Cambridge Assessment International Education

Cambridge O Level

PHYSICS **5054/12**

Paper 1 Multiple Choice **May/June 2025**

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.

1 Which list contains **only** vector quantities?

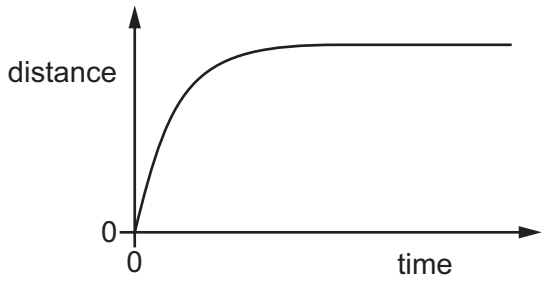
A mass, distance, weight

B momentum, gravitational field strength, displacement

C energy, force, velocity

D acceleration, time, speed

2 The diagram shows the distance–time graph for a moving object.



What is a description of the moving object?

A a ball thrown vertically upwards and falling back to the thrower

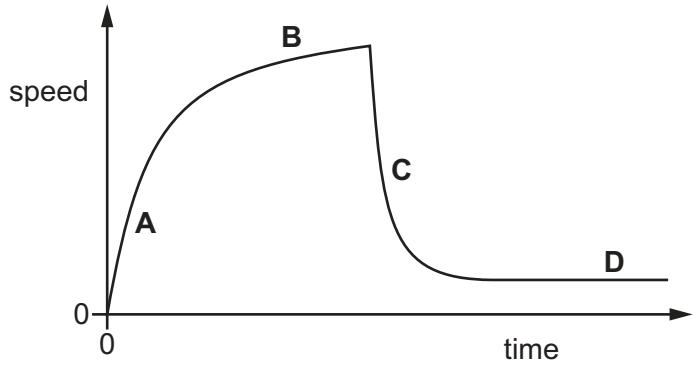
B a car starting from rest and speeding up as it moves away from a traffic signal

C a rock dropped from a high cliff and falling into the sea below

D a train braking to a halt as it stops at a station

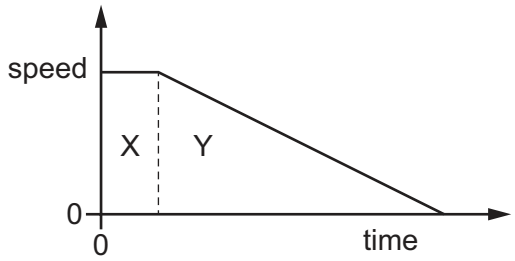
3 The speed–time graph for a falling skydiver is shown. As he falls, the skydiver spreads out his arms and legs and then opens his parachute.

Which part of the graph shows the skydiver falling with terminal velocity?



4 A car driver travelling at constant speed in a straight line sees a hazard in the road ahead at time = 0.

The speed–time graph shows how the speed of the car changes from time = 0.



Three students suggest what area X and area Y represent.

student 1 Area X represents the thinking distance.

student 2 Area Y represents the stopping distance.

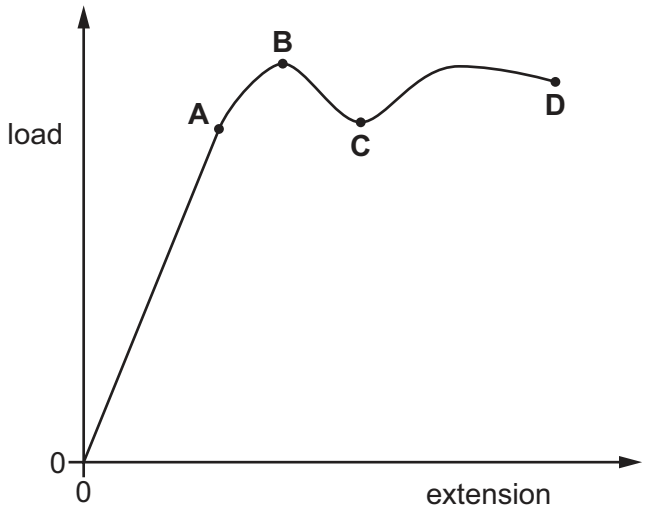
student 3 Area X + area Y represents the stopping distance.

