



Cambridge O Level

PHYSICS

5054/12

Paper 1 Multiple Choice

October/November 2024

1 hour

You must answer on the multiple choice answer sheet.



You will need: Multiple choice answer sheet

Soft clean eraser

Soft pencil (type B or HB is recommended)

INSTRUCTIONS

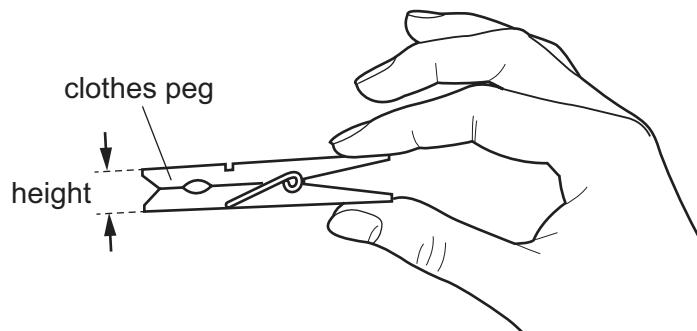
- There are **forty** questions on this paper. Answer **all** questions.
- For each question there are four possible answers **A**, **B**, **C** and **D**. Choose the **one** you consider correct and record your choice in soft pencil on the multiple choice answer sheet.
- Follow the instructions on the multiple choice answer sheet.
- Write in soft pencil.
- Write your name, centre number and candidate number on the multiple choice answer sheet in the spaces provided unless this has been done for you.
- Do **not** use correction fluid.
- Do **not** write on any bar codes.
- You may use a calculator.
- Take the weight of 1.0 kg to be 9.8 N (acceleration of free fall = 9.8 m/s^2).

INFORMATION

- The total mark for this paper is 40.
- Each correct answer will score one mark.
- Any rough working should be done on this question paper.

This document has **16** pages. Any blank pages are indicated.

1 The diagram shows a clothes peg.



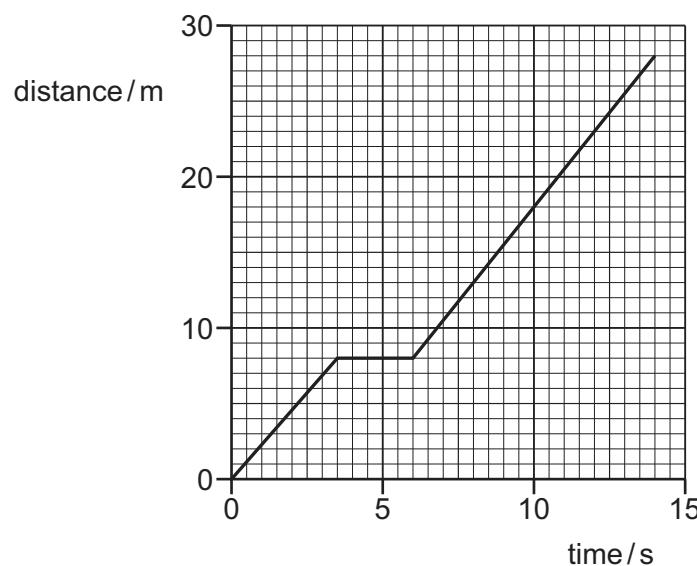
Which device is suitable for obtaining an accurate value for the height of the clothes peg?

- A a tape
- B a metre rule
- C a micrometer
- D a measuring cylinder

2 Which set of quantities are all vectors?

- A acceleration, displacement, velocity
- B chemical energy, mass, power
- C extension, force, gravitational potential energy
- D weight, kinetic energy, work

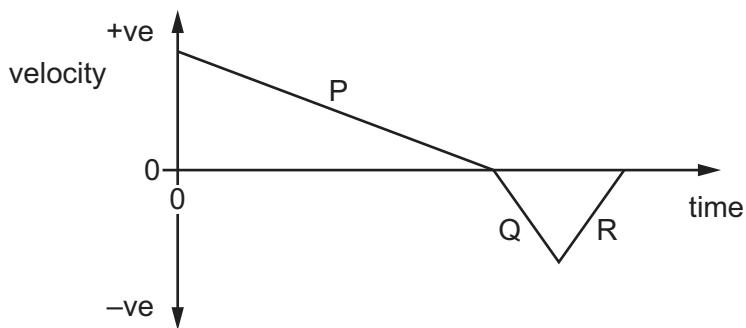
3 The graph shows the motion of a cyclist during a ride that lasts for 14 s.



