Name:		Index Number:		Class:	

CATHOLIC HIGH SCHOOL
Preliminary Examination
Secondary 4 (O-Level Programme)

PHYSICS 6091/01

Paper 1 Multiple Choice

3 September 2025
1 hour

Additional Materials: Multiple Choice Answer Sheet

READ THESE INSTRUCTIONS FIRST

Write in soft pencil.
Do not use paper clips, glue or correction fluid.
Write your name, index number and class on this paper and on the Answer Sheet in the spaces provided.

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.

For examiner's use only:

Total	**/ 40**

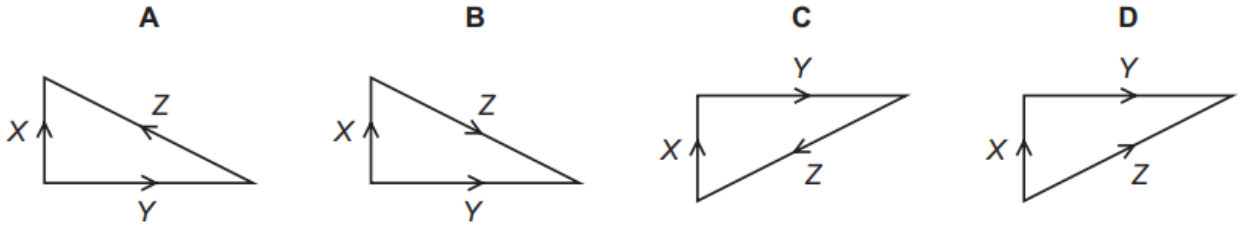
Overall	**Marks**	**%**
Paper 1	40	30%
Paper 2A	70	50%
Paper 2B	10	
Paper 3	40	20%

1 A student wishes to measure directly the circumference of a football.

Which is the most suitable instrument to use?

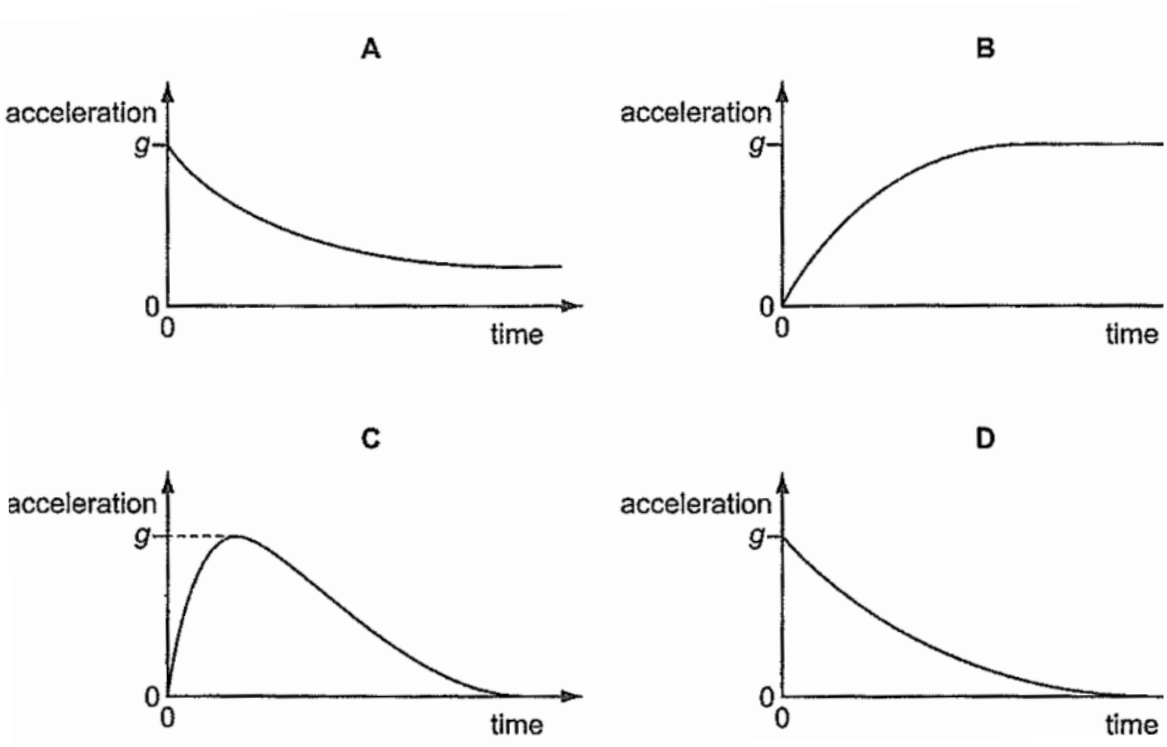
A a digital caliper
B a measuring tape
C a micrometer
D a ruler

