

UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
General Certificate of Education Ordinary Level

PHYSICS

5054/01

Paper 1 Multiple Choice

October/November 2005

1 hour

Additional Materials: Multiple Choice Answer Sheet
Soft clean eraser
Soft pencil (type B or HB is recommended)

READ THESE INSTRUCTIONS FIRST

Write in soft pencil.

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

Write your name, Centre number and candidate 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.

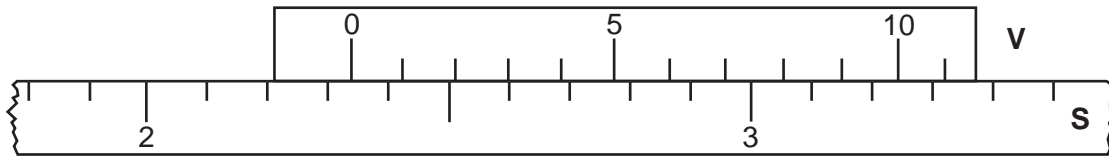
Each correct answer will score one mark. A mark will not be deducted for a wrong answer.

Any rough working should be done in this booklet.

This document consists of **17** printed pages and **3** blank pages.



- 1 The diagram shows a vernier **V** placed against a scale **S**.

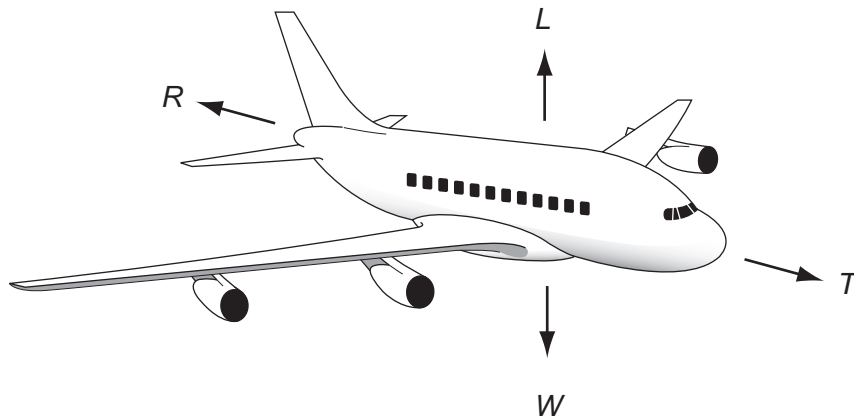


What is the vernier reading?

- A** 2.23 **B** 2.26 **C** 2.33 **D** 2.36
- 2 An aircraft, flying at a constant height, is gaining speed.

The four forces acting are

- L* lift due to the wings
R air resistance
T the thrust due to the engines
W the weight



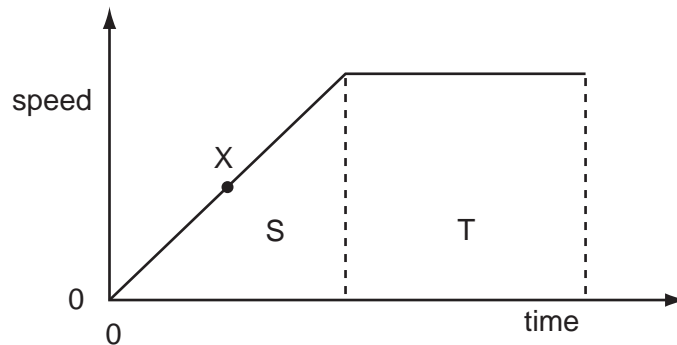
What is correct?

	vertical forces	horizontal forces
A	$L = W$	$T = R$
B	$L > W$	$T > R$
C	$L = W$	$T > R$
D	$L > W$	$T = R$

3 What **must** change when a body is accelerating?

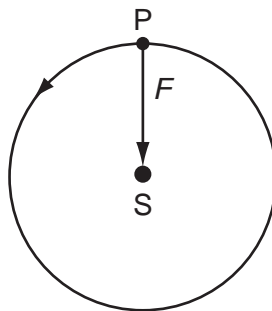
- A the force acting on the body
- B the mass of the body
- C the speed of the body
- D the velocity of the body

4 The graph illustrates the motion of an object.



Which feature of the graph represents the distance travelled by the object whilst moving at a constant speed?

- A area S
 - B area S + area T
 - C area T
 - D the gradient at point X
- 5 A body P moves in a circle around a point S. A force F keeps it moving in the circle.



What happens if the force F suddenly disappears?

- A P moves directly towards S.
- B P moves in a circle closer to S.
- C P moves away from S in a curved path.
- D P goes off in a straight line.

