BOTSWANA EXAMINATIONS COUNCIL
Botswana General Certificate of Secondary Education

PHYSICS **0571/01**

Paper 1 Multiple Choice **October/November 2021**

1 hour

Additional Materials: Multiple choice Answer Sheet
Soft clean eraser
Soft pencil (type B or HB is recommended)

READ THESE INSTRUCTIONS FIRST

Write in soft pencil.
Do not use staples, paper clips, glue or correction fluid.
Write your name, Centre number and candidate number on the Answer Sheet in the spaces provided unless this has been done for you.
DO **NOT** WRITE IN ANY BARCODES.

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 in **soft pencil** on the separate Answer Sheet.

Read the instructions on the separate Answer Sheet very carefully.

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.
Electronic calculators may be used.
Take the weight of 1.0 kg to be 10 N (acceleration of free fall = 10 m/s^2).

1 Which statement describes the period of a pendulum?

A the movement of the pendulum from one extreme end to another

B the movement of the pendulum from one extreme end to another and back

C the time taken by a pendulum to move from one extreme end to another

D the time taken by a pendulum to move from one extreme end to another and back

2 A car of mass 1500 kg accelerates uniformly at $4\,m/s^2$.
The friction force acting on the car is 600 N.

What is the force exerted by the car engine?

A 2400 N

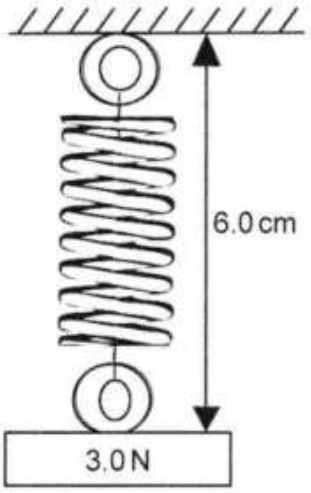
B 5400 N

C 6000 N

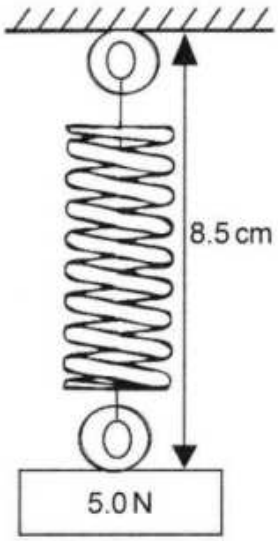
D 6600 N

858

3 Diagram (a) shows a load of 3.0 N hanging from a spring.
Diagram (b) shows a load of 5.0 N hanging from the same spring.



(a)



(b)

A002

The spring obeys Hooke's law.

What is the original length of the spring?

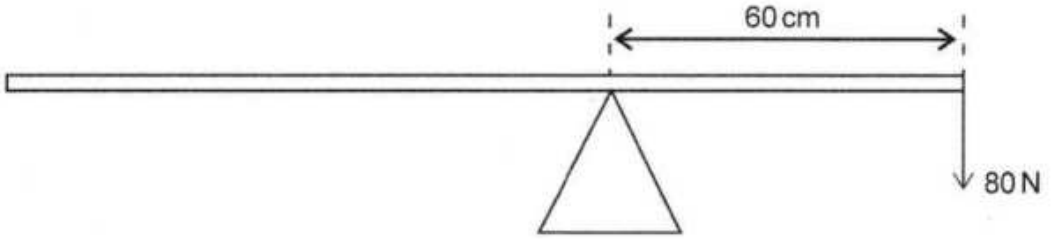
A 2.00 cm

B 2.25 cm

C 2.50 cm

D 3.75 cm

4 The diagram shows a long uniform plank of length 160 cm pivoted 60 cm from one end. The plank is balanced by a force of 80 N.



What is the weight of the plank?

