Class:	Register No:	Name:

CRESCENT GIRLS' SCHOOL
SECONDARY FOUR
PRELIMINARY EXAMINATION

PHYSICS 6091/01
Paper 1 **28 August 2023**

1 Hour

READ THESE INSTRUCTIONS FIRST

Write your name, index number and class in the spaces provided at the top of this page and on the optical answer sheet.
Do not use staples, paper clips, highlighters, glue or correction fluid.

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 optical answer sheet.

Read the instructions on the Answer Sheet very carefully.

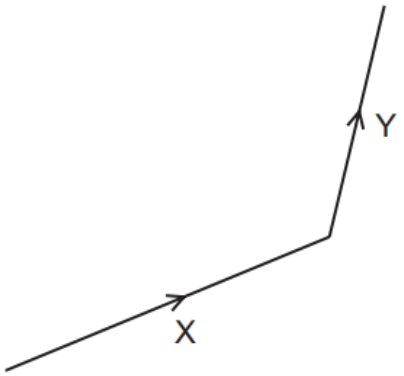
Each correct answer will score one mark. A mark will not be deducted for a wrong answer. Any rough working should be done in this booklet.

1 The magnitudes of three different electric charges are given below.

What is the correct order of size, from smallest to largest?

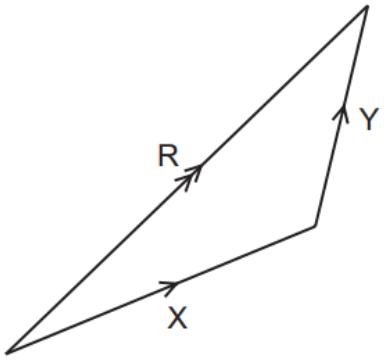
A 1 kC → 1 mC → 1 MC
B 1 mC → 1 kC → 1 MC
C 1 mC → 1 MC → 1 kC
D 1 MC → 1 mC → 1 kC

2 Two forces X and Y act as shown.

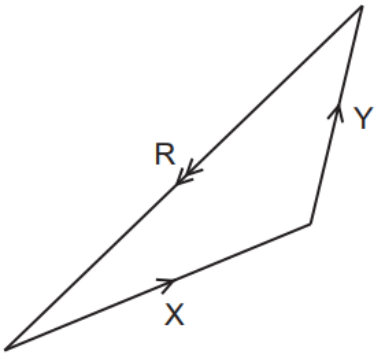


Which diagram shows the resultant force R of X and Y?