2 Which vector diagram correctly shows the force *Z* as the resultant of forces *X* and *Y*?

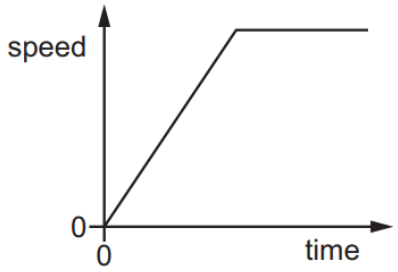


3 An object is dropped from a great height so that air resistance becomes significant.

Which graph shows how its acceleration varies with time?

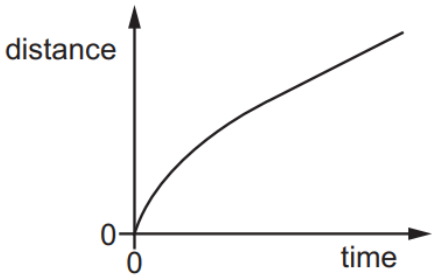


4 A speed-time graph for the journey of a car is shown.

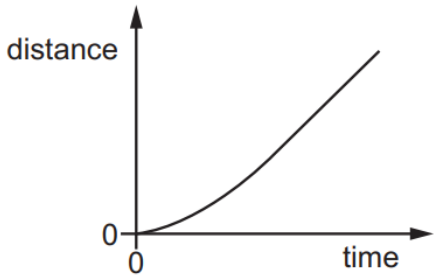


What is the distance-time graph for the journey?

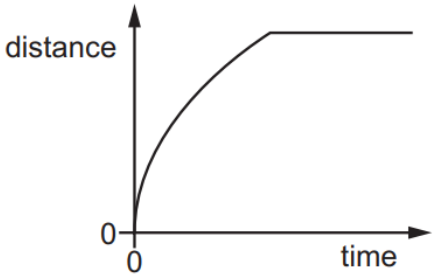
A



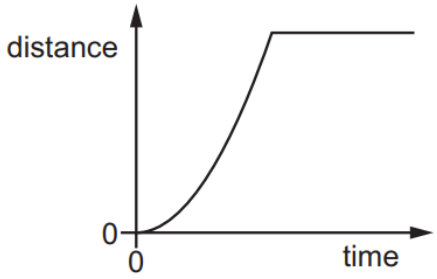
B



C

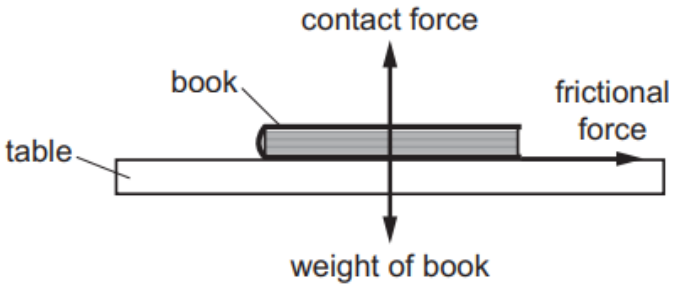


D



5 A train is travelling horizontally in a straight line. A book is on a table in the train.

The diagram shows all the forces acting on the book.



How is the train moving?

A accelerating to the left of the diagram.
B accelerating to the right of the diagram.
C moving at uniform speed to the left of the diagram.
D moving at uniform speed to the right of the diagram.

6 A parachutist jumps off a plane. After 1.0 min, he opens the parachute and his velocity decreases at a decreasing rate.

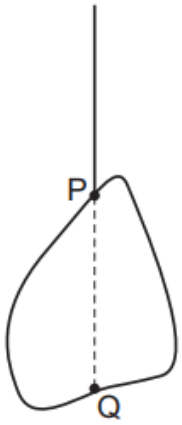
The following statements are possible explanations why the velocity of the parachutist decreases at a decreasing rate.

(I) As the velocity decreases, the air resistance acting on the parachute decreases.
(II) The air resistance is larger than the weight of the parachutist.
(III) The force of the parachute acting on the air increases.

Which of the above statements are correct explanations?

