



BOTSWANA EXAMINATIONS COUNCIL  
Botswana General Certificate of Secondary Education

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**PHYSICS**

**0571/01**

Paper 1 Multiple Choice

**October/November 2019**

**1 hour**

Additional Materials: Electronic calculator  
Soft clean eraser  
Soft pencil (type B or HB)  
Multiple Choice Answer Sheet

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**READ THESE INSTRUCTIONS FIRST**

**Do not open this booklet until you are told to do so.**

**Read the instructions on the separate Answer Sheet very carefully.**

Write your name, Centre number and candidate number in the spaces provided on the Answer Sheet unless this has already been done for you.

Sign your name in the space provided on the Answer Sheet.

There are **forty** questions in this paper. Answer **all** questions. For each question, there are four possible answers **A, B, C** and **D**. Choose the **one** you consider correct and record your choice using a **soft pencil** on the separate Answer Sheet.

Each correct answer will score one mark. A mark will not be deducted for a wrong answer.

Any rough working should be done in this booklet.

Do not use staples, paper clips, highlighters, glue or correction fluid.

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This document consists of **14** printed pages and **2** blank pages.



1 Which quantity is measured in joules?

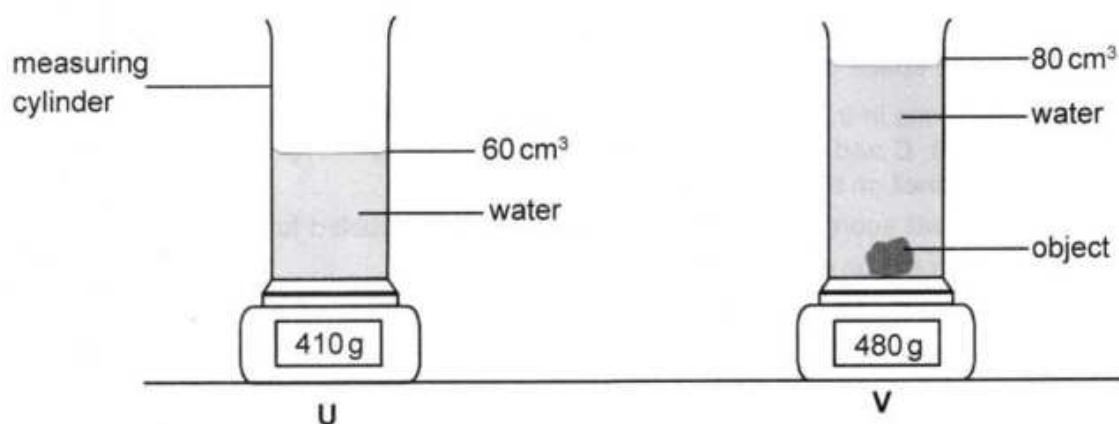
- A charge
- B mass
- C weight
- D work

2 What does Newton's third law of motion state?

- A An object will remain at rest unless acted on by a force.
- B The resultant force acting on an object is zero, when there is no acceleration.
- C The sum of the forces acting on an object is always zero.
- D To every force acting on an object, there is an equal but opposite force.

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3 Diagram U shows a measuring cylinder containing  $60 \text{ cm}^3$  of water on a balance. Diagram V shows the same set-up with a small object fully submerged in the water.



What is the density of the object?

- A  $1.1 \text{ g/cm}^3$
- B  $3.5 \text{ g/cm}^3$
- C  $6.0 \text{ g/cm}^3$
- D  $6.9 \text{ g/cm}^3$

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4 What are the main energy changes that occur in a coal-fired power station?

