

ANDERSON SECONDARY SCHOOL
Preliminary Examination 2022
Secondary Four Express



CANDIDATE NAME:

CLASS:

INDEX NUMBER:

PHYSICS

6091/01

Paper 1 Multiple Choice

12 September 2022

1 hour

0800 – 0900 h

Additional Materials: Multiple Choice Answer Sheet

READ THESE INSTRUCTIONS FIRST

Write in soft pencil.

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

Write your name, class and index number on the Answer Sheet in the spaces provided.

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.

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.

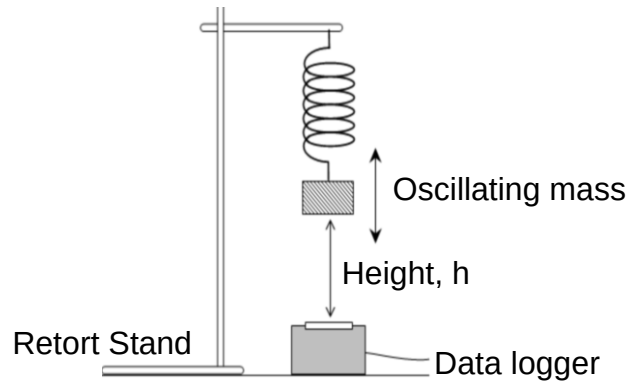
Any rough working should be done in this booklet.

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

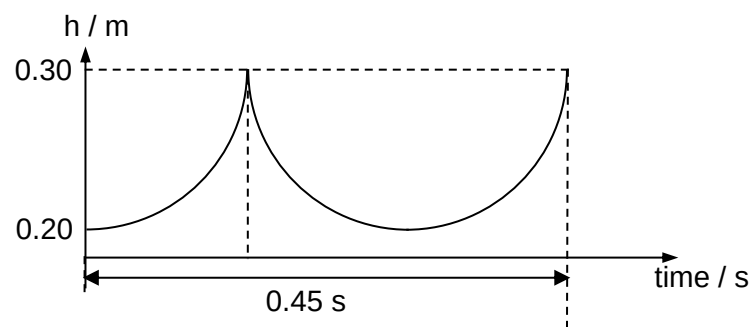
1 What is the typical size for a small atom?

- A** 0.1 cm **B** 0.1 km **C** 0.1 μm **D** 0.1 nm

2 The height, h , of an oscillating mass is measured by a data logger.



A graph of height, h , against time is shown below.



What is the period of the oscillation?

- A** 0.15 s **B** 0.30 s **C** 0.45 s **D** 0.60 s

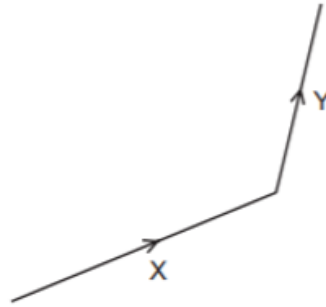
3 A car driver immediately stepped on the brakes when he saw a cat dashing across the road.

The car decelerated at a constant rate of 10 m/s^2 . The car finally came to a stop after it travelled for 45 m.

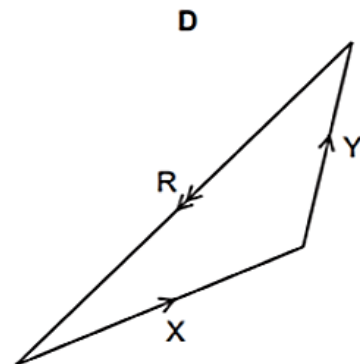
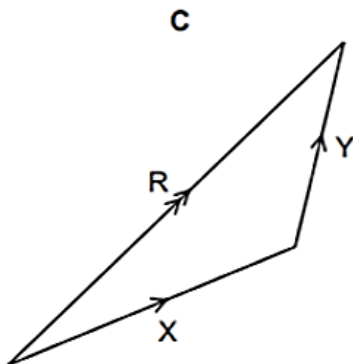
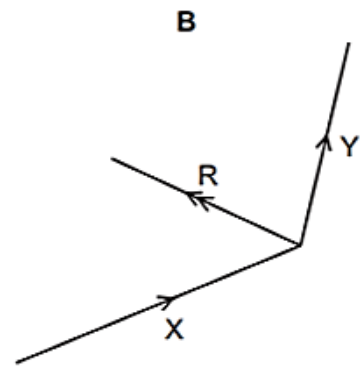
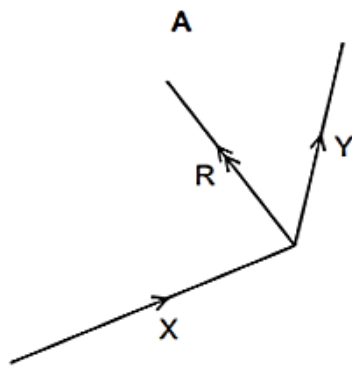
How long did the car take to come to a complete stop?

