

Name: _____ ()

Class : Sec 4 / ()



南 华 中 学

NAN HUA HIGH SCHOOL

PRELIMINARY EXAMINATION 2025

Subject : Physics

Paper : 6091/1

Level : Secondary Four

Date : 3 September 2025

Duration : 1 hour

Additional Materials: Multiple Choice Answer Sheet

READ THESE INSTRUCTIONS FIRST

Write in soft pencil.

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

Write your name, class and index number on the separate Answer Sheet in the spaces provided.

There are **forty** questions in 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.

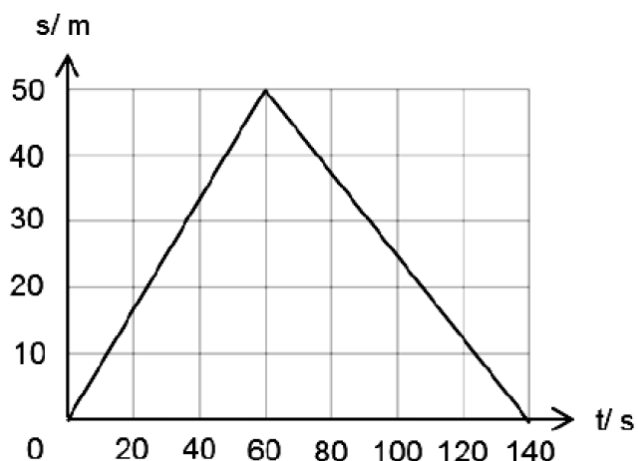
INFORMATION FOR CANDIDATES

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 What is the estimate of the radius of planet earth?
- A 6.4 km B 6.4 Mm C 6.4 Gm D 6.4 Tm
- 2 The graph shows how the displacement of a girl changes as she walks on a pavement.



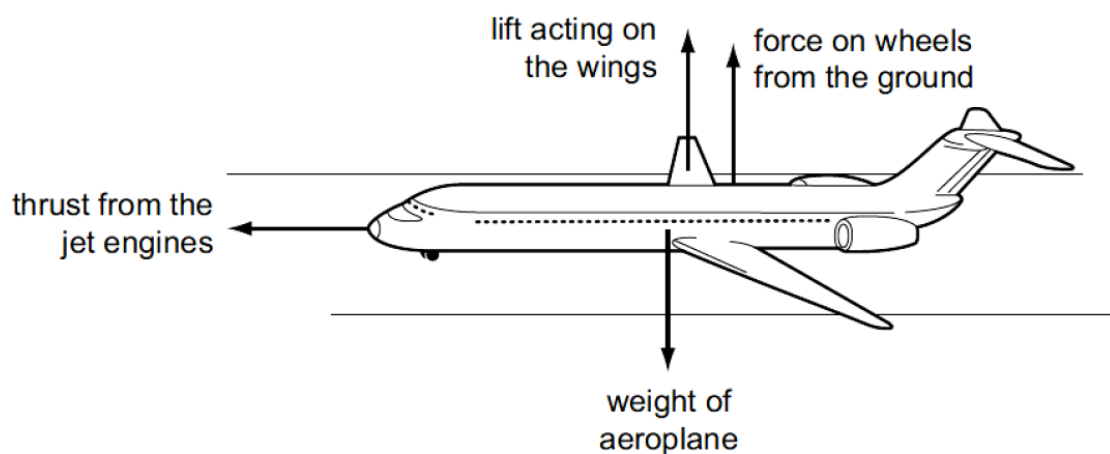
What is the total distance travelled by the girl?

- A 0 m B 50 m C 100 m D 3 500 m
- 3 At $t = 0$ s, a stone is thrown vertically up into the air at 20 m/s.

Which of the following best describes the motion of the stone in the air at $t = 2.0$ s?

	speed / m/s	acceleration / m/s ²
A	10	0
B	10	10
C	0	0
D	0	10

- 4 An aeroplane is half way along a runway before it takes off.



The arrows show the directions of four forces acting on the aeroplane.

