Name:	Target Grade:	Actual Grade:

BRIGHT CULTURE

ELECTRICITY
MCQ and STRUCTURED QUESTIONS

READ THESE INSTRUCTIONS FIRST

INSTRUCTIONS TO CANDIDATES

1. Find a quiet, comfortable spot free place from distractions.

2. Spend one minute on each mark.

3. Time yourself for every single question.

4. Every chapter has their own question types. Ensure that you know the different question type for each chapter.

5. Make a conscientious effort to remember your mistakes, especially in terms of answering techniques. E.g Take a picture for the mistakes that you made, keep it in a photo album, and revise it over and over again.

6. Highlight question types that you tend to keep making mistakes and review them nearing exams.

7. Always review the common questions and question type that you tend to make mistakes nearing exams.

8. During exams, classify the question type and recall what you have learnt, how you need to analyse the questions for the different question type, what you need to take note of and answer with the correct answering techniques!

✨ **Wishing you all the best for this test!**

You've got this!

💡 **With lots of love,**
Bright Culture 💛

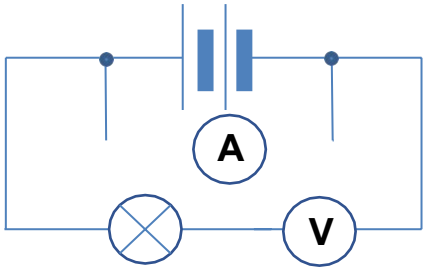
MARKS

GOOD LUCK FOR YOUR EXAM!

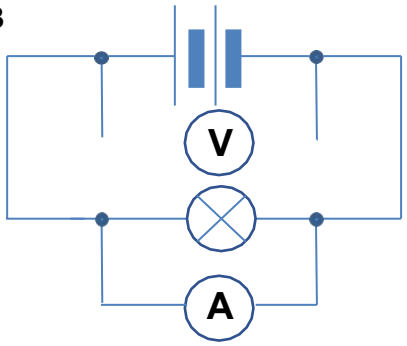
ELECTRICTY MCQ

1 Which circuit is connected correctly to find the resistance of the light bulb?

A



B



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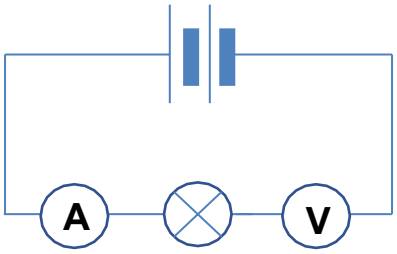

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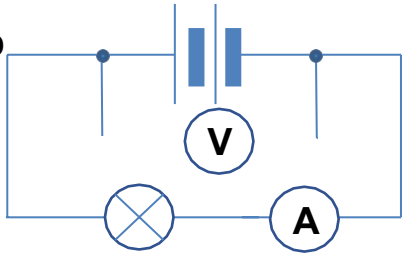
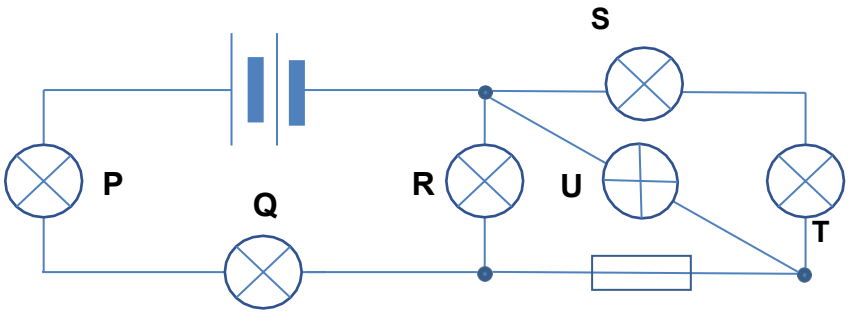
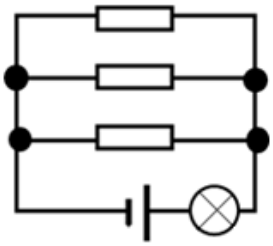


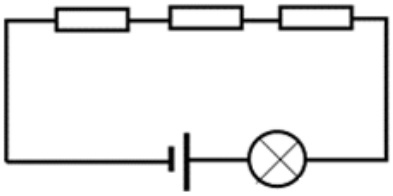
2 Which bulbs in the circuit below will switch off if the fuse melts?

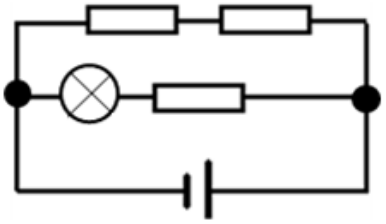


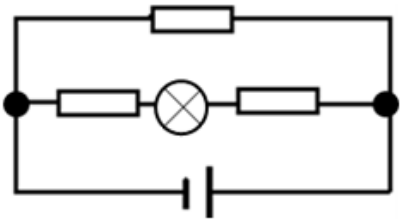
A P, Q and R
B S, U and T
C P, Q, S and T
D S, U, R and T

3 The cells and light bulbs used in the following circuits are identical.
Which circuit has the brightest bulb?

A


B


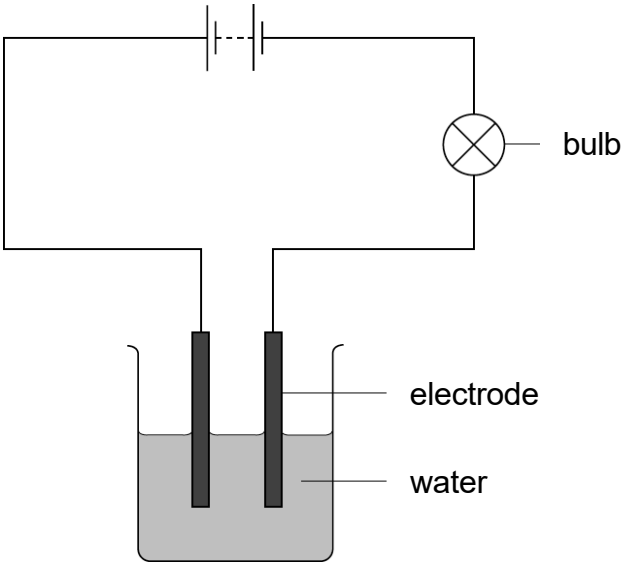
C


D


4 A machine operates normally when a current of 12 A flows through it. A miniature circuit breaker is connected to the machine.
Which of the following statements is true when 12 A flows through the circuit breaker?

A The circuit breaker will melt.
B The circuit breaker will trip.
C The machine will operate at a faster rate.
D The machine will operate normally.

5 The following was set up. The bulb did not light up.



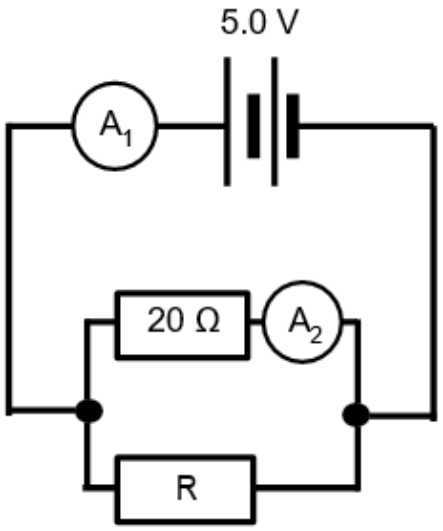
After substance **X** was added to the water, the

bulb lit up. What can **X** be?

A ammonium chloride
B barium sulfate
C calcium carbonate
D zinc powder

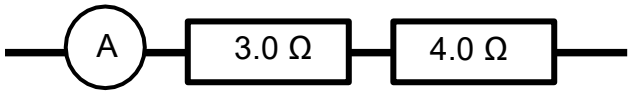
6 The diagram shows the current flow through a circuit. The ammeter readings of A_1 and A_2 are 0.40 A and 0.25 A respectively.

What would the resistance of R be?



A 13 Ω
B 20 Ω
C 33 Ω
D 40 Ω

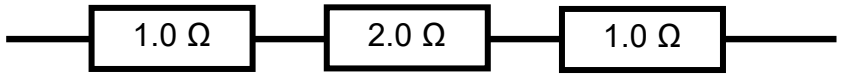
7 The diagram shows a section of a circuit. The reading of the ammeter is 2.0 A. What is the potential difference across the section of the circuit?



A 2.0 V
B 5.0 V
C 7.0 V
D 14.0 V

8 Which option has the lowest effective resistance?

A



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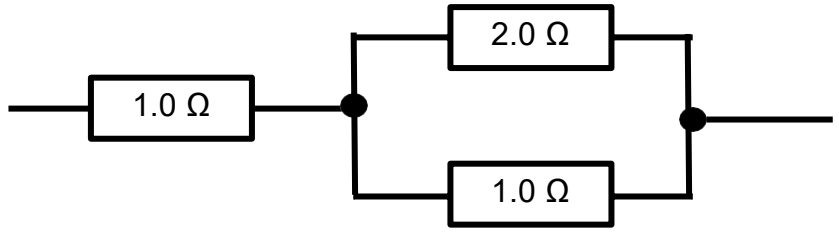
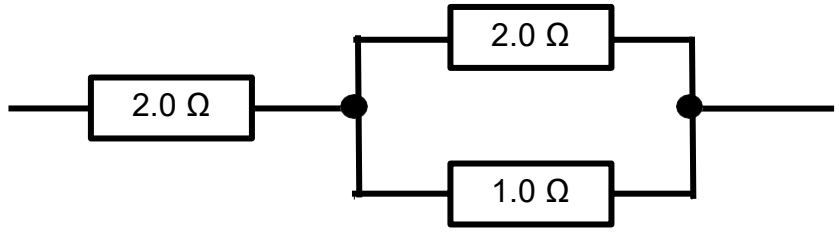


C



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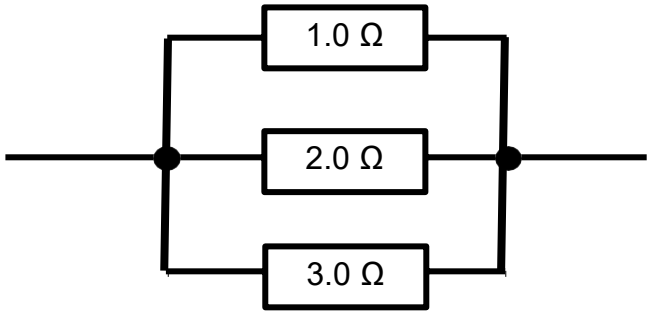


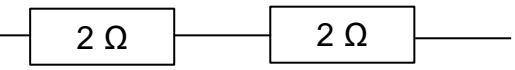
9 Electricity can be used in multiple ways.

