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NAME		INDEX NO.		CLASS	
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NORTHLAND SECONDARY SCHOOL
PRELIMINARY EXAMINATION
Secondary Four Express and Five Normal
Academic

SCIENCE (PHYSICS/CHEMISTRY)

5076/01

Paper 1

20 September 2019

Additional materials provided: Answer Sheet (OTAS Sheet)

1 hour

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 Answer Sheet in the spaces provided.

There are **forty** questions in this section. 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.

A copy of the Data Sheet is printed on page 18.

A copy of the Periodic Table is printed on page 19.

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

At the end of the examination, submit the Answer Sheet (OTAS sheet) separately.

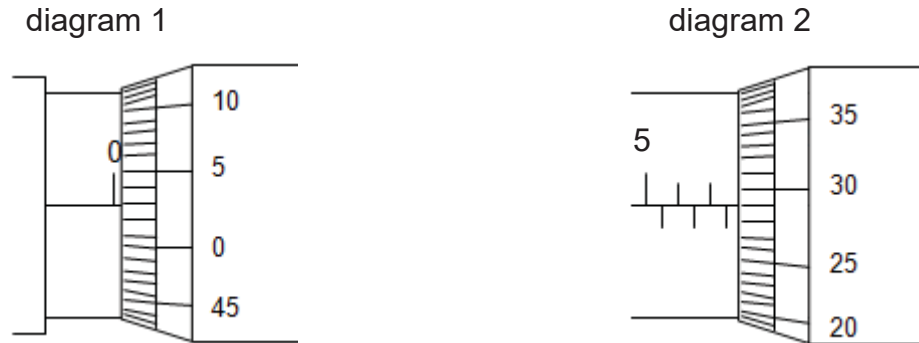
Setter: Mdm Nor Rasidah / Mdm Nilasari

Vetter: Ms Tan Lay Huay / Mr Koh Ee Beng

- 1 A student uses a micrometer screw gauge to measure the thickness of a pipe.

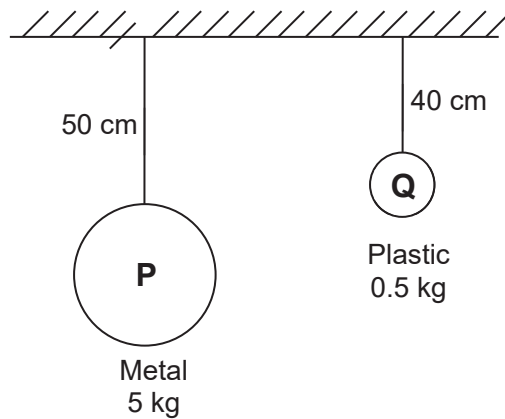
Diagram 1 shows the reading when it is closed without the pipe.

Diagram 2 shows the reading when it is closed with the pipe.



What is the thickness of the pipe?

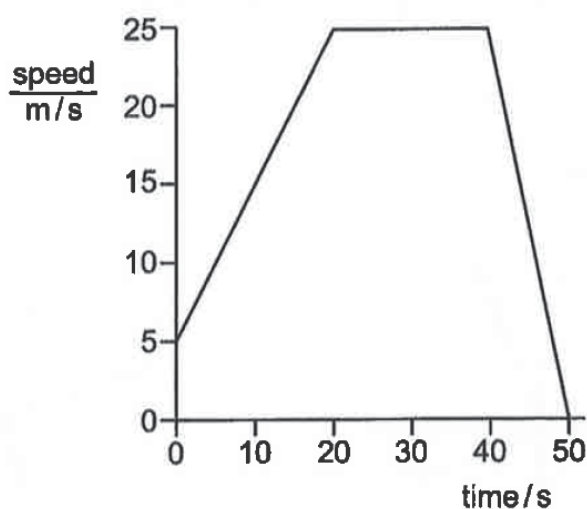
- A 5.51 mm
 - B 5.57 mm
 - C 7.76 mm
 - D 7.82 mm
- 2 **P** and **Q** are two pendulums of different lengths, masses, sizes and materials.



Which statement is true?

- A **P** has a longer period as it is larger in size.
- B **Q** has a longer period as it is smaller in size.
- C **P** has a longer period as it is longer.
- D **Q** has a longer period as it is shorter.

- 3 The diagram below shows a speed time graph of a car.



What is the average speed of the car for the first 20 s?

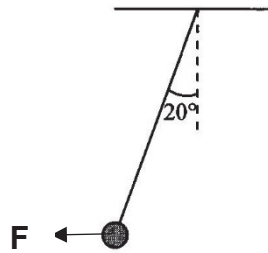
- A 10.0 m/s
 B 12.5 m/s
 C 15.0 m/s
 D 17.5 m/s
- 4 A ball is dropped in a vacuum tube. A series of photographs is taken at equal time intervals from the time of release.

Another ball of the same size but twice its mass is also dropped in the same tube and photographed.

Which diagram shows the motion of the heavier ball?

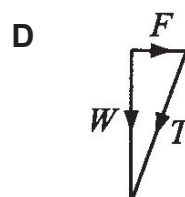
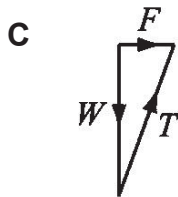
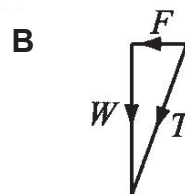
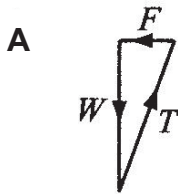
First Ball	heavier ball which is double in mass			
	A	B	C	D
☐	☐	☐	☐	☐
☐	☐	☐	☐	☐
☐	☐	☐	☐	☐
☐	☐	☐	☐	☐
☐	☐	☐	☐	☐
☐	☐	☐	☐	☐
☐	☐	☐	☐	☐

- 5 The diagram shows a pendulum bob, which is attached to one end of a string, suspended in mid-air. It is pulled to one side and held stationary.



The forces acting on the bob are its weight W , the tension T in the string and pulling force F .

Which of the following diagrams correctly shows the forces acting on the bob?



- 6 The friction between a body of mass 3 kg and the rough floor is 5.0 N.

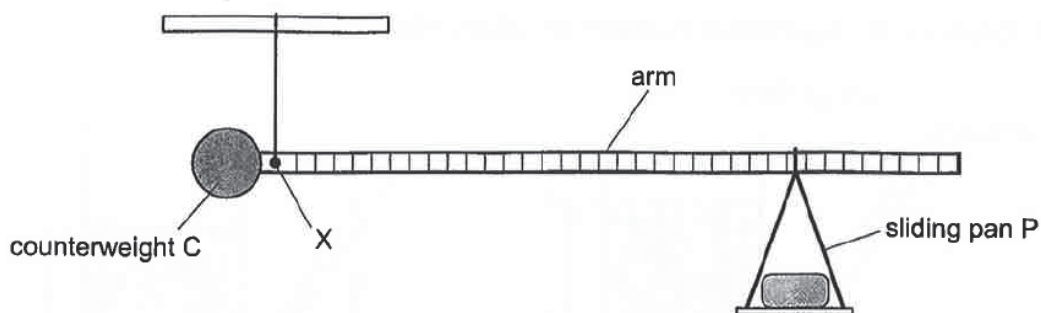
What is the force required to push it across the rough floor with an acceleration of 3.0 m s^{-2} ?