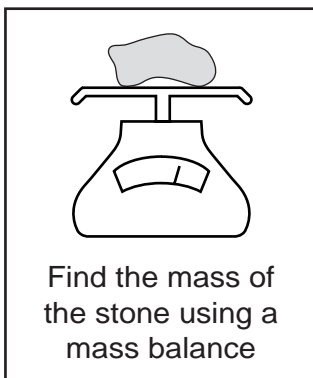
- 6 An object that has a mass of 15 kg on the Earth is taken to the Moon.

The gravitational field strength on the Earth is 10 N/kg and on the Moon is 1.6 N/kg.

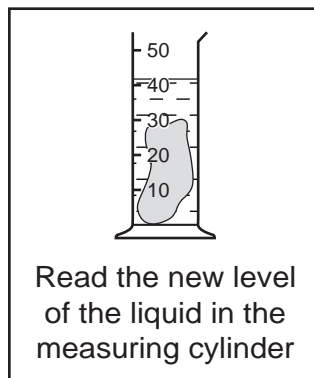
What are the mass and the weight of the object on the Moon?

	mass / kg	weight / N
A	15	24
B	15	150
C	24	15
D	150	24

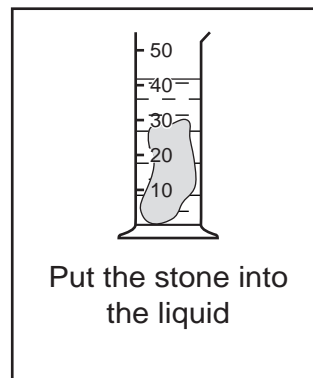
- 7 A student is trying to find the density of a stone, but he has mixed up the instruction cards.



