

Candidate Name	Form Class	Index Number
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**ANG MO KIO SECONDARY SCHOOL
PRELIMINARY EXAMINATION 2024
SECONDARY FOUR EXPRESS**

PHYSICS
Paper 1

6091(Revised)/01
28 August 2024
1 hour

Setter: Mdm Jessica Lew

Candidates answer on the OTAS Paper.

Additional Materials: OTAS Paper

READ THESE INSTRUCTIONS FIRST

Write in soft pencil.

Write your Name, Class and Index Number in the spaces provided.

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

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 OTAS

Read the instructions on the OTAS very carefully.

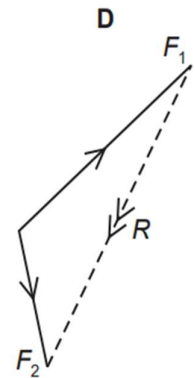
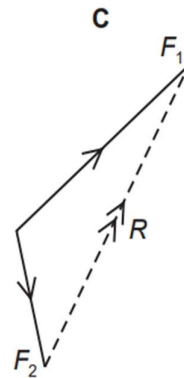
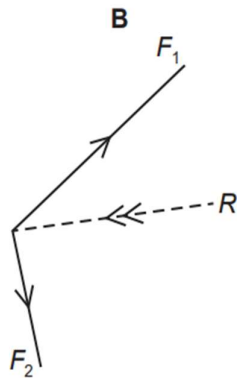
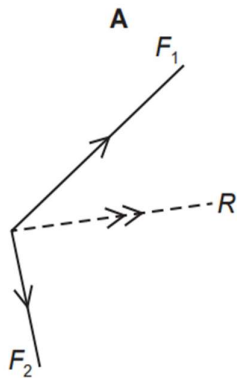
Each correct answer will score one mark. No marks will be deducted for a wrong answer.
Any rough working should be done in this booklet.

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

This document consists of **17** pages and **1** blank page

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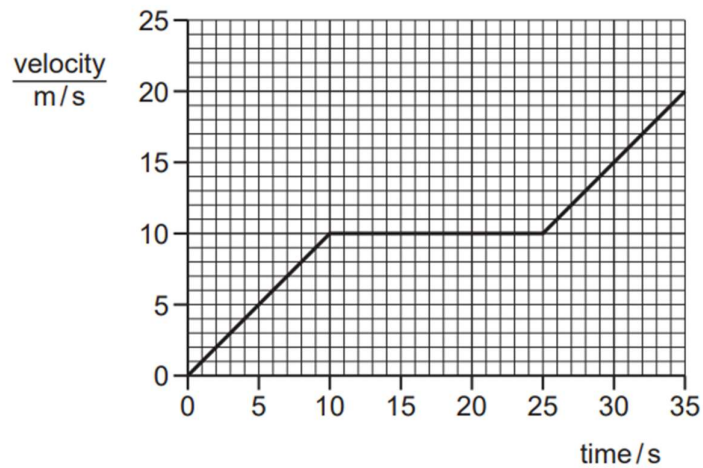
- 1 Which diagram shows the magnitude and direction of the resultant R of the two forces F_1 and F_2 ?



- 2 Which instrument can be directly used to measure the circumference of a cup?

- A** measuring tape
- B** metre rule
- C** caliper
- D** digital micrometer

- 3 The graph represents the motion of a vehicle.
What is the distance travelled by the vehicle in 35 s?



- A** 250 m
- B** 350 m
- C** 450 m
- D** 700 m

- 4 An object falls towards the surface of the Earth.

The object is falling at its terminal velocity.

Which statement is correct?

- A There is air resistance and the acceleration of the object is negative.
- B There is air resistance and the acceleration of the object is zero.
- C There is no air resistance and the acceleration of the object is negative.
- D There is no air resistance and the acceleration of the object is zero.

- 5 A sphere P is made of steel and has a weight of 10 N on Earth.

Another sphere Q is also made of steel and has a weight of 10 N on Mars.

