DUNMAN SECONDARY SCHOOL

CANDIDATE NAME			
CLASS		**INDEX NUMBER**	

PRELIMINARY EXAMINATION 2025
SECONDARY 4 EXPRESS

PHYSICS **6091/01**

Paper 1 Multiple Choice **26 August 2025**

1 hour

Additional Materials: Multiple Choice Answer Sheet

READ THESE INSTRUCTIONS FIRST

Write in soft pencil.

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

Write your name, class and index number on the Answer Sheet in the spaces provided unless this has been done for you.

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 Answer Sheet very carefully.

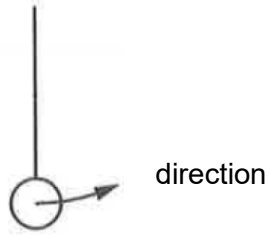
Each correct answer will score one mark. A mark will not be deducted for a wrong answer.

Any rough working should be done in this booklet.

The use of an approved scientific calculator is expected, where appropriate.

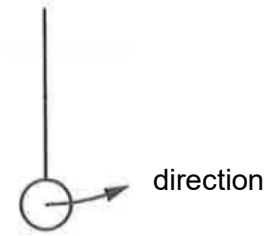
1 A pendulum has a period of 2.0 s.

A stopwatch is started when the pendulum is vertical and is moving to the right, as shown in the diagram.

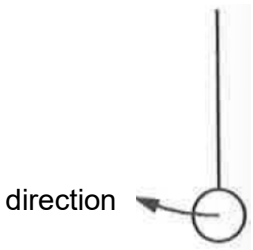


Which diagram shows the position and direction of the pendulum 5.0 s later?

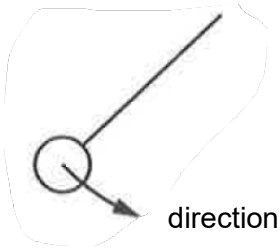
A



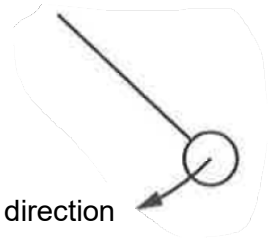
B



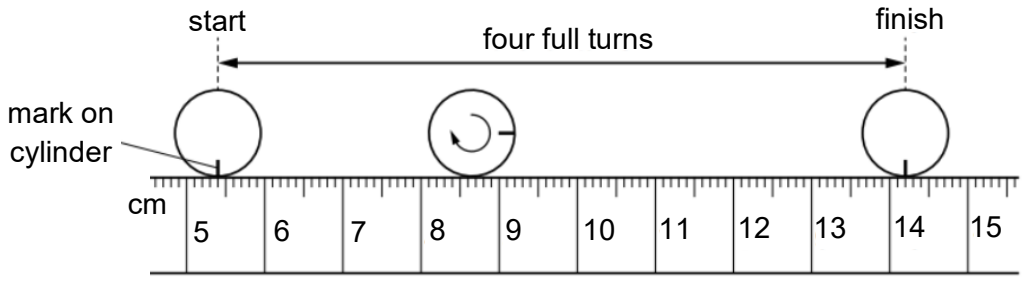
C



D



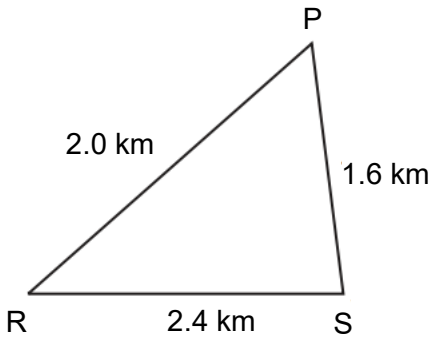
2 A small cylinder is rolled along a ruler and completes four full turns as shown in the diagram. The diagram is not drawn to scale.



What is the circumference of the cylinder?

A 2.2 cm **B** 4.4 cm **C** 8.8 cm **D** 10.2 cm

3 A woman runs 2.0 km from P to R in 20 minutes and then rests at R for 10 minutes. She then takes 10 minutes to run 2.4 km from R to S.



What is her average velocity for the journey from P to S?

A 0.040 km / minute

B 0.053 km / minute

C 0.090 km / minute

D 0.120 km / minute

4 An object falls from rest through air.

Which statement is correct if the object has not reached terminal velocity?

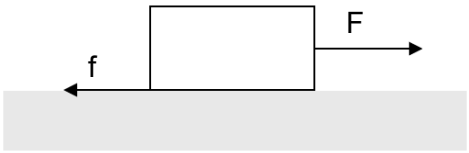
A Both its velocity and acceleration decrease.

