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ZHONGHUA SECONDARY SCHOOL
PRELIMINARY EXAMINATION 2020
SECONDARY 4E/5N

Candidate's Name

Class

Register Number

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SCIENCE(PHYSICS/CHEMISTRY)

5076 /01

22 September 2020
1 hour

Additional Materials: OTAS

READ THESE INSTRUCTIONS FIRST

Write in soft pencil.

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

Write your name, index number and class on the OTAS 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.

Where necessary, take acceleration due to gravity, $g = 10 \text{ m/s}^2$.

A copy of the Data Sheet is printed on page **17**.

A copy of the Periodic Table is printed on page **18**.

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

Set by: Mrs Lin Jiakuan and Mr Tan Li Chun

Vetted by: Mr Tan Jun Hong, Mr Ong Kai Kun and Mr Desmond Chong

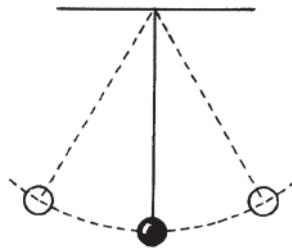
1 Which of the following statements is correct about all physical quantities?

- A All of them are scalars.
- B All of them have magnitude and direction.
- C Each of them consists of a magnitude and a direction.
- D Each of them consists of a magnitude and a unit.

2 What is the order of magnitude of the diameter of the Earth?

- A 1×10^3 m
- B 1×10^5 m
- C 1×10^7 m
- D 1×10^9 m

3 Sarah conducted an experiment to measure the period of a simple pendulum. The pendulum bob weighed 20 g and the length of the pendulum is 50 cm.



Which of the following changes to her experimental setup will decrease the period of the pendulum?

- A Change the length of the pendulum to 40 cm.
- B Change the length of the pendulum to 60 cm.
- C Use a 10 g pendulum bob.
- D Use a 30 g pendulum bob.

4 A pair of vernier calipers is used to measure the diameter of a marble. Diagram 1 shows the reading when the jaws are closed. Diagram 2 shows the reading when the marble is placed in between the jaws.

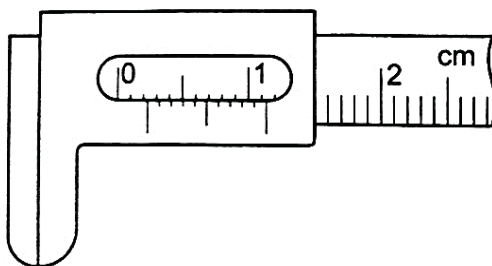


diagram 1

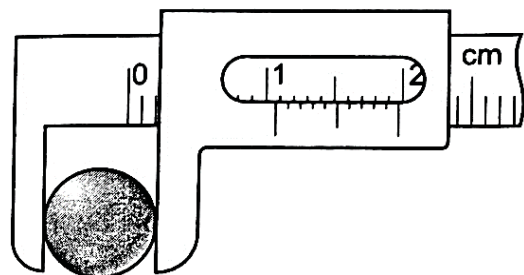
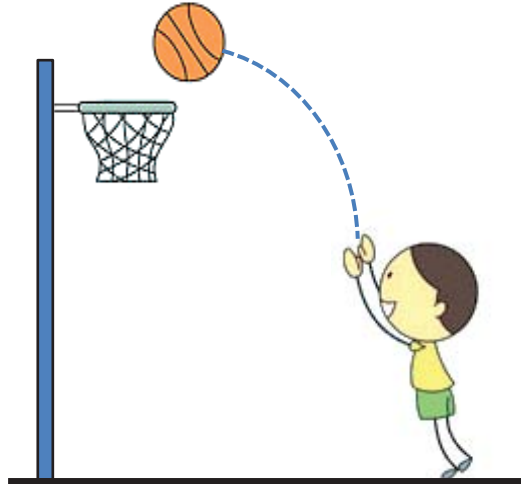


diagram 2

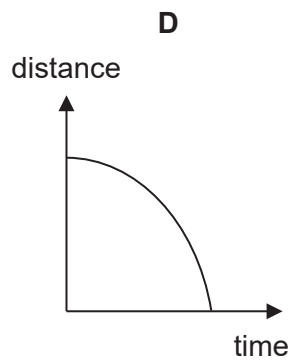
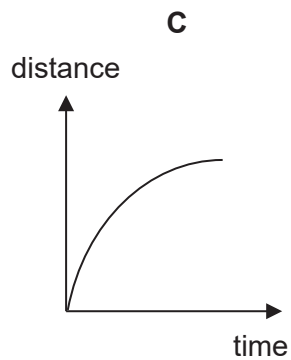
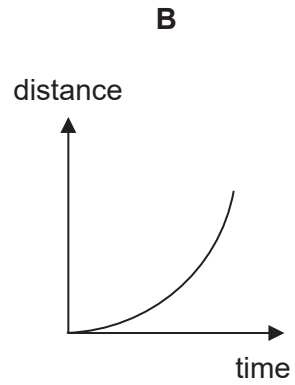
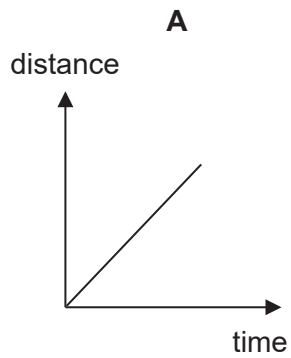
What is the diameter of the marble?

- A 0.80 cm
- B 0.84 cm
- C 0.94 cm
- D 1.24 cm

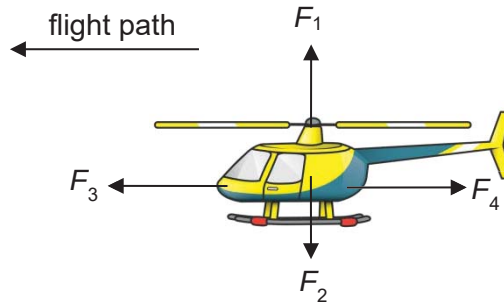
- 5 A basketball is thrown towards the net as shown in the diagram below.



Which distance-time graph correctly describes the motion of the basketball from the point of release to its highest point above the ground?



- 6 The diagram below shows forces that act on a helicopter during its flight. F_1 and F_2 are vertical forces while F_3 and F_4 are horizontal forces.



The helicopter now moves forward at a constant velocity at an altitude of 2000 m above ground. Which of the following pairs correctly describes the magnitudes of the four forces?

	vertical forces	horizontal forces
A	$F_1 = F_2$	$F_3 > F_4$
B	$F_1 = F_2$	$F_3 = F_4$
C	$F_1 > F_2$	$F_3 > F_4$
D	$F_1 > F_2$	$F_3 = F_4$

- 7 The densities of some liquids at 15 °C are as shown below.

liquid	density / kg m ⁻³
palm oil	914
rosin oil	980
naphtha	665
milk	1020

Source URL: https://www.engineeringtoolbox.com/liquids-densities-d_743.html

A solid cube weighs 1.3 kg and has sides of length 0.11 m.

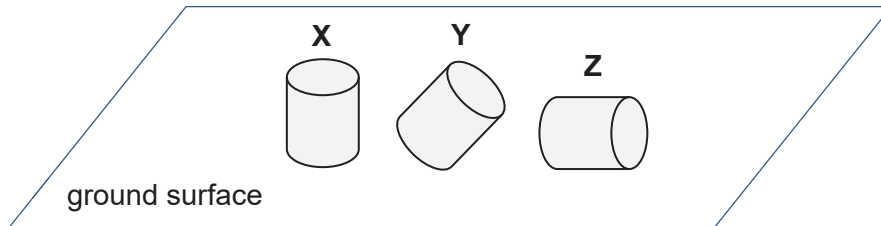
Will the cube float or sink in each of the liquids?

	palm oil	rosin oil	naphtha	milk
A	float	float	float	float
B	float	float	sink	float
C	sink	float	sink	float
D	sink	sink	sink	sink

8 Which of the following is an example of inertia?

- A a crane lifting a boulder at constant speed
- B a racing car making a sharp turn at a bend
- C a ship travelling a long distance after applying brakes before stopping completely
- D two vehicles coming to an immediate stop after a head-on collision

9 Three identical cylinders **X**, **Y** and **Z** are carefully placed on the ground such that all of them are in equilibrium.



