TANJONG KATONG GIRLS' SCHOOL
PRELIMINARY EXAMINATION
SECONDARY FOUR
PHYSICS

CANDIDATE NAME					
CLASS				INDEX NUMBER	

PHYSICS

6091/01

Paper 1 Multiple Choice

25 August 2025

1 hour

Additional Materials: Multiple Choice Answer Sheet

READ THESE INSTRUCTIONS FIRST

Write in soft pencil.
Write your name, index number on the Answer Sheet.

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.

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.

This document consists of **18** printed pages.

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1 A list of 8 physical quantities is shown below:

length	time	energy	force
speed	weight	mass	acceleration

How many of them are derived quantities?

A 3 **B** 4 **C** 5 **D** 6

2 Which sound frequency is within the range that can be heard by a healthy human ear?

A 12 mHz **B** 12 Hz **C** 12 kHz **D** 12 MHz

3 Which pair of physical quantities contains a vector and a scalar quantity?

A area and displacement

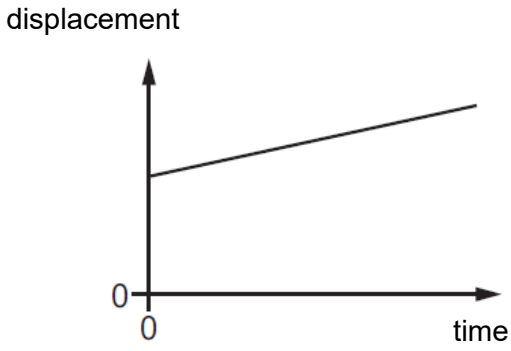
B distance and volume

C temperature and pressure

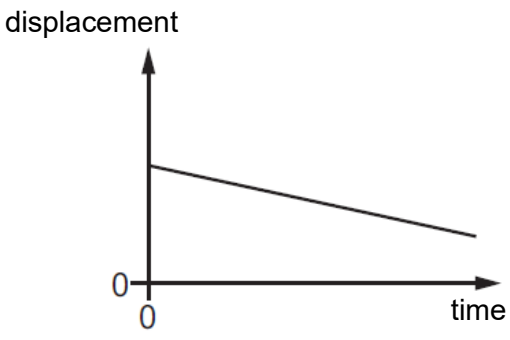
D weight and velocity

4 Which displacement-time graph represents a body whose velocity is decreasing?

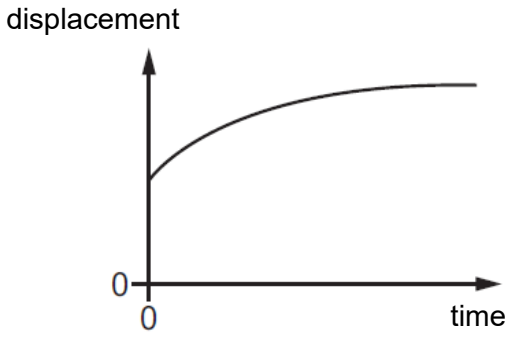
A



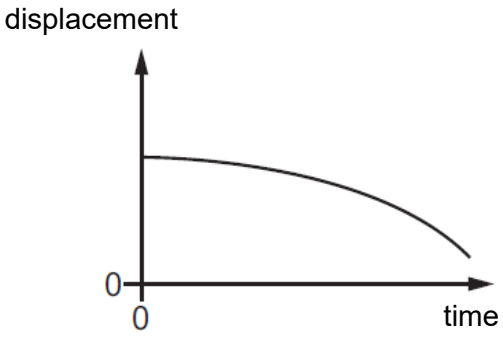
B



C

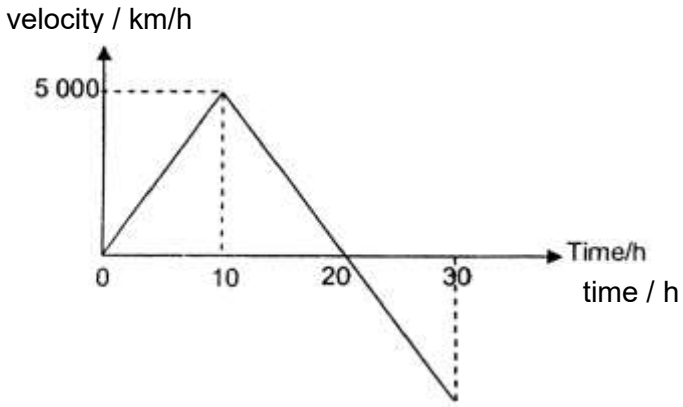


D



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5 A spacecraft is launched vertically. The velocity-time graph of the motion of the spacecraft is shown in the diagram.



What is the maximum height reached by the spacecraft?

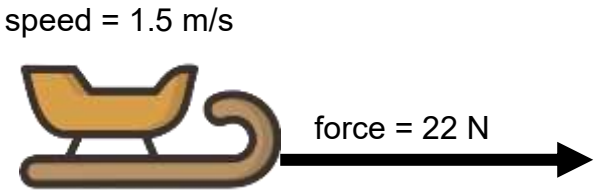
A 25 000 km

B 50 000 km

C 75 000 km

D 100 000 km

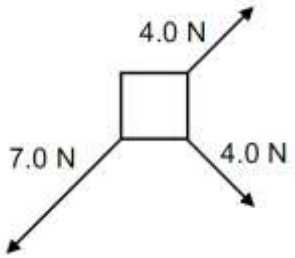
6 A sledge of mass 12 kg is pulled along the surface of a frozen lake at a constant speed of 1.5 m/s by a horizontal force of 22 N.



