BOON LAY SECONDARY SCHOOL

PRELIMINARY EXAMINATION

2021

Name	( )
Class	

Subject	:	**PHYSICS**
Paper No	:	**1**
Subject Code	:	**6091/01**
Level	:	**SECONDARY FOUR EXPRESS**
Date/Day	:	**13 SEPTEMBER / MONDAY**
Time	:	**1145 - 1245**
Duration	:	**1 HOUR**

READ THESE INSTRUCTIONS FIRST

Do not open until you are told to do so.

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

INFORMATION TO CANDIDATES

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.

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 paper.
The use of an approved scientific calculator is expected, where appropriate.

This question paper consists of 13 printed pages.

Section A [40 marks]
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.

1 A pendulum is set in motion and 25 complete oscillations are timed. The time measured
is 75 s.

X   Y
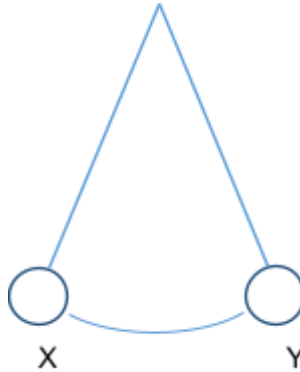
What is the period of the pendulum and the time taken for the pendulum to swing from
X to Y?

	period / s	time / s
A	0.17	0.33
B	0.33	0.17
C	1.5	3.0
D	3.0	1.5

2 A cyclist, riding at a speed of 5.0 m/s, brakes with uniform deceleration and stops in
3.0 m. How long does the cyclist take to stop?

A   0.30 s   **B**   0.60 s   **C**   0.83 s   **D**   1.2 s

3 A lift moves downwards at a constant acceleration of 2 m/s^2. Given that the lift has a
mass of 500 kg, what is the tension in the cable? (Take g = 10 N/kg)

A   2500 N   **B**   4000 N   **C**   5000 N   **D**   6000 N

4 Which graph below shows correctly how the car's displacement will change with time with the given velocity – time graph?
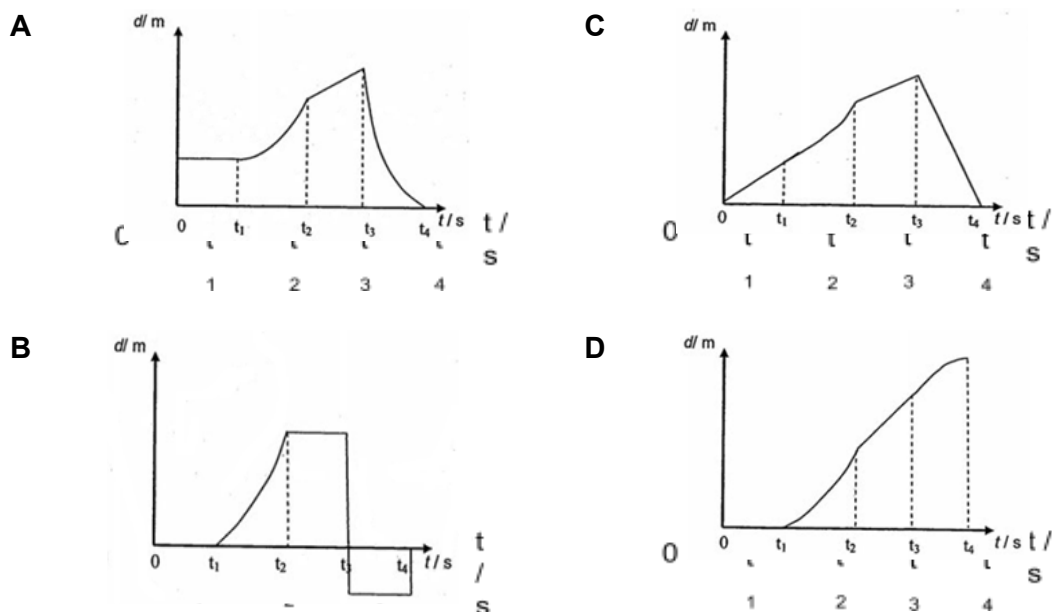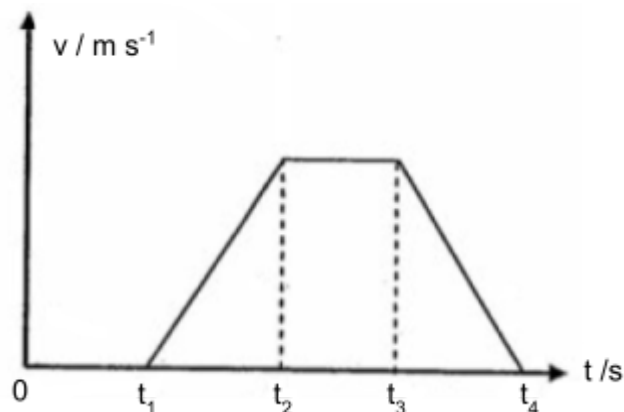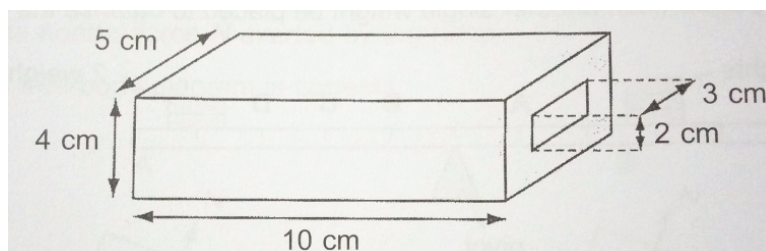

