

Class:	Candidate Name:	Candidate Index Number:
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EDGEFIELD SECONDARY SCHOOL

2024 PRELIMINARY EXAMINATION

Secondary 4

O
Syllabus

PHYSICS

Paper 1 Multiple Choice

Additional Materials: OTAS

6091/ 01
August 2024
1 hour

READ THESE INSTRUCTIONS FIRST

Write in soft pencil.

Do not use staples, paper clips, 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 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 booklet.

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

FOR EXAMINER'S USE	
TOTAL	/ 40

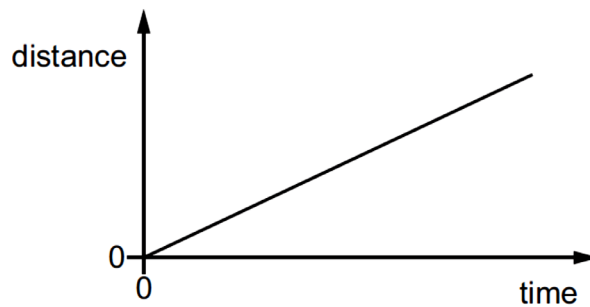
My target grade/mark: _____

Parent's signature

- 1 A car accelerates at 5.0 m / s^2 along a straight, horizontal road and reaches a velocity of 20 m / s in a time of 4.0 s .
During this time, its total displacement is 40 m .
Which quantity is a scalar?

- A a time of 4.0 s
- B a velocity of 20 m / s
- C an acceleration of 5.0 m / s^2
- D displacement of 40 m

- 2 The diagram shows the distance-time graph of a car.

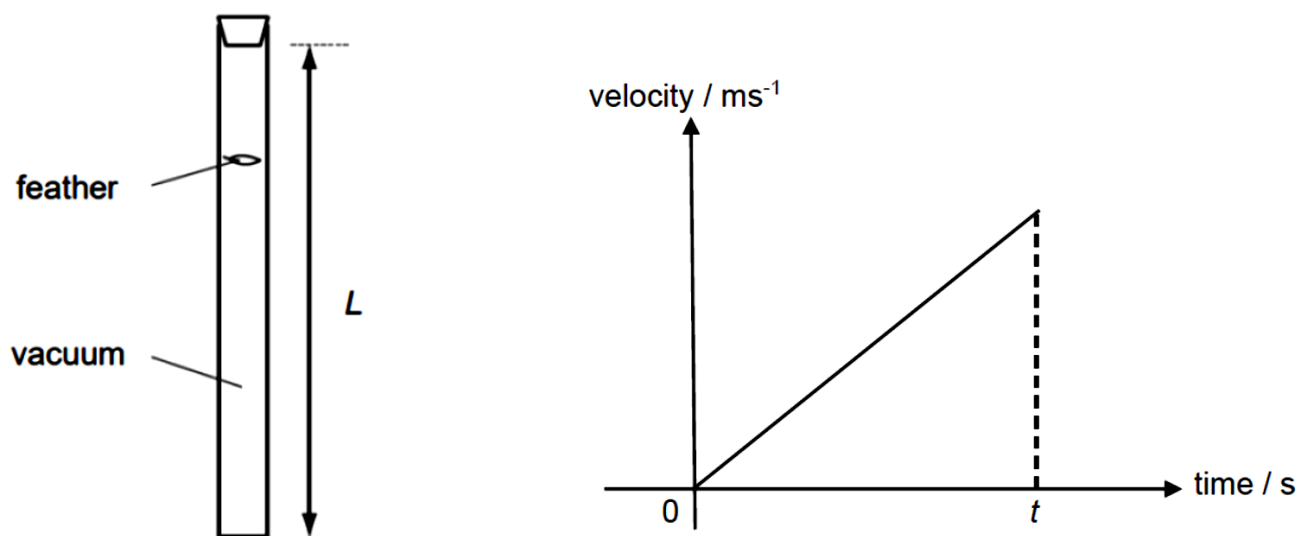


The car is travelling along a straight road up a hill.
Which quantity for the car is constant and greater than zero?

- A acceleration
 - B gravitational potential energy
 - C kinetic energy
 - D resultant force
- 3 On the Earth's surface, the gravitational field strength is 10 N / kg .
On the surface of Mars, the gravitational field strength is 3.8 N / kg .
A robot vehicle has a weight of 2000 N on Earth.
What is the weight of the robot vehicle on Mars?

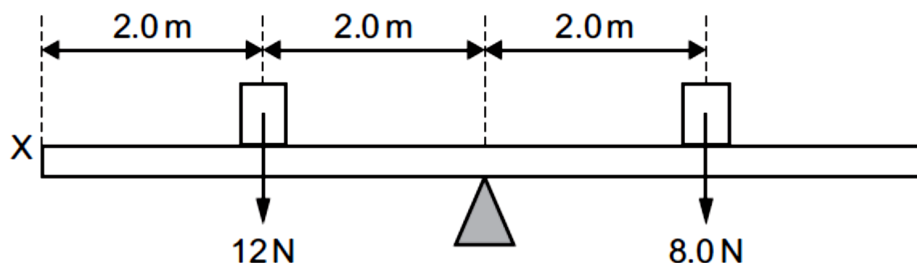
- | | | | | | | | |
|---|-------|---|-------|---|--------|---|----------|
| A | 200 N | B | 760 N | C | 7600 N | D | 76 000 N |
|---|-------|---|-------|---|--------|---|----------|

- 4 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 $0.5t$?

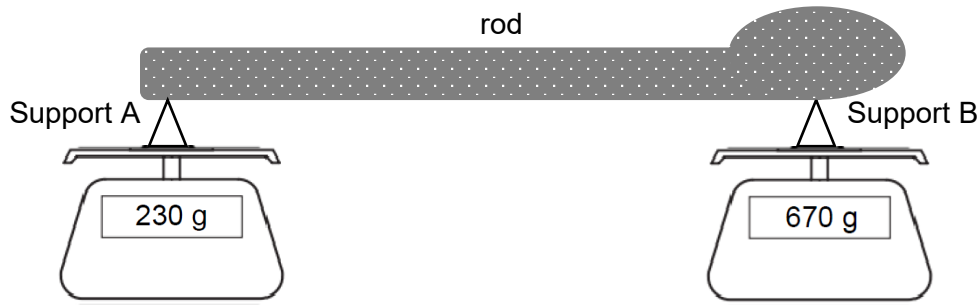
- A $0.13 L$ B $0.25 L$ C $0.50 L$ D $0.75 L$
- 5 A uniform plank is pivoted at its mid-point. Two weights are added to the plank, one weight on each side of the pivot in the positions shown.