What is the frictional force acting on the sledge?

A 0 N **B** 4 N **C** 18 N **D** 22 N

7 The diagram shows multiple forces acting on a square object along the diagonal.

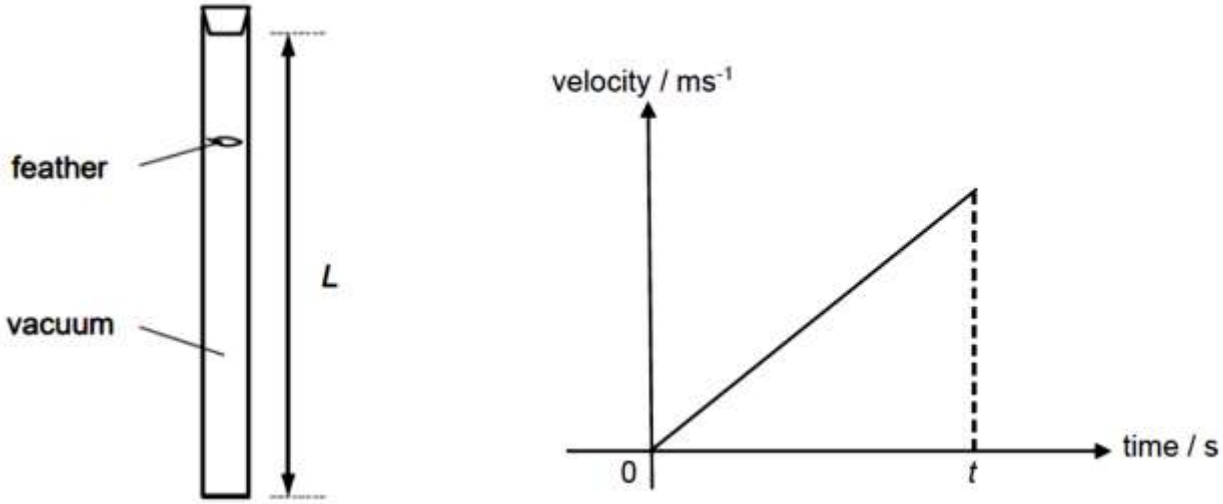


What is the possible magnitude of the resultant force acting on the object?

A 1.0 N **B** 3.0 N **C** 5.0 N **D** 11.0 N

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8 In a laboratory experiment, a feather falls from rest in an evacuated vertical tube of length *L*. The feather took a time of *t* to fall from the top to the bottom of the tube.

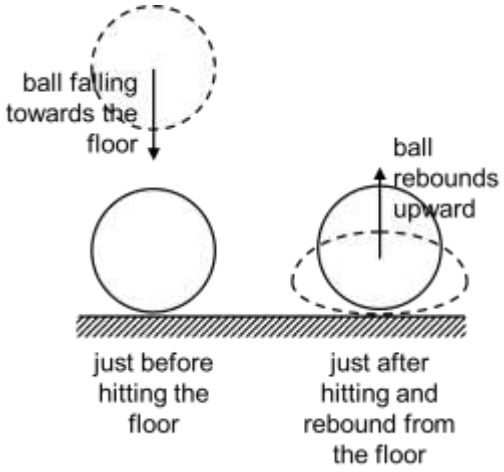


The diagram shows the experiment setup and the velocity-time graph of the feather as it falls.

How far will the feather have fallen from the top of the tube in 0.5*t* ?

A 0.13 L **B** 0.25 L **C** 0.50 L **D** 0.75 L

9 A ball is dropped downwards, hits the floor and rebounds upward. The figure below shows the instance of the ball just before and right after it hits the floor.



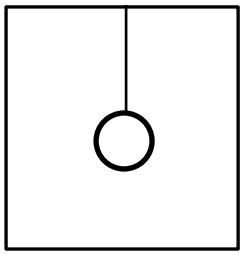
Which row shows the correct description of the acceleration just before and after the ball hits the floor?

	just before hitting the floor	**just after hitting the floor**
A	acceleration is 10 m/s^2 downwards	acceleration is 10 m/s^2 upwards
B	acceleration is 0 m/s^2 downwards	acceleration is 0 m/s^2 upwards
C	acceleration is 0 m/s^2 downwards	acceleration is 0 m/s^2 downwards
D	acceleration is 10 m/s^2 downwards	acceleration is 10 m/s^2 downwards

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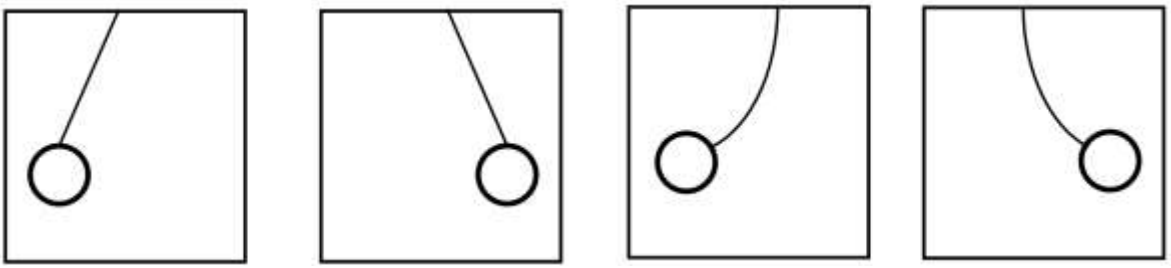
10 Ahmad hung a ball to the ceiling of his car using a thin thread.