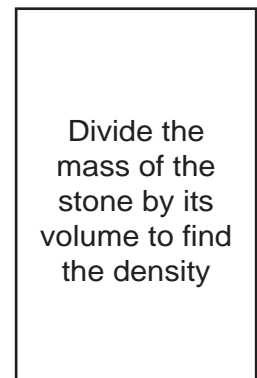
Card 1



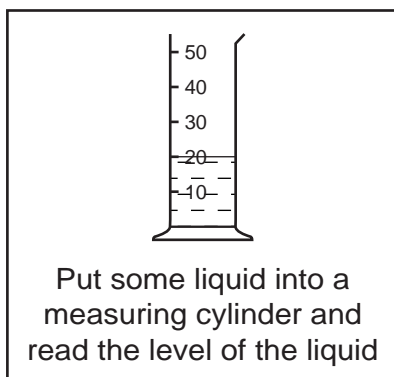
Card 2



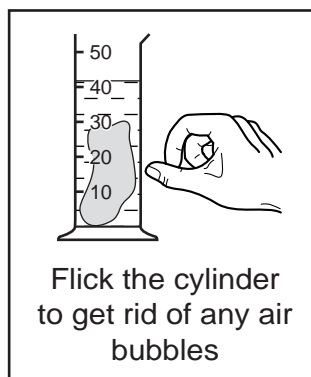
Card 3



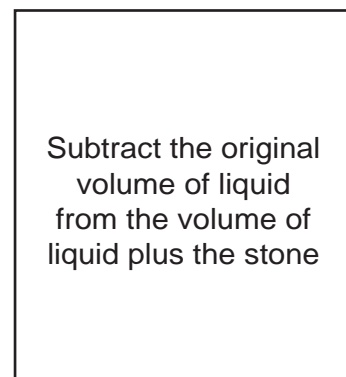
Card 4



Card 5



Card 6



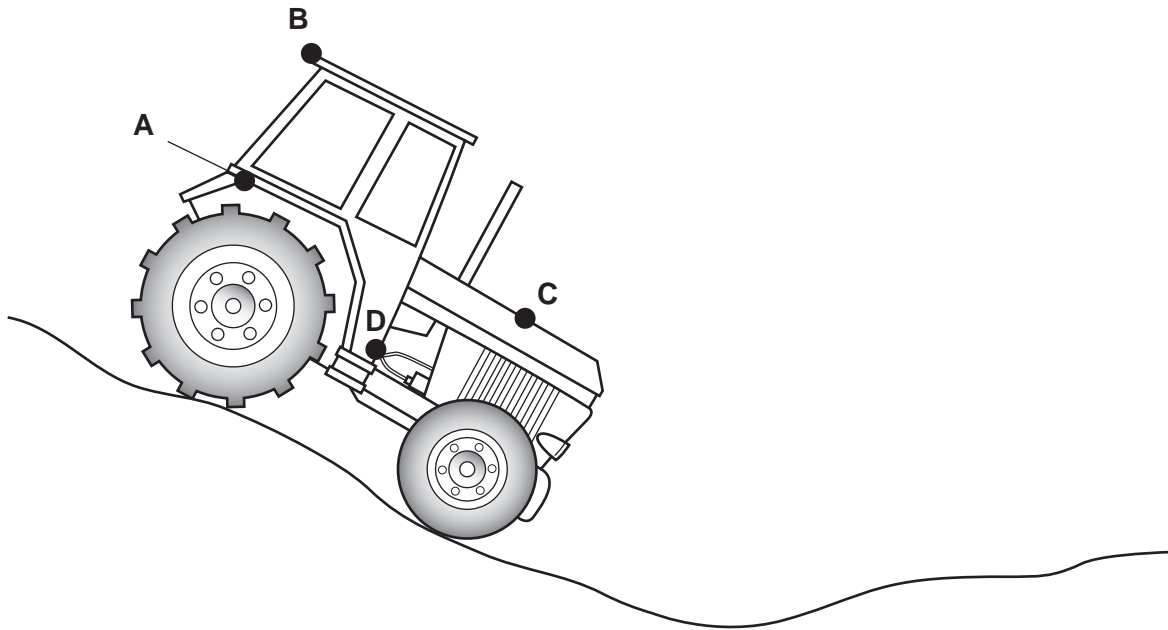
Card 7

What order should the cards be in?

- A** 5 → 3 → 6 → 2 → 1 → 4 → 7
B 1 → 5 → 3 → 6 → 2 → 7 → 4
C 5 → 6 → 3 → 2 → 1 → 7 → 4
D 1 → 4 → 5 → 3 → 6 → 2 → 7

- 8 A tractor is being used on rough ground.

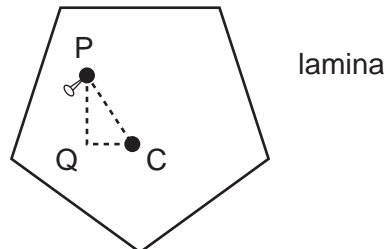
What is the safest position for its centre of mass?



- 9 A plane lamina is freely suspended from point P.

The weight of the lamina is 2.0 N and the centre of mass is at C.

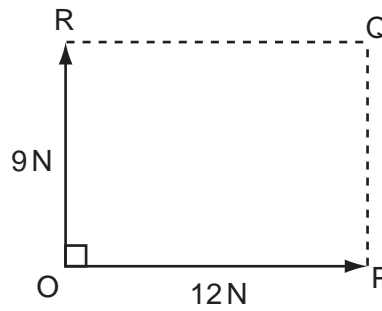
$$\begin{aligned} PC &= 0.50 \text{ m} \\ PQ &= 0.40 \text{ m} \\ QC &= 0.30 \text{ m} \end{aligned}$$



The lamina is displaced to the position shown. What is the moment that will cause the lamina to swing?

- A 0.60 N m clockwise
- B 0.80 N m anticlockwise
- C 1.0 N m clockwise
- D 1.0 N m anticlockwise

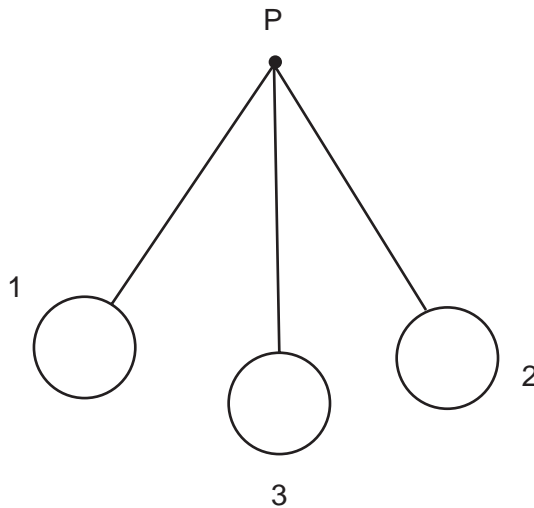
- 10 Two forces act at right angles at a point O as shown.



What is the resultant of the forces?