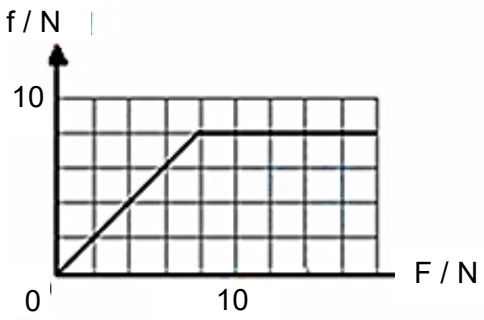
B Its velocity decreases and its acceleration is constant.

C Its velocity increases and its acceleration decreases.

D Its velocity increases and its acceleration is constant.

5 A pulling force F, increasing from zero, is applied on a block placed on a rough horizontal surface. A graph of friction f against the pulling force F is plotted as shown.





What is the value of F when the block starts to move?

A 0 N **B** 2 N **C** 8 N **D** 10 N

6 The mass of object X is less than the mass of object Y.

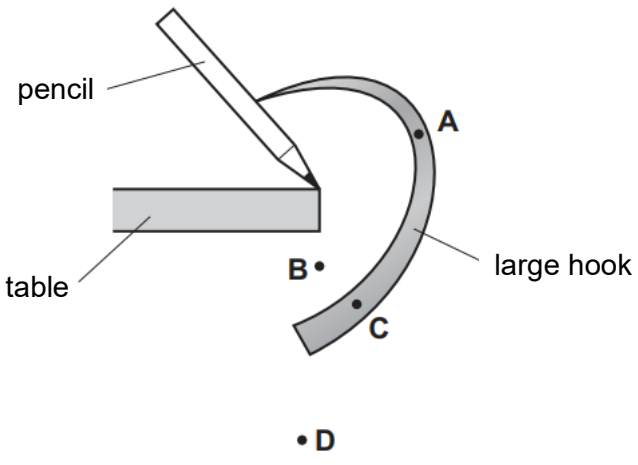
The objects contain different amounts of matter and have different inertias.

Which row is correct?

	less amount of matter	lower inertia
A	X	X
B	X	Y
C	Y	X
D	Y	Y

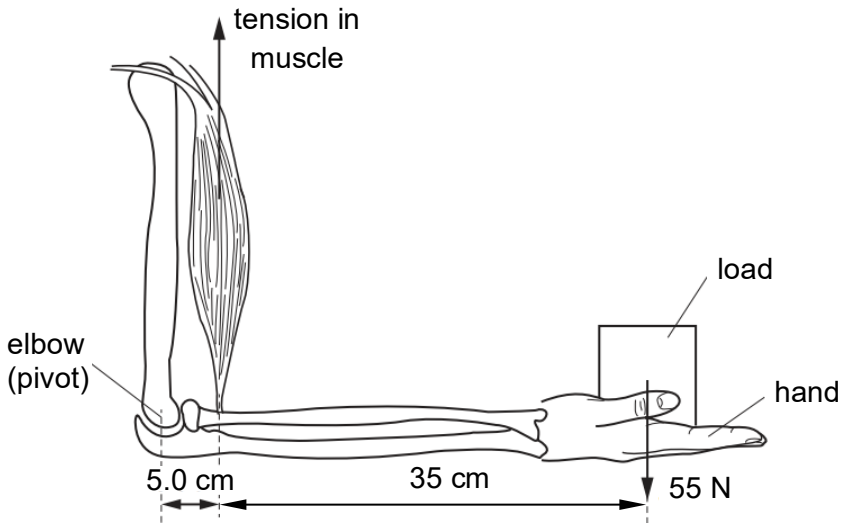
7 A large hook sticks into a pencil. The hook and pencil stay balanced on the edge of a table, as shown in the diagram.

Where is the centre of gravity of the hook and pencil?



8 The diagram shows a muscle and some bones in a human's arm.

The hand holds a load of weight 55 N. The elbow acts as a pivot and the tension in the muscle keeps the lower part of the arm horizontal.

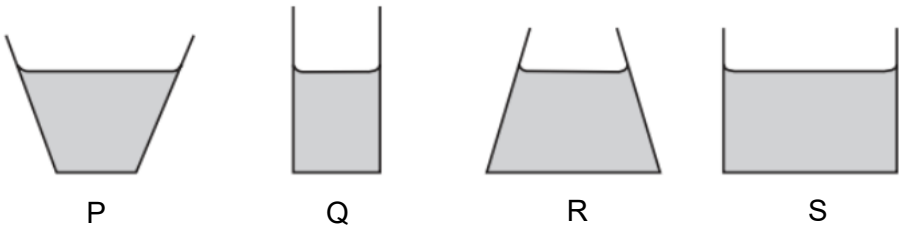


What is the tension in the muscle due to the load?

A 280 N **B** 390 N **C** 440 N **D** 2200 N

9 The diagrams drawn to the same scale, show the vertical sections of a set of circular vessels.

Each vessel contains the same depth of water.



Which statement is correct?