A 30 N

B 48 N

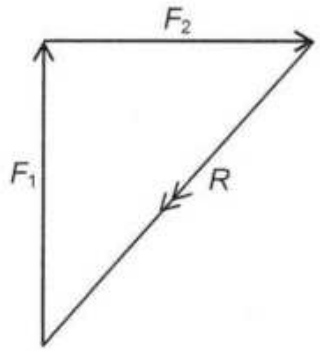
C 60 N

D 240 N

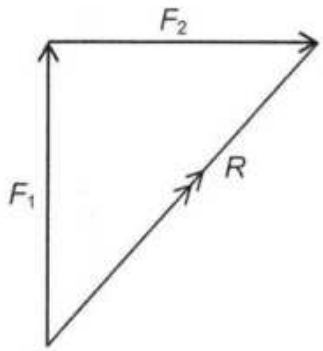
858

5 Which diagram shows the correct resultant force R of two forces, F_1 and F_2?

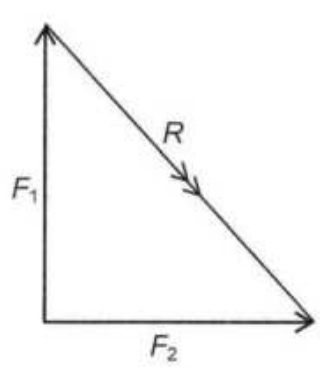
A



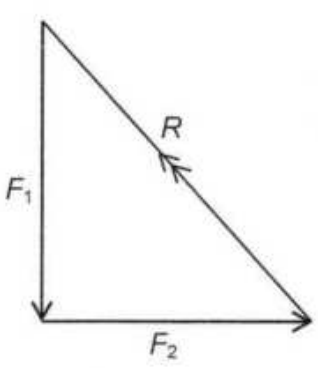
B



C



D



A002

6 A water pump draws 120 kg of water per minute from a borehole.
The depth of the borehole is 50 m.

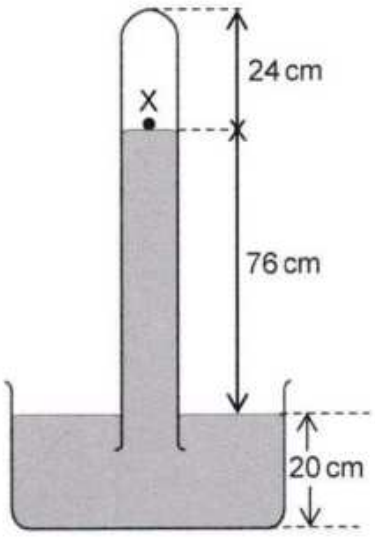
What is the power rating of the pump? (g = 10 N/kg)

A 100 W
B 1000 W
C 6000 W
D 60000 W

7 Which instrument is used to measure the density of a liquid?

A hydrometer
B manometer
C measuring cylinder
D triple beam balance

8 The diagram shows a mercury barometer.



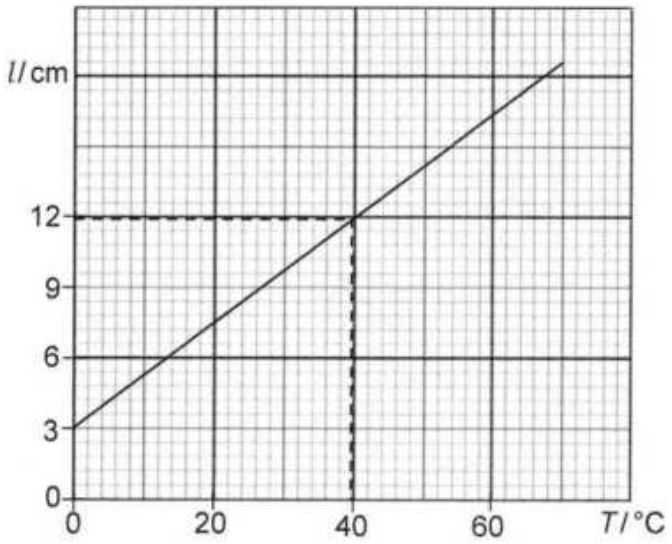
What is the pressure at point X?

A 0 cmHg
B 24 cmHg
C 76 cmHg
D 96 cmHg

9 At what temperature is the pressure of an ideal gas in a sealed container equal to zero?

A 0 °C
B 0 K
C 273 °C
D 273 K

10 The diagram shows a graph of length l of mercury thread against temperature T for a liquid-in-glass thermometer.



The scale of a thermometer ranges from –10 °C to 110 °C.

What is the minimum length of the mercury thread required to show this range?

A 27 cm
B 30 cm
C 36 cm
D 39 cm

11 During a hot day the water in a dam is cooler than the soil around the dam.

Which statement explains this?

