BOTSWANA EXAMINATIONS COUNCIL
Botswana General Certificate of Secondary Education

PHYSICS **0571/01**

Paper 1 Multiple Choice **October/November 2022**

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 on 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).

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A002

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

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1 A metre rule marked to the nearest 1 mm is used to measure length.

Which measurement can be accurately obtained using the metre rule?

A 0.3 m

B 0.34 m

C 0.343 m

D 0.3432 m

2 A car travels at a constant speed and the engine provides 24 kW of useful power. The driving force on the car is 600 N.

What is the speed of the car?

A 2.5 m/s

B 4.0 m/s

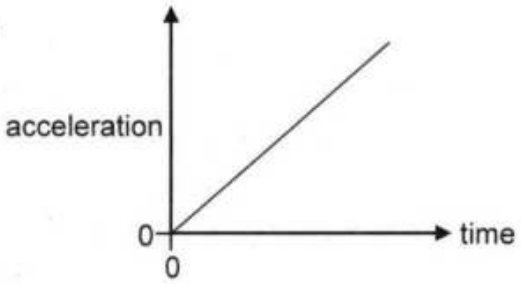
C 25 m/s

D 40 m/s

3 A stone falls freely from the top of a building.

Which graph shows the acceleration-time graph of the stone? Ignore air resistance.

A



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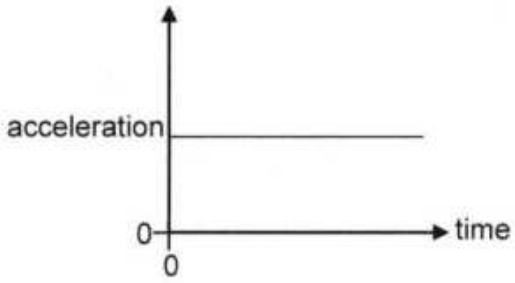

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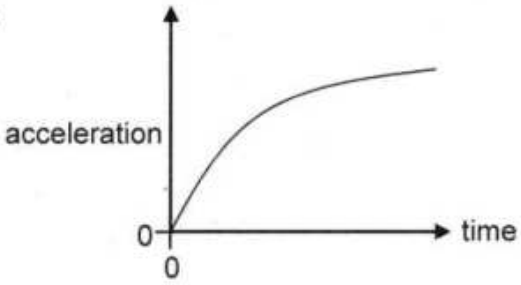

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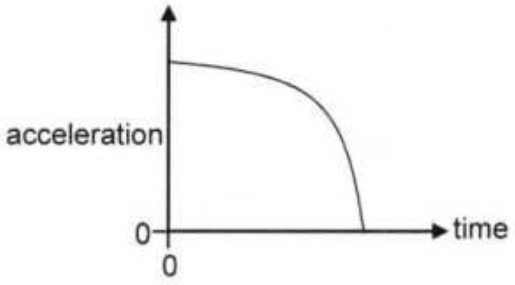

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4 A wooden block is pulled across a floor at a constant speed.
There is a frictional force between the block and the floor.

Which statement is correct about the frictional force?

A It decreases as the block moves.

B It increases as the block moves.

C It is equal to the pulling force.

D It is less than the pulling force.