The gravitational field strength on Earth is greater than the gravitational field strength on Mars.

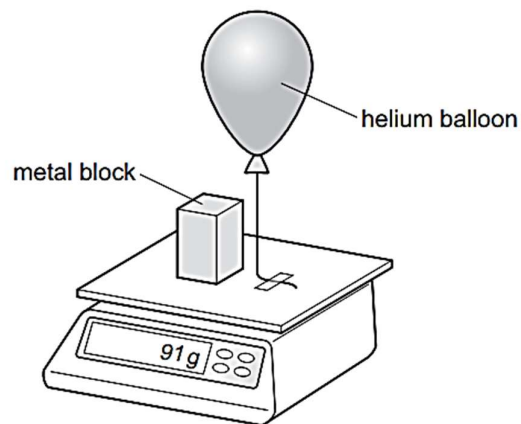
Which statement is correct?

- A The mass of sphere P is the same as the mass of sphere Q.
- B The mass of sphere P is less than the mass of sphere Q.
- C On Mars, the weight of sphere P is more than 10 N.
- D On Earth, the weight of sphere Q is less than 10 N.

- 6 Which substance in the table has the lowest density?

	substance	mass/g	volume/cm ³
A	nylon	1.2	1.0
B	cotton	1.5	1.0
C	olive oil	1.8	2.0
D	water	2.0	2.0

- 7 A helium balloon is tied to a top-pan balance. A metal block of mass 100 g is placed on the balance. The reading on the balance is 91 g.

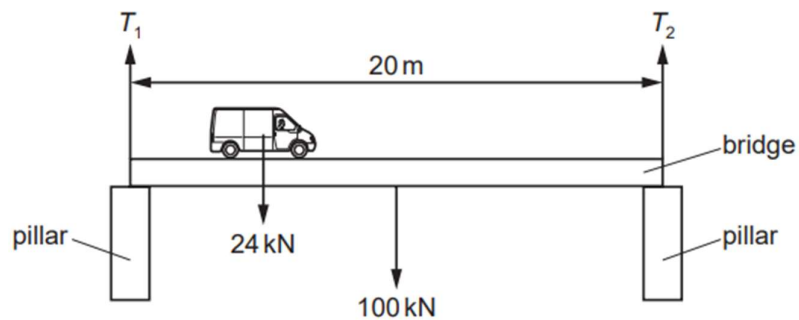


Which statement can be deduced from this experiment?

- A The balloon exerts a downward force of 0.09 N on the top-pan balance.
 - B The helium has a mass of -9 g.
 - C The helium has a mass of +9 g
 - D The resultant downward force on the top-pan balance is 0.91 N.
- 8 Which pair of forces is a pair of action-reaction forces?
- A Force exerted by a student pulling a rope and tension in the rope.
 - B Thrust acting on a car and air resistance acting on the car.
 - C Upward force acting on a plane and weight acting on the plane.
 - D Gravitational force on a book and reaction force acting on the book.

- 9 A uniform bridge of length 20 m and weight 100 kN is supported at each end by pillars as shown.

The pillars exert forces T_1 and T_2 on the ends of the bridge.



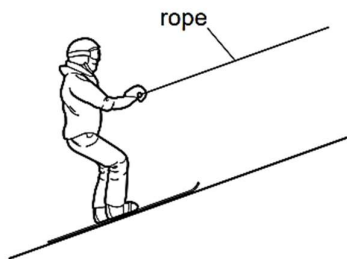
What are the values of T_1 and T_2 when a van of weight 24 kN is placed 5 m from the left-hand pillar of the bridge?

	T_1/kN	T_2/kN
A	56	68
B	62	62
C	68	56
D	74	50

- 10 A skier is pulled up a short straight slope at a constant speed by a rope.

The tension in the rope is 100 N and there is a combined frictional and air resistance force of 20 N acting on the skier.

The slope is 10 m long and the skier rises 1.5 m vertically.



How much work is done by the rope to only pull the skier up the slope?