A Soil has a larger specific heat capacity than water.
B Soil is a better conductor of heat than water.
C Water has a larger specific heat capacity than soil.
D Water is better conductor of heat than soil.

12 An immersion heater of power rating 100 W is used to heat a block of mass 1500 g for 300 seconds. The temperature of the block increases from 25 °C to 37 °C.

What is the specific heat capacity of the block?

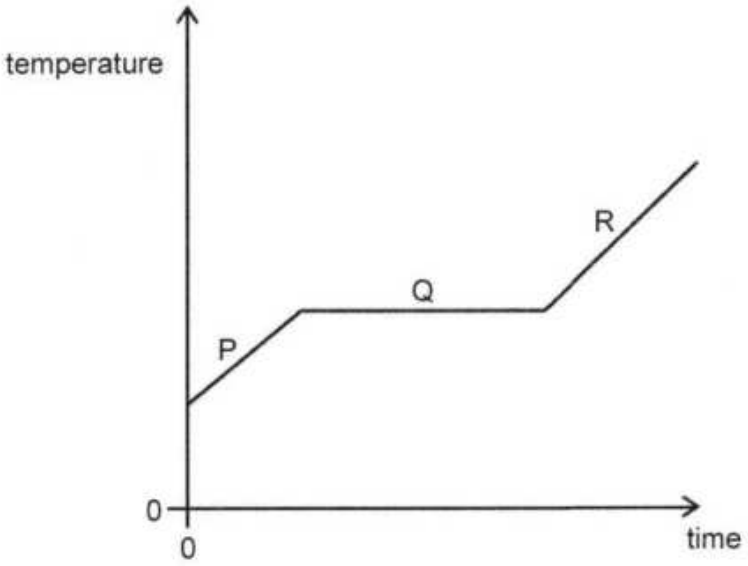
A 0.5 J/kg °C

B 0.7 J/kg °C

C 540.5 J/kg °C

D 1666.7 J/kg °C

13 The diagram shows the heating curve of a substance.



Which term is used to describe the thermal energy used at stage Q?

A heat capacity

B latent heat

C specific heat capacity

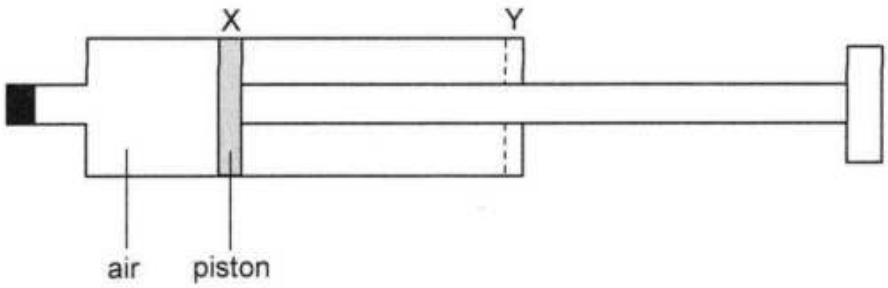
D specific latent heat

14 A cooking pot containing water is placed on a fire.

By which method is heat transferred through the pot and within the liquid?

	through the pot	within the liquid
A	conduction	convection
B	conduction	conduction
C	convection	conduction
D	convection	convection

15 The diagram shows a sealed syringe containing 60 cm^3 of air.



The piston of the syringe is pulled from position X to Y.
The volume of the air increases by 120 cm^3.
The pressure of the air decreases to 900 Pa.
The temperature of the air does not change.

What is the pressure of the air when the piston is at position X?

858

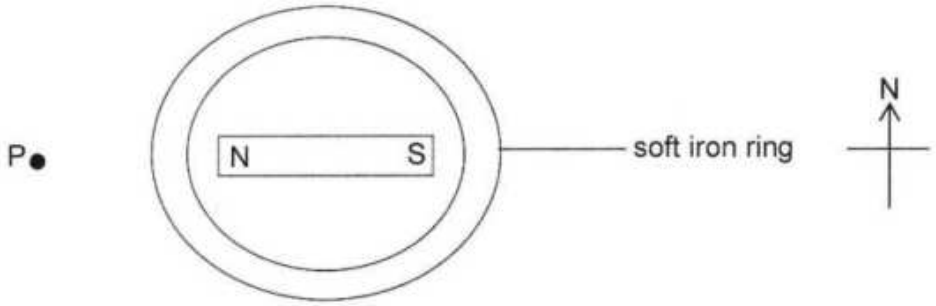
A 300 Pa

B 450 Pa

C 1800 Pa

D 2700 Pa

16 The diagram shows a bar magnet placed inside a soft iron ring. Point P is near the ring.

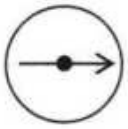


A002

A plotting compass is placed at point P.