- A 4.0 N
 B 9.0 N
 C 14.0 N
 D 18.0 N

- 7 A weighing machine consists of a counterweight, **C**, an arm and a sliding pan **P**. The arm is free to rotate about the point **X**.

The sliding pan is moved along the arm until the arm balances as shown.

All moments are measured about **X**. The weight and moment of the arm can be ignored.



Why does the arm balance in the position?

- A** The moment of **C** equals the moment of **P**. The weight of **C** equals the weight of **P**.
B The moment of **C** equals the moment of **P**. The weight of **C** is greater than the weight of **P**.
C The moment of **C** greater than the moment of **P**. The weight of **C** equals the weight of **P**.
D The moment of **P** equals the weight of **C**.
- 8 A boy launches a remote control helicopter up to the sky at a constant acceleration.

What are the changes in the gravitational potential energy and the kinetic energy?

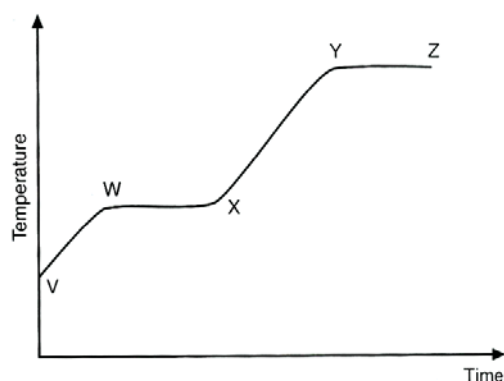
	Gravitational Potential Energy	Kinetic Energy
A	decrease	decrease
B	decrease	increase
C	increase	decrease
D	increase	increase

- 9 A substance consists of particles that are close together and moving past each other at random. The average speed of the particles is gradually decreasing.

What best describes the substance?

- A** a liquid being cooled
B a solid being cooled
C a gas being condensed to form a liquid
D a liquid being frozen to form a solid

- 10 A beaker of ice is heated until the beaker contains boiling water. The graph shows the temperature of the contents of the beaker during the experiment.



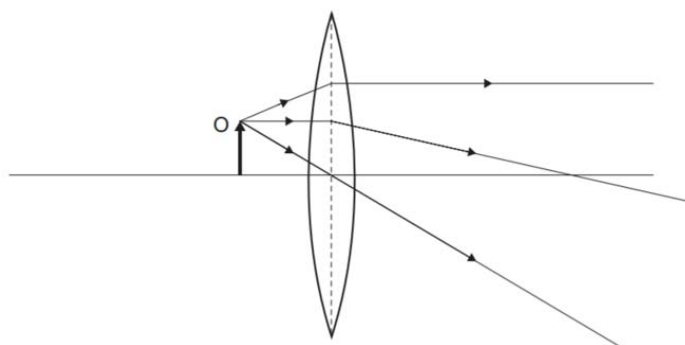
Between which two points are the contents in both liquid and solid states?

- A V and W
 - B W and X
 - C X and Y
 - D Y and Z
- 11 A cup of tea is stirred with two spoons, one metal and one plastic.

Why does the metal spoon feel hotter than the plastic one?

- A Convection occurs in metal faster than in plastic.
 - B Metal conducts heat faster than plastic.
 - C Metal needs more heat than plastic for the same rise in temperature.
 - D Metal radiates heat better than plastic.
- 12 An object **O** is placed close to a converging lens.

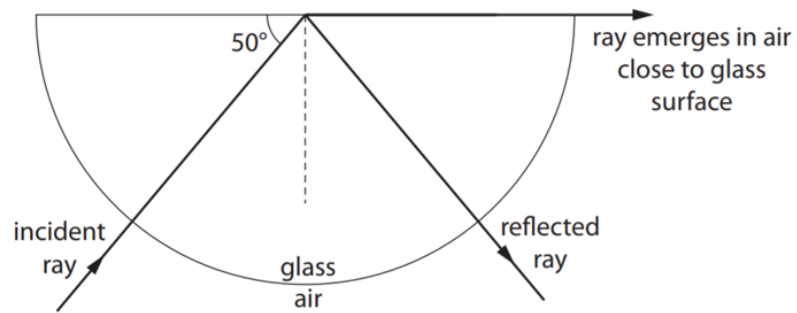
The diagram represents three rays from the top of **O** passing through the lens.



Which type of image is produced by the lens when the object is in this position?

- A real and diminished
- B real and enlarged
- C virtual and inverted
- D virtual and enlarged

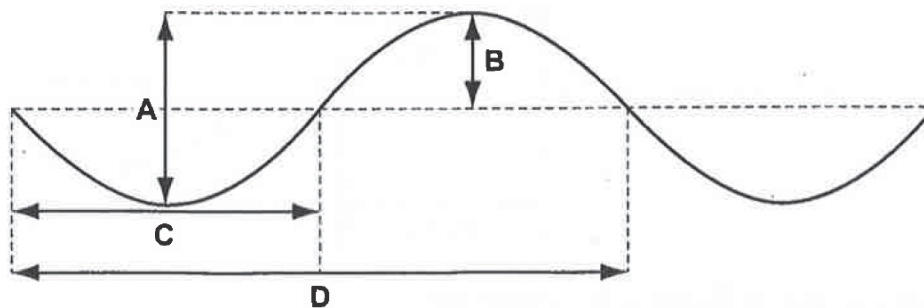
- 13 The diagram shows a ray of monochromatic light passing through a semi-circular glass block.



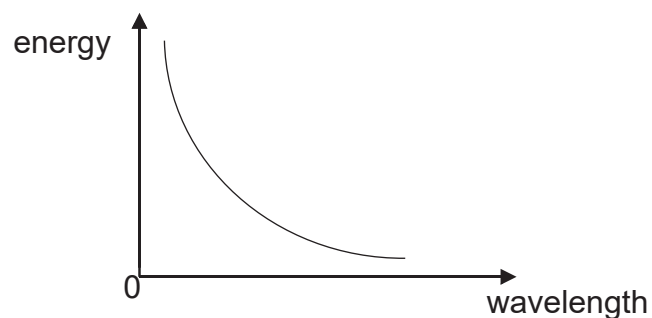
What is the critical angle of the glass?

- A 0°
 - B 40°
 - C 50°
 - D 55°
- 14 The diagram represents a wave.

Which letter marks the amplitude of the wave?



- 15 The diagram shows the relationship between energy and the wavelength of electromagnetic waves.