A (I) only
B (I) and (II) only
C (II) only
D (III) only

7 A thin, irregularly shaped metal plate is freely suspended from a point P and is in equilbrium, as shown. Point Q is vertically below P.



Where is the centre of gravity of the plate located?

A It is at P.
B It is at Q.
C It is exactly halfway between P and Q.
D Further investigation is needed to determine its position.

8 The diagram below shows a wine bottle placed in a wooden holder. The bottle and the holder are in equilibrium.

Which of the following statements is true?

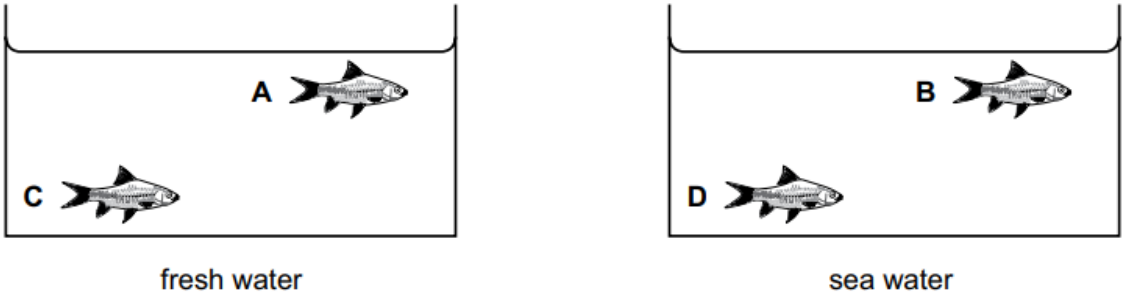
A The centre of gravity of the bottle is directly above the base of the wooden holder.
B The centre of gravity of the bottle and the centre of gravity of the wooden holder are at the same point.
C The centre of gravity of the wooden holder is directly above the base of the wooden holder.
D The combined centre of gravity of the bottle and the wooden holder is directly above the base of the wooden holder.

9 Two identical fish tanks are filled with water to the same level.

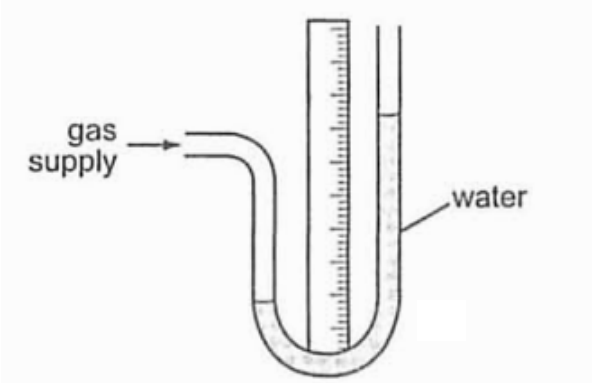
One tank contains fresh water. The other tank contains sea water.

Sea water is more dense than fresh water.

Which fish experiences the greatest pressure?



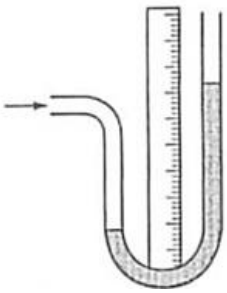
10 A water manometer is connected to a gas supply. The diagram shows the water levels.



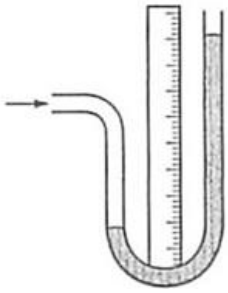
The water is replaced by mercury, which is more dense than water.

Which diagram shows the mercury levels when the manometer is connected to the same gas supply?

