Cambridge Assessment International Education

Cambridge O Level

PHYSICS **5054/11**

Paper 1 Multiple Choice **October/November 2023**

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.

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[Turn over

1 Which description is of a scalar quantity?

A It has a direction only.

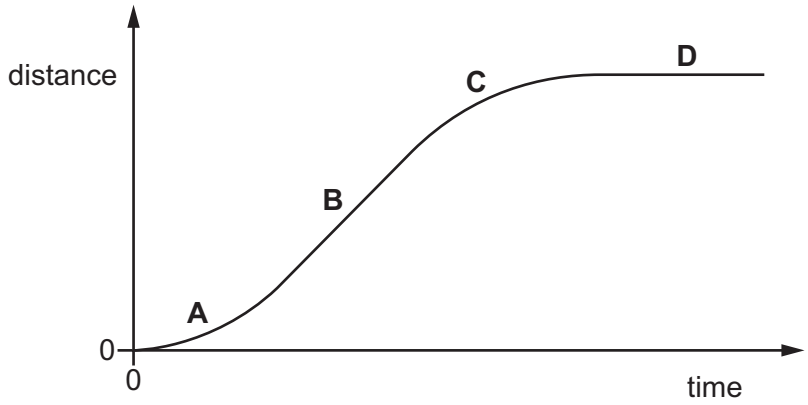
B It has direction and unit only.

C It has direction, magnitude and unit.

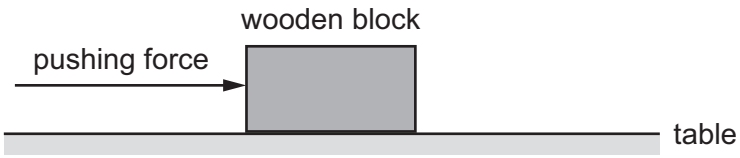
D It has magnitude and unit only.

2 The diagram shows a distance–time graph for a car travelling in a straight line.

In which region is the car decelerating?



3 A wooden block is pushed across a table at constant speed.



Which statement is correct?

A The frictional force increases as the block moves at constant speed.

B The frictional force is equal and opposite to the pushing force.

C The frictional force is greater than the pushing force.

D The frictional force is less than the pushing force.

4 A car begins to move. It speeds up until it reaches a constant speed.

What happens to the acceleration and what happens to the velocity of the car?

A Both the acceleration and the velocity change.

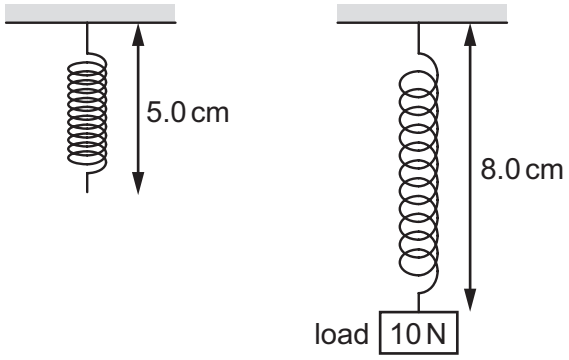
B Only the acceleration changes.

C Only the velocity changes.

D Neither the acceleration nor the velocity changes.

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5 The diagram shows how the length of a spring changes when a load of 10 N is suspended from it.

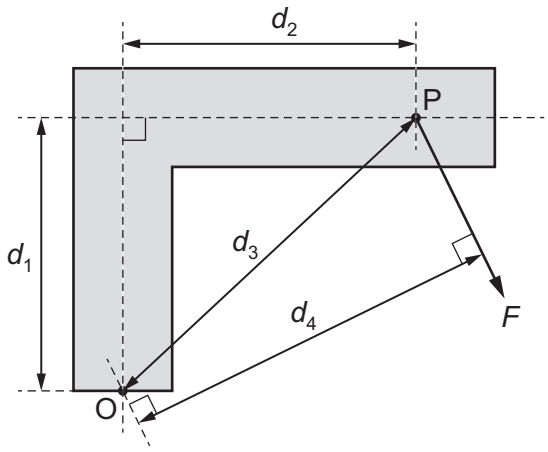


The 10 N load is replaced by a 20 N load.

What is the new length of the spring?