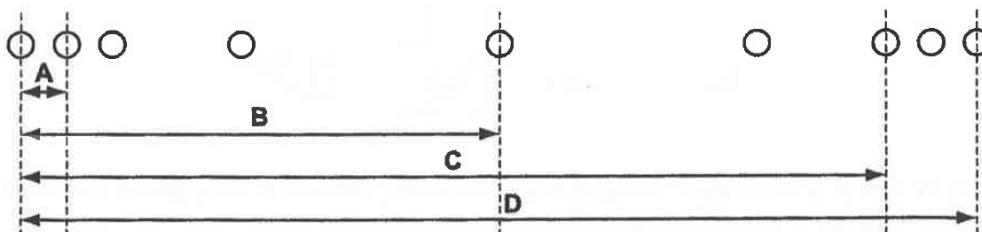


Which of the following has the lowest energy?

- A gamma ray
- B infra red
- C microwaves
- D x-rays

- 16 A sound wave passes through air. The diagram represents the arrangement of air molecules at one instance.

Which distance is the wavelength of the sound wave?

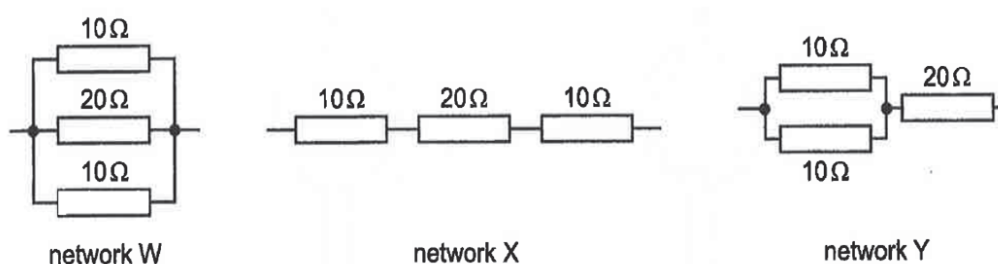


- 17 An electrical quantity is defined as 'the energy converted by a source in driving a unit charge round a complete circuit.'

What is this quantity called?

- A electromotive force
- B potential difference
- C power
- D voltage

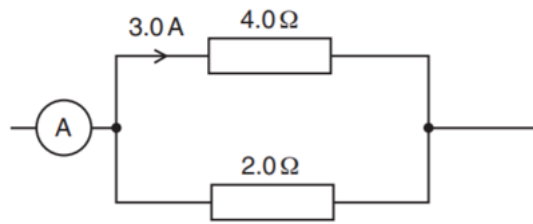
- 18 Three resistors are connected together to form three different networks.



What is the correct order, going from the network with the smallest resistance to the network with the largest resistance?

- A $W \rightarrow X \rightarrow Y$
- B $W \rightarrow Y \rightarrow X$
- C $X \rightarrow W \rightarrow Y$
- D $Y \rightarrow X \rightarrow W$

- 19** The diagram shows an electrical circuit. The current flowing through the $4.0\ \Omega$ resistor is $3.0\ \text{A}$.



What is the current through the ammeter?

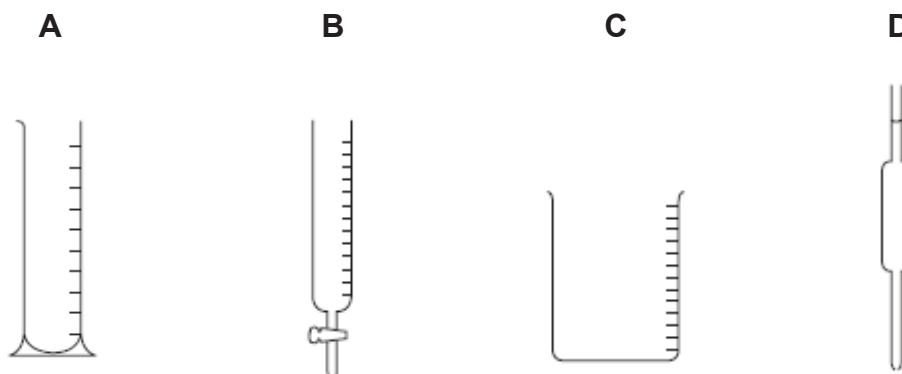
- A** $3.0\ \text{A}$
 - B** $4.5\ \text{A}$
 - C** $6.0\ \text{A}$
 - D** $9.0\ \text{A}$
- 20** A main socket supply ($240\ \text{V}$) is fitted with a $13\ \text{A}$ fuse.

Heating coils, each rated at $240\ \text{V}$ and $1\ 000\ \text{W}$, are connected to the socket.

What is the maximum number of such heating coils that can be connected to the socket?

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

21 Which piece of apparatus is used to measure exactly 28.3 cm^3 of a liquid?



22 A label is missing from a bottle of a colourless solution **X**.

In order to identify the solution, two simple chemical tests are carried out.

test 1	A few drops of aqueous ammonia are added to a sample of X . A white precipitate is formed. This precipitate dissolves when more aqueous ammonia is added.
test 2	Aqueous sodium hydroxide and aluminium are added to another sample of X and warmed. A pungent gas, which turns moist red litmus paper blue, is produced.

What is **X**?

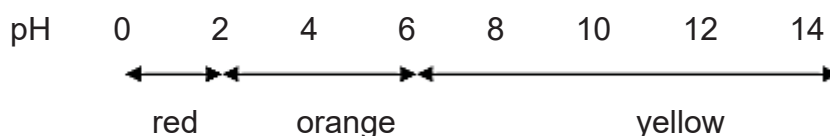
- A** ammonium carbonate **B** copper(II) chloride
C zinc chloride **D** zinc nitrate

- 23** The diagrams below show the change in the arrangement of atoms in a substance.

26 Which substances will **not** react with each other?

- A calcium oxide and silicon dioxide
- B carbon monoxide and potassium oxide
- C lead(II) oxide and sodium hydroxide
- D magnesium oxide and hydrochloric acid

27 The colour of an indicator **X** in solutions of different pH is shown below.



Indicator **X** can be used to distinguish between

- A ethanoic acid and hydrochloric acid.
- B sodium chloride solution and sodium hydroxide solution.
- C sodium hydroxide solution and aqueous ammonia.
- D sodium hydroxide solution and water.

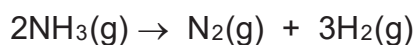
28 What is the oxidation state of sulfur in zinc sulfate, ZnSO_4 ?

- | | |
|------|------|
| A -6 | B -2 |
| C +6 | D +8 |

29 Which element has the **least** number of moles of atoms?

- A 1 g argon, ^{40}Ar
- B 1 g lithium, ^7Li
- C 1 g neon, ^{20}Ne
- D 1 g sodium, ^{23}Na

- 30 Ammonia gas, NH_3 , decomposed according to the equation

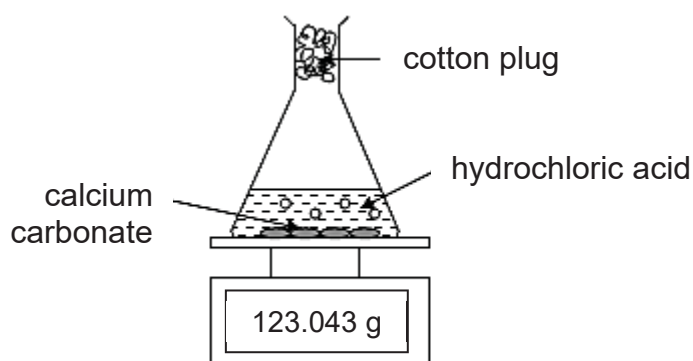


What volume of hydrogen (at room temperature and pressure) would be formed if 100 cm^3 of ammonia were decomposed?

