BOTSWANA EXAMINATIONS COUNCIL
Botswana General Certificate of Secondary Education

PHYSICS **0571/01**

Paper 1 Multiple Choice **October/November 2020**

1 hour

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

READ THESE INSTRUCTIONS FIRST

455

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 on the Answer Sheet in the spaces provided unless this has 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 in **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.

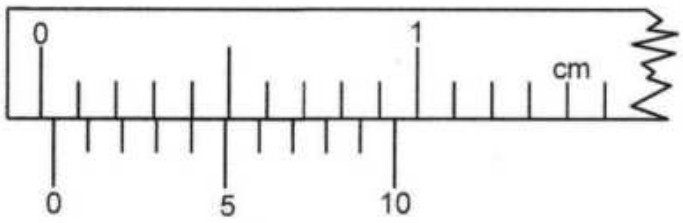
Do not use staples, paper clips, highlighters, glue or correction fluid.

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

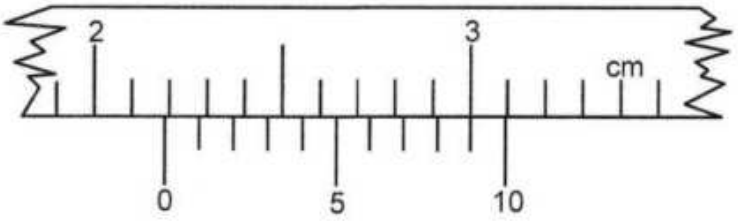
A003

1 The diagrams show the Vernier caliper scales before and after measuring the length of an object.

before measuring



after measuring



What is the length of the object?

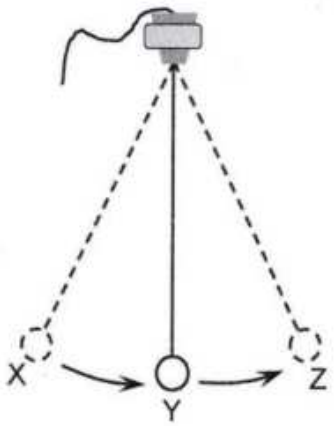
A 2.15 cm

B 2.19 cm

C 2.23 cm

D 3.09 cm

2 The diagram shows a simple pendulum.



Which term describes the time taken for the movement of the pendulum from X to Z and back to X?

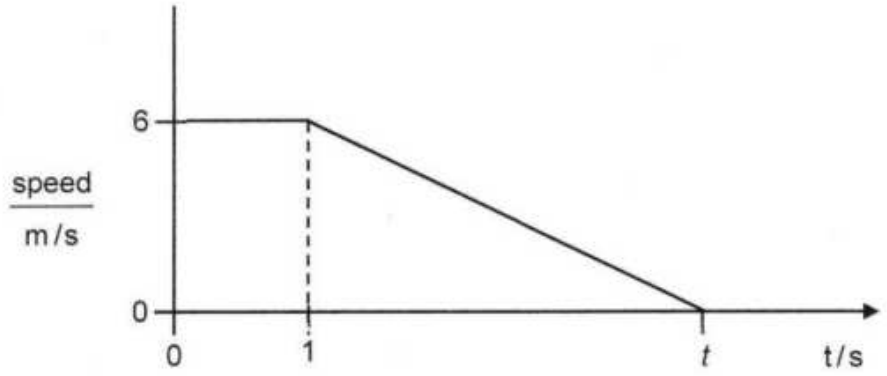
A amplitude

B frequency

C oscillation

D period

3 The diagram shows a speed-time graph of an object.
The object takes a time t seconds to travel 30 m. The diagram is **not** drawn to scale.



What is the time t represented on the graph?

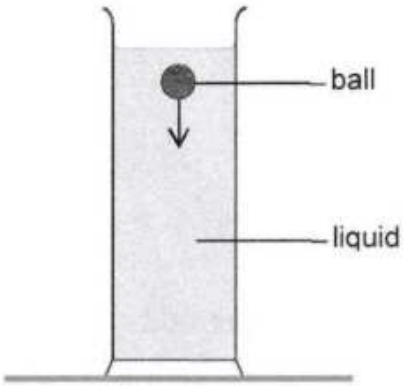
A 5 s

B 8 s

C 9 s

D 10 s

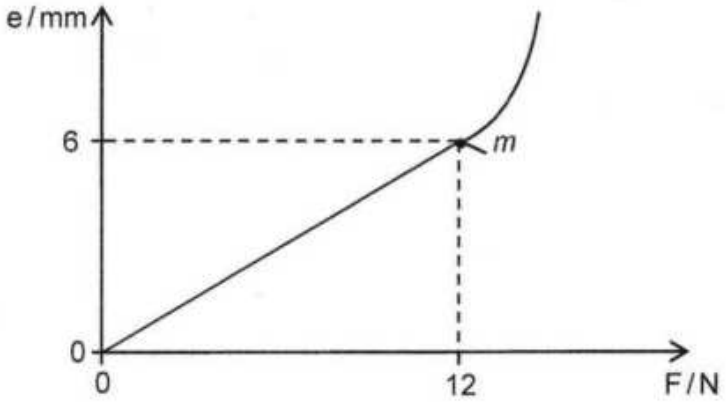
4 The diagram shows a small metal ball falling through a liquid in a glass tube.
The ball does not reach terminal velocity.