The drag forces on the aeroplane are negligible.

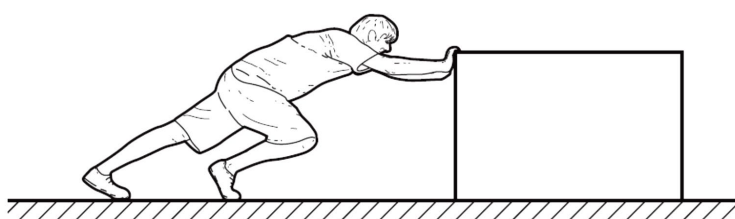
The gravitational field strength, g , is 10 N / kg .

The acceleration of the aeroplane is 2 m / s^2 .

What is the largest force?

- A the force on the wheels from the ground
- B the lift acting on the wings
- C the thrust from the jet engines
- D the weight of the aeroplane

- 5 A man pushes a heavy box along the ground.

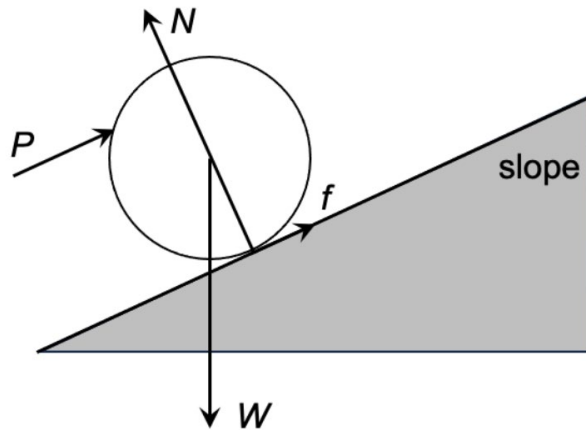


A force acts between the man's hands and the box. Another force acts between the man's feet and the floor.

In which directions do these forces act on the man?

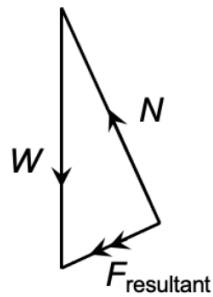
	force on man's hands	force on man's feet
A	towards the left	towards the left
B	towards the left	towards the right
C	towards the right	towards the left
D	towards the right	towards the right

- 6 A fully loaded barrel of weight W is being rolled up a slope before coming to a stop. The image below shows the force P required to hold the barrel at rest on the slope, the frictional force f between the barrel and the slope, and the normal contact force N on the barrel by the slope.

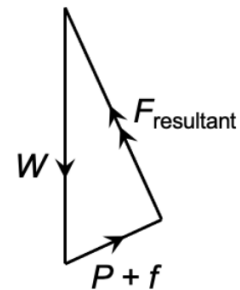


Which diagram represents the forces exerted by the slope on the barrel and their resultant force?