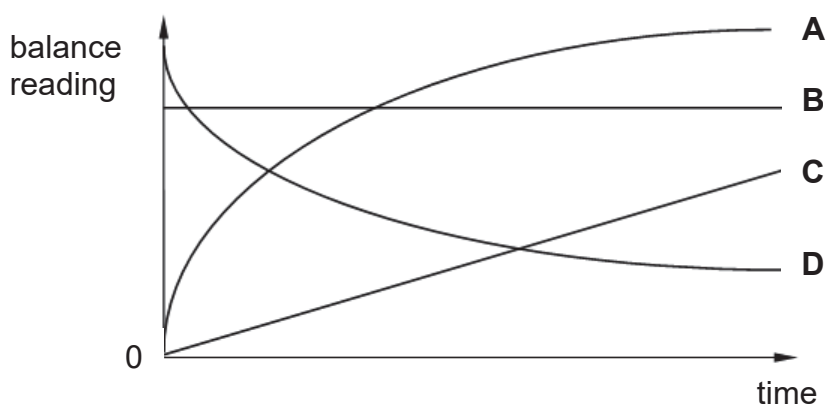
- A 25 cm^3
 B 75 cm^3
 C 100 cm^3
 D 150 cm^3
- 31 Which reaction does **not** involve either oxidation or reduction?
- A $\text{CH}_4(\text{g}) + 2\text{O}_2(\text{g}) \rightarrow \text{CO}_2(\text{g}) + 2\text{H}_2\text{O}(\text{g})$
 B $\text{Cu}^{2+}(\text{aq}) + \text{Zn}(\text{s}) \rightarrow \text{Cu}(\text{s}) + \text{Zn}^{2+}(\text{aq})$
 C $\text{CuO}(\text{s}) + \text{H}_2\text{SO}_4(\text{aq}) \rightarrow \text{CuSO}_4(\text{aq}) + \text{H}_2\text{O}(\text{l})$
 D $\text{Zn}(\text{s}) + \text{H}_2\text{SO}_4(\text{aq}) \rightarrow \text{ZnSO}_4(\text{aq}) + \text{H}_2(\text{g})$
- 32 The table shows the initial and final temperatures in a series of experiments. Which experiment is most exothermic?

	initial temperature / °C	final temperature / °C
A	16.0	24.5
B	18.0	25.0
C	20.0	15.5
D	22.0	12.0

- 33** The diagram shows an experiment to investigate the rate of a reaction. Readings of the total mass are taken every 30 seconds.



What is the correct graph for this experiment?



- 34** Carbon monoxide is formed when carbon is heated with the oxide of metal **X**. No carbon monoxide is formed when carbon is heated with the oxide of metal **Y**.

Which row shows the order of reactivity of carbon, metal **X** and metal **Y**?

	least reactive	—————>	most reactive
A	carbon	X	Y
B	carbon	Y	X
C	X	carbon	Y
D	Y	carbon	X

35 Four elements have the following electronic configurations.

W	2, 1
X	2, 2
Y	2, 5
Z	2, 8

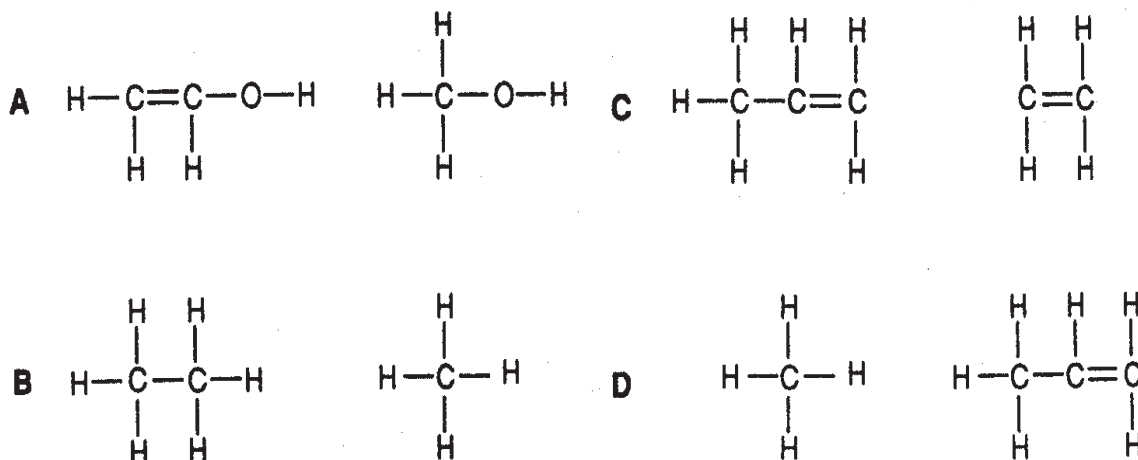
Which statement is correct?

- A** All four elements are in period 2.
 - B** All four elements belong to Group II.
 - C** **X** and **Y** are metals, **W** and **Z** are non-metals.
 - D** **Z** is a halogen and **X** is an alkali metal.
- 36** When petrol is burnt in a car engine, a gas that is produced reacts with hemoglobin to reduce its ability to transport oxygen throughout the body.

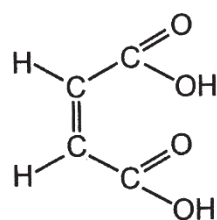
What reaction has taken place and name the gas produced?

	reaction	name of gas
A	complete combustion	carbon dioxide
B	incomplete combustion	carbon monoxide
C	substitution	hydrogen chloride
D	cracking	hydrogen

37 Which pair of molecules satisfies the general formula of C_nH_{2n} ?



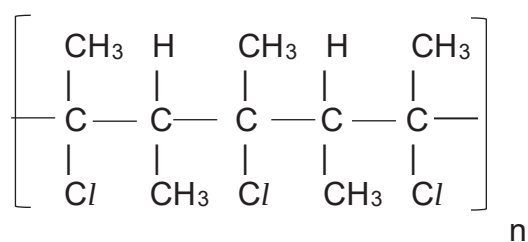
38 A compound **X** has the molecular structure as shown.



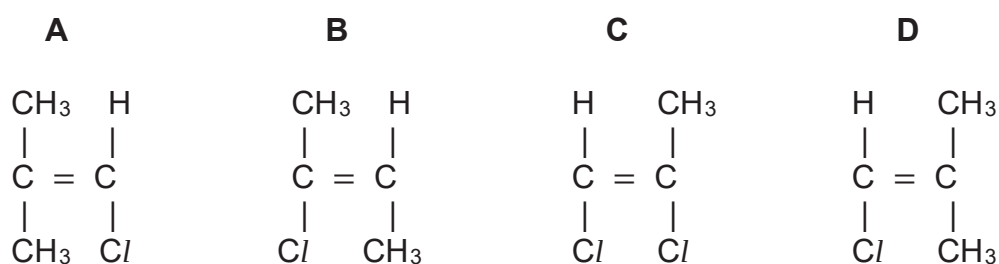
Which statement is **incorrect** about compound **X**?