How does the weight of the ball, the liquid resistance on the ball and the acceleration of the ball change as the ball falls through the liquid?

	weight	liquid resistance	acceleration
A	increases	decreases	remains the same
B	increases	increases	decreases
C	remains the same	decreases	increases
D	remains the same	increases	decreases

5 The graph shows the relationship between force and extension for a spring.
Point *m* is the limit of proportionality of the spring.



The spring is then placed in series with an identical spring.

455

What is the force needed to stretch the springs up to the limit of proportionality?

A 2.0 N

B 6.0 N

C 12.0 N

D 24.0 N

6 Which quantity is a vector?

A acceleration

B distance

C speed

D time

A003

7 An object of mass 5.0 kg has kinetic energy of 1.0 J.

What is the velocity of the object?

A 0.20 m / s

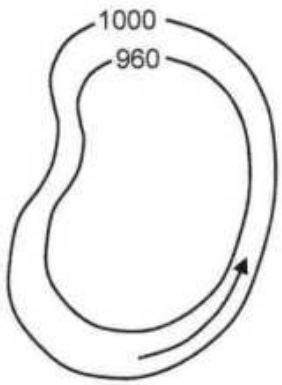
B 0.40 m / s

C 0.44 m / s

D 0.63 m / s

8 Which diagram shows a weather map for a cyclone in the Southern hemisphere?

A



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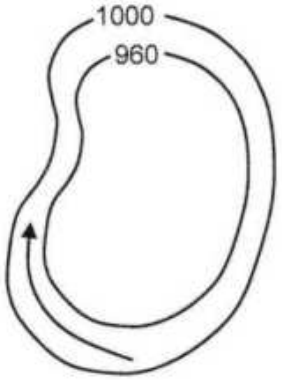

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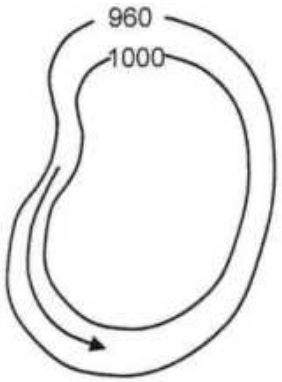

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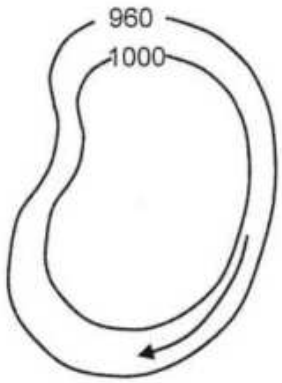
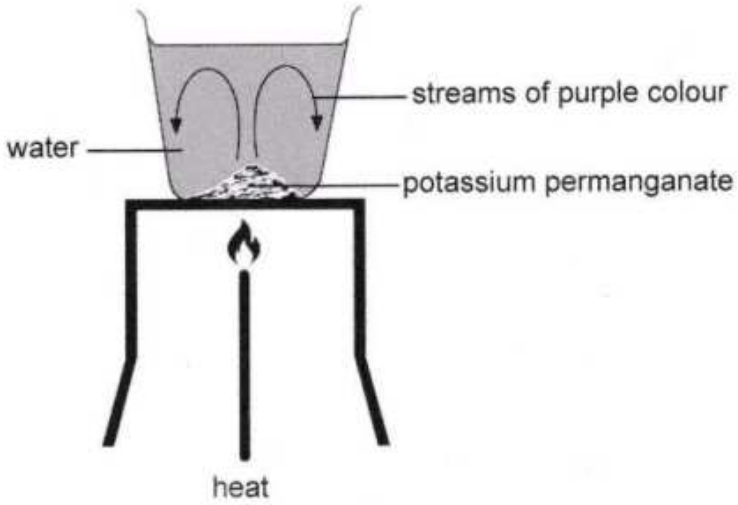


9 The diagram shows a set-up used to demonstrate convection.



Which statement is correct?

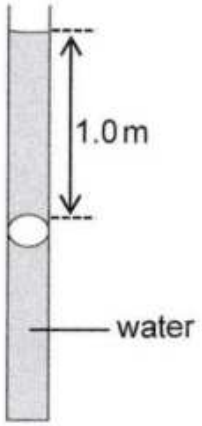
A the less dense water rises up carrying potassium permanganate

B the water particles expand and move the potassium permanganate

C the water is more dense than potassium permanganate

D the volume of potassium permanganate particles increases

10 The diagram shows an air bubble of volume 3.0 cm^3 trapped in a thin capillary tube.



The height of the water above the air bubble is reduced to 0.75 m.

What is the new volume of the air bubble?