- A** 1.0 s
B 3.0 s
C 4.5 s
D 10 s

- 4 Two forces, X and Y, act upon an object O. The arrows represent the magnitudes and directions of the forces.



Which diagram shows the resultant force of X and Y?



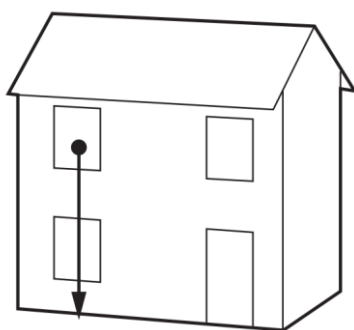
- 5 A man with an open parachute falls to Earth at constant speed. The following forces act on different bodies:

- P** the air resistance acting on the man
- Q** the upward force of the man on the Earth
- R** the weight of the man
- S** the downward pull of the man on the parachute

Which two forces are action-reaction force pair?

- A** P and Q **B** P and R **C** P and S **D** Q and R

- 6 A tennis ball falls from the upstairs window of a house.



What can be said about the acceleration of the ball if air resistance is ignored?

- A It depends on the mass of the ball.
B It increases as the density of the ball increases.
C It increases as the ball falls.
D It stays the same as the ball falls.
- 7 In a large container in an oil refinery, three oils of different densities are mixed. No chemical activity occurs.

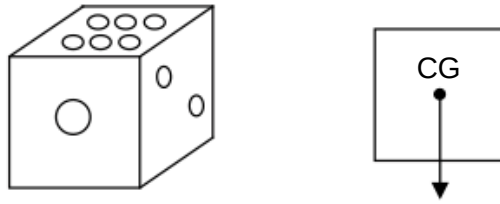
The mixture consists of:

- 1200 kg of oil of density 1100 kg/m^3
- 1500 kg of oil of density 860 kg/m^3

What is the density of the mixture?

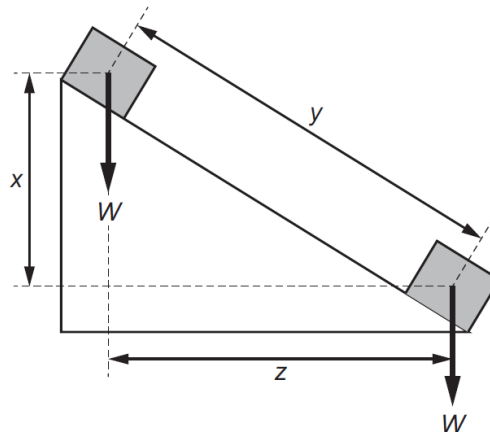
- A 920 kg/m^3
B 950 kg/m^3
C 980 kg/m^3
D 1800 kg/m^3
- 8 Which object, a bowling ball at rest or a soccer ball flying towards the goal mouth at a very high speed, has a higher inertia?
- A The bowling ball has the higher inertia because it has the greater mass.
B The bowling ball has the higher inertia because it is not moving.
C The soccer ball has the higher inertia because it has the greater volume.
D The soccer ball has the higher inertia because it is moving very fast.

- 9 An unbiased dice is a cube with the centre of gravity at the middle as shown in the diagram.



Which action changes the position of the centre of gravity of the dice?

- A Create the dice from a denser material.
 - B Drill a small hole at the side of the dice.
 - C Move it to a place with a larger gravitational field strength
 - D Rotate the dice 180° so that the top surface is now at the bottom
- 10 A heavy box of weight W is pushed up a frictionless slope.