- A** **X** can be described both as an alkene and as a carboxylic acid.
- B** **X** will react with sodium carbonate to give carbon dioxide gas.
- C** **X** will decolorize reddish brown aqueous bromine.
- D** **X** will react with sodium hydroxide to produce a white precipitate.

- 39 The diagram shows part of the structure of an addition polymer.



Which monomer is used to make this polymer?



- 40 Which product(s) is formed when glucose undergoes fermentation?

- A** CH_3OH and CO_2
B CH_3COOH and O_2
C C_2H_4 and O_2
D $\text{C}_2\text{H}_5\text{OH}$ and CO_2

End of Paper 1

DATA SHEET**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

Group																																																																																																																																																																																													
I	II						III	IV	V	VI	VII	0																																																																																																																																																																																	
3 Li lithium 7	4 Be beryllium 9	1 H hydrogen 1 proton (atomic) number atomic symbol name relative atomic mass																																																																																																																																																																																											
11 Na sodium 23	12 Mg magnesium 24	5 B boron 11	6 C carbon 12	7 N nitrogen 14	8 O oxygen 16	9 F fluorine 19	10 Ne neon 20																																																																																																																																																																																						
19 K potassium 39	20 Ca calcium 40	13 Al aluminium 27	14 Si silicon 28	15 P phosphorus 31	16 S sulfur 32	17 Cl chlorine 35.5	18 Ar argon 40																																																																																																																																																																																						
37 Rb rubidium 85	38 Sr strontium 88	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 -	113 Nh nihonium -	114 Fl flerovium -	115 Mc moscovium -	116 Lv livermorium -	117 Ts tennessine -	118 Og oganeson -	119 Nh nihonium -	120 Ds darmstadtium -	121 Nh nihonium -	122 Nh nihonium -	123 Nh nihonium -	124 Nh nihonium -	125 Nh nihonium -	126 Nh nihonium -	127 Nh nihonium -	128 Nh nihonium -	129 Nh nihonium -	130 Nh nihonium -	131 Nh nihonium -	132 Nh nihonium -	133 Nh nihonium -	134 Nh nihonium -	135 Nh nihonium -	136 Nh nihonium -	137 Nh nihonium -	138 Nh nihonium -	139 Nh nihonium -	140 Nh nihonium -	141 Nh nihonium -	142 Nh nihonium -	143 Nh nihonium -	144 Nh nihonium -	145 Nh nihonium -	146 Nh nihonium -	147 Nh nihonium -	148 Nh nihonium -	149 Nh nihonium -	150 Nh nihonium -	151 Nh nihonium -	152 Nh nihonium -	153 Nh nihonium -	154 Nh nihonium -	155 Nh nihonium -	156 Nh nihonium -	157 Nh nihonium -	158 Nh nihonium -	159 Nh nihonium -	160 Nh nihonium -	161 Nh nihonium -	162 Nh nihonium -	163 Nh nihonium -	164 Nh nihonium -	165 Nh nihonium -	166 Nh nihonium -	167 Nh nihonium -	168 Nh nihonium -	169 Nh nihonium -	170 Nh nihonium -	171 Nh nihonium -	172 Nh nihonium -	173 Nh nihonium -	174 Nh nihonium -	175 Nh nihonium -	176 Nh nihonium -	177 Nh nihonium -	178 Nh nihonium -	179 Nh nihonium -	180 Nh nihonium -	181 Nh nihonium -	182 Nh nihonium -	183 Nh nihonium -	184 Nh nihonium -	185 Nh nihonium -	186 Nh nihonium -	187 Nh nihonium -	188 Nh nihonium -	189 Nh nihonium -	190 Nh nihonium -	191 Nh nihonium -	192 Nh nihonium -	193 Nh nihonium -	194 Nh nihonium -	195 Nh nihonium -	196 Nh nihonium -	197 Nh nihonium -	198 Nh nihonium -	199 Nh nihonium -	200 Nh nihonium -	201 Nh nihonium -	202 Nh nihonium -	203 Nh nihonium -	204 Nh nihonium -	205 Nh nihonium -	206 Nh nihonium -	207 Nh nihonium -	208 Nh nihonium -	209 Nh nihonium -	210 Nh nihonium -	211 Nh nihonium -	212 Nh nihonium -	213 Nh nihonium -	214 Nh nihonium -	215 Nh nihonium -	216 Nh nihonium -	217 Nh nihonium -	218 Nh nihonium -	219 Nh nihonium -	220 Nh nihonium -	221 Nh nihonium -	222 Nh nihonium -	223 Nh nihonium -	224 Nh nihonium -	225 Nh nihonium -	226 Nh nihonium -	227 Nh nihonium -	228 Nh nihonium -	229 Nh nihonium -	230 Nh nihonium -	231 Nh nihonium -	232 Nh nihonium -	233 Nh nihonium -	234 Nh nihonium -	235 Nh nihonium -	

The volume of one mole of any gas is 24 dm^3 at room temperature and pressure (r.t.p.).

NAME		INDEX NO.		CLASS	
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NORTHLAND SECONDARY SCHOOL
PRELIMINARY EXAMINATION
Secondary Four Express and Five Normal Academic

SCIENCE (PHYSICS)

5076/02

Paper 2 Physics

17 September 2019

Candidates answer on the Question Paper.
No Additional Materials are required.

1 hour 15 minutes

READ THESE INSTRUCTIONS FIRST

Write your name and index number on the work you hand in.
You may use an HB pencil for any diagrams, graphs, tables or rough working.
Write in dark blue or black pen.
Do not use staples, paper clips, and glue or correction fluid.

The use of an approved scientific calculator is expected, where appropriate.
You may lose marks if you do not show your working or if you do not use appropriate units.

Section A [45 marks]

Answer **all** questions.

Write your answers in the spaces provided on the question paper.

Section B [20 marks]

Answer any **two** questions.

Write your answers in the spaces provided on the question paper.

At the end of the examination, fasten all your work securely together.
The number of marks is given in the brackets [] at the end of each question or part question.

For Examiner's Use	
Section A	
Section B	
TOTAL	65

Setter: Mdm Nor Rasidah

Vetter: Ms Tan Lay Huay

Section A

Answer **all** the questions in the spaces provide

1. In a experiment, a student drops a small metal ball into a cylinder of oil. The ball falls alongside a vertical ruler and a camera records its position at time intervals of 1.0 s, as shown in Fig. 1.1.