Which effect of electricity is correctly paired with a practical use?

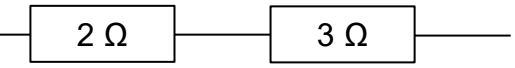
	effect of electricity	practical use
A	chemical	mechanism of electric bell
B	chemical	electrolysis of saltwater
C	magnetic	electroplating of copper
D	magnetic	heating coil of electric kettle

10 Which group of resistors has the lowest resistance?

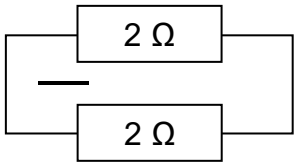
A



B



C



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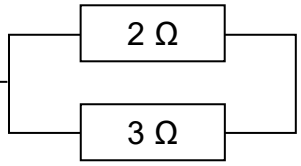
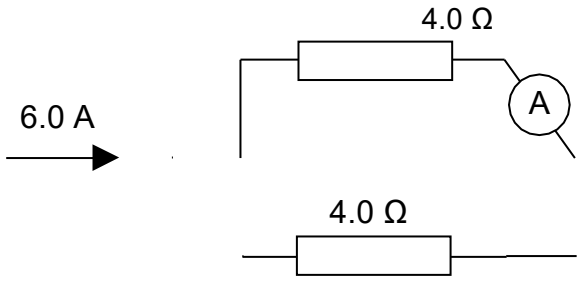


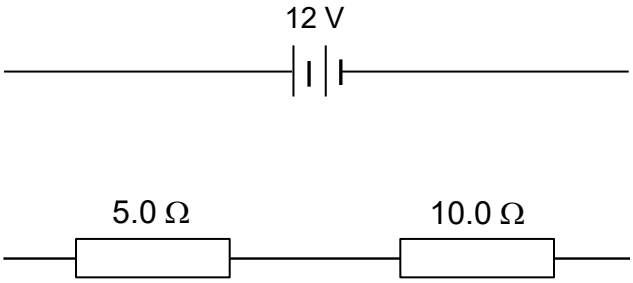
11 The diagram shows part of an electric circuit.



What is the reading on the ammeter?

A 6.0 A
B 3.0 A
C 1.5 A
D 0.75 A

12 Two resistors are connected to a 12 V battery as shown in the diagram.



What is the potential difference (p.d.) across the 5.0 Ω resistor?

A 4.0 V
B 6.0 V
C 8.0 V
D 12 V

13 An electric lamp has a power output of 60 W.

What is the amount of energy generated in 30 minutes?

A 30 J
B 60 J
C 1800 J
D 108 000 J

14 Which statement(s) about a fuse is correct?

(1) A fuse should be installed at the live wire of an electrical appliance.
(2) Fuse rating is the maximum current that can flow through the fuse.
(3) The fuse rating should be slightly lower than the operating current of an electrical appliance.

A (1) only
B (2) only
C (1) and (2) only
D (2) and (3) only

15 Why are thick transmission wires needed for high power appliances?

A Thick transmission wires reduce current flow to the high power appliances. This reduces the heat generated in the transmission wires.

B High power appliances require high current to operate. Thick transmission wires have low resistance, hence reduce the heat generated in the transmission wires.

C High power appliances are connected to high voltage hence thick transmission wires are needed to withstand the heat generated at high voltage.

D High current will flow in the high power appliances. The thick transmission wires are needed to withstand the heat generated as the high current flows through.

16 The label below is found on a 400 W electric jig saw. The electric jig saw is used for 2 hours daily for 300 days. What is the cost of 1 kWh of electrical energy if the cost of using this appliance for 300 days is $4.50?

A $0.02

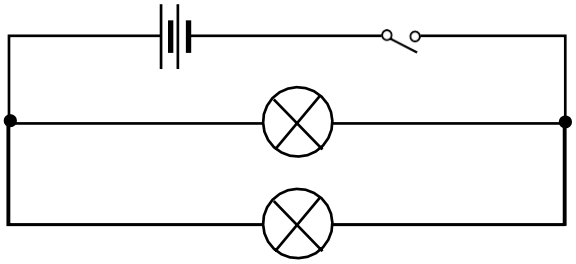
B $0.30

C $11.25

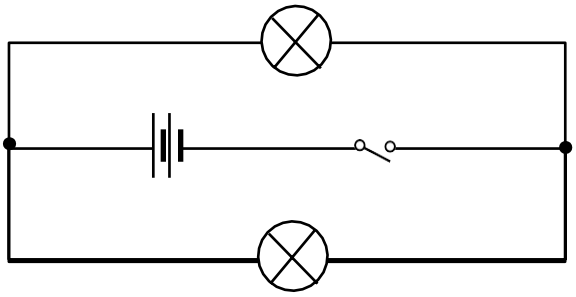
D $18.75

17 The following diagrams show two lamps, a switch and a battery connected in a circuit. Which of the circuit is not equivalent to the other three circuits?

A



B



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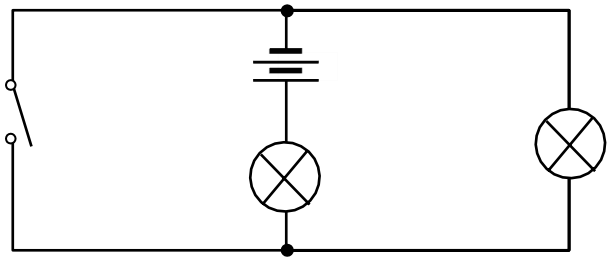
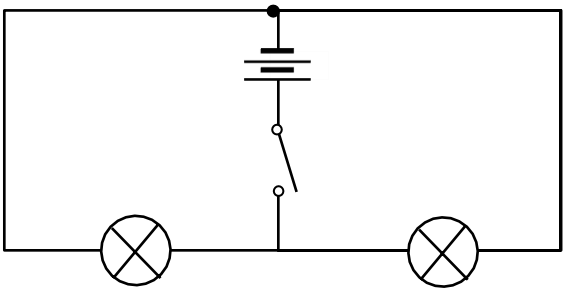


D



18 Which quantity can be measured in units of coulomb/second?

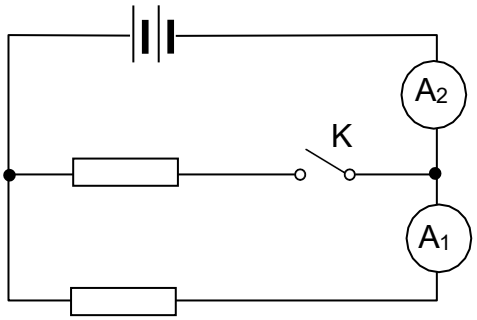
A charge
B current
C potential difference
D resistance

19 A portable camping lamp uses a 12.0 V battery to converts 180 kJ of electrical energy into heat energy.

What is the time taken to drain the battery given that the 0.75 A of current flows in the portable camping lamp?

A 675000 s
B 20000 s
C 15000 s
D 11250 s

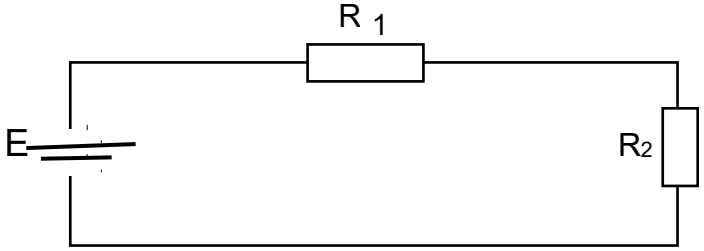
20 Two identical resistors are connected to a 15 V cell in the circuit below.



Which of the following correctly describes the readings on the ammeters A_1 and A_2 when switch K is closed?

A A_2 has the same reading as A_1.
B A_2 has half the reading of A_1.
C A_2 has double the reading of A_1.
D A_1 has a zero reading while A_2 has a non-zero reading.

21 In the circuit shown below, a battery of e.m.f. E is connected to two identical resistors.



What is the current flowing in the circuit?

A $\frac{E(R_1 + R_2)}{R_1R_2}$

B $\frac{E}{R_1 + R_2}$

C $\frac{1}{E(R_1 + R_2)}$

D $E(R_1 + R_2)$

ELECTRICTY STRUCTURED QUESTIONS

1 Fig. 9.1 shows an electrical circuit with two 4.0 Ω resistors, with 0.30 A of current flowing through a portion of the circuit.

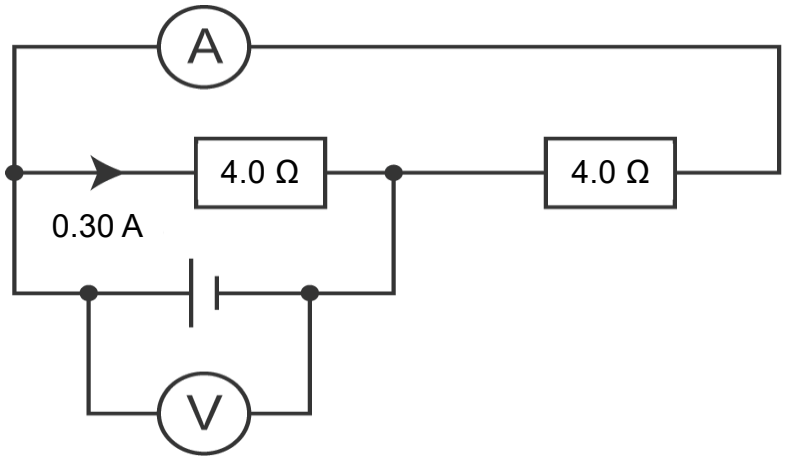


Fig. 9.1

(a) State if the direction of current drawn is conventional current or electron flow.