	magnitude	direction
A	15 N	OQ
B	15 N	PR
C	21 N	OQ
D	21 N	PR

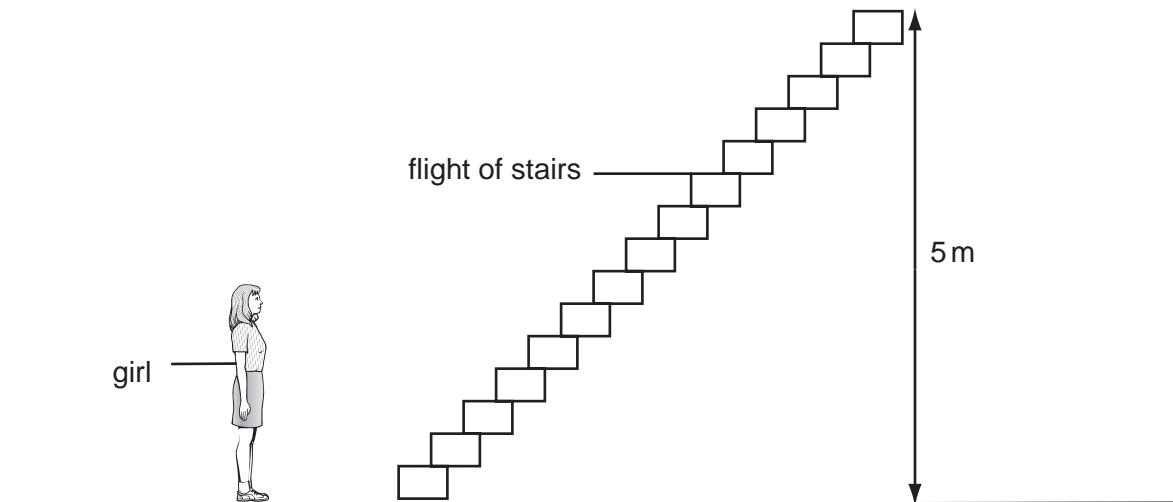
- 11 A mass hangs on a string fixed at point P. It starts from position 1 and swings to the furthest position on the opposite side, position 2. It then oscillates several times with decreasing amplitude before ending at position 3.



Where does the ball have the most kinetic energy?

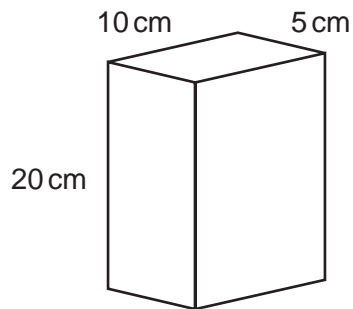
- A** at position 1
- B** at position 2
- C** the first time at position 3
- D** the last time at position 3

- 12 A girl of weight 500 N runs up a flight of stairs in 10 seconds. The vertical height of the stairs is 5 m.



What is the average power developed by the girl?

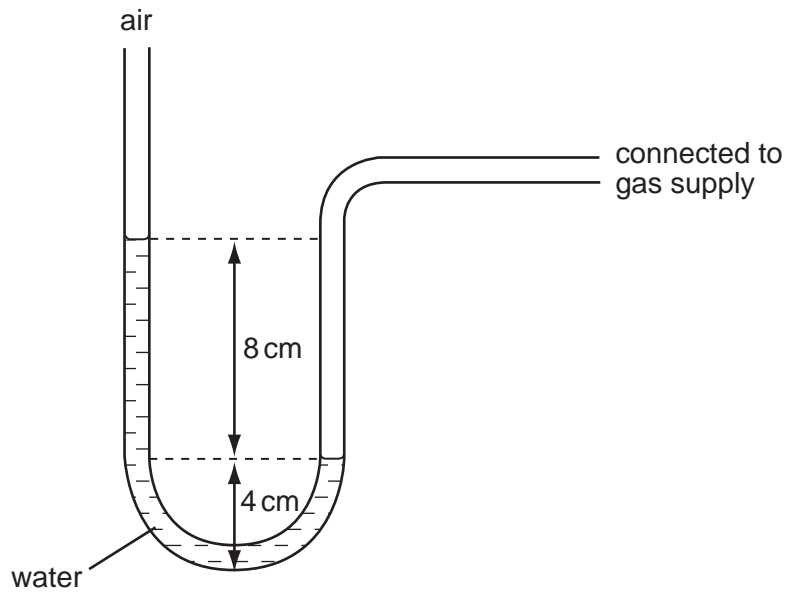
- A** 50 W **B** 100 W **C** 250 W **D** 1000 W
- 13 A brick of weight 80 N stands upright on the ground as shown.



What is the pressure it exerts on the ground?

- A** $\frac{80}{20 \times 10} \text{ N/cm}^2$
- B** $\frac{20 \times 10}{80} \text{ N/cm}^2$
- C** $\frac{80}{10 \times 5} \text{ N/cm}^2$
- D** $\frac{10 \times 5}{80} \text{ N/cm}^2$

14 A manometer is connected to a gas supply.

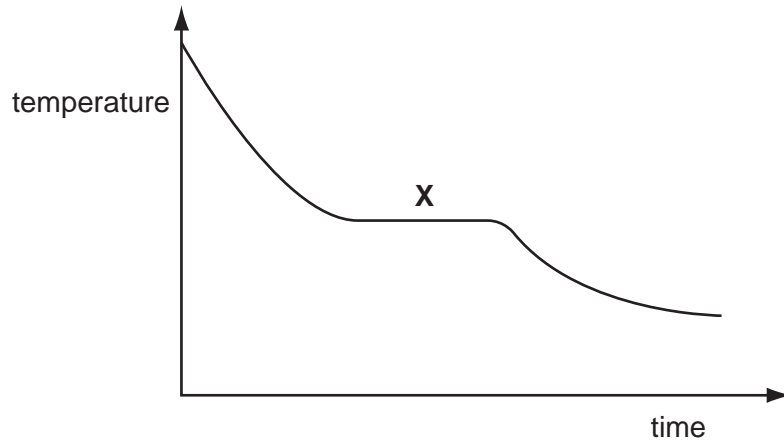


Pressure can be measured in cm of water.