Which students are correct?

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

5 The diagram shows a graph of load against extension for a material.

At which point is the limit of proportionality?



6 There is no atmosphere on the Moon.

Two metal spheres of identical volume but different mass are at rest at the same height above the ground on the Moon. The two spheres are dropped at the same time.

How do the spheres move after they are dropped?

A The sphere with the larger mass has a smaller acceleration.

B The sphere with the larger mass hits the ground first.

C The sphere with the smaller mass has a smaller acceleration.

D The two spheres hit the ground together.

7 A student determines the density of a small rock.

The weight of the small rock is 1.2 N.

She pours 100 cm^3 of water into a measuring cylinder.

She carefully submerges the rock in the 100 cm^3 of water. The new reading on the measuring cylinder is 147 cm^3.

What is the density of the rock?

A 0.026 N/cm^3 **B** 0.83 g/cm^3 **C** 1.8 N/cm^3 **D** 2.6 g/cm^3

8 A rock of mass 20 kg is travelling in space at a speed of 6.0 m/s.

What is its kinetic energy?

A 60 J **B** 120 J **C** 360 J **D** 720 J

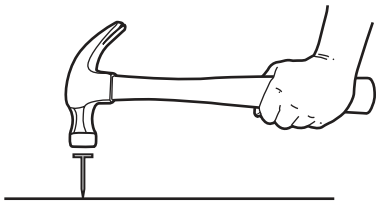
9 Which row shows an advantage and a disadvantage of using nuclear fuel to generate electrical power?

	advantage	disadvantage
A	does **not** produce carbon dioxide	produces radioactive waste
B	does **not** produce carbon dioxide	only works in some weather conditions
C	energy source is renewable	produces radioactive waste
D	energy source is renewable	only works in some weather conditions

10 Which row gives the definition of work done and the unit of work done?

	definition of work done	unit of work done
A	the energy transferred per unit time	J
B	the energy transferred per unit time	N / m
C	the force multiplied by the distance moved in the direction of the force	J
D	the force multiplied by the distance moved in the direction of the force	N / m

11 A hammer hits a nail into a piece of wood.



The weight of the nail is negligible.

The hammer exerts a force F_H and a pressure p_H on the nail.

The nail exerts a force F_W and a pressure p_w on the wood.

How do these forces and pressures compare?

	forces	pressures
A	$F_W = F_H$	$p_w > p_H$
B	$F_W = F_H$	$p_w < p_H$
C	$F_W > F_H$	$p_w > p_H$
D	$F_W > F_H$	$p_w < p_H$

12 The pressure at a point beneath the surface of a liquid varies with the depth of the point and with the density of the liquid.

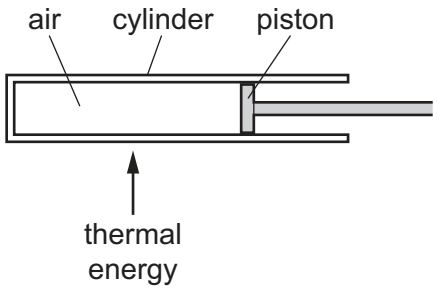
Which changes both increase the pressure beneath the surface of a liquid?

	change in depth	change in density
A	decrease	decrease
B	decrease	increase
C	increase	decrease
D	increase	increase

[Turn over

13 The diagram shows a cylinder containing air.

The piston is free to move inside the cylinder and atmospheric pressure acts outside the cylinder.



As the air inside the cylinder is heated, the piston moves to the right.

Which quantity decreases?

A the average force exerted on the piston each time that one air particle hits the piston

B the average speed of the air particles

C the mass of air inside the cylinder

D the number of collisions made by air particles with the piston in one second

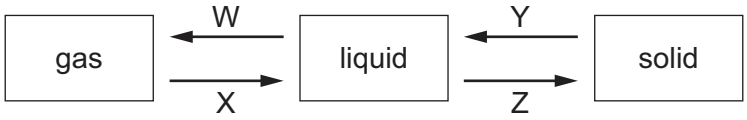
14 A fixed mass of air has a volume of 150 cm^3 and a pressure of 120 kPa.

