O

FAJAR SECONDARY SCHOOL
2021 PRELIMINARY EXAMINATIONS
SECONDARY 4 EXPRESS

11

CANDIDATE NAME

CLASS

INDEX NUMBER
N / O LEVEL INDEX NUMBER

PHYSICS
Paper 1 Multiple Choice

Additional Materials: OTAS Sheet

6091/01

Date: 14 September 2021
Duration: 1 Hour

READ THESE INSTRUCTIONS FIRST

Write in soft pencil.
Do not use staples, paper clips, highlighters, glue or correction fluid.
Write your name and index number on the Question Paper and OTAS Sheet in the spaces provided.

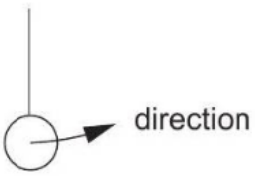
There are **forty** questions on this paper. Answer **all** questions. For each question there are **four** possible answers **A**, **B**, **C** and **D**.
Choose the **one** you consider correct and record your choice in **soft pencil** on the separate OTAS Sheet.

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.

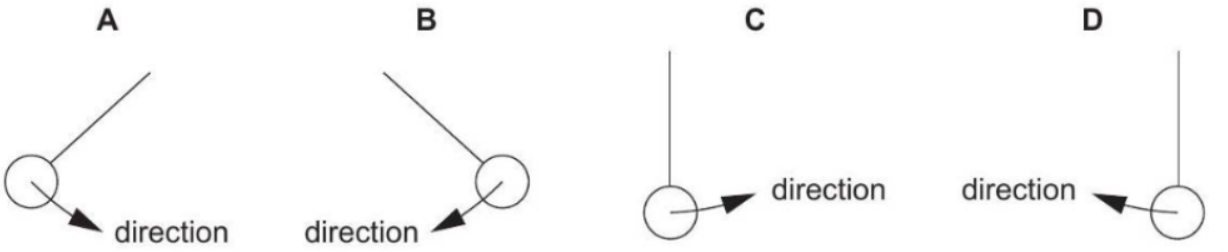
Do not open this document till permission is given.

This document consists of **24** printed pages and 0 blank pages.

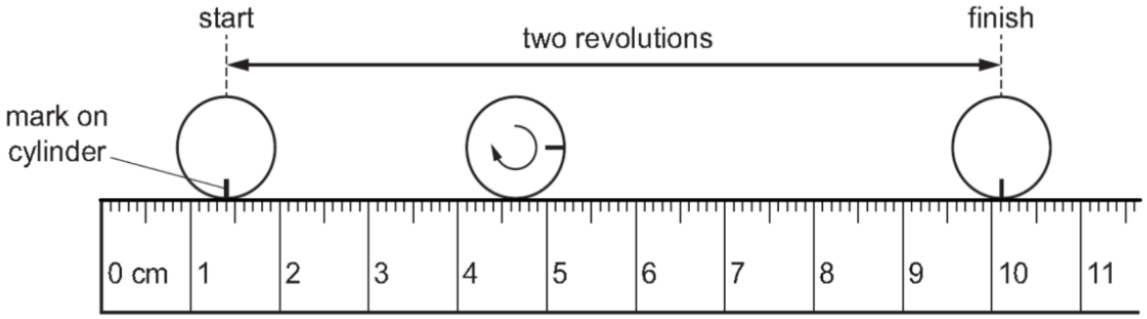
1 A pendulum has a period of 1.0 s. A stopwatch is started when the pendulum is vertical and is moving to the right as shown.



Which diagram shows the position and direction of the pendulum 2.5 s later?



2 A small cylinder is rolled along a ruler and completes two revolutions.



What is the circumference of the cylinder?

A 4.4 cm

B 5.2 cm

C 8.7 cm

D 10.1 cm

3 The diagram shows a satellite that is moving at a uniform rate in a circular orbit around the Earth.

Which statement describes the motion of this satellite?

A It is accelerating because its speed is changing.

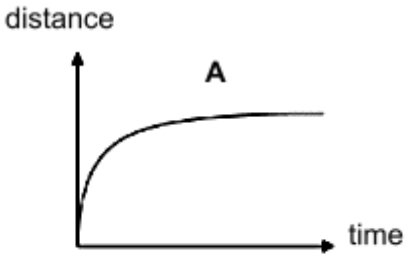
B It is accelerating because its velocity is changing.

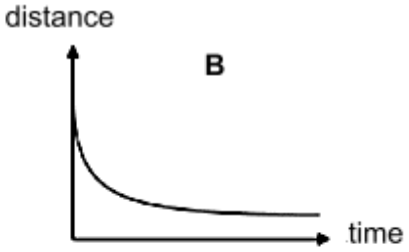
C It is not accelerating but its speed is changing.