- A** 120 J
- B** 150 J
- C** 1000 J
- D** 1200 J

- 11** A car is moving along a straight horizontal road. The car has 1.6 MJ of energy in the kinetic store. The car accelerates for 20 s until the energy in the kinetic store of the car increases to 2.5 MJ.

What is the minimum average power developed by the car engine for this acceleration?

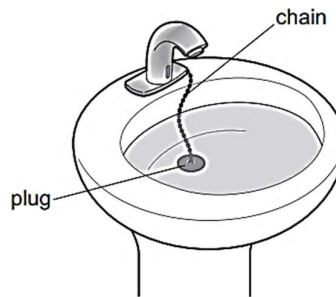
- A** 45 W
- B** 205 W
- C** 45 kW
- D** 205 kW

- 12** A washbasin has an exit pipe covered with a plug of area 12 cm^2 . A chain is attached to the centre of the plug to assist in pulling the plug away from the exit hole.

The washbasin contains water to a depth of 0.08 m.

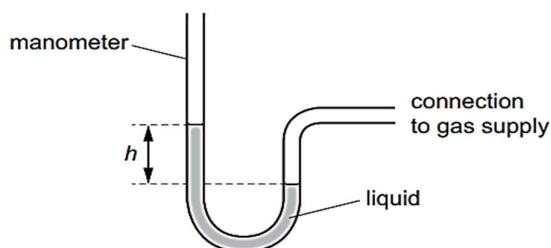
The density of the water is 1000 kg/m^3 .

What is the force acting on the plug due to the water?

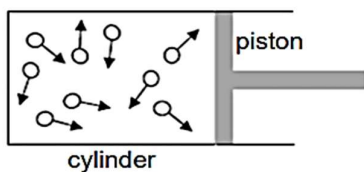


- A** 0.96 N
- B** 800 N
- C** 9600 N
- D** 80000 N

- 13** A manometer is used to measure the pressure of a gas supply.
Which change gives a greater value of height h ?



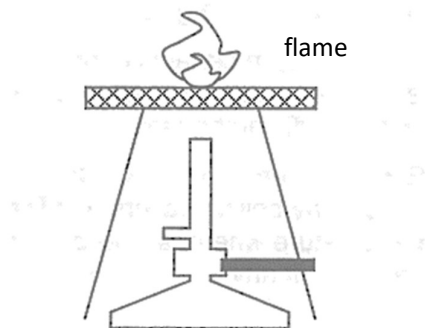
- A** using a less dense liquid
B using a denser liquid
C using a narrower tube
D using a wider tube
- 14** Which statements about evaporation of water are correct?
- 1 Evaporation causes the remaining liquid to cool.
 2 During evaporation, the more energetic particles escape from the surface of the liquid.
 3 Evaporation only happens at 100 °C.
- A** 1, 2 and 3
B 1 and 2 only
C 1 and 3 only
D 2 and 3 only
- 15** Hot gas inside a sealed cylinder is allowed to cool at room temperature. The volume of the cylinder remains constant as the piston remains in position.



What is true about the gas particles as the temperature drops?

	speed of gas particles	frequency of collision with piston
A	unchanged	decreases
B	unchanged	unchanged
C	decreases	decreases
D	decreases	unchanged

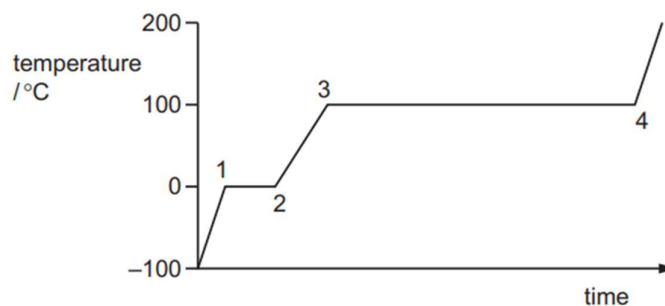
- 16** The diagram shows a wire gauze placed on a tripod. The gas from the Bunsen burner is turned on and lit from above the wire gauze. The flame is seen only above but not below the wire gauze.