The volume of the air is now changed to 100 cm^3. The temperature of the air remains constant.

What is the new pressure of the air?

A 80 kPa **B** 180 kPa **C** 80 000 kPa **D** 180 000 kPa

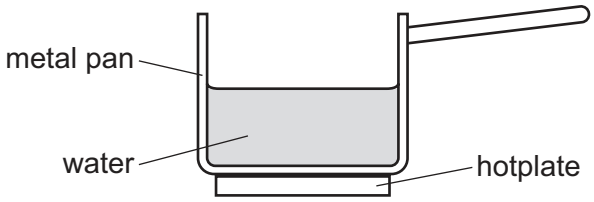
15 The diagram shows four changes of state, W, X, Y and Z.



Which row gives the names of the four changes of state?

	W	X	Y	Z
A	condensation	boiling	freezing	melting
B	condensation	boiling	melting	freezing
C	boiling	condensation	freezing	melting
D	boiling	condensation	melting	freezing

16 The diagram shows a metal pan on a hotplate.



The pan is heated by the hotplate.

How is the thermal energy transferred from the hotplate to the metal pan?

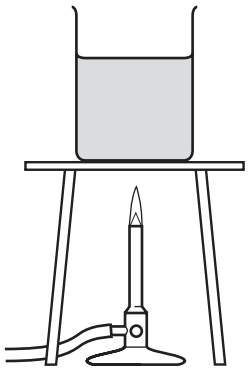
A conduction

B convection

C diffraction

D refraction

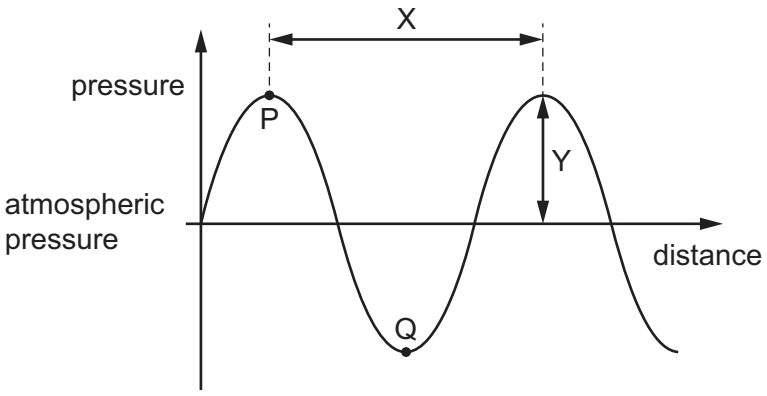
17 A beaker of cold water is heated at its base.



What happens to the heated water?

	density of heated water	movement of heated water
A	decreases	no movement
B	decreases	upwards
C	increases	no movement
D	increases	upwards

18 The graph shows, at one instant, the pressure variation along a sound wave.

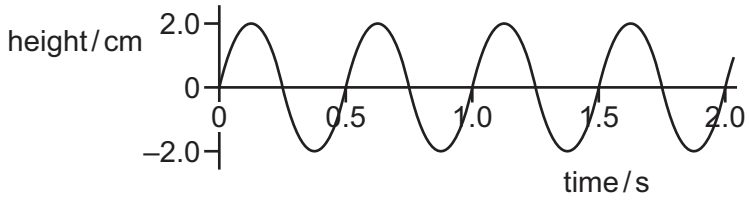


Which point on the diagram represents a rarefaction and what is the wavelength of the sound wave?

	rarefaction	wavelength
A	P	X
B	P	Y
C	Q	X
D	Q	Y

19 A cork on the surface of water moves up and down as a wave passes across the surface.

The diagram shows how the height of the cork above the average level of the surface varies with time.



The numerical value of the wavelength of this wave is equal to the numerical value of the amplitude of this wave.