What is the average speed of the cyclist for the ride?

- A 2.0 m/s
- B 2.3 m/s
- C 2.4 m/s
- D 2.5 m/s

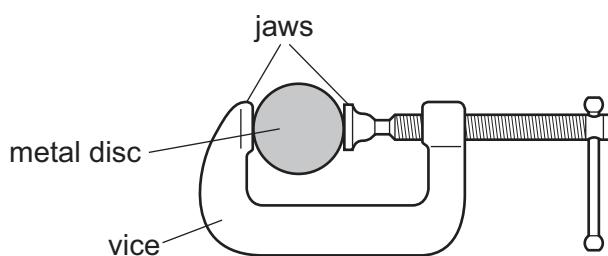
4 The diagram shows how the velocity of a train varies with time.



Which sections of the graph show where the magnitude of the velocity of the train is decreasing?

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

5 A metal disc is squeezed in the jaws of a vice.



Which property of the metal disc is unchanged when it is squeezed?

A mass
B radius
C distance between its atoms
D forces between its atoms

6 The gravitational field strength in space is smaller than on the Earth's surface.

How are the mass and the weight of a satellite affected as the satellite moves away from the surface of the Earth and into space?

A Both the mass and the weight are unaffected.
B The mass decreases and the weight decreases.
C The mass increases and the weight is unaffected.
D The mass is unaffected and the weight decreases.

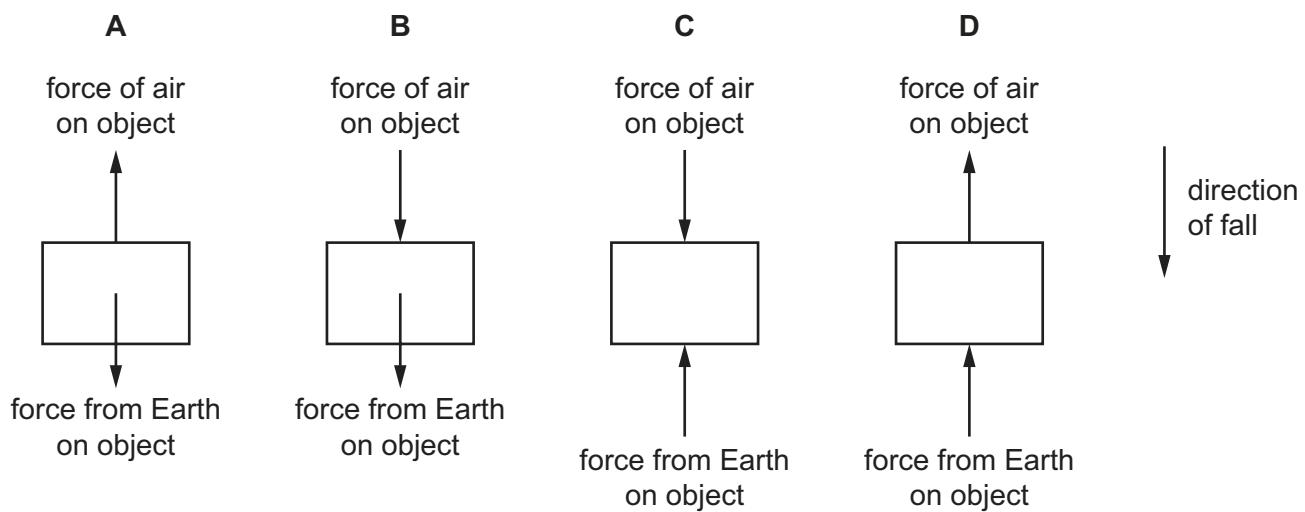
7 A material has a density of 2.4 g/cm^3 .