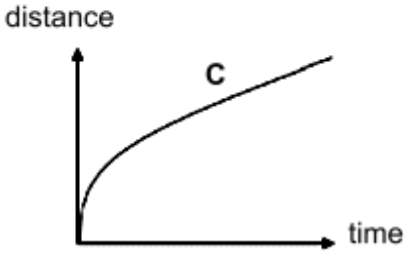
D It is not accelerating but its velocity is changing.

4 A sky diver jumps off from an aeroplane and reaches terminal velocity after some time.

Which graph shows how the distance of the sky diver changes with time?

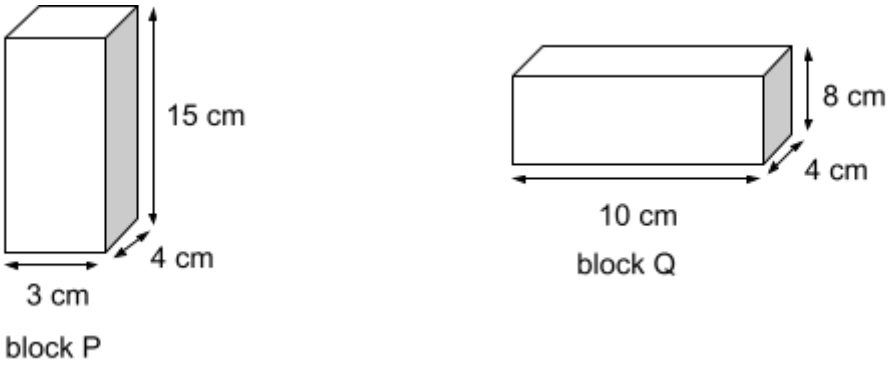






5 The diagram shows two blocks.

Block P has a density two times that of block Q.



Which statement about the mass of the blocks is correct?

A Blocks P and Q have the same mass.

B 8 blocks of P have the same mass as 9 blocks of Q.

C 9 blocks of P have the same mass as 8 blocks of Q.

D 16 blocks of P have the same mass as 9 blocks of Q.

6 When a resultant force is applied to a body, several effects are possible.

Which effect could **not** occur?

A The body changes direction at a constant speed.

B The body rotates about a fixed point.

C The body slows down.

D The mass of the body decreases.

7 A pulling force of 20 N is exerted on a block of wood of mass 2.0 kg.

If the block accelerates at 5.0 m/s^2, what is the frictional force acting on the wood?

A 1.0 N

B 8.0 N

C 10 N

D 30 N

8 Which situation illustrates the effect of inertia?

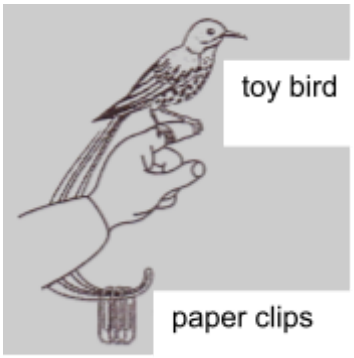
A A force applied to the shopping cart gives the cart an acceleration.

B A moving shopping cart will eventually come to rest.

C It is difficult to stop a moving shopping cart full of groceries immediately.

D The groceries inside a shopping cart jerk forward when the shopping cart starts moving forward.

9 A toy bird balances on the finger of a girl as shown in the diagram.



What is the use of the paper clips?

A To change the weight of the toy for stability.

B To increase the surface area of the toy for stability.

C To lower the centre of gravity of the toy for stability.

D To raise the centre of gravity of the toy for stability.

10 An object falls from the top of a building that is 25 m high. Air resistance is negligible.

What is the speed of the object when it hits the ground?

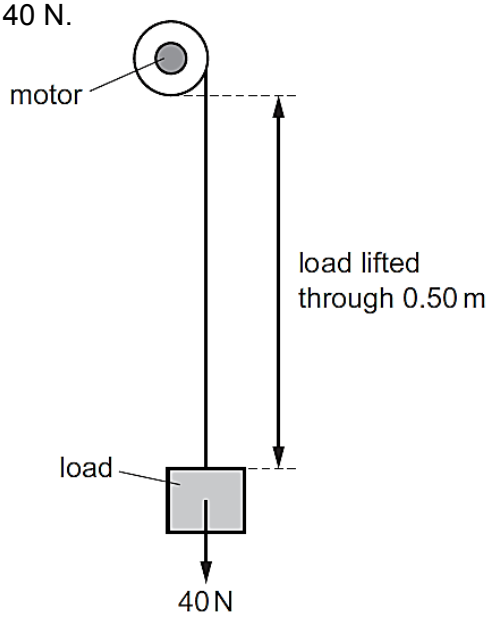
A 10 m/s

B 22 m/s

C 25 m/s

D 625 m/s

11 A motor is used to lift a load of 40 N.



The power of the motor is 40 W and the system is 20% efficient.