455

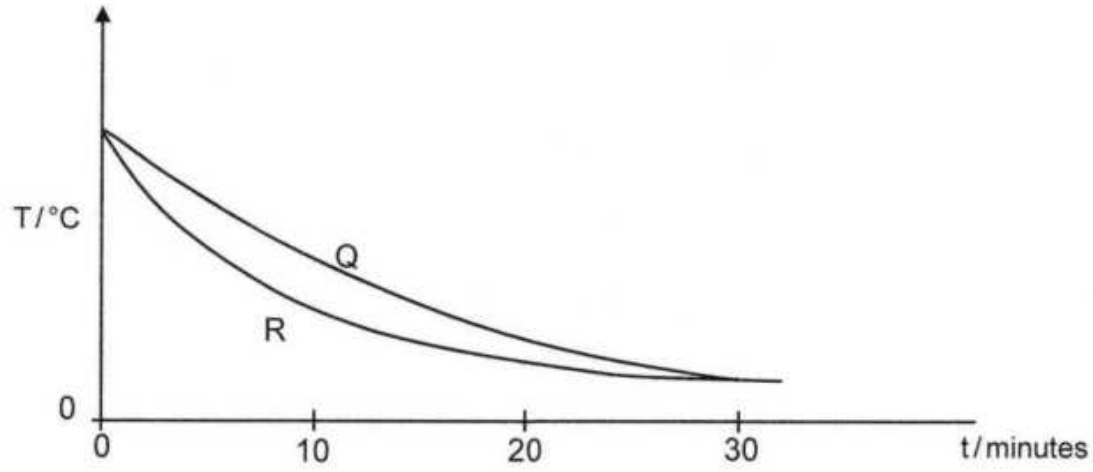
A 0.75 cm^3

B 2.25 cm^3

C 4.00 cm^3

D 12.00 cm^3

11 The graph shows the temperature changes of substances Q and R when left in a room to cool.



A003

The substances are identical in shape, size and material but are coloured differently.

Which conclusion can be made about the substances?

A Both Q and R lose the same amount of heat between 0 and 30 minutes.

B R loses more heat than Q between 0 and 30 minutes.

C R loses the same amount of heat as substance Q between 0 and 20 minutes.

D R has more heat than Q at 0 minutes

12 The table shows the melting points and boiling points of substances X, Y and Z.

substance	melting point / °C	boiling point / °C
X	−30	78
Y	0	100
Z	10	120

A student has a laboratory thermometer with a range of −10 °C to 100 °C.

For which substances can the student measure both the melting point and the boiling point using the thermometer?

A X only

B Y only

C X and Y

D Y and Z

455

13 In which state or states of matter does transfer of heat by convection take place?

A gases and liquids

B gases and solids

C gases only

D liquids only

14 An aluminium ball is placed in 0.1 kg of ice at 0 °C in an insulated container.
The ice takes 10 minutes to melt.

The latent heat of fusion of ice is 334 000 J / kg.

A003

What is the rate at which the ball gives out thermal energy?

A 55.7 J / s

B 3340 J / s

C 55 700 J / s

D 334 000 J / s

15 Which statement is **not** correct about a thermocouple thermometer?

A It measures a very wide range of temperatures.

B It measures rapidly changing temperatures.

C It uses varying lengths of junctions to measure temperature.

D It uses varying electromotive force to measure temperature.

16 Which is not a source of radio waves?

A arcs and sparks

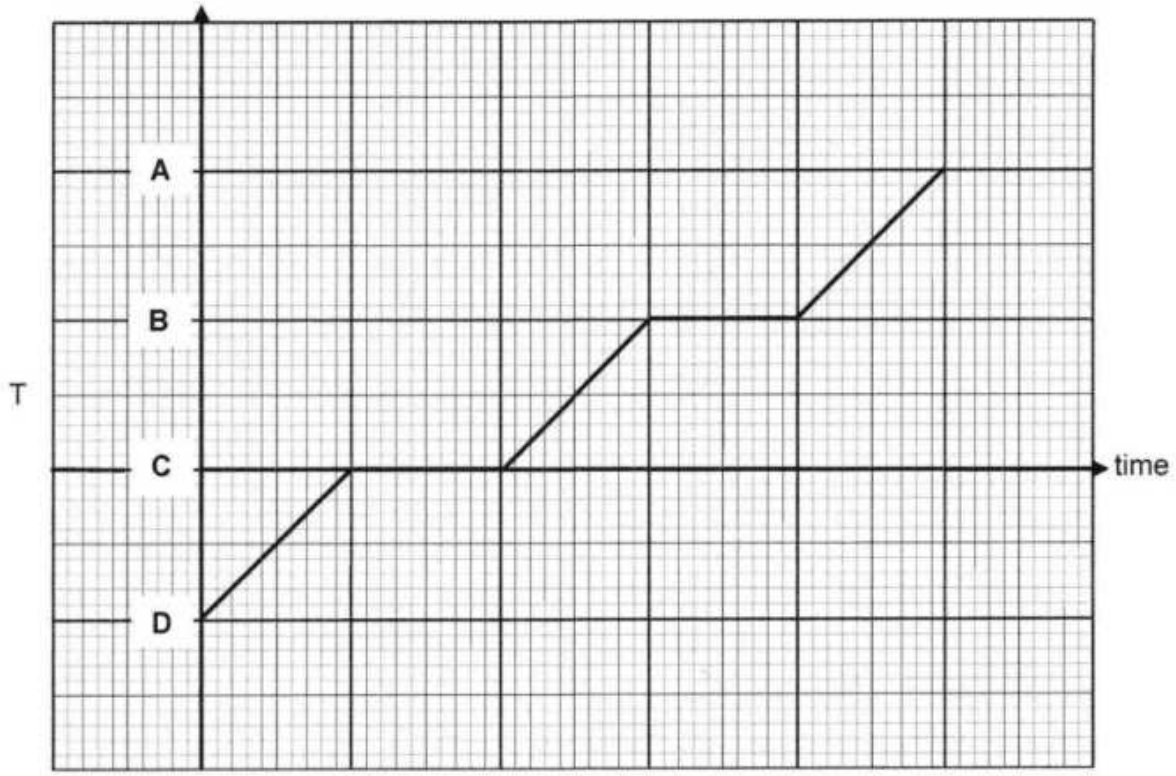
B a television transmitter

C radioactive isotopes

D the Sun

17 The diagram shows how the temperature of a substance changes with time when it is heated.

Which letter represents the boiling point of the substance?