…… [1]

(b) Calculate the effective resistance of the circuit.

effective resistance = ……[1]

(c) Determine the value of the ammeter and voltmeter readings of the circuit in Fig. 9.1.

ammeter value = ……

voltmeter value = ……[2]

2 Fig. 10.1 shows an electric kettle that needs to be connected to the power socket.

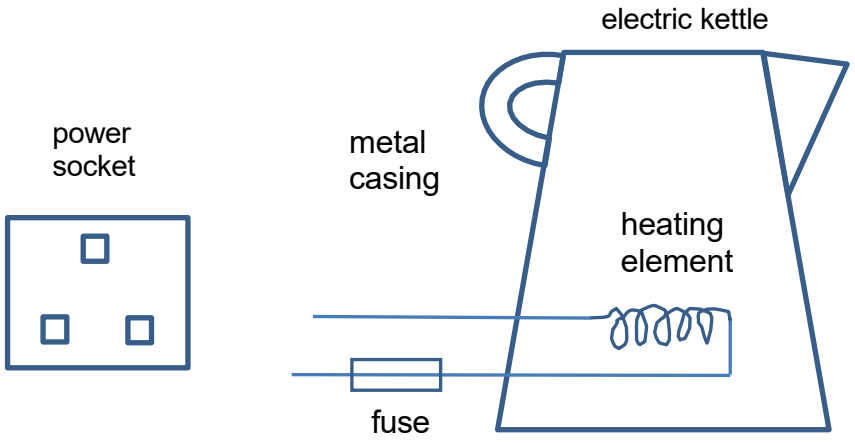


Fig. 10.1

(a) Study Fig. 10.1. Using straight lines, connect the Live, Neutral and Earth wires from the electric kettle to the power socket in Fig. 10.1. [3]

(b) State what the fuse protects and explain how it protects.

.....

.....

..... [2]

(c) The kettle draws a current of 8.7 A from the power socket. The following fuses with ratings of 1.0 A, 3.0 A, 5.0 A, 10.0 A and 13.0 A are available.

State and explain which fuse is appropriate for the kettle in Fig. 10.1.

.....

.....

..... [2]

(d) Explain how the Earth wire works in conjunction with the fuse to prevent the user from getting an electric shock.

.....

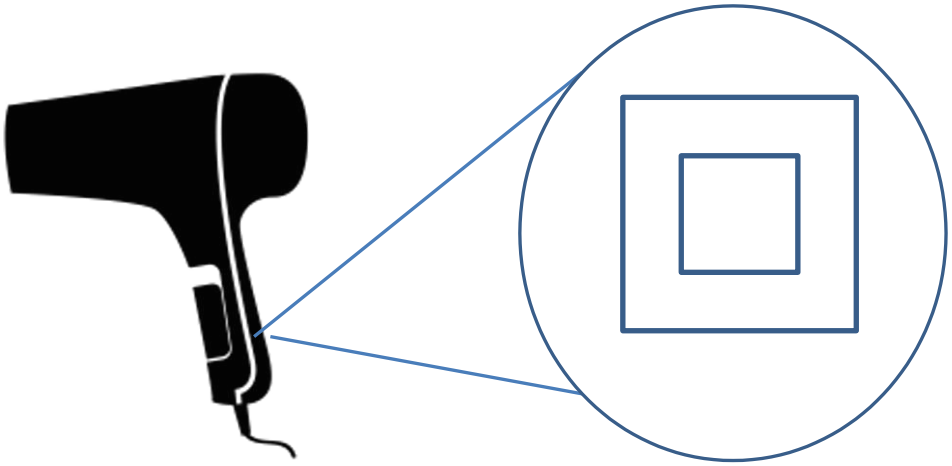
.....

.....

.....

..... [3]

3 Fig. 11.1 shows a hairdryer with a symbol plastered on it being magnified.



hairdryer symbol

Fig. 11.1

(a) State what the symbol represents and explain how the safety feature works.

……

……

……

……[2]

(b) Explain why an Earth wire is not required for a hairdryer.

……[1]

(c) Another label on the hairdryer reads "Power rating: 1500 W, 240V". Explain what the statement in the label means.

……

……[1]

(d) A student uses the hairdryer for 20 mins a day for a week. If the cost of electricity consumption is 30 cents per kWh, calculate how much she would need to pay for using the hairdryer for that week.

[2]

4 Fig 5.1 shows an electrical circuit with 2 resistors connected in series.

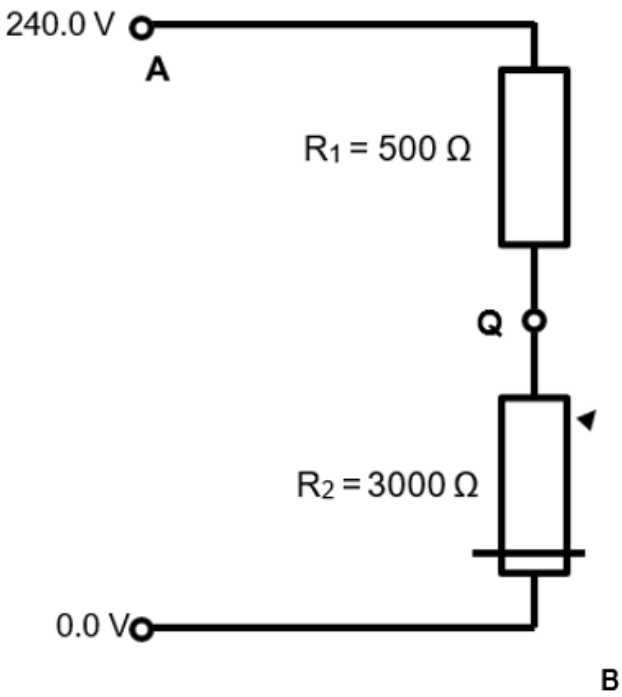


Fig. 5.1

1. Using a single arrow, draw the direction of electron flow along the wire between points **A** and **B**. Label the arrow '(a)'.[1]

2. Define the term *potential difference*.

.....

[1]

.....

3. On Fig 5.1, draw a device used to measure the potential difference across resistor R_2. [1]

4. Calculate the electric potential at point **Q** when R_2 is set to 3000 Ω.

potential at **Q** = …… [2]

Total [5]

5 Fig 6.1 shows part of a 3-pin plug and a water heater.

1. **(i)** Complete Fig 6.1 to show the connections between the wires of the 3-pin plug and parts of the water heater.[1]

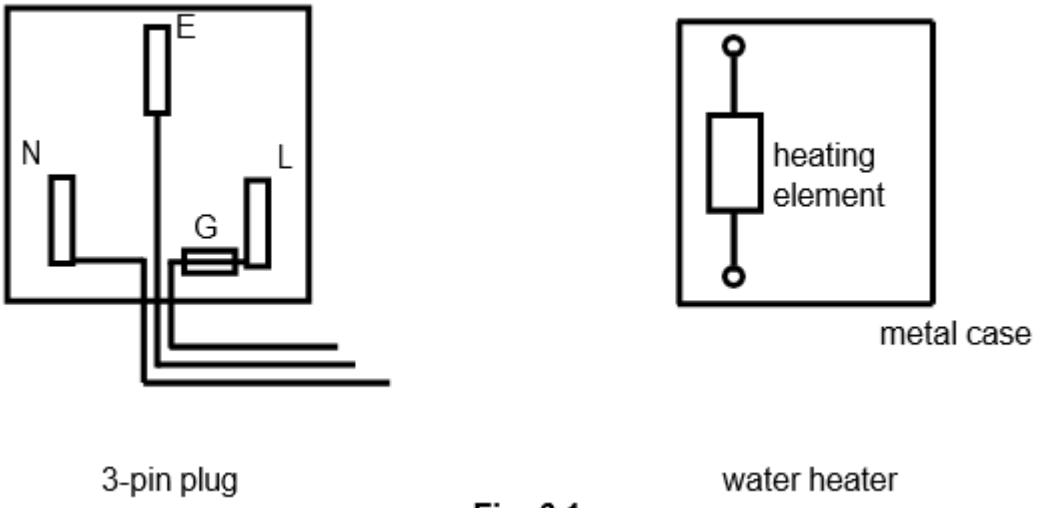


Fig. 6.1

(ii) State the colours of the wires in a 3-pin plug.

E: ..... N: ..... L [1]

2. State what is component G and explain how it contributes to the safety of the circuit.

.....

[2]

.....

3. The power rating of the heater is 1500 W. Calculate the cost of using the heater in 1 month (30 days) if it was used for 35 min a day. Unit cost of electricity is $0.24.

cost = ...[2]

4. Some appliances have 2-pin plugs instead. Explain if the plug is still safe.

.....

[1]

Total [7]

6 Fig. 6.1 shows a circuit with a variable resistor, a light bulb and an ammeter connected in series to a battery (consisting of 2 dry cells).

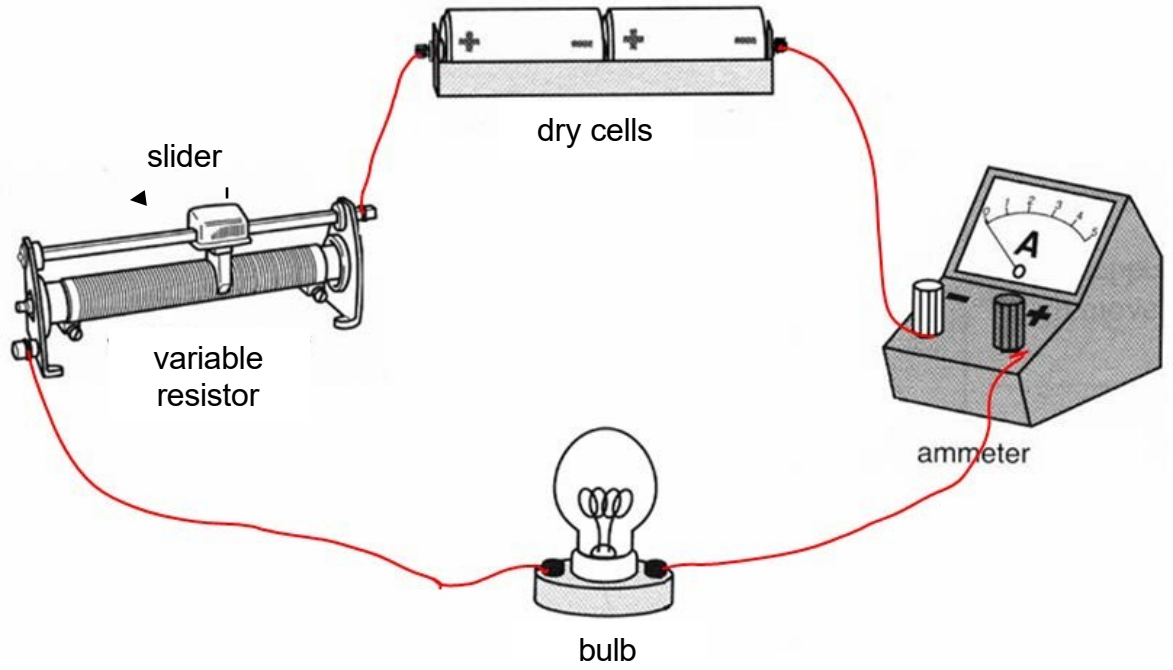


Fig. 6.1

a. In the box in Fig. 6.2, draw a circuit diagram to represent accurately the circuit shown in Fig. 6.1.