A vertical force is applied at point X to balance the plank. What is the size and direction of this force?

	size/ N	direction
A	2.0	downwards
B	2.0	upwards
C	4.0	downwards
D	4.0	upwards

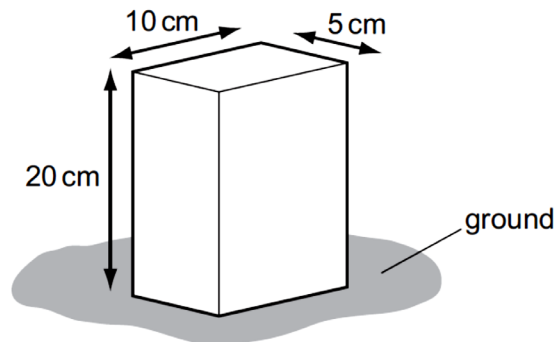
- 6 The diagram shows a non-uniform rod laid on two supports A and B across two weighing balances. Its centre of gravity is not at its geometrical centre. The rod has a length of 2 m.



Where is the rod's centre of gravity?

- A 0.27 m to the left of support B
- B 1.3 m to the left of support B
- C 1.5 m to the right of support A
- D 1.7 m to the right of support A

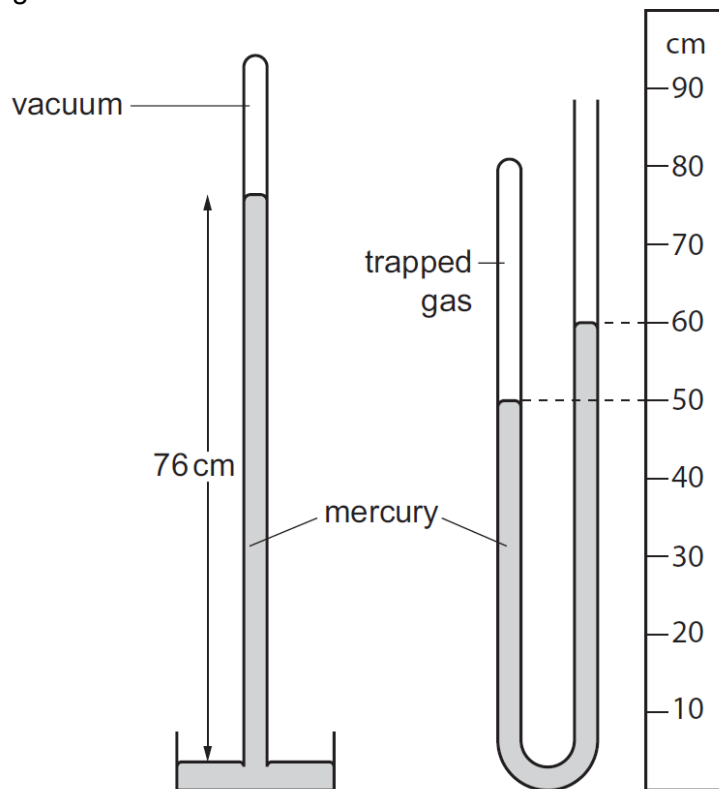
- 7 A brick of weight 80 N stands upright on the ground as shown.



What is the least and most pressure it exerts on the ground?

	least pressure/ Pa	most pressure/ Pa
A	4000	8000
B	4000	16000
C	8000	8000
D	8000	16000

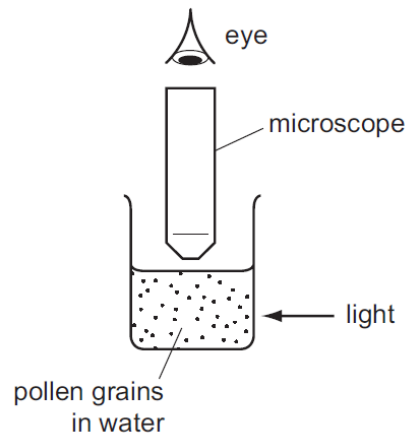
- 8 The diagram shows a simple mercury barometer alongside a mercury manometer. The manometer contains some trapped gas.



What is the pressure of the trapped gas?

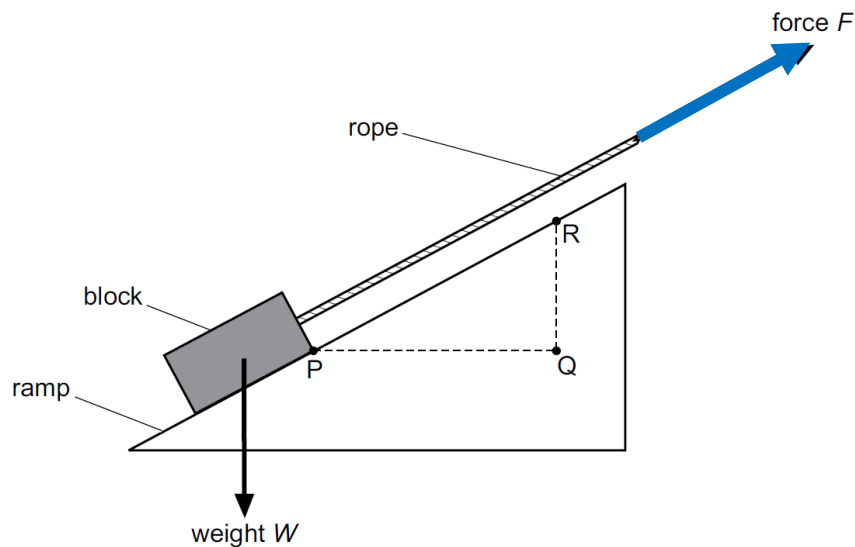
- A 10 cm of mercury
 - B 50 cm of mercury
 - C 66 cm of mercury
 - D 86 cm of mercury
- 9 A gas is in a sealed container of constant volume. The gas is heated and the pressure of the gas on the walls of the container increases.
How do the particles of the gas cause this increase in pressure?
- A They expand.
 - B They hit each other more frequently.
 - C They hit the container walls more frequently.
 - D They vibrate faster.