5 The figure shows force F_1 and F_2 exerted on a wooden block placed on a concrete surface. Another force which is the friction between the block and the concrete surface is 3.0 N.
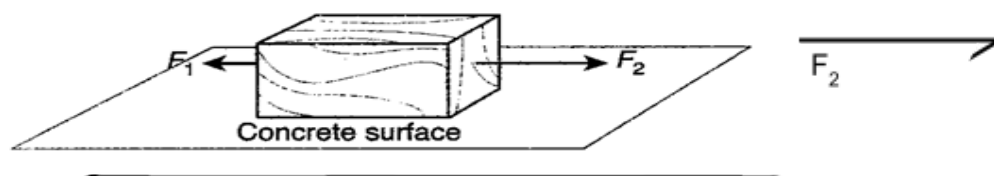
Which pair of forces for F_1 and F_2 causes the wooden block to move with an acceleration?

	F_1/ N	F_2/ N
A	3.0	6.0
B	5.0	8.0
C	6.0	10
D	8.0	11

6 A hollow rectangular block has the dimensions shown.
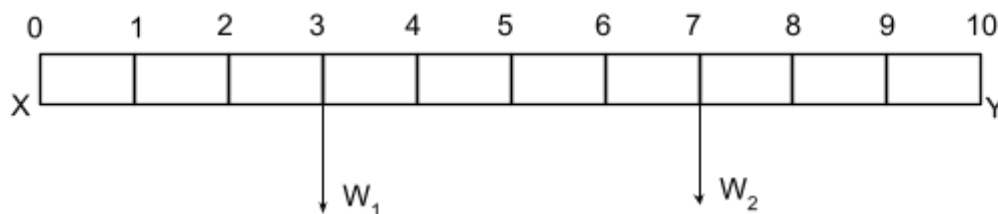

The hole in the middle goes all the way through the block.
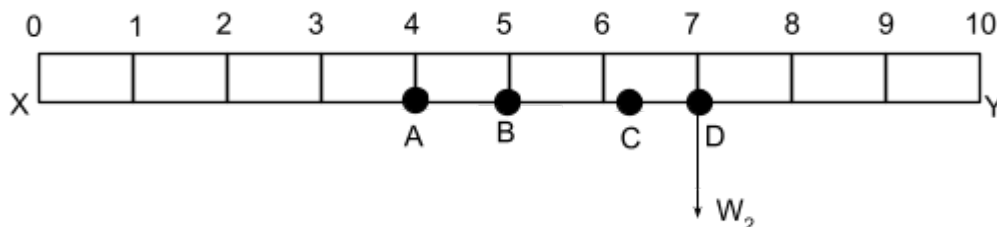The density of the metal is 15 g/cm³.
What is the mass of the block?