Which statement about their states of equilibrium is correct?

- A Both **X** and **Z** are in stable equilibrium.
- B **X** is in stable equilibrium as it has the lowest centre of gravity.
- C **Y** is in unstable equilibrium as its centre of gravity is at the pivot.
- D **Z** is in neutral equilibrium as the height of its centre of gravity does not change as when the cylinder is displaced slightly.

10 A 60 W electric motor lifts a 50 N load to a height of 2.4 m. Assume that the energy wasted is negligible.

What are the work done and the time taken by the motor to lift the load?

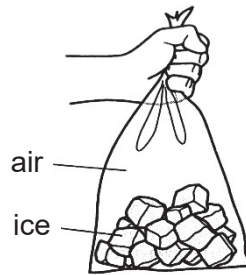
	work done / J	time taken / s
A	12	0.20
B	12	5.0
C	120	0.50
D	120	2.0

11 Steam undergoes condensation at 100 °C.

Which statement is correct about the molecules?

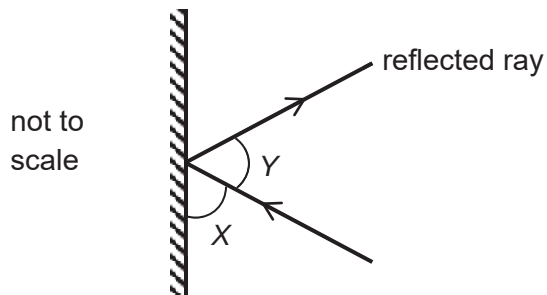
- A The molecules contract.
- B The molecules lose kinetic energy.
- C The molecules move closer together.
- D The molecules move slower.

- 12 In the bag shown below, the ice and the trapped air are at -5°C and 20°C respectively.



Which statement is correct about the ice molecules and the air molecules?

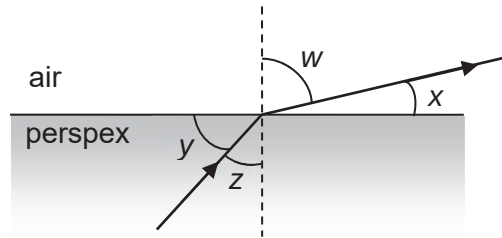
- A Both types of molecules are in constant random motion.
 - B Both types of molecules move at the same average speed.
 - C The air molecules move freely within the space while the ice molecules slide over one another.
 - D The distance between the air molecules is equal to the distance between the ice molecules.
- 13 A ray of light is reflected from a plane mirror.



What are the values of angles X and Y if the angle of reflection of the ray is 32° ?

	$X/^{\circ}$	$Y/^{\circ}$
A	32	116
B	58	64
C	64	58
D	116	32

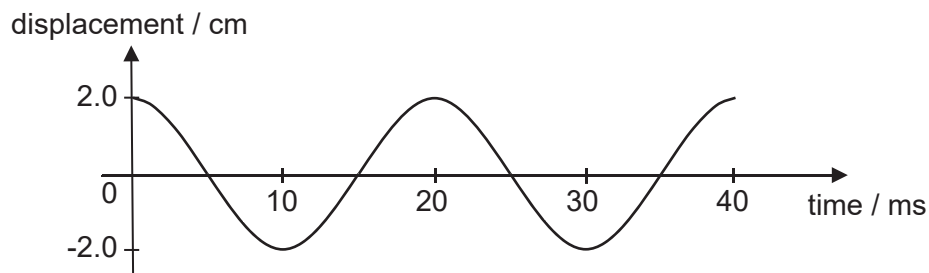
- 14 The diagram shows the path of a single ray of light as it emerges from a perspex block.



What is the refractive index of perspex?

- A** $\frac{\sin w}{\sin y}$ **B** $\frac{\sin w}{\sin z}$ **C** $\frac{\sin x}{\sin z}$ **C** $\frac{\sin z}{\sin w}$
- 15 The human eye has a thin converging lens. When the eye sees a distant object, which type of image is produced at the back of the eye?
- A** diminished, real, inverted
B diminished, virtual, upright
C magnified, virtual, inverted
D same size, real, upright

- 16 The diagram shows the displacement-time graph of a sound wave.



Which of the following pair of descriptions about the wave is correct?

	type of wave	wave frequency / Hz
A	longitudinal	25
B	longitudinal	50
C	transverse	50
D	transverse	25

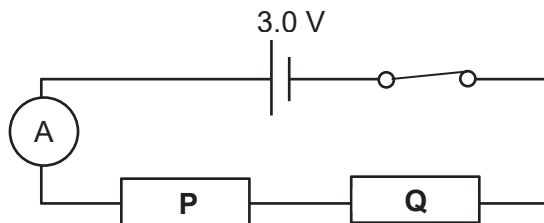
- 17 Two notes of the same loudness and the same pitch are played on a guitar. The two sound waves produced will travel through air with _____.
- A** the same amplitude and the same speed
B the same amplitude and different speeds
C different amplitudes and the same speed
D different amplitudes and different speeds

- 18 A spark plug produces a spark. The average current in the spark plug is 35 mA.

How long does it take for a charge of 84 μC to pass through the spark plug?

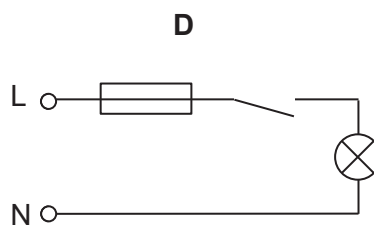
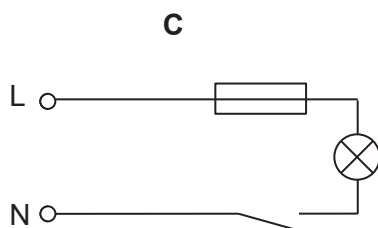
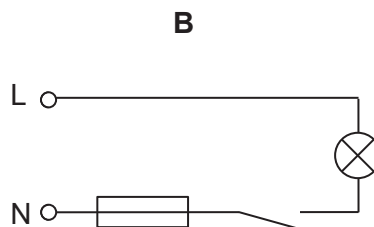
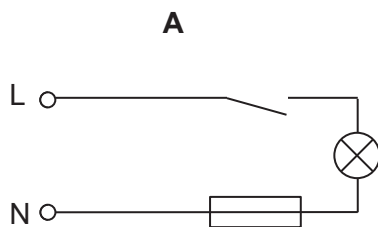
- A** $2.9 \times 10^{-9} \text{ s}$ **B** $2.4 \times 10^{-6} \text{ s}$ **C** $2.4 \times 10^{-3} \text{ s}$ **D** $2.9 \times 10^{-6} \text{ s}$

- 19 Two identical fixed resistors are connected in a series arrangement as shown.



Which of the following changes to the circuit will not affect the ammeter reading significantly?