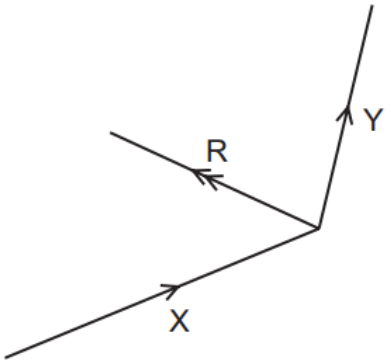
A



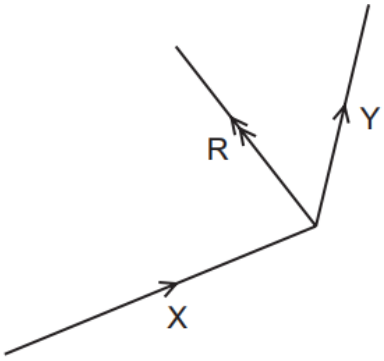
B



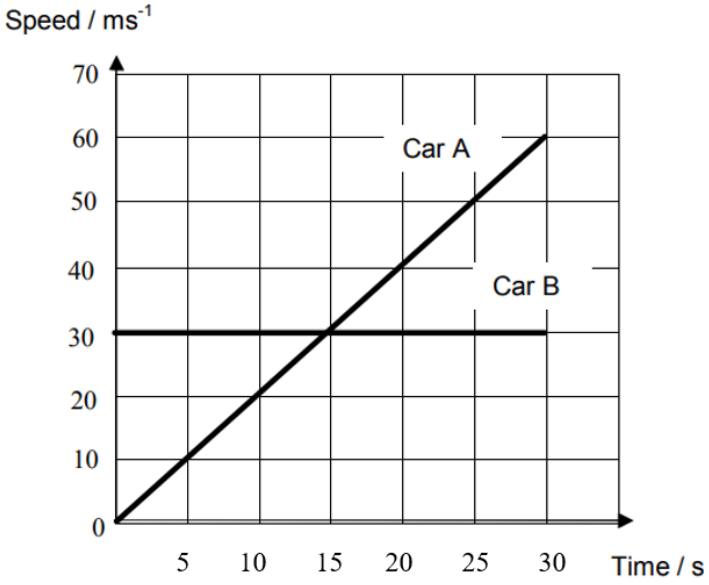
C



D



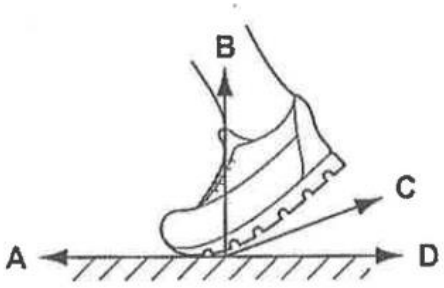
3 Car A and Car B are moving on two parallel straight tracks. Car A starts moving from rest when Car B passes it at t = 0 s.



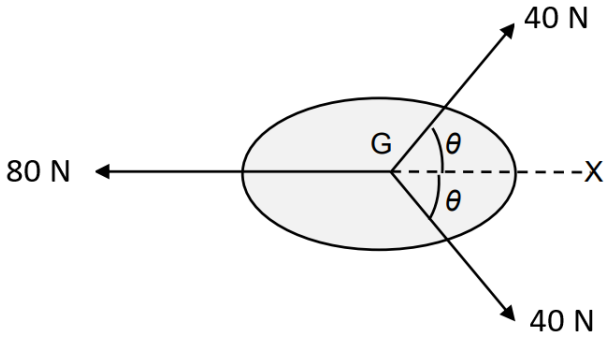
Which statement about the graph is correct?

A Car A covers more distance than Car B from t = 0 s to t = 30 s.
B Car A covers less distance than Car B from t = 0 s to t = 15 s.
C Car B covers more distance than Car A from t = 15 s to t = 30 s.
D Car B covers the same distance as Car A from t = 0 s to t = 15 s.

4 The diagram shows a person walking to the left. Which arrow shows the direction of friction acting on the shoe?



5 The diagram shows three forces acting on the centre of gravity G of a body which is initially at rest. The 40 N forces make an angle θ with the line GX.



What is the subsequent motion of the body?

A It accelerates to the left.
B It accelerates to the right.
C It moves at a constant speed to the left.
D It moves at a constant speed to the right.

6 When a heavy coin falls a short distance towards the ground, it does not reach terminal velocity.

Which best explains the above?

A The coin does not hit the ground.
B The weight of the coin equals to the air resistance.
C The weight of the coin increases as air resistance increases.
D The weight of the coin is always more than the air resistance.

7 A girl is sitting in an aeroplane which takes off and climbs to 12 000 m in a certain time.

During this ascent, what happens to the mass and to the weight of the girl?

	mass	**weight**
A	decreases	decreases
B	increases	increases
C	unchanged	decreases
D	unchanged	increases

8 A plastic hollow sphere of mass 60 g has a volume of 100 cm^3.

What is the maximum mass of sand that may be added to the sphere before it starts to sink in a liquid of density 1.1 g/cm^3?

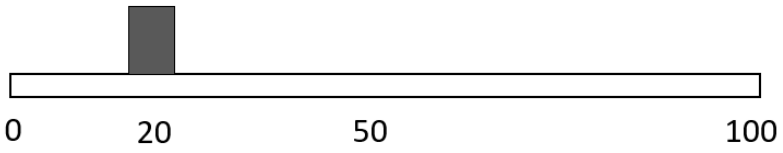
A 30 g
B 50 g
C 60 g
D 110 g

9 A car is designed to be stable.

To achieve good stability, where is the centre of mass of the car?

A above the front wheel
B above the rear wheel
C as high in the car as possible
D as low in the car as possible

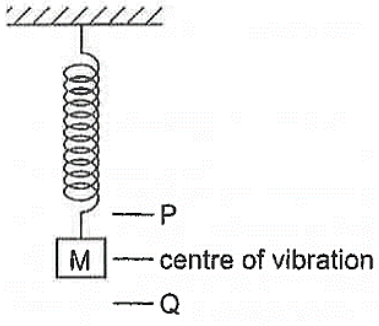
10 A uniform beam of weight 30 N has a length of 100 cm. A box of 15 N is placed at the 20 cm mark. The beam can be balanced on a pivot.



At which mark should the pivot be placed?