- 10 Very small pollen grains are suspended in a beaker of water. A bright light shines from the side. Small, bright dots of light are seen through a microscope. The dots move in rapidly changing, random directions.



What are the bright dots?

- A pollen grains being hit by other pollen grains
 - B pollen grains being hit by water molecules
 - C water molecules being hit by other water molecules
 - D water molecules being hit by pollen grains
- 11 The diagram shows a block being pulled up a ramp by a rope.



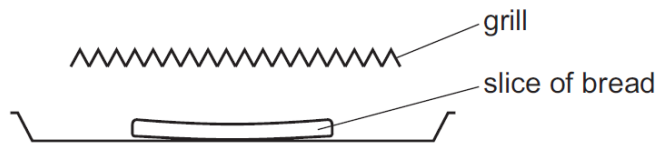
The block has weight W and the rope is pulled with force F .
The block moves distance PR and is raised through height QR .
What is the equation for the work done on the block by the rope?

- A force $F \times$ distance PR
- B force $F \times$ height QR
- C weight $W \times$ distance PQ
- D weight $W \times$ distance PR

12 Which row about the change of energy in the energy store is correct?

	process	energy store	change of energy in store
A	air passes through a wind turbine	gravitational potential energy of air	increases
B	air passes through a wind turbine	kinetic energy of air	increases
C	water pumped up to a high-altitude dam	gravitational potential energy of water	increases
D	water pumped up to a high-altitude dam	kinetic energy of water	decreases

13 A slice of bread is placed under a red-hot electric grill to make toast.



How does heat energy reach the bread?

- A** conduction and convection
- B** conduction only
- C** convection and radiation
- D** radiation only

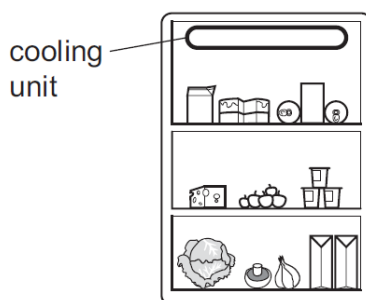
14 The following statements describe heat loss from objects:

- I.** heater with polished metal grills at 60 °C placed on the floor of room;
- II.** heating element of a kettle at 100 °C, in water;
- III.** metal pan with black surfaces at 200 °C, in contact with a concrete floor;
- IV.** filament of lamp at 1000 °C in an evacuated glass bulb.

Which object(s) loses most of its heat by radiation?

- A** IV only
- B** I and III
- C** II and IV
- D** I, II and IV

- 15 The diagram shows the inside of a refrigerator.



When the refrigerator is first switched on, what happens to the air near the cooling unit?

	the particles of this air	the density of this air
A	become smaller	decreases
B	become smaller	increases
C	move closer together	decreases
D	move closer together	increases

- 16 The same heater was used to heat three different liquids X, Y and Z.
The mass of the liquids and the temperature increase after five minutes was recorded.

liquid	mass of liquid / g	increase in temperature after 5.0 minutes / °C
X	200	15
Y	100	12
Z	150	10

Which of the following correctly compares specific heat capacities c_X , c_Y and c_Z of liquids X, Y and Z respectively?

- A** $c_X > c_Y > c_Z$
B $c_Y > c_Z > c_X$
C $c_Z > c_X > c_Y$
D $c_Z > c_Y > c_X$

- 17** Using an electric kettle, 200 g of water at 100 °C is converted into steam at 100 °C in 300 seconds.
The specific latent heat of steam is 2250 J / g.
What is the average electrical power used?

- A** $\frac{2250}{300 \times 200} \text{ W}$
B $\frac{200 \times 2250}{300} \text{ W}$
C $\frac{300 \times 2250}{200} \text{ W}$
D $200 \times 300 \times 2250 \text{ W}$

- 18** A substance can exist in three different states: solid, liquid or gas.

Each of the two statements below describes a change of state.

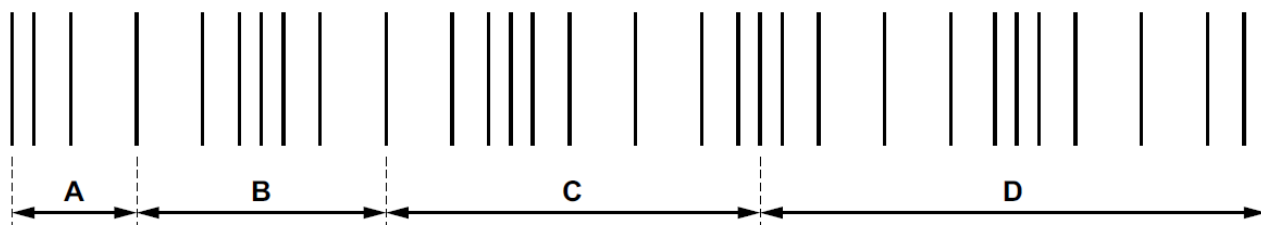
change 1: Particles move much closer together but continue to travel throughout the substance.

change 2: Particles stop travelling throughout the substance and just vibrate about fixed positions.

Which changes of state do these statements describe?