5 What is the name of the force that keeps objects moving in a circular path?

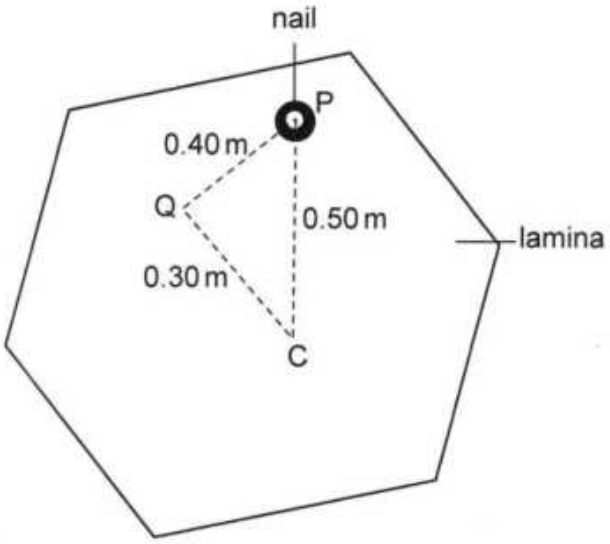
A centripetal

B couple

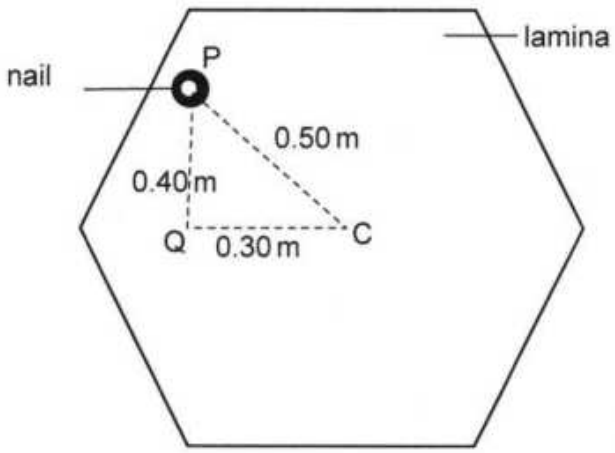
C friction

D gravitational

6 Diagram W shows a flat lamina suspended freely from a nail at point P.
The centre of mass of the lamina is at point C.
The lamina weighs 2.0 N.
Diagram X shows the same lamina rotated to the right until point Q is vertically below point P.
The diagram is not drawn to scale.



W



X

What is the moment that causes the lamina in diagram X to return to the position in diagram W?

A 0.60 Nm clockwise

B 0.80 Nm anticlockwise

C 1.0 Nm clockwise

D 1.0 Nm anticlockwise

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7 The acceleration due to gravity on a planet is $6.8\,m/s^2$.
An object of mass 5.0 kg is released from a height of 5.0 m.

What is the speed of the object when it hits the ground?

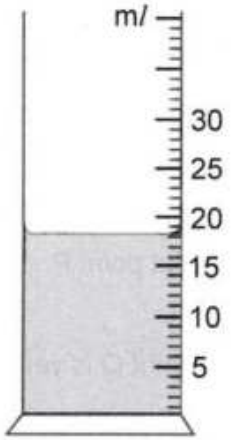
A 3.7 m/s

B 8.2 m/s

C 9.9 m/s

D 13.5 m/s

8 The diagram shows a liquid in a measuring cylinder. The mass of the liquid is 24 g.



What is the density of the liquid?

A $0.75\,g/cm^3$

B $0.79\,g/cm^3$

C $1.26\,g/cm^3$

D $1.33\,g/cm^3$

9 A student is investigating the evaporation of water from a beaker.

The student can change:

1. the depth of the water,
2. the surface area of the water,
3. the temperature of the water.

Which changes would have an effect on the rate of evaporation?

A 1, 2

B 1, 3

C 2, 3

D 1, 2, 3

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10 Pollen grains are suspended in a liquid and a bright light is shone on them.
When observed under a microscope, the pollen grains are seen to be in continuous random motion.

What is the reason for this observation?

A convection currents in the liquid

B molecules of the liquid are colliding with the pollen grains

C pollen grains are colliding with each other

D pollen grains are floating in water

11 The diagram shows a thermometer that has no scale.

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Where must the bulb be placed so that 100 °C can be marked?

A in the freezer

B in boiling tap water

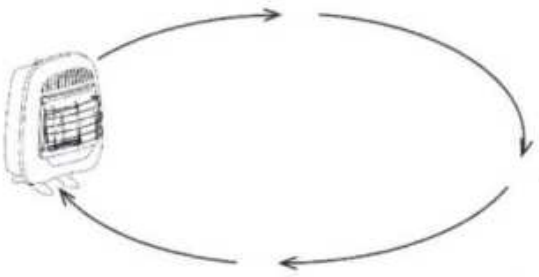
C in melting ice

D in steam over boiling water

12 A heater is placed in a room.

Which diagram shows the movement of air as the room is heated?

A



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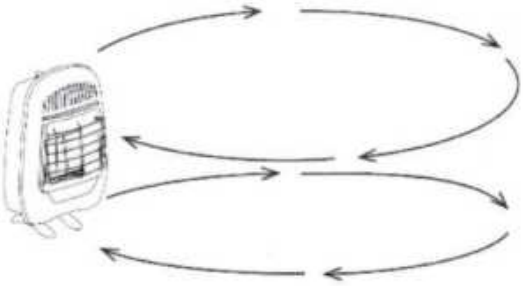

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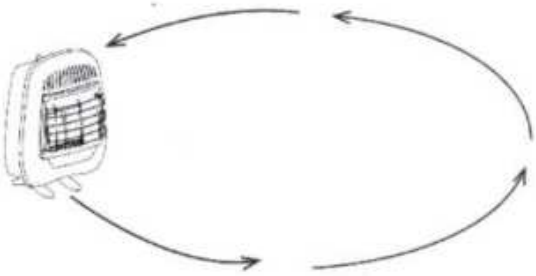
C