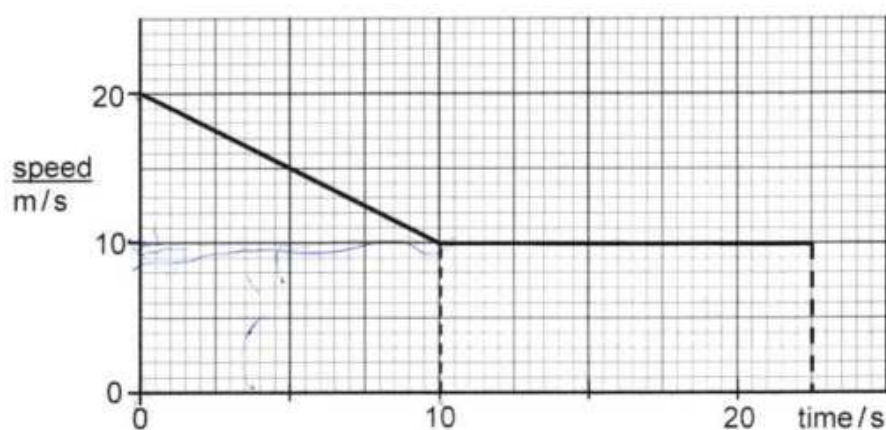
- A chemical  $\rightarrow$  heat  $\rightarrow$  kinetic  $\rightarrow$  electrical
- B chemical  $\rightarrow$  heat  $\rightarrow$  sound  $\rightarrow$  electrical
- C heat  $\rightarrow$  chemical  $\rightarrow$  kinetic  $\rightarrow$  electrical
- D heat  $\rightarrow$  kinetic  $\rightarrow$  potential  $\rightarrow$  electrical



- 5 Two cylindrical tanks, P and Q, are both open at the top. P and Q contain equal volumes of water. Tank P has a base area of  $0.5 \text{ m}^2$ . Tank Q has a base area of  $0.4 \text{ m}^2$ .

Which statement about pressure in the two tanks is correct?

- A More atmospheric pressure acts on the water in tank P.  
 B More atmospheric pressure acts on the water in tank Q.  
 C The water exerts more pressure on the base of tank P than on the base of tank Q.  
 D The water exerts more pressure on the base of tank Q than on the base of tank P.
- 6 The diagram shows the speed-time graph of a car.



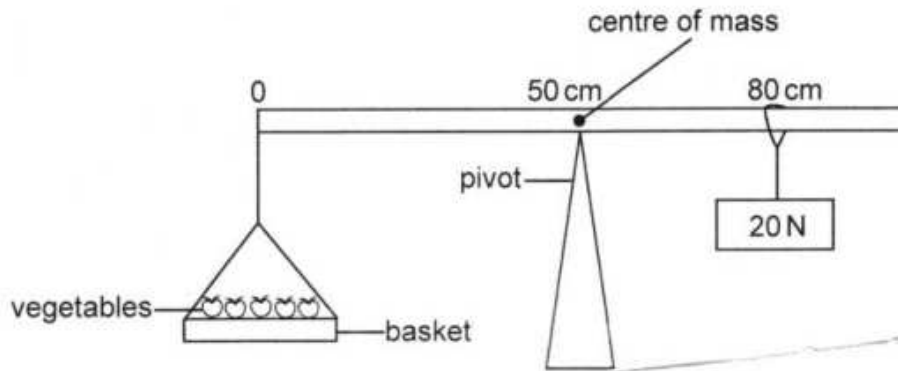
What is the distance travelled by the car before it reaches a constant speed?

- A 50 m  
 B 100 m  
 C 150 m  
 D 275 m
- 7 A car is driven along a road. One litre of petrol provides 35 MJ of energy. 13 MJ of the energy is converted to non-useful forms of energy.

What is the efficiency of the engine?

- A 22 %  
 B 37 %  
 C 59 %  
 D 63 %

- 8 The diagram shows a model of a balance used to determine the weight of some vegetables. Ignore the weight of the basket.



What is the weight of the vegetables?

- A 12.0 N  
 B 12.5 N  
 C 20.0 N  
 D 32.0 N

- 9 A piece of metal is placed 20 cm away from a fire. The metal soon becomes too hot to touch.

How is thermal energy transferred from the fire to the metal and through the metal?

	from fire to metal	through metal
<input type="radio"/> A	conduction	radiation
<input type="radio"/> B	convection	conduction
<input checked="" type="radio"/> C	radiation	conduction
<input type="radio"/> D	radiation	convection

- 10 Which features make a liquid-in-glass thermometer more sensitive?