What is the speed of the wave?

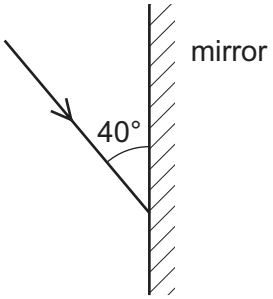
A 1.0 cm / s **B** 2.0 cm / s **C** 4.0 cm / s **D** 8.0 cm / s

20 A water wave travels from deep water to shallow water in a ripple tank.

What happens to the speed and to the wavelength of the wave?

	speed of wave	wavelength
A	increases	increases
B	increases	decreases
C	decreases	increases
D	decreases	decreases

21 The diagram shows a ray of light directed at a plane mirror.



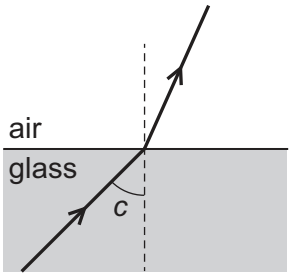
What are the angle of incidence and the angle of reflection?

	angle of incidence / °	angle of reflection / °
A	40	40
B	40	50
C	50	40
D	50	50

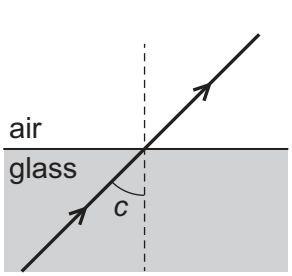
22 A ray of light in glass is incident on the surface at an angle *c*. The angle *c* is the critical angle.

Which diagram shows what happens to the light?