18 A positively charged plastic rod picks up a small piece of paper.

Which statement explains why this is so?

A The negative charges in the paper are attracted towards the rod.

B The positive charges in the paper move further away from the rod.

C The rod induces a positive charge in the paper.

D The rod makes the paper have more positive charges.

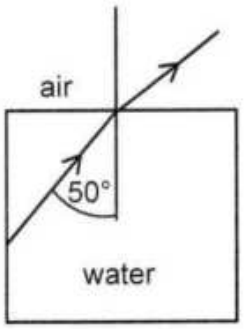
19 The table shows critical angles of different materials.

material	critical angle
water	49°
acrylic plastic	42°
glass (crown)	41°
diamond	24°

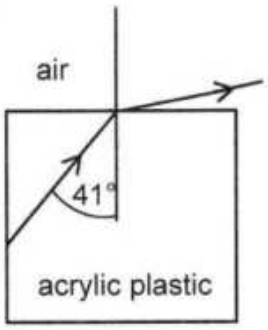
Which diagram shows the most likely path of a ray of light in one of the materials?

The diagrams are not drawn to scale.

A



B



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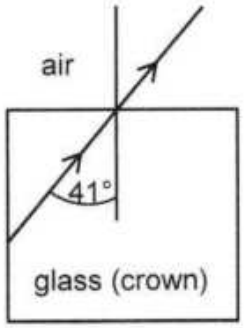

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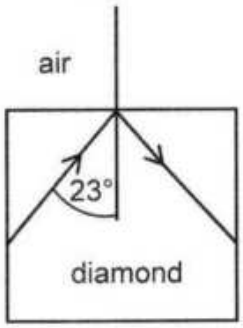


20 Which formula is for electrical energy?

A $E = \frac{V}{Q}$

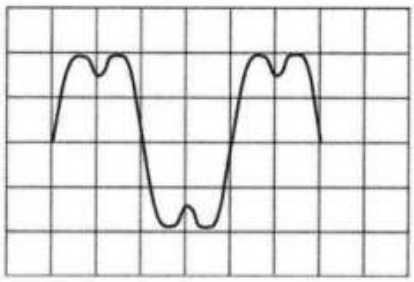
B $E = QV$

C $E = \frac{t}{P}$

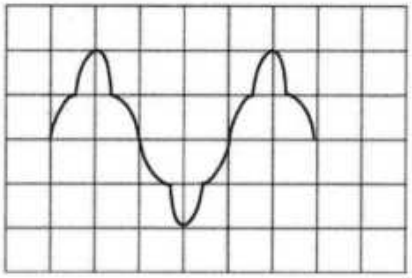
D $E = \frac{P}{t}$

21 The diagrams show some wave forms of sound. The waves are drawn to scale.

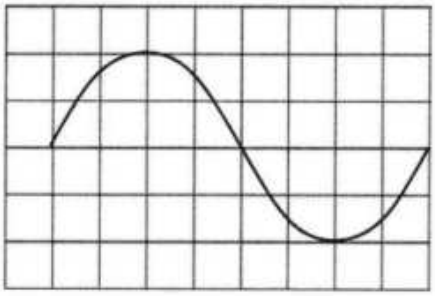
W



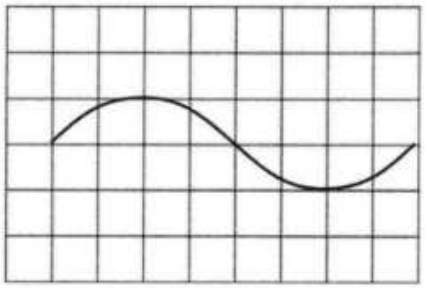
X



Y



Z



Which waves have the same quality?

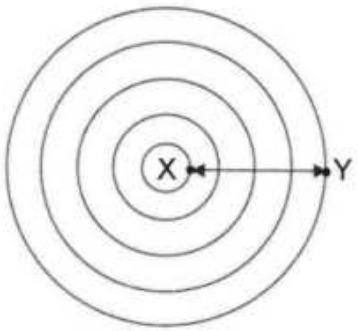
A W and X

B W and Y

C X and Y

D Y and Z

22 The diagram shows the wave fronts of water waves that move outwards.
Each wave takes 10.0 s to move from X to Y.



What is the frequency of the waves?