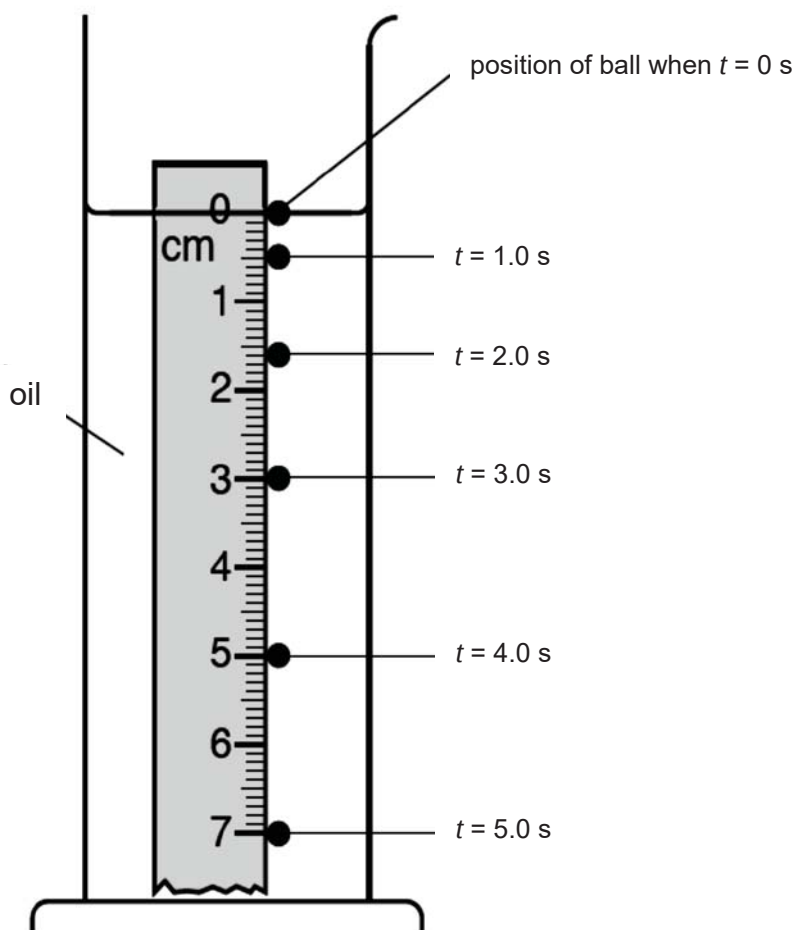
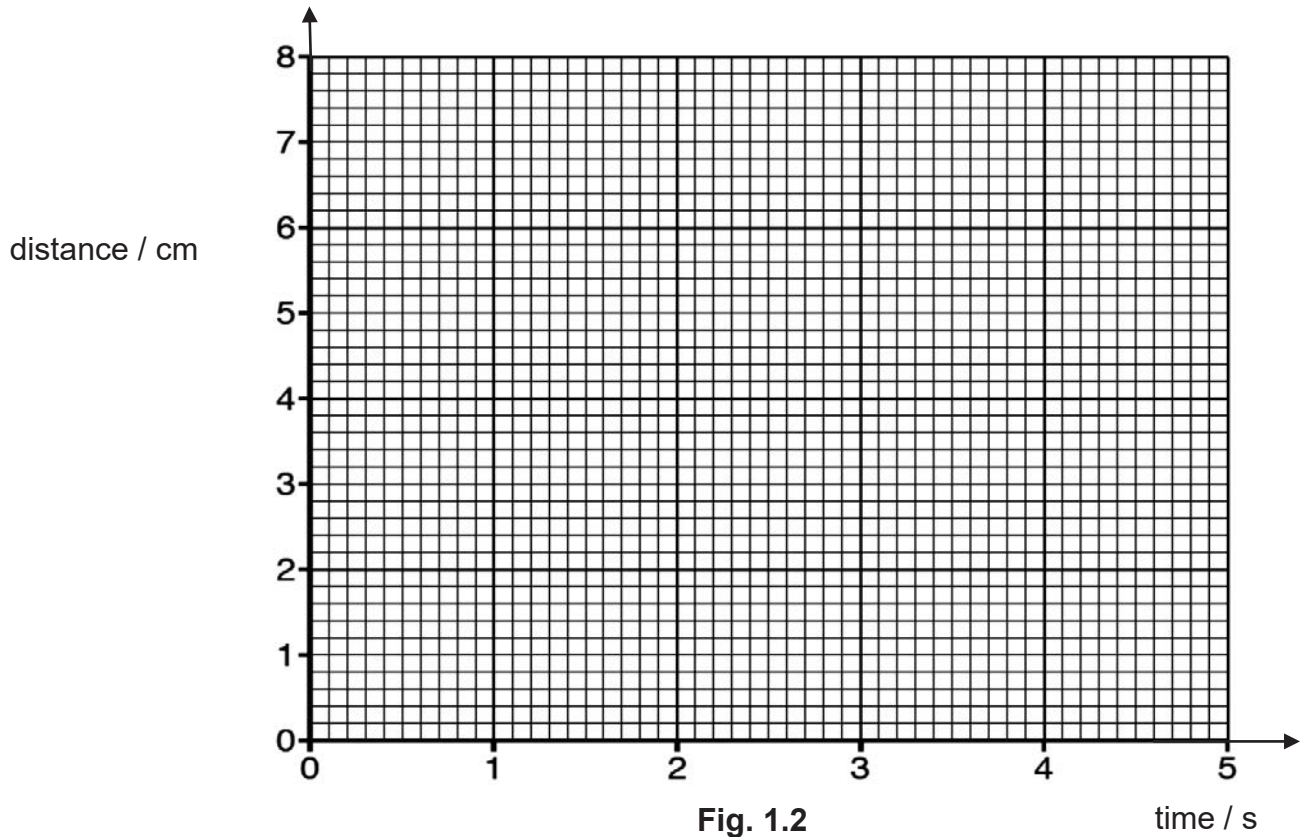


Fig. 1.1

- (a) On the grid in Fig. 1.2, plot a distance-time graph for the ball. [2]



- (b) Describe the motion of the ball for the whole 5 seconds.

.....

.....[2]

2. Fig 2.1 shows a kitchen cupboard mounted securely to a vertical wall. The cupboard rests on a support at **A**.

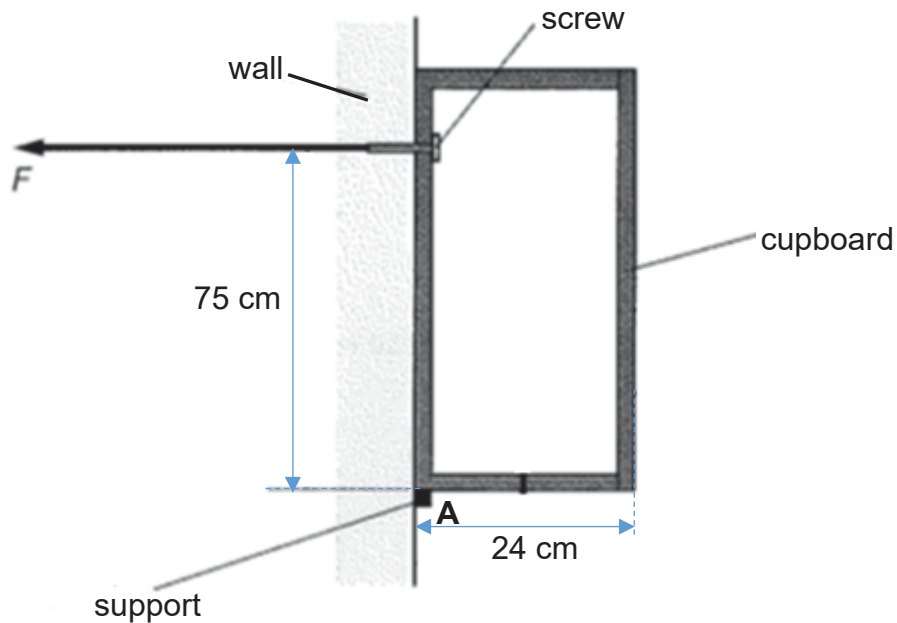


Fig 2.1

The total weight of the cupboard and its content is 200 N. The screw securing the cupboard to the wall is at a vertical distance of 75 cm from **A**.