The figure shows the ball when the car is at rest.



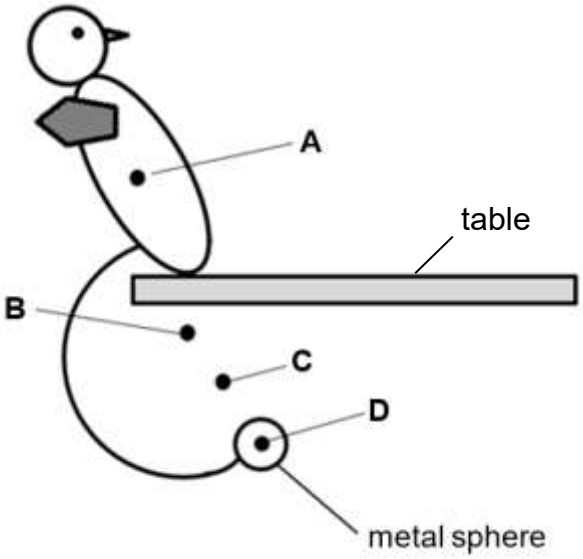
What is the position of the ball when his car starts moving to the right?

A **B** **C** **D**



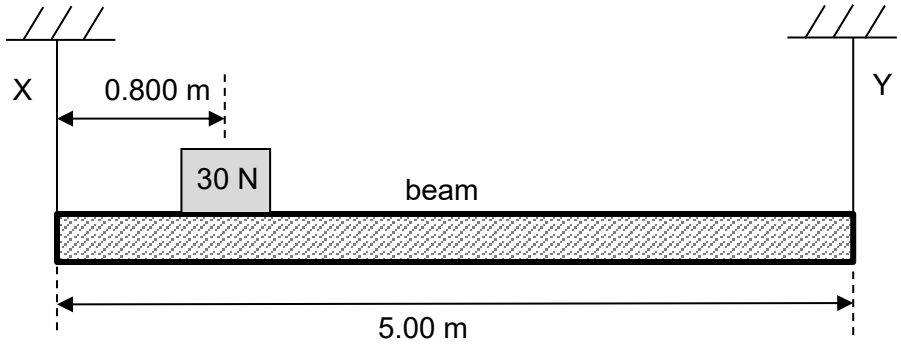
11 A toy is balanced and at rest when positioned as shown in the diagram on the edge of a table. The toy has a metal sphere attached to it.

Where is the likely centre of gravity of the toy?



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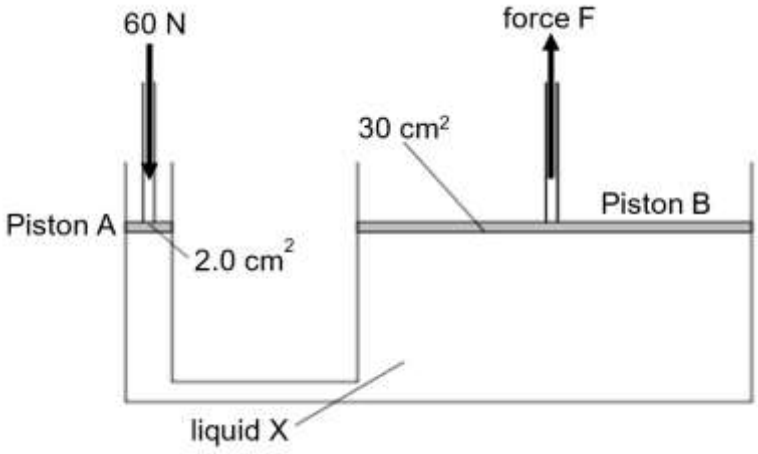
12 A uniform beam of 5.00 m has a weight of 140 N, is hung by two ropes at its ends. A wooden block of mass of 30.0 N is placed on the beam at 0.800 m from rope X.



What is the tension in each rope?

	tension in rope X/ N	tension in rope Y/ N
A	4.8	25.2
B	25.2	4.8
C	74.8	95.2
D	95.2	74.8

13 A hydraulic press contains an incompressible liquid X. Piston A has an area of 2.0 cm^2 and piston B has an area of 30 cm^2.



A downward force of 60 N is exerted on piston A and moves piston A downwards through a distance of 15.0 cm.

What is the upward force F exerted on piston B and the distance d moved by piston B?

	force F / N	distance d / cm
A	900	1.0
B	900	0.50
C	1800	1.0
D	1800	0.50

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14 The pressure inside a gas cylinder is measured separately using two different mercury manometers as shown in Fig. **P** and **Q**. One of the manometers has an open end while the other has a sealed end.

A barometer, as shown in Fig. **R**, is used to measure the atmospheric pressure at the location of the experiment.

