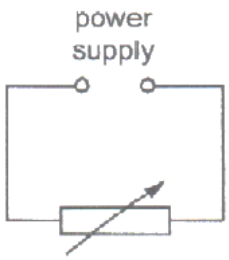
Electricity – 2022 November IGCSE 0625

1. Nov/2022/Paper_21/No.26

The diagram shows a circuit containing a variable resistor connected to a variable power supply.



The table shows the currents for different values of the potential difference (p.d.) and the resistance.

p.d. / V	resistance / Ω	current
3.6	12	I_1
1.2	12	I_2
3.6	6	I_3

$I = \frac{V}{R}$

$I_1 = \frac{3.6}{12} = 0.3\ A$

$I_2 = \frac{1.2}{12} = 0.1\ A$

$I_3 = \frac{3.6}{6} = 0.6\ A$

$I_2 < I_1 < I_3$

What is the order of the currents from smallest to largest?

A $I_1 \rightarrow I_2 \rightarrow I_3$ **B** $I_1 \rightarrow I_3 \rightarrow I_2$ **C** $I_2 \rightarrow I_1 \rightarrow I_3$ ✓ **D** $I_3 \rightarrow I_1 \rightarrow I_2$

2. Nov/2022/Paper_21/No.29

A lamp rated 12 V, 2.0 A is switched on for one minute.

How much energy is transferred by the lamp?

A 6.0 J **B** 24 J **C** 360 J **D** 1440 J ✓

$E = V \times I \times t$

$V = 12V$

$I = 2.0A$

$t = 1min = 60s$

(time in seconds)

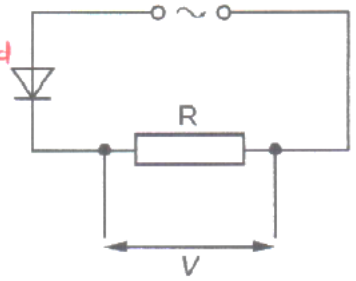
$E = 12 \times 2.0 \times 60$

$= 1440J$

3. Nov/2022/Paper_21/No.30

An alternating current (a.c.) power supply is connected in series with a resistor R and a diode.

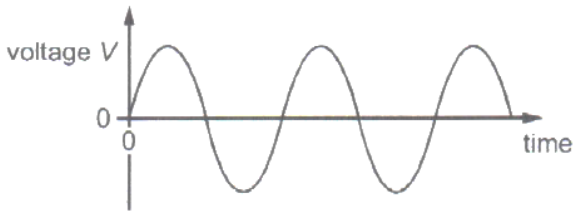
a.c oscillates forward and backward at a frequency of 50 times every second (50Hz)



- Diode is direction dependent resistor.
- It allows current only in one direction and block current in reverse direction

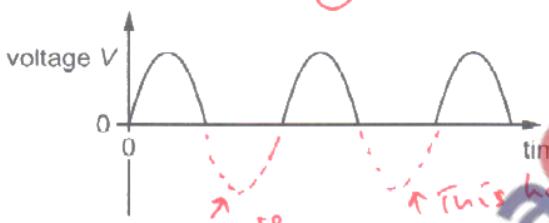
Which graph shows how the voltage *V* across the resistor R varies with time?

A

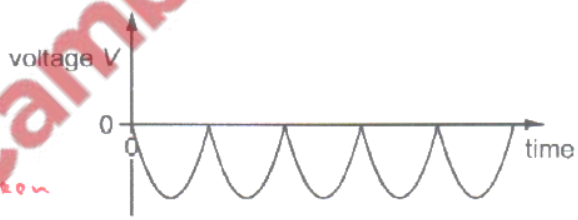


B

C ✓



D



4. Nov/2022/Paper_21/No.31

A student makes four resistors using different pieces of wire. The wires have different diameters and lengths. All the pieces of wire are made of the same material.

Which piece of wire will make the resistor with the largest resistance?