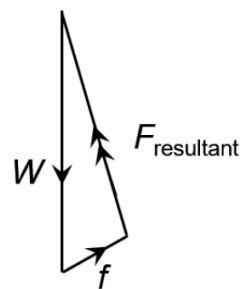
A



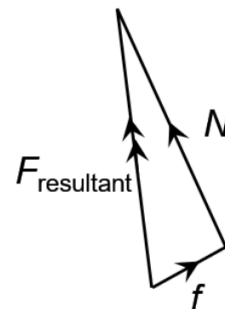
B



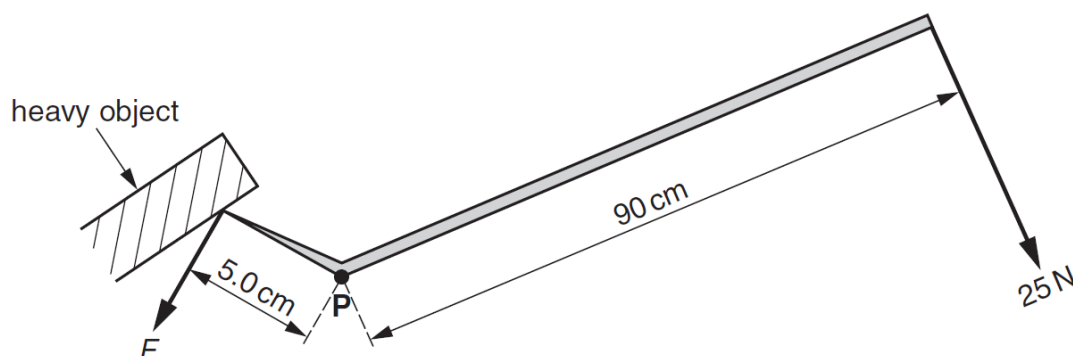
C



D



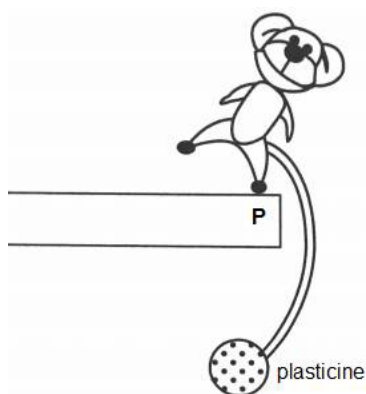
- 7 A lever is used to lift a heavy object.



A force of 25 N is applied at a distance of 90 cm from the pivot P. The load F exerted by the heavy object on the lever is 5.0 cm from pivot P. The directions of the 25 N force and of the load F are both at right-angles to the lever. Assume the mass of the lever is negligible.

What is the resultant moment about pivot P if load F is 500 N?

- A 0 Nm
B 2.5 Nm anticlockwise
C 22.5 Nm clockwise
D 250 Nm anticlockwise
- 8 A toy monkey is placed at the edge of a table at point P as shown. The toy can be balanced on the table by adding a lump of plasticine at the end of the tail.

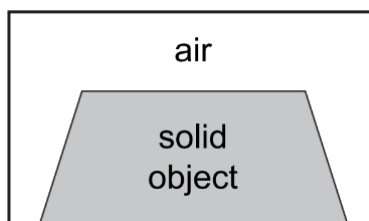


In which position is the toy's centre of gravity?

- A directly above P
B directly below P
C directly above the plasticine
D directly below the plasticine

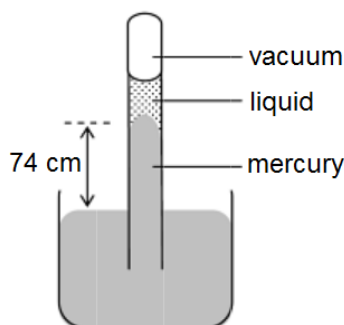
- 9 A box has an internal volume of 1000 cm^3 . When a solid object is placed in the closed box, the volume occupied by the air in the box is 520 cm^3 .

The density of the object is 8.00 g / cm^3 .



What is the mass of the object?

- A 60.0 g B 3840 g C 4160 g D 8000 g
- 10 Which statement about hydraulic machines is **not** true?
- A Liquids are used because they are almost incompressible.
B Hydraulic machines can multiply the effects of the effort force.
C Hydraulic machines can give larger energy outputs than the actual work done.
D Changes in liquid pressure are transmitted equally to all parts of the liquid.
- 11 The diagram shows a barometer containing a liquid of density 1200 kg / m^3 above the mercury column. The density of mercury is $13\,600 \text{ kg / m}^3$ and the atmospheric pressure is 76 cm Hg.



What is the height of the liquid?

- A 2.0 cm B 22.7 cm C 26.0 cm D 76.0 cm
- 12 A car with a total mass 850 kg is travelling along a road at a constant speed of 25 m/s. The driver applies the brakes to slow down the car to 12 m/s with a constant deceleration in 5.0 s.

What is the work done against the braking force?

- A 2.21 kJ B 11 kJ C 110 kJ D 204 kJ

- 13** A 12 kg bucket of sand was moved 8.0 m vertically in 4.0 s by a 0.40 kW motor.

What is the efficiency of the motor?