- A small bulb and wide capillary  
 B small bulb and narrow capillary  
 C large bulb and narrow capillary  
 D large bulb and wide capillary

11 What is the value of absolute zero?

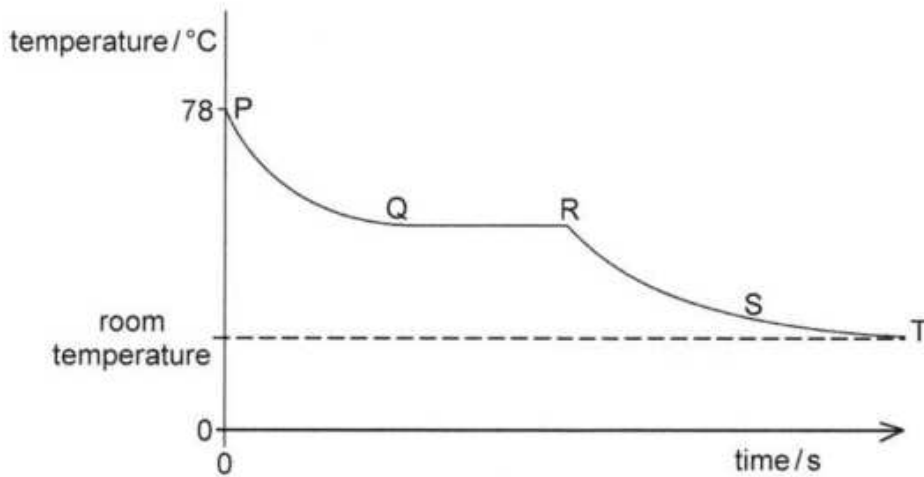
- A  $-273^{\circ}\text{C}$
- B  $-39^{\circ}\text{C}$
- C  $0^{\circ}\text{C}$
- D  $273^{\circ}\text{C}$

12 Two cups, P and R contain equal amounts of ice at  $0^{\circ}\text{C}$ .  
P and R are the same shape and size. Cup P is metal and cup R is polystyrene.

In which cup will the ice melt first, and why?

	cup	reason
A	P	the ice loses more heat to the cup
B	P	the cup loses more heat to the ice
C	R	the ice loses more heat to the cup
D	R	the cup loses more heat to the ice

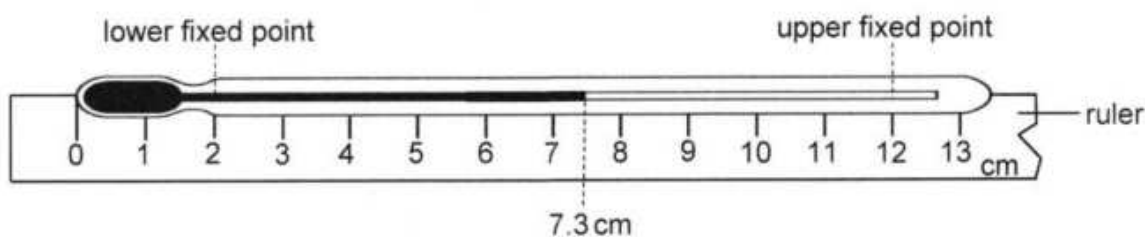
13 The graph shows the cooling curve of a liquid.



In which part of the curve is latent heat released?

- A PQ
- B QR
- C RS
- D ST

- 14 A ruler is fixed next to an unmarked liquid-in-glass thermometer as shown in the diagram. The lower fixed point and the upper fixed point are marked on the thermometer.



The liquid level is at the 7.3 cm mark.

What is the temperature shown on the thermometer?