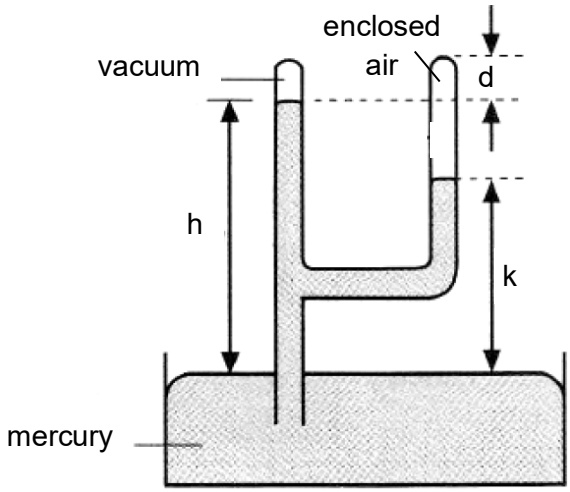
A The water exerts the greatest pressure on the base of vessel P.

B The water exerts the greatest pressure on the base of vessel S.

C The water exerts the same force on the base of each vessel.

D The water exerts the same pressure on the base of each vessel.

10 A forked tube contains air in one branch and a vacuum in the other as shown.



What is the pressure of the enclosed air?

A d cm Hg

B (h – d) cm Hg

C (h – k) cm Hg

D k cm Hg

11 A single metal bolt has a mass of 38 g.

Three of such bolts are immersed in a measuring cylinder that contains 30 cm^3 of water. The reading on the measuring cylinder rises to 42 cm^3.

What is the density of the metal?

A 0.90 g/cm^3 **B** 1.3 g/cm^3 **C** 3.2 g/cm^3 **D** 9.5 g/cm^3

12 A rocket of mass M when empty carries a mass M of fuel. The rocket and fuel travel at speed v. The engine of the rocket is fired and all the fuel is expelled until no fuel is left. The speed of the rocket increases to 2v.

What happens to the kinetic energy of the rocket?

A It doubles.

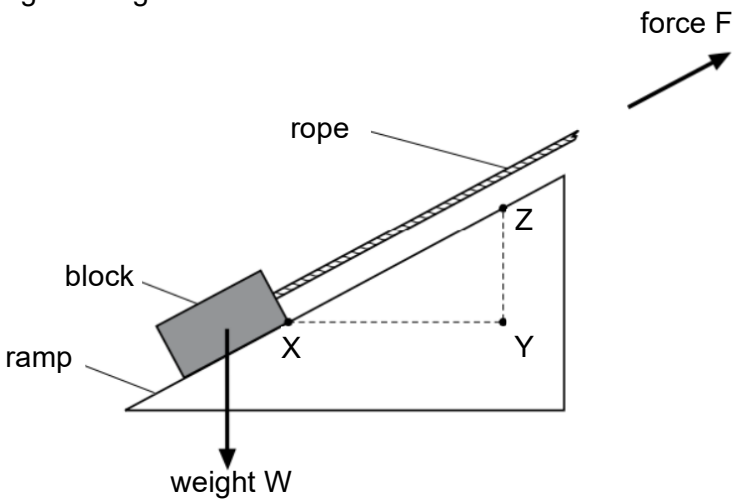
B It halves.

C It increases by a factor of four.

D It remains the same.

13 The diagram shows a block being pulled up along a ramp by a rope.

The block has weight W and the rope is pulled with force F. The block moves a distance XZ and is raised throught a height YZ.



What is the work done on the block by the rope?

A F x XZ

B F x YZ

C W x XY

D W x XZ

14 The size of a balloon increases when it is left under the Sun.

Why does this happen?

A The air molecules inside the balloon are bigger when it is heated.

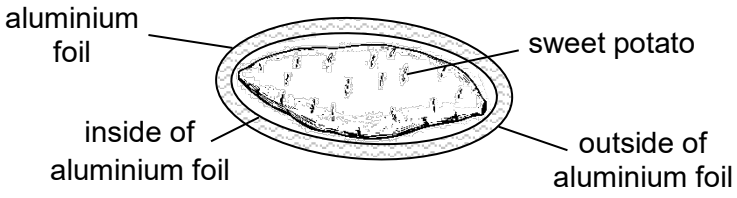
B The air molecules inside the balloon move faster when it is heated.

C The air molecules inside the balloon move outwards when it is heated.

D The number of air molecules inside the balloon increases when it is heated.

15 In aluminium foils, one side is shinier than the other. They are commonly used to wrap sweet potatoes cooked in a barbeque fire.

The diagram shows a sweet potato being wrapped in aluminium foil.



How should the sweet potato be wrapped in the aluminium foil to allow it to be cooked faster when placed in the fire?