What is the density in kg/m^3 ?

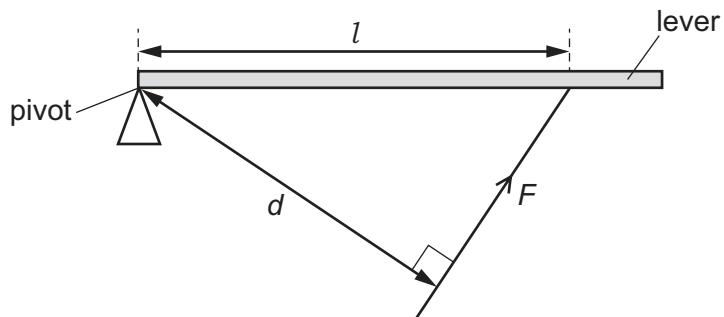
A 0.0024 kg/m^3
 B 0.24 kg/m^3
 C 24 kg/m^3
 D 2400 kg/m^3

8 An object falls vertically through the air.

Which diagram represents the forces acting on the object?



9 A force F is applied to a lever at distance l from the pivot as shown.



Length d is the perpendicular distance between the force and the pivot.

Which expression is the moment of force F about the pivot?

A $\frac{F}{d}$ B $\frac{F}{l}$ C $F \times d$ D $F \times l$

10 A rocket is launched vertically upwards by a constant force from its engines.

The data for the launch is shown.

| | |
|------------------------|---------|
| weight of rocket | 1.9 MN |
| average air resistance | 0.10 MN |
| force from engine | 3.5 MN |

How much of the work done on the rocket is used to increase its speed in the first 100 m?

A 150 MJ B 170 MJ C 350 MJ D 550 MJ

11 Which equation is used to calculate the efficiency of an energy transfer?

A efficiency = $\frac{\text{useful energy output}}{\text{total energy input}}$

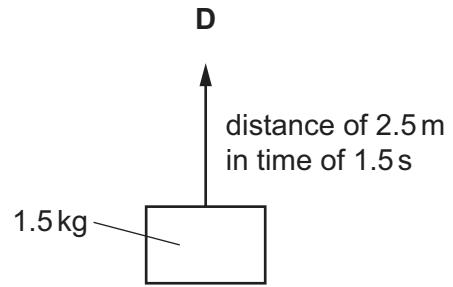
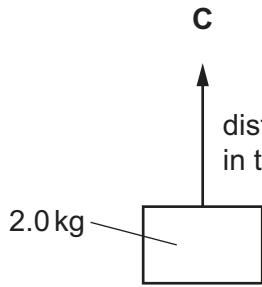
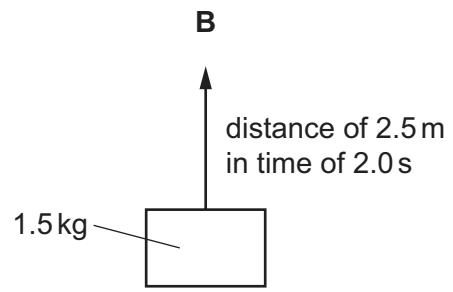
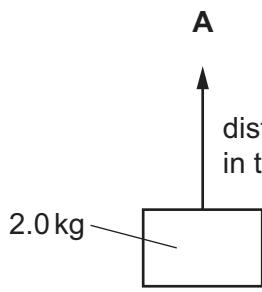
B efficiency = $\frac{\text{total energy input}}{\text{useful energy output}}$