What is the reason for this observation?

- A** There is no gas below the wire gauze.
 - B** Wire gauze is a good conductor of thermal energy.
 - C** Wire gauze is a poor conductor of thermal energy.
 - D** The wire gauze is not hot enough.
- 17** One end of a copper bar is heated to a high temperature. Which mechanism is responsible for the transfer of thermal energy to the other end of the copper bar?
- A** The lattice vibrations of copper ions only.
 - B** The lattice vibrations of copper ions and movement of high energy electrons along the bar
 - C** The movement of high energy copper ions along the bar.
 - D** The movement of high energy electrons along the bar only.

- 18 A block of ice is at a temperature of $-100\text{ }^{\circ}\text{C}$. Energy is supplied at a constant rate. The graph shows how its temperature changes.



At which points have the ice completely changed its state to water and all the water has completely changed state to steam?

	completely changed to liquid water	completely changed to steam
A	1	3
B	1	4
C	2	3
D	2	4

- 19 A block of copper with a mass of 0.5 kg is placed in boiling water at $100\text{ }^{\circ}\text{C}$ for 10 minutes. The block is then transferred into a Styrofoam box with 1.0 kg of water at a temperature of $30\text{ }^{\circ}\text{C}$. The specific heat capacity of copper is $400\text{ J/(kg}^{\circ}\text{C)}$ and the specific heat capacity of water is $4200\text{ J/(kg}^{\circ}\text{C)}$.

What is the final temperature of the copper and water mixture?

- A** $33.2\text{ }^{\circ}\text{C}$
B $36.5\text{ }^{\circ}\text{C}$
C $52.6\text{ }^{\circ}\text{C}$
D $70.0\text{ }^{\circ}\text{C}$
- 20 Visible light has wavelengths in the range of 400 nm to 700 nm . What is the range of the frequencies of visible light in air?
- A** 0.12 Hz to 0.21 Hz
B 120 Hz to 210 Hz
C $4.3 \times 10^{11}\text{ Hz}$ to $7.5 \times 10^{11}\text{ Hz}$
D $4.3 \times 10^{14}\text{ Hz}$ to $7.5 \times 10^{14}\text{ Hz}$

- 21** Different parts of the electromagnetic spectrum are used for different purposes.

Below are four statements about parts of the spectrum.

Statement 1: Infra-red waves are used in remote controllers.

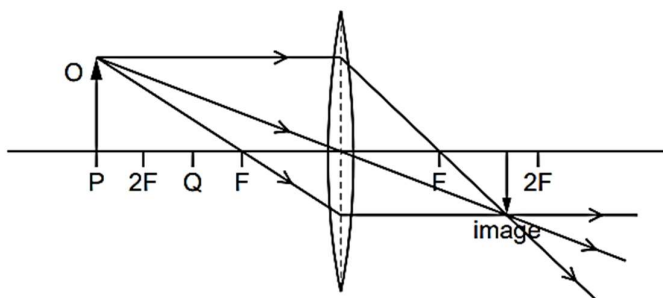
Statement 2: Radio waves are used to send television pictures from satellites to Earth.

Statement 3: Ultraviolet waves are used for intruder alarms.

Statement 4: X rays are used for security checks.

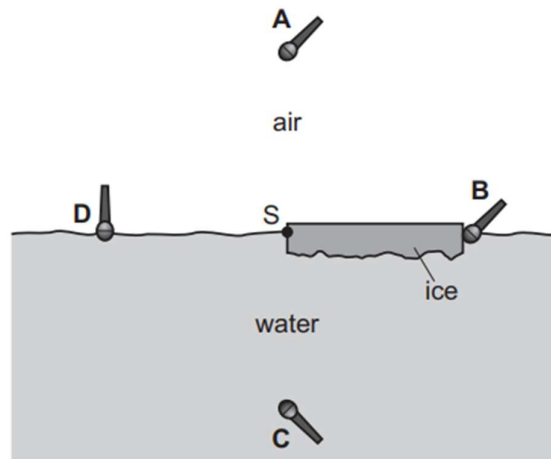
Which statements are correct?

