type of cable which was undamaged. It carries essential information.

Sentence 2 means that all the cables were undamaged and all the cables were armoured. The relative clause is a non- defining one. It adds more extra information to the sentence but it is not essential. We can remove it from the sentence and the sentence still makes good sense. It is separated from rest of the sentence by commas.

III. READING COMPREHENSION:

A washing machine is to be controlled by a PLC system. The model used, incorporates various basic functions found in the average domestic washing machine.

The machine can be switch on and off by a main switch.

A second switch allows the selection of either of two washing programs. The delicate washing (or fine- wash) program is selected when the switch is at a signal state 0; the normal wash program is selected with the signal state of 1.

The temperature of the wash can be set to 30 or 60 degrees.

Two sensors in the machine. H1 and H2, are used to detest the level of water and produce a 1 signal when activated. H2 can only be activated after H1. The switching state of the two sensors, is indicated by two LED's.

Two further outputs from the model, provide signals from the temperature of the wash- water, viz. 30 and 60 degrees. The temperatures are indicated on two LED's.

The heater for the wash - water is controlled by input H; the heater action is indicated by a red LED. When a drive signal is applied to the input, after a fixed time, the 30 degrees output is switched, followed by the 60 degree output after a delay.

IV. EXERCISES

Exercise1

Relative clause:

Making definitions

Study these two sentences

- The cables were undamaged

- The cables were armoured.

We can link them in two ways using a relative clause:

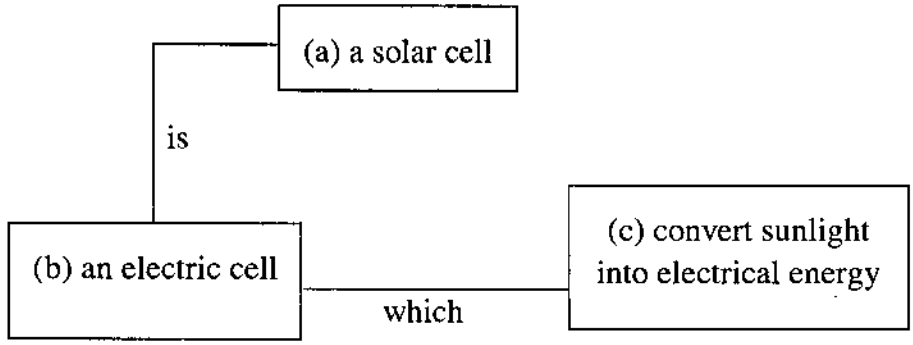
1. The cables ***which were armoured*** were undamaged.

2.The cables, ***which were armoured,*** were undamaged.

Sentence 1 means that only the armoured cables were undamaged. Other cables , for example pvc coated cables, were damaged. The relative clause is a defining one. It defines the type of cable which was undamaged. It carries essential information.

Sentence 2 means that all the cables were undamaged and all the cables were armoured. The relative clause is a non- defining one. It adds more extra information to the sentence but it is not essential. We can remove it from the sentence and the sentence still makes good sense. It is separated from rest of the sentence by commas.

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.

Now make eight definitions using the information in this table. You must decide on the correct combinations of (a), (b) and (c).

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

.....

.....

.....

.....

.....

.....

.....

.....

Exercise 2

Try to write your own definitions of these:

1. a voltmeter

.....

2. an electric motor

.....

3. a receiver

.....

4. a transmitter

.....

5. an electric cell

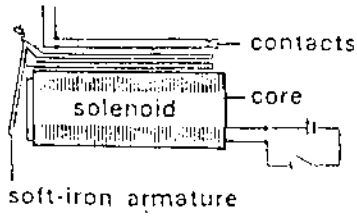
.....

Exercise 3

Relative clause

Adding information to a passage

Use non- defining relative clause to add extra information 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

Unit 15

WASHING MACHINE CONTROL
(Điều khiển máy giặt)

I. VOCABULARY

principle	: nguyên tắc
step	: bước
sequence	: tuần hoàn, sự nối tiếp, sự liên tiếp, liên tục
familiar	: quen thuộc, thân thiết
fill	: lấp đầy, đổ đầy
level	: mức độ
soak	: 1. ngâm, nhúng; 2. làm ướt sũng
CCW(counter- clockwise)	: ngược chiều kim đồng hồ
CW(clockwise)	: theo chiều kim đồng hồ
pump	: bơm
qualification	: phẩm chất , năng lực
dielectric.	: (điện) chất điện môi
standard	: tiêu chuẩn
accuracy	: chính xác
absorb	: hút , thu hút, hấp thụ

II. GRAMMAR

Qualification

Study these sentences:

1. All metals are conductors.

2. Some metals do not conduct well.

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

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. **Althrough** all metals are conductors, some do not conduct well.

Giving reasons for 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.

Reason and result connectives

How to use ***because*** and ***because of***

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.