C efficiency = $\frac{\text{total energy output}}{\text{total power input}}$

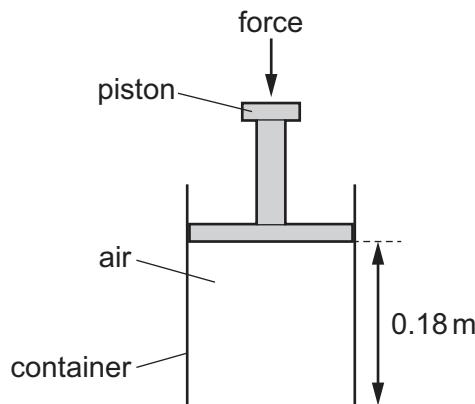
D efficiency = (useful energy output) \times (total energy input)

12 Four objects of different masses are lifted through different distances in different amounts of time.

In which combination of mass, distance and time is the greatest power transferred?



13 Air at a pressure of $1.0 \times 10^5 \text{ N/m}^2$ is trapped in a container by a piston.

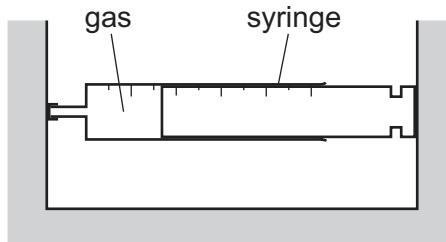


A force is applied to move the piston down into the container. The temperature of the air remains constant. The distance between the base of the container and the piston decreases from 0.18 m to 0.15 m.

What is the new air pressure inside the container?

- A $0.69 \times 10^5 \text{ N/m}^2$
- B $0.83 \times 10^5 \text{ N/m}^2$
- C $1.2 \times 10^5 \text{ N/m}^2$
- D $1.4 \times 10^5 \text{ N/m}^2$

14 A sealed gas syringe contains a gas that is kept at constant volume.



Which row describes how a change in the temperature of the gas affects its pressure?

| | temperature | pressure of gas |
|---|-------------|-----------------|
| A | decreases | increases |
| B | decreases | unchanged |
| C | increases | increases |
| D | increases | unchanged |

15 The melting temperature of gold is 1064 °C.

What is the melting temperature of gold on the Kelvin scale?

A 791 K B 964 K C 1164 K D 1337 K

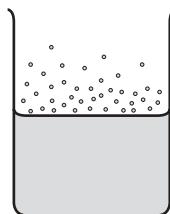
16 The table shows the melting and boiling temperatures of three elements.

| element | melting temperature / °C | boiling temperature / °C |
|----------|--------------------------|--------------------------|
| argon | –189 | –185 |
| nitrogen | –210 | –196 |
| oxygen | –218 | –183 |

At which temperature are the three elements in different states?

A –220 °C B –205 °C C –190 °C D –175 °C

17 The diagram shows a liquid at room temperature in a beaker.



What reduces the rate of loss of liquid by evaporation?

A blowing air across the top of the beaker
 B heating the liquid
 C putting a lid on the beaker
 D transferring the liquid to a beaker with a larger diameter

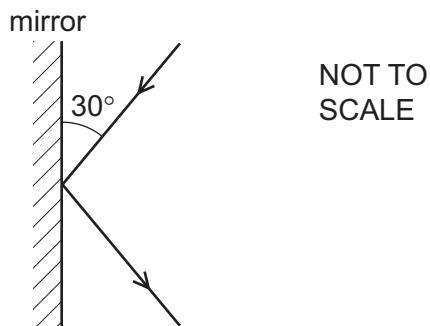
18 What is the colour and what is the texture of the best absorber of infrared radiation?