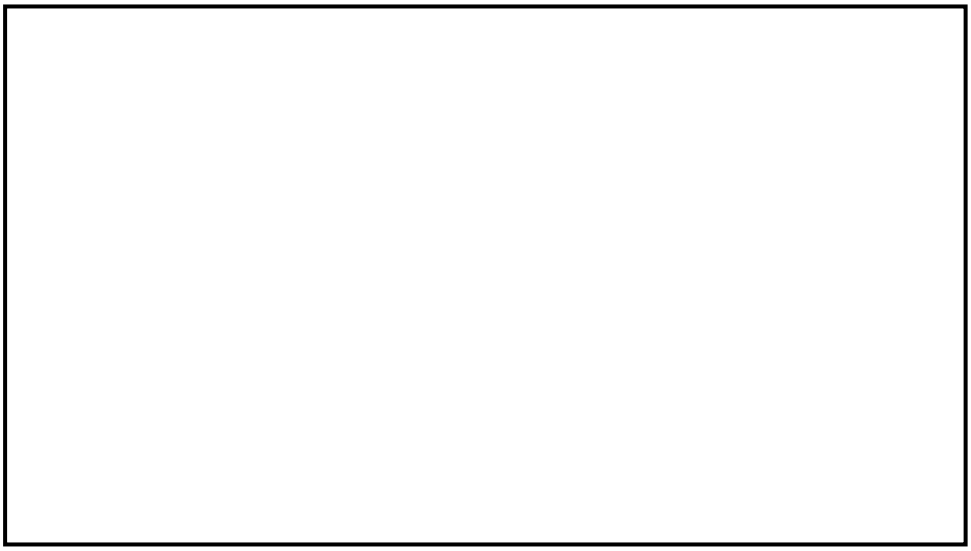


Fig. 6.2

[1]

b. State two changes that you would observe after the circuit is closed if the slider of the variable resistor in Fig. 6.1 is moved to the left as shown by the arrow.

.....

.....

.....

.....

[2]

c. If the ammeter reads 0.25 A and each of the dry cells has a voltage of 1.5 V, calculate the effective resistance in the circuit in Fig. 6.1.

effective resistance = ……[2]

d. An identical lamp is now connected in parallel with the original lamp in the circuit in Fig. 6.1. Explain how the reading of the ammeter will change.

.....

.....

[1]

Total [6]

7 Fig. 7.1 shows an electric kettle with a power rating of 1200 W.

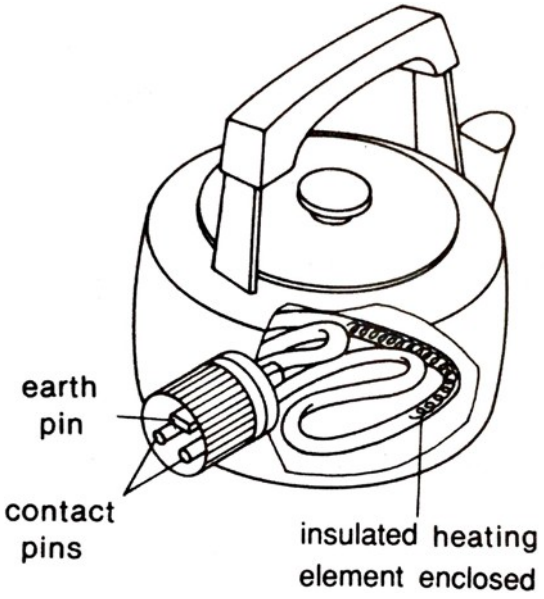


Fig. 7.1

a. Explain what is meant by the *power* of the electric kettle.

.....

[1]

b. The cost of electricity is 18 cents per kWh. Calculate the total cost of using the electric kettle for 5 hours each day for a month of 30 days.

total cost = ...[2]

c. In Fig. 7.1, the electric kettle has a metallic heating element enclosed in a metal tube and electrically insulated from the casing of the kettle. Explain why the heating element must be electrically insulated from the kettle.

.....

.....

[1]

.....

d. State which part of the electric kettle is connected to the earth pin shown in Fig. 7.1.

.....[1]

Total [5]

8 Fig. 5.1 shows the incomplete wiring of part of the mains electrical circuit in a house.

Two lamps L_A and L_B, a switch S, a power socket P and three wires L(live wire), N(neutral wire) and E(earth wire) are shown in Fig. 1.

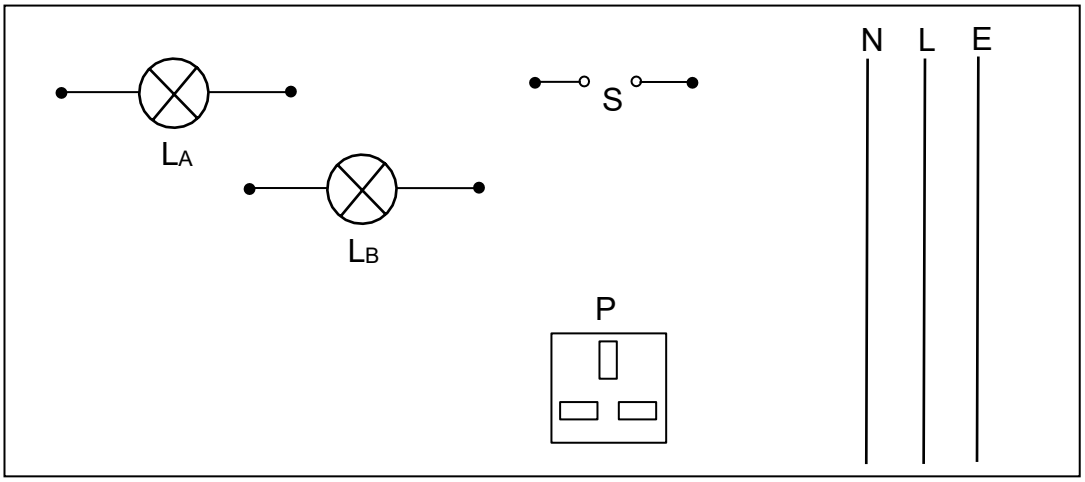


Fig. 5.1

a. Complete the diagram above to show the followings.

(i) L_A and L_B connected in parallel and controlled by a single switch to the main supply.

[2]

(ii) A fuse, to be labelled X for the lamps [1]

(iii) P correctly connected to the main supply.
[1]

b. Lamps L_A and L_B, each rated 60 W 240 V, are operating at normal brightness when connected to the live wire through fuse X.

(i) Calculate the operating current of the lamp L_A.

operating current of lamp =_____[1]

(ii) Suggest a suitable rating for fuse X if fuses of **0.3 A**, **1.0 A**, and **13 A** are available.

suitable rating for fuse X =
.....
[1]

[Total: 6m]

9 Fig. 6.1 below shows a circuit with a 12 V battery, a 1.0 m length of resistance wire and two measuring instruments, W and X. A current of 6.0 A flows through the resistance wire.

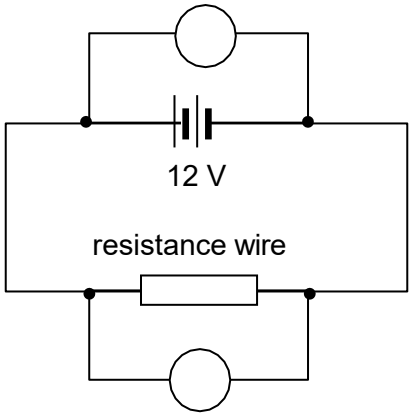


Fig. 6.1

a. Name the measuring instruments W and X used in the circuit.

instrument W = ……, instrument X =……[1]

b. Calculate the amount of charge passing through the resistance wire in 2.0 s.

amount of charge =
.....
[1]

c. Calculate the resistance of the resistance wire.

resistance =
.....
[1]

d. The resistance wire is replaced by a 1.5 m length of resistance wire of the same material but of twice the cross-sectional area.

(i) Calculate the new resistance wire, and

Resistance = ...[2]

(ii) state the reading shown on instrument X.