A 900 g	**B** 2100 g	**C** 3000 g	**D** 3600 g

7 A uniform beam XY is balanced on a pivot with two weights, W_1 and W_2 hung at equal distances from the pivot.
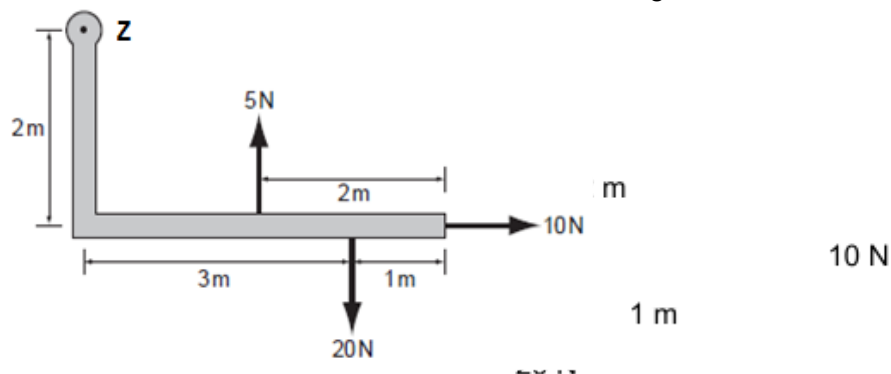

It is observed that the end Y moves downward when W_1 is removed.
Where should the pivot be in order to balance the beam again?

8 An L-shaped rigid lever arm is pivoted at point Z.
Three forces act on the lever arm, as shown in the diagram.

What is the magnitude of the resultant moment of these forces about point Z?

A 20 N m	**B** 30 N m	**C** 40 N m	**D** 70 N m

9 A 5.0 cm mercury column is suspended along a glass tube as shown in Fig. 9.1. Given that the length of the trapped air is 8.0 cm and the atmospheric pressure is 75 cm Hg, what is the length of the trapped air when the glass tube is inverted to the position shown in Fig. 9.2.
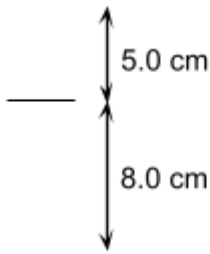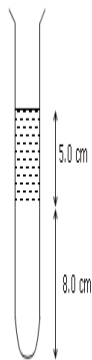
5.0 cm

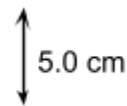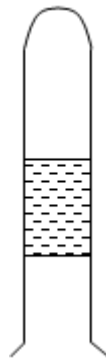8.0 cm

5.0 cm

8.0 cm

5.0 cm
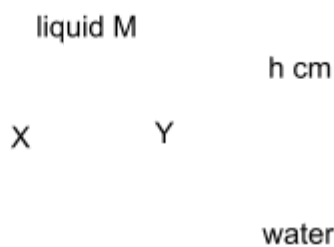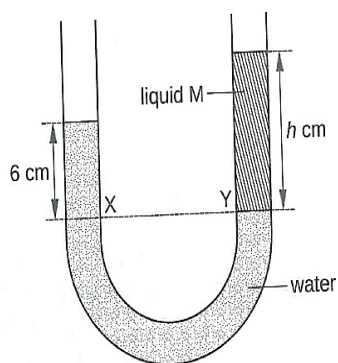
Fig. 9.1

Fig. 9.2

A 7.0 cm **B** 8.1 cm **C** 9.1 cm **D** 10.3 cm

10 The diagram shows a manometer used to determine the density of liquid M. When liquid M is poured into one arm, the water level in the other arm rises. If the densities of water and Liquid M are 1000 kg/m^3 and 750 kg/m^3 respectively, calculate the value of h.

liquid M

h cm

cm

6 cm

X

Y

water

liquid M

h cm

X   Y

water

A 8 cm **B** 10 cm **C** 12 cm **D** 14 cm

11 The figure below shows a box being pushed using a constant force of F through a distance d. The box has a weight of W and there is a total resistive force R acting against the box.

F

R

W

d

What is the useful work done on the box?

A Fd – Rd – Wd
B Fd + Rd + Wd
C Fd – Rd
D Fd – Wd

12 Water is pumped out of a tank by an electric motor at the rate of 150 kg/s. The speed of the water as it leaves the tank is 20 m/s. What is the power of this electric motor?
Take g = 10 N/kg.