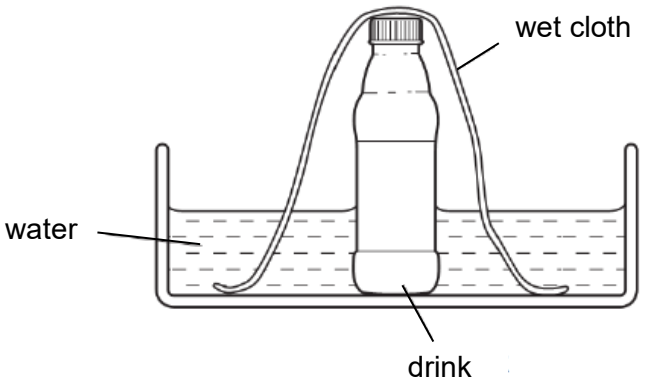
A The dull side should be on the outside because it is a better absorber of radiation.

B The dull side should be on the outside because it is a better conductor of heat.

C The shiny side should be on the outside because it is a better absorber of radiation.

D The shiny side should be on the outside because it is a better conductor of heat.

16 On a hot day, a cold drink in a bottle can be kept cool by standing it in a bowl of water and placing a wet cloth over it.



Why will the drink be kept cool?

A Hot air cannot escape from the bottle.

B The cloth conducts heat from the bottle into the water.

C The drink cannot evaporate from the bottle.

D Water evaporating from the cloth cools the drink.

17 Two liquids P and Q are placed in two similar polystyrene cups. Initially, both liquids are at the same temperature and have equal masses. They are simultaneously heated by identical immersion heaters.

If liquid P has a lower specific heat capacity, which result(s) will be observed?

1 Liquid P will be boiled away before liquid Q does.

2 Liquid P will reach its boiling point first.

3 The temperature of liquid P will rise more rapidly than liquid Q.

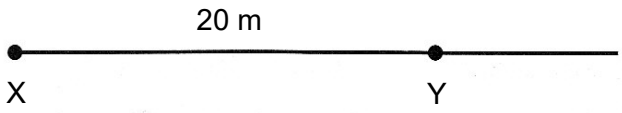
A 1 only

B 1, 2 and 3

C 2 only

D 3 only

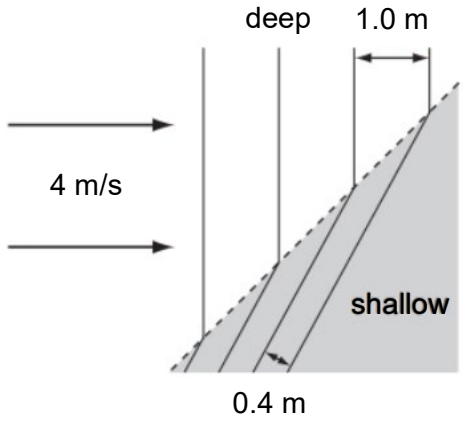
18 X and Y are two points 20 m apart on a string. Point X is vibrated 5 times in one second and the first resulting wave reaches Y two seconds later.



What is the period and wavelength of the wave?

	period / s	wavelength / m
A	0.20	2.0
B	0.20	4.0
C	2.5	2.0
D	2.5	4.0

19 Refraction occurs when waves travel from deep water to shallow water.



What is the speed of the waves in the shallow water?

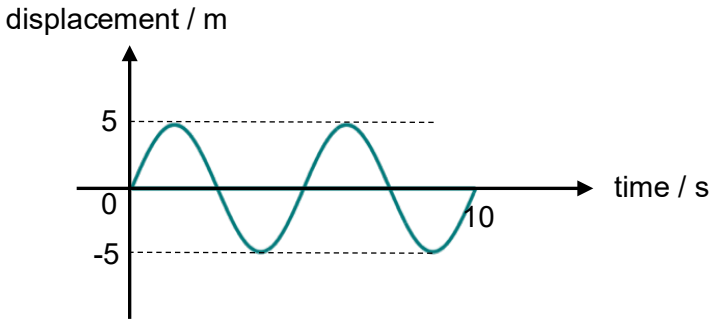
A 0.4 m/s **B** 1.2 m/s **C** 1.6 m/s **D** 4.0 m/s

20 A sonic 'tape measure' is used to measure the length of a room. It measures a time interval of 0.080 s between transmitting a sound pulse and receiving its echo. The speed of sound in air is 330 m/s.

How far is the reflecting wall from the 'tape measure'?

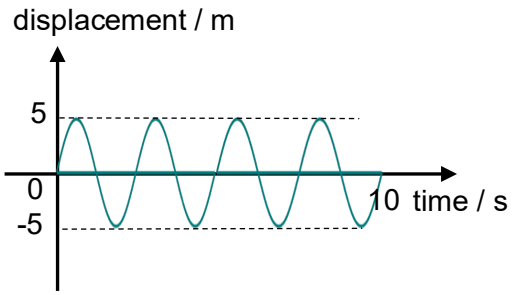
A 5.5 m **B** 11 m **C** 13 m **D** 26 m

21 A musical note is represented on the displacement-time graph below.

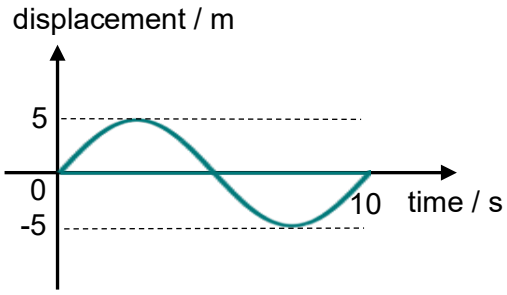


Which displacement-time graph shows another musical note which has twice the loudness and half the pitch of the original musical note?