What is work done by the weight W in moving from top to bottom?

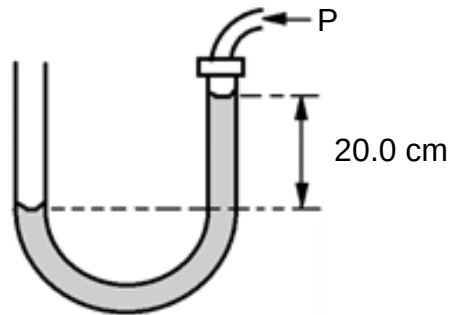
- A Wx
 - B Wy
 - C $W(y-z)$
 - D $W(x+z)$
- 11 Energy resources are used to produce electricity.

Which resource is non-renewable?

- A hydroelectric
- B nuclear fission
- C tidal waves
- D wind

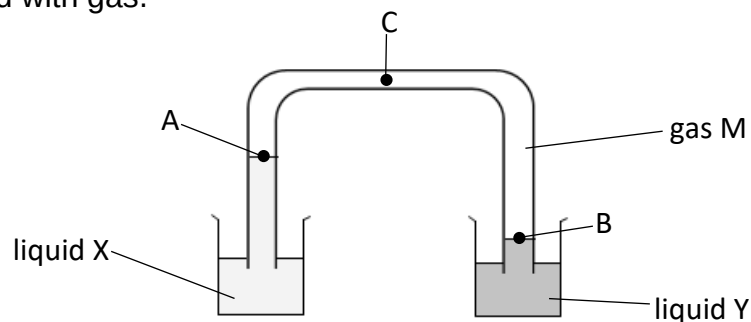
- 12** A manometer is connected to an air pump, P as shown. The atmospheric pressure is $1.03 \times 10^5 \text{ Pa}$ and the density of the liquid used in the manometer is 1550 kg/m^3 .

(The gravitational field strength is 10 N/kg)



What is the pressure at P?

- A** $3.10 \times 10^2 \text{ Pa}$
B $1.00 \times 10^5 \text{ Pa}$
C $1.06 \times 10^5 \text{ Pa}$
D $3.10 \times 10^5 \text{ Pa}$
- 13** The diagram below shows a tube with its ends placed in liquid X and Y. The tube is filled with gas.



Which statement(s) is/are true?

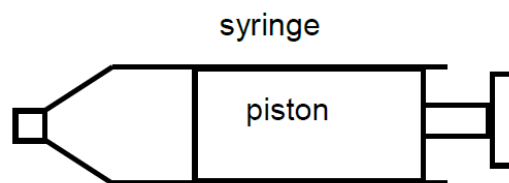
- I. Pressures at A, B and C are the same.
 II. The density of liquid X is greater than that of liquid Y.
 III. The gas pressure is greater than atmospheric pressure.

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

- 14** Illuminated smoke particles, suspended in air, are viewed under a microscope. They are seen to move randomly.

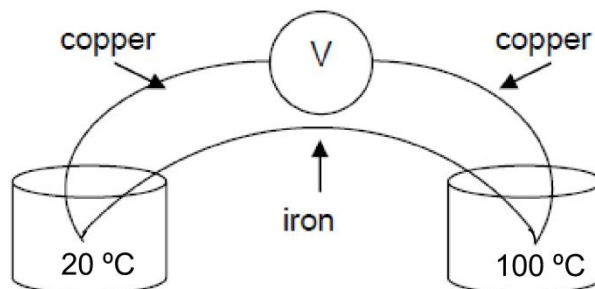
Which statement best explains the movement of the smoke particles?

- A** The smoke particles are bombarded continuously by the air molecules.
 - B** The smoke particles are gaining kinetic energy from the hot light bulb.
 - C** The smoke particles are moving about due to convection currents.
 - D** The smoke particles are vibrating more vigorously in their fixed positions.
- 15** A fixed mass of gas is heated in a frictionless syringe and expands at constant pressure.



Which statement about the gas is correct?

- A** The average distance between the gas molecules decreases.
 - B** The average force of the molecules on the wall of the piston remains constant.
 - C** The average speed of the gas molecules remains constant.
 - D** The frequency of collisions of the gas molecules on the wall of the syringe decreases.
- 16** The diagram below shows a thermocouple with its two metal wires placed in solutions of different temperatures. The voltmeter reads 16 mV.