A 0.4 Hz

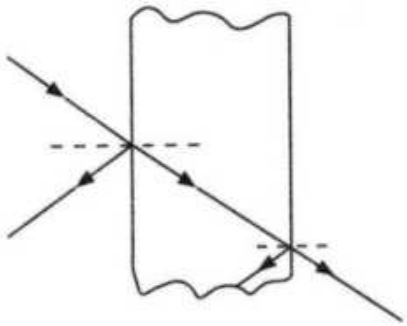
B 0.5 Hz

C 2.0 Hz

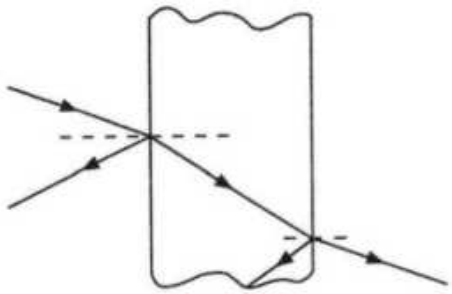
D 2.5 Hz

23 Which diagram shows the most likely path of a ray of light as it passes through a window glass? The diagrams are not drawn to scale.

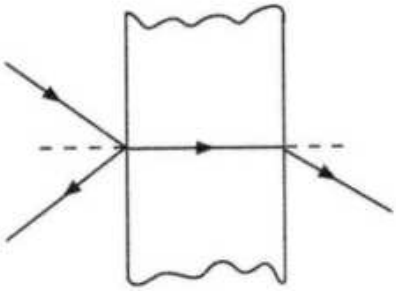
A



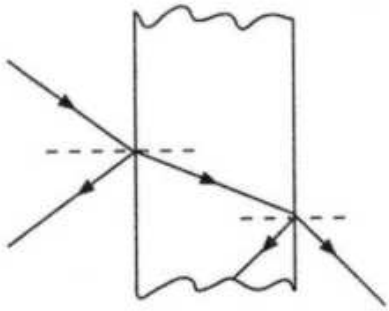
B



C



D



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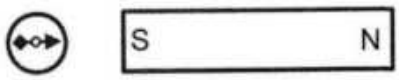
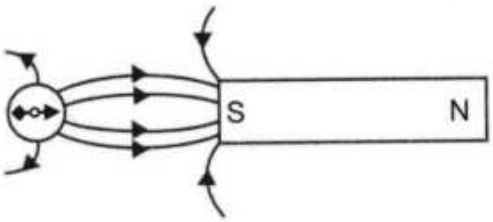
24 The diagram shows a plotting compass placed near the end of a permanent magnet. The poles of the magnet are labelled S and N.

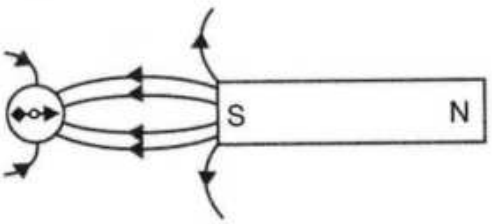


Which diagram shows the correct magnetic field pattern between the compass and the magnet?

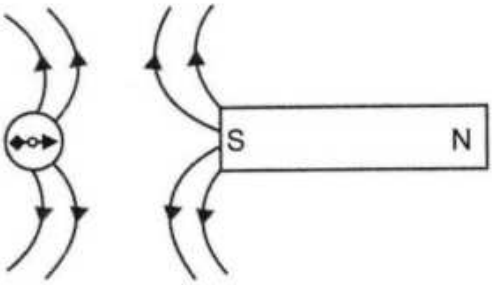
A



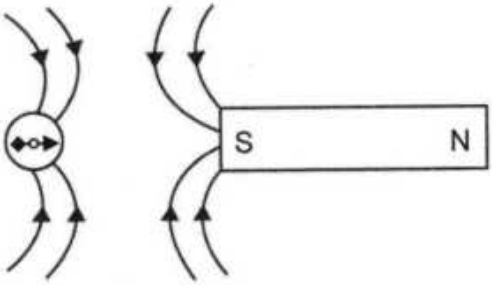
B



C

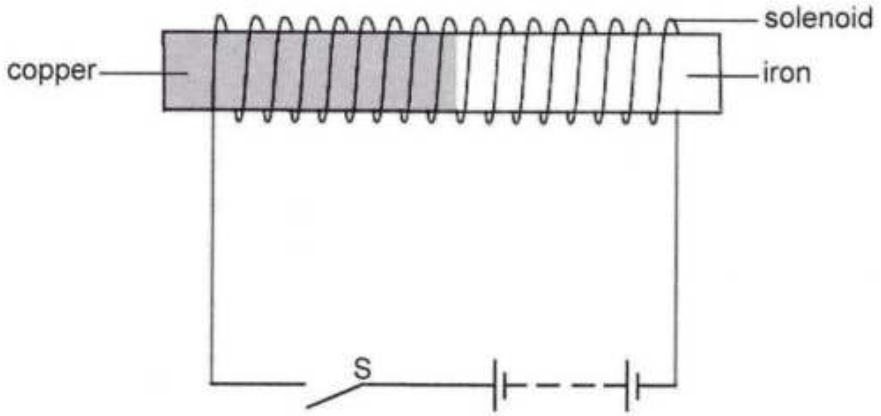


D



A003

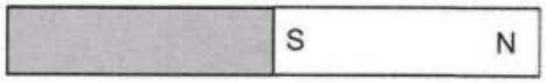
25 The diagram shows two identical rods, copper and iron, joined together.
The rods are placed inside a solenoid.



Which diagram shows the poles induced on the rods when switch S is closed?