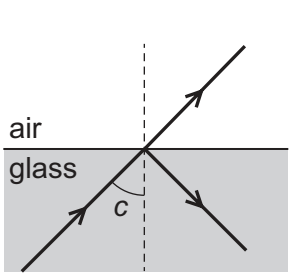
A



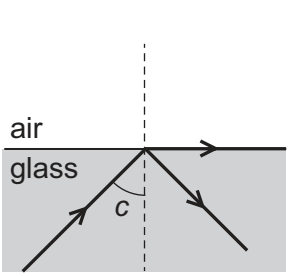
B



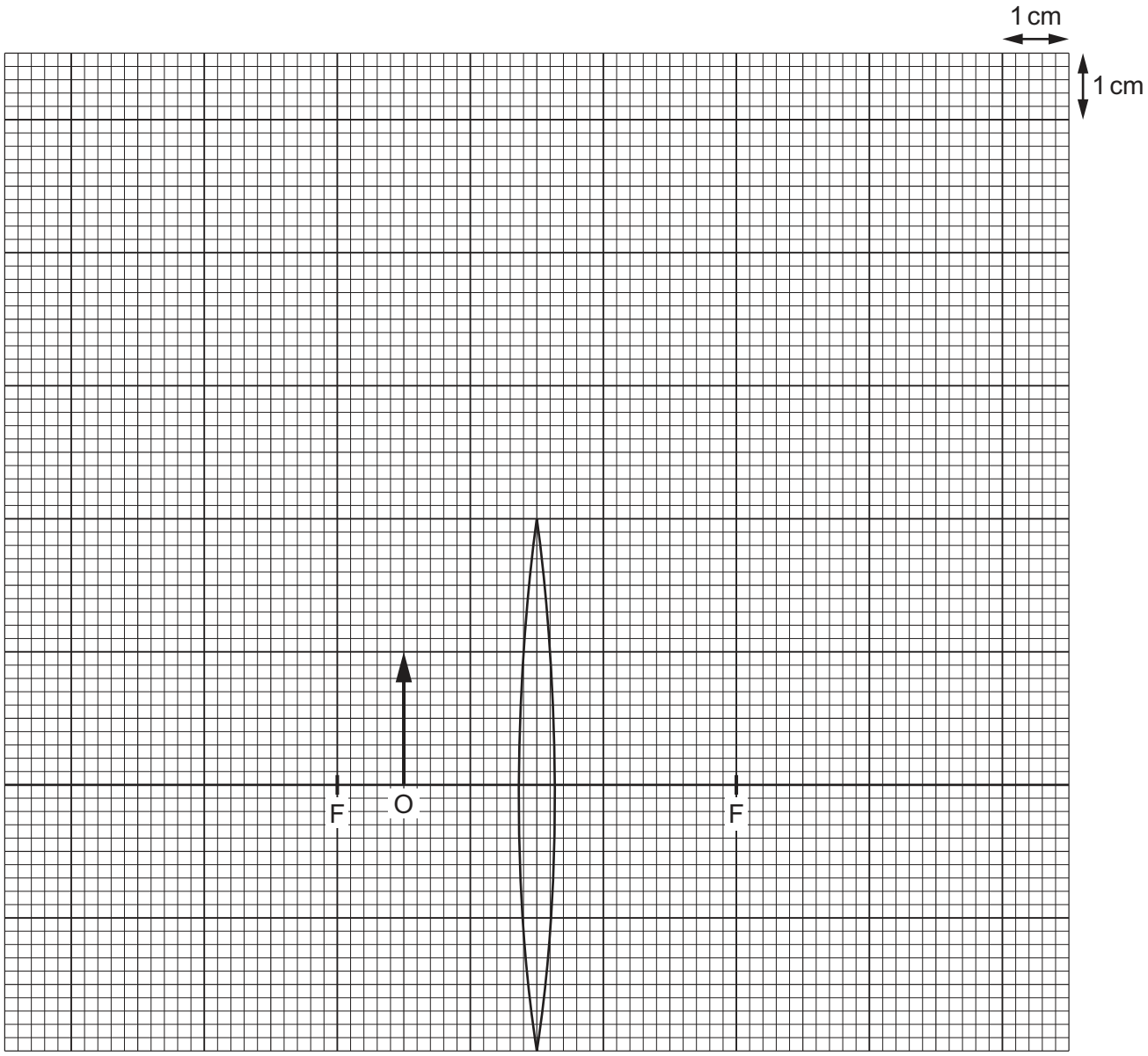
C



D



23 An object O is placed between a converging lens and one principal focus F of the lens.



What is the magnification of the image formed?

A 1.0 **B** 2.0 **C** 3.0 **D** 6.0

24 Which statement about red light and violet light is correct?

A A prism deviates red light more than it deviates violet light.

B Red light has a lower frequency than violet light.

C Red light has a shorter wavelength than violet light.

D The speed of red light in a vacuum is less than the speed of violet light in a vacuum.

25 Ultrasound is used to clean jewellery in a liquid.

What is another use of ultrasound?

A optical fibre communication

B prenatal scanning

C photography

D telephone communications

26 A ship that is stationary on the surface of the sea sends pulses of sound vertically downwards towards the sea bed.

Each pulse that reflects from the sea bed is received 1.0 s after it is sent out.

A whale swims under the boat and a pulse is received 0.60 s after it is sent out.

The speed of sound in sea water is 1500 m / s.

What is the distance of the whale above the sea bed?

A 300 m **B** 450 m **C** 600 m **D** 750 m

27 Which row describes ultrasound waves?

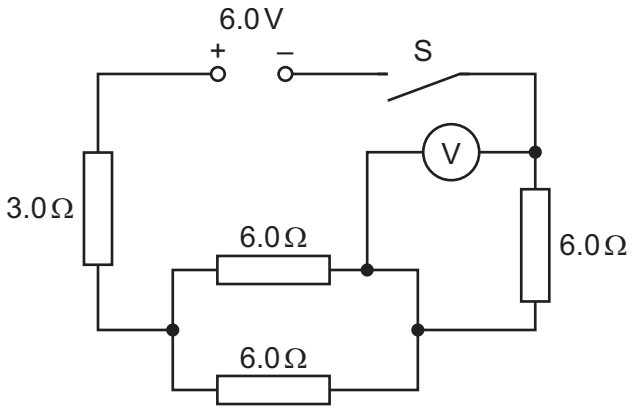
	type of wave	frequency
A	longitudinal	smaller than 20 kHz
B	longitudinal	greater than 20 kHz
C	transverse	smaller than 20 kHz
D	transverse	greater than 20 kHz