A black and shiny
 B black and dull
 C white and shiny
 D white and dull

19 Which row gives the velocity and wavelength of a wave that is an ultrasound wave?

| | velocity m/s | wavelength /cm |
|---|-----------------|-------------------|
| A | 330 | 6.6 |
| B | 890 | 89 |
| C | 1500 | 6.0 |
| D | 4000 | 25 |

20 The diagram shows a ray of light incident on a plane mirror.

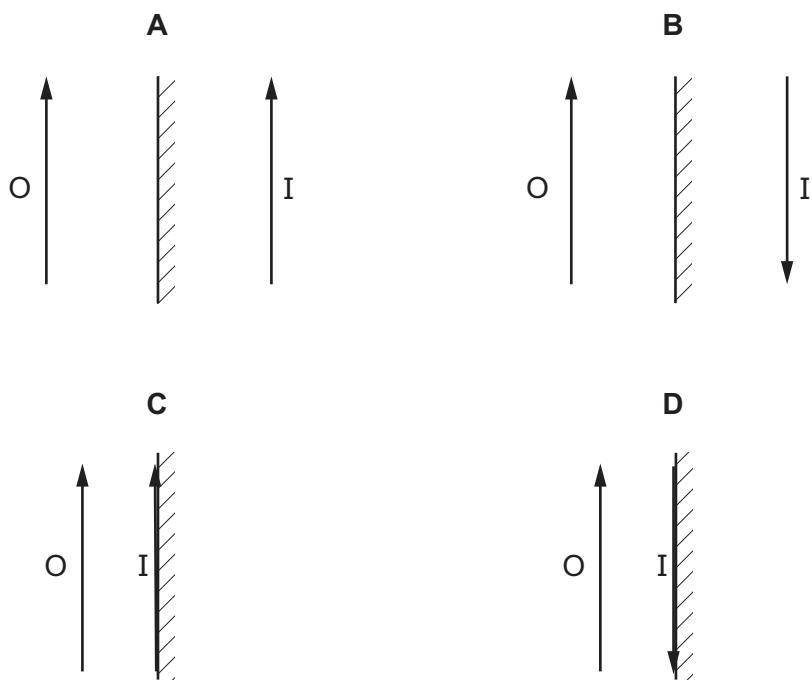


What is the angle of reflection?

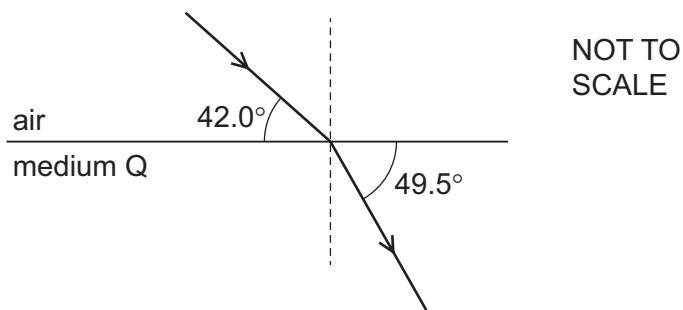
A 30° B 60° C 90° D 120°

21 An object O is placed in front of a plane mirror.

Which diagram shows the image I formed by the mirror?



22 The diagram shows a ray of light travelling from air to medium Q.



What is the critical angle for the boundary between medium Q and air?