- A** 1 and 2
 - B** 1 and 4
 - C** 2 and 3
 - D** 3 and 4
- 22** An object O is placed at point P near to a thin converging lens. The diagram shows three rays from the top of O passing through the lens. Each point F is one focal length from the centre of the lens. The object is moved to point Q on the diagram. Which type of image is produced when the object O is moved to Q?

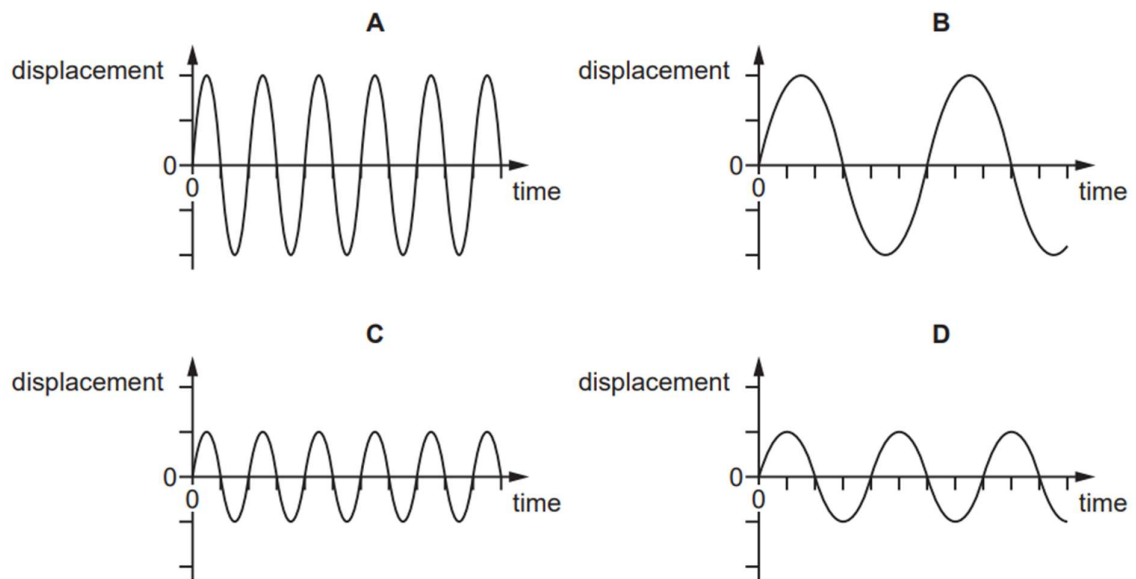


- A** inverted and same size as the object
 - B** inverted and enlarged
 - C** upright and the same size as the object
 - D** upright and enlarged
- 23** The speed of light in air is 3.0×10^8 m/s. The critical angle for light in a transparent plastic material placed in air 37° . What is the speed of light in the plastic material?
- A** 1.8×10^8 m/s
 - B** 2.4×10^8 m/s
 - C** 3.8×10^8 m/s
 - D** 5.0×10^8 m/s

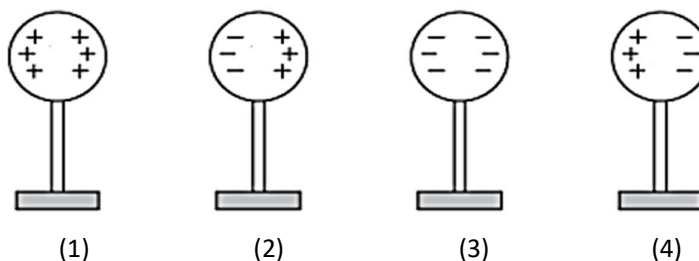
- 24** A block of ice floats on water. A source of sound S is positioned at the edge of the ice block. Four microphones are placed equal distances from S. Which microphone detects the sound from S first?