- A 47 °C
- B 53 °C
- C 63 °C
- D 73 °C

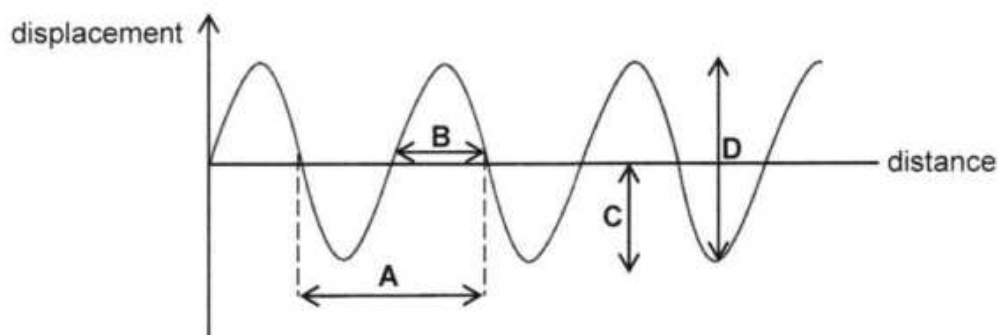
- 15 Ice is used to cool 0.25 kg of water. The specific heat capacity of water is 4200 J/kg °C.

How much thermal energy must the ice gain from the water to reduce the temperature of the water by 15 °C?

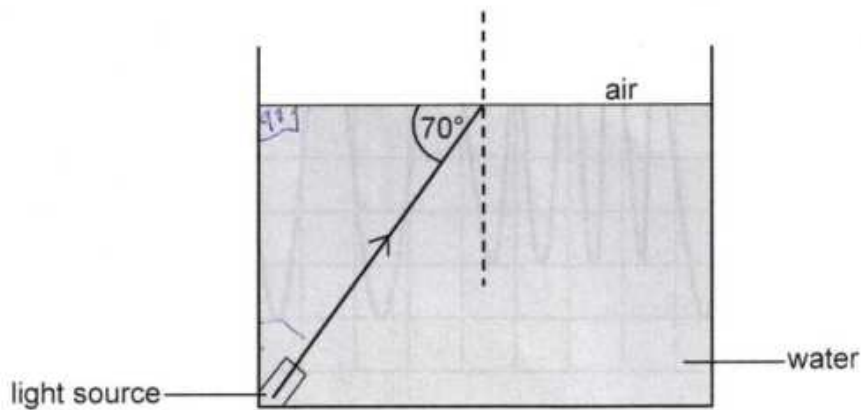
- A 70 J
- B 1050 J
- C 15 750 J
- D 252 000 J

- 16 The diagram shows a transverse wave form.

Which letter represents the wavelength of the wave?



- 17 A ray of light is incident from water to air at an angle of  $70^\circ$  to the surface as shown in the diagram. The refractive index of water is 1.33. The diagram is not drawn to scale.



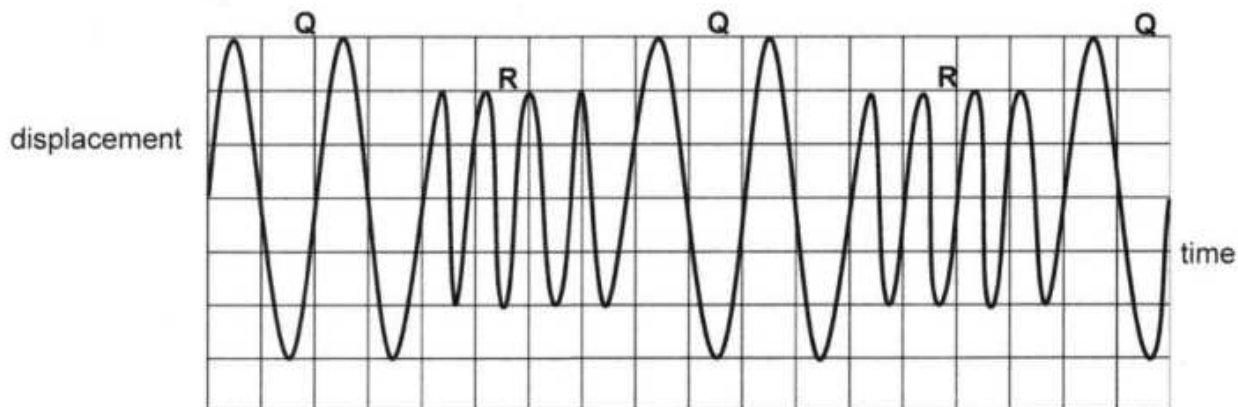
What is the angle of refraction of the ray of light?