How long does it take the motor to lift the load through 0.50 m?

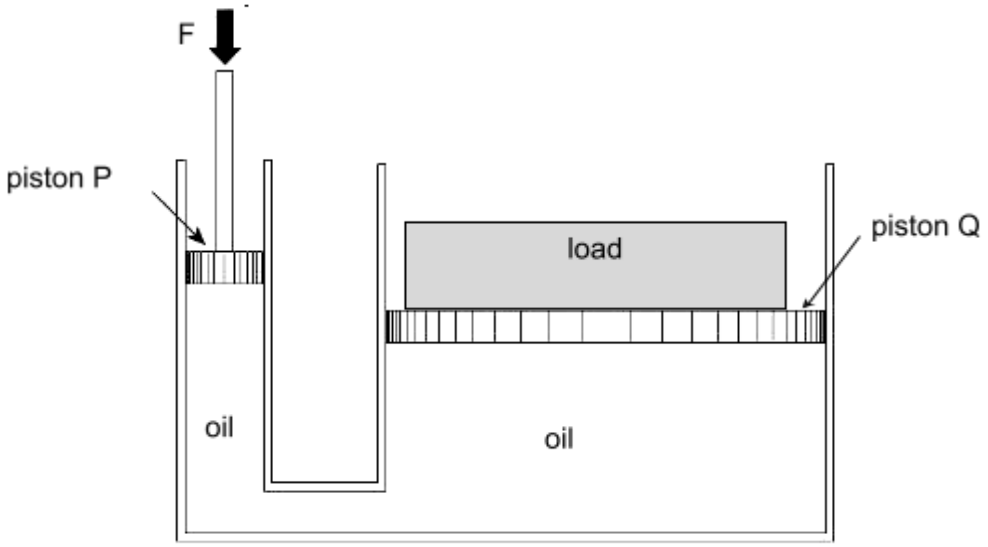
A 0.50 s

B 2.5 s

C 5.0 s

D 25 s

12 The diagram shows a simple hydraulic system.



Which comparison is true?

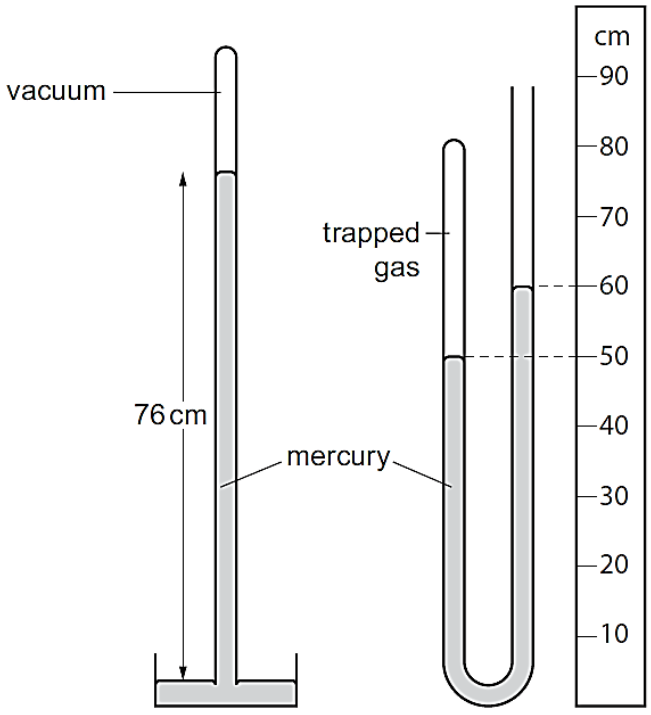
A The force F is the same as the weight of the load.

B The force F is greater than the weight of the load.

C The pressure on piston P is the same as the pressure on piston Q.

D The pressure on piston P is smaller than the pressure on piston Q.

13 The diagram shows a simple mercury barometer alongside a mercury manometer. The manometer contains some trapped gas.



What is the pressure of the trapped gas?

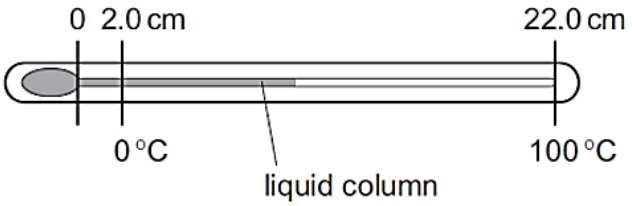
A 10 cm of mercury

B 50 cm of mercury

C 66 cm of mercury

D 86 cm of mercury

14 The diagram shows a liquid-in-glass thermometer. At 0 °C, the length of the liquid column is 2.0 cm. At 100 °C, the length of the liquid column is 22.0 cm.