What is the correct direction of the compass needle?

A



B

C

D

17 Which electromagnetic waves are used for detecting forgeries in bank notes?

A infrared

B microwave

C ultraviolet

D X-rays

18 The diagram shows a man holding a starter pistol standing between a wall and an observer. The distance between the man and the observer is 120 m. The diagram is not drawn to scale.

The man fires the pistol and the observer hears an echo 0.20 s after hearing the pistol shot. The speed of sound in air is 330 m / s.

What is the distance between the observer and the wall?

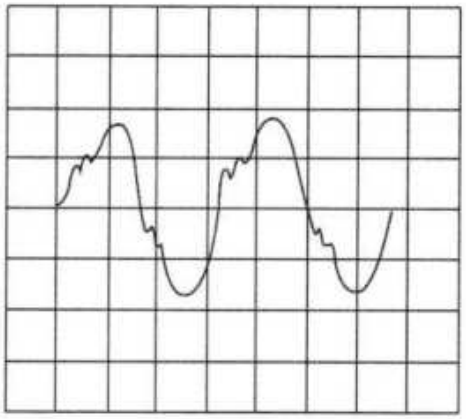
A 33 m

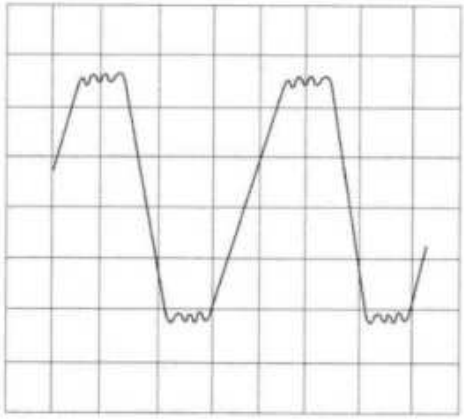
B 66 m

C 153 m

D 186 m

19 The diagram shows waveforms of sounds produced by two different musical instruments. The diagrams are drawn to scale.

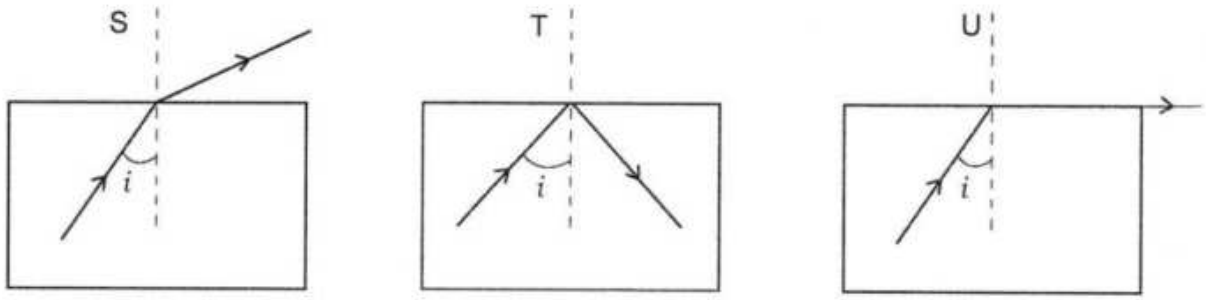




Which row is correct about the characteristics of the two sounds?

	loudness	pitch
A	different	different
B	different	same
C	same	different
D	same	same

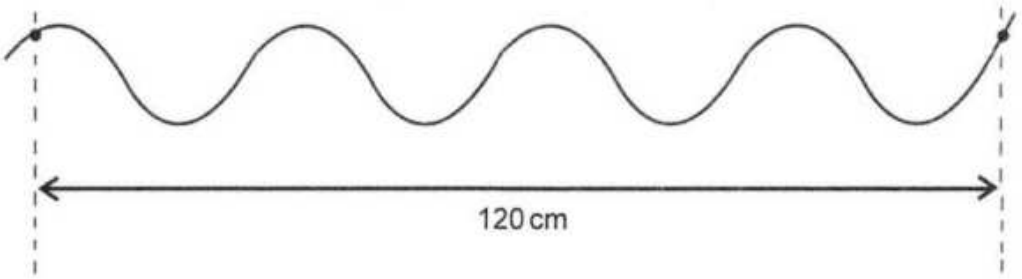
20 Diagrams S, T and U show ray diagrams for a ray of light at different angles of incidence in a glass block. The diagrams are not drawn to scale.