A 6.0 cm **B** 11 cm **C** 14 cm **D** 16 cm

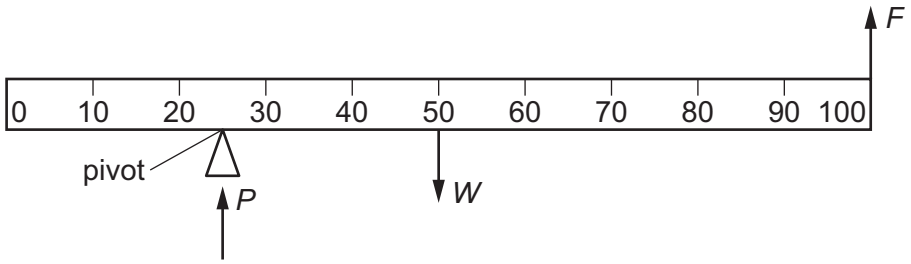
6 A force *F* causes a moment about point O on an L-shaped bar. The force *F* acts at point P.



What is the moment of *F* about O?

A Fd_1 **B** Fd_2 **C** Fd_3 **D** Fd_4

7 A uniform metre rule of weight W is pivoted at the 25 cm mark and held horizontal by a force F applied upwards at the 100 cm mark. The rule is supported by a vertical force P acting at the pivot.

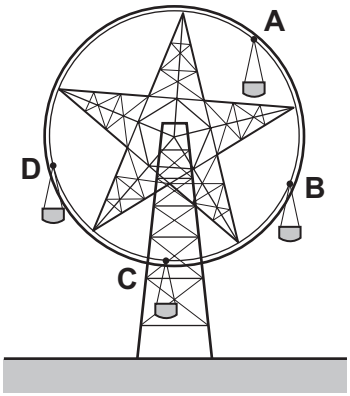


What is the magnitude of P?

A $\frac{1}{3}W$ **B** $\frac{1}{2}W$ **C** $\frac{2}{3}W$ **D** $\frac{4}{3}W$

8 The diagram shows a stationary fairground ride with four chairs of equal mass.

Which chair has the most gravitational potential energy?



9 Hydroelectric and tidal power stations generate electrical energy.

Do these use renewable sources of energy?

	hydroelectric	tidal
A	no	no
B	no	yes
C	yes	no
D	yes	yes

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10 Which energy resource is correctly described?

	energy resource	renewable	availability
A	biofuels	yes	at all times
B	nuclear	yes	intermittent
C	solar radiation	no	at all times
D	wind	no	intermittent

11 A small motor has an input power rating of 10 W and is switched on for 5.0 minutes.

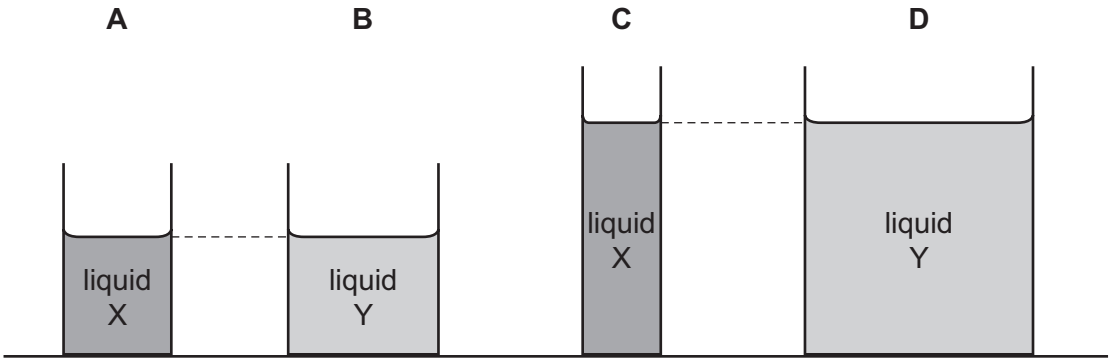
What is the electrical energy input to the motor in this time?

A 2.0 J **B** 50 J **C** 300 J **D** 3000 J

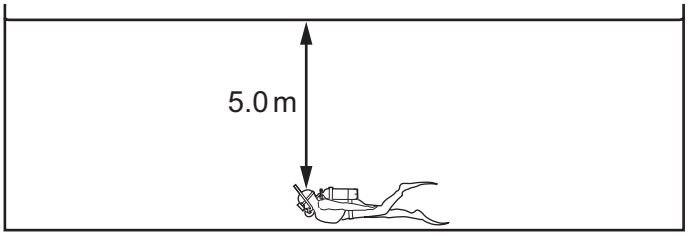
12 Two liquids, X and Y, are poured into beakers of different sizes.