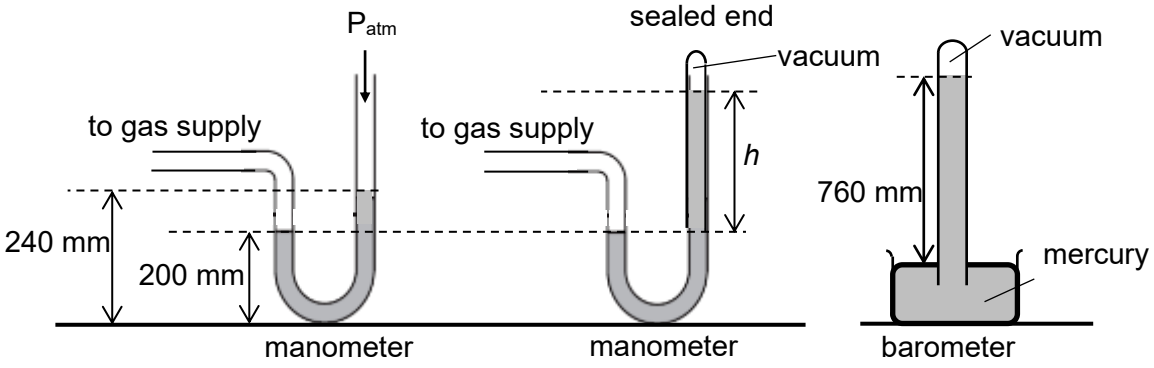


Fig. **P** Fig. **Q** Fig. **R**

The diagrams are not drawn to scale.

What is the height, *h*, of the mercury in Fig. **Q**?

A 40 mm

B 720 mm

C 800 mm

D 1000 mm

15 Two identical measuring cylinders containing different liquids are placed on a simple balance. They are balanced as shown.



How does the density of P compare with the density of Q?

A Density of P is half the density of Q.

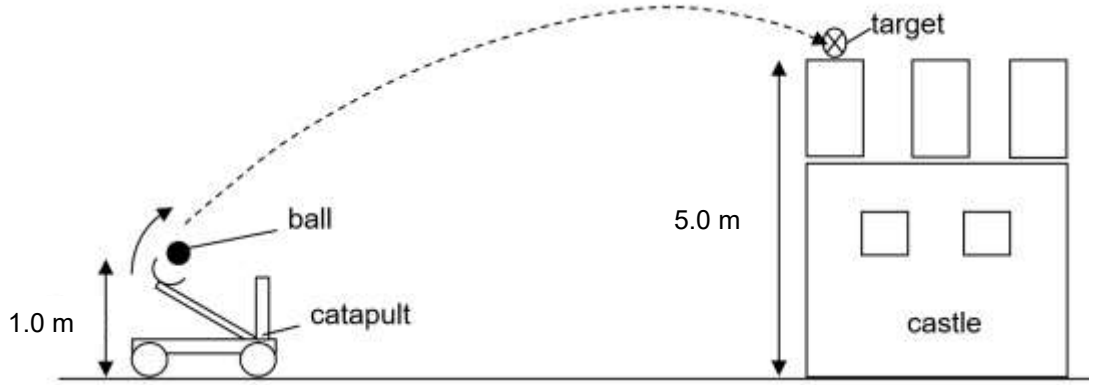
B Density of P is equal to the density of Q.

C Density of P is twice the density of Q.

D Density of P is four times the density of Q.

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16 A catapult launches a 3.0 kg ball into a castle. The ball leaves the catapult at a height of 1.0 m and with a speed of 15 m/s. A target is placed 5.0 m at the top of the castle.

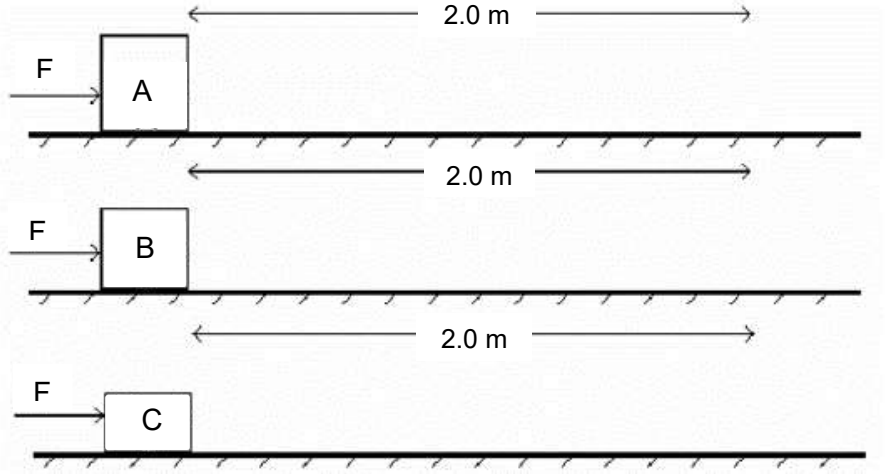


What is the speed of the ball when it hits the target? Assume there is no air resistance.

A 9.80 m/s **B** 11.1 m/s

C 12.0 m/s **D** 13.0 m/s

17 Three blocks A, B, and C are each pushed by equal forces, F, across a smooth horizontal floor for a distance of 2.0 m.



The mass of block A is greater than block B, and the mass of block B is greater than block C.

Which block/s would have the greatest amount of energy in the kinetic store at the end of the 2.0 m push?

A Block A

B Block B

C Block C

D All blocks will have the same amount of energy in the kinetic store

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18 A cup of coffee is warmed from 20 °C to 30 °C. Which energy store of the coffee rises?