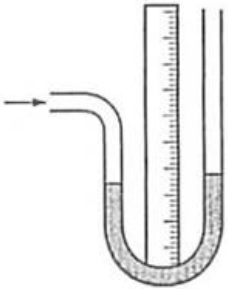
A



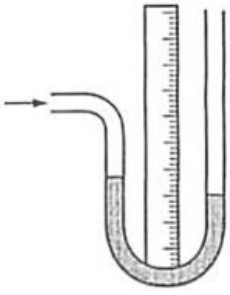
B



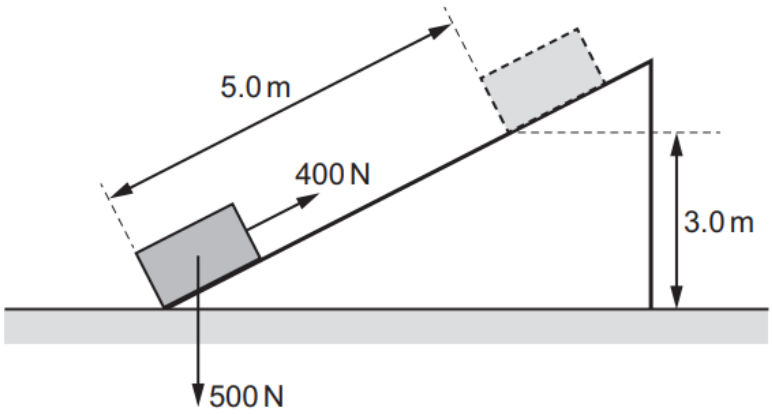
C



D



11 Work is done when a force of 400 N pulls a crate of weight 500 N at a constant speed along a ramp, as shown.



Part of the work done increases the gravitational potential energy E of the crate and the rest is work done W against friction.

What are the values of E and W?

	E / J	W / J
A	1500	500
B	1500	2000
C	2000	2500
D	3500	500

12 A student calculates his power in running up a flight of stairs. He measures the vertical height of the stairs, the time taken to run up the stairs and his weight.

How does he calculate his power?

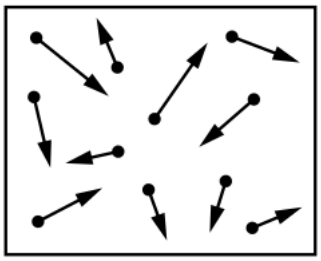
A height × time × weight
B (height × weight) / time
C (time × weight) / height
D weight / (height x time)

13 A student observes the Brownian motion of smoke particles in air with a microscope. He sees moving points of light.

Where do these points of light come from?

A air particles only moving randomly
B air particles only vibrating
C smoke particles only moving randomly
D smoke particles only vibrating

14 The diagram represents particles of a gas inside a closed container of constant volume.



The gas is heated.

What happens to the particles of the gas?

A They expand.
B They get closer together.
C They hit the container walls with less force.
D They move faster.

15 A cold solid is placed on top of a hot solid. Heat is transferred from the hot solid to the cold one.

What is the explanation for this?

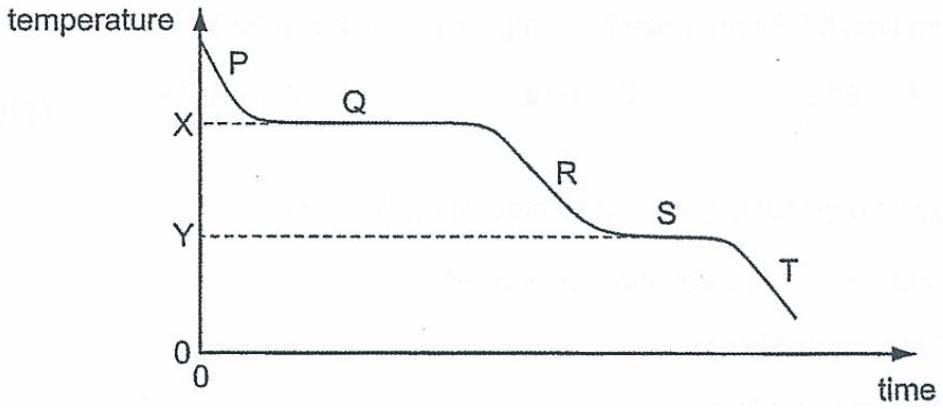
A A hot solid expands, so its particles will move further apart.
B Energy is transferred from one particle to the next.
C Heat always rises.
D Molecules are free to move randomly through the solids.

16 Some hot water is sealed inside a metal can. The can is in a vacuum in outer space. The hot water slowly cools down.

How does the heat escape into space?

A conduction then convection
B conduction then radiation
C evaporation then convection
D evaporation then radiation

17 A vapour in a container is at a high temperature and loses heat to its surroundings. The graph shows how its temperature changes over the next few minutes.



Which feature of the graph indicates that the specific latent heat of vaporisation of the substance is greater than its specific latent heat of fusion?

A The gradient of the graph at P is greater than the gradient at R.
B The gradient of the graph at T is greater than the gradient at R.
C The length of the line Q is greater than the length of the line S.
D The value of X is greater than the value of Y.