If the copper wire is replaced by an iron wire, what is the voltmeter reading?

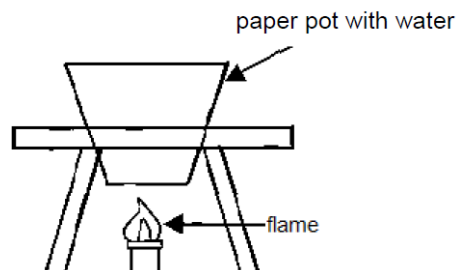
- A** 0 mV
- B** 12 mV
- C** 16 mV
- D** 24 mV

- 17 A platinum resistance thermometer has a resistance of $100\ \Omega$ at $0\ ^\circ\text{C}$ and resistance of $350\ \Omega$ at $100\ ^\circ\text{C}$.

What would the temperature be when the platinum wire has a resistance of $75\ \Omega$?

- A $-30\ ^\circ\text{C}$
- B $-10\ ^\circ\text{C}$
- C $10\ ^\circ\text{C}$
- D $30\ ^\circ\text{C}$

- 18 Some Japanese restaurants use paper pots for their customers to boil the food themselves.



Why does the paper pot not catch fire when in contact with the flame?

- I. The paper is thin and heat is conducted quickly to the water in the paper pot.
- II. Water has a boiling point lower than the burning temperature of the paper.
- III. Water has a high specific latent heat

- A I and II only
 - B I and III only
 - C II and III only
 - D I, II and III
- 19 Less thermal energy is needed to raise the temperature of $1.0\ \text{kg}$ of copper by $1.0\ ^\circ\text{C}$ than is needed to raise the temperature of $1.0\ \text{kg}$ of water by $1.0\ ^\circ\text{C}$.

Which statement explains this?

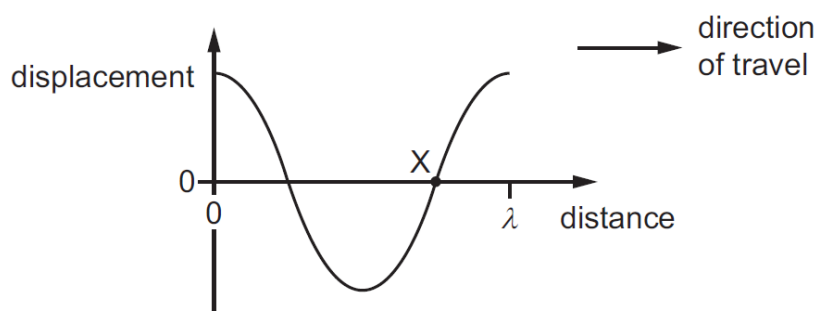
- A Copper has a higher melting point.
- B Copper has a lower specific heat capacity.
- C Copper has a smaller specific latent heat.
- D Copper is a better conductor of thermal energy.

20 What is meant by the amplitude of a wave?

- A** the distance between the extreme points of a particle's motion
- B** the maximum distance a particle moves from its equilibrium position
- C** the maximum energy carried by the wave
- D** the maximum power of the vibrations carrying the wave

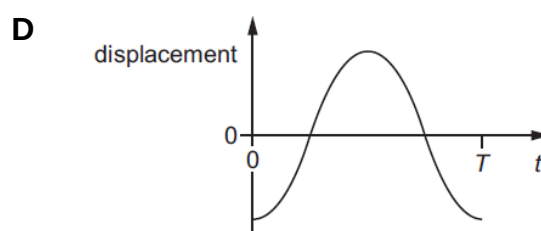
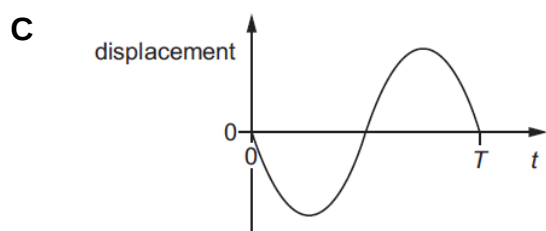
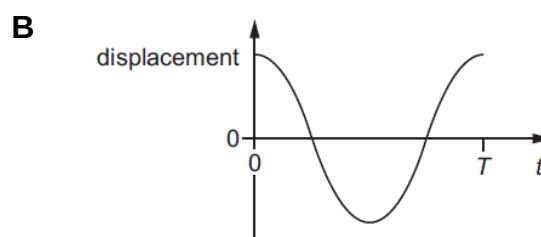
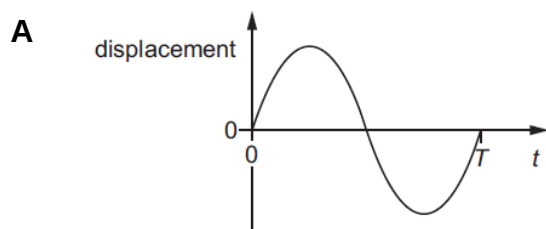
21 A transverse wave on a rope has wavelength λ and period T .