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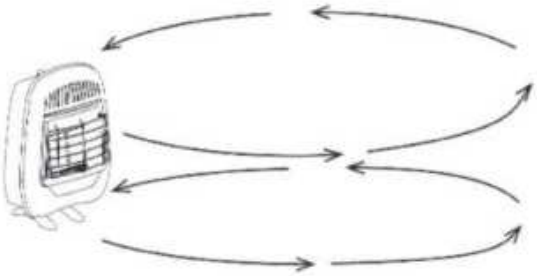

13 A vacuum flask contains 150 g of water at 10 °C.
The specific heat capacity of water is 4200 J/kg °C.
The latent heat of fusion of water is 3.4×10^5 J/kg.

What mass of ice at 0 °C must be added to the flask to change the temperature of the water to 0 °C?

A 1.9 g

B 19 g

C 1.9 kg

D 19 kg

14 Four cylinders made of different materials are supplied with the same quantity of thermal energy.

Which cylinder has the greatest heat capacity?

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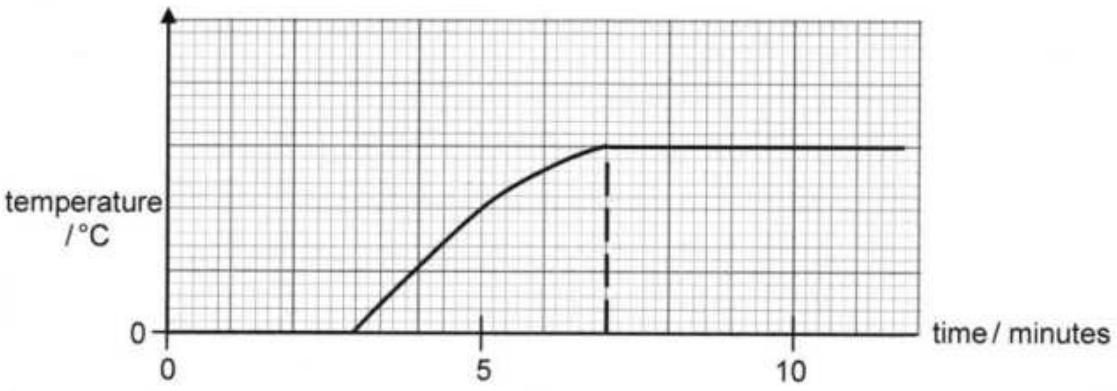
	mass / kg	temperature rise / °C
A	1	4
B	2	8
C	3	2
D	4	6

15 A block of ice is heated at a constant rate until it melts. The water is allowed to boil.

The graph shows how the temperature changes with time.

A002



How many minutes does it take for all the ice to melt?

A 3 minutes

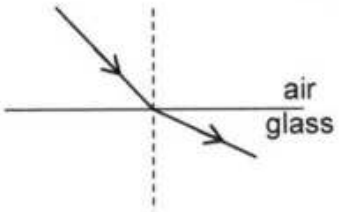
B 4 minutes

C 7 minutes

D 10 minutes

16 Which diagram shows the correct path of light travelling from air to glass?

A



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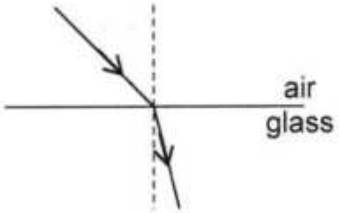

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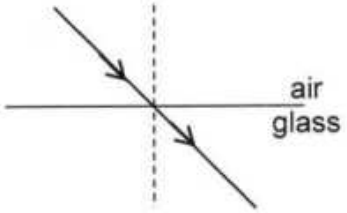

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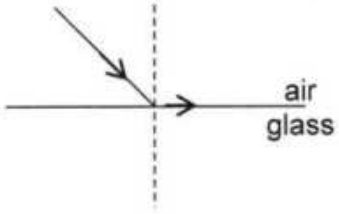