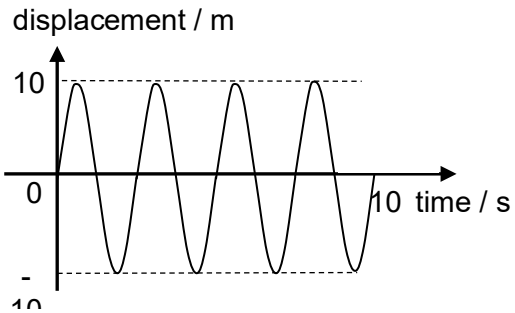
A



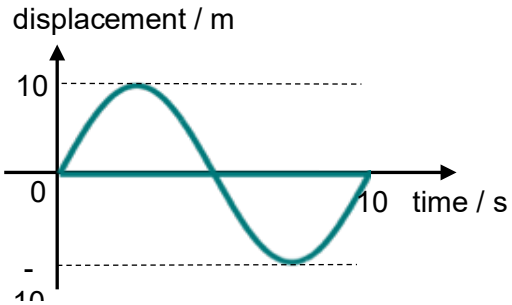
B



C

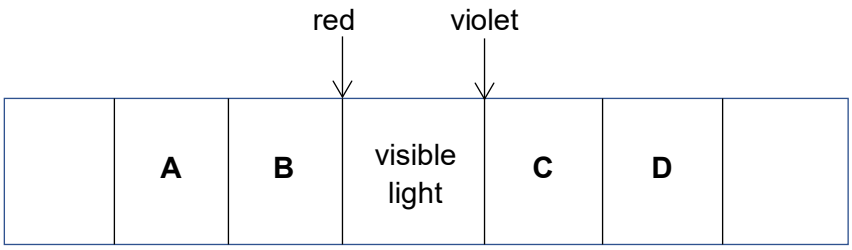


D

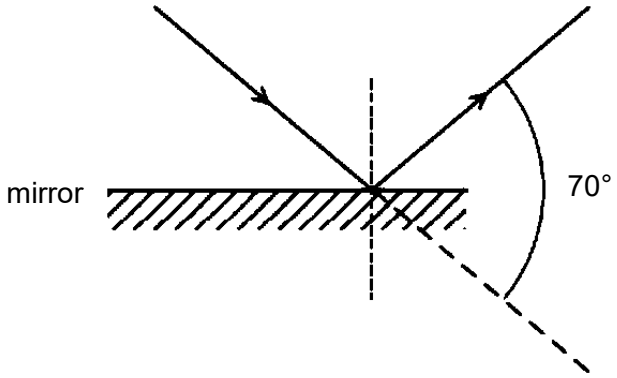


22 The diagram below shows the electromagnetic spectrum.

Which component can be used to detect counterfeit notes?



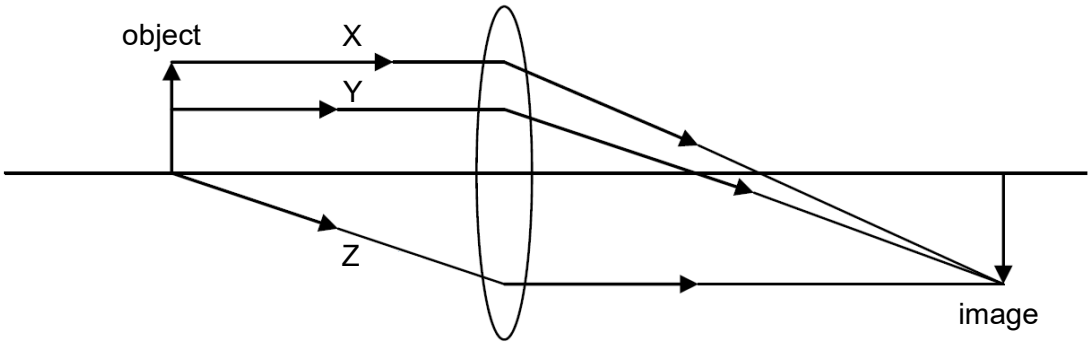
23 Light is incident on a mirror and reflected as shown.



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

	angle of incidence / °	angle of reflection / °
A	35	35
B	35	55
C	55	55
D	70	70

24 Which ray(s) is/are correctly drawn in the diagram below?



A ray X only

B ray Y only

C rays X and Z only

D rays X, Y and Z

25 An electrostatically charged object will pick up small pieces of paper.

Which object will not pick up any piece of paper?