A 18 kW **B** 27 kW **C** 30 kW **D** 45 kW

13 A vessel contains a gas. More gas is added into the vessel. If the temperature and the volume of the vessel are kept constant, which statement is **not** correct?

A The pressure of the gas increases.
B The intermolecular distance decreases.
C The total weight of the vessel increases.
D The average kinetic energy of the molecules increases.

14 A person places his two feet on two separate surfaces, both initially at the room temperature. One surface is a woollen carpet while the other is a ceramic tile.
Which of the following best describes how the person will feel?

A The foot on the carpet feels warmer because it transfers heat to the foot.
B The foot on the tile feels cooler because it transfers coldness to the foot.
C The foot on the carpet feels warmer because heat transfer is slower by the wool.
D Both surfaces are felt the same by the person since both are at the same temperature initially.

15 Which of the following processes is an illustration of heat transfer by only radiation?

A From a hot flame to the water in a saucepan.
B From the filament of an electric lamp to the inner surface of the bulb.
C From the hot surface of an electric lamp to the rest of the room.
D From the sun to earth atmosphere.

16 A laboratory thermometer gave a reading of − 1 °C and 99 °C when inserted into melting ice and boiling water at standard atmospheric pressure respectively. What is the error when the same thermometer is used to measure the difference between two temperatures?

A − 1 °C   **B** 0 °C   **C** 1 °C   **D** 2 °C

17 A piece of wire has an electrical resistance of 2.0 Ω in melting ice, and 2.5 Ω in boiling water. What is the resistance at 20 °C assuming that resistance changes uniformly with temperature?

A 0.1 Ω   **B** 2.0 Ω   **C** 2.1 Ω   **D** 2.2 Ω

18 An ice-cube has a mass of 8.0 g. The ice-cube is at 0 °C.
Heat from the surroundings reaches the ice-cube at an average rate of 1.30 J / s.
How long does it take for the ice to melt completely?
Specific latent heat of fusion of water is 336 kJ / kg.

A 2.07 s   **B** 2070 s   **C** 3500 s   **D** 2 070 000 s

19 2.0 kg of water at 10 °C is mixed with 4.0 kg of water at 70 °C. If no heat is lost, the temperature of the mixture will be

A 20 °C   **B** 30 °C   **C** 40 °C   **D** 50 °C

20 The diagram below shows a wave on a string with two points P and Q marked.
The wave is moving in the direction shown.
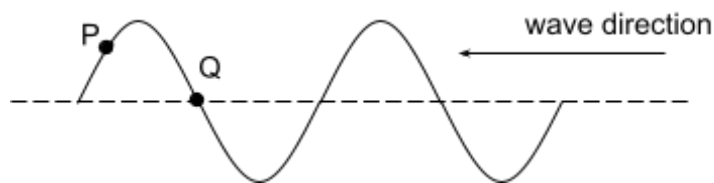
What will happen next?

A P will move up.
B P will move down.
C Q will move up.
D Q will not move.

21 The diagram below shows the wavefronts of ripple travelling forward from P to Q in a ripple tank. The time to reach Q from P is 6.0 s.
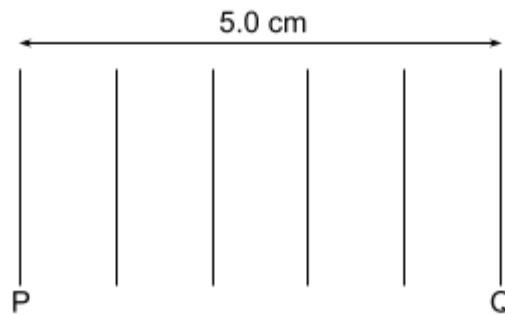

What is the frequency of the wave?

A   0.17 Hz   **B**   0.83 Hz   **C**   6.0 Hz   **D**   30.0 Hz

22 A ray of light in a glass block is incident on a boundary with air at an angle of incidence of 38°. The critical angle at this air-glass boundary is 38°.
What happens to the ray of light at the boundary?

A   It is partly reflected back into the glass and party refracted along the boundary.
B   It is party reflected back into the glass and partly refracted into the air.
C   It is totally reflected back into the glass.
D   It is totally refracted into the air.