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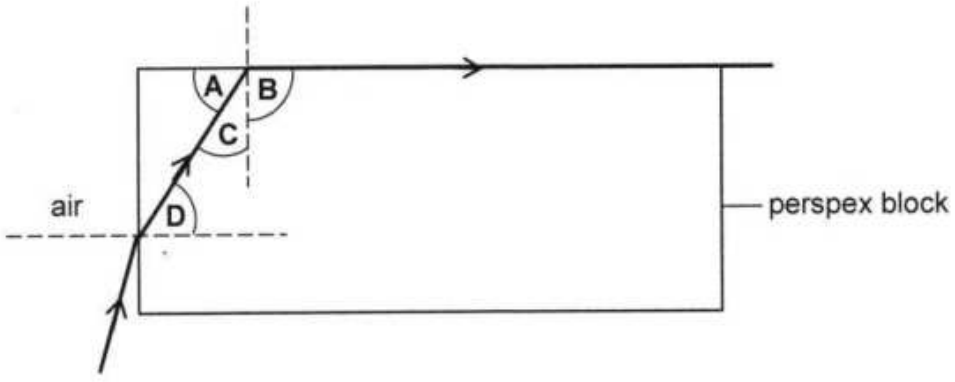
17 Which row shows the change in frequency and speed when moving from infra-red to ultra violet in the electromagnetic spectrum?

	frequency	speed
A	decreases	decreases
B	decreases	remains constant
C	increases	remains constant
D	increases	increases

18 The diagram shows the path of a ray of light.

Which angle is the critical angle for the ray of light?

A002



19 What is the approximate range of audible frequencies for humans?

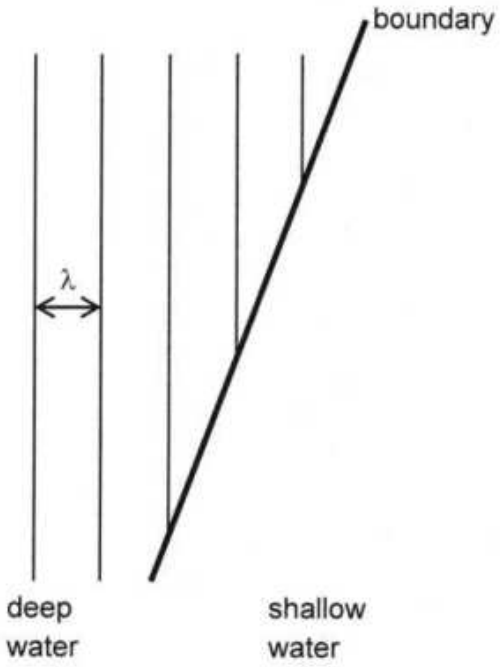
A 10 Hz to 10000 Hz

B 20 Hz to 20000 Hz

C 10 kHz to 10000 kHz

D 20 kHz to 20000 kHz

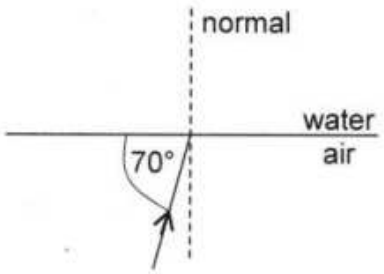
20 The diagram shows wave fronts travelling from deep to shallow water.



Which row correctly describes what happens to the waves after crossing the boundary?

	speed of waves	wavelength
A	faster	shorter
B	slower	shorter
C	the same	longer
D	the same	the same

21 The diagram shows a ray of light incident to an air/water boundary at an angle of 70° to the boundary. The refractive index of water is 1.5. The diagram is not drawn to scale.



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

A 13°

B 20°

C 30°

D 39°

22 A filament bulb is labelled 240 V, 60 W.

What is the resistance of the bulb?

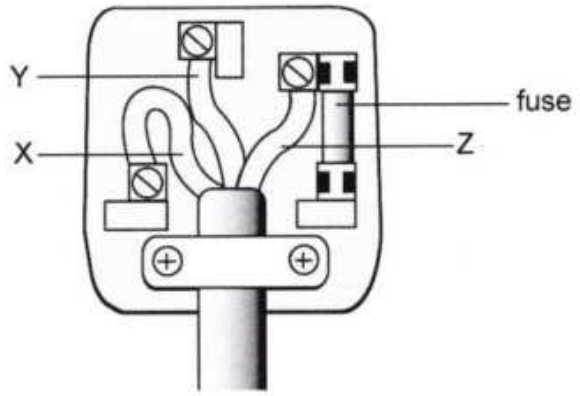
A 4 Ω

B 60 Ω

C 960 Ω

D 14400 Ω

23 The diagram shows a connection of the three pin plug of an appliance.



Which wires carry electric current when the appliance is operating normally?