Liquid X has a density of 1000 kg / m^3 and liquid Y has a density of 900 kg / m^3.

On the base of which beaker is the pressure greatest?



13 A swimmer is at the bottom of a pool. The density of the water in the pool is 1000 kg / m^3 and the gravitational field strength is 9.8 N / kg.



NOT TO SCALE

Which expression gives the pressure exerted on the swimmer due to the water?

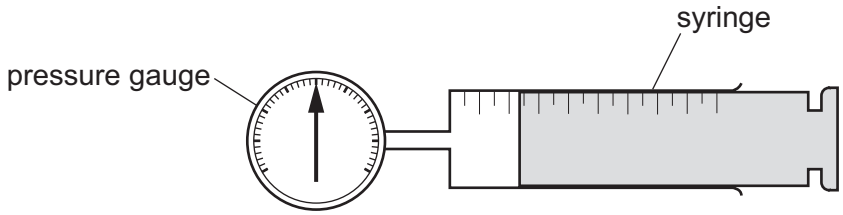
A $\frac{5.0 \times 1000}{9.8}$ Pa

B $5.0 \times 1000 \times 9.8$ Pa

C $\frac{1000}{5.0}$ Pa

D $\frac{1000 \times 9.8}{5.0}$ Pa

14 Some gas is trapped in a large syringe.



The atmospheric pressure is 100 kPa. The gas pressure is 200 kPa above atmospheric pressure.

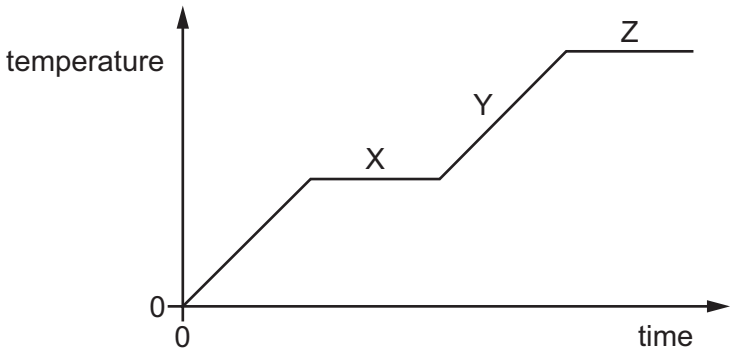
The piston moves outwards and the volume of the trapped gas doubles. The temperature remains constant.

What is the new gas pressure?

A 100 kPa **B** 150 kPa **C** 200 kPa **D** 400 kPa

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15 A graph of temperature against time is shown for a material being heated from its solid state.



Which row describes what is happening at X, Y and Z?

	X	Y	Z
A	boiling	solid becomes hotter	melting
B	liquid becomes hotter	boiling	gas becomes hotter
C	solid becomes hotter	melting	liquid becomes hotter
D	melting	liquid becomes hotter	boiling

16 A student on a camping expedition cools a sealed bottle of water which is at the same temperature as the surrounding air.

Which method cools the water at the greatest rate?

A Wrap the bottle in aluminium foil and place it in a shady place.

B Wrap the bottle in dry, white paper and put it in a sunny place.

C Wrap the bottle in foam and put it in a breeze.

D Wrap the bottle in wet paper and put it in a breeze.

17 A student suggests three factors that affect the rate of emission of thermal energy by radiation from a hot object. These are:

1 the surface temperature of the object

2 the surface area of the object

3 the surface colour of the object.

Which suggestions are correct?

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

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18 A plane mirror on a vertical wall forms an image of an object placed in front of it.

Which characteristics describe the image?