What is the pressure of the gas?

- A 8 cm of water more than atmospheric pressure
 - B 12 cm of water more than atmospheric pressure
 - C 8 cm of water less than atmospheric pressure
 - D 12 cm of water less than atmospheric pressure
- 15 What will **not** affect the rate of evaporation from the surface of a liquid?
- A depth of the liquid
 - B draughts above the surface of the liquid
 - C surface area of the liquid
 - D temperature of the liquid
- 16 What makes a thermometer sensitive to small changes in temperature?
- A a bulb with a thin glass wall
 - B a shiny liquid in its bore
 - C a stem with a thick glass wall
 - D a very narrow bore

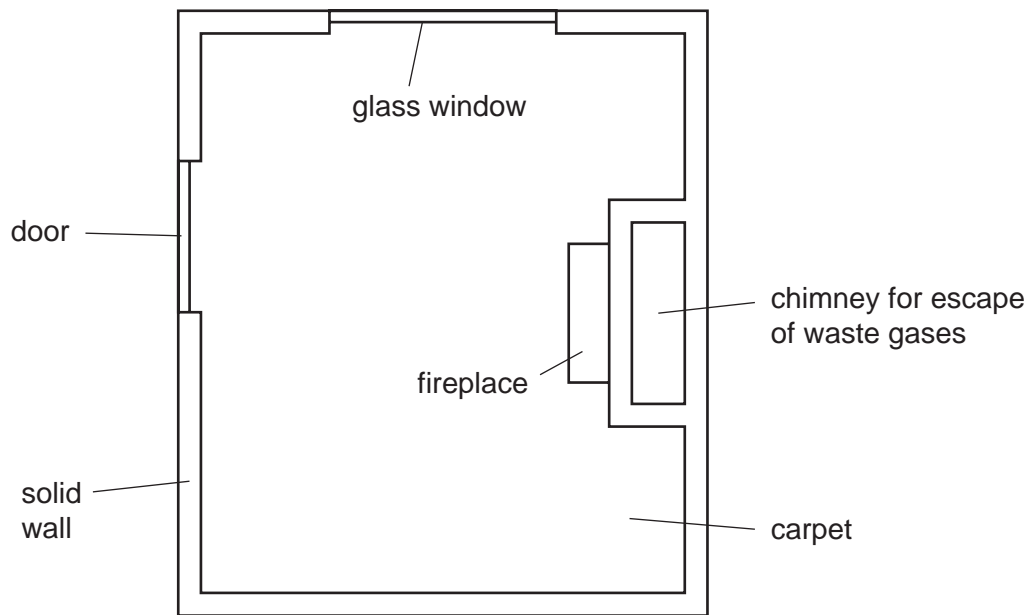
- 17 A hot liquid is carefully poured into a beaker. The graph shows how its temperature changes as it cools towards room temperature.



Which processes are taking place at region X?

- A boiling and evaporation
- B condensation only
- C evaporation only
- D solidification and evaporation

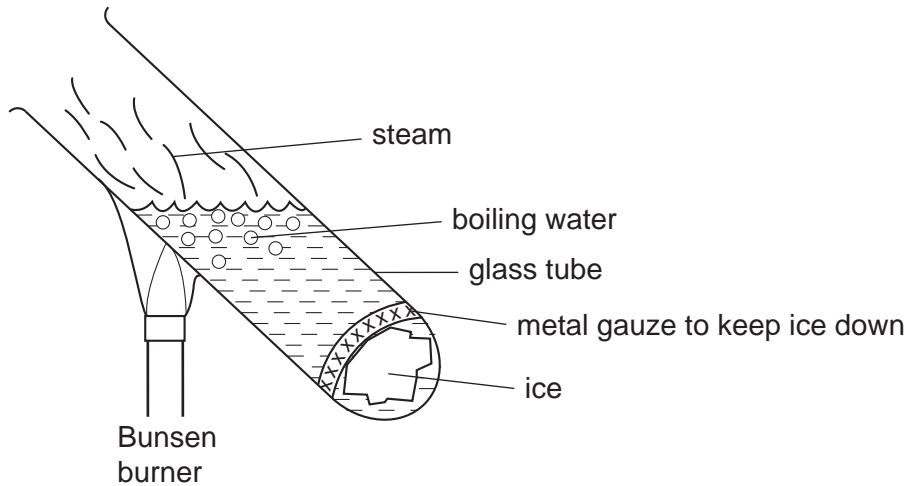
- 18 The diagram shows a room seen from above. It is cold outside the room. The room is heated by a small fire in the fireplace.