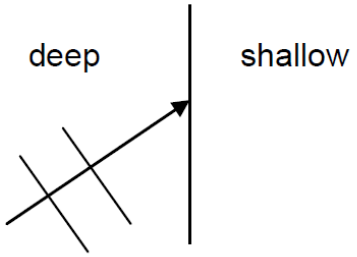
18 Equal masses of copper and water are heated to the same temperature. As they cool down, the copper and the water lose heat at the same rate.

The temperature of the copper falls faster.

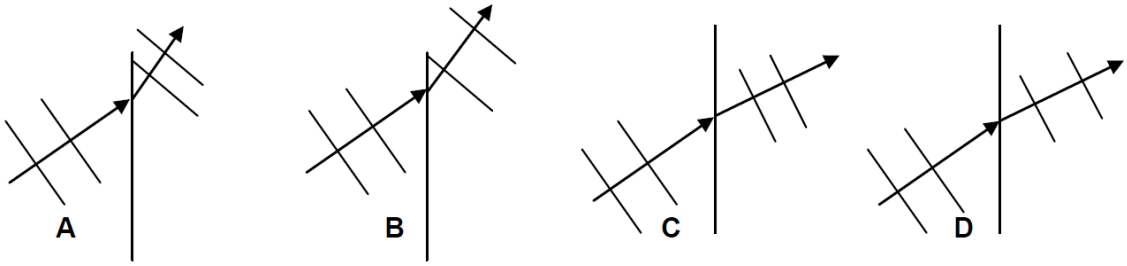
Why is this?

A Copper has a larger specific heat capacity.
B Copper has a larger specific latent heat.
C Copper has a smaller specific heat capacity.
D Copper has a smaller specific latent heat.

19 The figure below shows straight parallel water waves travelling from the deep region to the shallow region in a ripple tank.

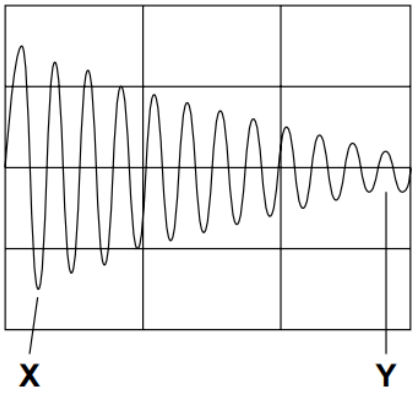


Which one of the following diagrams shows correctly the waves in the shallow region?



20 The diagram represents a sound wave, where the x-axis represents time.

The sound wave changes from X to Y.



Which statement about the sound wave is correct?

A The amplitude of the wave is increasing.
B The frequency of the wave is decreasing.
C The loudness of the sound is decreasing.
D The pitch of the sound is increasing.

21 Which of the following does a remote controller emit?

A infra-red radiation
B microwave radiation
C ultrasound
D ultraviolet radiation

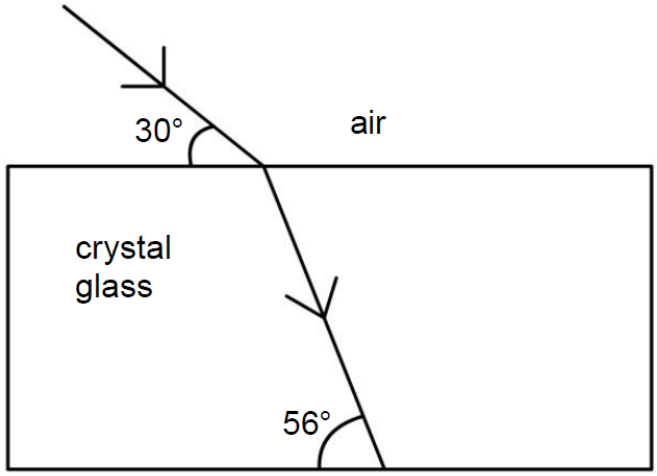
22 What is the speed of electromagnetic waves in a vacuum?

A 3.0×10^4 cm / s
B 3.0×10^5 km / s
C 3.0×10^6 cm / s
D 3.0×10^{11} km / s

23 What is the refractive index of a medium?

A the ratio of the speed of light in air to the speed of light in the medium
B the ratio of the speed of light in the medium to the speed of light in air
C the ratio of the speed of light in the medium to the speed of light in vacuum
D the ratio of the speed of light in vacuum to the speed of light in the medium

24 The figure below (not drawn to scale) shows a ray of light passing from air into a rectangular block made of crystal glass.