A A plastic comb pulled through dry hair.

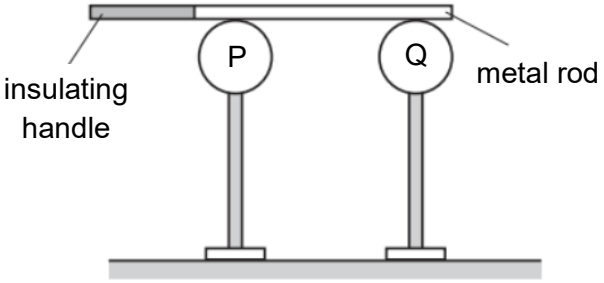
B A polythene rod rubbed with a woollen cloth.

C A rubber balloon rubbed on a nylon shirt.

D An earthed metal rod rubbed with a duster.

26 Two metal spheres are mounted on insulating stands. Sphere P is initially uncharged and sphere Q is initially positively charged.

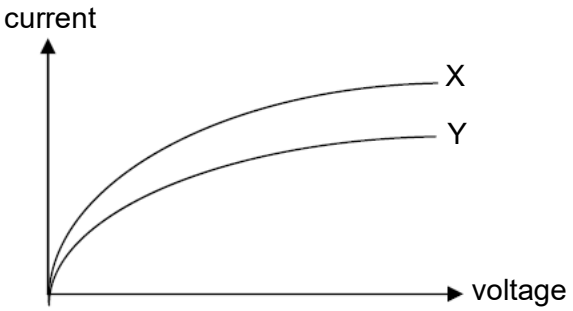
A metal rod, held by an insulating handle, is placed in contact with P and Q as shown.



Which statement correctly describes the charge on the metal spheres when the metal rod is placed in contact with the metal spheres?

	charge on P	charge on Q
A	positive	positive
B	positive	uncharged
C	uncharged	positive
D	uncharged	uncharged

27 The graph shows the current - voltage relationship of two filament lamps made of the same type of metal.



Which statement is correct?

A Both filaments X and Y obey Ohm's law.

B Filament X is longer and thinner than filament Y.

C The resistance of both filaments decreases with temperature rise as current increases.

D The resistance of filament X is smaller than the resistance of filament Y when both are at the same voltage.

28 Why are batteries sometimes made from several identical cells arranged in parallel?

A The battery has a greater e.m.f. than a single cell on its own.

B The battery has a lower e.m.f. than a single cell on its own.

C The battery lasts longer than a single cell on its own.

D The battery supplies a smaller current than a single cell on its own.

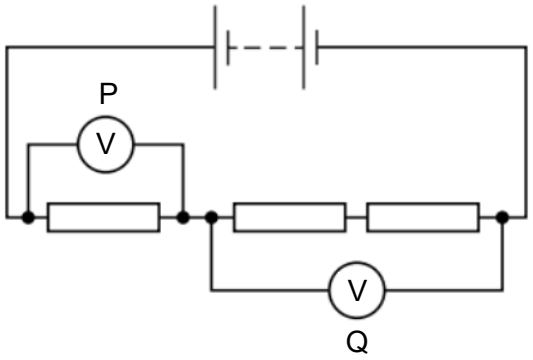
29 A charge of 0.40 C passes through a resistor in 1.0 s.

In 5.0 s, 50 J of work is done by the battery to drive the charges through the resistor.

What is the potential difference across the resistor?

A 0.020 V **B** 0.040 V **C** 25 V **D** 50 V

30 Three identical resistors are connected in series to a battery.

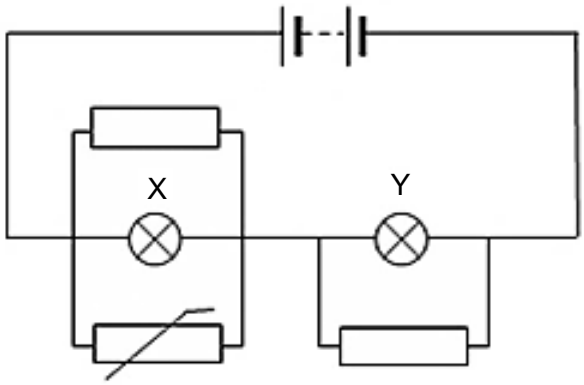


Voltmeter Q reads 10.0 V.

What is the reading on voltmeter P and what is the e.m.f. of the battery?

	reading on P / V	e.m.f. of battery / V
A	5.0	10.0
B	5.0	15.0
C	10.0	10.0
D	10.0	15.0

31 A circuit is set up as shown.



What will happen to the brightness of bulb X and Y if the temperature of the thermistor is increased?

	brightness of bulb X	brightness of bulb Y
A	brighter	brighter
B	brighter	dimmer
C	dimmer	brighter
D	unchanged	unchanged

32 The cable to an electric cooker contains a live wire, a neutral wire and an earth wire.

In which wires are the currents the same when the cooker is operating under normal conditions?