- A  $15^\circ$   
 B  $20^\circ$   
 C  $27^\circ$   
 D  $45^\circ$
- 18 A ship sends a pulse of sound to the sea bed. An echo is heard 2.0 seconds later. The speed of sound in water is 1500 m/s.

What is the depth of the water below the ship?

- A 750 m  
 B 1500 m  
 C 3000 m  
 D 6000 m

- 19 The diagram shows the waveform of sound produced by the siren of an ambulance.



Which part of the waveform has the louder sound and which part has the lower pitch?

	louder	lower pitch
A	Q	Q
B	Q	R
C	R	Q
D	R	R

- 20 A thin converging lens has a focal length of 10 cm. An object is placed 20 cm from the lens.

What are the characteristics of the image?

	orientation	size
A	inverted	larger than the object
B	inverted	same size as the object
C	upright	larger than the object
D	upright	same size as the object

- 21 Waves in deep water have a wavelength of 1.4 cm and a speed of 11.2 cm/s. The wavelength of the waves in shallow water is 0.8 cm.

What is the speed of the waves in shallow water?

- A 6.4 cm/s
- B 8.0 cm/s
- C 11.2 cm/s
- D 19.6 cm/s

22 Which electrical component is used as a rectifier in circuits?

- A capacitor
- B diode
- C potentiometer
- D thermistor

23 Which material is used as a core of an electromagnet?

- A aluminium
- B copper
- C iron
- D steel

24 What is the unit for electromotive force?

- A ampere
- B newton
- C ohm
- D volt

25 The turning effect of a motor and the output of an alternating current (a. c.) generator can be increased by modifying the device.

Which modification affects the a. c. generator only?

- A having more turns of wire on the coil
- B rotating the coil faster
- C using stronger magnets
- D winding the wire around a soft iron core

26 A household uses a multi-plug adaptor to connect an electric kettle, an iron and a hot plate burner to the socket.

What is the most likely effect of the connection?

- A appliances not working properly
- B electric shock
- C fire outbreak
- D high voltage in the appliances

27 Which quantity should remain constant for Ohm's law to be obeyed?

- A length
- B resistance
- C temperature
- D thickness

28 Three metal rods X, Y and Z are tested for magnetism. Both ends of each rod are brought close to the north pole of a permanent magnet.

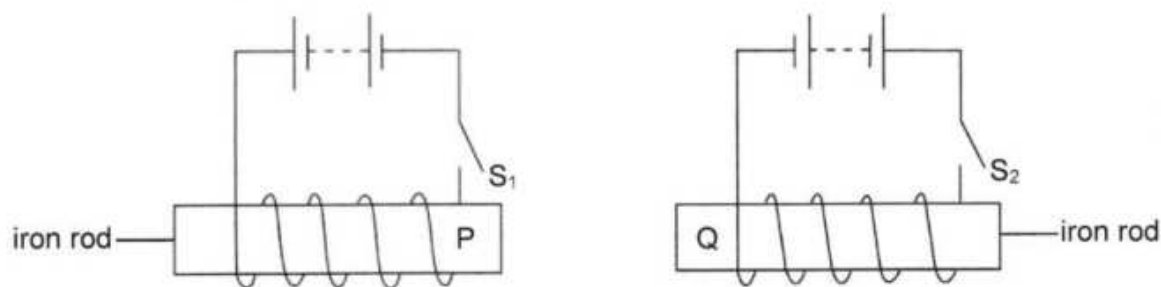
The table shows the results of the test.

metal	end 1	end 2
X	no effect	no effect
Y	repulsion	attraction
Z	attraction	attraction

What conclusion can be made about the metal rods?