Where is most heat lost by convection?

- A carpet
- B chimney
- C glass window
- D solid wall

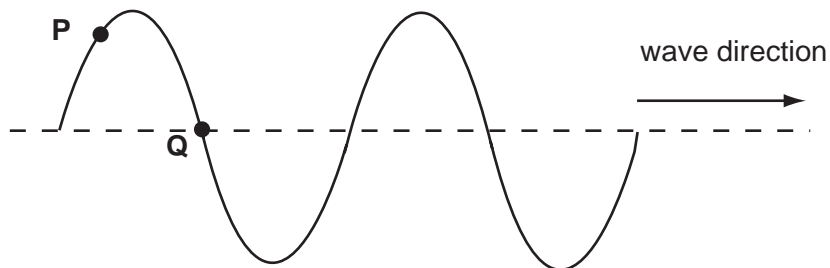
19 An experiment is carried out as shown in the diagram.



Why does the ice take a long time to melt, even though the water at the top of the tube is boiling?

- A Convection never occurs in water.
- B Ice is a poor conductor of heat.
- C The gauze prevents the energy reaching the ice.
- D Water is a poor conductor of heat.

20 The diagram shows a wave on a string with two points **P** and **Q** marked. The wave is moving in the direction shown.

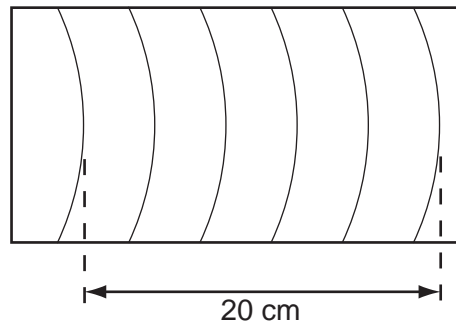


What will happen next?

- A **P** will move to the right.
- B **P** will move up.
- C **Q** will not move.
- D **Q** will move up.

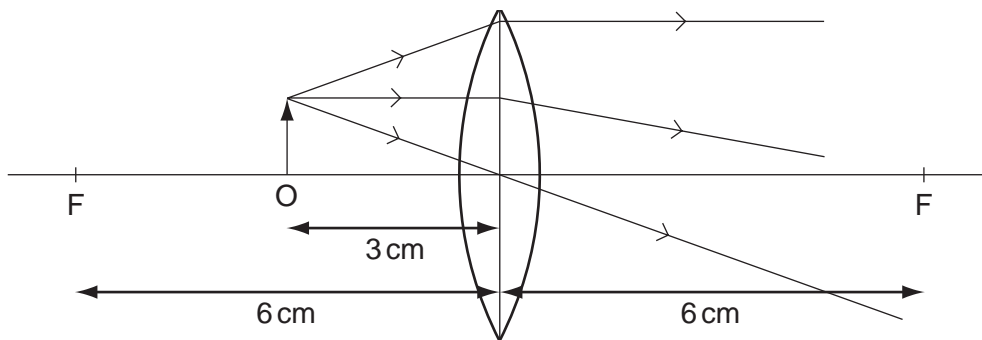
- 21 The dipper in a ripple tank vibrates at a frequency of 4.0 Hz and the resulting wave pattern is photographed.

The distance between the two crests shown is 20 cm.



What is the speed of the wave?

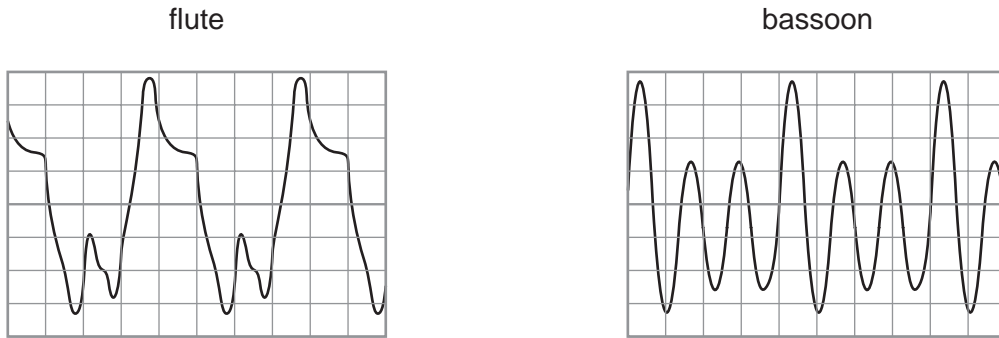
- A 4 cm/s B 5 cm/s C 16 cm/s D 20 cm/s
- 22 Which characteristics describe an image formed in a plane mirror?
- A real and inverted
 B virtual and upright
 C real and larger than the object
 D virtual and smaller than the object
- 23 The diagram shows an object O placed 3 cm away from a converging lens of focal length 6 cm.