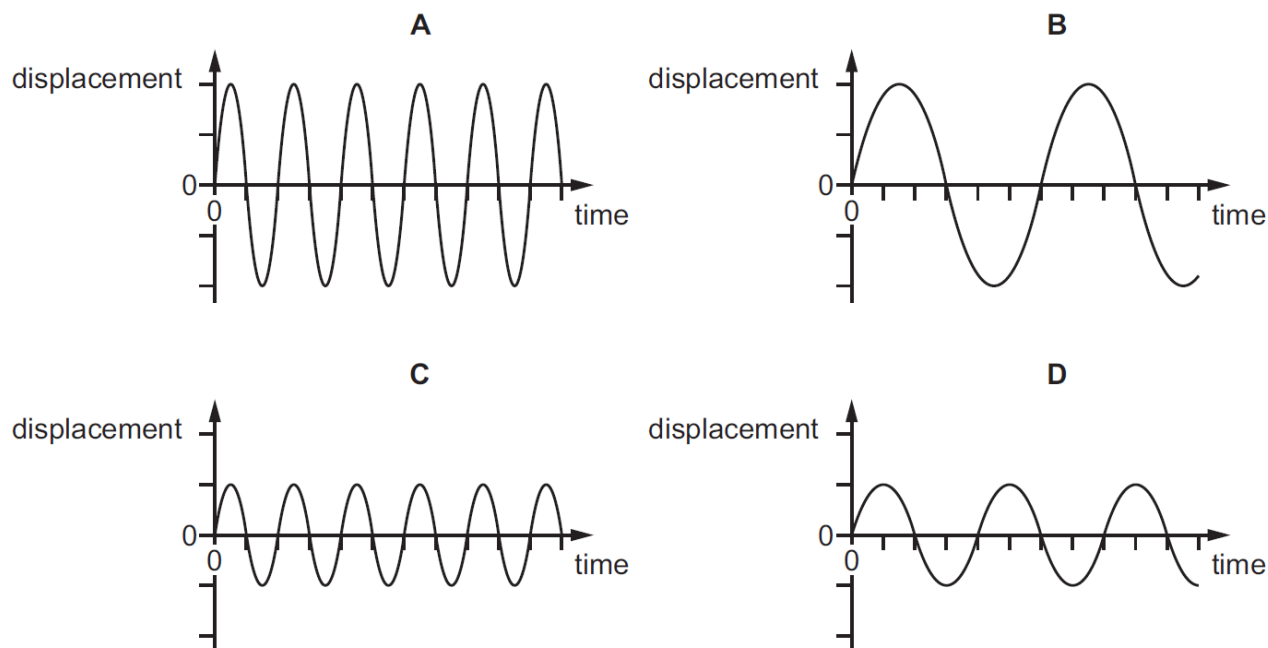
	change 1	change 2
A	condensation	melting
B	condensation	solidification
C	solidification	condensation
D	solidification	melting

- 19** A sound wave travels through air. The lines in the diagram show the positions of particles of air at one particular time.
Which distance is the wavelength of the wave?

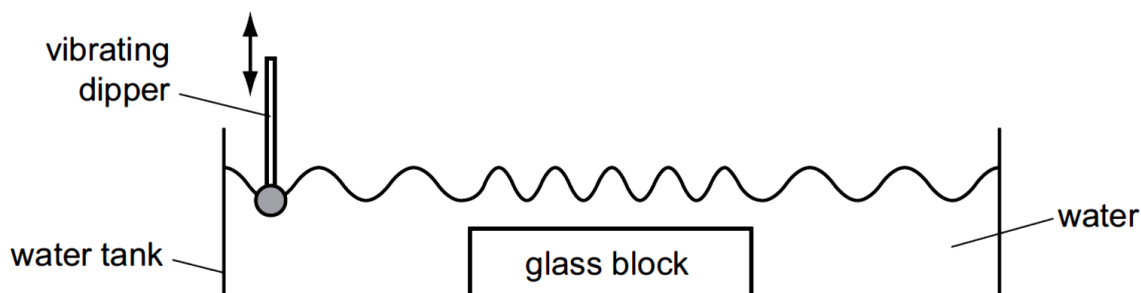


- 20** The diagrams show graphs of displacement against time for four waves. All the graphs are drawn to the same scale.

Which wave has the least amplitude and the highest frequency?



- 21** A ripple tank is used to show wave behaviour. The dipper vibrates up and down at a constant frequency.



What happens to the frequency and to the speed of the wave as it reaches the glass block?

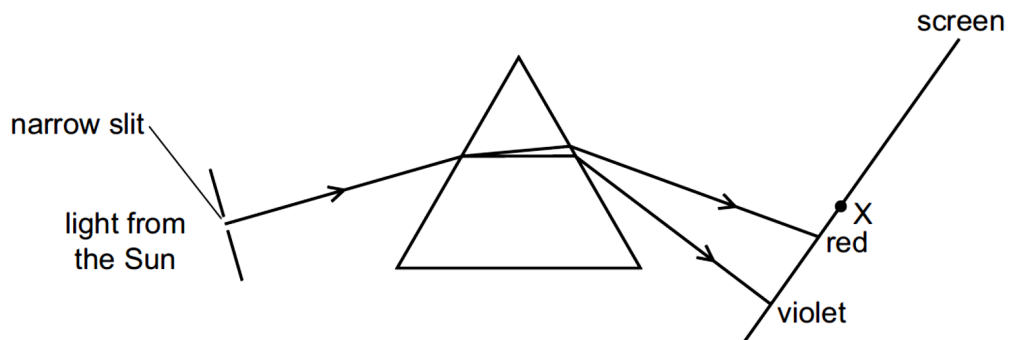
	frequency	speed
A	decreases	decreases
B	decreases	increases
C	remains the same	decreases
D	remains the same	increases

- 22** A ship that is stationary on the surface of the sea sends pulses of sound vertically downwards towards the sea bed.
 Each pulse that reflects from the sea bed is received 1.0 s after it is sent out.
 A whale swims under the ship and a pulse is received 0.60 s after it is sent out.
 The speed of sound in sea water is 1500 m/s.

What is the distance of the whale above the sea bed?

- A** 300 m **B** 450 m **C** 750 m **D** 900 m

- 23** Light from the Sun passes through a narrow slit and a spectrum is produced on a screen.



A thermometer placed at X shows a large temperature increase.