	X	Y	Z
A	non-magnetic material	magnetic material	magnet
B	non-magnetic material	magnet	magnetic material
C	magnetic material	magnet	non-magnetic material
D	magnet	non-magnetic material	magnetic

29 Two circuits are set-up as shown.

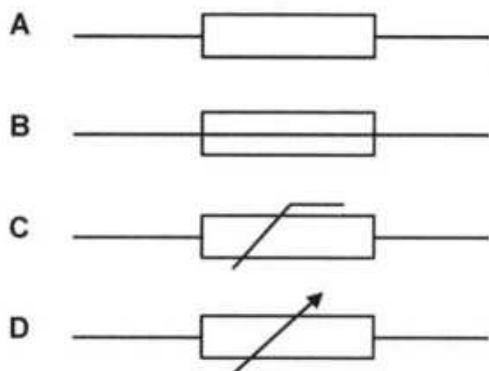


What poles would be ends P and Q when the two switches  $S_1$  and  $S_2$  are closed at the same time?

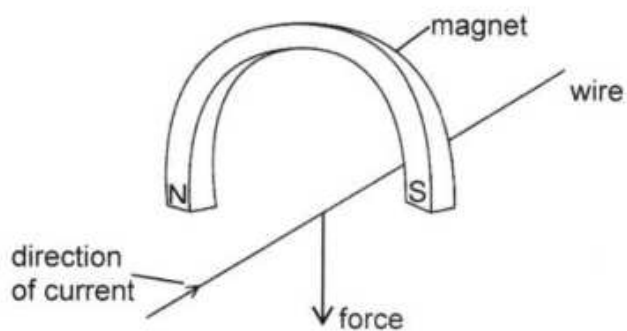
	P	Q
A	N	N
B	S	S
C	N	S
D	S	N



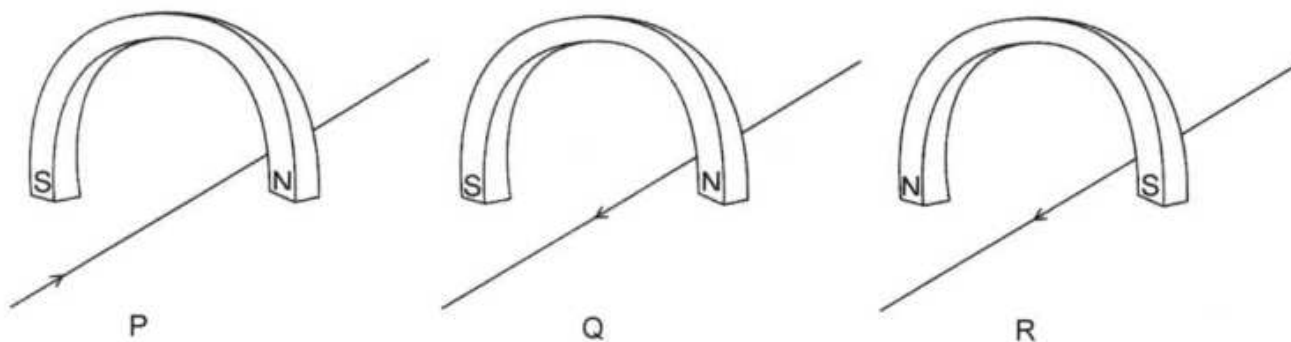
30 Which circuit symbol is for a fuse?



31 The diagram shows a current carrying conductor placed between the poles of a horseshoe magnet.



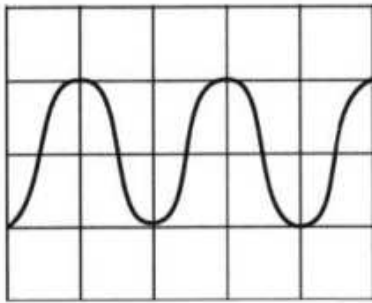
Three other arrangements P, Q and R are set-up as shown.



Which of the arrangements will cause a force in the same direction as the original arrangement?

- A P, Q and R
- B P and R
- C Q only
- D R only

- 32 The diagram shows a waveform displayed on the screen of a cathode ray oscilloscope (c.r.o.). The time base of the c.r.o is set at 2 ms/div.



What is the frequency of the wave?

- A 0.10 Hz
- B 0.25 Hz
- C 100 Hz
- D 250 Hz

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- 33 The current in an electric heater is 10 A. The heater is switched on for 5 minutes.

How much charge flows through the heater?