	diameter / mm	length / cm
A	0.8	10
B	0.8	17
C	2.0	10
D	2.0	17

Resistance depends on
1. Length of wire
2. Temperature
3. material
4. Thickness

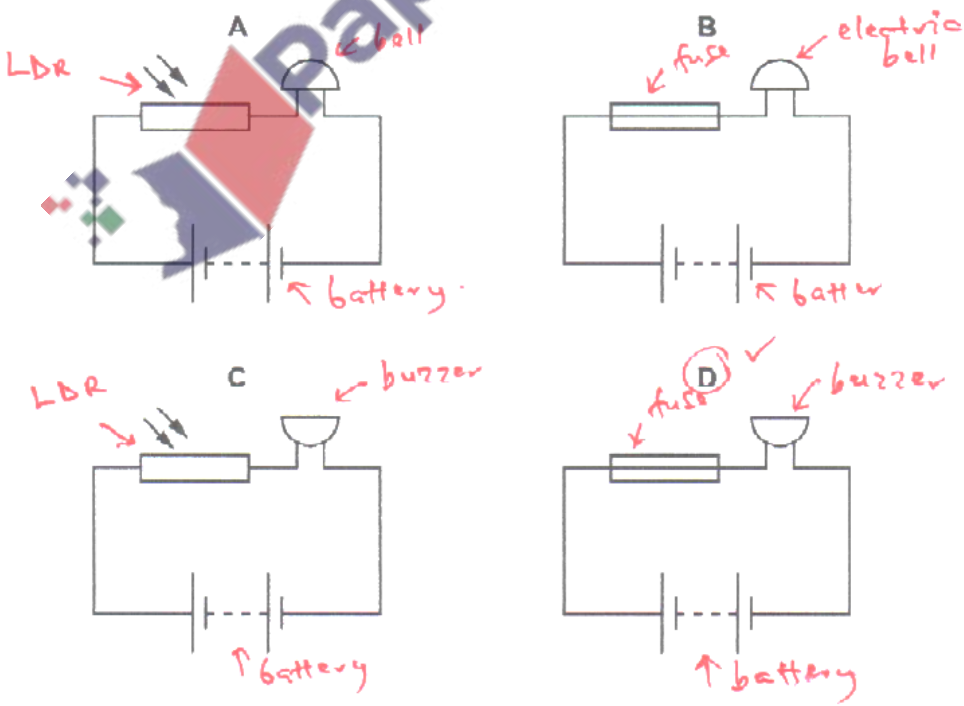
$R = \frac{\rho \times l}{A}$

$\therefore$ $R \propto l$ – longer wire has more resistance

$R \propto \frac{1}{A}$ – Thinner wire has more resistance.

5. Nov/2022/Paper_21/No.32

Which diagram shows a circuit containing a battery, a fuse and a buzzer?

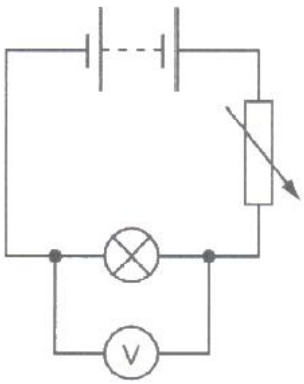


6. Nov/2022/Paper_22/No.26

The diagram shows a circuit used to control the potential difference (p.d.) across a lamp.

The variable resistor is adjusted until the p.d. across the lamp is 6.0 V.

The current in the lamp is 0.5 A.



$R = \frac{V}{I}$

$= \frac{6.0\,V}{0.5\,A}$

$= 12\,\Omega$

What is the resistance of the lamp?

A 0.083 Ω **B** 3.0 Ω **C** 6.5 Ω **D** 12.0 Ω ✓

7. Nov/2022/Paper_22/No.27

A charge Q flows for time *t* through a resistor of resistance *R*.

$Q = I \times t$

$I = \frac{Q}{t}$

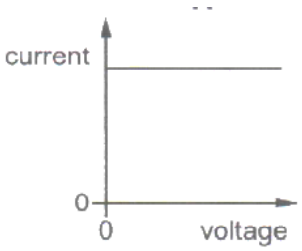
Which equation gives the current *I* in the resistor?

A $I = Qt$ **B** $I = Rt$ **C** ✓ $I = \frac{Q}{t}$ **D** $I = \frac{R}{t}$

8. Nov/2022/Paper_22/No.29

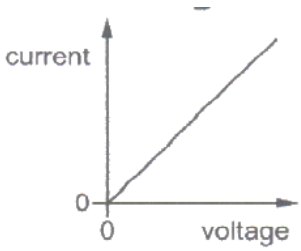
Which diagram shows a graph of current against voltage for a filament lamp?