A the live, the neutral and the earth

B the live and the earth only

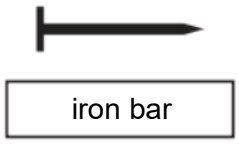
C the neutral and the earth only

D the neutral and the live only

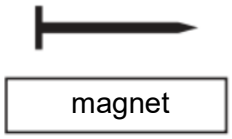
33 The diagrams show an iron nail in four different set-ups.

In which diagram will the nail become an induced magnet?

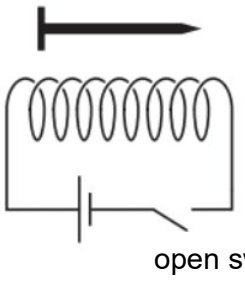
A



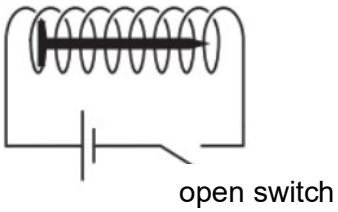
B



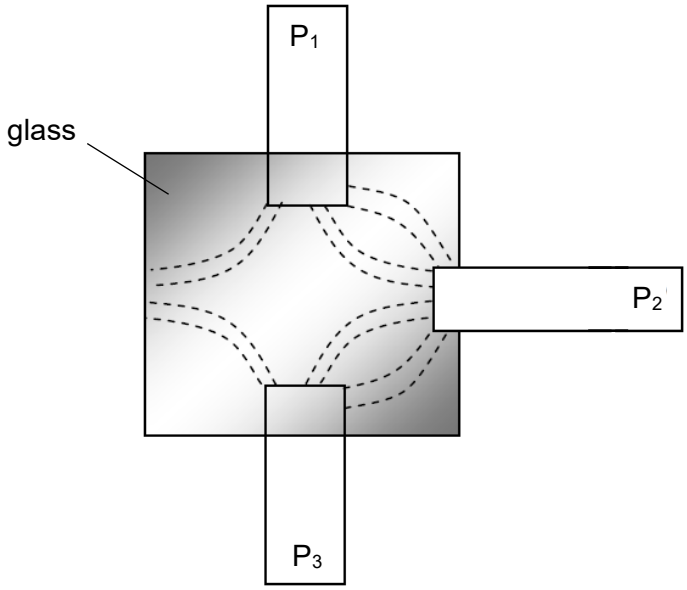
C



D



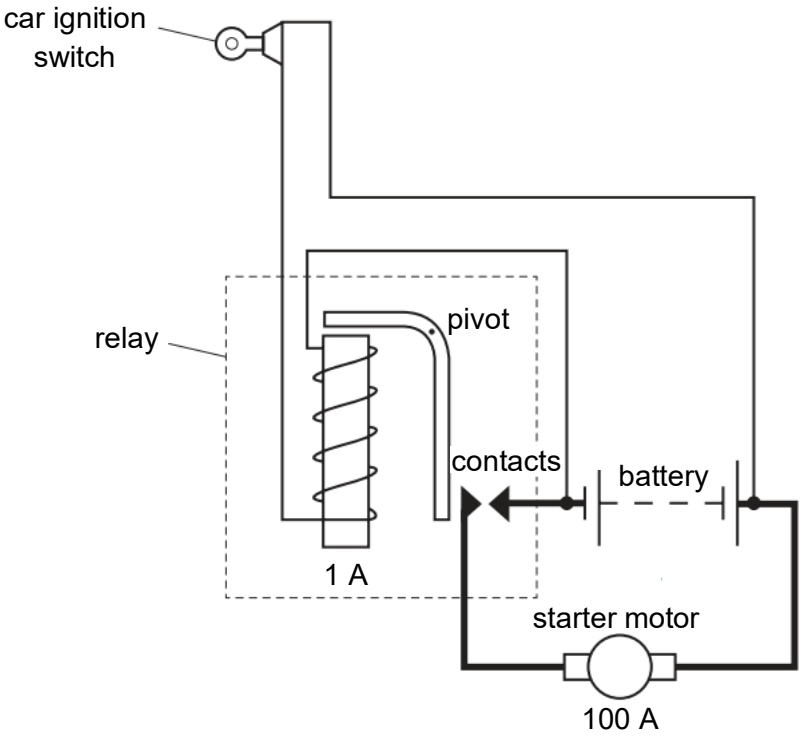
34 A piece of thin glass is placed on top of three strong magnets positioned as shown. Iron filings are then sprinkled on the glass and the pattern is produced as shown.



What are the correct poles at P_1, P_2 and P_3?

	P_1	P_2	P_3
A	north	north	north
B	north	south	south
C	south	north	south
D	south	south	north

35 The diagram shows a car ignition switch and starter motor.



The ignition switch is in a circuit with long, thin wires. The starter motor is in a circuit with short, thick wires.

What is the explanation for the choice of wires?