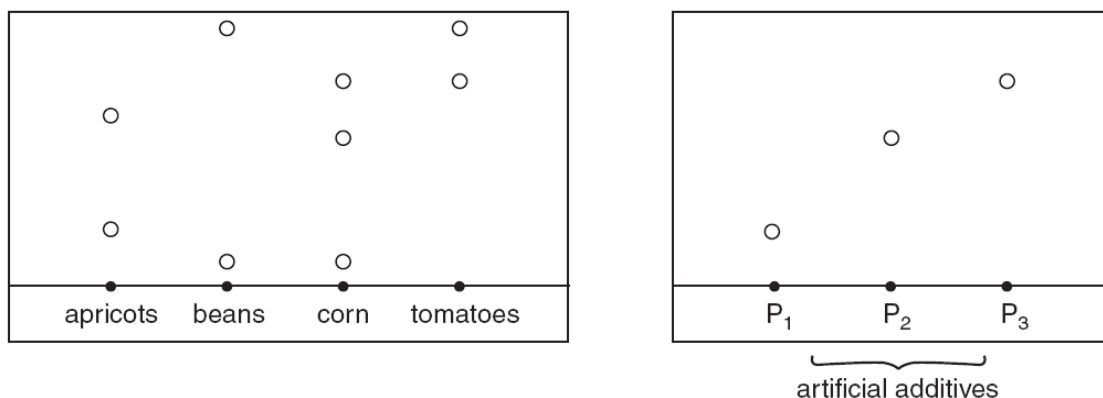
- A** Connect a voltmeter across resistor **P**.
B Connect an ammeter across resistor **Q**.
C Replace the 3.0 V cell with a 1.5 V cell.
D Replace the switch with a resistor of the same resistance as resistors **P** and **Q**.
- 20 Which circuit shows the correct positions for the fuse and the switch in the lighting circuit of a house?



key
 L = live wire
 N = neutral wire

- 21** Samples of tinned apricots, beans, corn and tomatoes were tested for additives using chromatography. The chromatograms were compared with those of three artificial additives, P₁, P₂ and P₃.

The results were as follows.



Which tinned food does not contain any artificial additives?

- A** apricots
 - B** beans
 - C** corn
 - D** tomatoes
- 22** Aqueous solution of an unknown salt gives the following observations when added to the following reagents.

reagents	observations
aqueous sodium hydroxide	green precipitate that turns brown slowly.
aqueous silver nitrate	white precipitate

What is the unknown salt?

- A** FeCl₂
- B** FeSO₄
- C** CuSO₄
- D** CuCl₂

- 23 Which row correctly shows the order of the rates of diffusion of the gases sulfur dioxide, carbon dioxide and ammonia?

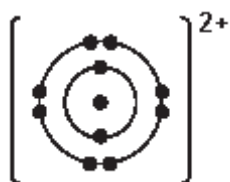
	slowest $\longrightarrow$ fastest		
A	ammonia	carbon dioxide	sulfur dioxide
B	sulfur dioxide	ammonia	carbon dioxide
C	ammonia	sulfur dioxide	carbon dioxide
D	sulfur dioxide	carbon dioxide	ammonia

- 24 An atom, **Q**, has 17 protons and 18 neutrons in its nucleus.

Which row gives a possible correct number of protons, neutrons and electrons in an ion of an isotope of **Q**?

	protons	neutrons	electrons
A	17	18	16
B	17	20	18
C	17	20	16
D	18	20	18

- 25 The diagram shows the structure of an ion. The ion has 12 protons and 12 neutrons.



What is the correct position in the Periodic Table of the element from which this ion was formed?

	period	Group
A	2	II
B	2	0
C	3	II
D	3	0

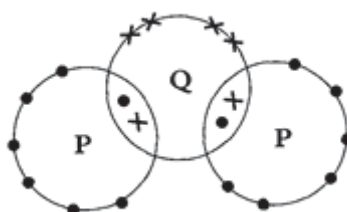
- 26 Element **X** can be represented by $^{28}_{13}\text{X}$.

Element **Y** has an electronic configuration of 2.7.

What is the formula of the compound formed between **X** and **Y**?

- A XY
- B X_3Y
- C XY_3
- D X_2Y_3

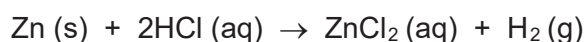
- 27 The diagram below shows the outer electron arrangement in a molecule of a compound P_2Q .



Which of the following pairs of elements are correct?

	element P	element Q
A	sulfur	nitrogen
B	oxygen	chlorine
C	fluorine	sulphur
D	nitrogen	oxygen

- 28 Zinc reacts with hydrochloric acid according to the equation below:



If 0.05 mol of zinc was added to 0.075 mol of hydrochloric acid, which substance would be the limiting reactant?

- A Zn
- B HCl
- C ZnCl_2
- D H_2

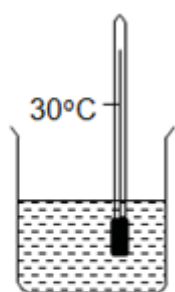
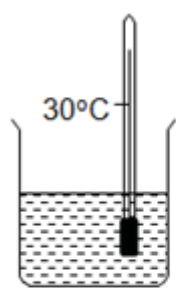
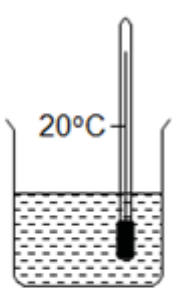
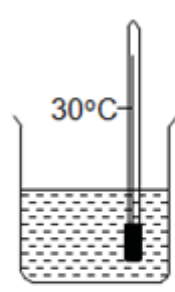
- 29 Ammonia react with copper(II) oxide to produce nitrogen, copper and water.



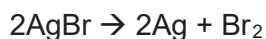
What is the mass of water produced when 24 dm^3 of ammonia reacts with excess copper oxide?

- A 18 g
- B 27 g
- C 32 g
- D 64 g

- 30 The diagrams below show four reaction set-ups.
Which set-up has the fastest speed of reaction?

A  1 g zinc powder in 100 cm^3 of 2 mol/dm^3 nitric acid	B  1 g zinc pellets in 100 cm^3 of 2 mol/dm^3 nitric acid	C  1 g zinc powder in 100 cm^3 of 2 mol/dm^3 nitric acid	D  1 g zinc pellets in 100 cm^3 of 1 mol/dm^3 nitric acid
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- 31 The equation represents the reaction which takes place in a photographic film.



Which of the following statement above the reaction is correct?

- A Silver ions are oxidised to form silver atoms.
- B Silver ions are lose electrons to form silver atoms.
- C Bromide ions are oxidised to form bromine molecules.
- D Bromide ions gain electrons to form bromine molecules.

32 Which method of preparation of a pure salt solution requires the use of a pipette and burette?

- A** $\text{Ba}(\text{NO}_3)_2 (\text{aq}) + \text{H}_2\text{SO}_4 (\text{aq}) \rightarrow \text{BaSO}_4 (\text{s}) + 2\text{HNO}_3 (\text{aq})$
- B** $\text{CuO} (\text{s}) + 2\text{HCl} (\text{aq}) \rightarrow \text{CuCl}_2 (\text{aq}) + \text{H}_2\text{O} (\text{l})$
- C** $2\text{KOH} (\text{aq}) + \text{H}_2\text{SO}_4 (\text{aq}) \rightarrow \text{K}_2\text{SO}_4 (\text{aq}) + \text{H}_2\text{O} (\text{l})$
- D** $\text{MgCO}_3 (\text{s}) + \text{H}_2\text{SO}_4 (\text{aq}) \rightarrow \text{MgSO}_4 (\text{aq}) + \text{H}_2\text{O} (\text{l}) + \text{CO}_2 (\text{g})$

33 Solid **X** forms a residue and a gas when heated. When the gas produced is bubbled through limewater, a white precipitate is formed. The residue is able to react with dilute hydrochloric acid and also aqueous sodium hydroxide.

What is the identity of solid **X**?

- A** carbon
- B** magnesium carbonate
- C** sodium carbonate
- D** zinc carbonate

34 Elements **X**, **Y** and **Z** are all in the same period of the Periodic Table.

X forms an amphoteric oxide.