- A** 41.6 % **B** 60.0 % **C** 96.0 % **D** 167 %

- 14** Some gas is trapped in a closed container. The gas is cooled and the volume of the container is kept constant.

What happens to the gas molecules?

- A** They collide with the walls more often.
B They contract.
C They get closer together.
D They move more slowly.

- 15** Four bars, all of exactly the same size, are each placed with one end in boiling water.

The times taken for the temperature of the other end to increase by 2 °C are measured.

material of bar	time for 2 °C rise / s
aluminium	10
copper	5
cork	800
styrofoam	1200

To make a large metal tank with the least heat loss, which materials should be used for the walls of the tank and its insulation?

	tank	insulation
A	aluminium	cork
B	aluminium	styrofoam
C	copper	cork
D	copper	styrofoam

- 16** The outer surface of an electric kettle is always kept polish and shiny.

What is the purpose of this?

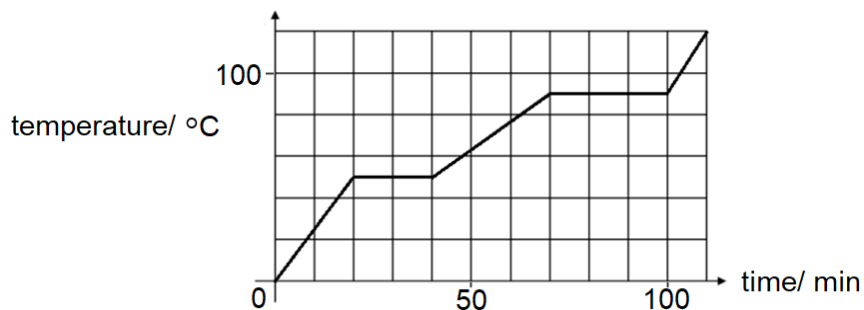
- A** To stop energy loss by radiation and conduction.
B To reflect any radiation incident on its outer surface.
C To reduce energy loss by thermal conduction.
D To be a poor emitter so as to reduce energy loss.

- 17** 24 000 J of energy is required to increase the temperature of 2.0 kg of water by 3.0 K.

What is the heat capacity of the water?

- A** 4000 J / K **B** 6000 J / K **C** 8000 J / K **D** 12 000 J / K

- 18** The graph shows the change in temperature when heat is supplied at 200 W to 1.0 kg of the substance.



What is the specific latent heat of vaporization of the substance?

- A** 4000 J / kg **B** 6000 J / kg **C** 240 000 J / kg **D** 360 000 J / kg

- 19** Which statement about water is correct?

- A** Evaporation does not take place when water is at 100 °C.
B Boiling only takes place on the surface of the water
C Steam causes less severe burn than boiling water
D Solidified water has less internal energy than water.

- 20** Springs and ropes can both be used to illustrate wave motion.

Which statement is correct?

- A** Ropes are only suitable for illustrating longitudinal waves.
B Ropes are suitable for illustrating both transverse and longitudinal waves.
C Springs are only suitable for illustrating longitudinal waves.
D Springs are suitable for illustrating both transverse and longitudinal waves.

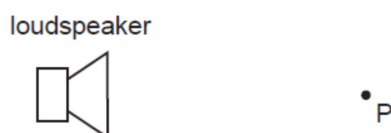
- 21** A sound wave of frequency 400 Hz travels through a gas with velocity 980 m/s.

The frequency of the wave is doubled to 800 Hz.

Which row is correct for the 800 Hz wave?

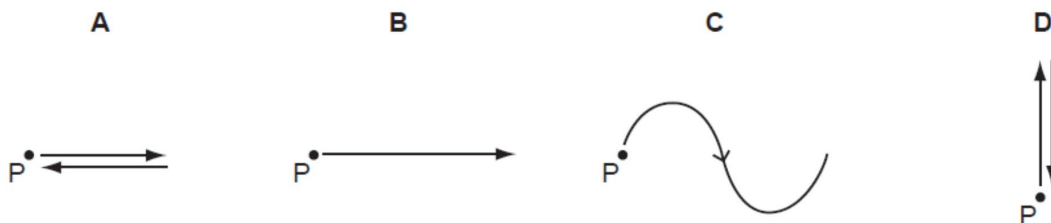
	velocity in m/s	wavelength in m
A	980	1.2
B	980	2.5
C	1960	1.2
D	1960	2.5

- 22** The diagram shows a loudspeaker that is producing a continuous sound wave of frequency 200 Hz in air.