A Its nuclear store

B Its internal store

C Its chemical potential store

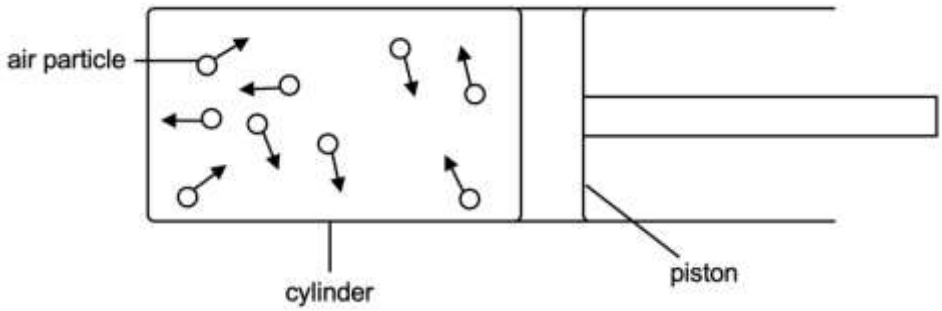
D Its kinetic store

19 Electrical power of 3000 W is supplied to a motor to lift a weight of 100 N at a speed of 20 m/s for 5.0 s.

What is the efficiency of the motor?

A 0.07 **B** 0.33 **C** 0.67 **D** 1.30

20 Which statement describes what happens when a gas in a piston is compressed at constant temperature?



A The number of gas molecules per unit volume decreases.

B The rate of collisions between the gas molecules and the piston wall increases.

C The speed of gas molecules increases.

D The volume of each gas molecule decreases.

21 Brownian motion can be observed by the behaviour of smoke particles in a smoke cell.

What does Brownian Motion show?

A Air is a poor conductor.

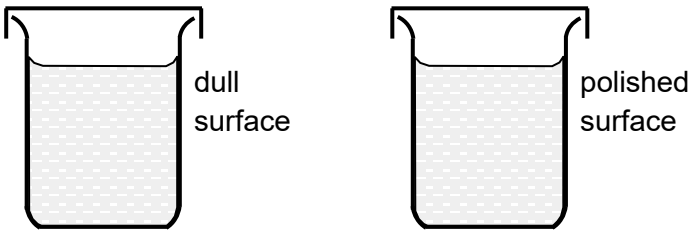
B Air molecules are moving.

C Air molecules have more mass than smoke particles.

D Convection occurs in air.

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22 In the diagram, two copper cans **X** and **Y** with outer surface of different texture are filled with the same amount of water at boiling point and left in the room.



Which of the following statements about the temperature of the two cans after a short while is true?

A **X** is cooler because a dull surface is a good absorber.

B **X** is cooler because a dull surface is a good emitter.

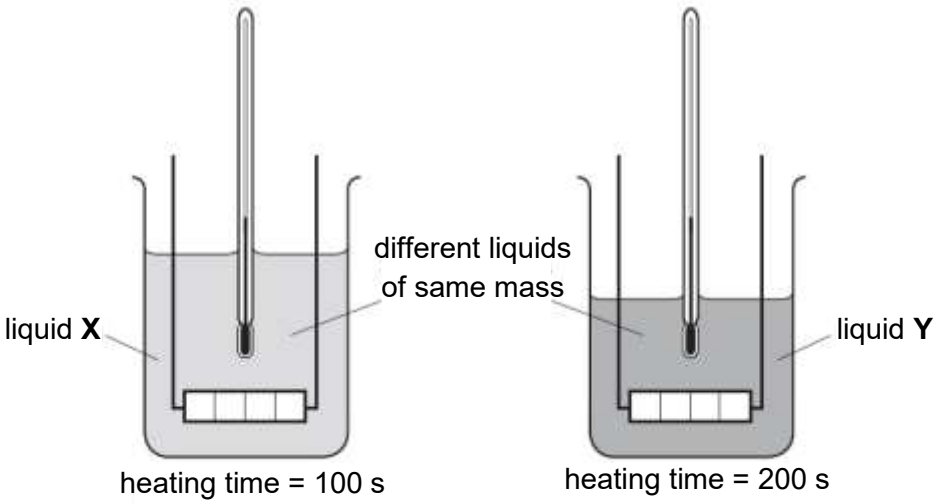
C **X** is warmer because a dull surface is a good absorber.

D **X** is warmer because a dull surface is a good emitter.

23 Equal masses of two different liquids are put into identical beakers.

Liquid **X** is heated for 100 s and liquid **Y** is heated for 200 s by heaters of the **same power**.

Each liquid has the same rise in temperature.



Which of the following statements is correct?

A Each beaker of liquid has the same heat capacity.

B Each beaker of liquid receives the same energy.

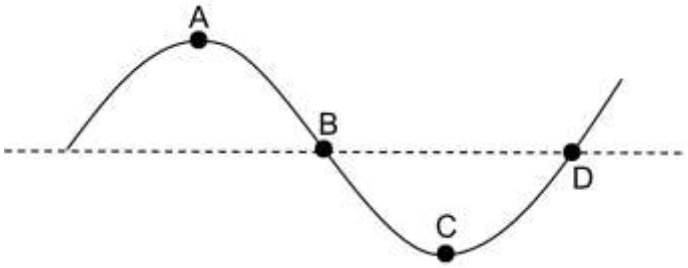
C Liquid **X** receives more energy than liquid **Y**.