Solid **Y** does not conduct electricity.

Z forms an ionic oxide, ZO .

In which order do the elements appear in the Periodic table?

- A** $\text{X} \rightarrow \text{Y} \rightarrow \text{Z}$
- B** $\text{Y} \rightarrow \text{X} \rightarrow \text{Z}$
- C** $\text{Z} \rightarrow \text{X} \rightarrow \text{Y}$
- D** $\text{Z} \rightarrow \text{Y} \rightarrow \text{Z}$

35 Which deduction about astatine, At, can be made from its position in the Periodic Table?

- A** It is more reactive than fluorine.
- B** It is a gas at room temperature.
- C** It forms a covalent compound with magnesium.
- D** It is displaced from aqueous potassium astatide, KAt , by chlorine.

- 36** The table below shows the results when different strips of metals, **X**, **Y** and **Z** are placed into different salt solutions.

metal	salt solution		
	X	Y	Z
X	no change	no change	no change
Y	brown deposit	no change	no change
Z	brown deposit	grey deposit	no change

Which of the following shows the metal in order of least reactive to most reactive?

- A** X, Y, Z
- B** X, Z, Y
- C** Z, Y, X
- D** Z, X, Y

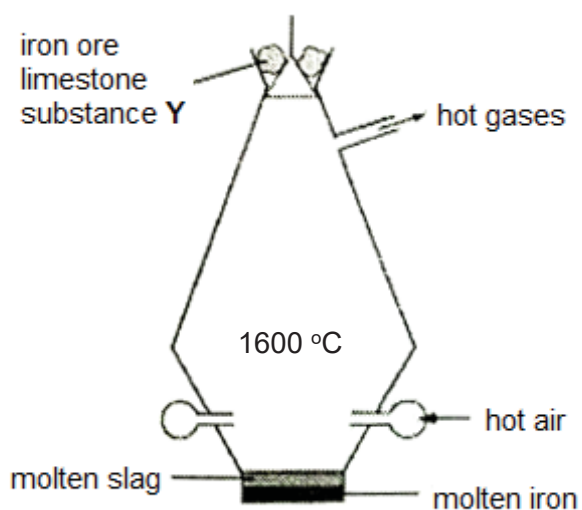
- 37** The table below shows some reactions of a metal, manganese.

reaction with	observation
cold water	no observable reaction
steam	hydrogen gas evolved
acid	hydrogen gas evolved

Which of the following gives the correct arrangement of the metals in order of increasing reactivity?

- A** manganese, copper, calcium
- B** calcium, copper, manganese
- C** copper, manganese, calcium
- D** copper, calcium, manganese

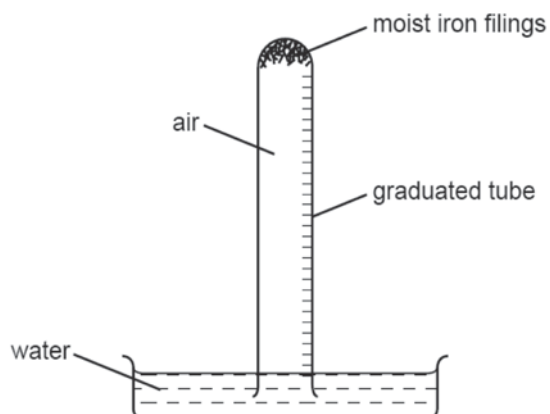
- 38 The diagram shows a blast furnace used to extract iron from iron ore.



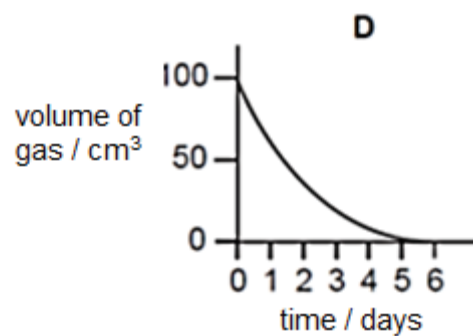
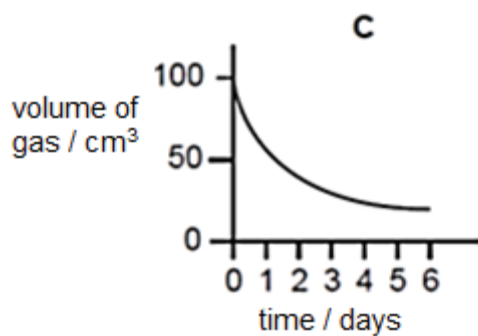
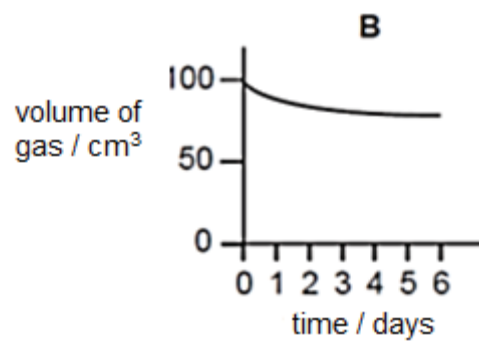
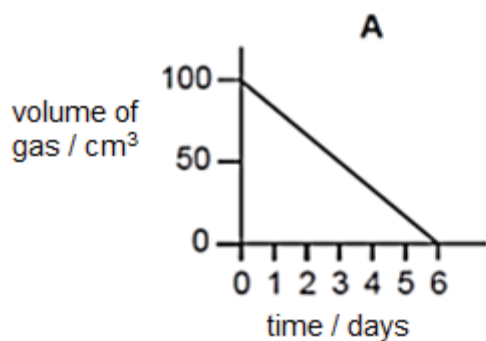
Which statement is not a function of substance Y?

- A acts as a reducing agent
 - B source of carbon monoxide gas
 - C a source of heat energy
 - D help in removal of acidic impurities
- 39 Which statements about air pollutants are correct?
- 1 Sulfur dioxide can be produced by combustion of coal.
 - 2 Carbon monoxide is responsible for the production of acid rain.
 - 3 Catalytic converter helps to reduce the amount of nitrogen oxides, carbon monoxide, and hydrocarbons emitted from car exhausts.
- A 1 and 2
 - B 1 and 3
 - C 2 and 3
 - D 1, 2 and 3

- 40 The apparatus shown was set up with 100 cm^3 volume of air in the graduated tube. The volume of gas in the graduated tube was measured at intervals for six days.



Which graph best represents how the volume of gas changes with time?



< End of paper >

Colours of Some Common Metal Hydroxides

calcium hydroxide	white
copper(II) hydroxide	light blue
iron(II) hydroxide	green
iron(III) hydroxide	red-brown
lead(II) hydroxide	white
zinc hydroxide	white