A 10 cm
B 30 cm
C 40 cm
D 60 cm

11 A mass M is hung from a spring. It is then pulled down slightly and allowed to vibrate vertically between P and Q.



Which of the following is correct about the energy in the setup?

	energy at point P	**energy at point Q**
A	kinetic	kinetic
B	kinetic	potential
C	potential	kinetic
D	potential	potential

12 A weightlifter of 80 kg lifts some masses through a height of 1.7 m.

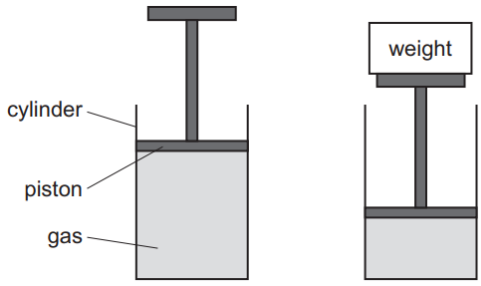
The gravitational field strength is 10 N / kg.

During the lift, the gravitational potential energy of the masses increases by 4200 J.

What is the total mass lifted?

A 25 kg
B 250 kg
C 330 kg
D 2500 kg

13 A piston is supported by gas trapped in a cylinder.

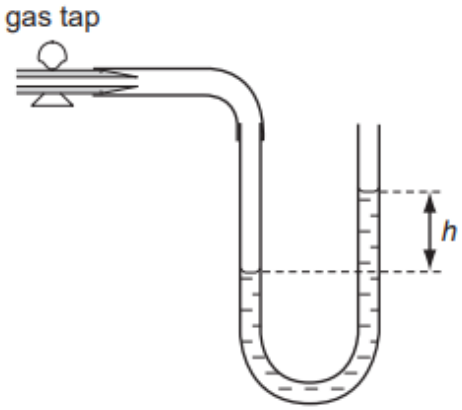


A weight is put on the piston. The volume of the gas supporting the piston decreases but the temperature of the gas is unchanged.

What happens to the molecules?

A They have a smaller size.
B They have a more kinetic energy.
C They hit the piston more frequently.
D They move more slowly.

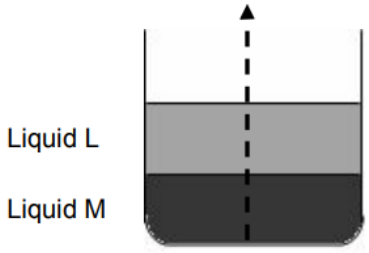
14 A water manometer is connected to a gas supply. One end of the manometer is opened to the atmosphere.



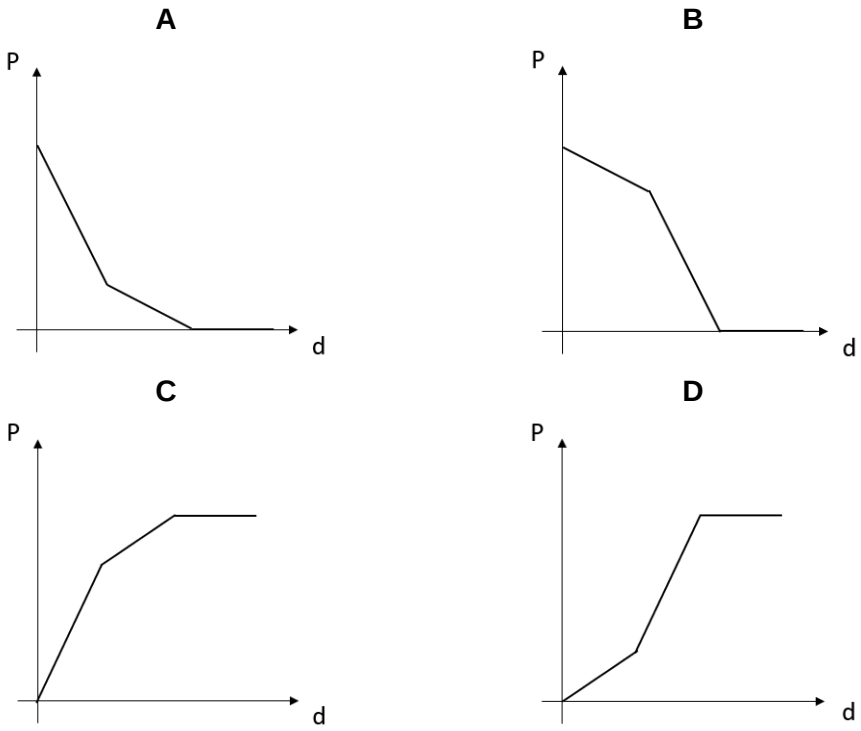
Which statement about the pressure of the gas supply is true?

A The pressure is *h* cm of water.
B The pressure is *h* cm of water above atmospheric pressure.
C The pressure is *h* cm of water below atmospheric pressure.
D The pressure is the same as atmospheric pressure.

15 A container has two immiscible layers of liquids, L and M. The density of liquid M is twice the density of liquid L.



Which graph best shows how pressure varies with the height, d, measured from the bottom of the container?