Which row shows the correct comparison of angle of incidence i and the critical angle c for each diagram?

	S	T	U
A	$i = c$	$i > c$	$i < c$
B	$i > c$	$i < c$	$i = c$
C	$i < c$	$i > c$	$i = c$
D	$i < c$	$i = c$	$i > c$

21 The diagram shows a transverse waveform.



The frequency of the wave is 0.5 Hz.

What is the speed of the wave?

A 2 cm / s
B 12 cm / s
C 15 cm / s
D 60 cm / s

858

22 Which material is best used to make a permanent magnet?

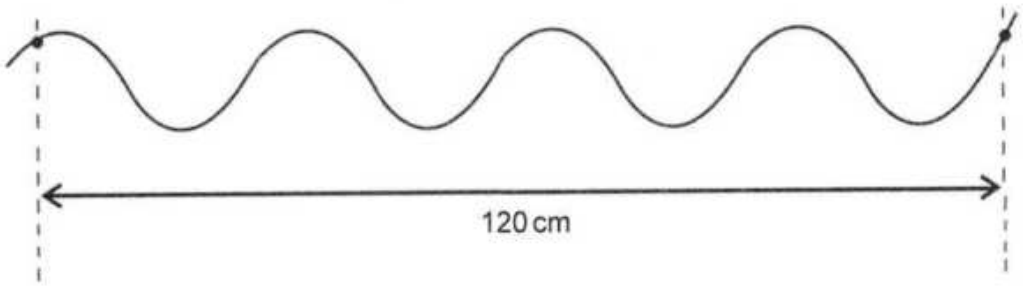
A brass
B copper
C iron
D steel

23 Which term describes the number of waves passing a point per second?

A amplitude
B frequency
C period
D wavelength

A002

21 The diagram shows a transverse waveform.



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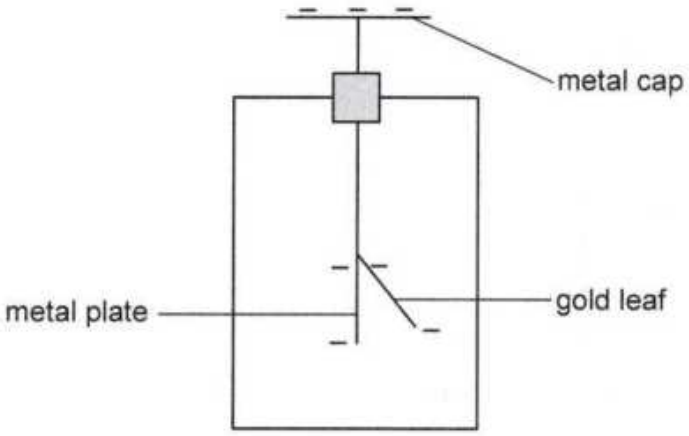
B frequency
C period
D wavelength

A002

24 The diagram shows a negatively charged gold leaf electroscope.



A positively charged rod is brought near the metal cap of the gold leaf electroscope.

What happens to the gold leaf and what is the reason for that?

	gold leaf moves	reason
A	closer to the metal plate	negative charges attracted to the metal cap
B	closer to the metal plate	positive charges attracted to the metal cap
C	further away from the metal plate	negative charges attracted to the metal cap
D	further away from the metal plate	positive charges attracted to the metal cap