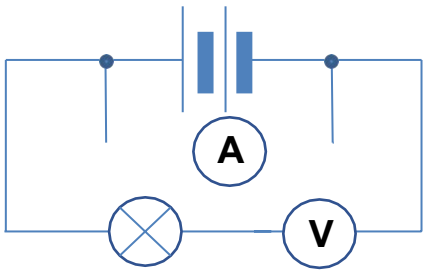
reading of instrument X = ...[1]

[Total: 4m]

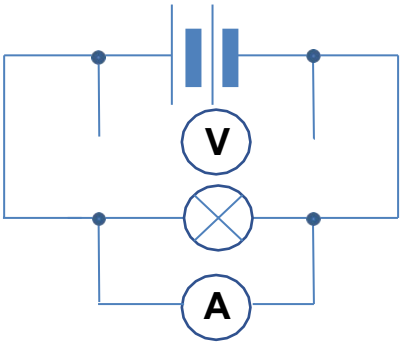
ANSWERS FOR ELECTRICTY MCQ

1 Which circuit is connected correctly to find the resistance of the light bulb?

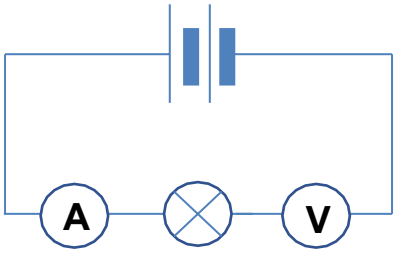
A



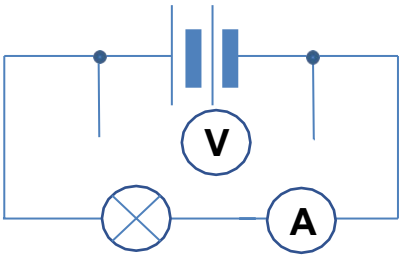
B



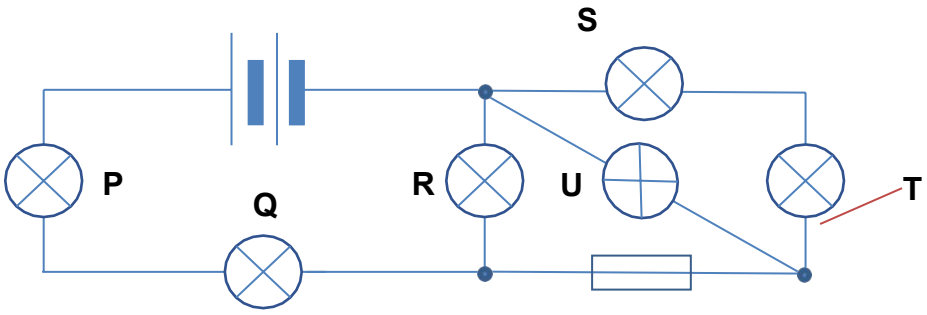
C



D



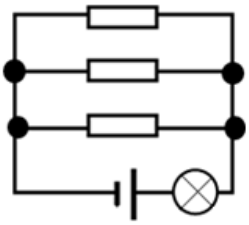
2 Which bulbs in the circuit below will switch off if the fuse melts?



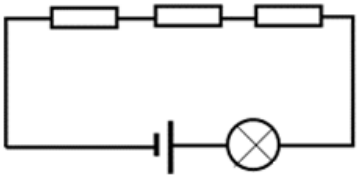
A P, Q and R
B S, U and T
C P, Q, S and T
D S, U, R and T

3 The cells and light bulbs used in the following circuits are identical. Which circuit has the brightest bulb?

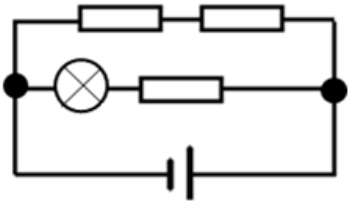
A



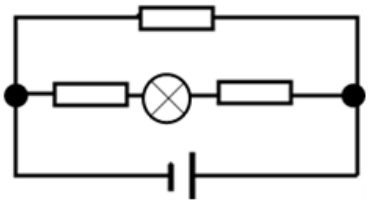
B



C



D



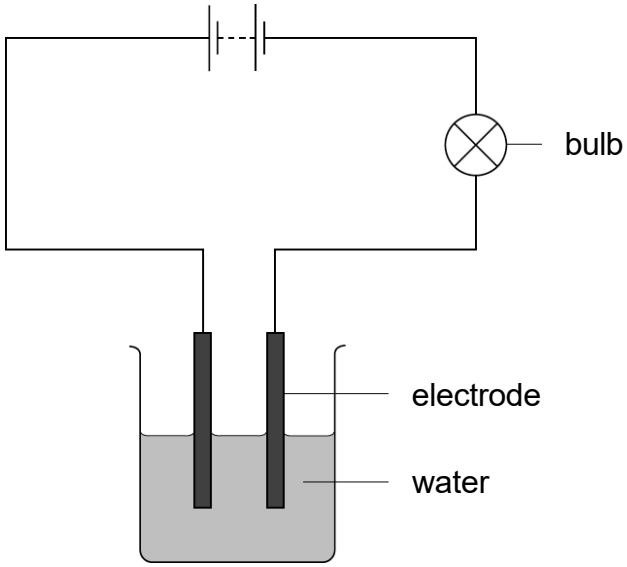
Ans : A

4 A machine operates normally when a current of 12 A flows through it. A miniature circuit breaker is connected to the machine.

Which of the following statements is true when 12 A flows through the circuit breaker?

A The circuit breaker will melt.
B The circuit breaker will trip.
C The machine will operate at a faster rate.
D The machine will operate normally.

5 The following was set up. The bulb did not light up.



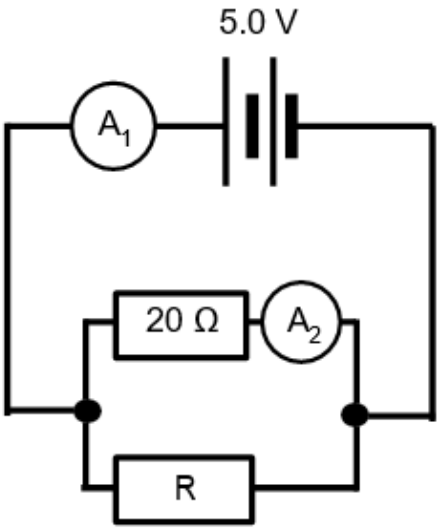
After substance **X** was added to the water, the bulb lit up.

What can **X** be?

A ammonium chloride
B barium sulfate
C calcium carbonate
D zinc powder

6 The diagram shows the current flow through a circuit. The ammeter readings of A_1 and A_2 are 0.40 A and 0.25 A respectively.

What would the resistance of R be?

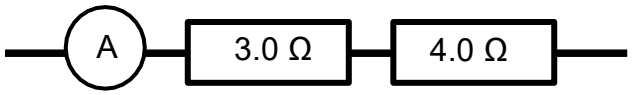


A	13 Ω
B	20 Ω
C	33 Ω
D	40 Ω

Ans: C

7 The diagram shows a section of a circuit. The reading of the ammeter is 2.0 A.

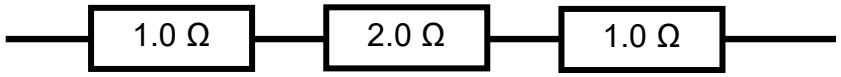
What is the potential difference across the section of the circuit?



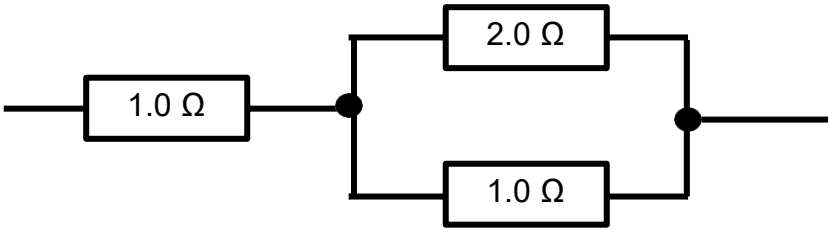
A	2.0 V
B	5.0 V
C	7.0 V
D	14.0 V

8 Which option has the lowest effective resistance?

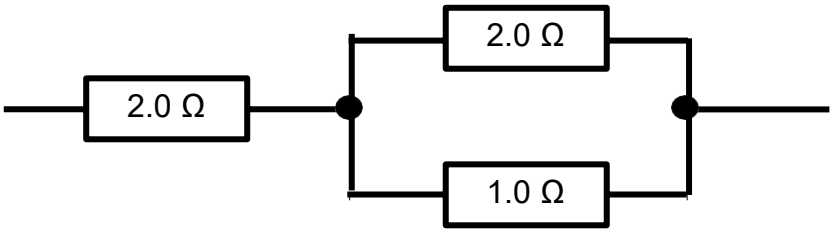
A



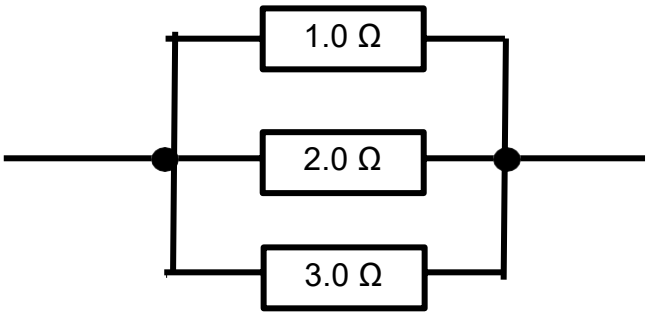
B



C



D



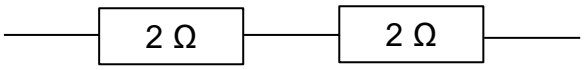
9 Electricity can be used in multiple ways.

Which effect of electricity is correctly paired with a practical use?

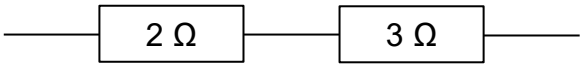
	effect of electricity	practical use
A	chemical	mechanism of electric bell
B	chemical	electrolysis of saltwater
C	magnetic	electroplating of copper
D	magnetic	heating coil of electric kettle

10 Which group of resistors has the lowest resistance?

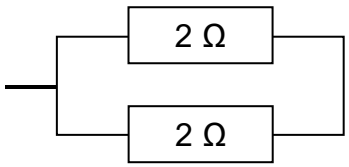
A



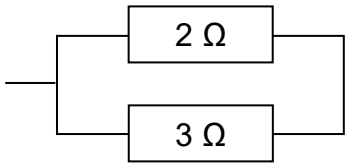
B



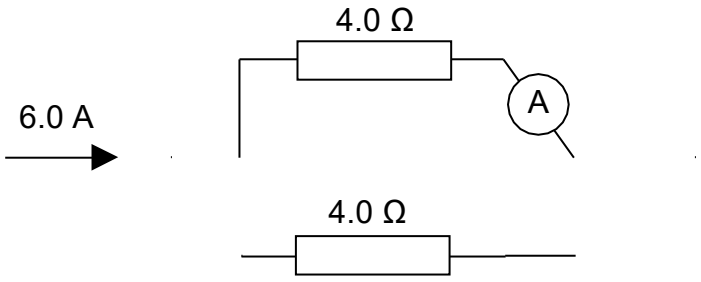
C



D



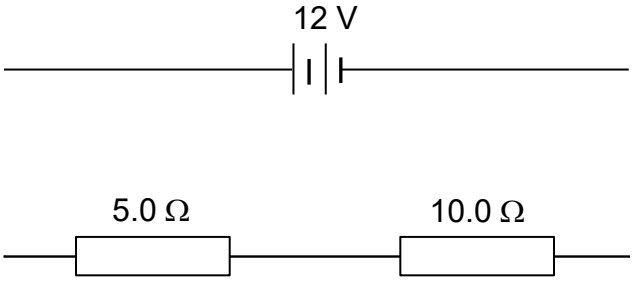
11 The diagram shows part of an electric circuit.