A



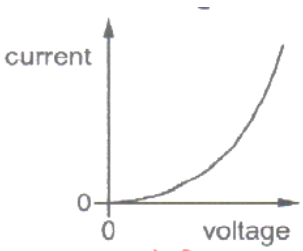
None

B



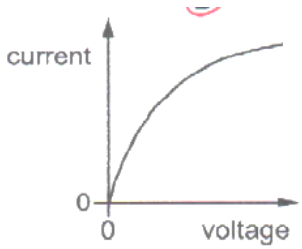
Ohmic resistor

C



diode

D ✓



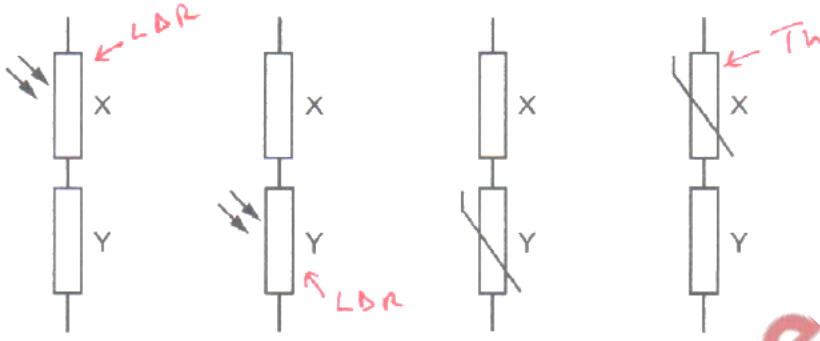
filament lamp

9. Nov/2022/Paper_22/No.30

Each potential divider is placed in a circuit with a power supply.

Which potential divider makes the potential difference (p.d.) across component Y increase when the light intensity increases?

A ✓ B C D



See question 30 in Paper 23 for explanation

10. Nov/2022/Paper_22/No.31

1 Diagram 1 is a circuit diagram showing an a.c. power supply connected to four diodes and a resistor.

Diagram 2 shows the output voltage from the power supply.

diagram 1

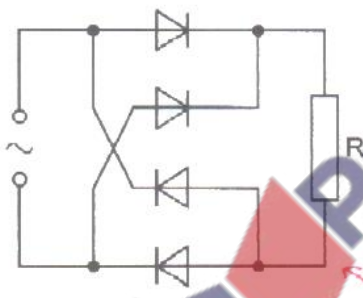
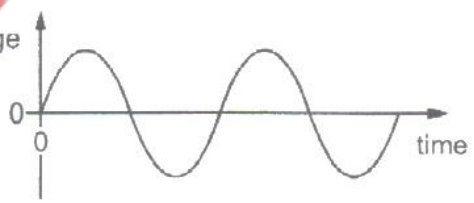


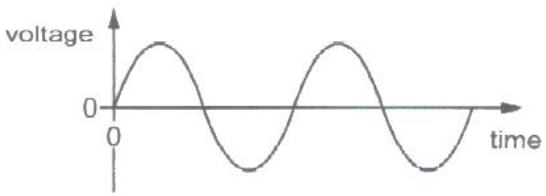
diagram 2



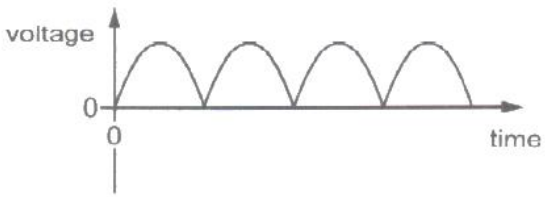
This is a rectification circuit, it converts a.c to d.c

Which graph correctly shows the voltage–time curve across resistor R?

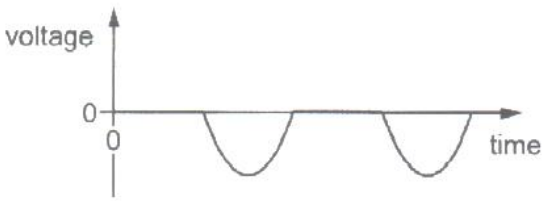
A



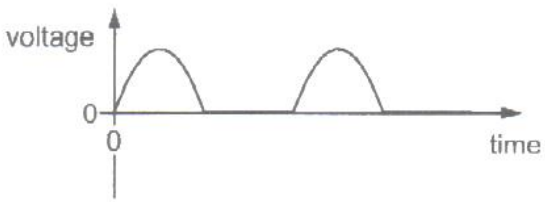
B ✓



C



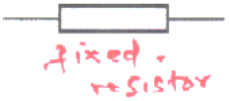
D



11. Nov/2022/Paper_22/No.32

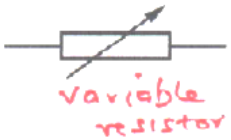
Which diagram shows the circuit symbol for a fuse?

A



fixed resistor

B



variable resistor

C

heater

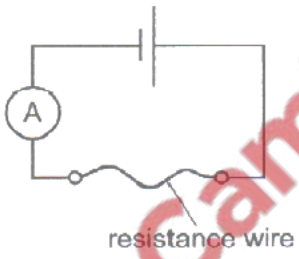
D ✓

fuse

12. Nov/2022/Paper_23/No.26

A student is investigating a resistance wire.

She measures the current in a 50 cm length of resistance wire.



The student repeats the experiment using a 100 cm length of the same resistance wire.

What is the effect of this change on the current in the circuit and on the resistance of the wire?