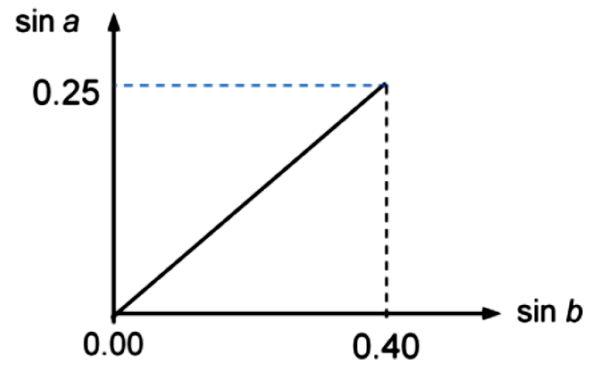
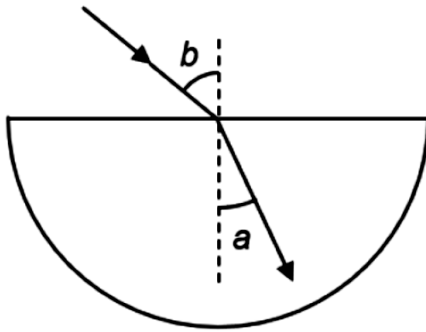
Which type of radiation causes this temperature increase?

- A** infra-red
B microwave
C ultraviolet
D visible light
- 24** Below are four statements about the uses of electromagnetic radiation.
- Gamma rays are used in medical treatment
 - Infrared waves are used in sunbeds
 - Microwaves are used in satellite TV
 - Ultrasound is ionising and used in medical scanners

How many of these statements are correct?

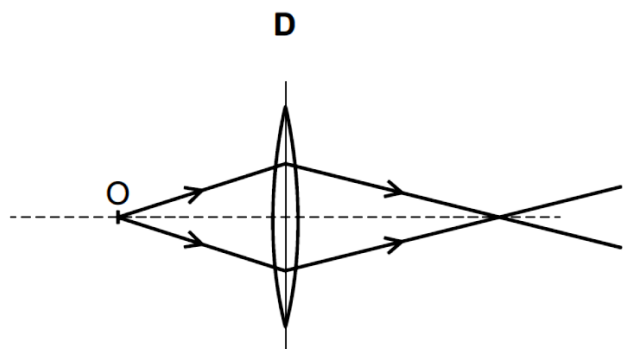
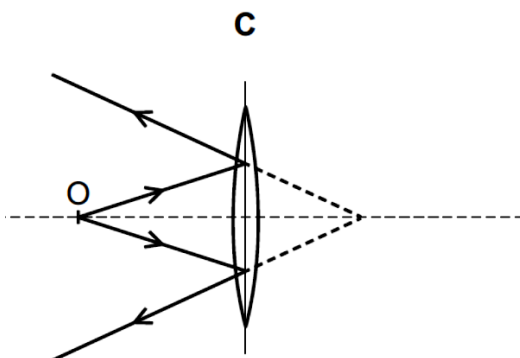
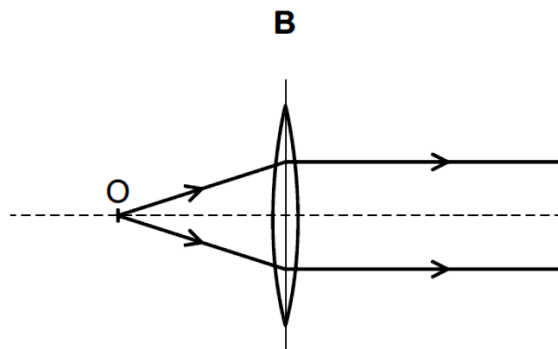
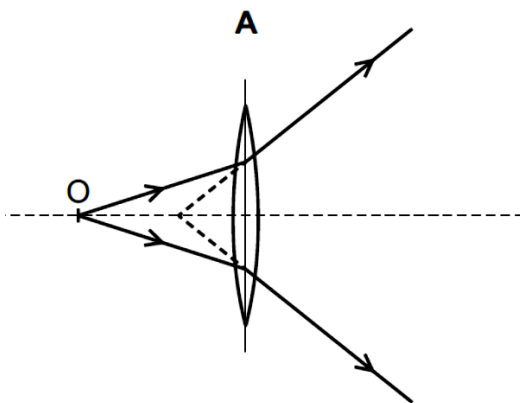
- A** 1 **B** 2 **C** 3 **D** 4

- 25 A light beam is incident on the flat surface of a semi-circular glass block and refracted in the diagram below. A graph of $\sin a$ against $\sin b$ is plotted as shown.

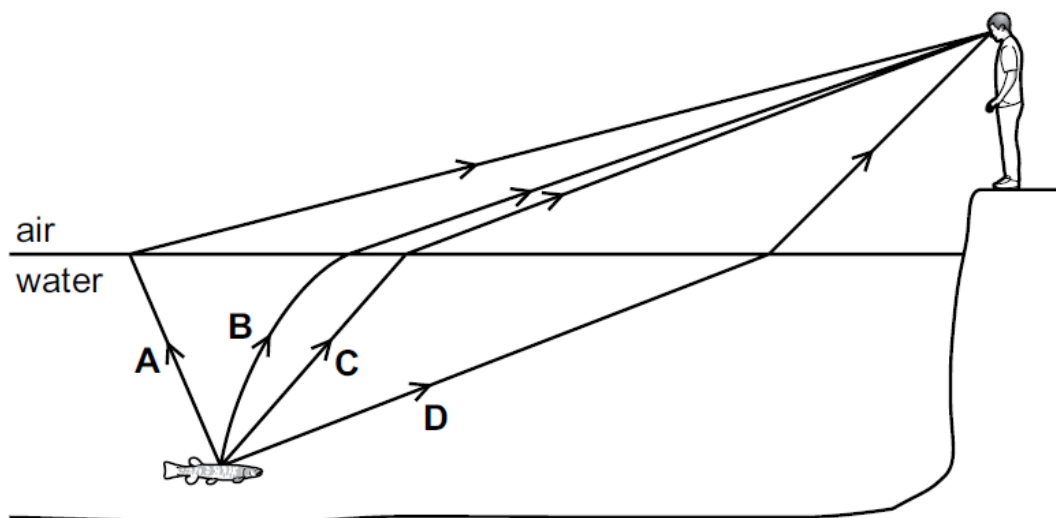


What is the critical angle of the glass?