A real and inverted

B real and upright

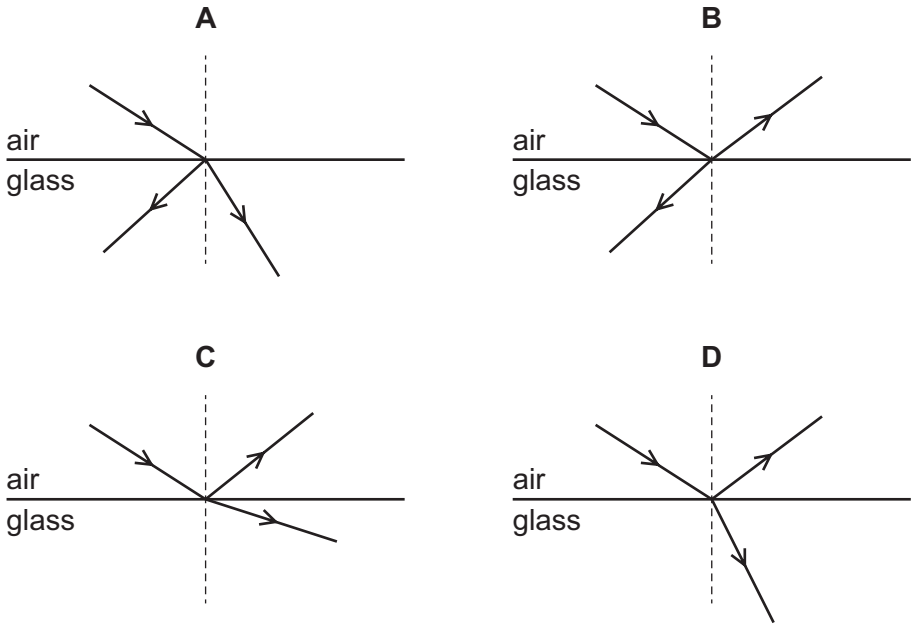
C virtual and inverted

D virtual and upright

19 The diagrams show light travelling in air incident on the surface of a glass block.

Some light is reflected and some light is refracted.

Which diagram shows the reflection and refraction of the light?



20 Which statement is correct?

A Total internal reflection only occurs when light travels from air into glass.

B The larger the refractive index of glass, the larger is the critical angle.

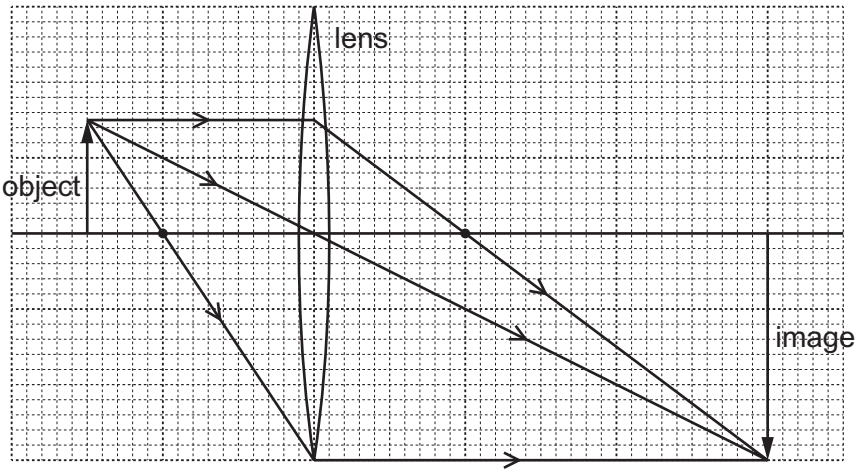
C When total internal reflection occurs, the angle of incidence is equal to the angle of reflection.

D When total internal reflection occurs, the angle of incidence is less than the critical angle.

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21 An object is placed in front of a converging lens of focal length 4.0 cm. The height of the image is 6.0 cm.

The arrangement is shown on the scale diagram.



What is the linear magnification produced by the lens?

A 0.50 **B** 1.5 **C** 2.0 **D** 6.0

22 Which range of sound frequencies includes only frequencies of sound that can be heard by a healthy human ear?

A 0.5–50 Hz **B** 5–500 Hz **C** 50–5000 Hz **D** 500–50 000 Hz

23 An aircraft flying through the air becomes electrically charged.

What causes this to happen?

A background radiation in the aircraft

B friction of the aircraft with the air

C heating of the aircraft surface

D radio waves emitted by the aircraft

24 Two metal spheres are brought close to each other. The two spheres repel each other.

Which statement explains this?

A Both spheres are charged and both are positive.