The Periodic Table of Elements

Group																		
I	II											III	IV	V	VI	VII	0	
1 H hydrogen 1 Key proton (atomic) number atomic symbol name relative atomic mass																		
3 Li lithium 7	4 Be beryllium 9																	
11 Na sodium 23	12 Mg magnesium 24																	
19 K potassium 39	20 Ca calcium 40	21 Sc scandium 45	22 Ti titanium 48	23 V vanadium 51	24 Cr chromium 52	25 Mn manganese 55	26 Fe iron 56	27 Co cobalt 59	28 Ni nickel 59	29 Cu copper 64	30 Zn zinc 65	31 Ga gallium 70	32 Ge germanium 73	33 As arsenic 75	34 Se selenium 79	35 Br bromine 80	36 Kr krypton 84	
37 Rb rubidium 85	38 Sr strontium 88	39 Y yttrium 89	40 Zr zirconium 91	41 Nb niobium 93	42 Mo molybdenum 96	43 Tc technetium -	44 Ru ruthenium 101	45 Rh rhodium 103	46 Pd palladium 106	47 Ag silver 108	48 Cd cadmium 112	49 In indium 115	50 Sn tin 119	51 Sb antimony 122	52 Te tellurium 128	53 I iodine 127	54 Xe xenon 131	
55 Cs caesium 133	56 Ba barium 137	57 – 71 lanthanoids		72 Hf hafnium 178	73 Ta tantalum 181	74 W tungsten 184	75 Re rhenium 186	76 Os osmium 190	77 Ir iridium 192	78 Pt platinum 195	79 Au gold 197	80 Hg mercury 201	81 Tl thallium 204	82 Pb lead 207	83 Bi bismuth 209	84 Po polonium -	85 At astatine -	86 Rn radon -
87 Fr francium	88 Ra radium	89 – 103 actinoids		104 Rf Rutherfordium	105 Db dubnium	106 Sg seaborgium	107 Bh bohrium	108 Hs hassium	109 Mt meitnerium	110 Ds darmstadtium	111 Rg roentgenium	112 Cn copernicium	114 Fl flerovium	116 Lv livermorium				
lanthanoids																		
57 La lanthanum 139	58 Ce cerium 140	59 Pr praseodymium 141	60 Nd neodymium 144	61 Pm promethium -	62 Sm samarium 150	63 Eu europium 152	64 Gd gadolinium 157	65 Tb terbium 159	66 Dy dysprosium 163	67 Ho holmium 165	68 Er erbium 167	69 Tm thulium 169	70 Yb ytterbium 173	71 Lu lutetium 175				
89 Ac actinium	90 Th thorium 232	91 Pa protactinium 231	92 U uranium 238	93 Np neptunium -	94 Pu plutonium -	95 Am americium -	96 Cm curium -	97 Bk berkelium -	98 Cf californium -	99 Es einsteinium -	100 Fm fermium -	101 Md mendelevium -	102 No nobelium -	103 Lr lawrencium				
actinoids																		

The volume of one mole of any gas is 24 dm³ at room temperature and pressure (r.t.p.).



ZHONGHUA SECONDARY SCHOOL

PRELIMINARY EXAMINATION 2020

SECONDARY 4E/5N

Candidate's Name

Class

Register Number

SCIENCE(PHYSICS)

5076 /02

16 September 2020

1 hour 15 minutes

Additional Materials: NIL

READ THESE INSTRUCTIONS FIRST

Write your name, index number and class in the spaces at the top of this page and on all separate answer paper used.

Write in dark blue or black pen.

You may use a pencil for any diagrams, graphs or rough working.

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

Section A

Answer **all** questions.

Write your answers in the spaces provided on the question paper

Section B

Answer any **two** questions.

Write your answers on the writing papers provided

At the end of the examination, fasten all your work securely together

The number of marks is given in brackets [] at the end of each question or part question.

All essential working must be shown clearly.

Where necessary, take acceleration due to gravity, $g = 10 \text{ m/s}^2$.

Set by: Mr Chen Yit Chien

Vetted by: Mr Tan Jun Hong

For Examiner's Use	
Section A	45
Section B	20
Total	65

Section A (45 marks)

Answer **all** the questions in this section.

- 1 Fig. 1.1 shows how the speed of a ball varies with time.

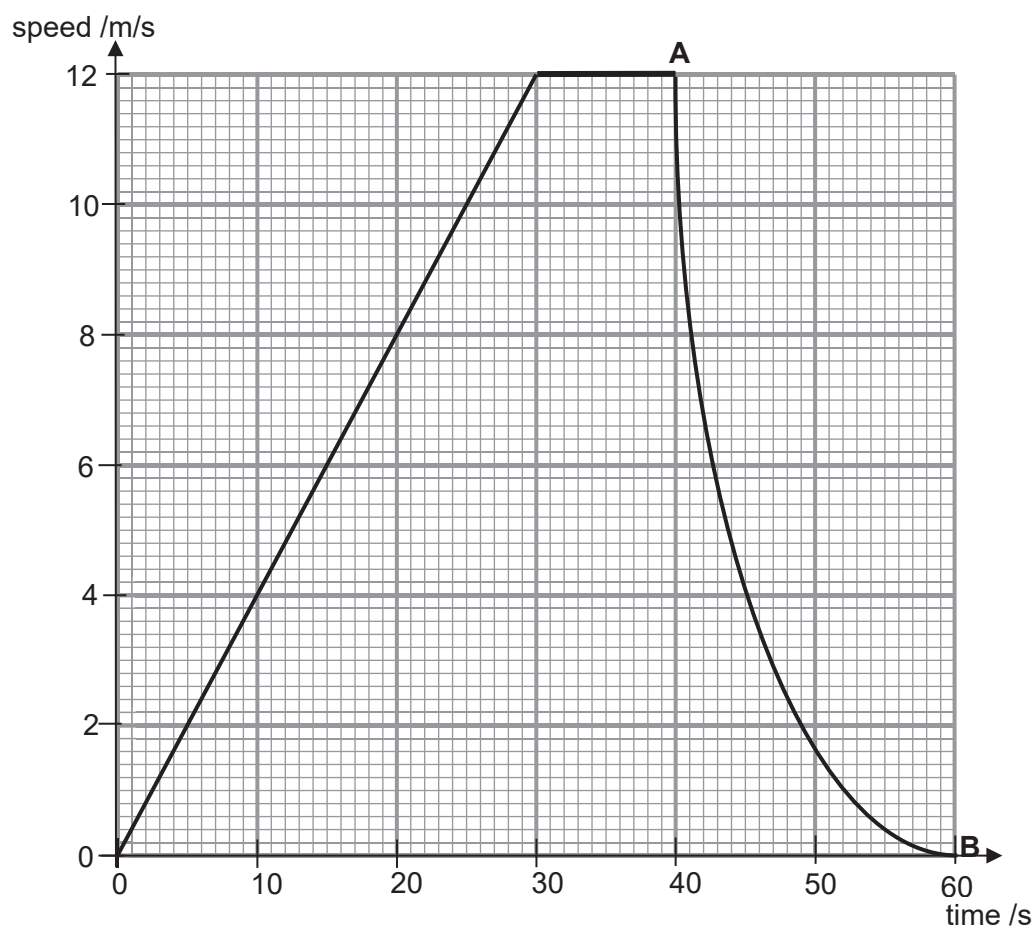


Fig. 1.1

Calculate, showing your working clearly,

- (a) the acceleration of the ball during the first 20 s.

acceleration = m/s^2 [1]

- (b) the total distance travelled by the ball during the first 40 s.

total distance = m [2]

(c) The average speed of the ball for the first 40 s.

average speed = m/s [1]

(d) Describe the motion of the ball between **A** and **B**.

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[1]

- 2 A small jet plane which can carry six people is shown in Fig. 2.1.

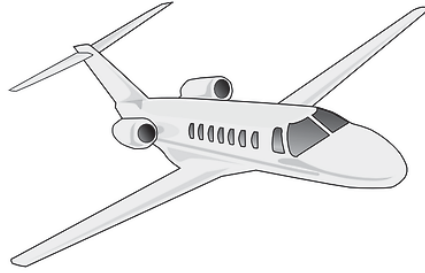


Fig. 2.1

The mass of the fully-loaded plane is 4550 kg. It is initially at rest.

When the plane starts to move, the two jet engines can exert a total thrust force of 7000 N and the friction between the wheels and the ground is 350 N. Both forces remain constant during take-off.

The air resistance experienced by the plane as it starts to move is 800 N.

- (a) Calculate the resultant force acting on the plane as it starts to move.

resultant force = N [1]

- (b) Calculate the acceleration of the plane as it starts to move.

acceleration = m/s^2 [1]

- (c) As the speed of the plane increases towards the take-off speed, the air resistance continues to increase.
Explain what happens to the acceleration of the plane as it speeds up.