A X and Y

B X and Z

C Y and Z

D X, Y and Z

24 Which component does a relay operate like in a circuit?

A electric motor

B electric switch

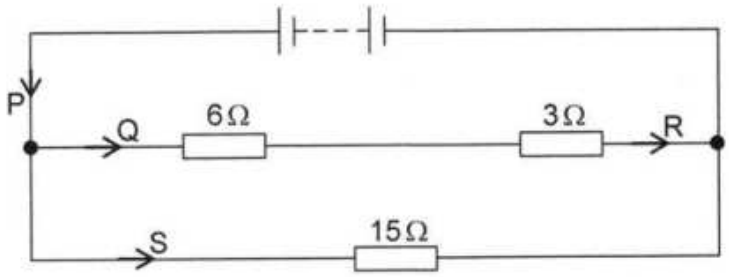
C generator

D transformer

25 Which row consists of a magnetic material, non-magnetic material and a magnet under the correct heading?

	magnetic material	non-magnetic material	magnet
A	cobalt	copper	compass needle
B	iron	nickel	compass needle
C	cobalt	copper	steel
D	iron	nickel	steel

26 The circuit diagram shows an arrangement of resistors.
P, Q, R and S represent the current at the points shown.



Which statement is correct?

A current P equals sum of current Q and current S

B current Q is less than current R

C current R equals current S

D current S is greater than current P

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27 Which particles flow in an electrical conductor to give current?

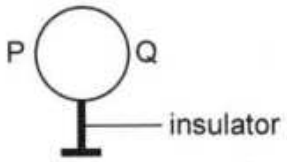
A atoms

B electrons

C neutrons

D protons

28 The diagram shows a metal sphere supported by an insulator.



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Some of the steps done to charge the sphere by induction are listed:

1. a positively charged rod is brought close to P
2. the rod is removed
3. the sphere is touched with a finger at side Q
4. a negatively charged rod is brought close to P

What is the correct order of the steps that must be performed to have the sphere positively charged?

A 1, 2, 3

B 1, 3, 2

C 4, 2, 3

D 4, 3, 2

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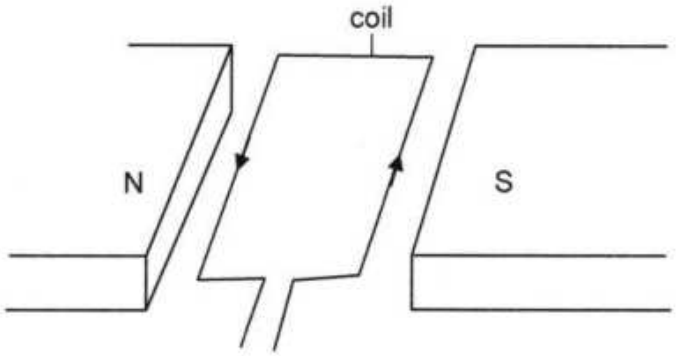
29 The diagram shows a rectangular coil placed between the poles of a magnet.
A current passes through the coil. The arrows show the direction of the current in the coil.



What happens to the coil?

A moves downwards

B moves upwards

C rotates anticlockwise

D rotates clockwise

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30 Which appliance uses more energy when operated from the mains supply?

A 100 W lamp used for 1 day

B 500 W electric iron used for 1 hour

C 1000 W electric fire used for 10 minutes

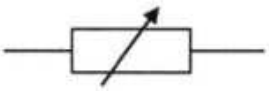
D 5000 W cooker used for 1 minute

31 Which symbol is for a fuse?

A002

A

B



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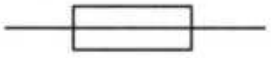

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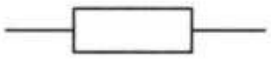

32 What is the reason for **not** using steel as a core of the electromagnet?

A It forms a permanent magnet.

B It has a high resistance.

C It heats up easily.

D It is a good conductor of electricity.

33 An electric oven uses 5 kW of power when connected to a 240 V mains.

Which fuse rating is the most suitable for use in this circuit?

A 5 A

B 13 A

C 30 A

D 50 A

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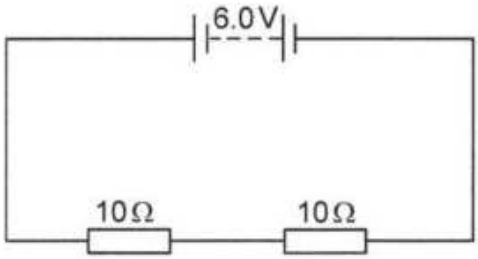
34 The diagram shows a 6.0 V battery connected in series with two 10 Ω resistors.