455

A



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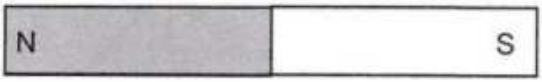

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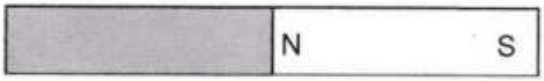

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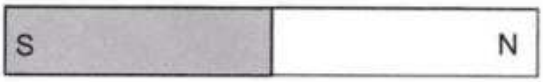


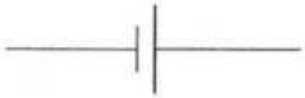
26 The diagram shows an electric component.

A003

Which symbol is used to represent the component?

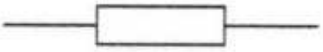
A

B

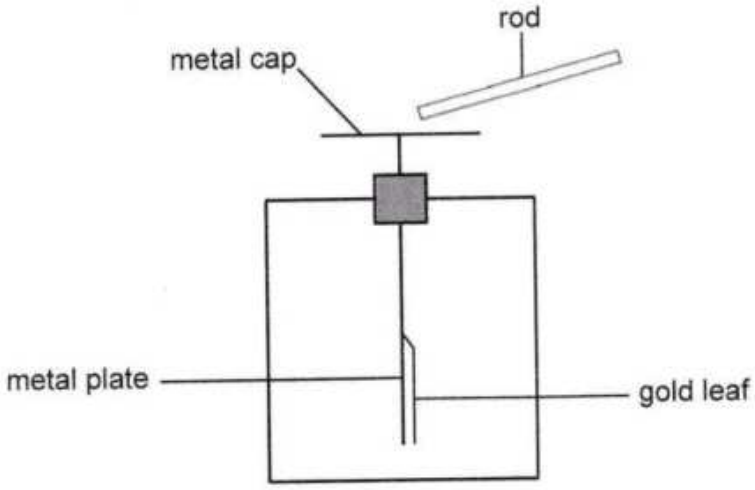


C

D



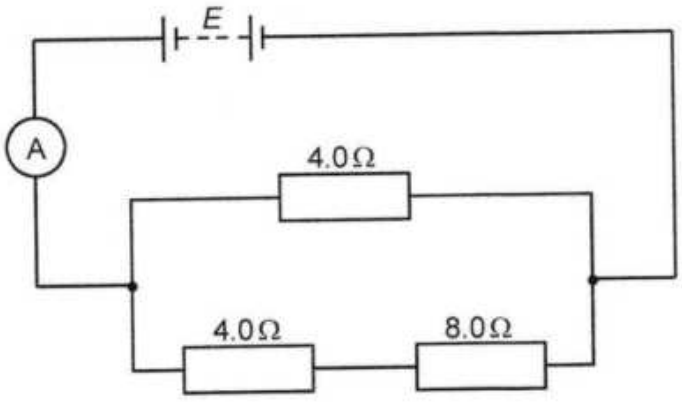
27 A polythene rod and a copper rod are each rubbed with a cloth.
The rubbed ends of the rods are brought near the metal cap of an electroscope as shown in the diagram.



What will be observed when each rod is brought near the metal cap?

	copper rod	polythene rod
A	gold leaf deflected	gold leaf deflected
B	gold leaf deflected	gold leaf not deflected
C	gold leaf not deflected	gold leaf deflected
D	gold leaf not deflected	gold leaf not deflected

28 The diagram shows an electric circuit.

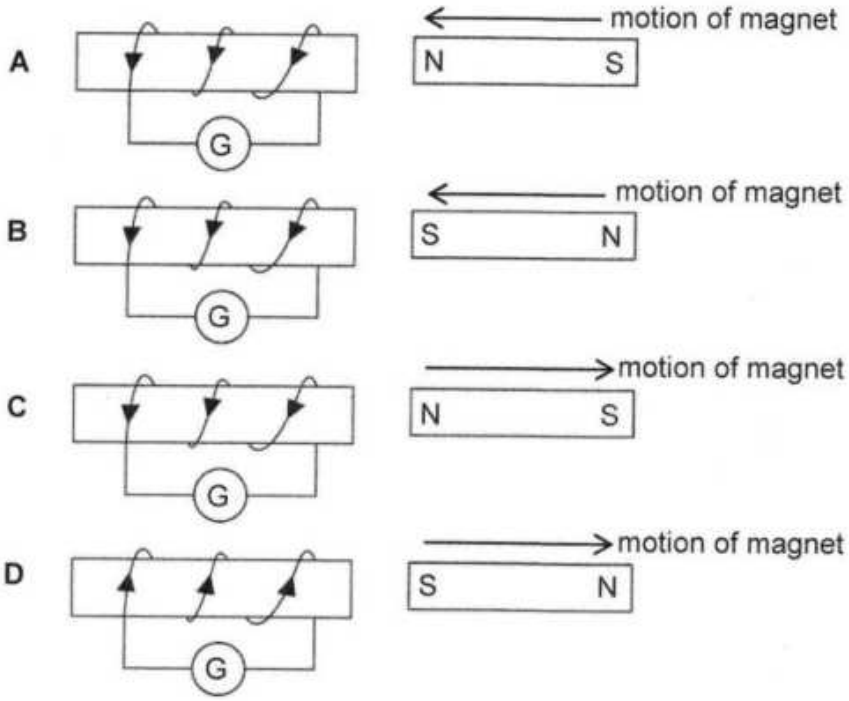


The ammeter reading is 2.0A.

What is the electromotive force *E* of the battery?