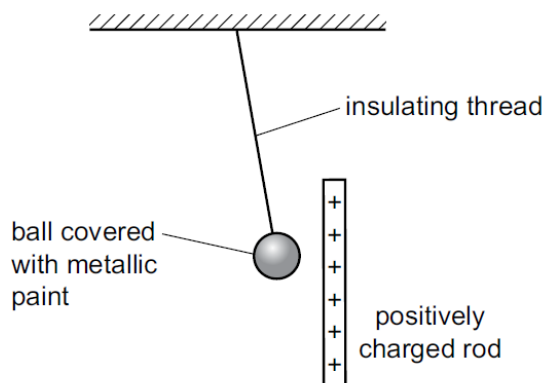
- A 36.1° B 38.7° C 51.3° D 55.3°
- 26 Which diagram shows the formation of a real image of an object O placed in front of a converging lens?



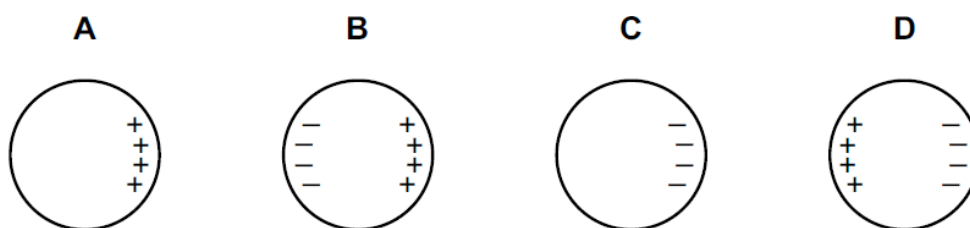
- 27 A boy sees a fish in a lake.
Which labelled path is taken by the light travelling from the fish to the boy's eye?



- 28 The diagram shows an uncharged ball covered with metallic paint. The ball is suspended from an insulating thread. It is placed near a positively charged rod.



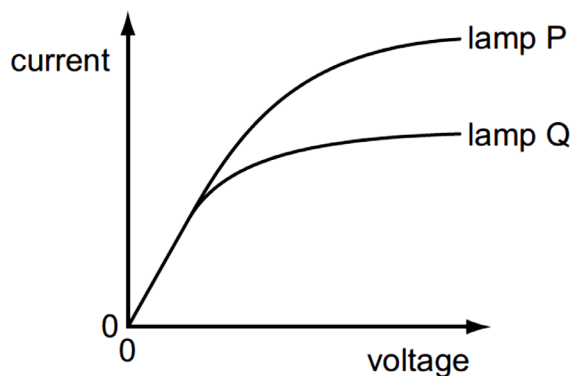
Which diagram shows the charge distribution on the ball?



- 29 A lightning flash carries 40 C of charge and lasts for 5.0 ms.
What is the average current in the flash?

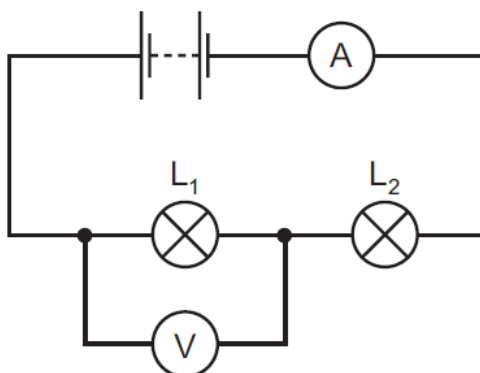
A 0.20 A **B** 8.0 A **C** 200 A **D** 8000 A

- 30 The diagram shows the current-voltage graph of two filament lamps.



Which statement is correct?

- A Lamp P has a lower resistance than lamp Q at all currents.
 - B Lamp P has a higher resistance than lamp Q at high currents.
 - C Lamp P has the same resistance as lamp Q at high currents.
 - D Lamp P has the same resistance as lamp Q at low currents.
- 31 A circuit containing two lamps L1 and L2 is connected as shown.

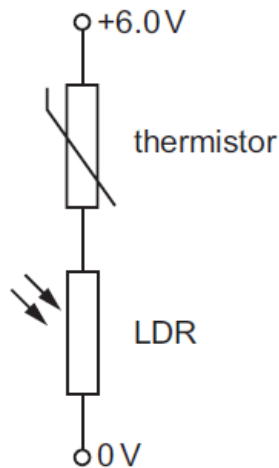


A voltmeter measures the potential difference across the lamp L1.

The filament of lamp L1 breaks. What happens to the readings of the ammeter and of the voltmeter?

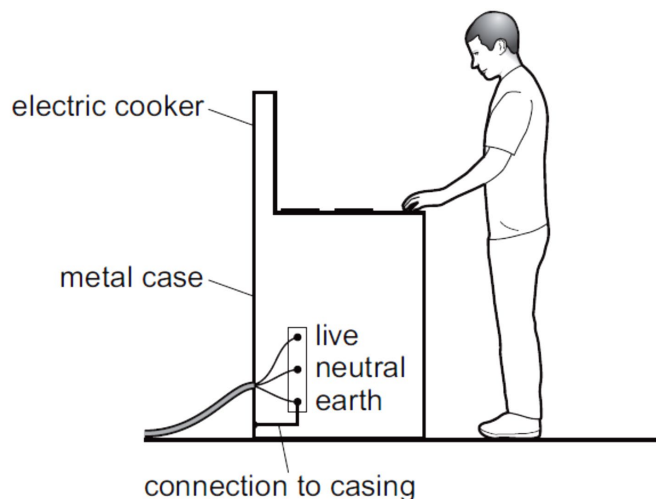
	reading on the ammeter	reading on the voltmeter
A	decreases	decreases
B	decreases	increases
C	increases	decreases
D	increases	increases

- 32 A thermistor and a light-dependent resistor (LDR) are connected in series. A potential difference (p.d.) of 6.0 V is applied across them as shown.