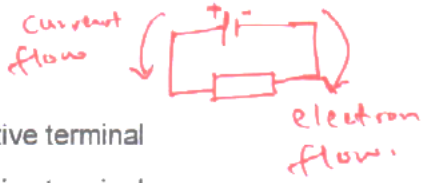
	effect on current	effect on resistance
A	decreases ✓	decreases
B	decreases ✓	increases ✓
C	increases	decreases
D	increases	increases ✓

$R = \frac{\rho \times l}{A}$

- $R \propto l$ – longer wire has more resistance
- The higher the resistance the less the current.

13. Nov/2022/Paper_23/No.27

A resistor is connected to a cell so that there is a current from the positive terminal of the cell to the negative terminal.



What causes the current in the resistor?

A electrons moving from the negative terminal of the cell to the positive terminal

B electrons moving from the positive terminal of the cell to the negative terminal

C protons moving from the negative terminal of the cell to the positive terminal

D protons moving from the positive terminal of the cell to the negative terminal

14. Nov/2022/Paper_23/No.29

Which combination of the current in a resistor and the time for which it is present results in a charge of 240 C passing through the resistor?

$Q = I \times t$

A a current of 2.0 A for 120 s → $Q = 2 \times 120 = 240\,C$ ✓

B a current of 4.0 A for 960 s → $Q = 4 \times 960 = 3840\,C$

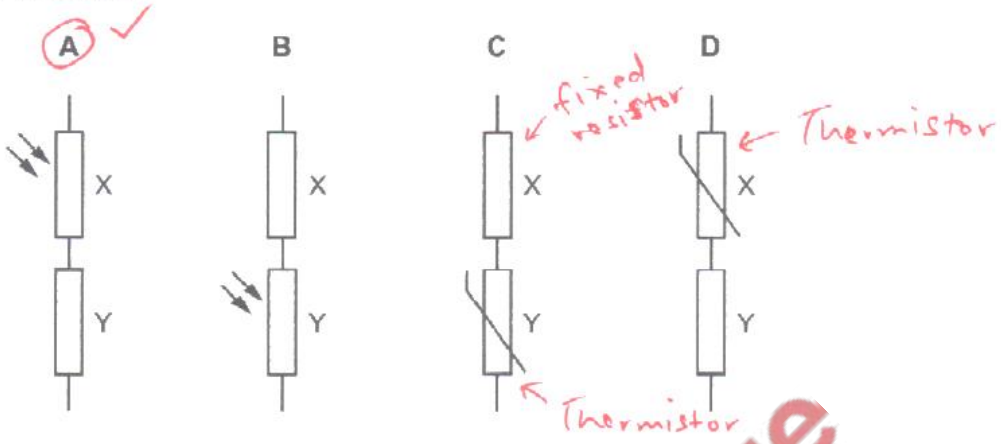
C a current of 6.0 A for 40 minutes → $Q = 6 \times 40 \times 60 = 14400\,C$

D a current of 8.0 A for 30 minutes → $Q = 8 \times 30 \times 60 = 14,400\,C$

15. Nov/2022/Paper_23/No.30

Each potential divider is placed in a circuit with a power supply.

Which potential divider makes the potential difference (p.d.) across component Y increase when the light intensity increases?



LDR - is light dependent resistor

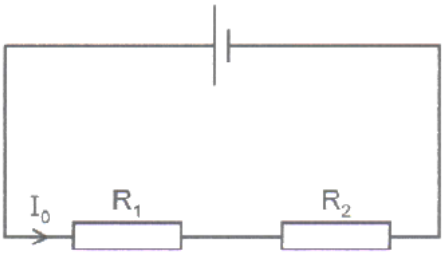
- At higher light intensity, resistance is less
- So p.d at Y will increase, since

p.d at X + p.d at Y = constant.

- Fixed resistors are not affected by change in light intensity
- Also thermistors, not affected by light, but by temperature.

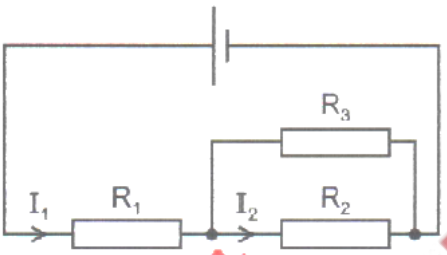
16. Nov/2022/Paper_23/No.31

Two resistors, R_1 and R_2, are connected in series in a circuit, as shown.



The current in the resistors is I_0.

Another resistor, R_3, is then connected in parallel with R_2, as shown.



How do the currents I_1 and I_2 in the resistors R_1 and R_2 compare to current I_0?