16 In an uncalibrated thermometer, the length of a mercury thread is 3.0 cm when immersed in pure melting ice, and 28.0 cm when surrounded by steam from boiling water under normal atmospheric pressure. When placed in a liquid of temperature T °C, the length is 18.0 cm.

What is the temperature of the liquid?

A 37.5 °C
B 40.0 °C
C 57.0 °C
D 60.0 °C

17 At a constant temperature, a solid has a fixed shape and a fixed volume.
Which of the following describes the shape and the volume of a liquid at constant temperature?

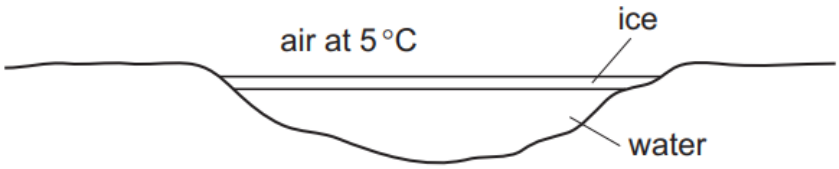
	shape	**volume**
A	fixed	fixed
B	fixed	not fixed
C	not fixed	fixed
D	not fixed	not fixed

18 Some pollen grains are dropped on the surface of the water in a tank.

Which of the following causes the movement of the pollen grains?

A bombardment of pollen grains on water molecules
B bombardment of water molecules on pollen grains
C random motion of pollen grains
D random motion of water molecules and pollen grains

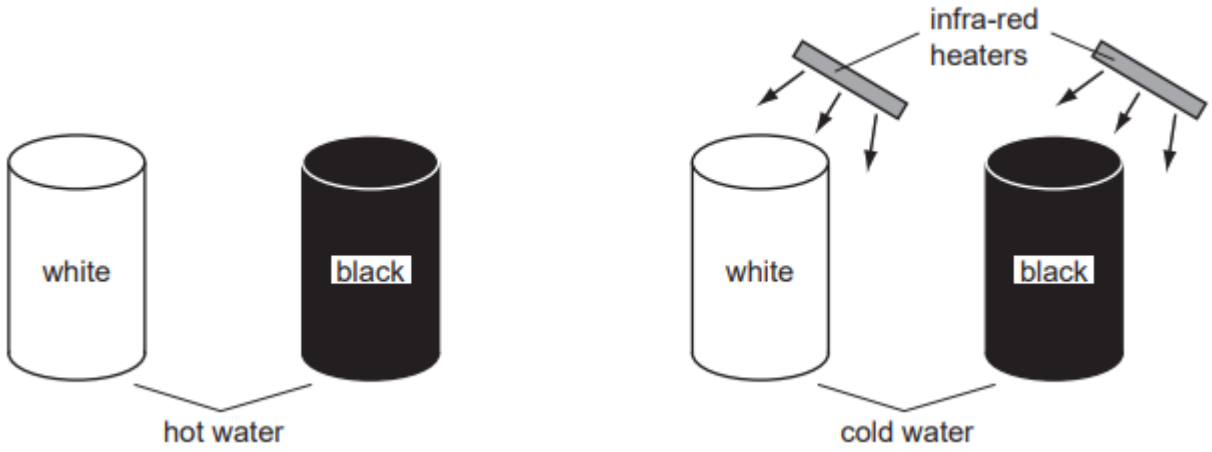
19 The diagram shows a frozen pond with the surface of the ice slowly melting as heat is transferred from the warmer air above it.



By which processes is the heat transferred from the air to the ice?

A conduction, convection and radiation
B conduction and convection only
C conduction and radiation only
D convection and radiation only

20 The diagrams show four cans in a cool room. They are painted as shown. One pair is filled with hot water and left to cool down. The other pair is filled with cold water and placed near infra-red heaters.



The hot water in the black can cools more quickly than the hot water in the white can. The cold water in the black can heats up more quickly than the cold water in the white can.

Which of the following shows the reasons for this?

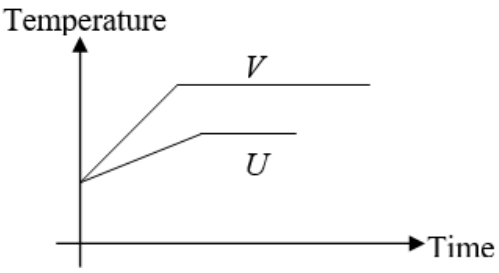
	better emitter of infra-red radiation	**better absorber of infra-red radiation**
A	black	black
B	black	white
C	white	black
D	white	white

21 Two substances *U* and *V* which are of the same mass are heated by identical heaters until they have fully melted.

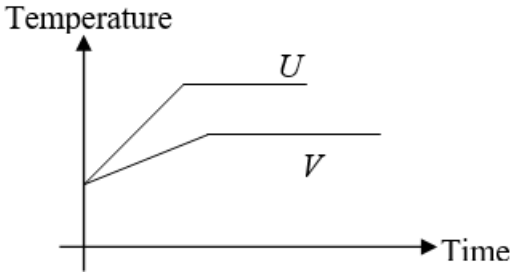
The specific heat capacity of solid *U* is smaller than that of solid *V*. The specific latent heat of fusion of solid *U* is also lower than that of solid *V*.