23 A man is standing still while a plane mirror is moving away from him at a speed of 2.0 m/s. How fast does he see his image moving away from himself?
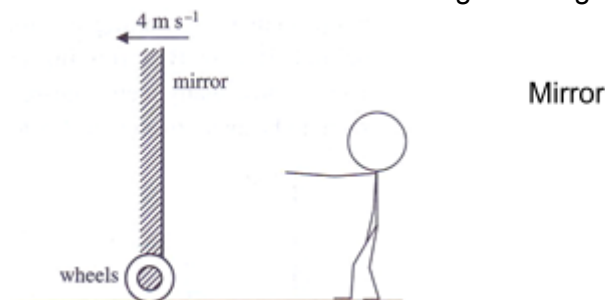

A   1.0 m/s   **B**   2.0 m/s   **C**   4.0 m/s   **D**   8.0 m/s

24 A hospital needs to sterilise medical equipment.
Which electromagnetic waves could be used?

A   infra-red
B   Microwaves
C   Radiowaves
D   Ultraviolet

25 A sound wave of wavelength of 0.50 m travels at a speed of 320 m/s in air. It enters a liquid and its wavelength becomes 2.5 m. What is the frequency of the sound in the liquid?

A   128 Hz   **B**   320 Hz   **C**   640 Hz   **D**   3200 Hz

26 The diagram shows the trace produced on a cathode-ray oscilloscope (c.r.o.) by a sound.
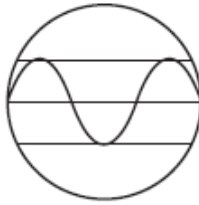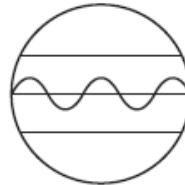
Which trace is produced when both the loudness and the pitch of the sound are increased?
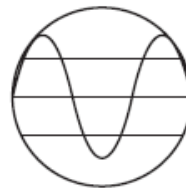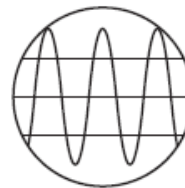
A
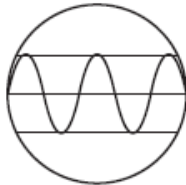
C

B

D

27 Static shocks are caused by

A a build-up and subsequent discharge of protons.
B a build-up and subsequent discharge of electrons.
C a build-up and subsequent discharge of neutrons.
**D** a build-up and subsequent discharge of cations.

28 Two out of three different plastic rods were charged by rubbing. The following results were obtained when two of the rods are placed near each other.

Rod X and Rod Y repelled.
Rod X and Rod Z attracted.

Which of the following show the charge of the rods?

	Rod X	Rod Y	Rod Z
A	negative	negative	neutral
B	negative	neutral	positive
C	positive	negative	positive
D	positive	positive	positive

**29** A resistance wire XY is connected in a circuit as shown.
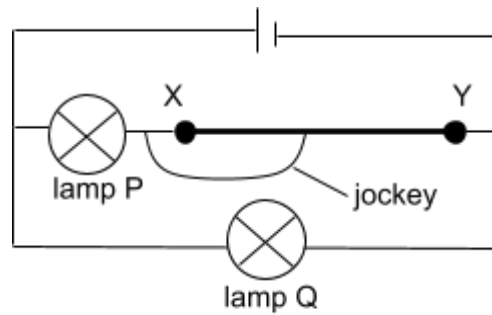
What happens to the brightness of the lamps as the jockey slides along the resistance wire from point X to Y?

A lamp P will be brighter, while lamp Q will be dimmer.
B lamp P will be dimmer, while lamp Q will have the same brightness.
C lamp P will be brighter, while lamp Q will have the same brightness.
D lamp P will have the same brightness, while lamp Q will be brighter.