- (a) Mark the center of gravity and draw an arrow to represent the weight of the cupboard on Fig. 2.1. [1]
- (b) The direction of F provided by the screw on the cupboard is horizontal as shown in Fig. 2.1.

Calculate the magnitude of F .

force F = N [2]

- (c) State and explain how the magnitude of F would change, if at all, if the same screw is secured much closer to point **A**.

.....

.....[2]

3. A 50 g golf ball is released from the top of a smooth track as shown in Fig. 3.1. The golf ball moves round the loop **BCD** and then along the track **DE**.

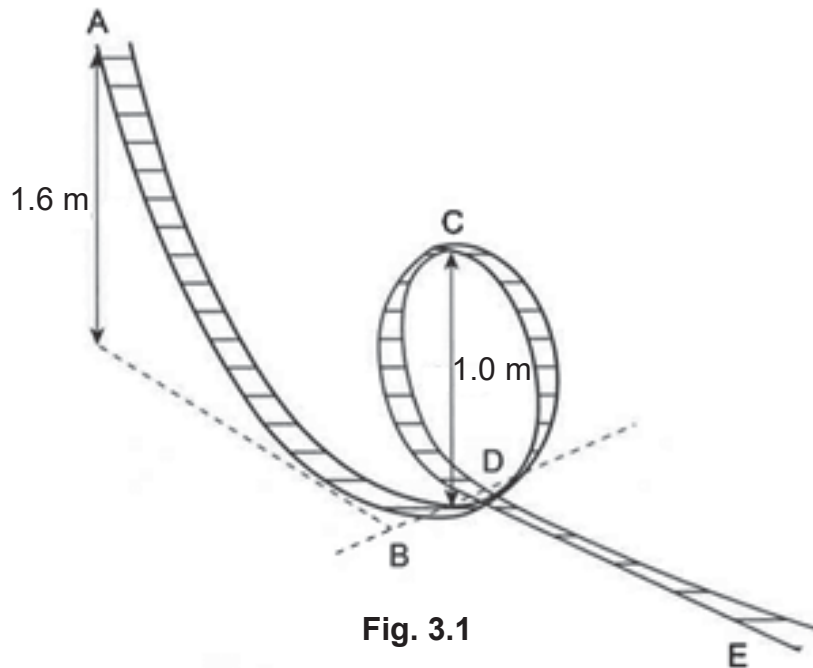


Fig. 3.1

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

gravitational potential energy = J [2]

- (b) Calculate the speed of the golf ball at **B**.

speed = m/s [2]

- (c) Calculate the kinetic energy of the golf ball at **C**.

kinetic energy at **C** = J [2]

4. Thermal flasks are used to store hot liquids such as soup to keep them warm for a period of time. Fig. 4.1 shows a thermal flask that uses foam as an insulating material and Fig. 4.2 shows one that uses vacuum.

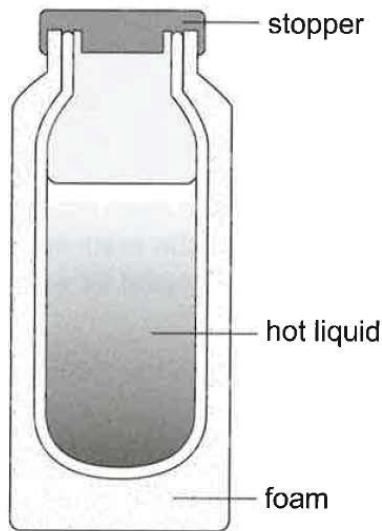


Fig. 4.1

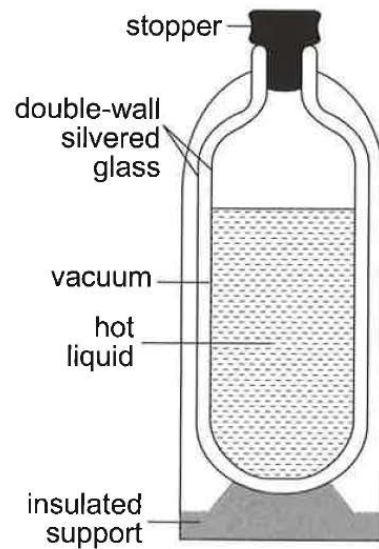


Fig. 4.2

- (a) Explain why it is important for the stopper to be in place in order to keep the liquid hot.

.....

[2]

- (b) Why does the vacuum flask store hot liquid better than the flask with foam?

.....

[2]

- (c) State the purpose of the silvered glass.

.....[1]

- (d) Explain why the vacuum flask can also be used to maintain cold drinks at a low temperature.

.....
[1]

5. A ray of light passes through the glass prism as shown in Fig. 5.1.

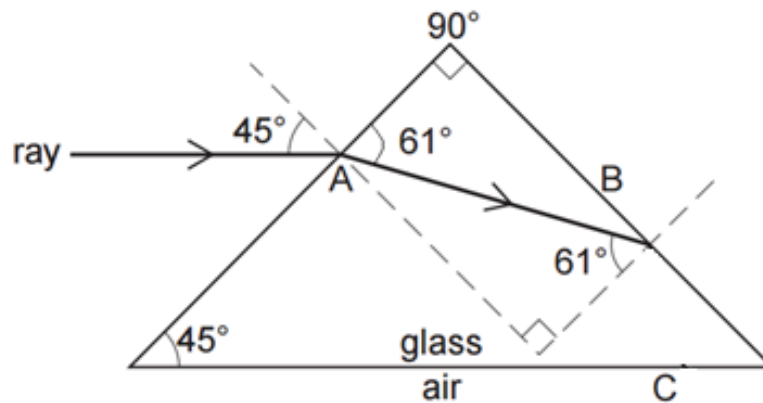


Fig. 5.1

- (a) Calculate the refractive index of the glass.

refractive index = [2]

- (b) Calculate the critical angle of glass.