- 25** The diagrams show graphs of displacement against time for four sound waves. All the graphs are drawn to the same scale. Which wave is loudest and has the highest pitch?

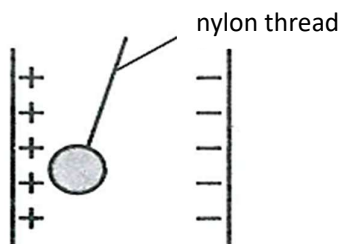


- 26** Four identical metal spheres on insulating stands are placed next to each other. The charge on each of the spheres are shown. Which of the following is true when two of the spheres are placed in contact with each other and far away from the other spheres?



	Spheres in contact	Movement of charge	Final charge on both spheres
A	(1) and (2)	positive charges from (1) to (2)	positive
B	(2) and (3)	negative charges from (3) to (2)	negative
C	(2) and (4)	negative charges from (2) to (4) and positive charges from (4) to (2)	neutral
D	(1) and (3)	positive charges from (1) to (3) and negative charges from (3) to (1)	neutral

- 27** The diagram shows a small conducting ball hanging on an insulating thread near a positively charged metal plate. If the ball is given a positive charge, it



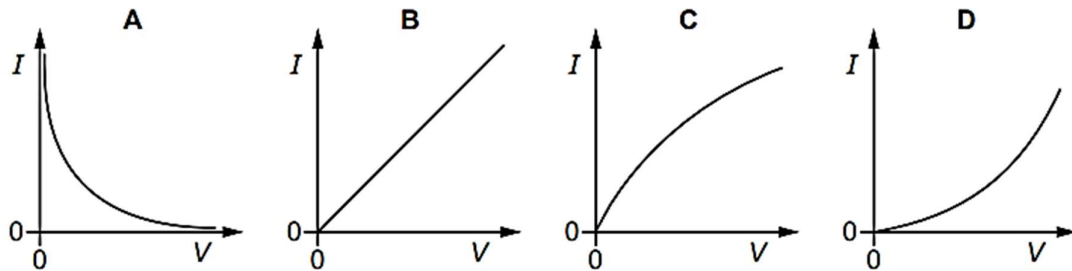
- A** moves away from the plate.
B remains stationary
C is attracted to the plate and sticks to it
D is attracted to the plate and is then repelled by it.
- 28** A battery-operated fan is switched on with a current of 0.30 A passing through it. It lasted for an hour. What is the total charge passing through the fan?
- A** 0.005 C
B 0.30 C
C 18 C
D 1080 C

- 29** A wire of length L and cross-sectional area A has a resistance of R . Both wires are made from the same material.

What is the resistance of another wire having twice the length and a quarter of the cross-sectional area of the first wire?

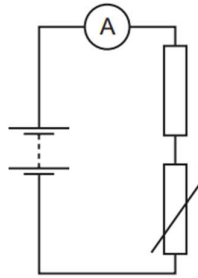
- A** $R/2$
- B** R
- C** $2R$
- D** $8R$

- 30** Which diagram shows the current-voltage(I-V) characteristic for a filament lamp?



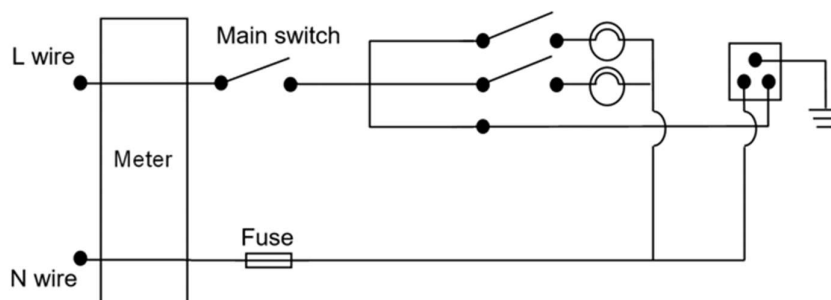
- 31** The diagram shows a circuit with a fixed resistor connected in series with a thermistor and an ammeter.