D The heat capacity of liquid **X** is less than the heat capacity of liquid **Y**.

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24 The diagram below shows the position of a string at a particular instant of time as a transverse wave travels along it from left to right.

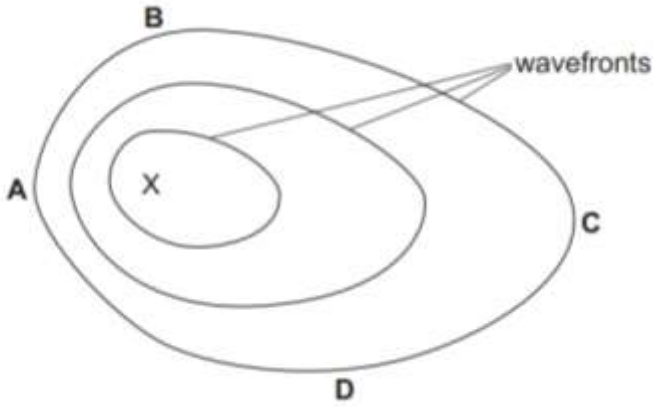
Which point represents the particle on the string that is moving downwards and with highest speed?



25 Waves travel more quickly on the surface of water when the water is deep.

A stone is dropped at point X into a pool of varying depth. The diagram shows the first three wavefronts on the surface of the pool.

The region between X and which labelled point is likely to be the deepest?



26 Visible light, X-ray and microwaves are all components of the electromagnetic spectrum.

Which of the following statements about the waves is correct?

A In a vacuum, microwaves travel faster than visible light and have a shorter wavelength.

B In a vacuum, microwaves travel at the same speed as visible light and have a shorter wavelength.

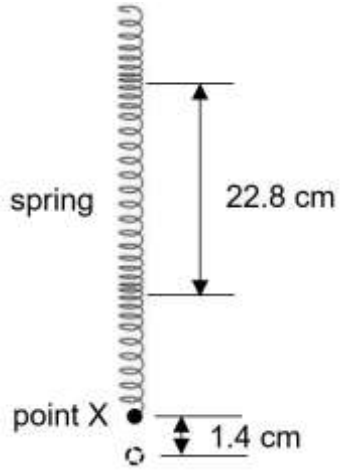
C In a vacuum, X-rays travel faster than visible light and have a shorter wavelength.

D In a vacuum, X-rays travel at the same speed as visible light and have a shorter wavelength.

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27 The diagram shows a spring oscillating vertically.

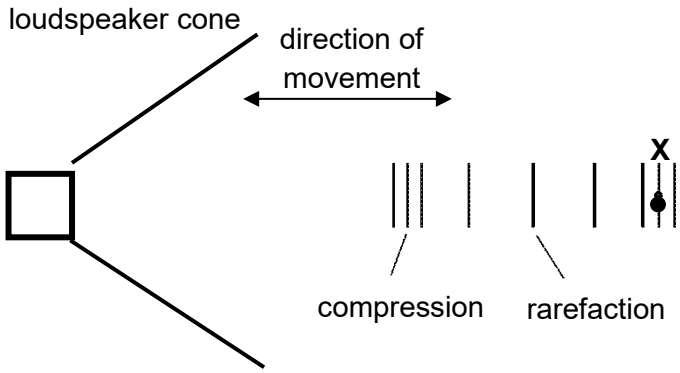
Point X at the end of the spring is oscillating between two vertical points 1.4 cm apart.



Which row describes the wave?

	amplitude / cm	wavelength / cm
A	0.7	11.4
B	0.7	22.8
C	1.4	11.4
D	1.4	22.8

28 Compressions and rarefactions are sent out from a loudspeaker cone as it vibrates backwards and forward. The frequency of vibration is 50 Hz.



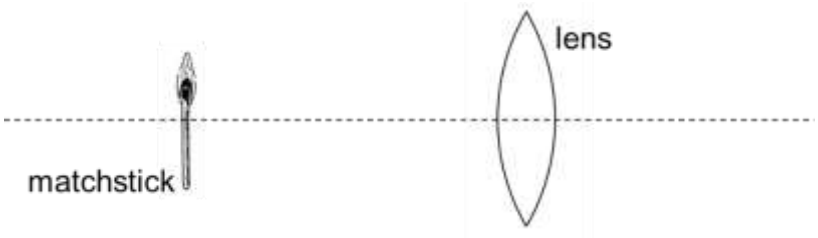
A compression is at point **X**.

How much time elapses before the first rarefaction arrives at **X**?

A 0.010 s
B 0.020 s
C 25 s
D 50 s

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29 A lighted matchstick is placed 20 cm from a converging lens with a focal length of 10 cm.

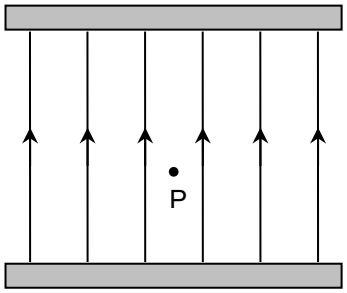


How much should the matchstick move in order to form a parallel beam of light on the other side of the lens?