What is the reading on the ammeter?

A 6.0 A
B 3.0 A
C 1.5 A
D 0.75 A

12 Two resistors are connected to a 12 V battery as shown in the diagram.



What is the potential difference (p.d.) across the 5.0 Ω resistor?

A 4.0 V
B 6.0 V
C 8.0 V
D 12 V

13 An electric lamp has a power output of 60 W.

What is the amount of energy generated in 30 minutes?

A 30 J
B 60 J
C 1800 J
D 108 000 J

14 Which statement(s) about a fuse is correct?

(1) A fuse should be installed at the live wire of an electrical appliance.
(2) Fuse rating is the maximum current that can flow through the fuse.
(3) The fuse rating should be slightly lower than the operating current of an electrical appliance.

A (1) only
B (2) only
C (1) and (2) only
D (2) and (3) only

15 Why are thick transmission wires needed for high power appliances?

A Thick transmission wires reduce current flow to the high power appliances. This reduces the heat generated in the transmission wires.

B High power appliances require high current to operate. Thick transmission wires have low resistance, hence reduce the heat generated in the transmission wires.

C High power appliances are connected to high voltage hence thick transmission wires are needed to withstand the heat generated at high voltage.

D High current will flow in the high power appliances. The thick transmission wires are needed to withstand the heat generated as the high current flows through.

16 The label below is found on a 400 W electric jig saw. The electric jig saw is used for 2 hours daily for 300 days. What is the cost of 1 kWh of electrical energy if the cost of using this appliance for 300 days is $4.50?

A $0.02

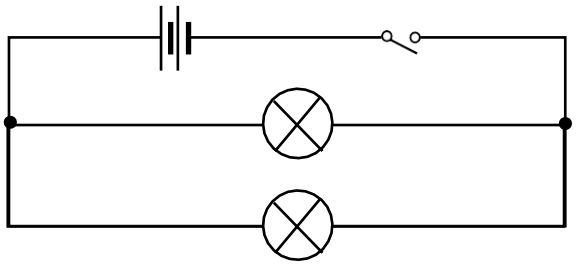
B $0.30

C $11.25

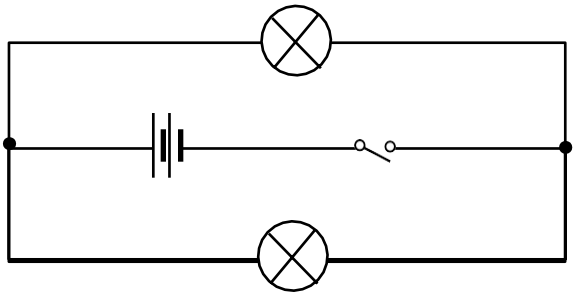
D $18.75

17 The following diagrams show two lamps, a switch and a battery connected in a circuit. Which of the circuit is not equivalent to the other three circuits?

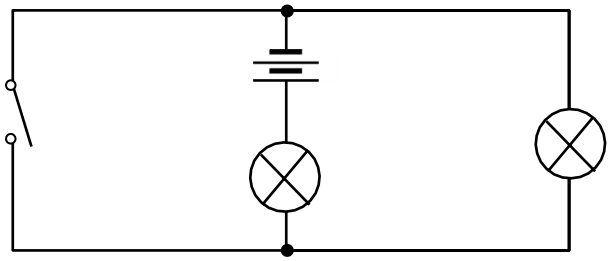
A



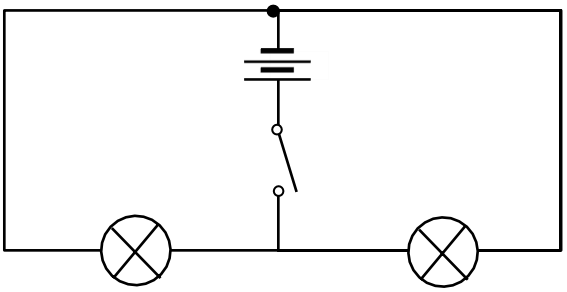
B



C



D



18 Which quantity can be measured in units of coulomb/second?

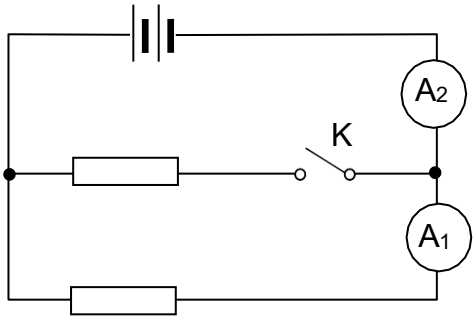
A charge
B current
C potential difference
D resistance

19 A portable camping lamp uses a 12.0 V battery to converts 180 kJ of electrical energy into heat energy.

What is the time taken to drain the battery given that the 0.75 A of current flows in the portable camping lamp?

A 675000 s
B 20000 s
C 15000 s
D 11250 s

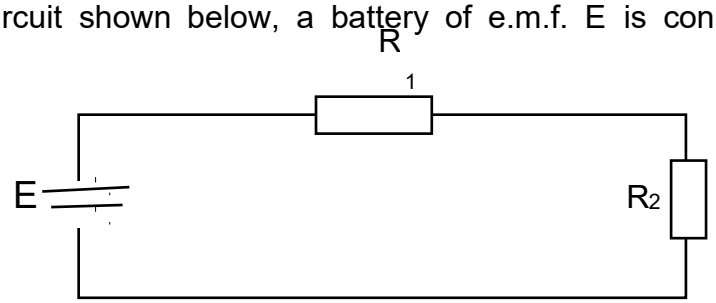
20 Two identical resistors are connected to a 15 V cell in the circuit below.



Which of the following correctly describes the readings on the ammeters A_1 and A_2 when switch K is closed?

A A_2 has the same reading as A_1.
B A_2 has half the reading of A_1.
C A_2 has double the reading of A_1.
D A_1 has a zero reading while A_2 has a non-zero reading.

21 In the circuit shown below, a battery of e.m.f. E is connected to two identical resistors.



What is the current flowing in the circuit?

A $\frac{E(R_1 + R_2)}{R_1R_2}$

B $\frac{E}{R_1 + R_2}$

C $\frac{1}{E(R_1 + R_2)}$

D $E(R_1 + R_2)$

ANSWER FOR ELECTRICTY STRUCTURED QUESTIONS

1 Fig. 9.1 shows an electrical circuit with two 4.0 Ω resistors, with 0.30 A of current flowing through a portion of the circuit.

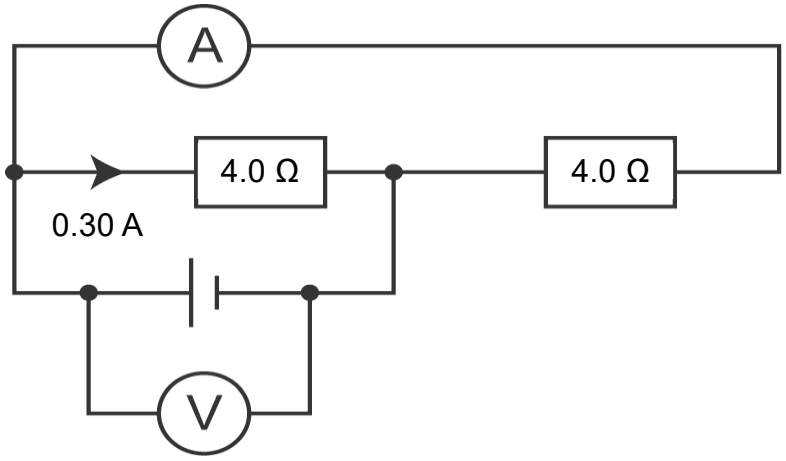


Fig. 9.1

(a) State if the direction of current drawn is conventional current or electron flow.

Conventional current [1]

(b) Calculate the effective resistance of the circuit.

Effective resistance = 1/Reff = ¼ + ¼
Reff = 2.0 Ω [B1]

[1]

(c) Determine the value of the ammeter and voltmeter readings of the circuit in Fig. 9.1.

Ammeter reading = 0.30 A [B1] V = RI
V = 4.0 x 0.30
V = 1.2 V [B1]

[Total = 10 marks]

2 Fig. 10.1 shows an electric kettle that needs to be connected to the power socket.

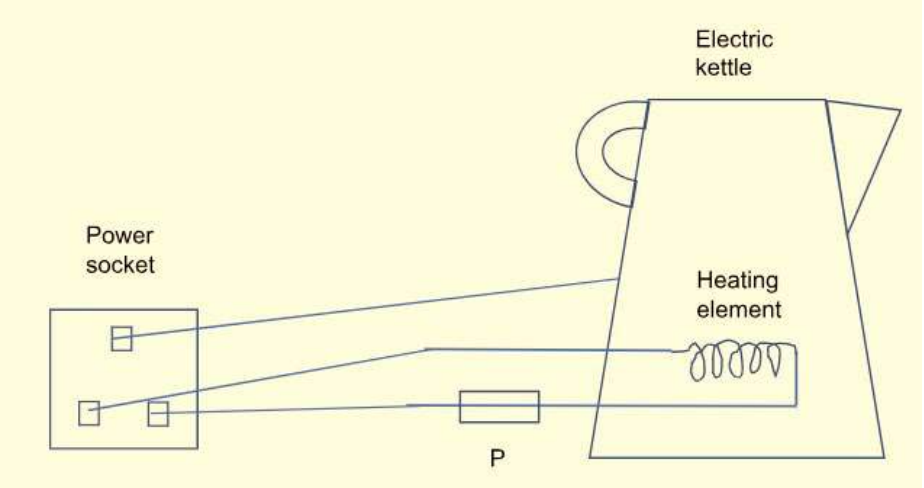


Fig. 10.1

(a) Study Fig. 10.1. Using straight lines, connect the Live, Neutral and Earth wires from the electric kettle to the power socket in Fig. 10.1. [3]

(b) State what the fuse protects and explain how it protects.