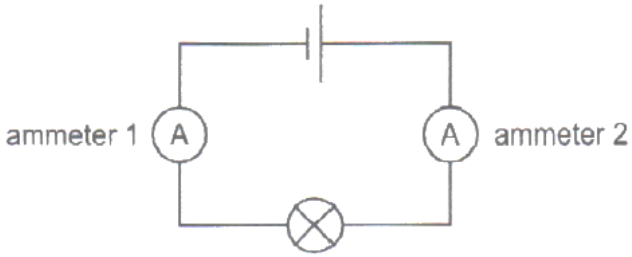
	current in R_1	current in R_2
A	$I_1 = I_0$	$I_2 < I_0$
B	$I_1 = I_0$	$I_2 = I_0$
C	$I_1 > I_0$	$I_2 = I_0$
D ✓	$I_1 > I_0$	$I_2 < I_0$

- When R_3 is connected parallel to R_2, the total circuit resistance decreases.
- So $I_1 > I_0$

- At the junction current splits, so $I_2 < I_0$.

17. Nov/2022/Paper_23/No.32

The diagram shows a circuit containing a cell, a lamp and two ammeters.



The current reading on ammeter 2 is 0.20 A.

What is the name for this type of circuit and what is the reading on ammeter 1?

	type of circuit	reading on ammeter 1
A	series ✓	0.20 A ✓
B	series ✓	greater than 0.20 A
C	parallel	0.20 A
D	parallel	greater than 0.20 A

- In a series circuit, current is same at all points.
- So ammeter 2 will read 0.20 A just like ammeter 1.

18. Nov/2022/Paper_31/No.8

Fig. 8.1 shows an electric circuit set up by a student.

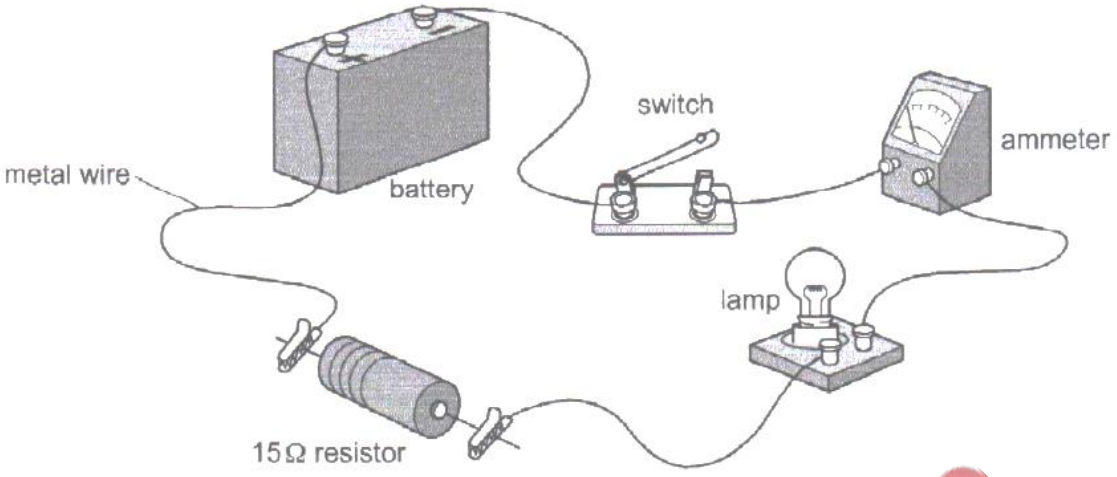
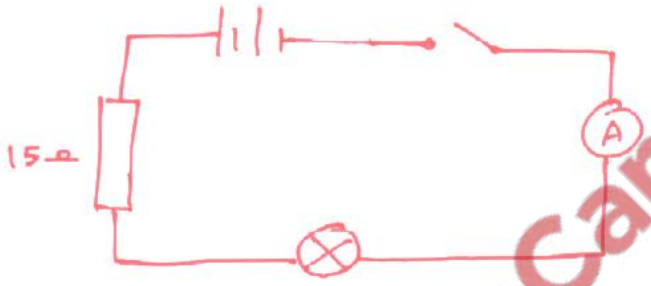


Fig. 8.1

(a) Using standard symbols, draw a circuit diagram for the student's circuit.



[4]

(b) When the switch is closed there is a current in the circuit.

State the name of the particles flowing in the metal wire.

electrons ..... [1]

(c) The current in the 15Ω resistor in Fig. 8.1 is 0.40 A when the switch is closed.

Calculate the potential difference (p.d.) across the 15Ω resistor.

$V = I \times R$

$= 0.40 \times 15$

$= 6.0$ V

p.d. across resistor = 6.0 V [3]

[Total: 8]

19. Nov/2022/Paper_32/No.8

A student uses the circuit in Fig. 8.1 to find the resistance of a piece of iron wire.