The graph shows the variation of the displacement of the particles of the rope with distance in the direction of travel of the wave at time $t = 0$.

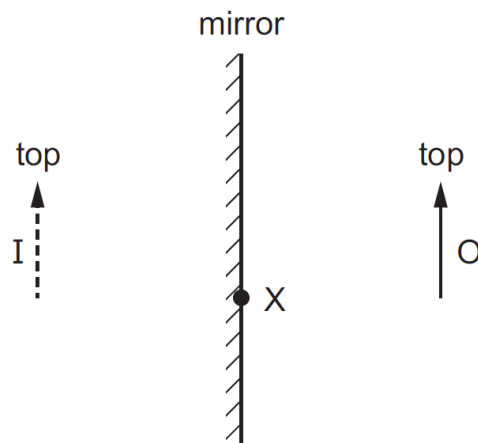


A particle X is labelled on the graph.

Which graph shows the variation of the displacement of particle X with time t ?



- 22** Which statement about electromagnetic waves in vacuum is correct?
- A** Electromagnetic waves with longer wavelengths travel farther than those with shorter wavelengths.
 - B** Electromagnetic waves with higher frequencies have shorter wavelengths.
 - C** Gamma rays travel faster than radio waves as they have more energy.
 - D** The speed of electromagnetic waves is proportional to their wavelength.
- 23** An object O is placed in front of a plane mirror. I is the image formed.

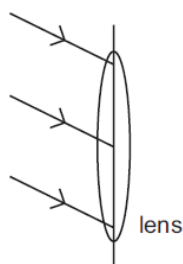


A light ray from the top of the object is incident on the mirror at X.

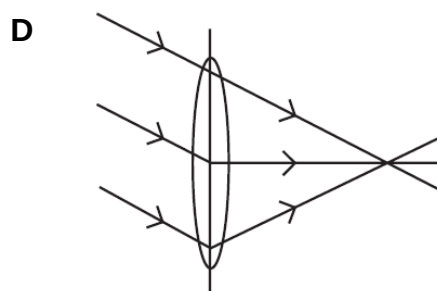
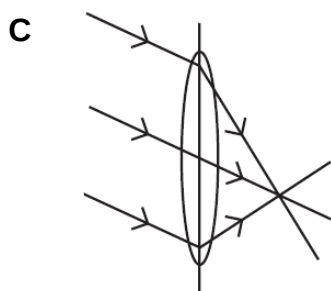
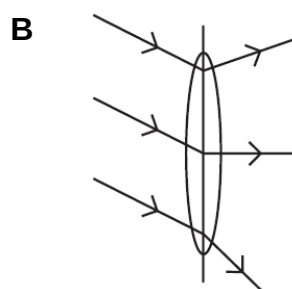
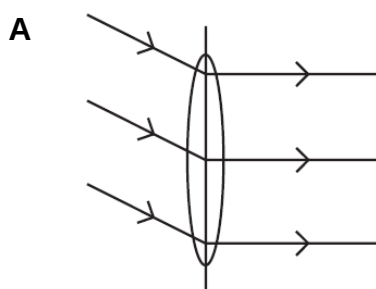
What happens to this light ray?

- A** It reflects and passes through the bottom of O.
- B** It reflects and passes through the top of O.
- C** It reflects as though it came from the bottom of I.
- D** It reflects as though it came from the top of I.