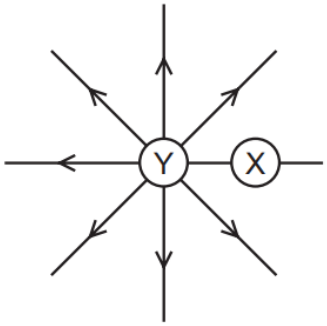


What is the critical angle of the crystal glass?

A 37° **B** 40° **C** 63° **D** 73°

25 Object X is stationary and negatively charged. It experiences a force due to the field produced by object Y.

The arrows show the direction of the field produced by Y.



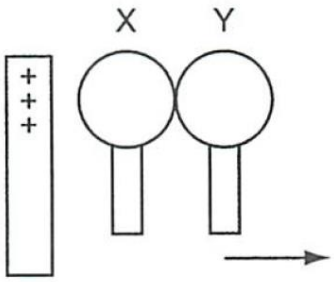
Which statement about the direction of the force on X is correct?

A It is towards the left because it is in an electric field.
B It is towards the right because it is in an electric field.
C It is towards the left because it is in a magnetic field.
D It is towards the right because it is in a magnetic field.

26 Two insulated, uncharged metal spheres X and Y are initially in contact.

While a positively-charged rod is near X, the spheres are moved apart.

After this action, X has a negative charge.



Which of the following describes the charge on Y?

A negative and smaller than the charge on X
B negative and the same size as the charge on X
C positive and smaller than the charge on X
D positive and the same size as the charge on X

27 A battery is connected to a circuit. It is switched on for 1.0 minute. During that time, there is a current of 0.40 A in the circuit and the battery supplies 48 J of energy.

Which row gives the charge that passes and the electromotive force (e.m.f.) of the battery?

	charge that passes in 1.0 minute / C	e.m.f. of the battery / V
A	0.40	2.0
B	0.40	120
C	24	2.0
D	24	120

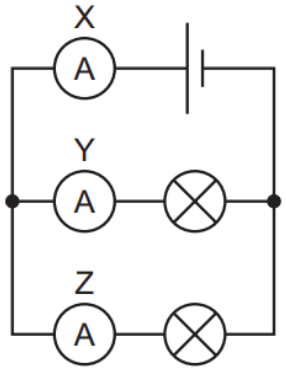
28 A resistor with resistance R is made from a length L of resistance wire with a cross-sectional area A.

A second resistor with resistance $2R$ is made from wire of the same material with a cross-sectional area of $A/4$.

What length of wire is needed for the second resistor?

A $L / 2$ **B** L **C** $2L$ **D** $8L$

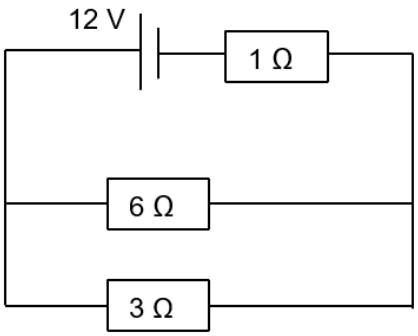
29 The circuit diagram shows two identical lamps connected in parallel to a cell. Three ammeters, X, Y and Z, are also connected in the circuit, as shown.



Which statement about the current in X is correct?

A It is equal to the current in Y and to the current in Z.
B It is less than either the current in Y or the current in Z.
C It is equal to the sum of the current in Y and the current in Z.
D It is equal to the difference between the current in Y and the current in Z.

30 The circuit below consists of a 12 V d.c. supply and three resistors.



What is the potential difference across the 3 Ω resistor?

A 4.0 V
B 8.0 V
C 11.3 V
D 12.0 V

31 X and Y are lamps with filaments made from the same material. The filament of lamp X is thicker and shorter than that of lamp Y.

When individually connected to the mains and switched on, which is the brighter lamp and which lamp has the larger resistance?

	brighter lamp	larger resistance
A	X	X
B	X	Y
C	Y	X
D	Y	Y

32 An electric cooker is rated 2.5 kW, 250 V.

What is the correct fuse rating, and where should it be connected to a 125 V supply?