28 A quantity is defined as the work done by a source in moving unit charge around a complete circuit.

What is the quantity and what is its unit?

	quantity	unit
A	electromotive force	N
B	electromotive force	V
C	potential difference	N
D	potential difference	V

29 A student connects the circuit shown.

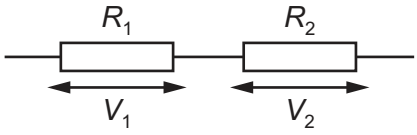


The switch S is closed.

What is the reading on the voltmeter?

A 1.0 V **B** 3.0 V **C** 4.5 V **D** 6.0 V

30 Two resistors connected in series act as a potential divider as shown.

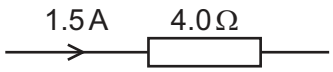


The resistors have resistances R_1 and R_2 and the potential differences across them are V_1 and V_2 respectively.

Which expression is equal to $\frac{V_1}{V_2}$?

A $\frac{R_1}{R_2}$ **B** $\frac{R_2}{R_1}$ **C** $\left(\frac{R_1}{R_2}\right)^2$ **D** $\left(\frac{R_2}{R_1}\right)^2$

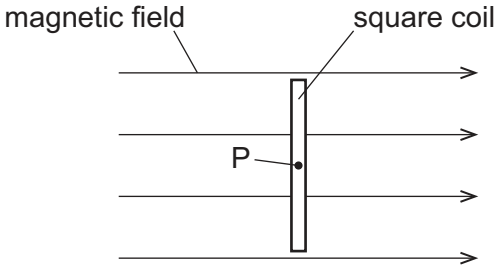
31 There is an electric current of 1.5 A in a 4.0 Ω resistor.



How much energy is transferred electrically to thermal energy in 1.0 minute?

A 6.0 J **B** 360 J **C** 540 J **D** 1440 J

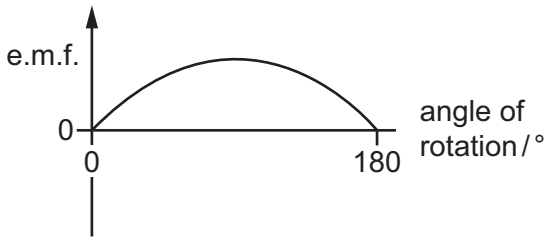
32 A square coil is placed in a horizontal uniform magnetic field. The plane of the coil is perpendicular to the magnetic field.



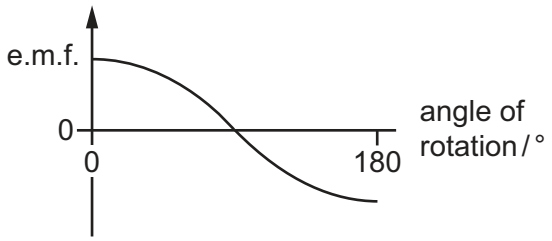
The coil is now rotated about an axis through P at a steady rate. The coil rotates through 180°.

Which diagram shows how the electromotive force (e.m.f.) induced in the coil varies as it rotates through 180°?

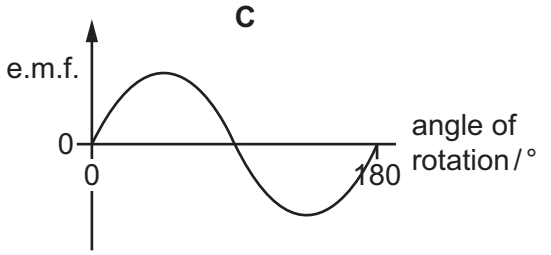
A



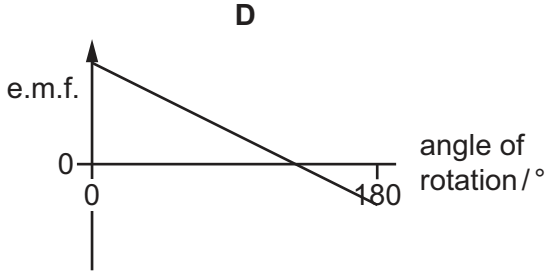
B



C



D



33 Three pieces of equipment made of magnetic materials are listed.

1 the core of a transformer

2 the needle of a compass

3 iron filings used to show a magnetic field pattern

Which pieces of equipment act as temporary magnets when in use?