What charge flows through each resistor in 1 minute?

A 0.3 C

B 0.6 C

C 18 C

D 36 C

A002

35 A bicycle is fitted with an electric motor. The motor is switched on for 3.0 minutes. The motor draws a current of 3.5 A from a 24 V battery.

What is the energy supplied by the battery?

A 84 J

B 250 J

C 630 J

D 15000 J

36 A transformer steps down 240 V to 12 V.
There are 600 turns on the primary coil of the transformer.

How many turns are on the secondary coil?

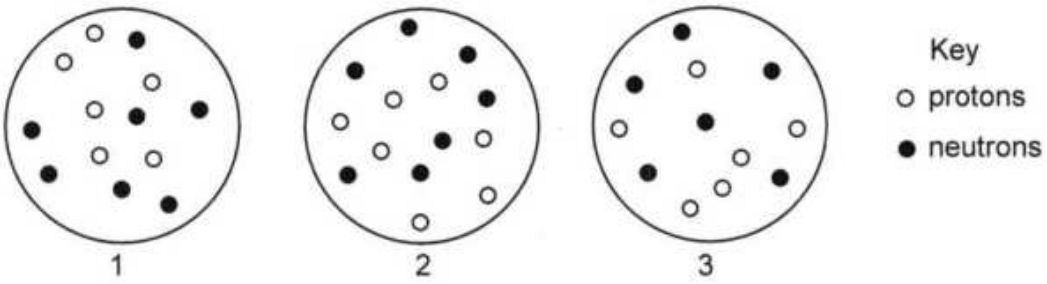
A 20 turns

B 30 turns

C 50 turns

D 12000 turns

37 The diagrams represent different nuclei.



Which diagrams show isotopes of the same element?

A 1, 2

B 1, 3

C 2, 3

D 1, 2, 3

38 The table shows some of the properties of radioactive elements.

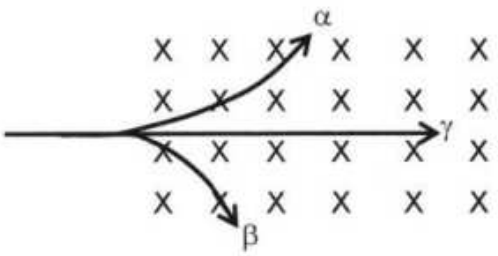
radioactive substance	emissions	half-life
P	α – particles	3.82 days
Q	γ – rays and β – particles	8.04 days
R	α – particles and γ – rays	1600 years
S	β – particles	5700 years

Which radioactive element is most suitable to be used as a tracer in medicine and which element is most suitable for dating old substances?

	tracer	dating
A	P	R
B	Q	S
C	R	Q
D	S	P

39 Which diagram shows the likely paths of radioactive emissions in a magnetic field?

A



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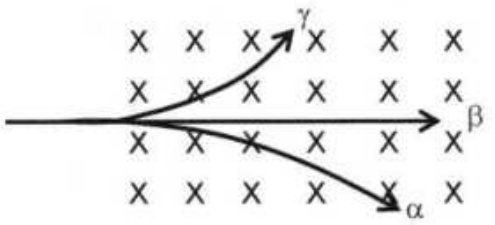

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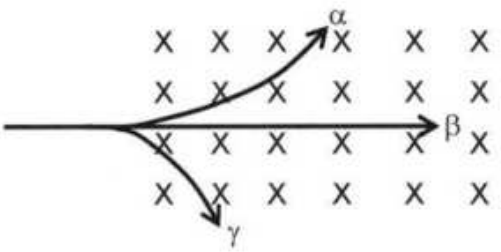

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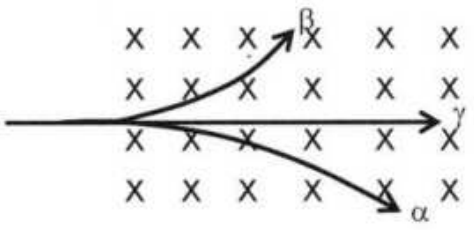

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40 The nuclear equation for a fission reaction is shown below:

$$^{235}_{92}U + {}^{1}_{0}n \rightarrow {}^{93}_{X}Rb + {}^{141}_{55}Cs + Y\ {}^{1}_{0}n$$

What are the values of X and Y?

	X	Y
A	37	1
B	37	2
C	35	1
D	35	2

A002