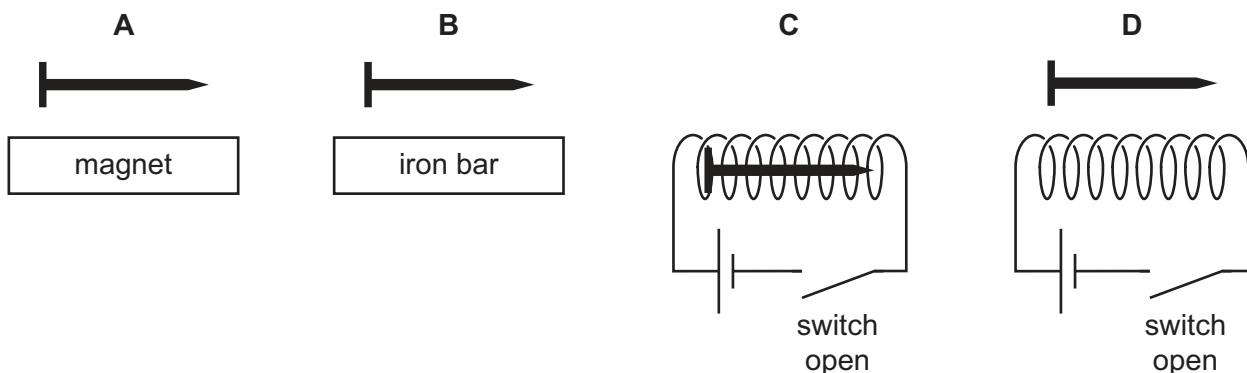
A 57.5° B 58.0° C 60.9° D 61.6°

23 Which two waves are components of the electromagnetic spectrum?

A light and sound
 B ultrasound and ultraviolet
 C water waves and infrared
 D X-rays and microwaves

24 The diagrams show an iron nail in four different situations.

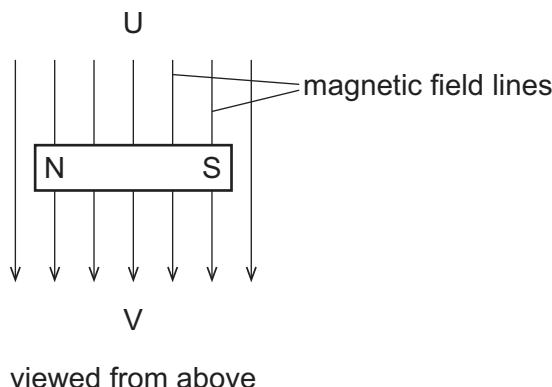
In which diagram is the nail an induced magnet?



25 Which row correctly shows a magnetic metal and a non-magnetic metal?

| | magnetic metal | non-magnetic metal |
|---|----------------|--------------------|
| A | aluminium | copper |
| B | copper | steel |
| C | iron | copper |
| D | steel | iron |

26 A freely suspended magnet is held perpendicular to a uniform magnetic field as shown. The magnet is viewed from above.



What happens to the magnet when it is released?

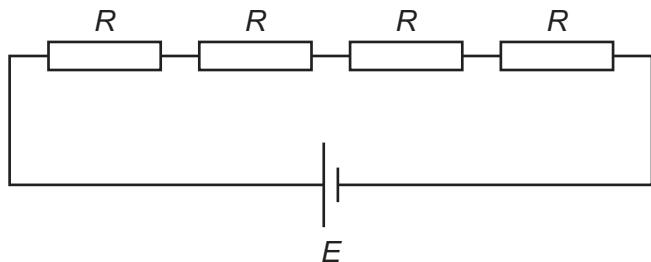
- A It turns through 90° clockwise and then stops moving.
- B It turns through 90° anticlockwise and then stops moving.
- C It turns through 90° clockwise and moves towards U.
- D It turns through 90° anticlockwise and moves towards V.

27 A plastic rod becomes charged when it is rubbed with a cloth.

Which statement gives the reason for the charge on the rod?

- A The plastic rod loses protons and becomes negatively charged.
- B The plastic rod loses electrons and becomes negatively charged.
- C The plastic rod gains protons and becomes positively charged.
- D The plastic rod loses electrons and becomes positively charged.

28 Four resistors, each of resistance R , are connected in series with a cell of e.m.f. E .



From left to right, what is the current in each of the resistors?