**30** How much charge flows through the 6 Ω resistor in 1 second?
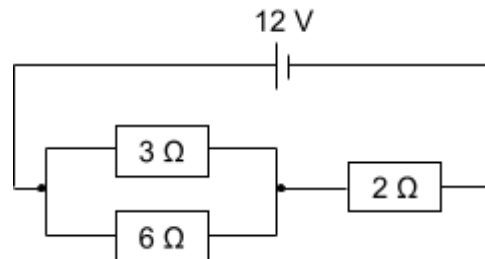
A 1 C **B** 2 C **C** 3 C **D** 4 C

31 Two resistors of 6 Ω and 12 Ω are arranged in parallel. A potential difference is connected across the terminals X and Y. The current in the 6 Ω resistor is 4 A.
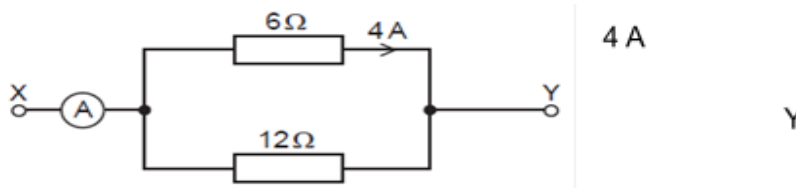
What is the current in the ammeter?

A 4 A **B** 6 A **C** 8 A **D** 12 A

**32** The circuit diagram shows a variable resistor R connected in parallel to the lower half of a potential divider.
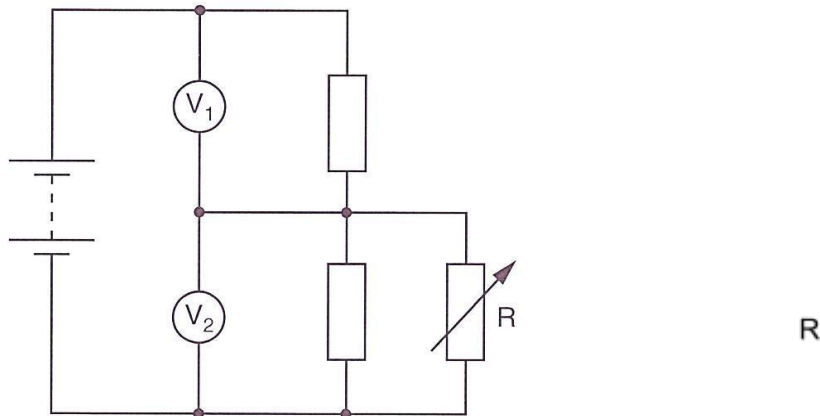
The resistance of R increases. What happens to the voltmeters readings?

	reading on V_1	reading on V_2
A	decreases	decreases
B	decreases	increases
C	increases	decreases
D	increases	increases

33 A kilowatt-hour of electrical energy is expended when _____.

A   a 50 W lamp is used for 2 hours.
B   a 3000 W heater is used for 20 minutes.
C   a current of 0.1 A is maintained in a resistance of 100 Ω for 10 hours.
D   two 50 W lamps in parallel are operated on a 200 V supply for 30 minutes.

34 The metal case of an electric heater is earthed. The plug to the heater contains a 5 A fuse. There is a current of 4 A when the heater works normally.
The cable to the heater becomes so worn that the live wire makes electrical contact with the case.
What happens?

A   The current flows to earth and the fuse is not affected.
B   The fuse melts and switches off the circuit.
C   The metal case becomes live and dangerous.
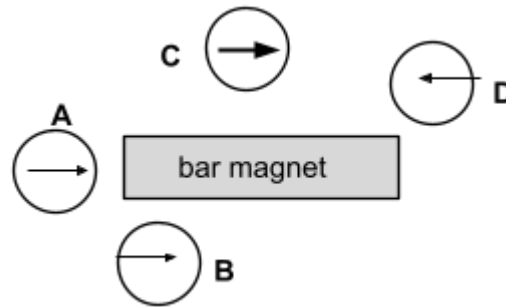D   The metal case becomes very hot.

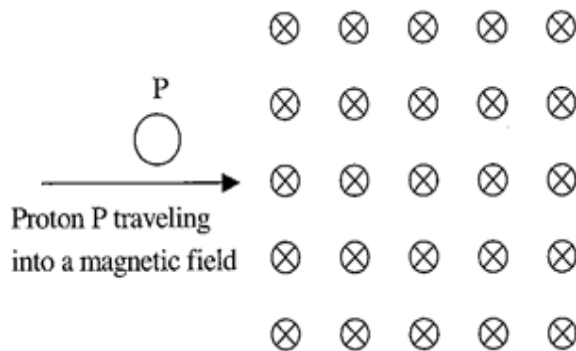**35** A small plotting compass X is placed in between the two magnets as shown below.
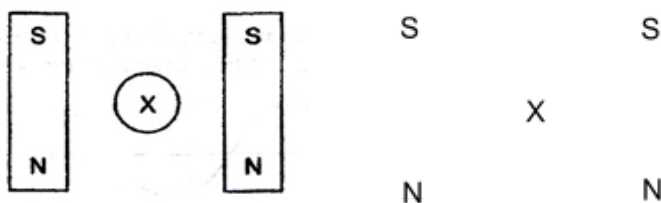
Which one of the following shows the direction along which the compass needle will point?