What is the length of the liquid column at 40 °C?

A 6.0 cm

B 8.0 cm

C 8.8 cm

D 10.0 cm

15 When the Brownian motion of smoke particles in air is observed with a microscope, bright specks of light are seen.

These bright specks of light are reflections from

A air molecules only, moving randomly.

B both smoke particles and air molecules, moving randomly.

C smoke particles only, moving randomly.

D smoke particles only, vibrating.

16 Which statement about thermal radiation is correct?

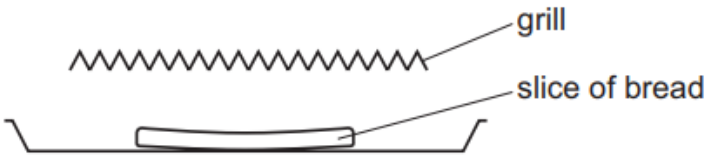
A In a vacuum, thermal radiation travels at the speed of light.

B Thermal radiation is a longitudinal wave.

C Thermal radiation travels as an ultra-violet wave.

D White surfaces are better emitters of thermal radiation than black surfaces.

17 A slice of bread is placed under a red-hot electric grill to make toast.



How is thermal energy transferred from the grill to the bread?

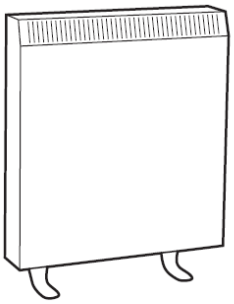
A radiation only

B conduction and radiation

C convection and radiation

D conduction, convection and radiation

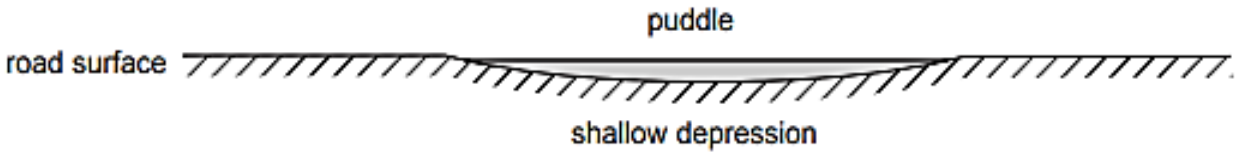
18 A night storage heater contains a large block of material that is heated electrically during the night. During the day the block cools down, releasing thermal energy into the room.



Which thermal capacity and which night-time temperature increase will cause the most energy to be stored by the block?

	thermal capacity of block	night-time temperature increase
A	large	large
B	large	small
C	small	large
D	small	small

19 The diagram shows a cross-section through a rain-water puddle formed in a shallow depression on a road surface.



Over a period of time, the air temperature, wind speed and wind direction all remain constant.

What happens to the rate of evaporation of water from the puddle?

A It decreases, because the surface area decreases.

B It increases, because the puddle gets shallower.

C It increases, because the surface area decreases.

D It remains constant.

20 A student wishes to calculate the specific heat capacity of copper.

He has a block of copper and an electrical heater. He knows the power of the heater.

Which other apparatus does he need?

	balance	stopwatch	thermometer
A	✔	✔	✔
B	✔	✔	☐
C	✔	☐	✔
D	☐	✔	✔

key:

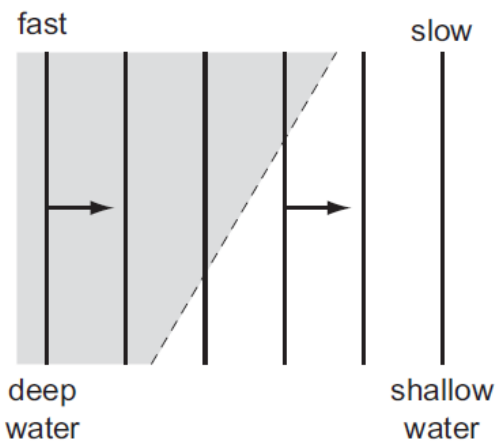
✔ = needed

☐ = not needed

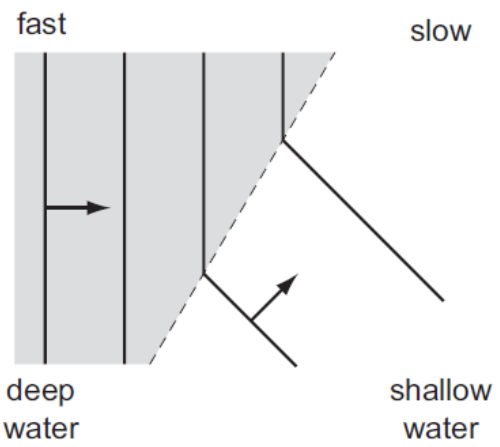
21 The diagrams show water waves that move more slowly after passing into shallow water.