The fuse protects the heating element / electric kettle / appliance. [B1] When a current that is higher than the fuse rating passes through the fuse, it **disconnects the appliance from the high potential source**. [B1]

[2]

(c) The kettle draws a current of 8.7 A from the power socket. The following fuses with ratings of 1.0 A, 3.0 A, 5.0 A, 10.0 A and 13.0 A are available.

State and explain which fuse is appropriate for the kettle in Fig. 10.1.

10.0 A. [B1]
The fuse rating chosen has to be a **little higher than the operating current**. [B1 [2]

(d) Explain how the Earth wire works in conjunction with the fuse to prevent the user from getting an electric shock.

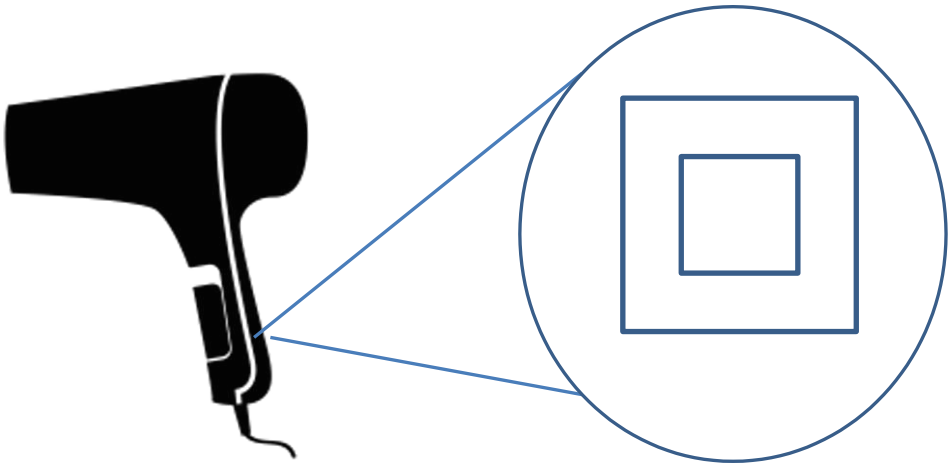
When there is a fault, the metal casing is at high potential/ becomes live. [B1]

The earth wire provides a low resistance path for the current to travel from the metal casing to the ground. [B1]

The low resistance causes a large surge of current through the live wire that will cause the fuse to blow. [B1]

[3]

3 Fig. 11.1 shows a hairdryer with a symbol plastered on it being magnified.



Hairdryer symbol

Fig. 11.1

(a) State what the symbol represents and explain how the safety feature works.

Double Double insultation [B1]. These appliances are constructed such that the live wire will have an additional layer of insulation from the outer casing [B1].

[2]

(b) Explain why an Earth wire is not required for a hairdryer.

The hairdryer does not have a metal casing. [1]

(c) Another label on the hairdryer reads “Power rating: 1500 W, 240V”. Explain what the statement in the label means.

This means that the hairdryer will operate at 1500 W of power when connected to a source of potential difference of 240 V.

[1]

(d) A student uses the hairdryer for 20 mins a day for a week. If the cost of electricity consumption is 30 cents per kWh, calculate how much she would need to pay for using the hairdryer for that week.

Energy used by hairdryer
= 1.5 kW x (0.333 x 7) h
= 3.50 kWh [M1]

Cost of using hairdryer
= 3.5 x $0.30
= $1.05 [A1] [2]

[Total = 6 marks]

4 Fig 5.1 shows an electrical circuit with 2 resistors connected in series.

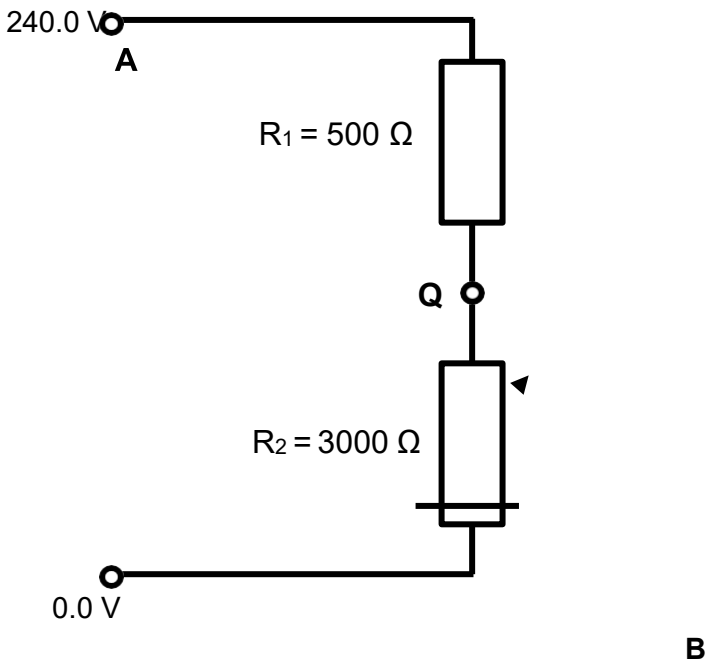


Fig. 5.1

1 Using a single arrow, draw the direction of electron flow along the wire between points **A** and **B**. Label the arrow '(a)'. [1]

Labelled arrow goes from B to A (through the wire)

2 Define the term *potential difference*.

the energy (or work done) required to move a unit of charge across a component

[1]

3 On Fig 5.1, draw a device used to measure the potential difference across resistor R_2. [1]

Voltmeter across R_2 in parallel. (drawn in the correct orientation)

4 Calculate the electric potential at point **Q** when R_2 is set to 3000 Ω.

Re = 3500 Ω
I = V/R = 240.0 / 3500 = 0.068571 A [1]

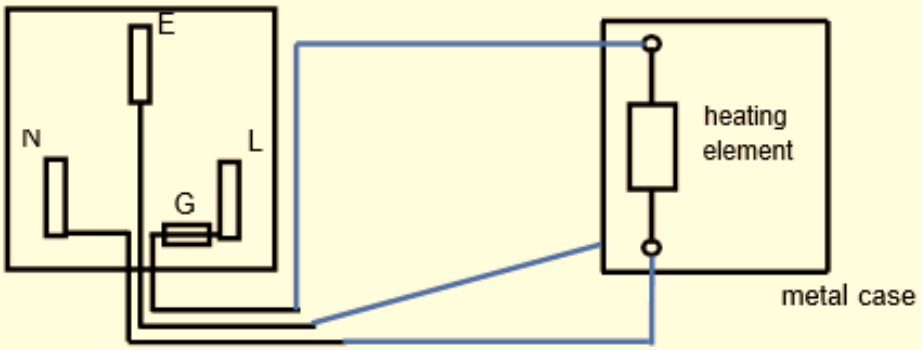
V_{R2} = IR = (0.0686)(3000) = 205.7 = 206 V or 210 V [1]

[2]

Total [5]

5 Fig 6.1 shows part of a 3-pin plug and a water heater.

1. **(i)** Complete Fig 6.1 to show the connections between the wires of the 3-pin plug and parts of the water heater.[1]



×N or L connected to either end

(ii) State the colours of the wires in a 3-pin plug.

E: green + yellow N: blue L: brown
*reject green OR yellow [1]

2. State what is component G and explain how it contributes to the safety of the circuit.

G is a fuse. [1]
It will melt when a high current exceeds the fuse rating, creating an open circuit and isolating the device. [1] [2]

3. The power rating of the heater is 1500 W. Calculate the cost of using the heater in 1 month (30 days) if it was used for 35 min a day. Unit cost of electricity is $0.24.

E = Pt
= (1.5 kW) (35/60 h × 30)
= 26.25 kWh [1]

Cost = E × Unit cost
= (26.25)($0.24)
= $6.30 [1] [2]

4. Some appliances have 2-pin plugs instead. Explain if the plug is still safe.

The plug should still be safe to use as they are usually double insulated. This will prevent shocks to the user.

6 Fig. 6.1 shows a circuit with a variable resistor, a light bulb and an ammeter connected in series to a battery (consisting of 2 dry cells).

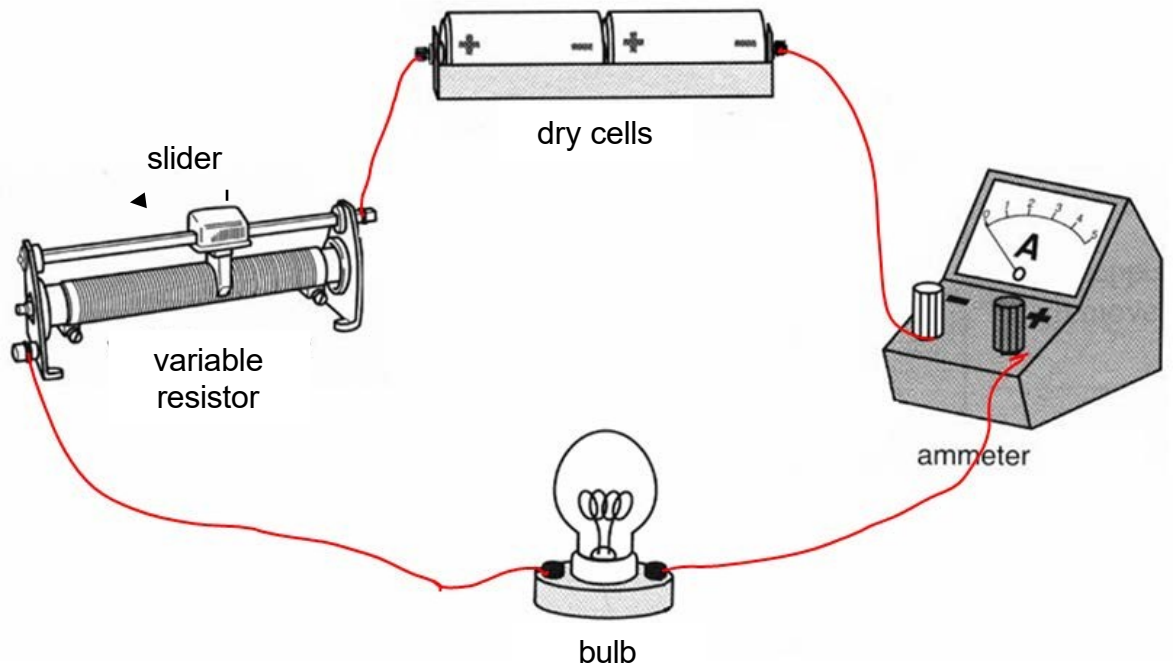


Fig. 6.1

(a) In the box in Fig. 6.2, draw a circuit diagram to represent accurately the circuit shown in Fig. 6.1.