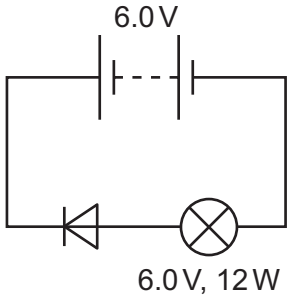
B Both spheres are charged but one is positive and the other is negative.

C The spheres have the same number of electrons.

D The spheres have the same number of protons.

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25 A student sets up the circuit shown. The lamp does not light.



What makes the lamp light?

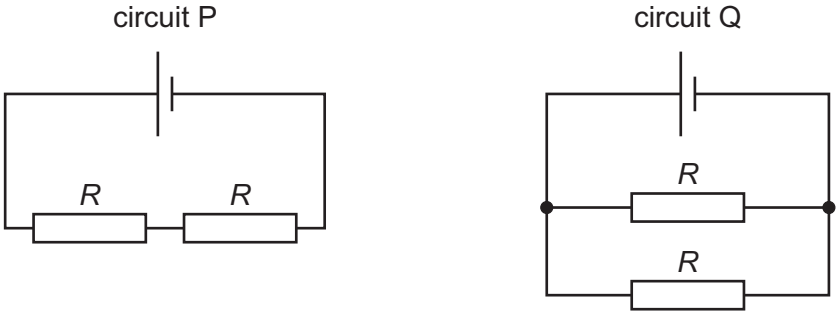
A changing the supply to a 12 V battery

B inserting a fuse

C reversing the battery connections

D reversing the connections to the lamp

26 Circuits P and Q each contain two identical resistors, each of resistance *R*.



What is the resistance of circuit P and what is the resistance of circuit Q?

	resistance of circuit P	resistance of circuit Q
A	R	$\frac{R}{2}$
B	R	$2R$
C	$2R$	$\frac{R}{2}$
D	$2R$	$2R$

27 The current in an electric motor is 2.0 A.

It transfers 20 J of energy in 5.0 s.

What is the potential difference (p.d.) across the motor?

A 0.50 V **B** 2.0 V **C** 8.0 V **D** 50 V

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28 Three students make comments about appliances with double insulation.

student P Appliances with double insulation do not need an earth wire.

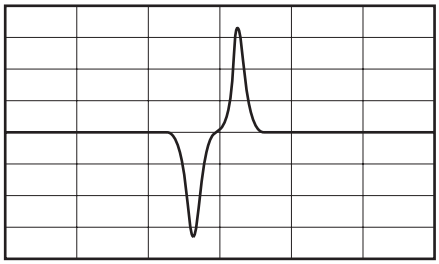
student Q Double insulation protects the user of the appliance from an electric shock.

student R The circuits of appliances with double insulation do not contain fuses.

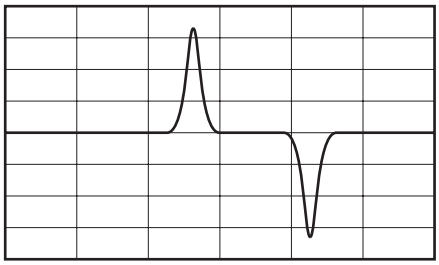
Which students are correct?

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

29 A magnet moves at constant speed through a coil of wire. The coil is connected to an oscilloscope. The diagram shows the trace produced on the screen.



The experiment is changed and a new trace is produced.



Which statement explains why the new trace is different from the original trace?

A The coil is longer and the other pole of the magnet enters the coil first.

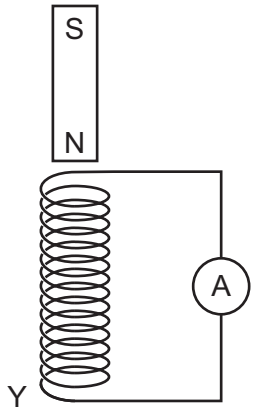
B The coil is longer and the same pole of the magnet enters the coil first.

C The coil is shorter and the other pole of the magnet enters the coil first.

D The coil is shorter and the same pole of the magnet enters the coil first.

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30 A bar magnet is dropped through a vertical solenoid that is connected to a sensitive ammeter.



A current is induced in the solenoid and the solenoid becomes an electromagnet.