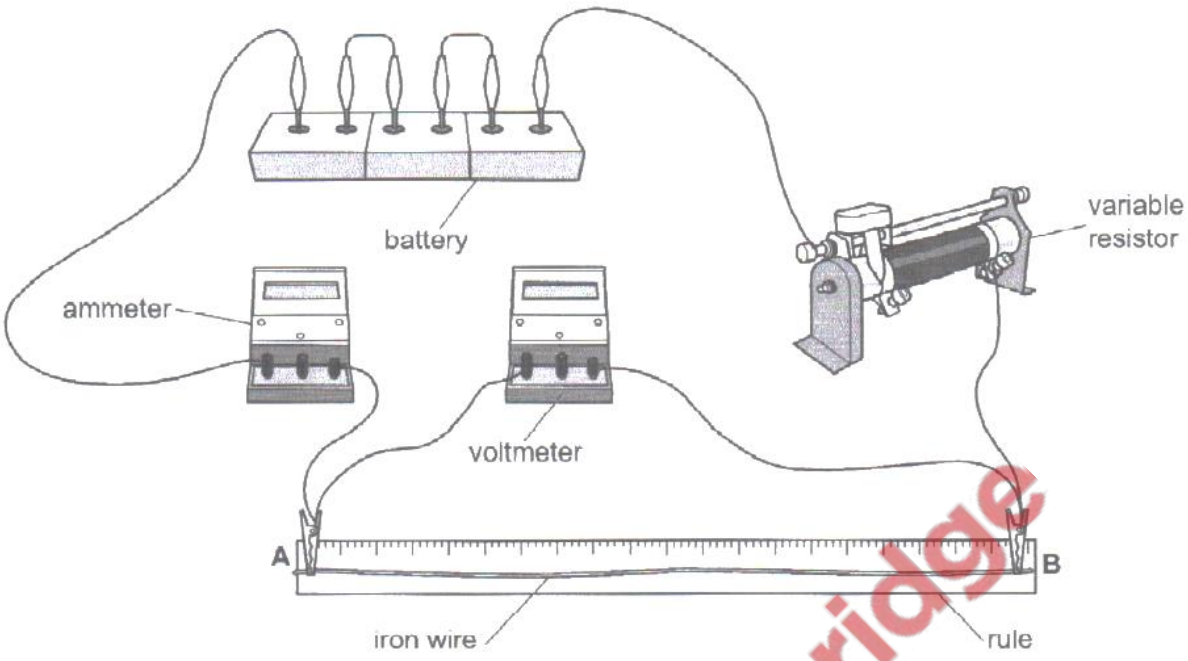
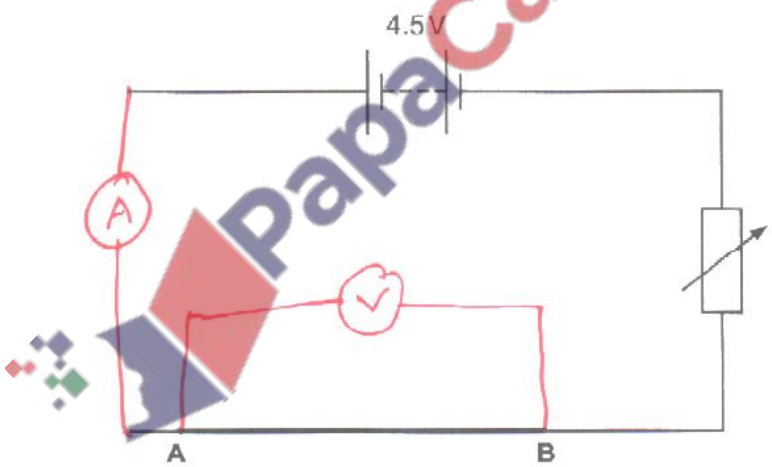


Fig. 8.1

(a) Complete Fig. 8.2 to show the circuit diagram for the arrangement shown in Fig. 8.1.

The piece of iron wire is shown as the thicker line between the points A and B.



[3]

Fig. 8.2

(b) The reading on the voltmeter is 1.56V.

The reading on the ammeter is 0.112A.

Calculate the resistance of the iron wire. Include the unit in your answer.

$R = \frac{V}{I}$

$= \frac{1.56\,V}{0.112\,A}$

$= 13.9\,\Omega$

$\simeq 14\,\Omega$ (2.s.f)

resistance = ... 14 ..... unit ..... Ω ..... [4]

[Total: 7]

20. Nov/2022/Paper_32/No.9(d_ e)

(d) Using the information in Fig. 9.1, calculate the reading on the voltmeter.