Which row shows how the temperature change affects the resistance of the thermistor and the current flowing in the circuit?



	temperature	resistance of thermistor	current in circuit
A	decreases	decreases	increases
B	decreases	increases	decreases
C	increases	decreases	decrease
D	increases	increases	increases

32 What is the mistake in the household circuit shown?



- 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 live wire in the socket should be interchanged.

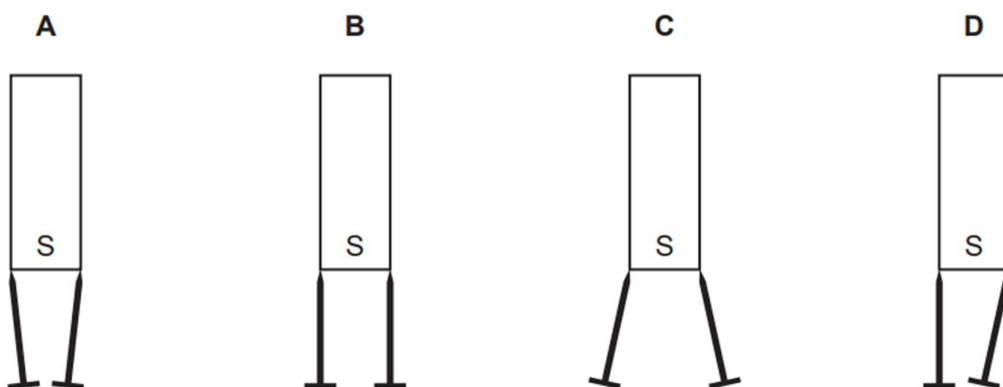
33 A refrigerator with 1.1 kW of power and a ceiling fan of 0.85 kW of power are connected in parallel to a 240 V mains supply.

Which of the following fuse ratings is the most suitable to be used?

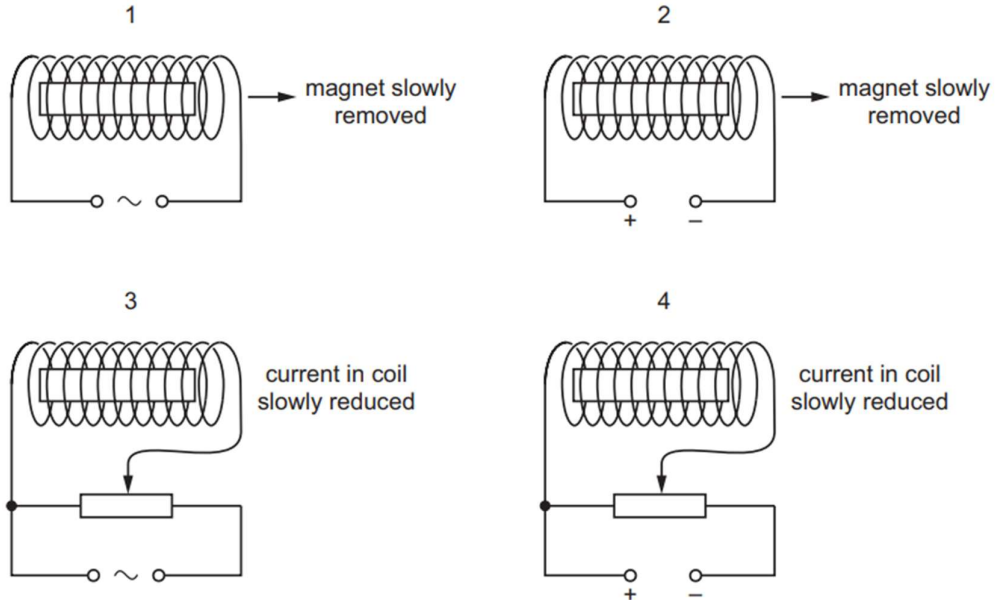
- A 7 A
- B 8 A
- C 10 A
- D 13 A

34 Two soft pins are suspended from the S pole of a bar magnet.

Which diagram shows how the pins are deflected?