What type of image is produced?

- A real, erect and diminished
 B real, inverted and magnified
 C virtual, erect and magnified
 D virtual, inverted and diminished

- 24 Wave forms are shown on an oscilloscope for a flute and a bassoon playing the same note. The oscilloscope settings are the same for both wave forms.



What is the difference between the two sounds?

- A the amplitude
 - B the frequency
 - C the quality (timbre)
 - D the wavelength
- 25 A student tries to magnetise a short steel rod.
- Which of these tests will show that he has been successful?
- A both ends of a permanent magnet attract the rod
 - B one end of a permanent magnet repels the rod
 - C the rod picks up a small piece of paper
 - D when freely suspended, the rod points in any direction
- 26 Four processes are used to charge an isolated metal sphere.

- P The sphere is earthed by touching it.
- Q The earth connection is removed from the sphere.
- R A charged rod is brought close to the sphere.
- S The charged rod is removed.

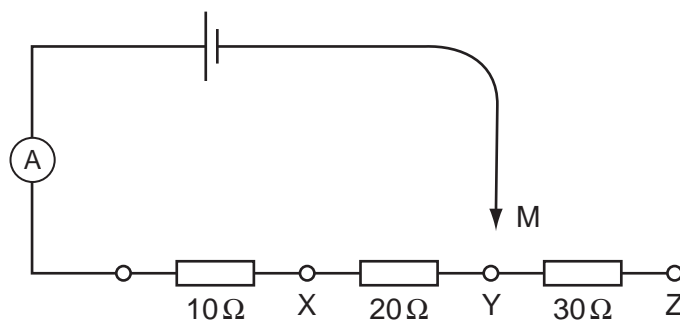
In which order should these processes be carried out to charge the sphere?

	first	→			last
A	P	Q	R	S	
B	P	R	S	Q	
C	R	P	Q	S	
D	R	S	P	Q	

27 Why can birds stand on an overhead high voltage transmission line without suffering any harm?

- A Their bodies have a very high resistance.
- B Their feet are very good insulators.
- C The spaces between their feathers act as insulators.
- D They are not connected to earth.

28 The diagram shows a cell connected in series with an ammeter and three resistors ($10\ \Omega$, $20\ \Omega$, $30\ \Omega$). The circuit can be completed by a moveable contact M.



When M is connected to X, the ammeter reads $0.6\ \text{A}$.

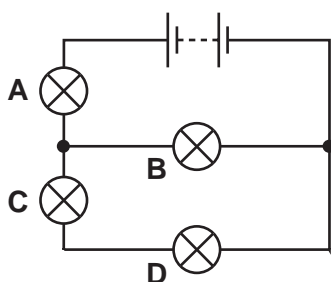
What is the ammeter reading when M is connected to Y?

- A $0.1\ \text{A}$
- B $0.2\ \text{A}$
- C $0.3\ \text{A}$
- D $0.6\ \text{A}$

29 In the circuit shown, the battery lights up all four lamps.

When one of the lamp filaments melts, the other three lamps stay on.

Which lamp filament melts?



30 A combined bathroom unit of a heater and a lamp is controlled by one switch. The unit contains a $2\ \text{kW}$ heater and a $100\ \text{W}$ lamp. In one week, the lamp uses $1\ \text{kWh}$ of electrical energy.

How much electrical energy is used by the heater alone?

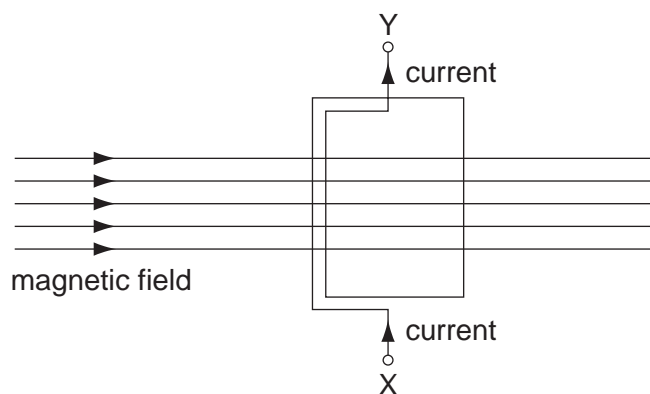
- A $2\ \text{kWh}$
- B $4\ \text{kWh}$
- C $10\ \text{kWh}$
- D $20\ \text{kWh}$

31 An electric kettle is plugged in and switched on. The fuse in the plug blows immediately.

Which single fault could cause this?