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[2]

- (d) Suggest why the wheels of the plane are folded into the body of the plane after take-off.

.....
.....
..... [1]

- (e) When the plane is at rest, the total contact area between the wheels and ground is 0.094 m^2 .

- (i) Calculate the weight of the plane.

weight = N [1]

- (ii) Calculate the pressure exerted by the plane on the ground.

pressure = Pa [1]

- 3** Fig. 3.1 shows a force, F is applied on a box. This force, F is used to turn the box about the point **P**.
The weight of the box is 80 N.

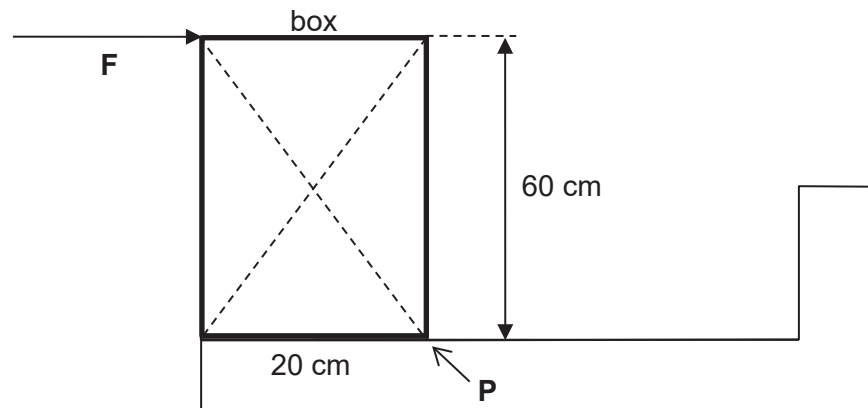


Fig. 3.1

- (a) On Fig. 3.1, draw an arrow and label it “80 N” to indicate where the weight of the box seems to act. [1]
- (b) (i) Calculate the moment due to the weight of the box about **P**.

moment = N cm [1]

- (ii) Calculate the minimum value of force F to just turn the box about **P**.

$F =$ N [2]

(c) Fig. 3.2 shows the width of the box as 15 cm.

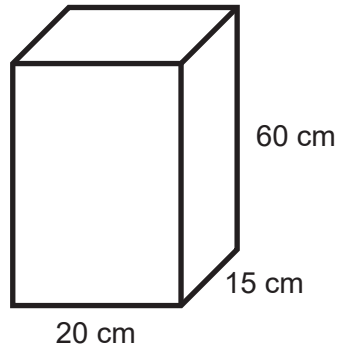


Fig. 3.2

(i) Calculate the density of the box.

density = g/cm³ [2]

(ii) The box can be placed on the ground in different ways to maintain stable equilibrium.

Sketch the placement of the box in the space provided below, to show how the box can achieve the most stable equilibrium position.

Label the length of each side clearly.

Explain briefly the reason why the placement which you showed is the most stable position.

reason

.....

.....

[2]

- 4 A pure solid substance is heated from $-15\text{ }^{\circ}\text{C}$ to $170\text{ }^{\circ}\text{C}$, using a 500 W heater. Fig. 4.1 shows the temperature change of the substance with respect to time.

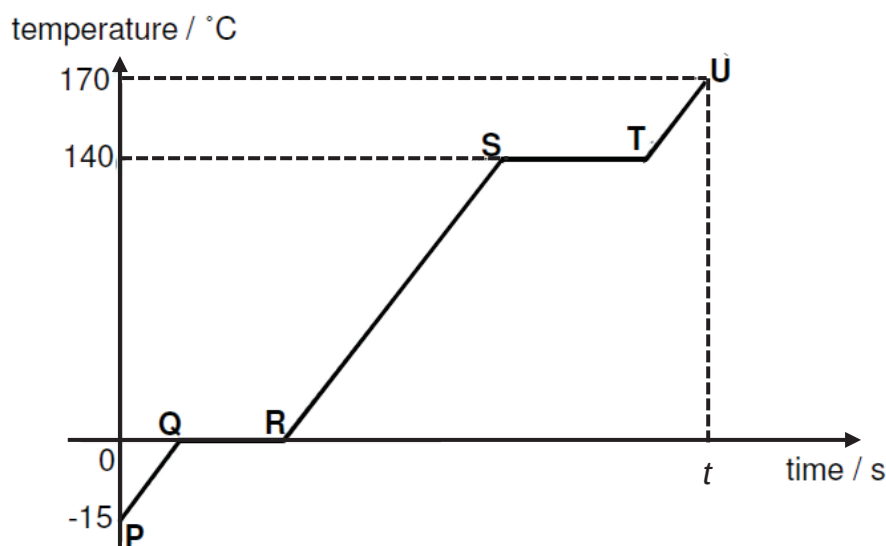


Fig. 4.1

- (a) State the melting point and boiling point of the substance.

melting point = $^{\circ}\text{C}$

boiling point = $^{\circ}\text{C}$ [2]

- (b) Describe what happens to the internal energy of the molecules in the substance when the temperature is increasing from $150\text{ }^{\circ}\text{C}$ to $170\text{ }^{\circ}\text{C}$.

.....

 [2]

- (c) Assume there is no loss of energy to the surroundings, the total amount of thermal energy needed to raise the temperature of the substance from $-15\text{ }^{\circ}\text{C}$ to $170\text{ }^{\circ}\text{C}$ is $400\,000\text{ J}$, calculate the time, t in Fig. 4.1.

$t = \dots\dots\dots\text{ s}$ [1]

- 5 Fig. 5.1 shows a hot water storage tank. It is made of metal with double walls with silvery surfaces on both sides. Air is trapped between the walls.

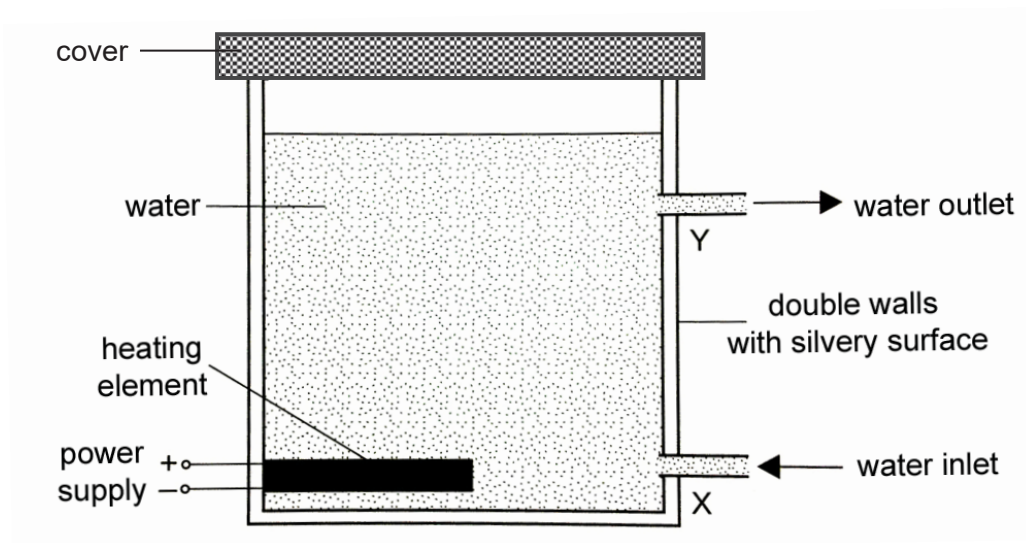


Fig. 5.1

- (a) Why is the heating element placed near the bottom of the tank?

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.....

[2]

- (b) Describe how the design of the storage tank reduces heat loss to the surroundings by conduction, convection and radiation.

conduction

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convection

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radiation

.....