Which graph correctly shows the variation of temperature with time for the two substances *U* and *V*?

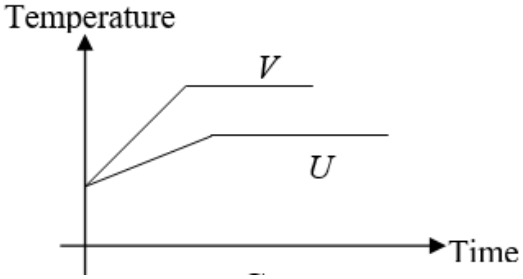
A



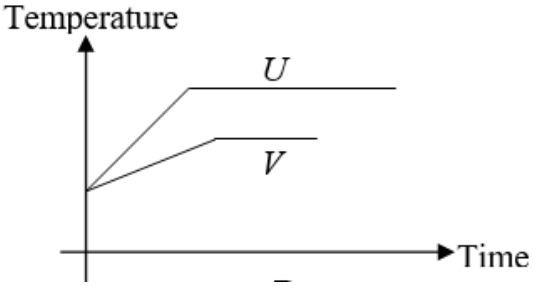
B



C

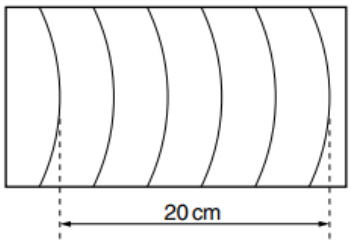


D



22 The dipper in a ripple tank vibrates at a frequency of 5.0 Hz and the resulting wave pattern is photographed.

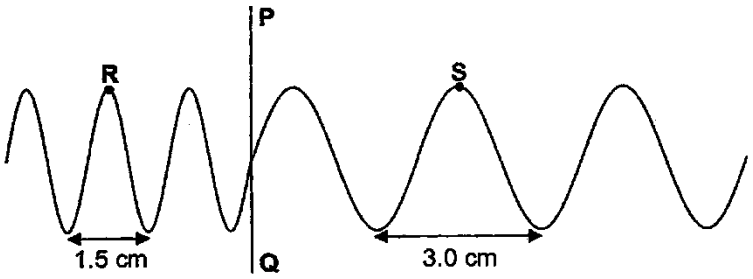
The distance between the two crests shown is 20 cm.



What is the speed of the wave?

A 4.0 cm/s
B 20 cm/s
C 25 cm/s
D 100 cm/s

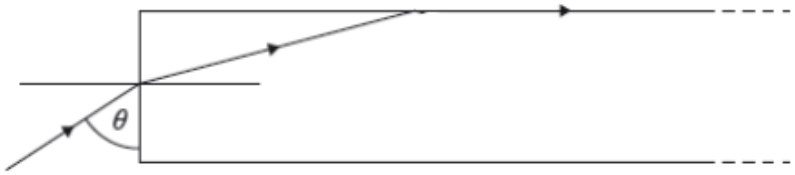
23 The diagram shows a water wave in a ripple tank. The wave has a speed of 10 m/s at **R**. The wave crosses a boundary **PQ** and the distance between two successive troughs changes from 1.5 cm to 3.0 cm.



What is the velocity of the wave at **S**?

A 2.5 m/s
B 5.0 m/s
C 10 m/s
D 20 m/s

24 A ray of light passes from the air into a long glass plate of refractive index n at an angle θ to the edge of the plate.



The ray is incident on the internal surface of the glass plate and the refracted ray travels along the external surface of plate.

What changes to n and θ respectively cause the ray to travel entirely within the plate after incidence?

	change to n	**change to θ**
A	decrease	decrease
B	decrease	increase
C	increase	decrease
D	increase	increase

25 A clinic needs to sterilise medical equipment.

What electromagnetic waves could be used?