III. READING COMPREHENSION

WASHING MACHINE CONTROL (NORMAL PROGRAM)

Once the basic principles of the function of step sequence control are familiar. A control sequence can be defined for the control of the washing machine. The sequence should be divided into 4 main groups, as follows:

1. Prewash

- Fill the machine to level H1. (Height 1)
- Wait 5 s for the washing to soak up the water.
- Fill the machine to level H2.
- Wash for 60 s (5 s for CCW (counter- clockwise), 5 s for CW (clockwise), 5 s pause, and so on...)

2. Main wash

- Fill the machine to level
- Heat the washing water to the set temperature.
- Wash for 99 s (5 s for CCW, 5 s pause, 5 s CW, 5s pause, and so on...)
- Pump out water with 5 s run - on after reaching level H1.

3. Rinsing

- Fill the machine to level H2.
- Wash for 60 s (5 s for CCW, 5 s pause, 5 s CW, 5s pause, and so on...)
- Pump out water with 5 s run - on after reaching level H1.

4. Spin- dry

- 20 s spinning and pumping out water.

- 3 s run- on time for the pump, after spinning.

IV. EXERCISES

Exercise 1

Qualification

Study these sentences:

1. All metals are conductors.

2. Some metals do not conduct well.

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

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. ***Althrough*** all metals are conductors, some do not conduct well.

Link each of the statements in the left - hand column with a suitable qualification from the right - hand column.

1. The unit of capicitance is the farad.	Valves are still used in large transmitters.
2. In an ideal transsformer there would be no loss	For professional work a tolerance of 1 or 2 % required.
3. Moving - iron meters can measure ac voltages without a rectifier.	Capacitance is usually areasuled at microfarads or picoparads.
4. Resistors usually have a tolerance of 5 or 10 %	In practice there is always sme loss.
5. Semiconductors have replaced valves in most applications	Moving-coil meters with rectifiers are preferred

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Exercise 2

Giving reasons for qualification

Reason and result connectives

How to use ***because*** and ***because of***

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.

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.

Add an explanation to each of the qualifications you made in exercise 1 using the information below. Use ***because*** or ***because of***.

1. the resistance of the winding.

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2. the farad is too large a unit

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3. higher standards of accuracy are needed

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4. the very high powers required

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.....

5. they do not absorb so much power from the circuit

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.....

.....

Unit 16

ELECTRICAL LABOR SAFETY

(An toàn điện)

I. VOCABULARY

fatal	: không tránh được
shock	: sốc
necessarily	: cần thiết
amount	: lượng , số lượng, tổng số
determines	: định, đã định, xác định rõ
barely	: công khai, rõ ràng, vừa đủ
perceptible	: có thể nhận biết thấy, có thể cảm thấy
unpleasant	: không dễ chịu, khó chịu, khó ưa
victim	: nạn nhân
lead	: dẫn đến
muscular	: bắp thịt, cơ
freeze	: làm tê liệt
prevent	: ngăn cản, ngăn chặn, ngăn ngừa
circumstances	: hoàn cảnh, trường hợp, tình huống
distinguish	: phân biệt
case	: trường hợp
completely	: hoàn toàn

surface : bề mặt
syllable : âm tiết
crane : cần trục
rise : nâng lên, kéo lên
consequently : do đó, vì vậy, bởi vậy, cho nên
conventional : quy ước, thường
prefer : thích hơn, ưa hơn
convenient : tiện lợi, thuận lợi, thích hợp
reality : tính chính xác, tính xác thực
portable : có thể xách tay
ultrasonic : siêu âm
distort : vặn vẹo, làm méo nó, bóp méo
watchmakers : thợ đồng hồ
advice : lời khuyên
rule : nguyên tắc
bare wire : điện trần, điện sống
sharpen : mài sắc
chisel : cái đục
grill : nướng, thiêu đốt
welding : hàn
helmet : mũ bảo hộ
goggles : kính bảo hộ

II. GRAMMAR

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.***

Qualification

Study these sentences:

1. All metals are conductors.

2. Some metals do not conduct well.

Sentence 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.

Reason and result connective 2

You have learned that ***because*** links a statement and a reason and that ***therefore*** links a statement and a result. The following connectives can also be used:

Statement + reason

Since

as

for the reason that

Statement + result

hence

consequently

for this reason

If the connective has more than one syllable, use a comma before it.

Example

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

Although connectives link ideas, these ideas need not be put into one sentence.

Example

The current rose above the maximum. ***Consequently*** the circuit- breaker opened.

These ideas are link by ***consequently*** but each is a separate sentence.

Reason connectives, however, are almost always used to link ideas into one sentence.

Example

- Copper is often used for cables since it is a good conductor.

III. READING COMPREHENSION

HOW DANGEROUS ARE SHOCKS?

Most people think it is a high voltage that causes fatal shocks. This is not necessarily so. The amount of current flowing through the body determines the effect of a shock. A miliampere is one thousandth of an ampere. A current of one miliampere through the body is just barely perceptible. One to eight miliampere causes mild to strong surprise. Currents from 8 to 15 miliamperes are unpleasant, but usually the victim is able to free himself, to lat go of is causing the shock. Currents over 15 miliamperes are likely to lead to " muscular freeze" which prevent the victim from letting go. Current over 75 miliamperes are likely to be fatal; much depends on the individual involved.