A $\frac{E}{4R}$ $\frac{E}{4R}$ $\frac{E}{4R}$ $\frac{E}{4R}$

B $\frac{E}{4R}$ $\frac{E}{3R}$ $\frac{E}{2R}$ $\frac{E}{R}$

C $\frac{E}{R}$ $\frac{E}{2R}$ $\frac{E}{3R}$ $\frac{E}{4R}$

D $\frac{E}{R}$ $\frac{E}{R}$ $\frac{E}{R}$ $\frac{E}{R}$

29 How can one volt also be expressed?

A one coulomb per ampere

B one coulomb per joule

C one joule per ampere

D one joule per coulomb

30 X is a piece of wire with length l , area a and resistance R .

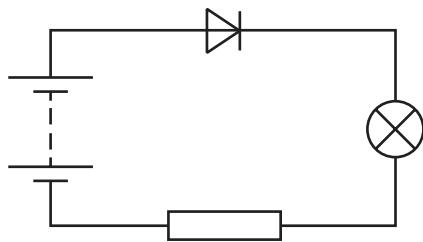
Wire Y is made from the same material and is connected to wire X to produce a component with a total resistance of $\frac{R}{2}$.

What are the dimensions of Y and how is it connected to X?

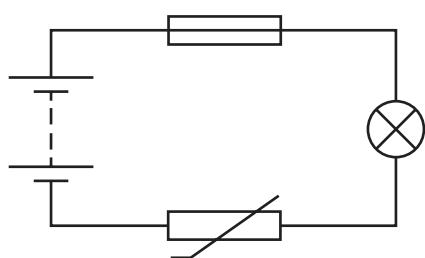
| | length | area | connection |
|---|--------|---------|-------------|
| A | $2l$ | $0.25a$ | in parallel |
| B | $2l$ | $0.25a$ | in series |
| C | $4l$ | $4a$ | in parallel |
| D | $4l$ | $4a$ | in series |

31 Which circuit contains a fuse and a diode?

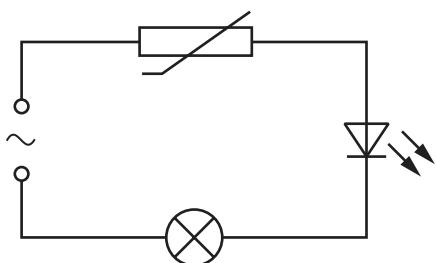
A



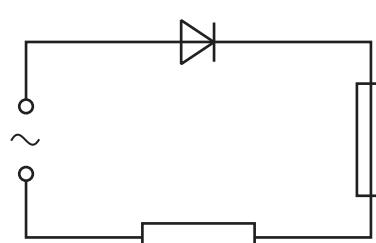
B



C



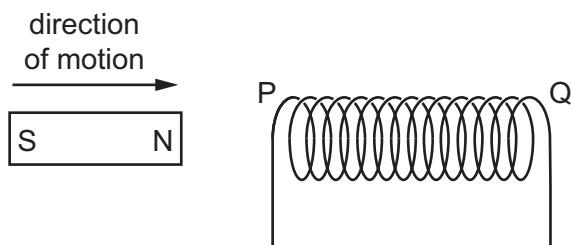
D



32 How is energy transferred within a kettle that is powered by the mains supply?

- A by electrical work done to chemical energy
- B by electrical work done to thermal energy
- C by mechanical work done to chemical energy
- D by mechanical work done to thermal energy

33 A magnet moves through a coil of wire as shown.

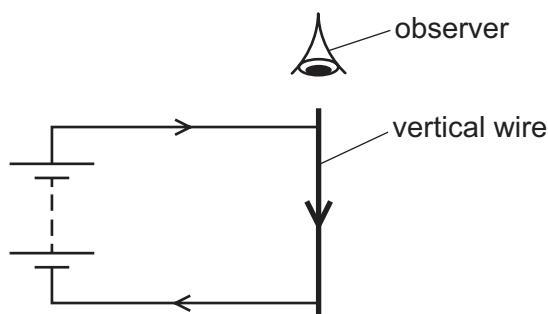


Magnetic poles are produced at the two ends of the coil as the magnet enters and as the magnet leaves the coil.