A gamma rays
B infrared
C microwaves
D ultraviolet

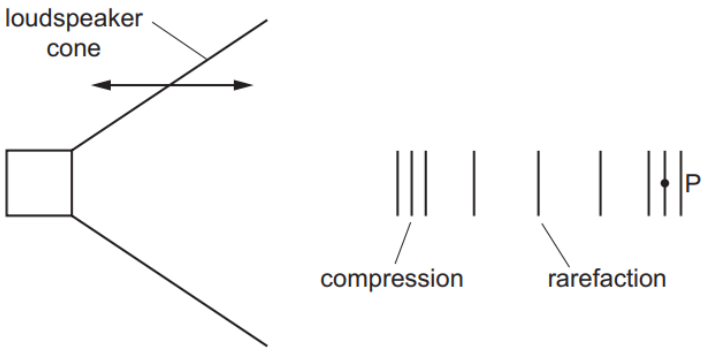
26 An ultrasonic tape-measure is used to find the distance to a wall. It sends out an ultrasonic pulse and times how long it takes for the reflected pulse to return from the wall.

The ultrasonic pulse has a frequency, a wavelength and a speed.

Which pair of values is needed to find the distance to the wall?

A frequency and wavelength
B frequency and time taken for the pulse to return
C speed and time taken for the pulse to return
D wavelength and time taken for the pulse to return

27 Compressions and rarefactions are sent out from a loudspeaker cone as it vibrates backwards and forwards. The frequency of the vibrations is 50 Hz.



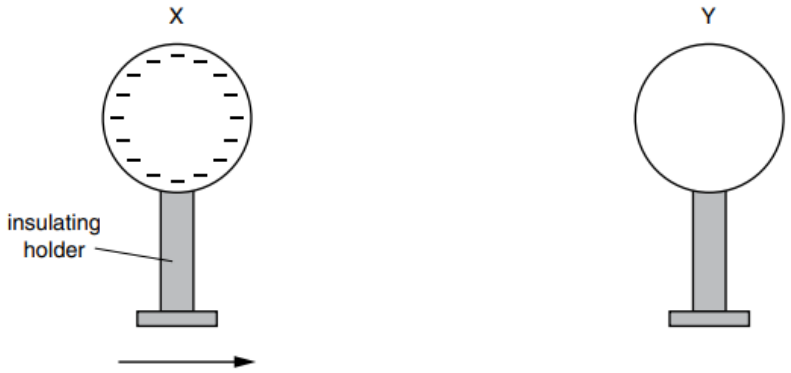
A compression is at point P. How much time lapses before the next rarefaction arrives at P?

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

28 Which list contains two electrical conductors?

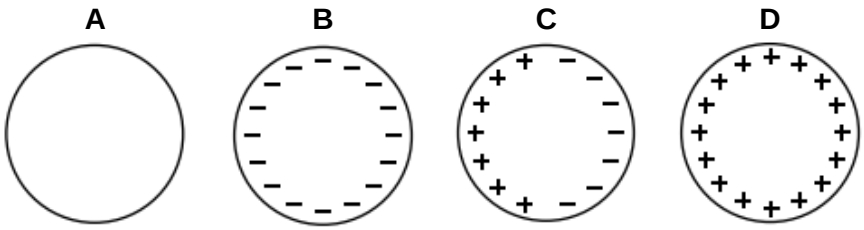
A glass, plastic, rubber
B glass, rubber, steel
C graphite, rubber, glass
D graphite, rubber, steel

29 A negatively charged sphere X is moved close to an identical uncharged sphere Y. The spheres do not touch each other.



Sphere Y is earthed by touching it with a finger, which is then removed. Sphere X is then moved away from sphere Y.

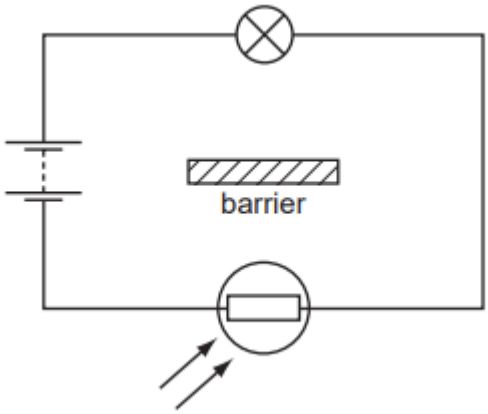
What is the final charge on sphere Y?



30 One volt can also be written as _____ .

A one coulomb per ampere
B one coulomb per joule
C one joule per ampere
D one joule per coulomb

31 A lamp is connected in series with a light-dependent resistor (LDR) and a battery. The barrier shields the LDR from the lamp.