Which diagram best shows how the sound causes a molecule at P to move during

$$\frac{1}{200} \text{ s} ?$$

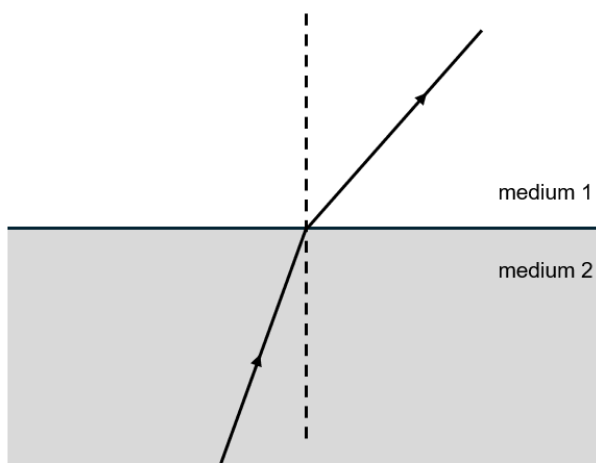


- 23** The main components of the electromagnetic spectrum have many well-known uses.

What is a use of infra-red radiation?

- A** Checking metal castings for cracks.
- B** Alarms to detect intruders.
- C** Transmitting satellite television signals.
- D** Detecting forgery in counterfeit notes.

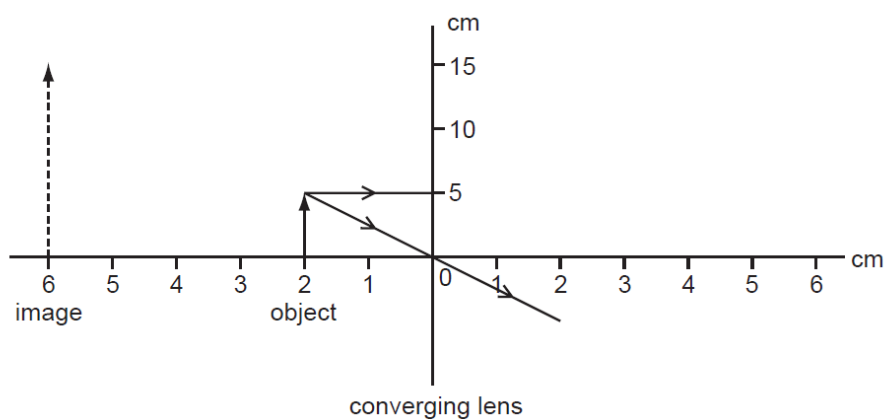
- 24 The diagram shows a ray of light moving from medium 2 to medium 1.



Which row compares medium 2 with medium 1?

	medium 2	medium 1
A	light travels faster	higher refractive index
B	light travels faster	lower refractive index
C	light travels slower	higher refractive index
D	light travels slower	lower refractive index

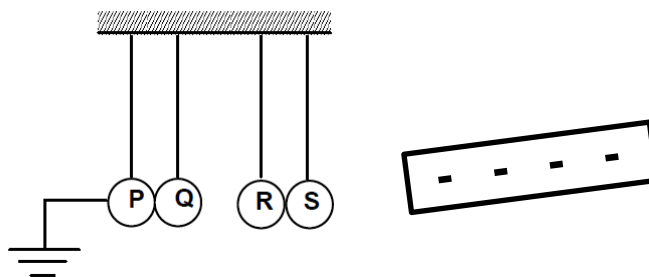
- 25 An object 5.0 cm high is placed 2.0 cm from a converging (convex) lens which is being used as a magnifying glass. The image produced is 6.0 cm from the lens and is 15 cm high.