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[3]

- 6 Fig. 6.1 shows the displacement-distance graph of a wave which travels outwards towards the right from a vibrating source.

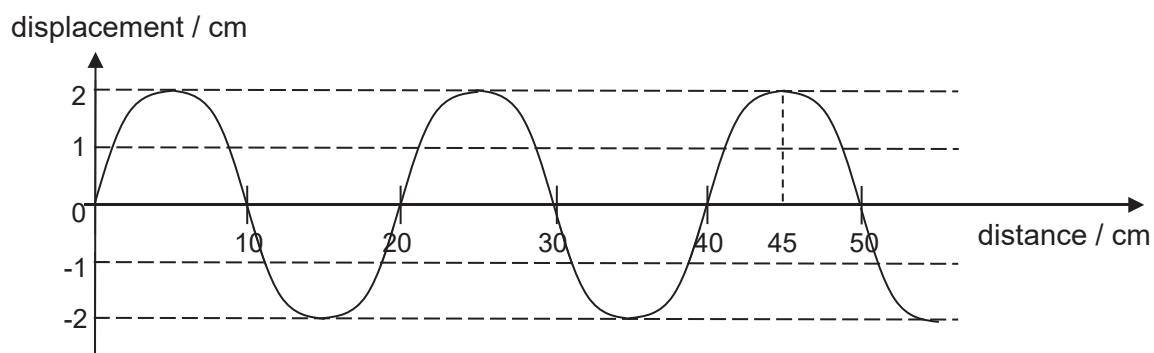


Fig 6.1

- (a) State the wavelength of the wave.

wavelength = cm [1]

- (b) Draw the wavefront of this wave from the vibrating source up to a distance of 45 cm away from the source. Label the distance of 45 cm clearly on your diagram.



[2]

- (c) The frequency of this wave is 150 Hz.
Calculate the speed of the wave.

speed = cm/s [1]

- (d) Calculate the time taken for the wave to travel a distance of 45 cm.

time taken = s [1]

- 7 A student rubs one side of an inflated balloon on her hair. This side of the balloon becomes positively charged. The charged side of the balloon is now brought close to a stream of water flowing from a pipe. The original position of the stream of water is shown in Fig. 7.1.

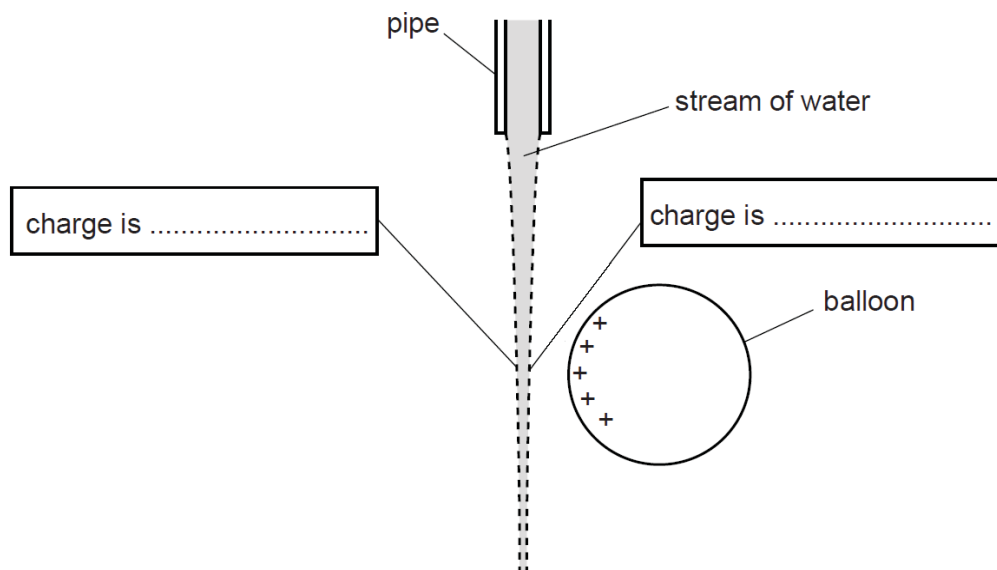


Fig. 7.1

- (a) Explain why the side of the balloon rubbed on the hair becomes positively charged.

.....
 [1]

- (b) On Fig. 7.1, write in the boxes to indicate how the charges on each side of the stream of water is affected, when the balloon is slowly brought near to the stream of water.

Complete the boxes in each case with the appropriate word: *positive*, *negative* or *neutral*. [1]

- (c) On Fig. 7.1, draw the new position of the stream of water. [1]

- (d) Explain your answer for (c).

.....

 [1]

- (e) Suggest a method to confirm whether the stream of water is charged or uncharged initially before the balloon is brought near to it.

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 [1]

- 8 Figure 8.1 shows part of a household circuit. A mains supply of 240 V is connected to a heating element of a water heater.

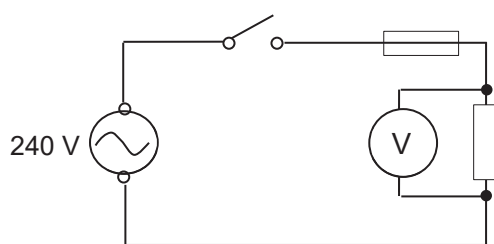


Fig. 8.1

- (a) When the switch is closed, a current 12.5 A flows in the heating element,

- (i) calculate the resistance of the heating element,

resistance = Ω [1]

- (ii) calculate the power output of resistor,

power output = W [1]

- (b) When there is a short circuit occurs in this circuit, describe what will happen to the safety device in this circuit.

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 [2]

- (c) State another safety device which will also respond to short circuit in the household circuit.

..... [1]

Section B (20 marks)

Answer any **two** questions in the spaces provided.

- 9 A 300 g ball falls freely from **X**, a height of 60 cm. Fig. 9.1 shows that it reaches **Y** after falling a distance of 35 cm. The air resistance experienced by the ball is negligible.

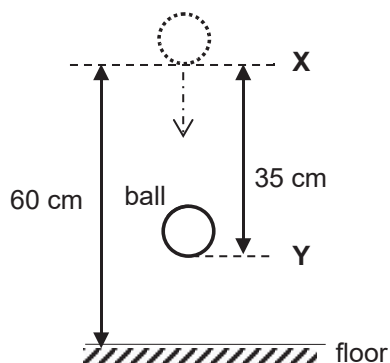


Fig. 9.1

- (a) Calculate the gravitational potential energy of the ball at **X**.

gravitational potential energy = J [2]

- (b) Calculate the speed of the ball when it hits the floor.

speed = m/s [2]

- (c) Calculate the time taken by the ball to hit the floor, after it is released from X.

time taken = s [1]

- (d) Calculate the gravitational force acting on the ball as it falls.

gravitational force = N [1]

- (e) Calculate work done on the ball by the gravitational force to move it from **X** to the floor.

work done = J [1]

- (f) The ball then bounces off the floor and travels upwards. It reaches the highest point at **Y**.
Suggest a reason why the ball does not return to **X**.

.....
..... [1]

- (g) After the ball has bounced off the floor and is moving upwards, state the resultant force acting on the ball and its direction.

resultant force = N

direction = [2]

- 10 (a) Fig. 10.1 shows a rectangular glass block with an incident light ray on side **AB** at an angle of 30° as shown. The glass block has an index of refraction of 1.52.