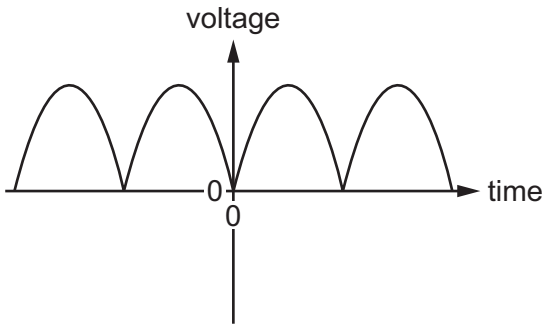
Which row describes the polarity of end Y of the solenoid and the force between the solenoid and the bar magnet when the bar magnet leaves the solenoid?

	polarity of end Y of the solenoid	force between solenoid and bar magnet
A	north	attraction
B	north	repulsion
C	south	attraction
D	south	repulsion

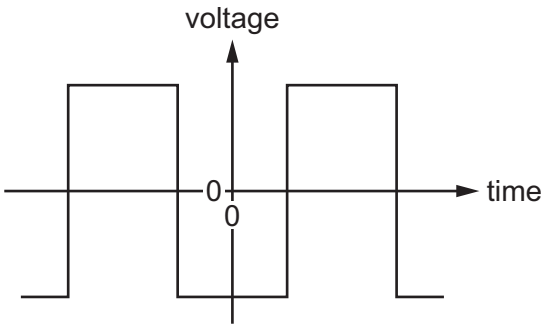
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31 Which graph shows the voltage output against time for a simple a.c. generator?

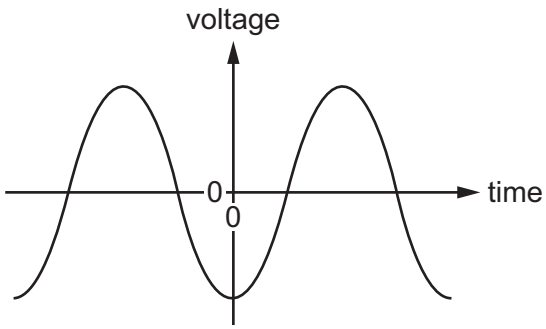
A



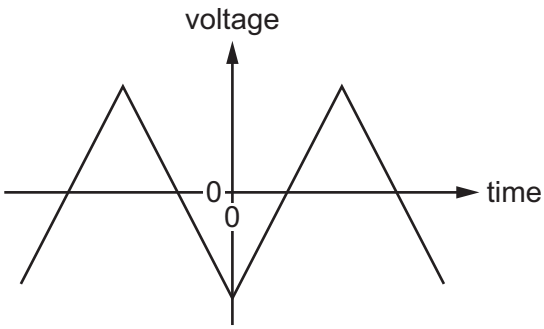
B



C



D



32 A charger for a mobile phone (cellphone) uses a transformer which steps the voltage down from 230 V to 5.0 V.

The primary coil in the transformer has 2500 turns.

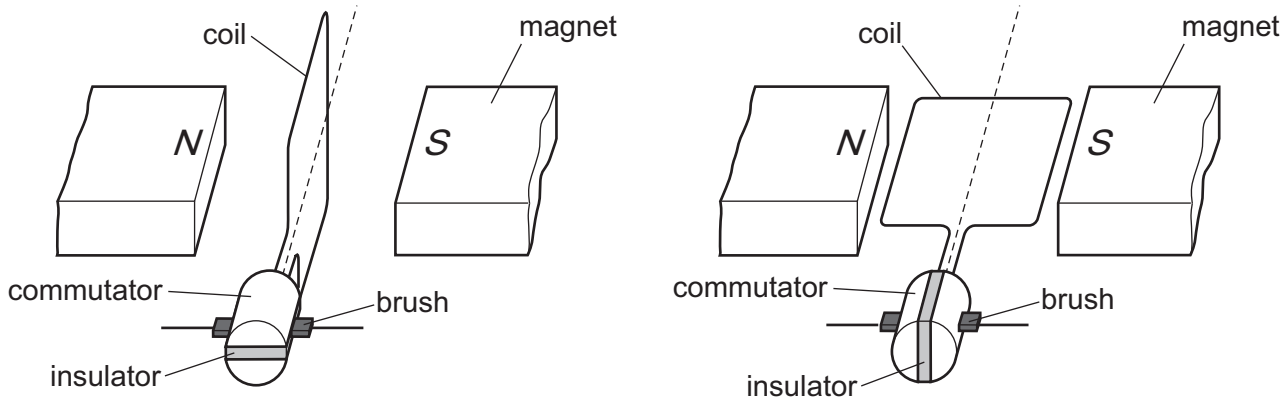
How many turns are on the secondary coil?