A 5 cm to the right
B 5 cm to the left
C 10 cm to the right
D 15 cm to the right

30 The figure shows a uniform electric field between two metal plates.

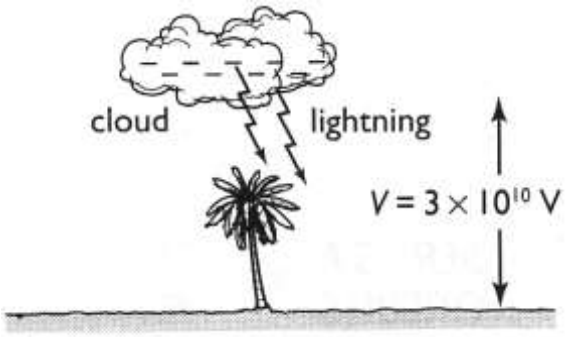
Describe the movement of the electron at P.



A downwards
B to the left
C to the right
D upwards

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31 During a thunderstorm, a lightning sent an electric charge of 90 C from a thundercloud to the earth. The potential difference between the thundercloud and the earth was 3 x 10^{10} V during the discharge.



How much energy was produced during the lightning?

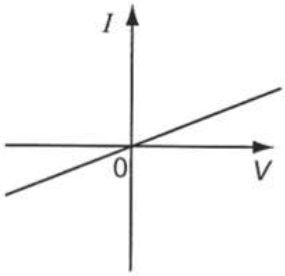
A 2.7 x 10^{10} J

B 2.7 x 10^{12} J

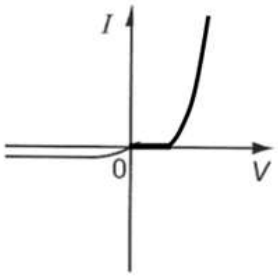
C 3.0 x 10^{12} J

D 1.3 x 10^{13} J

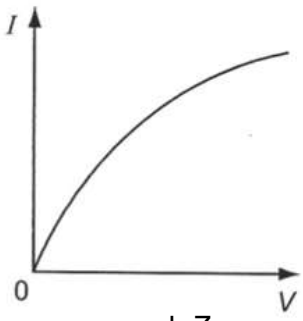
32 The three graphs X, Y and Z show the I-V characteristics for three different components.



graph X



graph Y



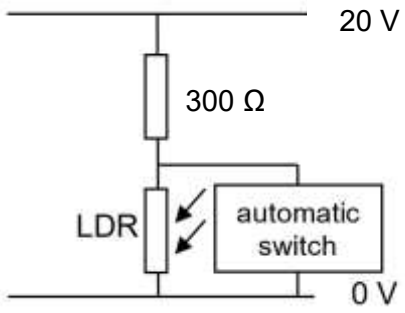
graph Z

Which components do each of the graphs represent?

	graph X	graph Y	graph Z
A	diode	filament lamp	metallic conductor
B	filament lamp	diode	metallic conductor
C	metallic conductor	diode	filament lamp
D	metallic conductor	filament lamp	diode

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33 The circuit shown below is connected to an automatic switch for a streetlight. The automatic switch needs a voltage of 12 V or higher for the lights to be on. The lights are to turn on at sunset and the value of the fixed resistor is 300 Ω.



What must the minimum resistance of the light-dependent resistor be in order for lights to turn on at sunset?

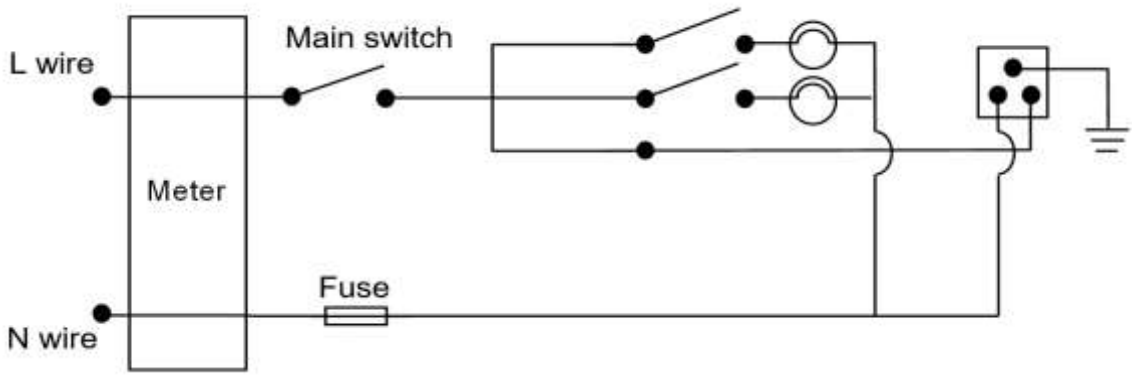
A 120 Ω

B 200 Ω

C 450 Ω

D 600 Ω

34 What is the mistake in the household circuit shown below?



A The position of the earth wire in the socket is wrong.