$V_p = 10V$
$N_p = 200$
$N_s = 800$
$V_s = ?$

$V_s = \frac{N_s \times V_p}{N_p}$

$V_s = \frac{800 \times 10}{200}$

$= 40V$

reading on voltmeter = ... 40 ..... V [3]

(e) The 10 V a.c. power supply is replaced by a 10 V d.c. battery.

State the reading on the voltmeter.

transformers do not work with direct current (dc).

reading on voltmeter = ... 0 ..... V [1]

[Total: 7]

21. Nov/2022/Paper_33/No.9

(a) Fig. 9.1 shows a hazardous scenario of using electricity in a kitchen.

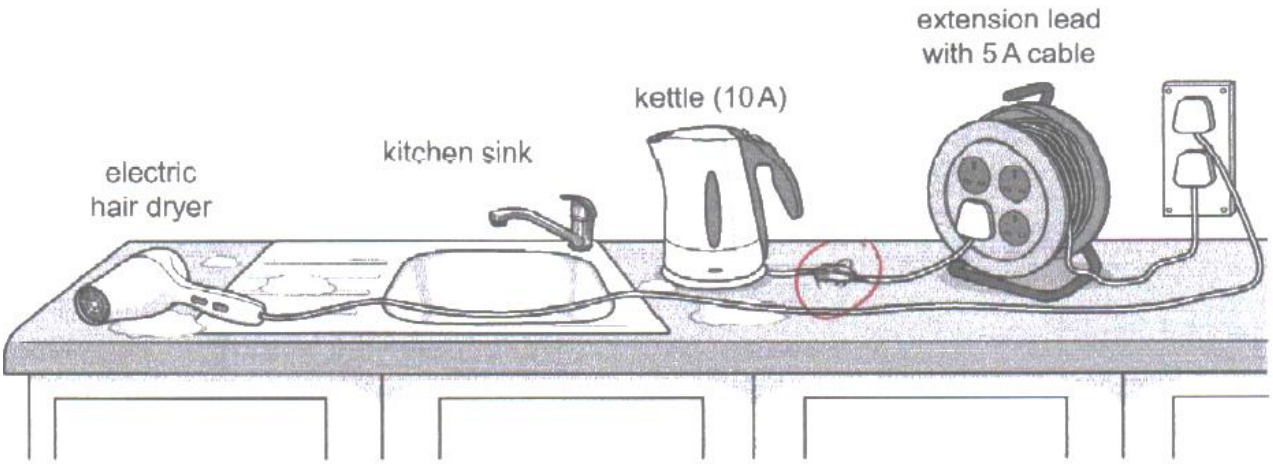


Fig. 9.1

(i) Identify **three** electrical hazards in Fig. 9.1.

1. damage insulation of the wire
2. Wet conditions
3. 5A cable connected to 10A kettle.

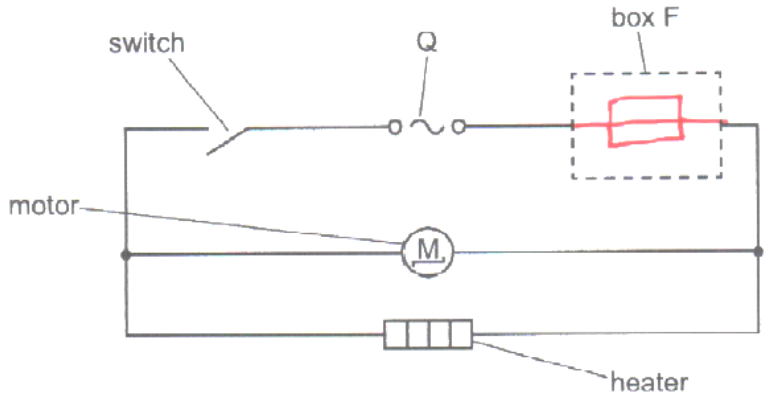
[3]

(ii) Give **two** possible consequences of the electrical hazards in Fig. 9.1.

1. Overheating - this can cause fire outbreak.
2. Electric shock - can be fatal when touched..

[2]

(b) Fig. 9.2 shows the circuit for a hair dryer.



a-c – alternating current.

Fig. 9.2

(i) State the name of the component labelled Q in Fig. 9.2. a-c power supply [1]

(ii) On Fig. 9.2, in the dashed box F, draw the circuit symbol for a fuse. [1]

(iii) State the purpose of a fuse.

to protect circuit from excessive current [1]

(iv) State an advantage of using a circuit breaker instead of a fuse.

can be reset quickly [1]

(c) A different hair dryer has a fuse and two heat settings.

When the hair dryer is used on the low heat setting, the current in the hair dryer is 5.2A.
When the hair dryer is used on the high heat setting, the current in the hair dryer is 8.9A.

Circle **one** correct fuse rating for this hair dryer.