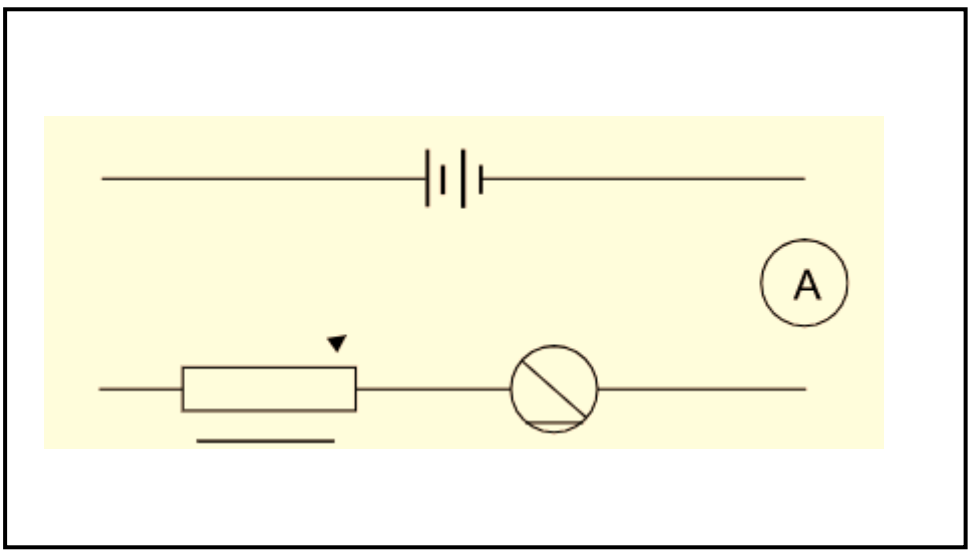


Fig. 6.2

[1]

(b) State two changes that you would observe after the circuit is closed if the slider of the variable resistor in Fig. 6.1 is moved to the left as shown by the arrow.

If connected as in above diagram, resistance decreases

- Brightness of light bulb decreases / light bulb becomes brighter

- Ammeter reading increases [2]

(c) If the ammeter reads 0.25 A and each of the dry cells has a voltage of 1.5 V, calculate the effective resistance in the circuit in Fig. 6.1.

V = IR→ (2 × 1.5 V) = (0.25 A)(R) R = 3 / 0.25 = 12 Ω [2]

(d) An identical lamp is now connected in parallel with the original lamp in the circuit in Fig. 6.1. Explain how the reading of the ammeter will change.

When connected in parallel, effective resistance decreases. Hence the ammeter reading will increase.

[1]

Total [6]

7 Fig. 7.1 shows an electric kettle with a power rating of 1200 W.

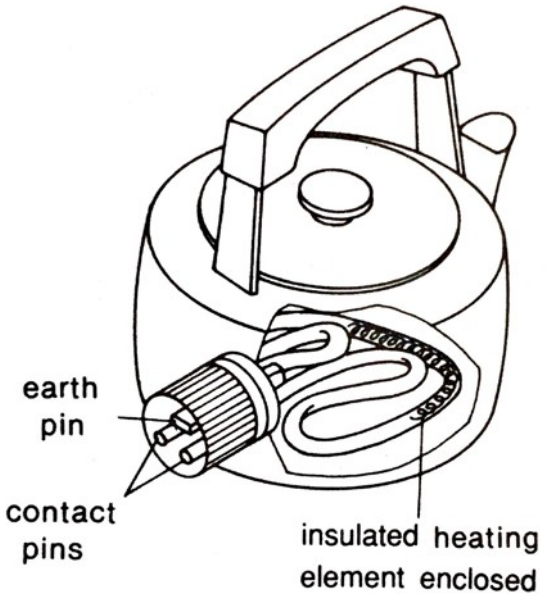


Fig. 7.1

a. Explain what is meant by the *power* of the electric kettle.

Power means the amount of electrical energy the kettle converts into other forms of energy per unit time.[1]

b. The cost of electricity is 18 cents per kWh. Calculate the total cost of using the electric kettle for 5 hours each day for a month of 30 days.

E = P x t → E = 1.2 kW × 5 h × 30 = 180 kWh

Cost = E x unit cost = 180 kWh × $0.18 / kWh = $32.40 / 3240 ¢

[2]

c. In Fig. 7.1, the electric kettle has a metallic heating element enclosed in a metal tube and electrically insulated from the casing of the kettle. Explain why the heating element must be electrically insulated from the kettle.

The heating element carries a current / is connected to a high voltage. If it is not insulated from the kettle, (it would become live and) anyone touching the kettle would be electrocuted / get an electric shock.

[1]

d. State which part of the electric kettle is connected to the earth pin shown in Fig. 7.1.

The metal casing

[1]

Total [5]

8 Fig. 5.1 shows the incomplete wiring of part of the mains electrical circuit in a house.

Two lamps L_A and L_B, a switch S, a power socket P and three wires L(live wire), N(neutral wire) and E(earth wire) are shown in Fig. 1.

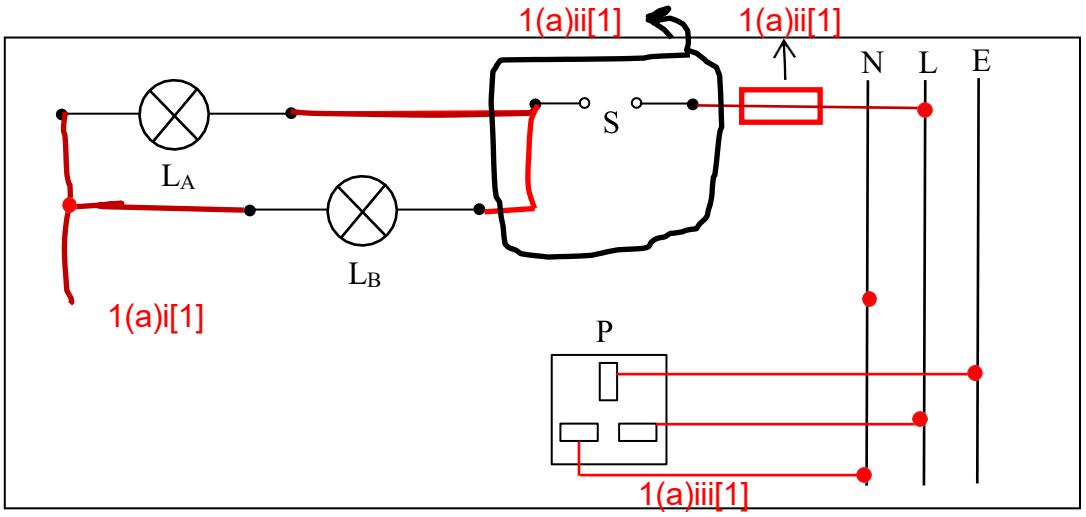


Fig. 5.1

(a) Complete the diagram above to show the followings.

(i) L_A and L_B connected in parallel and controlled by a single switch to the main supply.

Switch on live wire and controls both lamp A and B.
Lamp A and B connected in parallel to Live and Neutral wire.

[2]

(ii) A fuse, to be labelled X for the lamps [1]

Fuse on live wire and symbol of fuse is correctly drawn.

(iii) P correctly connected to the main supply [1]

power socket connected correctly to live, neutral and earth wire

(b) Lamps L_A and L_B, each rated 60 W 240 V, are operating at normal brightness when connected to the live wire through fuse X.

(i) Calculate the operating current of the lamp L_A.

operating current of lamp =I = 60/240 = 0.25 A

[1]

(ii) Suggest a suitable rating for fuse X if fuses of **0.3 A**, **1.0 A**, and **13 A** are available.

Suitable rating for fuse X = 1.0 A

[1]

[Total: 6m]

9 Fig. 6.1 below shows a circuit with a 12 V battery, a 1.0 m length of resistance wire and two measuring instruments, W and X. A current of 6.0 A flows through the resistance wire.

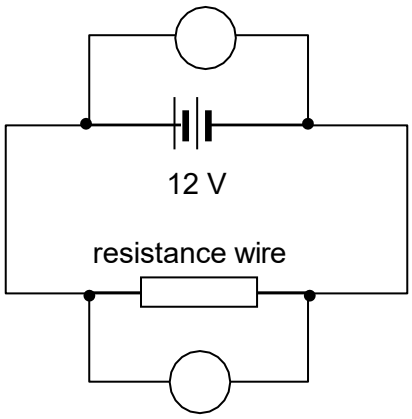


Fig. 6.1

(a) Name the measuring instruments W and X used in the circuit.

instrument W = voltmeter , instrument X = voltmeter [1]

(b) Calculate the amount of charge passing through the resistance wire in 2.0 s.

I = Q/t, Q = I x t = 6.0 x 2.0 = 12 C [1]

(c) Calculate the resistance of the resistance wire.

R = V/I = 12/6 = 2.0 Ω [1]

(d) The resistance wire is replaced by a 1.5 m length of resistance wire of the same material but of twice the cross-sectional area.

(i) Calculate the new resistance wire, and

Length of new wire = 1.5 x length of old wire
Cross sectional area of new wire = 2 x cross sectional area of old wire

$R = \frac{\rho L}{A} = \rho \frac{(1.5\ L\ bold)}{2\ A\ old} = \frac{1.5}{2}\left(\frac{\rho L}{A}\right)$

$\frac{1.5}{2}\ x\ 2$ = 1.5 Ω ; allow e.c.f from 2(c)

[2]

(ii) state the reading shown on instrument X.

Reading of instrument X = 12 V [1]

[Total: 4m]