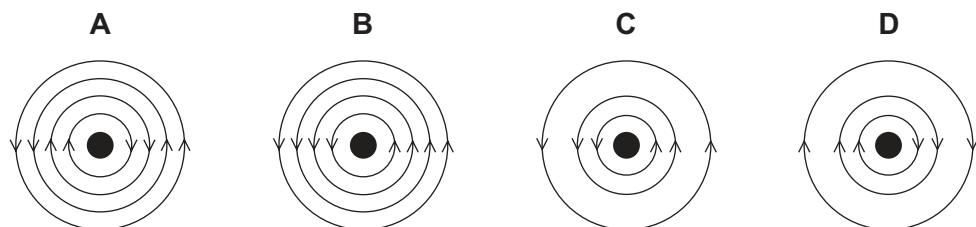
Which pole is induced at P when the magnet enters the coil and which pole is induced at Q when the magnet leaves the coil?

| | pole at P when magnet enters the coil | pole at Q when magnet leaves the coil |
|----------|---|---|
| A | N | N |
| B | N | S |
| C | S | N |
| D | S | S |

34 A straight vertical wire carries a current in the direction shown.



What is the pattern of the magnetic field around the wire seen by an observer viewing the wire from the position shown?



35 Which part of a simple d.c. motor reverses the direction of current in the coil once every half rotation of the coil?

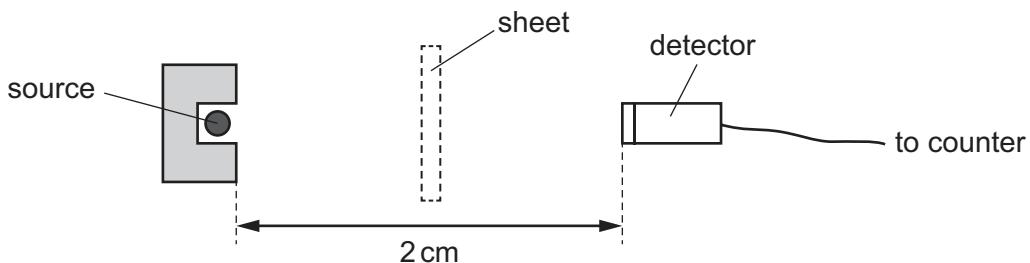
- A the armature
- B the brushes
- C the slip rings
- D the split-ring commutator

36 Which statement about the nuclide notation ${}^R_Z X$ is correct?

- A R is the nucleon number which is different for different isotopes of X.
- B R is the proton number which is the same for different isotopes of X.
- C Z is the nucleon number which is the same for different isotopes of X.
- D Z is the proton number which is different for different isotopes of X.

37 During a radioactivity experiment, the background reading is 28 counts per minute.

A radioactive source is placed 2 cm in front of a detector which is connected to a counter.



Counter readings are taken with and without sheets of different materials placed between the source and the detector.

| type of sheet | reading / counts per minute |
|----------------------|-----------------------------|
| no sheet | 750 |
| thin card | 750 |
| 5 mm thick aluminium | 478 |

Which types of radiation are being emitted by the source?

- A alpha particles, beta particles and gamma rays
- B alpha particles and beta particles only
- C alpha particles and gamma rays only
- D beta particles and gamma rays only

38 A radioactive isotope is injected into a patient as part of a medical test. The radiation emitted is detected outside the body.

What are suitable properties for this isotope?

| | radiation type | half-life |
|----------|-----------------|-------------|
| A | alpha particles | a few hours |
| B | beta particles | a few years |
| C | gamma rays | a few hours |
| D | gamma rays | a few years |

39 A student writes four statements about the Solar System.

- 1 Light takes approximately 3.0×10^8 seconds to travel from the Sun to the Earth.
- 2 The Earth takes approximately 24 hours to rotate on its axis once.
- 3 The Moon takes approximately 1 month to orbit the Earth.
- 4 The Sun takes approximately 365 days to orbit the Earth.

Which statements are correct?

A 1 and 2 **B** 2, 3 and 4 **C** 2 and 3 only **D** 3 and 4 only

40 What is **never** formed by the explosion of a red supergiant?

A a black hole
B a neutron star
C a white dwarf
D new heavier elements

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