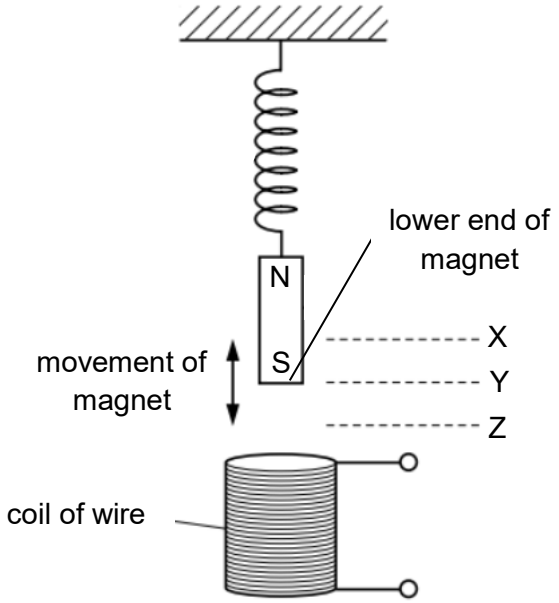
A Each circuit needs to contain the same total mass of wire.

B The ignition switch circuit carries a smaller current than the starter motor circuit.

C Thicker wires heat up more quickly when the relay is switched on.

D Thin wires have lower resistances.

36 A magnet oscillates vertically above a coil of wire.



As the lower end of the magnet oscillates between X and Z, a varying e.m.f. is induced across the coil.

When this e.m.f. is 0 V, where could the lower end of the magnet be at?

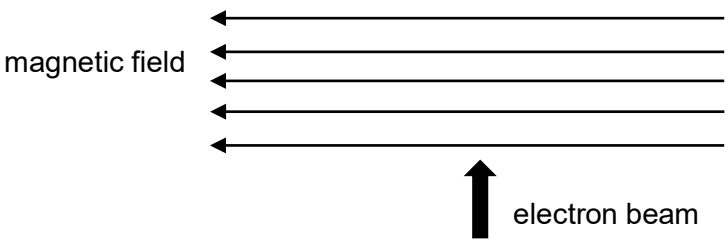
A at X or at Y

B at X or at Z

C at Y only

D at Z only

37 An electron beam is aimed perpendicularly at a magnetic field. The direction of the magnetic field is from right to left as shown.



In which direction will the electron beam be deflected?

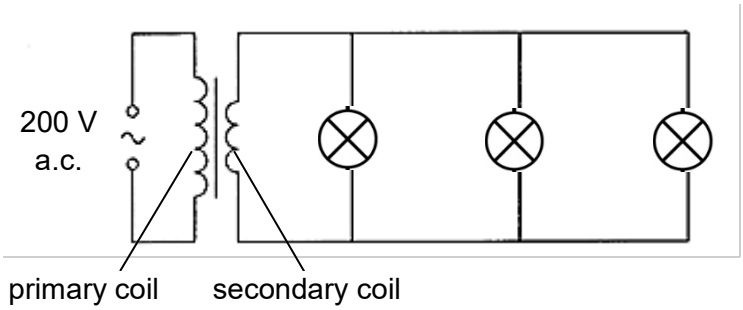
A into the page

B out of the page

C to the bottom right of the page

D to the top left of the page

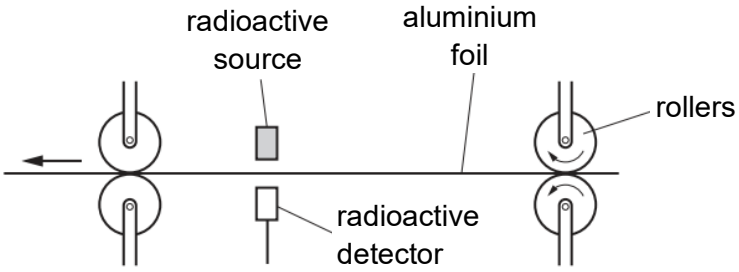
38 The diagram shows a transformer with 80 % efficiency.
Each light bulb is rated at '12 V, 24 W' and is operating normally.



What is the current flowing in the primary coil?

A 0.20 A **B** 0.45 A **C** 2.00 A **D** 2.50 A

39 Thin aluminium foil is used in cooking.
The diagram shows a system used to control the thickness of aluminium foil being made in a factory.



What is the most suitable radioactive source for the system?

	source	half-life of source
A	beta	1 hour
B	beta	6 years
C	gamma	1 hour
D	gamma	6 years

40 $^{14}_{6}C$ is a natural radioactive isotope of carbon and is present in all living things. It has a half-life of 5700 years. The amount of $^{14}_{6}C$ in an animal stays constant while the animal is alive and only starts reducing when the animal dies.

How old is a bone that is found to have only 25% of the natural proportion of $^{14}_{6}C$ remaining?

A 5700 years

B 11 400 years

C 17 100 years

D 22 800 years