The thermistor has a resistance of $6000\ \Omega$ in a cold room and $1000\ \Omega$ in a warm room. The LDR has a resistance of $2000\ \Omega$ in dim light and $500\ \Omega$ in bright light. When is the p.d. across the LDR equal to 2.0 V?

- A in a cold room with bright light
 - B in a cold room with dim light
 - C in a warm room with bright light
 - D in a warm room with dim light
- 33 A simple wiring diagram for an electric cooker is shown.

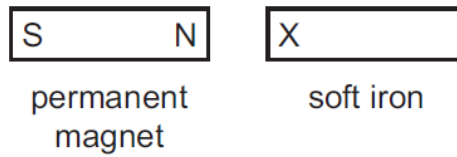


Why is there a wire connecting the metal case of the cooker to earth?

- A It improves the efficiency of the cooker.
- B It prevents the metal case from becoming too hot when the cooker is left on.
- C It reduces the risk of an electric shock if the live wire touches the metal case.

D The electric cooker will not switch on without it.

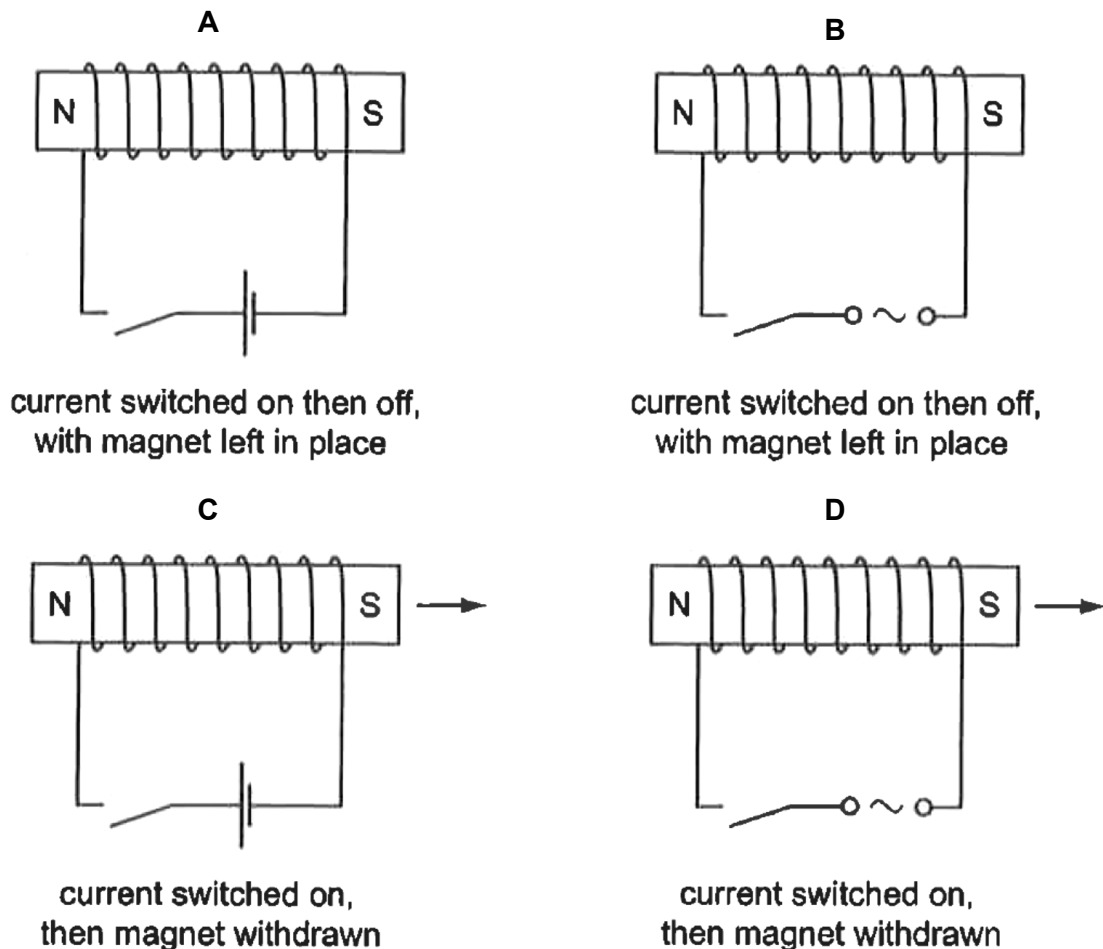
- 34** An unmagnetised piece of soft iron is placed close to a strong permanent magnet, as shown.



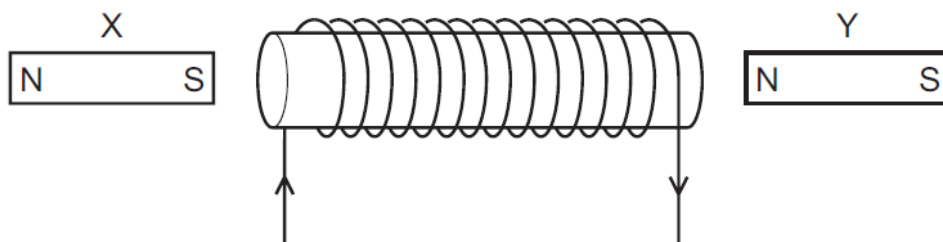
What is the induced polarity of end X of the soft iron and in which direction does the magnetic force act on the soft iron?

	polarity of end X	direction of force on the soft iron
A	N	to the left
B	N	to the right
C	S	to the left
D	S	to the right

- 35** A permanent magnet can be demagnetized by using a solenoid and switching the current on then off. Which diagram shows the most effective method of producing demagnetization?