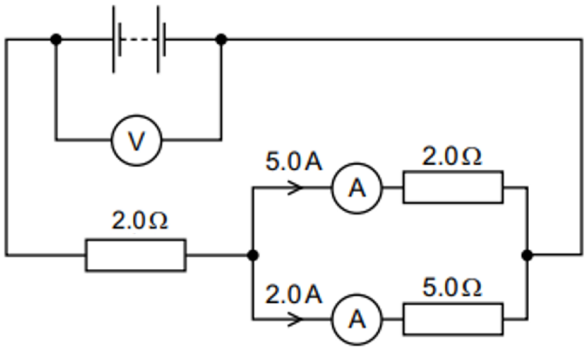


When light falls on the LDR, the lamp glows with normal brightness.

If the light intensity on the LDR increases, what happens to the lamp?

A It gets brighter.
B It gets dimmer.
C It goes out.
D There is no change.

32 The circuit diagram shows a 2.0 Ω resistor connected in series with a parallel arrangement of a 2.0 Ω resistor and a 5.0 Ω resistor. The current readings for the parallel arrangement are shown.



What is the reading on the voltmeter?

A 10 V
B 12 V
C 20 V
D 24 V

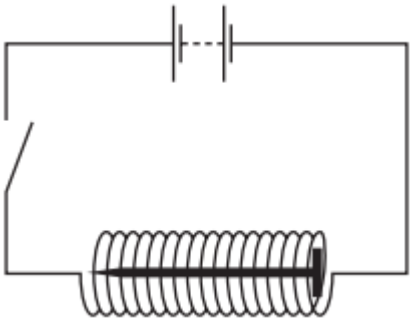
33 An electric iron is marked 240 V, 2000 W.

Four fuses are available with values 5 A, 7 A, 10 A and 13 A.

Which fuse should be used?

A 5 A
B 7 A
C 10 A
D 13 A

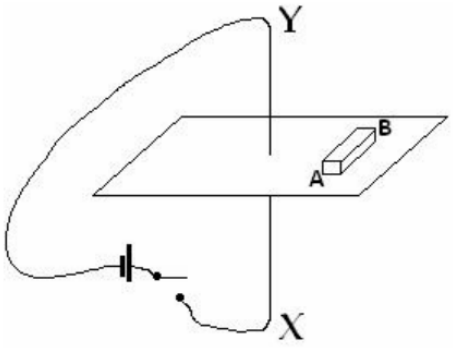
34 An iron nail can be magnetised using a coil.



How can the nail be demagnetised?

A leaving the apparatus switched on for a long time
B removing the nail from the coil after replacing the d.c supply with an a.c. supply
C using a coil with fewer turns
D using more cells

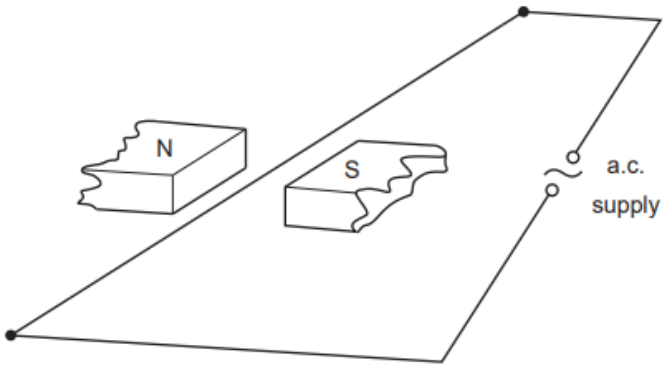
35 The diagram shows a wire XY connected to a battery and a switch. An unmagnetised soft iron AB is placed near the wire XY in a horizontal plane.



What happens to the soft iron when the switch is closed?

A End A is magnetised with a south pole.
B End B is magnetised with a south pole.
C The soft iron is attracted towards the wire.
D The soft iron is repelled away by the wire.

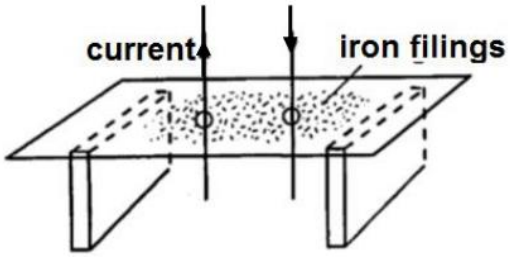
36 An a.c. supply is connected to a wire stretched between the poles of a magnet.



Which way does the wire move?

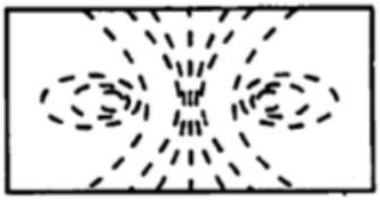
A left and right
B right only
C up and down
D up only

37 The diagram shows two straight and parallel current-carrying wires passing through a horizontal plane with some iron filings on it.



Which diagram shows the pattern of the magnetic field produced by the current-carrying wires?