A 8 A fuse connected to live wire
B 8 A fuse connected to neutral wire
C 23 A fuse connected to live wire
D 23 A fuse connected to neutral wire

33 It costs $0.30 for 1 kWh of energy transferred electrically to a household.

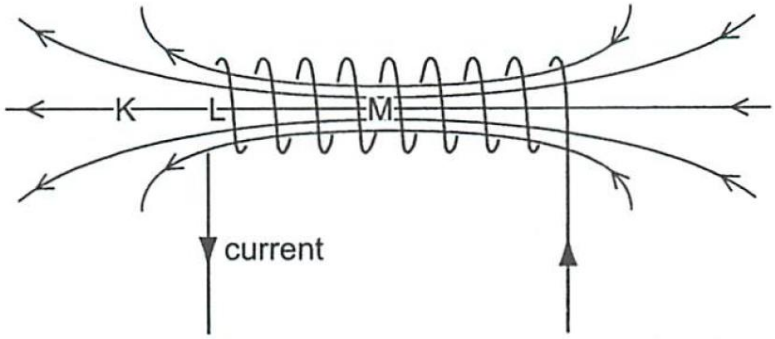
How much will it cost to run a 60 W lamp for 10 hours?

A $0.05 **B** $0.18 **C** $3.00 **D** $18.00

34 Which statement about magnetism is correct?

A A magnet attracts small pieces of aluminium.
B Steel makes a better permanent magnet than iron does.
C There is no limit to the magnetic strength of a magnet made from a steel bar.
D Two like poles always attract one another.

35 The diagram shows the magnetic field pattern due to a current in a solenoid.

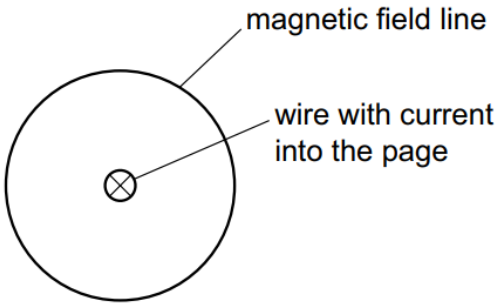


Which statement is correct?

A The strength of the field is greater at K than it is at L.
B The strength of the field is greater at M than it is at L.
C The strength of the field is greater at K than it is at M.
D The strength of the field is greater at L than it is at M.

36 There is an electric current in a straight wire in the direction into the page. This produces a magnetic field around the wire.

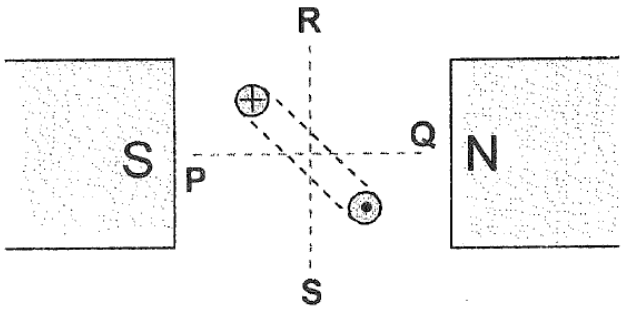
All the field lines are circles but only one field line is shown.



Which row describes the magnetic field?

	direction of field lines	spacing of field lines
A	anti-clockwise	equally spaced over the whole field
B	anti-clockwise	more widely spaced further from the wire
C	clockwise	equally spaced over the whole field
D	clockwise	more widely spaced further from the wire

37 The diagram below shows the plan view of a current-carrying rectangular coil placed in a uniform magnetic field. The coil is free to rotate, and the direction of the current in the coil is constant.