5A **10A** **13A** **15A** **30A** [1]

[Total: 10]

The fuse rating should be slightly bigger than the highest current in the circuit of the device, but not too large

eg 15A and 30A are way too large from 8.9A

22. Nov/2022/Paper_41/No.8

The unit of the two electrical quantities electromotive force (e.m.f.) and potential difference (p.d.) is the volt (V).

(a) State **one** other similarity between e.m.f. and p.d.

Both are energy per unit charge

$V = \frac{I}{a}$ [1]

(b) State **one** difference between e.m.f. and p.d.

p.d is voltage across an electrical component, emf is voltage of the power source in a circuit [1]

(c) A battery consists of four cells, each of e.m.f. 1.2V, in series.

(i) Calculate the e.m.f. of the battery.

emf = 1.2 × 4
= 4.8 V

e.m.f. = 4.8 V [1]

(ii) The battery is connected in a circuit with four 12Ω resistors. Fig. 8.1 is the circuit diagram.

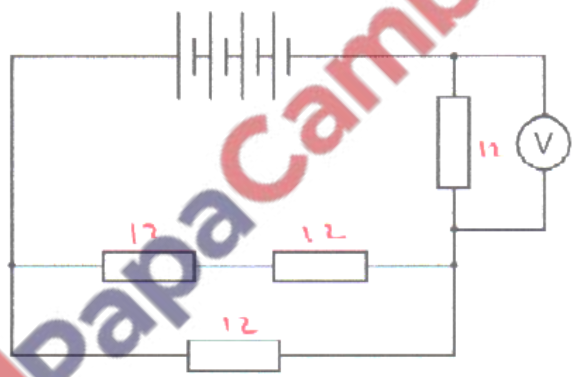


Fig. 8.1

Calculate the total resistance of this arrangement of resistors.

Series: R = 12 + 12 = 24Ω

Parallel R = $\frac{24 \times 12}{24+12}$ = 8Ω

Total Series R = 12 + 8 = 20Ω

resistance = 20 Ω [3]

(iii) Calculate the reading on the voltmeter in Fig. 8.1.

Current in circuit

$I = \frac{4.8\text{V}}{20\Omega}$

= 0.24 A

V = I × R
= 0.24 × 12
= 2.88 V

reading = 2.9 V [2]

[Total: 8]

23. Nov/2022/Paper_42/No.8

Fig. 8.1 shows an electrical circuit.

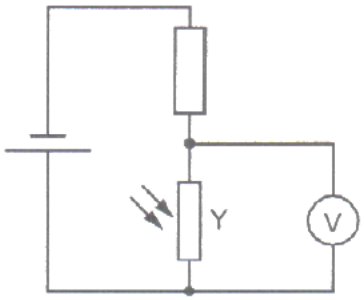


Fig. 8.1

(a) The light intensity at the circuit increases from dark to bright.

State any effect on the resistance of component Y.

Resistance of Y decreases

State and explain any effect on the reading of the voltmeter.

- Voltmeter reading will decrease.
- Resistance is proportional to voltage across component Y.

[3]

(b) The circuit shown in Fig. 8.2 is switched on for 2.0 min.

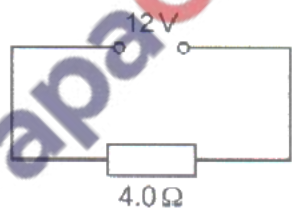


Fig. 8.2

The current in the 4.0 Ω resistor is 3.0 A and the magnitude of the charge on an electron is 1.6×10^{-19} C.

(i) Calculate the number of electrons that pass through the resistor each second.

$Q = I \times t$
$= 3 \times 2 \times 60$
$= 360\ C$

No of e⁻s $= \frac{360\ C}{1.6 \times 10^{-19}\ C} = \frac{2.25 \times 10^{21}}{120} = 1.875 \times 10^{19}$

number = 1.9×10^{19} e's [3]

(ii) Calculate the power dissipated by the resistor.

$P = I \times V$
$= 3\ A \times 12\ V$
$= 36\ W$

power = 36 W [2]

[Total: 8]

24. Nov/2022/Paper_43/No.8(b)

(b) Fig. 8.2 shows an electric circuit.

negative charge.

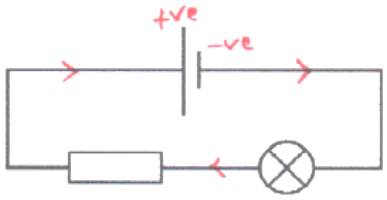


Fig. 8.2

On Fig. 8.2, draw an arrow to show the direction of flow of electrons and explain how you determined the direction.

explanation ..... Current flow from +ve to -ve terminal opposite to the direction of flow of electrons. [1]

[Total: 5]