Which diagram shows what happens to the waves?

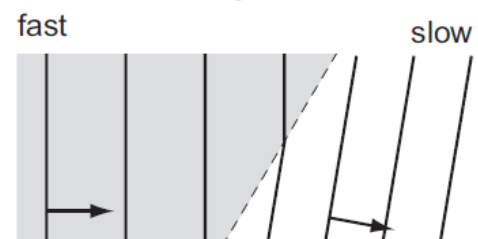
A



B



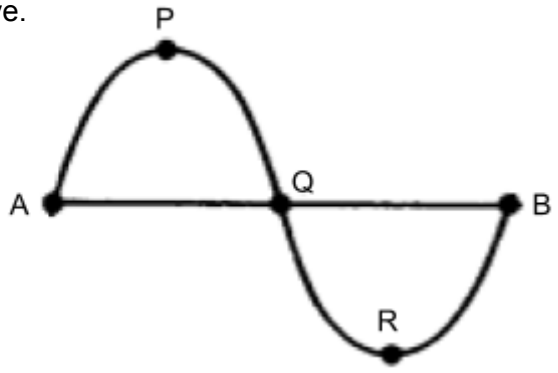
C



D

22 The diagram shows a rope wave moving from point A to B.

P, Q and R are points on the wave.



At the particular instant shown, what is the direction of movement of points P, Q and R?

	P	Q	R
A	down	down	down
B	down	up	up
C	up	down	up

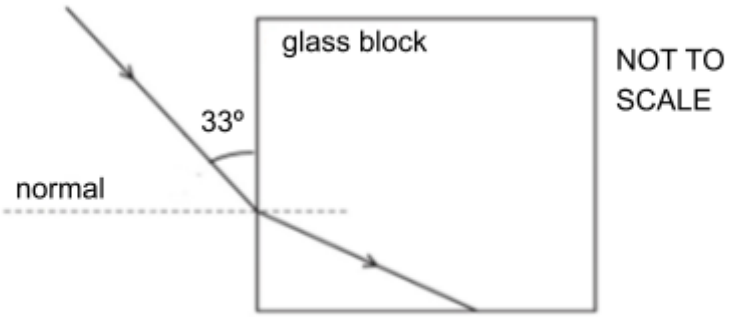
D	up	up	up

23 The wavelengths of visible light range from 4.0×10^{-7} m to 7.0×10^{-7} m.

Which combination represents wavelengths for infrared, red and violet light?

	infrared	red light	violet light
A	1.0×10^{-4} m	4.0×10^{-7} m	7.0×10^{-7} m
B	1.0×10^{-4} m	7.0×10^{-7} m	4.0×10^{-7} m
C	1.0×10^{-7} m	4.0×10^{-7} m	7.0×10^{-7} m
D	1.0×10^{-9} m	7.0×10^{-7} m	4.0×10^{-7} m

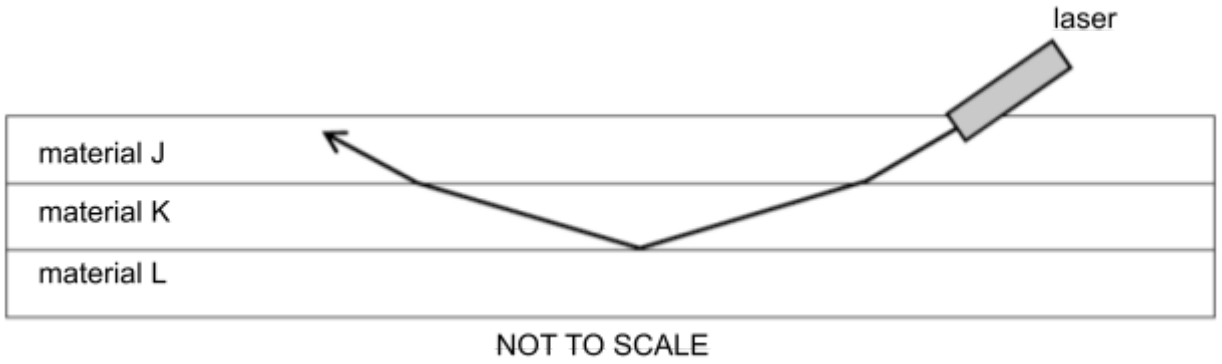
24 The diagram shows a light ray passing from air into a glass block of refractive index 1.5.