25 Which instrument is used to measure the rate of flow of charge?

A ammeter
B manometer
C thermometer
D voltmeter

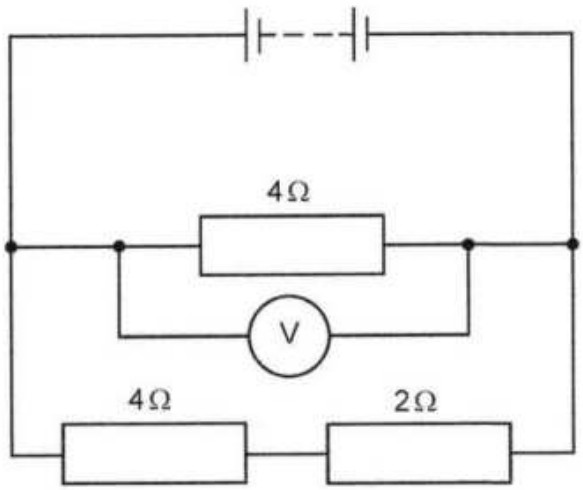
26 The resistance of conductor W is 8.0 Ω.

Conductor Y is made from the same material as conductor W.
The cross sectional area of conductor Y is double that of conductor W.
The length of conductor Y is half of that of conductor W.

What is the resistance of conductor Y?

A 2.0 Ω
B 8.0 Ω
C 16.0 Ω
D 32.0 Ω

27 The diagram shows an electric circuit.



The voltmeter reading is 6.0 V.

858

What is the total current supplied by the battery?

A 0.4 A

B 0.6 A

C 1.5 A

D 2.5 A

28 An appliance labelled 1.2 kW, 240 V is fitted with a 3 A fuse.
The appliance is connected to 240 V mains supply and switched on.

Which row is correct?

	the appliance	reason
A	works	there is normal current in the appliance
B	works	there is current of 3 A in the appliance
C	does not work	the current in the appliance is small
D	does not work	the fuse breaks

A002

29 An electric iron has a current of 9 A when in full operation.
A fault develops in the iron and the live wire touches the metal plate of the iron.
The fuse blows.

Which statement is correct about the current in the earth wire after the fuse has blown?

A It is less than 9 A.

B It is more than 9 A.

C It is equal to 9 A.

D It is equal to 0 A.

30 What causes the deflection of a conductor carrying current when placed between the poles of a permanent magnet?

A the interaction between the magnetic fields

B the repulsion of the charges in the conductor

C the resistance of the conductor

D the voltage across the conductor

31 A transformer has 1500 turns in the primary coil and 200 turns in the secondary coil.
The transformer is connected to a 240 V mains supply to provide a current of 2.0 A to an electrical appliance.

What is the current in the primary coil of the transformer?

A 0.13 A

B 0.27 A

C 15 A

D 16 A

858

32 Which component does **not** operate with direct current?

A electric bell

B motor

C relay switch

D transformer

33 Which quantity can be measured using a cathode ray oscilloscope?

A charge

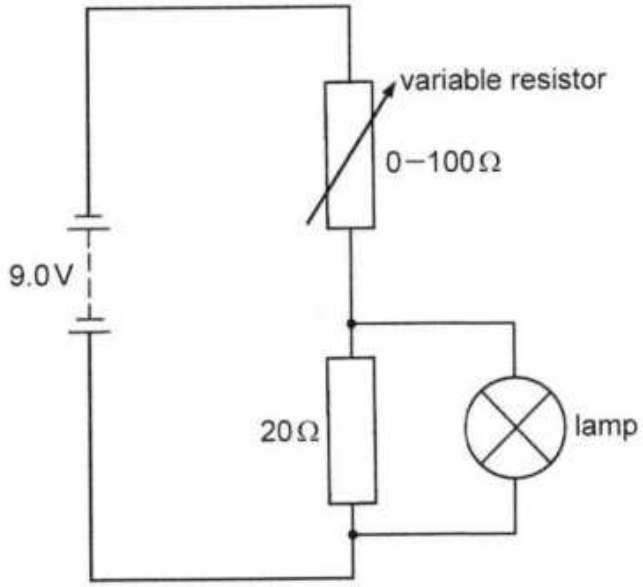
B current

C resistance

D voltage

A002

34 The diagram shows a circuit diagram used to control the brightness of a lamp.



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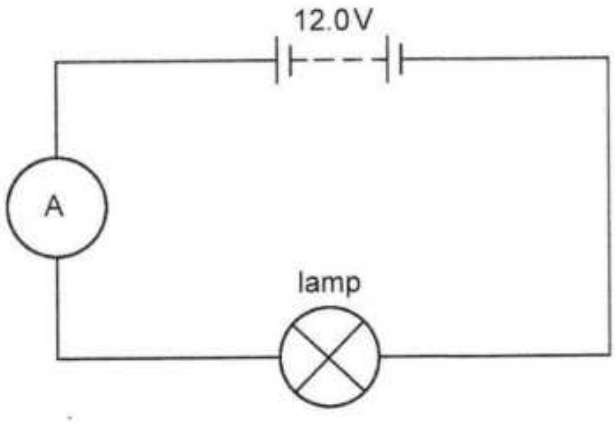
The resistance of the variable resistor is set at 10Ω.