- A The earth wire is not connected to the kettle.
- B The live wire and neutral wire connections in the plug are swapped around.
- C The live wire touches the metal case of the kettle.
- D The wires connected to the plug are too thin.

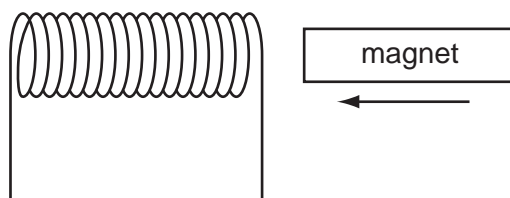
32 A coil, carrying a current, is arranged within a magnetic field. The coil experiences forces that can make it move.



In which direction does the coil move?

- A along the magnetic field
- B from X to Y
- C out of the paper
- D turns about the axis XY

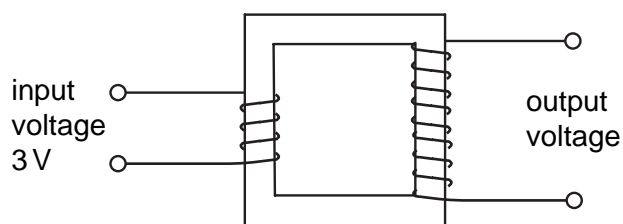
33 A magnet is pushed horizontally towards a coil of insulated wire, inducing an e.m.f. in the coil.



In which direction does the induced e.m.f. make the coil move?

- A away from the magnet
- B towards the magnet
- C downwards
- D upwards

- 34 A step-up transformer with 100 % efficiency has an input voltage of 3 V and an input current of 2 A.



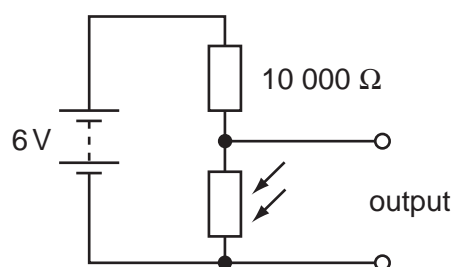
Under these conditions, what output voltage and output current could be obtained?

	output voltage / V	output current / A
A	1	6
B	2	3
C	4	1
D	6	1

- 35 Why is a reed relay used in a switching circuit?

- A** to switch on a small current using a large current
- B** to switch on a small voltage using a large voltage
- C** to switch on a large current using a small current
- D** to switch on a large voltage using a large current

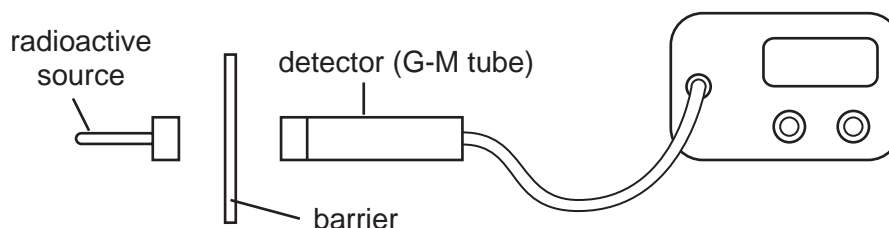
- 36 A potential divider consists of an LDR and a resistor connected to a 6 V battery.



What should be the resistance of the LDR for the output to be 3 V?

- A** 0
- B** between 0 and 10 000 Ω
- C** 10 000 Ω
- D** more than 10 000 Ω

- 37 The diagram shows the apparatus used in an experiment in which barriers of various materials are placed in turn between different radioactive sources and a detector.



The table shows the count rates recorded by the detector for four sources.

Which source emits alpha-particles only?

source	count rate / counts per minute			
	no barrier	paper	thin aluminium	thick lead
A	200	200	200	30
B	200	30	30	30
C	1200	600	200	30
D	1200	1200	30	30

- 38 A nucleus is represented by ${}^{230}_{91}\text{Z}$. It emits one alpha-particle and then one beta-particle.

What is the resulting nucleus X?

- A** ${}^{226}_{88}\text{X}$ **B** ${}^{226}_{89}\text{X}$ **C** ${}^{226}_{90}\text{X}$ **D** ${}^{230}_{89}\text{X}$

- 39 A nuclide of the element plutonium is ${}^{242}_{94}\text{Pu}$.

What is the number of neutrons in its nucleus?

- A** 94 **B** 148 **C** 242 **D** 336

- 40 Which statement defines isotopes?

- A** two (or more) nuclides which have the same number of protons but different numbers of electrons
- B** two (or more) nuclides which have the same number of neutrons but different numbers of electrons
- C** two (or more) nuclides which have the same number of neutrons but different numbers of protons
- D** two (or more) nuclides which have the same number of protons but different numbers of neutrons

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