A   (←)   B   (↑)   C   (↖)   D   (↙)

36 Four magnetic compasses are placed near a bar magnet as shown in the figure below. Which compass is faulty?
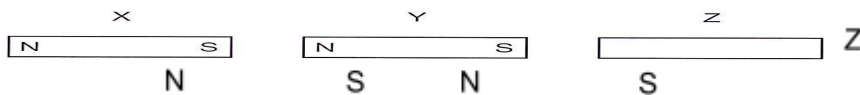

37 A positive ion enters a region of magnetic field as shown below.


The positive ion will

A not be affected and continue to travel straight through.

B experience an upwards force.

C experience a downwards force.

D experience a force into the paper.

38 The diagram shows three bars placed in a line. X and Y are both magnets. Z is soft iron.

What are the magnetic forces on X and Z due to magnet Y?

	force on X	force on Z
A	attraction	attraction
B	attraction	repulsion
C	repulsion	attraction
D	repulsion	repulsion

39 Two current carrying conductors are placed a distance from each other.
The directions of current flowing through them are shown in the diagram.
Which diagram correctly shows the forces acting on the two conductors?

A   **B**

C   **D**
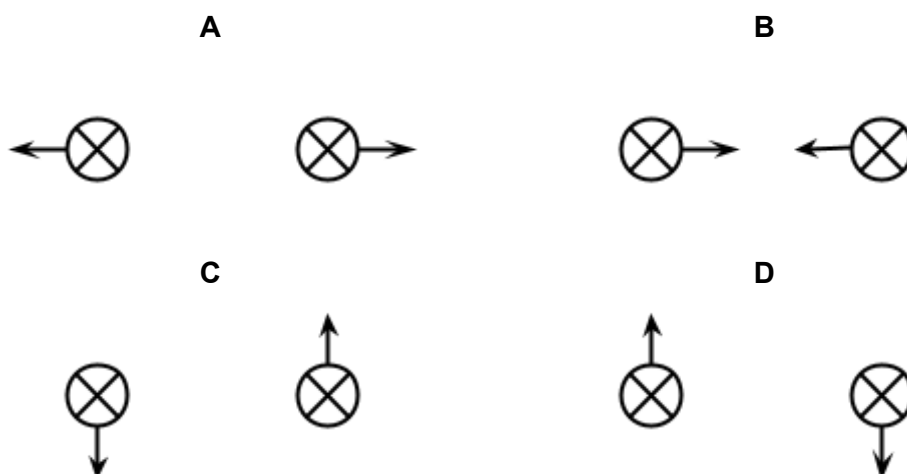
40 A transformer consists of one coil with 1200 turns and a second coil, with total of 120 turns, which can be tapped at various places.

240 V, 1200 turns

R
40 turns
S
40 turns
T
20 turns
U
20 turns
V
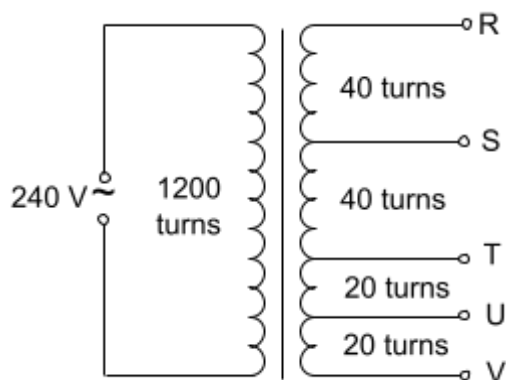
Which pair of terminals should be connected to a 12 V, 24 W lamp for it to be lit normally?

A   RT   **B**   RV   **C**   SU   **D**   TV