What is the focal length of the lens?

- A** 2.0 cm **B** 3.0 cm **C** 4.0 cm **D** 5.0 cm

- 26 Four metal spheres, P, Q, R and S are suspended by cotton threads with P touching Q and R touching S. A negatively charged rod is brought near S and then P is earthed, as shown in the diagram below.

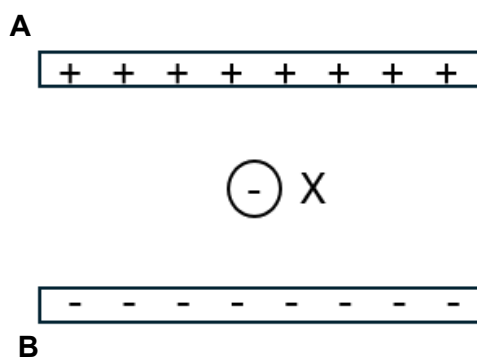


The earth connection is first removed, followed by the rod.

What are the charges on the spheres?

	P	Q	R	S
A	positive	positive	neutral	neutral
B	positive	positive	negative	positive
C	negative	positive	neutral	positive
D	neutral	negative	positive	positive

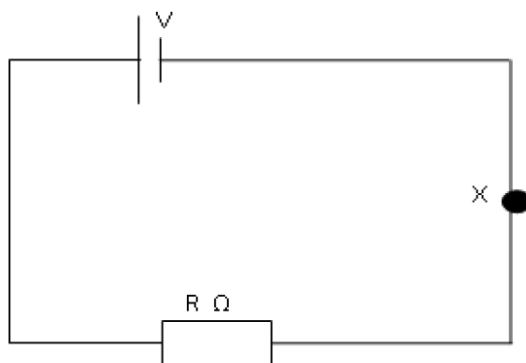
- 27 Two metal plates A and B are charged positively and negatively respectively. A negative charge X is put into the electric field between the plates as shown.



Which of the following pairs of arrows show the direction of the electric field between the metal plates and the direction of the electric force on X?

	direction of the electric field between metal plates	direction of electric force on X
A	↓	↓
B	↓	↑
C	↑	↑
D	↑	↓

- 28** The circuit in the diagram shows a fixed resistor of resistance $R \, \Omega$ connected to a power supply of V volts. Assuming each electron has a charge of e coulomb, how many electrons pass through point X in 1 minute?

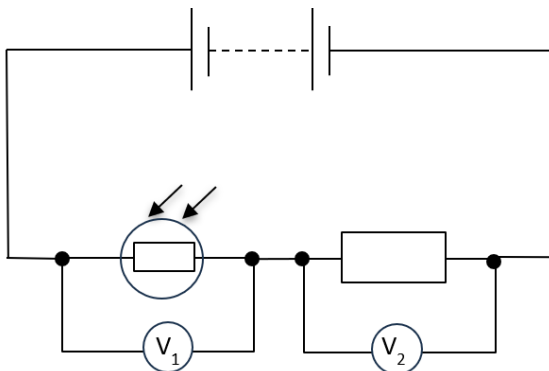


- A** $\frac{60V}{Re}$ **B** $\frac{60Re}{V}$ **C** $\frac{60Ve}{R}$ **D** $\frac{V}{60Re}$
- 29** A 0.40 m length of resistance wire with a cross-sectional area of 0.20 mm^2 has a resistance of $2.0 \, \Omega$.