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

34 Students are asked to suggest factors that affect the speed of rotation of a direct current (d.c.) motor.

Three of their suggestions are listed.

1 the strength of the magnetic field

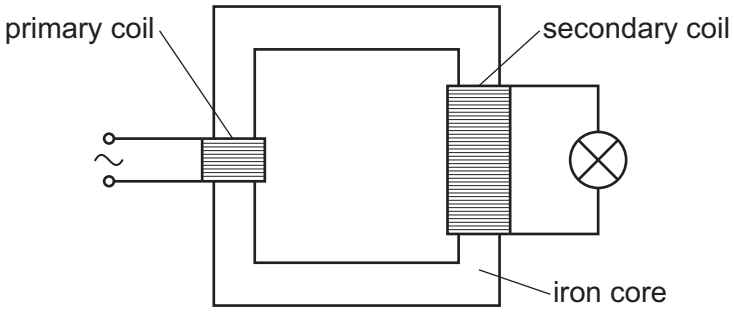
2 the current

3 the number of turns on the coil

Which suggestions are correct?

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

35 A transformer is used to power a lamp.



There are more turns on the secondary coil than on the primary coil.

Which statement is correct?

A There is an alternating current (a.c.) in the primary coil and a direct current (d.c.) in the secondary coil.

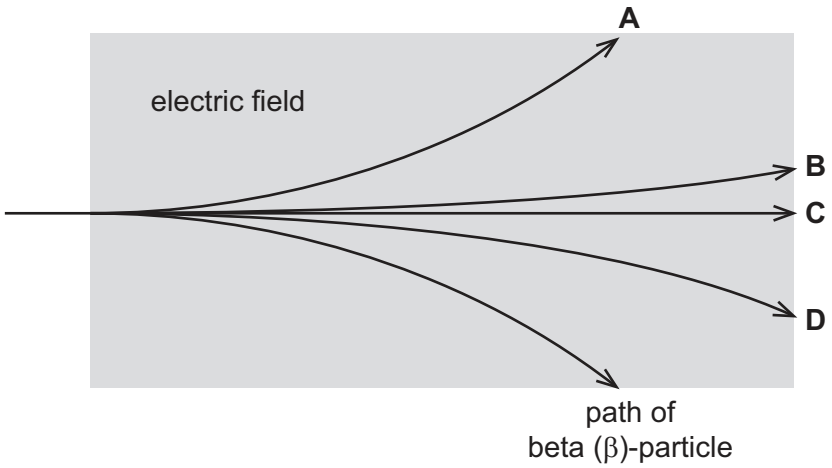
B There is a larger current in the secondary coil than in the primary coil.

C There is a changing magnetic field in the iron core.

D In the iron core there is an alternating current from the primary coil to the secondary coil.

36 In an electric field, a beta (β)-particle follows the path shown.

Which path does an alpha (α)-particle travelling at the same speed follow?



37 Which row gives the sign of the charge on the nucleus of an atom and the sign of the charge of an electron?

	charge on nucleus	charge on electron
A	negative	positive
B	neutral	negative
C	neutral	positive
D	positive	negative

38 An isotope has a half-life of 6000 years.

How much time passes before the count rate due to emissions from a sample of the isotope decreases to $\frac{1}{16}$ of the initial value?

A 6000 years

B 18 000 years

C 24 000 years

D 96 000 years

39 What is the approximate time taken by light from the Sun to travel to the Earth?

A 0.50 s **B** 5.0 s **C** 50 s **D** 500 s

40 Where in the Solar System is the asteroid belt?

A between the Sun and Mercury

B between Venus and the Earth

C between Mars and Jupiter

D between Uranus and Neptune