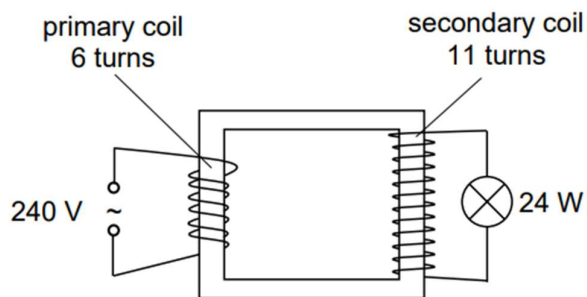


- 35** A bar magnet is placed inside a current-carrying coil. The diagram shows four different experiments. In which experiments is the magnet demagnetised?

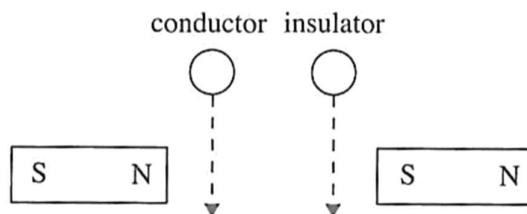


- A** 1 and 2
B 1 and 3
C 2 and 4
D 3 and 4
- 36** What is the function of the split ring commutator in an electric motor with a single rotating coil?
- A** To enable the motor to function with an a.c source.
B To reverse the current in the coil once every revolution.
C To reverse the current in the coil whenever the plane becomes perpendicular to the magnetic field.
D To reverse the current in the coil whenever its plane is parallel with the magnetic field.

- 37** The secondary coil of an ideal transformer is connected to a 24 W lamp. What is the current in the secondary coil?



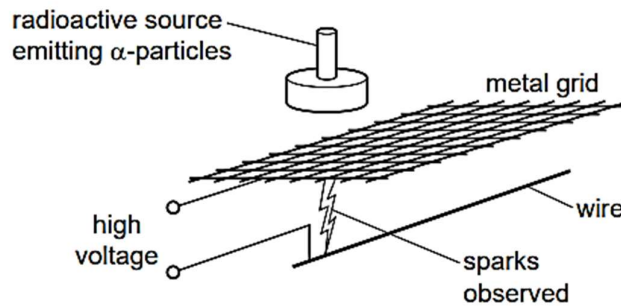
- A** 0.05 A
B 0.10 A
C 0.18 A
D 18.3 A
- 38** A conducting rod and an insulating rod are being dropped between two magnets as shown. Which of the following are true?



1. The induced current in the conducting rod flows out of the paper.
2. The conducting rod takes a longer time to pass through the magnetic field than the insulating rod.
3. The conducting rod will be attracted to the magnets.

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

- 39** The background count rate measured by a radiation counter is 40 counts per minute(cpm).
 With the counter close to a radioactive source, the counter reading is 960 cpm.
 Given that the half-life of the source is 20 minutes, what is the counter reading one hour later?
- A** 115 cpm
B 120 cpm
C 155 cpm
D 160 cpm
- 40** A high voltage power supply is connected to a metal grid and a wire as shown. When the radioactive source is placed close to the metal grid, sparks are observed in the position indicated.
- Which statement explains why sparks are formed?



- A** α particles have a long range.
B α particles have no charge.
C α particles have no mass.
D α particles are strongly ionising.

End of Paper

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Answers for Paper 1

Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10
A	A	B	B	B	C	D	A	C	C
Q11	Q12	Q13	Q14	Q15	Q16	Q17	Q18	Q19	Q20
C	A	A	B	C	B	B	D	A	D
Q21	Q22	Q23	Q24	Q25	Q26	Q27	Q28	Q29	Q30
B	B	A	B	A	B	A	D	D	C
Q31	Q32	Q33	Q34	Q35	Q36	Q37	Q38	Q39	Q40
B	C	C	C	B	C	A	A	C	D