Which wire of the same material will also have a resistance of $2.0 \, \Omega$?

	length	area
A	0.20 m	0.20 mm^2
B	0.20 m	0.40 mm^2
C	0.80 m	0.10 mm^2
D	0.80 m	0.40 mm^2

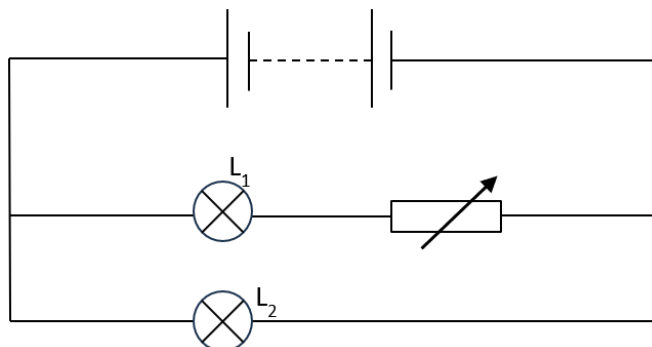
- 30 A circuit is set up as shown. The initial reading on both voltmeters is 2.5 V. The light intensity shining on the LDR is increased.



What are the possible new readings on voltmeters V_1 and V_2 ?

	reading on V_1	reading on V_2
A	2.0	3.0
B	2.5	2.0
C	2.5	3.0
D	3.0	2.0

- 31 A rheostat and two identical light bulbs are connected as shown.



What happens to the brightness of the light bulbs as the resistance of the rheostat increased gradually?

	L_1	L_2
A	decrease	no change
B	decrease	increase
C	increase	decrease
D	no change	decrease

- 32** An electric kettle should always be fitted with an earth connection as a protective device.

What is being “protected” by the earth connection?

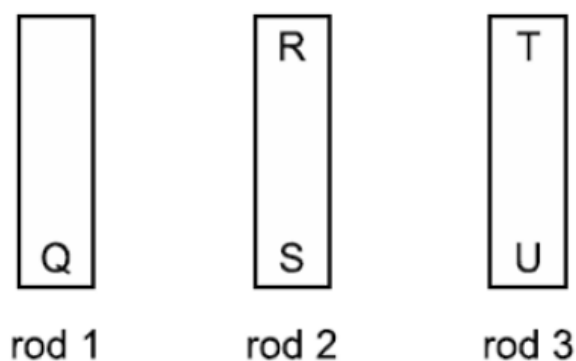
- A** The person using the kettle.
- B** The fuse in the circuit.
- C** The heating element of the kettle.
- D** The cable connecting the kettle.

- 33** An electric bulb has a rating of 120 V, 50 W.

If the bulb is connected to a voltage supply of 60 V, what is the power dissipated by the bulb?

- A** 13 W **B** 15 W **C** 25 W **D** 50 W

- 34** A student was given three metal rods as shown in the diagram below and was tasked to determine which one(s) is a/are magnet(s). The ends of the 3 metal rods are tested by holding end Q close to the others one by one.



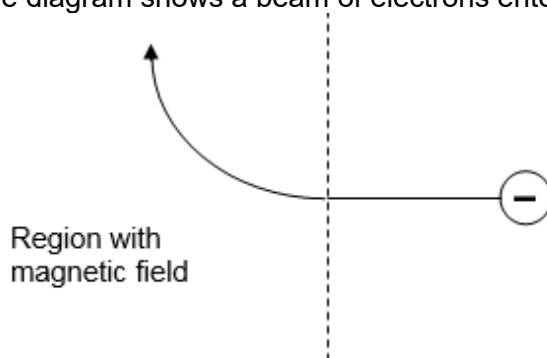
The results show that end Q

- 1) attracts end R
- 2) attracts end S
- 3) attracts end T
- 4) repels end U

Which of the metal rod(s) is a/are magnet(s)?

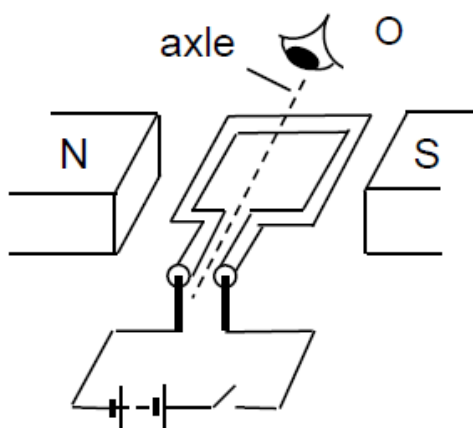
- A** rod 1 only
- B** rod 1 and rod 2
- C** rod 1 and rod 3
- D** rod 3 only

- 35 The diagram shows a beam of electrons entering a magnetic field.