A



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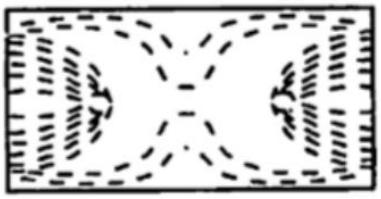
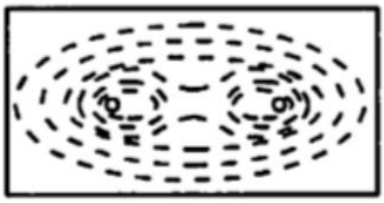
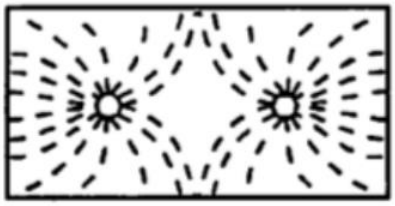


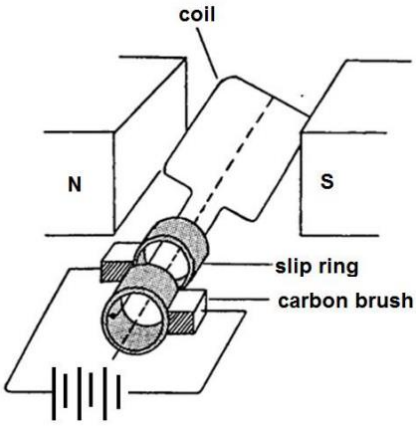
C



D



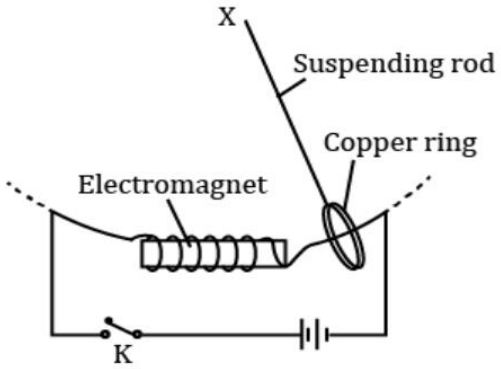
38 The diagram shows a simple d.c. motor connected to a pair of slip rings instead of split ring.



Which statement is correct?

A The coil will rotate at a faster rate.
B The coil will rotate continuously in the anti-clockwise direction.
C The coil will rotate continuously in the clockwise direction.
D The coil will rotate in alternating directions.

39 The diagram shows a copper ring suspended by a long and light rod pivoted at X. The copper ring can swing freely like a pendulum. An electromagnet is mounted in such a way that the copper ring passes through it when swinging.

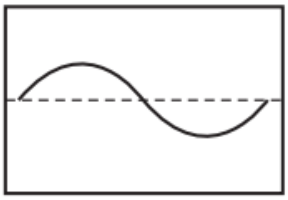


The copper ring is set into oscillation with the switch open.

What happens after the switch is closed?

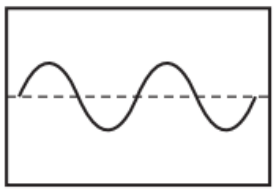
A The amplitude of the oscillation increases.
B The oscillation dies out quickly.
C The ring accelerates towards the electromagnet.
D There is no change in the motion of the ring.

40 The coil of an a.c. generator is rotated and the output is displayed on the screen of a cathode-ray oscilloscope (c.r.o). The diagram shows the trace on the screen.

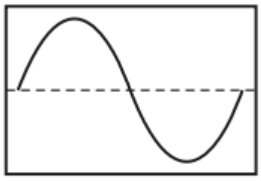


What trace appears on the screen when the speed of rotation of the coil is doubled while the settings on the c.r.o are unaltered?

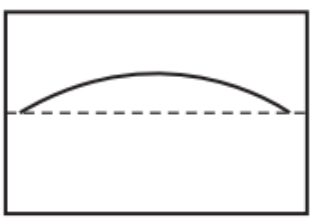
A



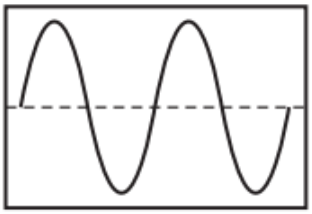
B



C



D



Answer

1	B
2	A
3	B
4	A
5	A
6	D
7	C
8	B
9	D
10	C

11	D
12	B
13	C
14	B
15	A
16	D
17	C
18	B
19	C
20	A

21	B
22	B
23	D
24	D
25	D
26	C
27	A
28	D
29	D
30	D

31	A
32	D
33	C
34	B
35	A
36	C
37	A
38	D
39	B
40	D