What is the angle of refraction in the glass and critical angle of the glass?

	angle of refraction / °	critical angle / °
A	34	42
B	34	60
C	38	42
D	38	60

25 A laser shoots a ray of light into a stack of 3 different transparent materials as shown in the diagram.



Which row shows the refractive indices of materials J, K and L?

	material J	material K	material L
A	1.13	1.44	1.52
B	1.13	1.52	1.44
C	1.44	1.13	1.52
D	1.52	1.44	1.13

26 What happens when a sound dies away?

A Its amplitude decreases.

B Its frequency decreases.

C Its speed decreases.

D Its wavelength decreases.

27 A student stands 210 m in front of a vertical, flat cliff and bangs together two pieces of wood to make a short, loud sound.

A timer records the echo of the sound 1.5 seconds after the pieces of wood are banged together.

Based on this result, what is the speed of sound?

A 140 m/s

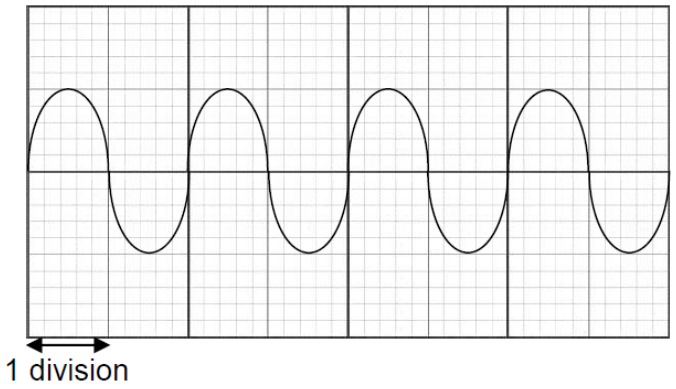
B 280 m/s

C 320 m/s

D 630 m/s

28 The diagram shows the trace on a cathode-ray oscilloscope when a microphone which is connected to it picks up sound.

The time base is set at 10 ms/div.



What is the frequency of the sound?

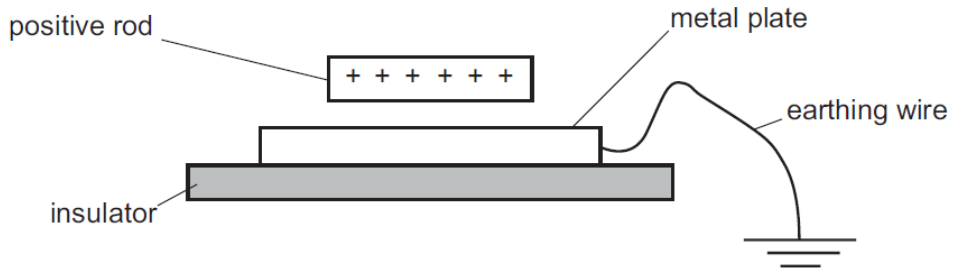
A 0.050 Hz

B 0.10 Hz

C 50 Hz

D 100 Hz

29 A positively charged plastic rod is placed just above a thick metal plate. The metal plate rests on an insulator and is connected to the earth by a wire.



A student disconnects the earthing wire and then removes the positively charged rod.

The experiment is repeated. This time the student removes the positively charged rod and then removes the earthing wire.

Which statement is correct?

A When the earthing wire is disconnected first, the metal plate becomes positively charged.

B When the earthing wire is disconnected first, the metal plate becomes negatively charged.

C When the plastic rod is removed first, the metal plate becomes positively charged.

D When the plastic rod is removed first, the metal plate becomes negatively charged.

30 Which piece of copper wire has the greatest electrical resistance?

	length of wire/ m	diameter of wire/ mm
A	1.0	2.0
B	1.0	4.0
C	5.0	2.0
D	5.0	4.0

31 The electromotive force of a battery is 4.0 V.

How much current flows through it when 3.0 kJ of chemical potential energy is converted to electrical energy in a minute?