What will be the direction of the magnetic field?

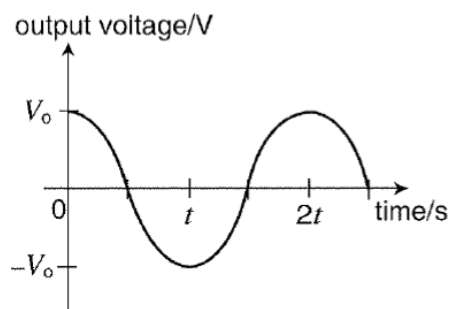
- A into the page
 - B out of the page
 - C towards the bottom of the page
 - D towards the top of the page
- 36 A coil of wire that can spin on an axle is placed between the poles of two magnets.



When the switch is closed, as seen by the observer, the coil will

- A oscillate about the axle but finally rest in a position with its plane parallel to the magnetic field.
- B oscillate about the axle but finally rest in a position with its plane perpendicular to the magnetic field.
- C rotate anti-clockwise direction.
- D rotate clockwise direction.

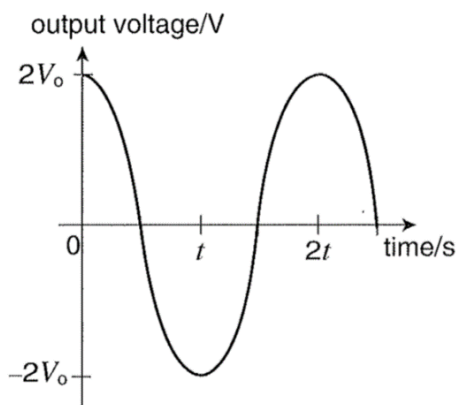
- 37 Graph 1 shows the output voltage-time graph of an a.c. generator.



graph 1

The output voltage can be changed by the following methods:

- 1) Increase the frequency of rotation of the coil.
- 2) Increase the number of turns of the coil.
- 3) Increase the strength of the magnet.

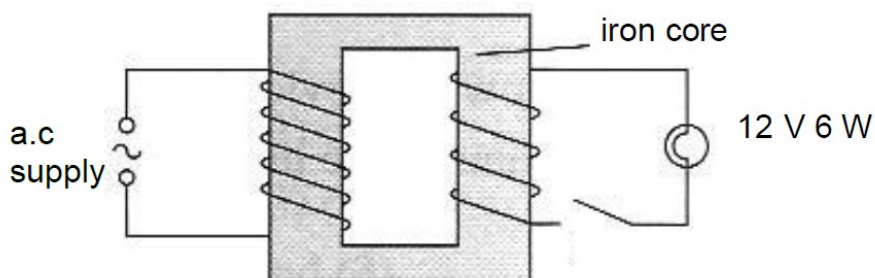


graph 2

Which of the method(s) listed above is / are possible to obtain the output voltage shown in graph 2?

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

- 38 What is the likely voltage and current from an a.c. supply to the **ideal** transformer shown below?



	voltage/ V	current/ A
A	18	0.34
B	18	0.75
C	220	0.34
D	220	0.75

- 39 A factory produces thin aluminium sheets. A radioactive isotope and a detector are used to continuously check the thickness of the aluminium sheets.

What is the most suitable source to use?

- A** an alpha source with a half-life of a few years
B a beta source with a half-life of a few years
C an alpha source with a half-life of a few minutes
D a beta source with a half-life of a few minutes
- 40 Three different radioactive nuclides P, Q and R each decay by three different successive emissions.
- P emits α , α , β
 - Q emits α , β , β
 - R emits β , β , β

Which nuclide produces a final nucleus that has the same proton number as its starting nucleus, and which nuclide produces the same nucleon number as its starting nucleus?

	same proton number	same nucleon number
A	P	Q
B	P	R
C	Q	P
D	Q	R