A 2.0V
B 6.0V
C 8.0V
D 24V

29 Which of the diagrams shows the correct direction of the current induced in a coil?



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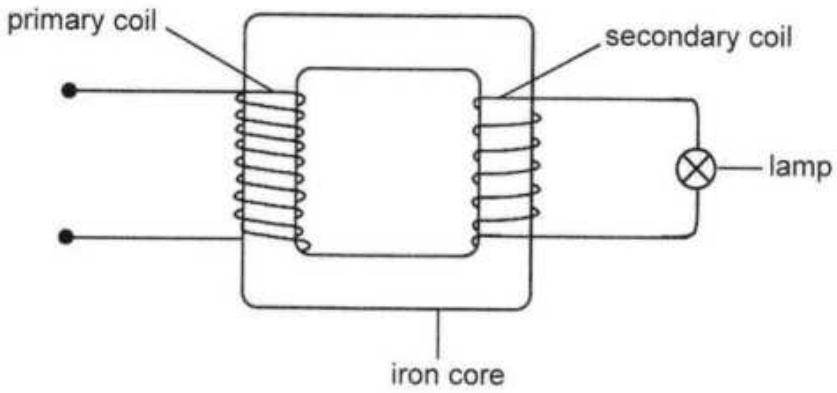
30 The diagram shows a step-down transformer used to operate a lamp.



A003

The transformer is connected to the mains.

Which statement about the transformer is correct?

A The current flows from primary coil to secondary coil through the core.

B The current in the primary coil is equal to the current in the secondary coil.

C The current in the primary coil is less than the current in the secondary coil.

D The current in the secondary coil is less than the current in the primary coil.

31 What is the purpose of a split-ring commutator in a direct current motor?

A to change the direction of current in the coil

B to change the direction of rotation of the coil

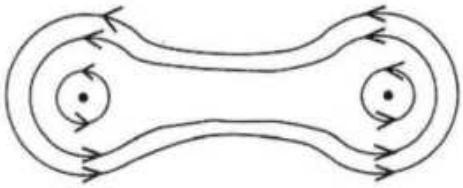
C to increase the current in the coil

D to maintain the smooth rotation of the coil

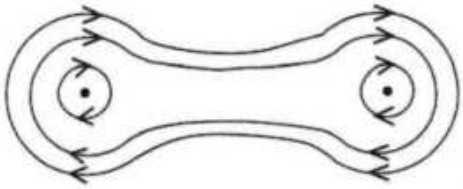
32 Two parallel conductors carry current in the same direction.

What is the correct magnetic field pattern between the conductors?

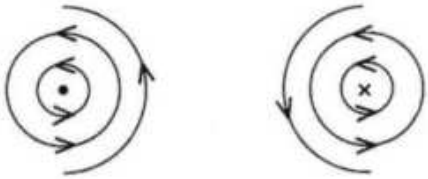
A



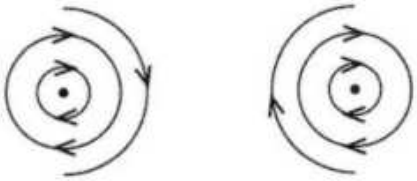
B



C



D



key

• current out of page

× current into page

33 What component can be used to cause a time delay whenever a circuit is switched on?

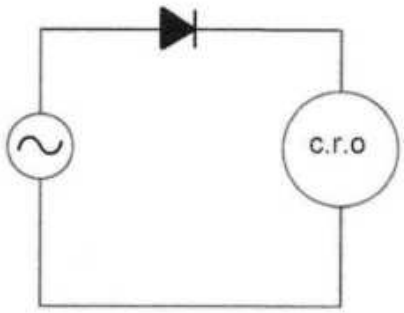
A capacitor

B fixed resistor

C light dependent resistor

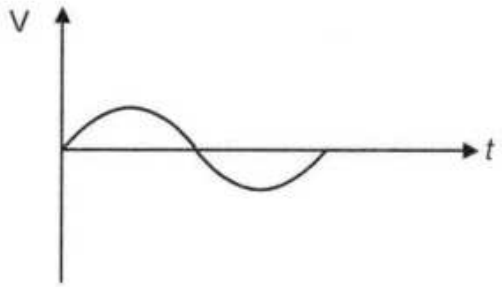
D thermistor

34 The diagram shows a diode and a cathode ray oscilloscope (c.r.o.) connected to an alternating current.
The output of the current is displayed on the c.r.o.

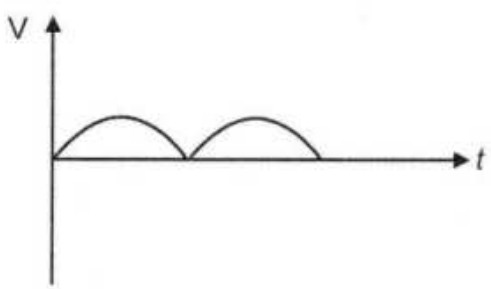


Which graph shows the display of voltage against time on the c.r.o?