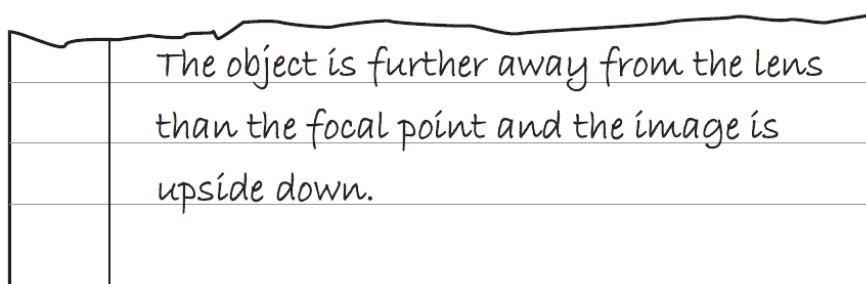
- 24 Three rays of light fall on a converging lens as shown.



Which diagram shows the path of the rays after passing through the lens?



- 25 A piece of paper torn from an exercise book is shown.



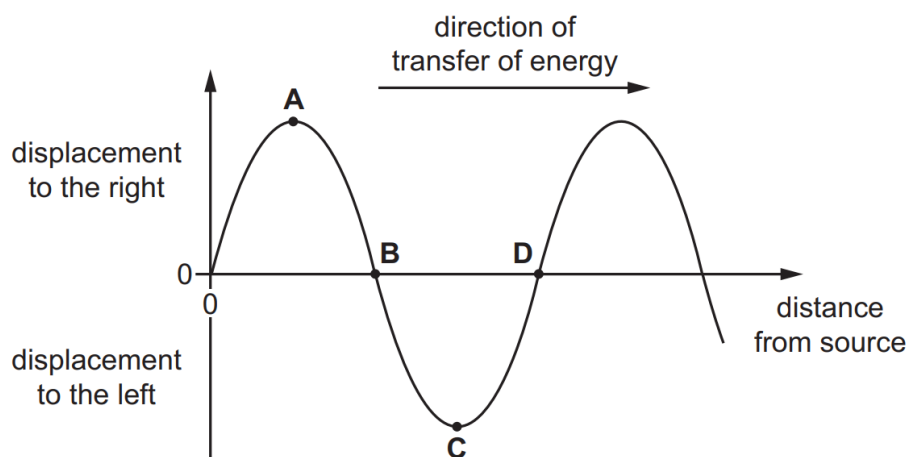
Which process is being described?

- A** the formation of a virtual image by a diverging lens
- B** the formation of a virtual image by a converging lens
- C** the formation of a real image by a diverging lens
- D** the formation of a real image by a converging lens

- 26** A longitudinal wave travelling from left to right has vibrations parallel to the direction of transfer of energy by the wave.

The wave can be represented on a graph showing the variation with distance of the displacement of the particles from their equilibrium positions at one instant.

Which point on the graph is the centre of a compression?

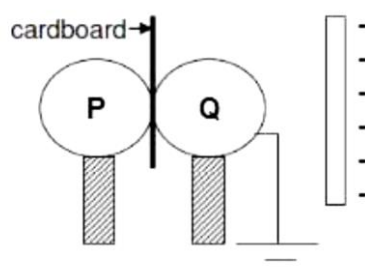


- 27** Two notes of different pitch but the same loudness are played on a musical instrument.

The two sound waves produced will have

- A** different frequencies and different speeds.
- B** different frequencies but the same speed.
- C** different speeds but the same amplitude.
- D** different speeds and different amplitudes.

- 28** Two uncharged metal spheres P and Q are placed together with a thick cardboard inserted between them. Both spheres are supported by insulating stands and Q is earthed with a wire.



A negatively-charged rod is brought near the spheres as shown.

What would be the distribution of charges on spheres P and Q when the wire is removed followed by the charged rod?

	P	Q
A	negative	positive
B	negative	neutral
C	neutral	positive
D	neutral	neutral

- 29** A battery drives 300 C of charge round a circuit. The total work done is 600 J. What is the electromotive force of the battery?