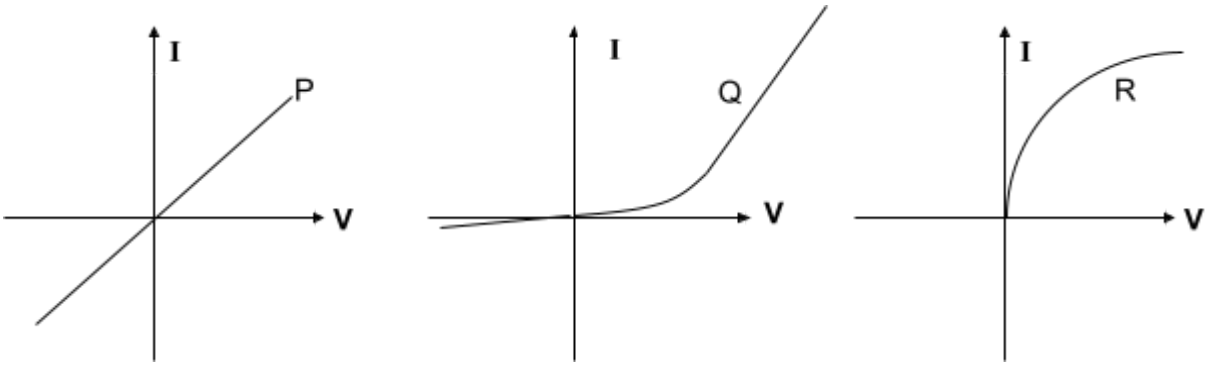
A 0.0125 A

B 12.0 A

C 12.5 A

D 750 A

32 The diagram shows the graphs for the I-V characteristics of three different components P, Q and R.



Which statement is true?

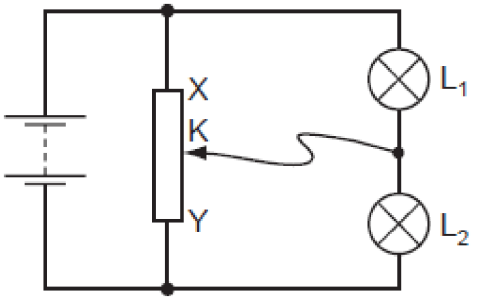
A P is not an ohmic component.

B Q is a filament lamp.

C The resistance of P is increasing.

D The resistance of R is increasing.

33 The diagram shows a potential divider circuit with two identical lamps L_1 and L_2.



The contact K is halfway between X and Y and the lamps are equally bright.

What will happen to the brightness of the lamps when contact K is moved a short distance towards X?

	lamp L_1	lamp L_2
A	brighter	brighter
B	brighter	dimmer
C	dimmer	brighter
D	dimmer	dimmer

34 An electrical household appliance uses 12 kWh of electrical energy after 4 hours of operation. If one unit of electricity costs 26 cents, what would be the electrical power of the appliance and the cost of energy usage?

	electrical power / kW	cost / cents
A	3	104
B	3	312
C	12	312
D	48	1248

35 Which method is used to magnetise a steel bar?

A placing the steel bar inside a coil connected to an a.c. supply

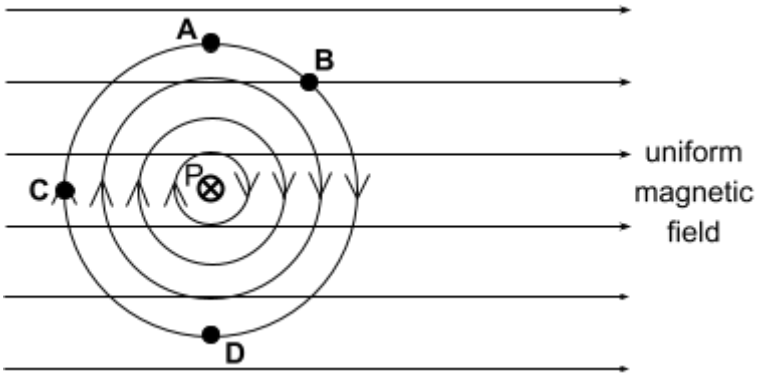
B placing the steel bar inside a coil connected to a d.c. supply

C withdrawing the steel bar from inside a coil connected to a d.c. supply

D withdrawing the steel bar from inside a coil connected to an a.c. supply

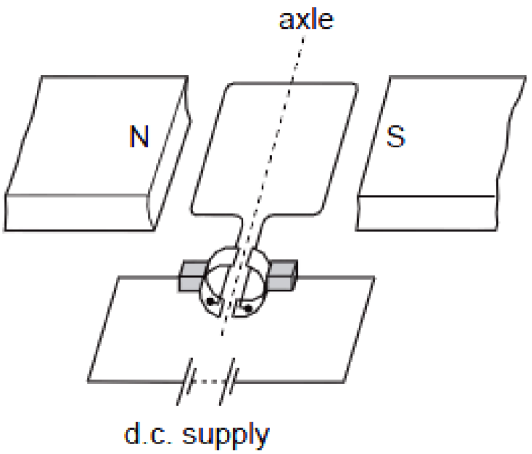
36 P represents one straight wire carrying current into the plane of the paper. This produces a circular magnetic field in the region around P.

P is placed in a uniform magnetic field.



At which point will the magnetic field be the strongest?

37 The diagram below shows a d.c. motor.



What is the purpose of the split-ring commutator?