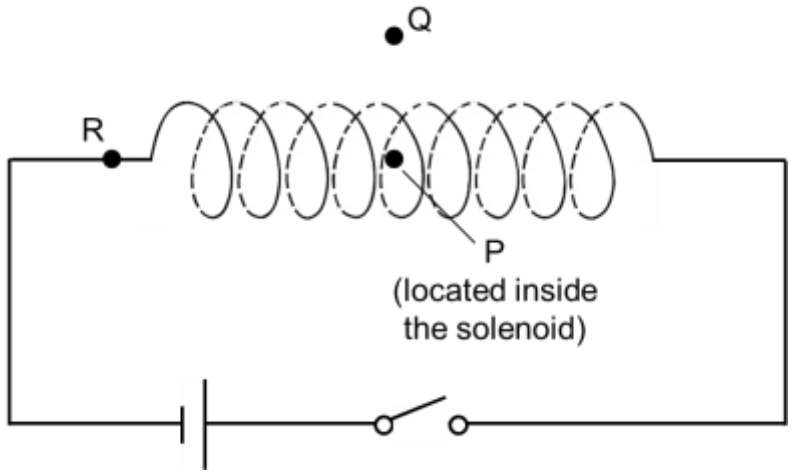
B There should be an earth wire connected to the bulbs.

C The fuse should be installed at the live wire.

D The neutral and the live wire in the socket should be interchanged.

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35 A solenoid is connected to a DC supply and three compasses, P, Q and R, are placed around the solenoid as shown below.



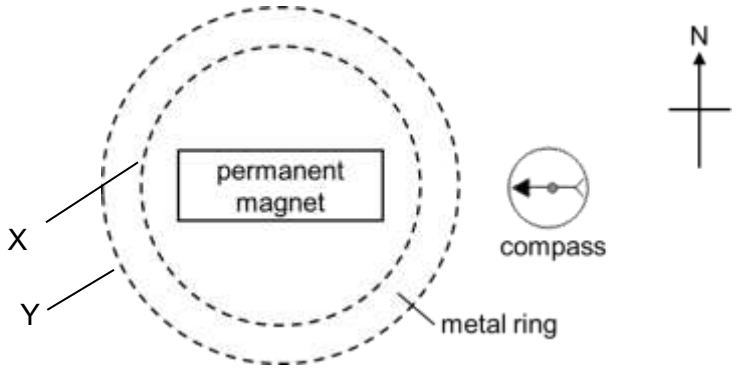
When the switch is closed, which row shows the direction in which the compass needles point to?

	P	Q	R
A	→	←	→
B	←	→	←
C	←	←	→
D	→	→	←

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36 A magnet and a compass is placed next to each other as shown. Under the influence of the magnet, the compass pointer is deflected from the North direction.

Two different metal rings (X and Y) are then placed around the magnet, occupying the dotted area.

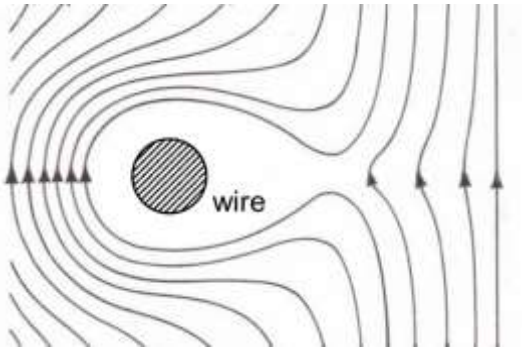


When metal ring X is placed first around the magnet, the compass pointer continues to point left. However, when metal ring Y is placed around the magnet, the compass pointer returns to the North direction.

What are rings X and Y made of?

	ring X	**ring Y**
A	aluminium	copper
B	copper	iron
C	iron	aluminium
D	iron	steel

37 The diagram below shows the resultant field pattern around the cross-section of a direct-current carrying straight wire placed in a uniform magnetic field.



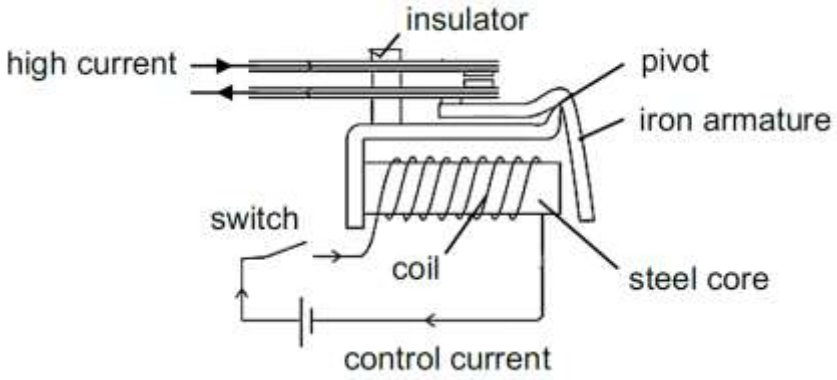
What is the direction of the current flowing through the wire?

A left **B** right

C out of the paper **D** into the paper

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38 The diagram shows a magnetic relay.



When the switch is turned on, the electromagnet is unable to attract the iron armature to allow the high current to flow in the circuit.

Which change will resolve this problem?

A moving the armature further from the steel core

B reducing the number of turns of coil around the steel core

C replacing the steel core by an iron core

D using a smaller control current

39 A power station produces 150 MW of power. It uses a transformer to step-up the transmission voltage to 250 kV. The transmission cable has a resistance of 15 Ω.

What is the ratio of power loss in the transmission cable to the power produced?

A 0.00036 **B** 0.0036 **C** 0.036 **D** 0.36

40 In an experiment to determine the half-life of a radioactive isotope, the following results were obtained.

activity/counts per second	60	44	29	21	15	11
time/s	0	1	2	3	4	5

What is the approximate half-life of the isotope?

A 1.0 s **B** 2.0 s **C** 3.0 s **D** 4.0 s

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