What is the voltage across the lamp?

A 3.0V
B 4.5V
C 6.0V
D 9.0V

35 The diagram shows an electric circuit.



A002

The current in the lamp is 0.6A. It takes 3.0s for charge to flow around the circuit.

How much work is done in driving the charge around the circuit?

A 2.4J
B 6.7J
C 7.2J
D 21.6J

36 Which component allows current to flow in only one direction?

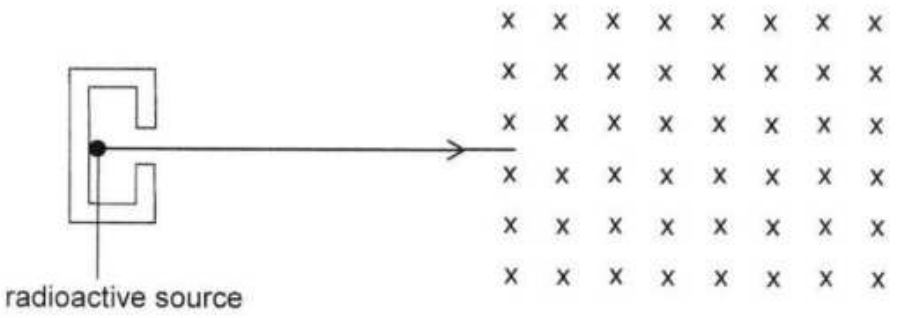
A capacitor
B diode
C fuse
D thermistor

37 What is the number of protons in an alpha particle?

A 0
B 1
C 2
D 4

858

38 The diagram shows a radioactive source that emits alpha, beta and gamma radiations. The emissions enter a magnetic field which is directed into the page.

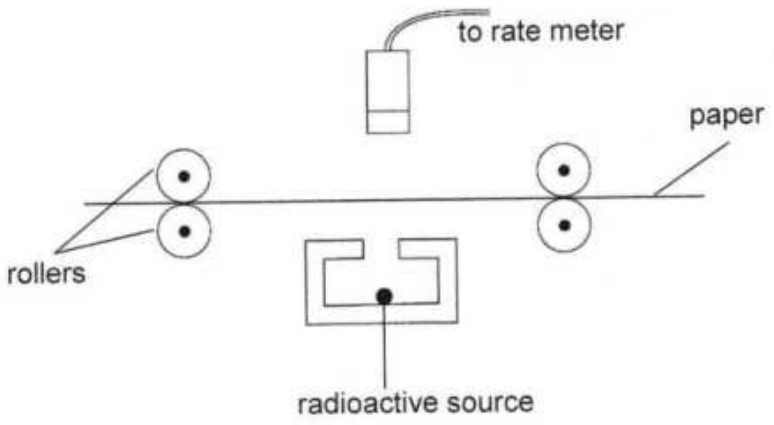


Which row correctly describes the behaviour of the emissions in the field?

	bend up	bend down	does not bend
A	alpha	beta	gamma
B	beta	alpha	gamma
C	alpha	gamma	beta
D	gamma	beta	alpha

A002

39 The diagram shows a set-up used to monitor the thickness of paper during production.



The radioactive source is used to monitor the thickness of papers produced.

What are the characteristics of a radioactive source that is suitable for this use?

858

A emits alpha particles and has a long half life

B emits alpha particles and has a short half life

C emits beta particles and has a long half life

D emits beta particles and has a short half life

40 The mass of a radioactive sample decreases from 275 g to 120 g to give out energy in a nuclear reaction. Take the speed of light to be 3×10^8 m/s.

What is the amount of energy released?

A 1.08×10^{16} J

B 1.40×10^{16} J

C 1.08×10^{19} J

D 1.40×10^{19} J

A002