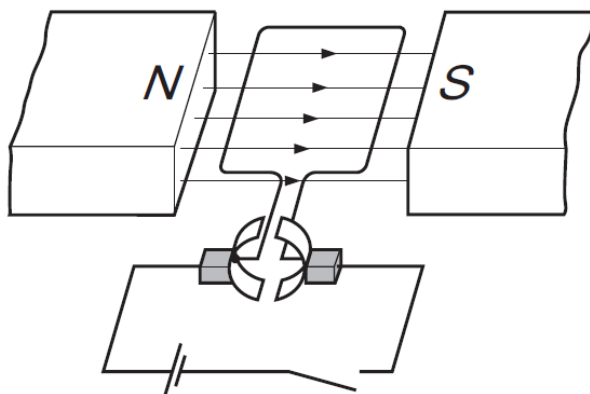


- 36 Two magnets are placed near a current-carrying coil.
The diagram shows this experimental arrangement and the current direction in the coil.



Which statement is correct?

- A Both X and Y are attracted to the coil.
 - B Both X and Y are repelled by the coil.
 - C X is attracted to the coil and Y is repelled.
 - D X is repelled by the coil and Y is attracted.
- 37 The diagram shows a simple d.c. motor.



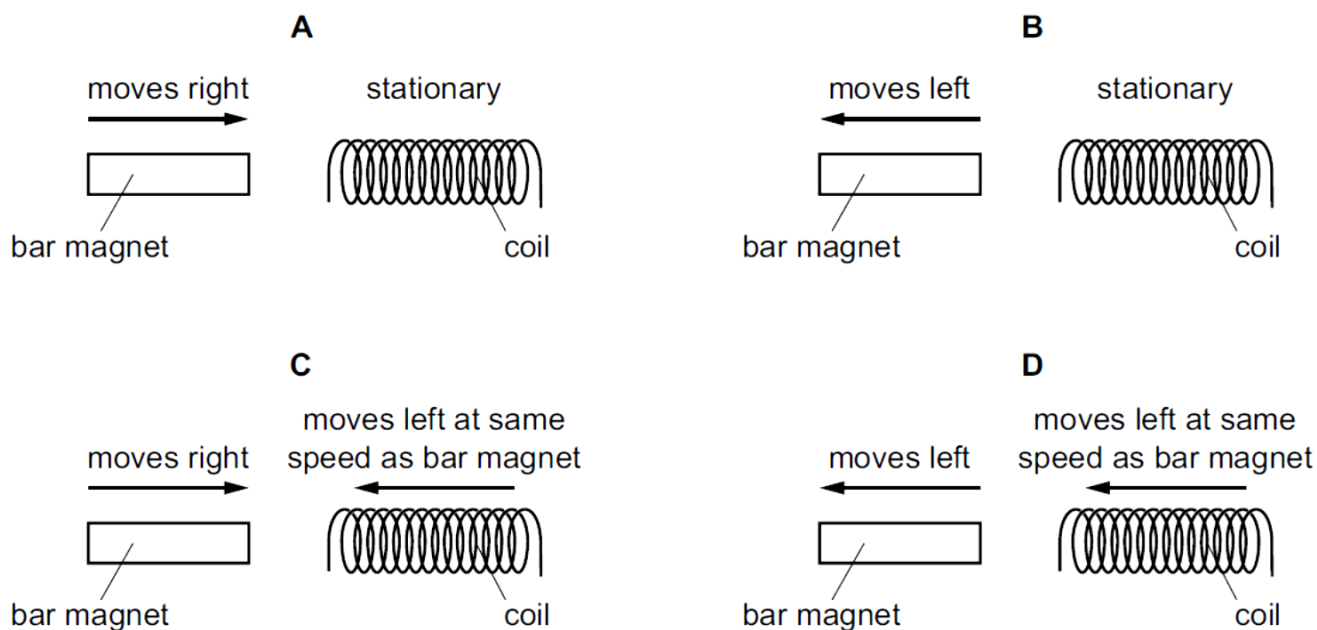
The switch is closed and the coil rotates.

Which change makes the coil rotate in the opposite direction and at a faster rate?

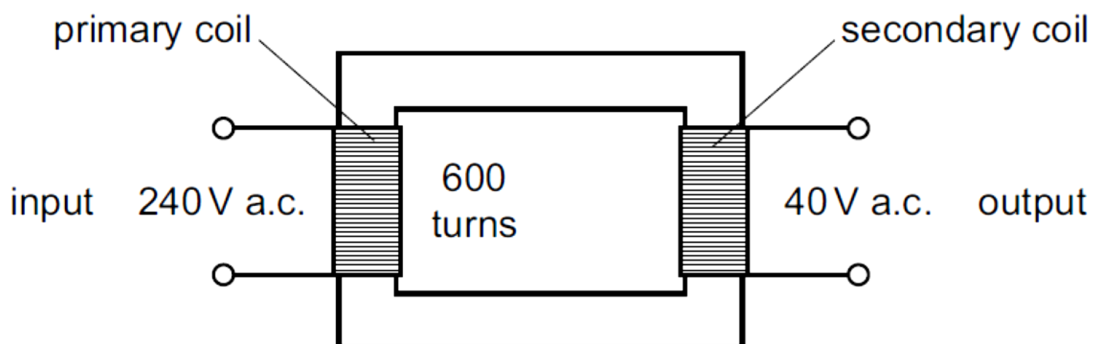
- A increase the current in the coil and increase the number of turns in the coil
- B reverse both the magnetic field and the current in the coil
- C reverse the magnetic field and decrease the current in the coil
- D reverse the magnetic field and increase the current in the coil

- 38** The diagram shows a bar magnet and a coil of wire. The bar magnet is moved at the same speed in each experiment.

In which situation is the largest electromotive force (e.m.f.) induced?



- 39** The diagram shows a simple transformer with an input of 240 V a.c. and an output of 40 V a.c. There are 600 turns on the primary coil.



How many turns are there on the secondary coil?

- A** 100 **B** 320 **C** 400 **D** 3600

- 40** When a radioactive isotope is set up close to a counter, a count rate of 38 000 counts / s is obtained. The table shows the count rate from the isotope over a three-year period.

time / years	<u>count rate</u> counts / s
0	38 000
1	26 000
2	17 000
3	12 000

What is the half-life of the isotope?

- A** less than 1 year
- B** more than 1 year but less than 2 years
- C** more than 2 years but less than 3 years
- D** more than 3 years

End of Paper