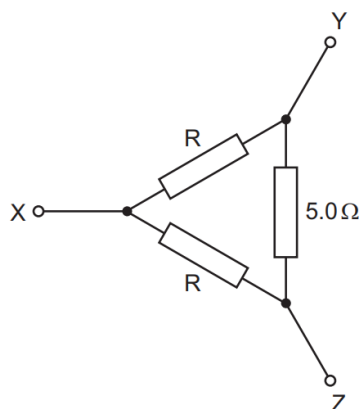
A 1.8 V **B** 2.0 V **C** 20 V **D** 450 V

- 30** A lightning strike transfers 1200 coulombs of charge past a point in a time of 30 μs .

What is the average current during the lightning strike?

A 0.04 mA **B** 36 mA **C** 40 A **D** 40 MA

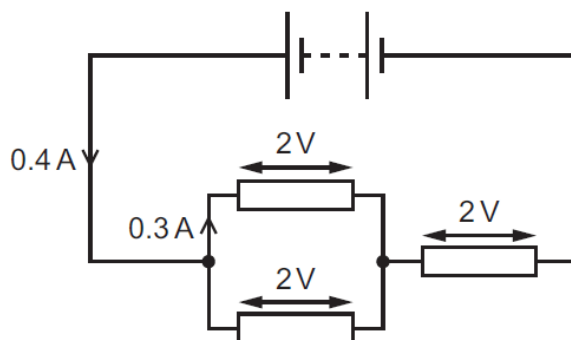
- 31** The diagram shows a network of three resistors. Two of these, marked R , are identical. The other resistor has a resistance of $5.0\ \Omega$.



The resistance between Y and Z is found to be $2.5\ \Omega$.

What is the resistance of R ?

- A** $0.2\ \Omega$
 - B** $0.5\ \Omega$
 - C** $2.5\ \Omega$
 - D** $5.0\ \Omega$
- 32** A battery is connected to three resistors, as shown.



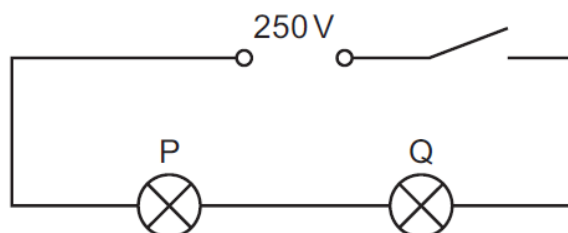
The potential difference across each resistor is $2\ \text{V}$.

The current from the battery is $0.4\ \text{A}$ and the current through one of the resistors connected in parallel is $0.3\ \text{A}$.

What is the total resistance of the circuit?

- A** $5.0\ \Omega$
- B** $6.7\ \Omega$
- C** $10\ \Omega$
- D** $20\ \Omega$

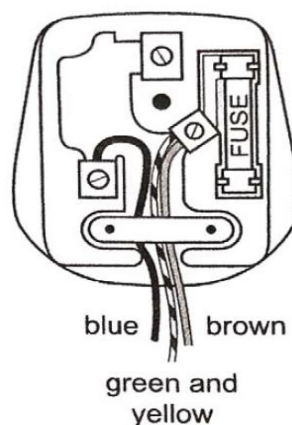
- 33** In the circuit shown, lamp P is rated 250 V, 50 W and lamp Q is rated 250 V, 200 W. The two lamps are connected in series to a 250 V power supply.



Assume that the resistance of each lamp remains constant.

Which statement most accurately describes what happens when the switch is closed?

- A** Lamp P is brighter than lamp Q.
 - B** Lamp P and Q will be equally bright.
 - C** Lamp Q is brighter than lamp P.
 - D** Lamp Q will not light up.
- 34** The plug of an electric toaster is wired as shown.



What happens when the switch is closed?

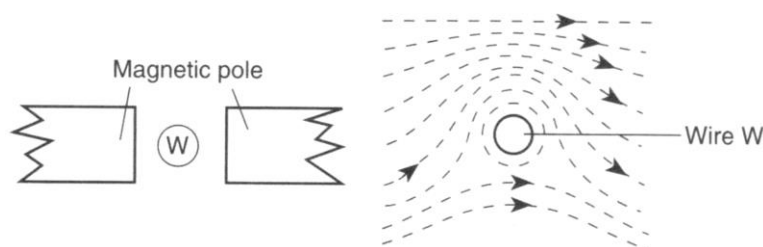
- A** The electric toaster does not work.
 - B** The electric toaster catches fire.
 - C** The fuse in the plug blows.
 - D** The metal case of the toaster becomes live.
- 35** Which material is used for the needle of a plotting compass?
- A** aluminium **B** cobalt **C** iron **D** steel

- 36** A teacher wants to demagnetise a bar magnet and tries three different methods.