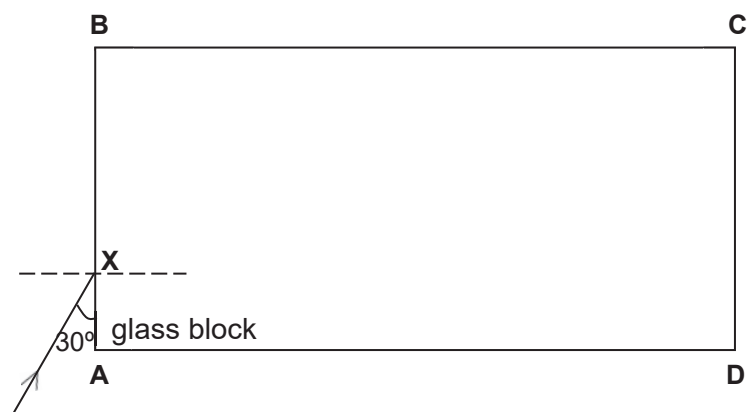


Fig. 10.1

- (i) Calculate the angle of refraction of the light ray at **X** when the light ray incident on the glass block.

angle of refraction = $^\circ$ [1]

- (ii) Calculate the critical angle of the glass block.

critical angle = $^\circ$ [1]

- (iii) Explain whether the light ray will emerge from side **BC** of the glass block.

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[2]

- (b) Fig. 10.2 shows an object of height 5.4 cm is placed 12.6 cm from a thin converging lens of focal length 6.0 cm.

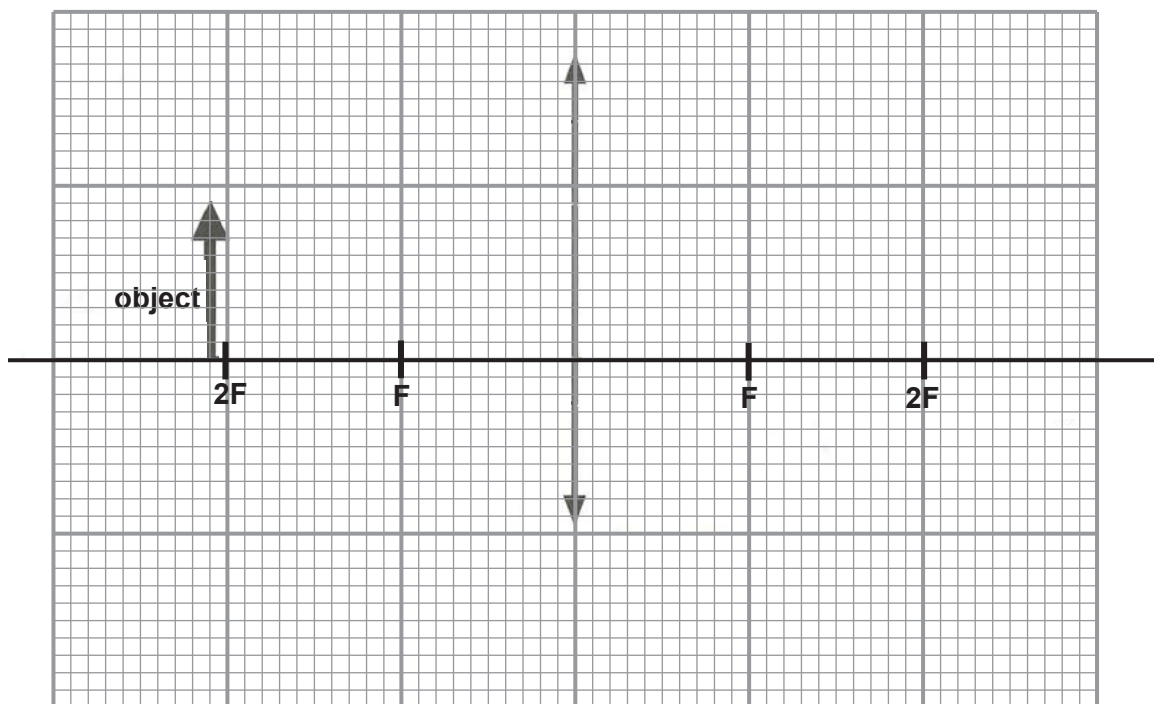


Fig. 10.2

- (i) By drawing rays on Fig. 10.2, locate the position of the image, and complete the ray diagram. [2]
- (ii) Write down two characteristics of the image formed. [1]
- [1]
- (iii) Name one use for such a lens arrangement. [1]
- [1]
- (c) Light ray is an electromagnetic wave.
Name one region of the electromagnetic spectrum that contains waves with a longer wavelength than all the visible light. State one use of waves from the region you have named.
- name of region
- use
- [2]

- 11 (a) Three wires, A, B and C, are made from the same material.
Wire A has area of cross-section A and length L. Its resistance is $10\ \Omega$.

Complete Table 11.1 for the resistance of each wire.

Table 11.1

wire	cross-sectional area	length	resistance / Ω
A	A	L	10
B	2A	L	
C	5A	2L	

[1]

- (b) Fig. 11.1 shows three different resistors, of resistance $1\ \Omega$, $3\ \Omega$ and $5\ \Omega$, are connected in series with a $18\ \text{V}$ direct current supply as shown in.

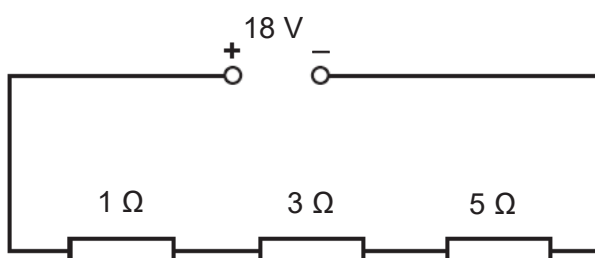


Fig. 11.1

- (i) State *Ohm's Law*.

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[1]

- (ii) Draw the I - V graph of a fixed resistor and explain whether it is an ohmic conductor in Fig. 11.2.

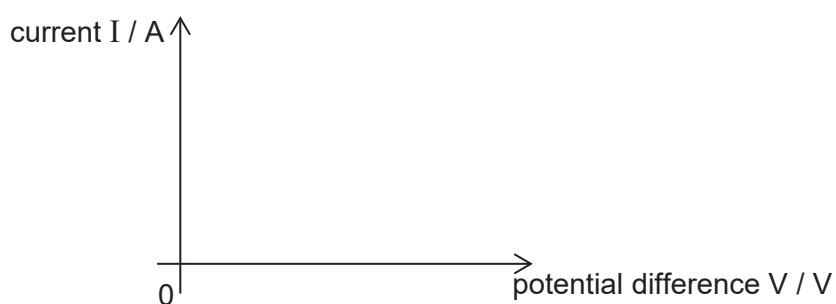


Fig. 11.2

.....
 [2]

- (iii) Calculate the current flowing through $5\ \Omega$ resistor.

current = A [1]

- (iv) Calculate the amount of charge flowing through $5\ \Omega$ resistor in 5 minutes.

amount of charge = C [1]

- (v) Calculate the potential difference across $5\ \Omega$ resistor.

potential difference = V [1]

- (c) Fig. 11.3 shows another resistor of resistance 3Ω is now connected to the circuit.

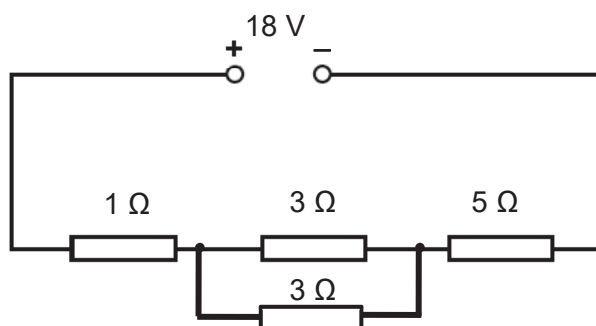


Fig. 11.3

- (i) Calculate the effective resistance of the two 3Ω resistors.

- (ii) Calculate the current flowing through the 5Ω resistor. resistance = Ω [1]

- (iii) State the current flowing through one of the 3Ω resistor. current = A [1]

current = A [1]

END OF PAPER