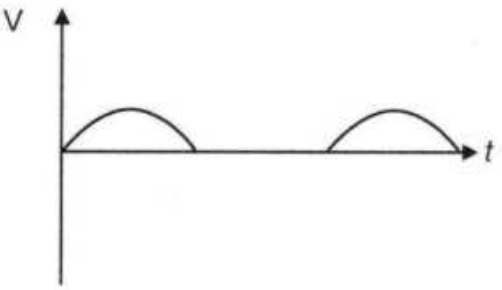
A



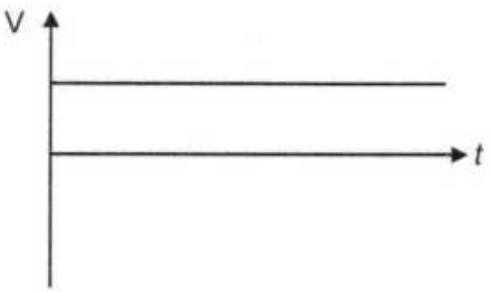
B



C

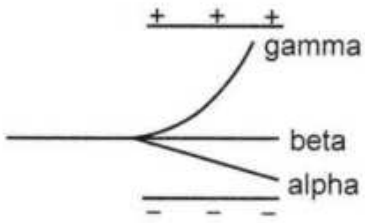


D

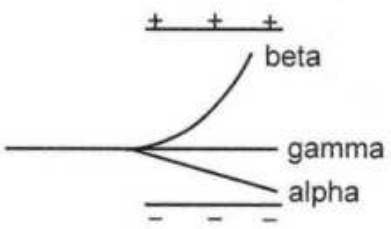


35 Which diagram shows the correct paths of the radioactive emissions when they move through an electric field?

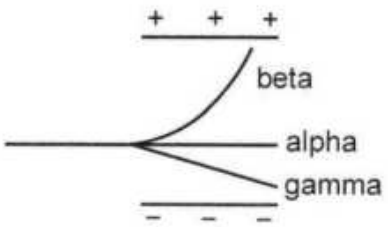
A



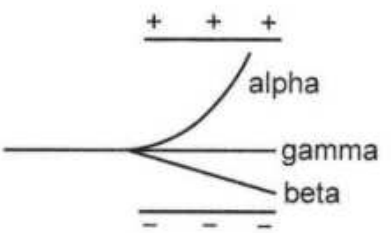
B



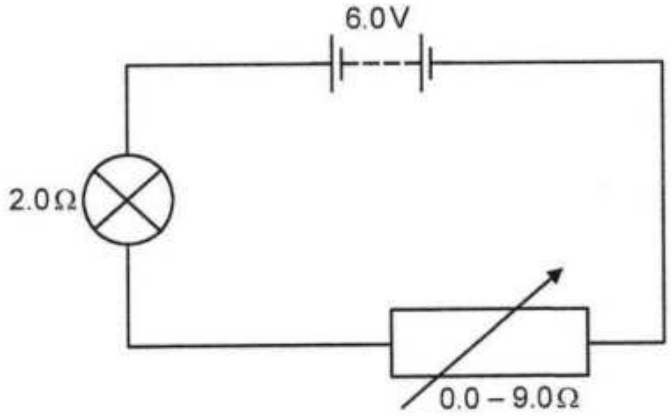
C



D



36 The diagram shows an electric circuit.



What is the smallest possible current in the lamp?

455

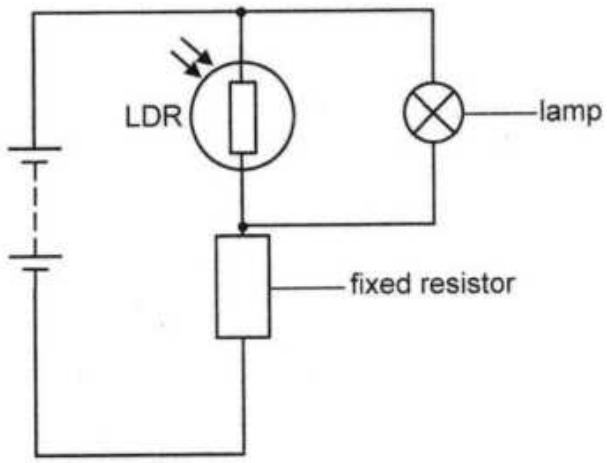
A 0.33A

B 0.55A

C 1.83A

D 3.00A

37 The diagram shows an electric circuit.



A003

What happens to the resistance of the LDR and the brightness of the lamp when the light intensity on the LDR increases?

	resistance of LDR	lamp
A	decreases	becomes bright
B	decreases	becomes dim
C	increases	becomes bright
D	increases	becomes dim

38 A Geiger-Muller tube detects background radiation of 18 counts / second.

The detector is placed 50 cm from a radioactive source.

The table shows the activity when different materials are placed between the source and the detector.

material	activity / counts/s
no material	1800
paper	1800
8 mm aluminium	1200
thick lead	25

Which radiations are emitted by the source?

455

A alpha and beta

B beta only

C beta and gamma

D gamma only

39 Which nuclear reaction is possible?

A $^{243}_{95}Z \rightarrow {}^{243}_{96}Y + \beta$

B $^{243}_{95}Z \rightarrow {}^{243}_{94}Y + \beta$

C $^{243}_{95}Z \rightarrow {}^{247}_{97}Y + \alpha$

A003

D $^{243}_{95}Z \rightarrow {}^{243}_{95}Y + \alpha$

40 Iodine–131 decays from 2 000 counts / second to 125 counts / second in 32 days.

What is the half-life of iodine–131?

A 4 days

B 8 days

C 16 days

D 32 days