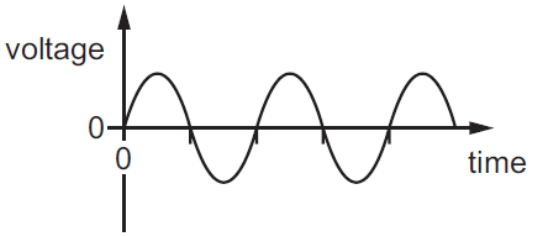
A to change the current direction in the coil as the coil passes the horizontal position

B to change the current direction in the coil as the coil passes the vertical position

C to change the current direction in the d.c. supply as the coil passes the horizontal position

D to change the current direction in the d.c. supply as the coil passes the vertical position

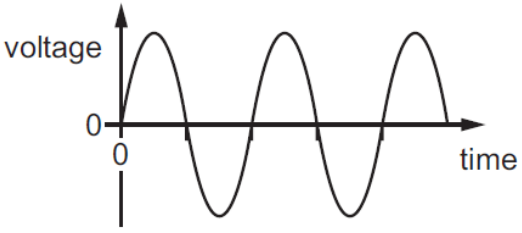
38 The graph shows how the voltage induced across a coil changes with time as the coil spins in a magnetic field.



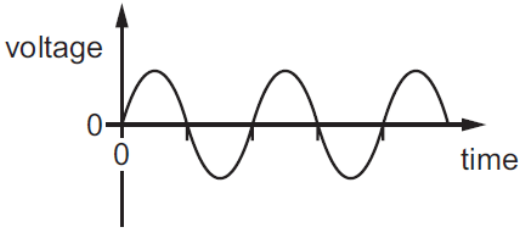
Which graph shows what happens when the coil spins more quickly?

(All graphs are drawn to the same scale.)

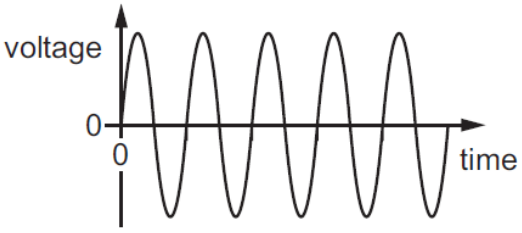
A



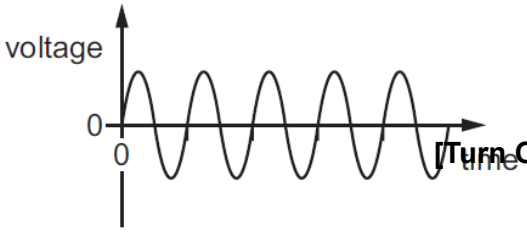
B



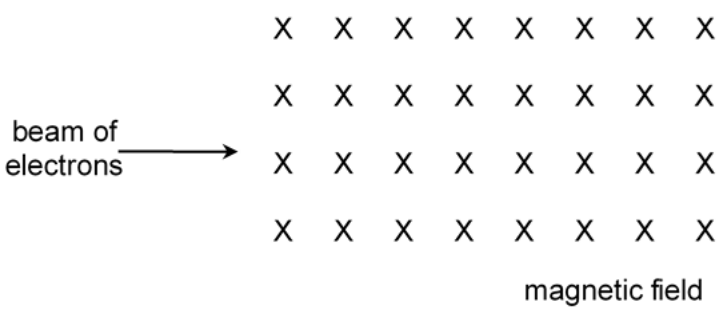
C



D



39 The diagram shows a beam of electrons entering a magnetic field.



What is the effect of the magnetic field on the electrons?

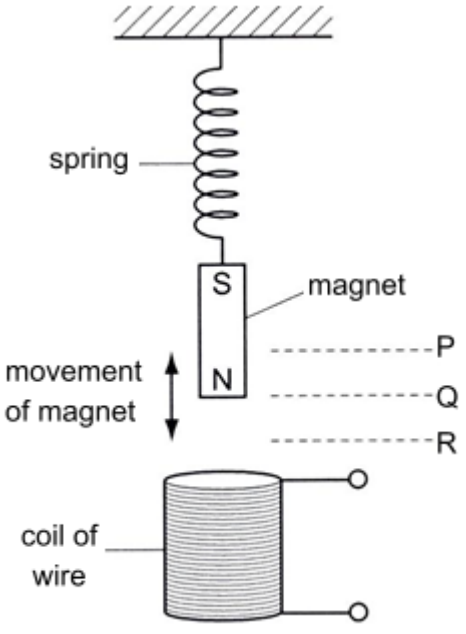
A The electrons undergo no deflection.

B The electrons are deflected out of the paper.

C The electrons are deflected towards the bottom of the diagram.

D The electrons are deflected towards the top of the diagram.

40 A magnet moves up and down above a coil of wire.



The bottom of the magnet moves up and down between P and R.

Where is the bottom of the magnet when there is no induced electromotive force (e.m.f.) in the coil?

A at P and at Q

B at P and at R

C at Q only

D at R only

- End of Paper -