A 11 **B** 54 **C** 500 **D** 11 500

33 A commutator is connected to the coil of a d.c. motor.

The commutator rotates and connects the coil to the power supply.

Once every half-turn, the current in the coil reverses.



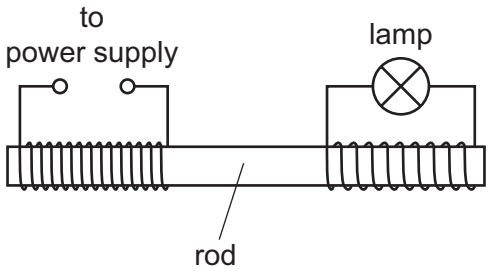
coil perpendicular to magnetic field

coil parallel to magnetic field

What is the name of the commutator and what is the orientation of the plane of the coil as the current reverses?

	name	orientation
A	slip ring	parallel to the magnetic field
B	slip ring	perpendicular to the magnetic field
C	split ring	parallel to the magnetic field
D	split ring	perpendicular to the magnetic field

34 A girl makes a simple transformer to illuminate a low voltage lamp. The transformer is shown.



What is the material of the rod and what is the type of power supply?

	material of rod	power supply
A	plastic	d.c. supply
B	plastic	a.c. supply
C	iron	d.c. supply
D	iron	a.c. supply

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35 Which particles are in the nucleus of a large atom?

A neutrons and electrons only

B protons and electrons only

C protons and neutrons only

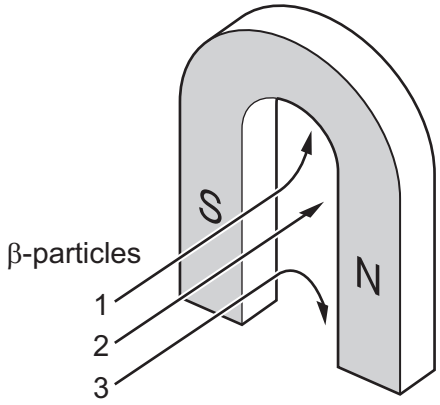
D protons, neutrons and electrons

36 Alpha (α) particles and beta (β) particles are emitted during radioactive decay.

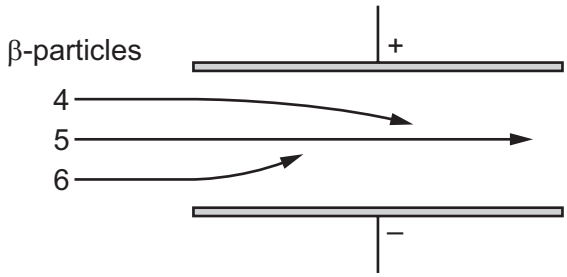
Which particle has the weaker ionising effect and which has the weaker penetrating power?

	weaker ionising effect	weaker penetrating power
A	α	α
B	α	β
C	β	α
D	β	β

37 A beam of beta (β) particles passes into a magnetic field and into an electric field.



into magnetic field



into electric field

Which numbers show the paths of the beam through the fields?

A 1 and 4 **B** 1 and 6 **C** 2 and 5 **D** 3 and 6

38 The isotope radon-222 has a half-life of 3.8 days.

Which statement about a sample containing 1.0 mg of radon-222 is correct?

A After 1.9 days there is 0.50 mg of radon-222 left.

B After 3.8 days there is 0.50 mg of radon-222 left.

C Its half-life is half that of a 2.0 mg sample.

D There is no radon-222 left after 7.6 days.

39 What is the first stage in the life cycle of stars?

A a black hole

B a cloud of gas and dust

C a red supergiant

D a supernova

40 What is the definition of redshift?

A the increase in observed frequency of light from galaxies that are moving away from the Earth

B the increase in observed wavelength of light from galaxies that are moving away from the Earth

C the light emitted by distant galaxies that is blue when it reaches the Earth

D the light reaching the Earth that is red when it is emitted by distant galaxies

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