- A 0.5 C
- B 30 C
- C 50 C
- D 3000 C

- 34 A lamp rated 240 V, 15 W is switched on for 60 seconds.

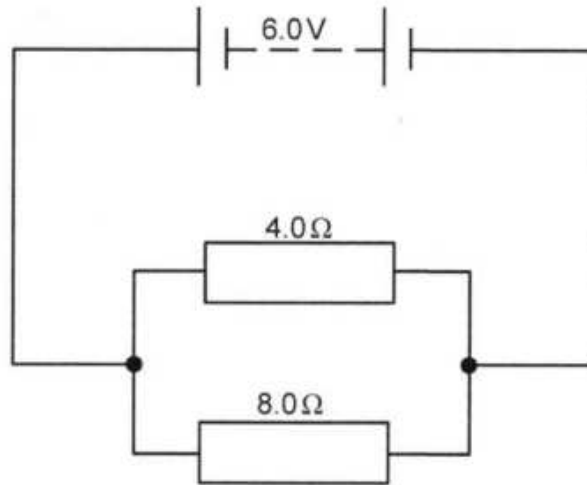
How much energy is converted by the lamp?

- A 0.25 J
- B 60 J
- C 900 J
- D 960 J

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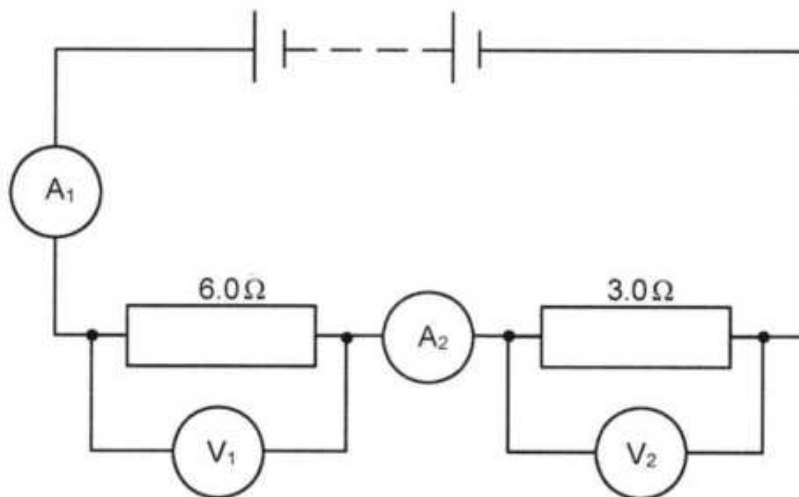
35 The diagram shows an electric circuit.



What is the current supplied by the battery?

- A 0.50 A
- B 0.75 A
- C 1.50 A
- D 2.25 A

36 The diagram shows an electric circuit.



Which statement about the meter readings of the circuit is correct?

- A  $A_1$  is half of  $A_2$
- B  $A_1$  is twice  $A_2$
- C  $V_1$  is half of  $V_2$
- D  $V_1$  is twice  $V_2$

37 Which radioactive emissions are deflected by electric and magnetic fields?

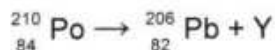
- A alpha and beta
- B alpha and gamma
- C beta and gamma
- D alpha, beta and gamma

38 A lithium, Li, nucleus contains 3 protons and 4 neutrons.

What is the nuclide notation of lithium?

- A  ${}^3_4\text{Li}$
- B  ${}^4_3\text{Li}$
- C  ${}^7_3\text{Li}$
- D  ${}^7_4\text{Li}$

39 Polonium, Po, decays to lead, Pb, as shown by equation.



What is represented by Y in the equation?

- A a beta particle
- B a beta particle and gamma-rays
- C an alpha particle
- D an alpha particle and a beta particle

40 The table shows details of two samples of radioactive nuclides X and Y.

nuclide	number of radioactive atoms at time = 0	half-life
X	16 000	1 day
Y	2 000	2 days

After how many days will the number of atoms of nuclide X be equal to the number of atoms of nuclide Y?

- A 2 days
- B 4 days
- C 6 days
- D 8 days