- 1 Heat the bar magnet to a high temperature and let it cool.
- 2 Place the bar magnet east to west and hammer it.
- 3 Place the bar magnet inside a coil that has a direct current in it and remove it from the coil slowly.

Which methods demagnetise the bar magnet?

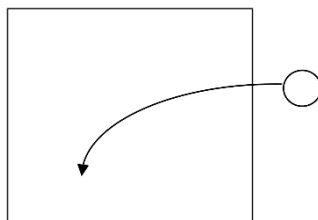
- A** 1 only
B 1 and 2 only
C 2 and 3 only
D 1, 2 and 3
- 37** A long straight wire W is placed between the poles of two magnets. The pattern of the magnetic field produced is as shown below.



Which arrangement will give rise to the pattern of magnetic field observed?

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

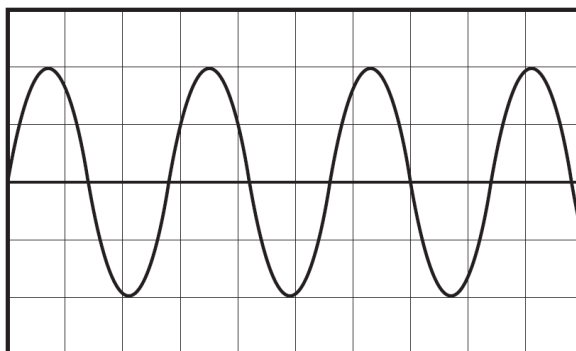
- 38** A beam of particles is observed to deflect through a certain region of space as shown in the diagram below.



Which row of conditions will not lead to the path above?

	Field	Direction of field	Particles
A	Electric	Into page	Negatively charged
B	Electric	Towards bottom of page	Positively charged
C	Magnetic	Into page	Negatively charged
D	Magnetic	Out of page	Positively charged

- 39** The diagram illustrates the trace obtained on the screen of a cathode ray oscilloscope (C.R.O) when a single signal of 71 Hz is applied to it.

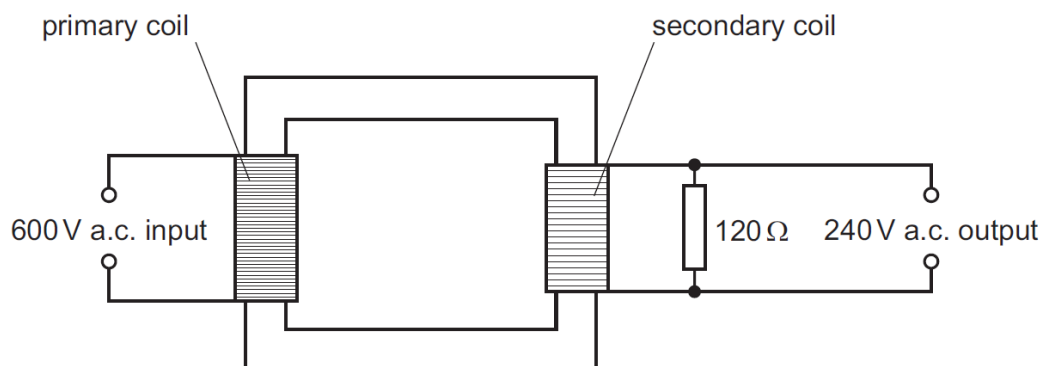


What is the time-base setting of the C.R.O at this instant?

- A** 0.14 ms/div
- B** 1.0 ms/div
- C** 5.0 ms/div
- D** 7.5 ms/div

- 40** A transformer with an efficiency of 100% has a primary voltage input of 600 V and a secondary voltage output of 240 V.

The secondary coil is attached to a resistor of resistance $120\ \Omega$.



What is the current in the primary coil?

- A** 0.8 A **B** 2.0 A **C** 5.0 A **D** 300 A

End of paper