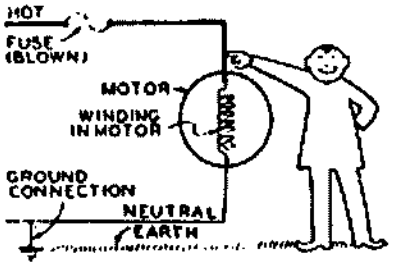


Fig. GR-2A 115-volt motor properly installed except for a grounding wite

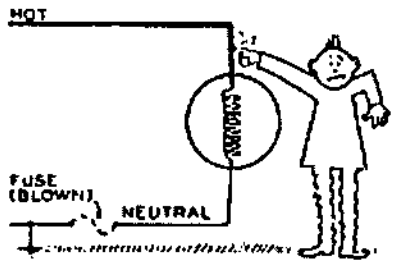


Fig. GR-3A 115-volt motor installed with a fuse in the neutral

Of cause the higher the voltage, the higher the number of miliamperes that would flow through the body, under any given set of circumstances. We must distinguish between shock resulting from touching two hot wires, and those resulting from touching one hot wire. In later case, a shock from a relatively high voltage while the victim is standing on a completely dry surface will result in fewer milliamperes than a shock from a much lower voltage while he is standing in water. Many deaths have been caused by shock on circuits considerably below 115 volts; many have survived shock from circuit of 600 volts and more.

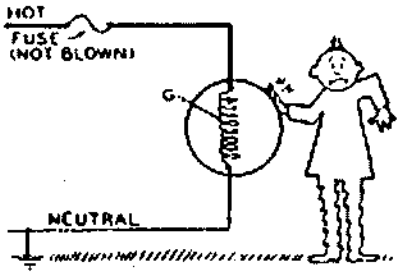
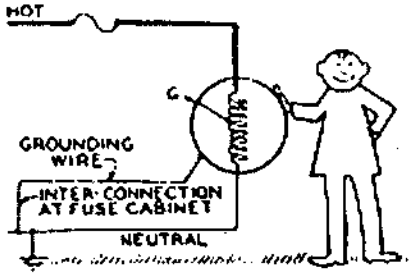


Fig. GR4 The motor of Fig GR-2, but the motor is defective



Gig. GR-5 The motor of Fig GR-4, but grounding wire has been added

IV. EXERCISES

Exercise 1

Reason and result connectives 1.

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⟶ 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.***

Qualification

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1. All metals are conductors.

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Sentence 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.

Reason and result connective 2

You have learned that because links a statement and a reason and that therefore links a statement and a result. The following connectives can also be used:

statement + reason

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as

for the reason that

statement + result

hence

consequently

for this reason

If the connective has more than one syllable, use a comma before it.

Example

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

Although connectives link ideas, these ideas need not be put into one sentence.

Example

- The current rose above the maximum. ***Consequently*** the circuit- breaker opened.

These ideas are link by consequently but each is a separate sentence.

Reason connectives, however, are almost always used to link ideas into one sentence.

Example

- Copper is often used for cables since it is a good conductor.

Now link these ideas with either reason , result, or qualification connective.

1. Conventional current flow is from positive to negative.

In fact electrons flow from negative to positive.

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2. Alternators are preferred to dynamos for cars.

Alternators give higher output at low speeds.

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3. Dirt and dust reduced effective light.

Lamps must be kept clean

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

Squirrel- cage motors are used for many general duties.

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

In reality magnetic lines of force do not exist.

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6. Transistorized equipment is easily portable.

Transistors can operate from battery voltages

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7. Ultrasonic welding is better than heat welding.

The materials are not distorted

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8. Watchmakers work with very small parts.

Watchmakers require a lot of light.

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Exercise 2

You must never smoke near petrol

Study this

Rules (Very important)	Advice (This is not as important as the rules)
1. You must not smoke here	1. You should not use a dirty saw
2. You must never smoke here.	2. You should never use a dirty saw
3. You must switch off	3. You should clean all tools
4. You must always switch off	4. You should always clean your tools

Use ***should*** or ***must***

Example:

1. You ***should*** clean your tools before you use them.

Now you do the same:

1. Here is some advice: clean your tools before you use them.

.....

2. This is a rule: switch off the electricity before you touch a bare wire.

.....

3. Here is a rule: do not smoke near petrol.

.....

4. This is some advice: Always sharpen chisels before you use them.

.....

5. Here is a rule: Always wear goggles when you grill a chisel.

.....

6. This is some advice: never use a screwdriver for opening a tin of paint

.....

7. Here is some advice: Use a narrow brush for painting corners.

.....

8. This is a rule: never do any welding without helmet or goggles

.....

TÀI LIỆU THAM KHẢO

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38. ASSEMBLY
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