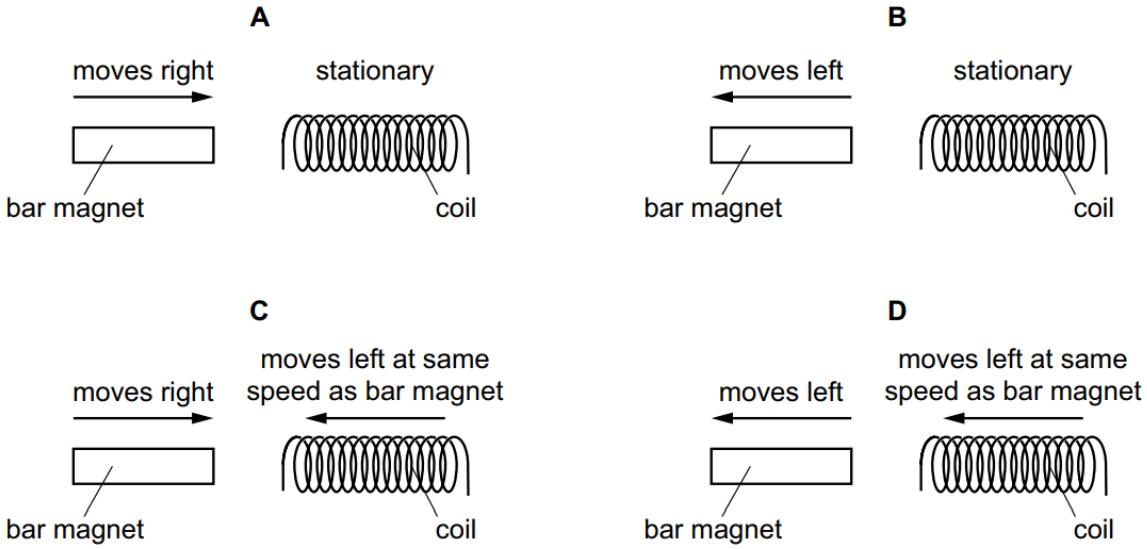


Which of the following correctly describes the motion of the coil?

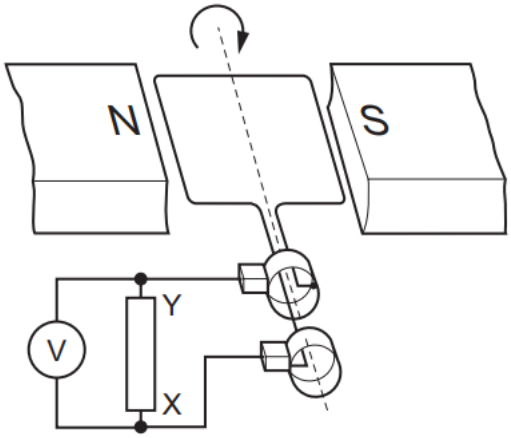
A It rotates anti-clockwise and stops.
B It rotates anti-clockwise continuously.
C It rotates clockwise and stops.
D It rotates clockwise continuously.

38 The diagram shows a bar magnet and a coil of wire. The bar magnet is moved at the same speed in each experiment.

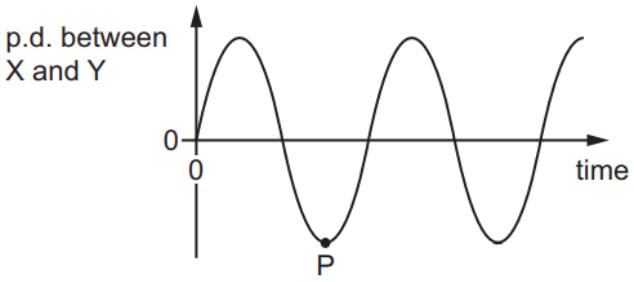
In which situation is the largest electromotive force (e.m.f.) induced?



39 The diagram shows an a.c. generator.

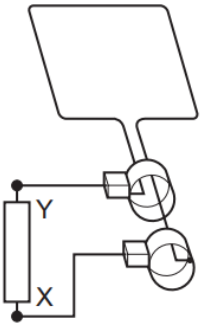


The graph shows the potential difference (p.d.) between points X and Y plotted against time. A positive value of p.d. indicates that X is at a higher potential than Y.

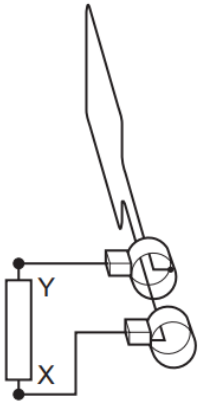


Which diagram shows the position of the coil at point P on the graph?

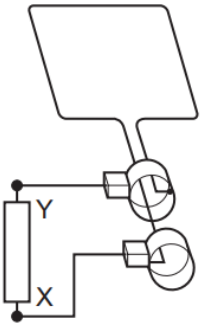
A



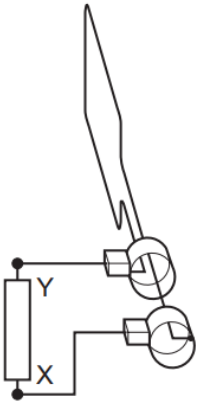
B



C



D



40 The uranium atom $^{238}_{92}U$ emits an α-particle to become thorium, which then emits a β-particle to become protactinium.

What is the atomic number of protactinium?

A 89
B 90
C 91
D 93

END OF PAPER