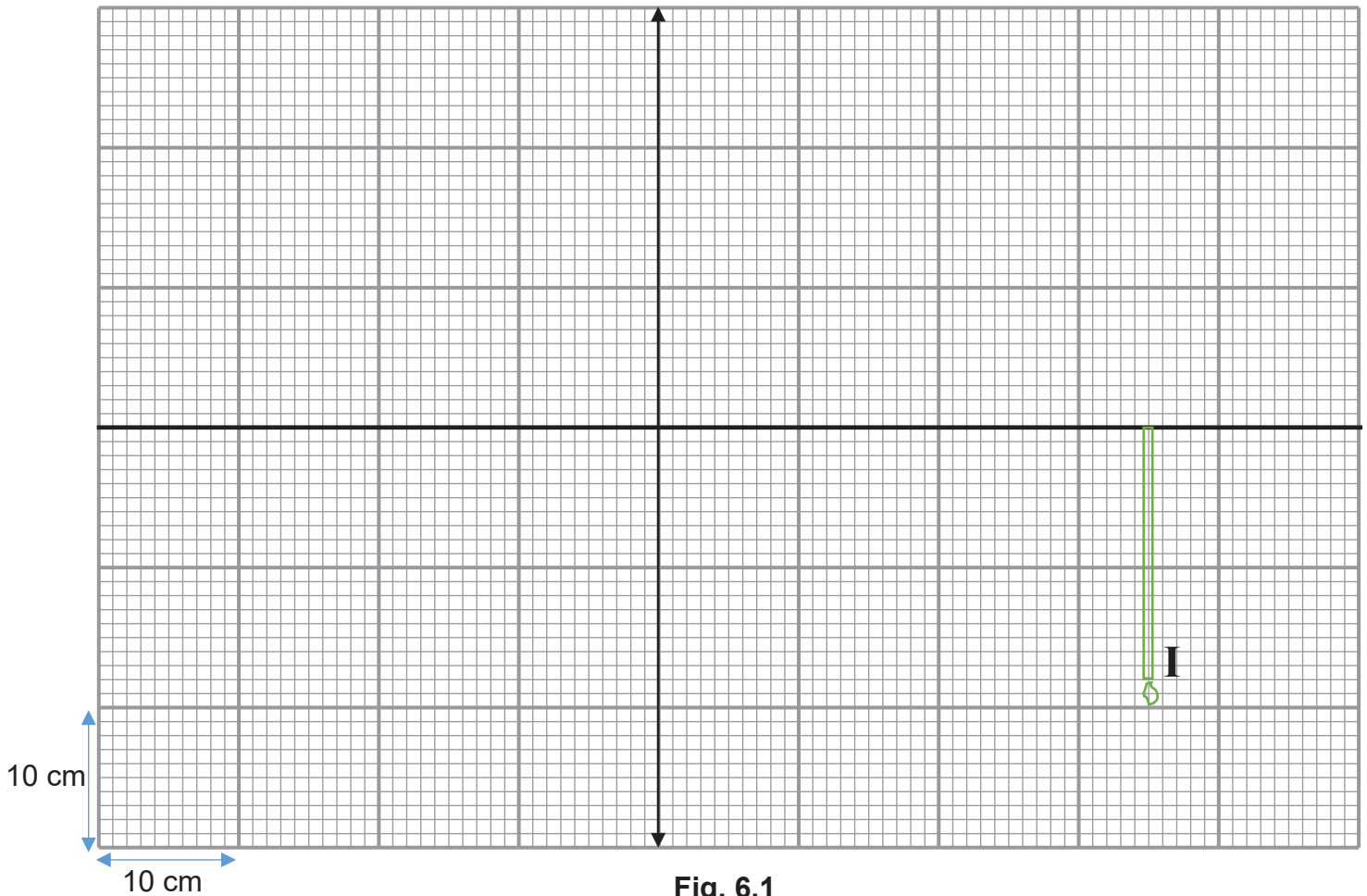
critical angle =° [1]

- (c) (i) Draw what happens to the light ray when it incident on surface **B**.

(ii) Label the relevant angle clearly. [2]

6. An image, **I**, of a candle is seen to be inverted in front of a convex lens. The image formed by the lens is 20 cm high and is 35 cm away from the lens.

The focal length of the lens is 15 cm.



- (a) On Fig. 6.1, construct a ray diagram to show how the image is formed. [3]
- (b) State the object distance of the object from the lens.

distance = cm [1]

- (c) State **two** other characteristics of the image formed.

.....[1]

7. Two small positively charged metal spheres **A** and **B** are suspended using insulating thread, as shown in Fig. 7.1.

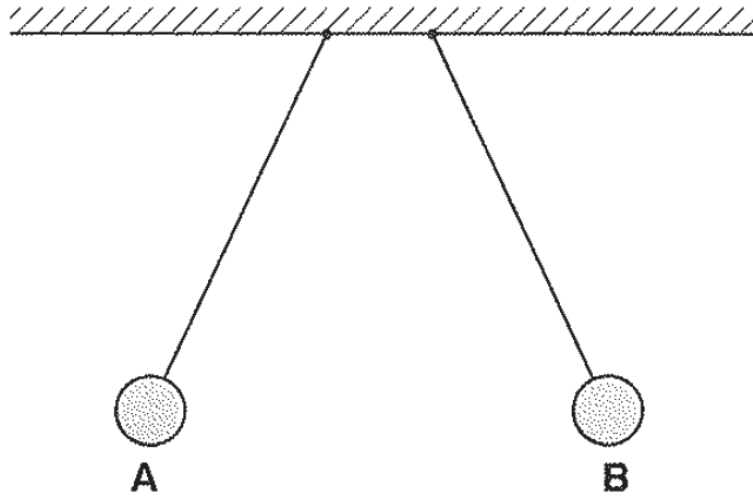


Fig. 7.1

- (a) Draw the electric field between the spheres. [2]
- (b) A conductor rod touch the metal sphere **B**. 0.02 C of charge flow in 0.05 s. Calculate the current flow.

current = A [1]

8. Fig. 8.1 shows two lamps and a $4\ \Omega$ resistor connected in a circuit with a 6 V cell. The lamps have a resistance of $2\ \Omega$ each.

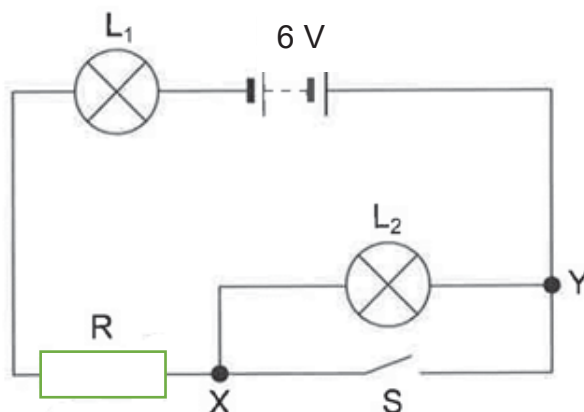


Fig. 8.1

- (a) Calculate the current through the resistor in the circuit as shown in Fig. 8.1.

current = A [2]

- (b) Compare the brightness of L_1 and L_2 . Explain your answer.

.....
[2]

- (c) The switch is closed.
 Calculate the current flowing through the resistor.

current = A [2]

9. Fig. 9.1 shows a copper rod **XY** hung at rest in a uniform magnetic field pointing into the paper. The two contacts **X** and **Y** at the ends of the copper rod can move smoothly along the fixed vertical conducting rails **PQ** and **RS** which are connected to a power supply. As a result, current flows through the copper rod.

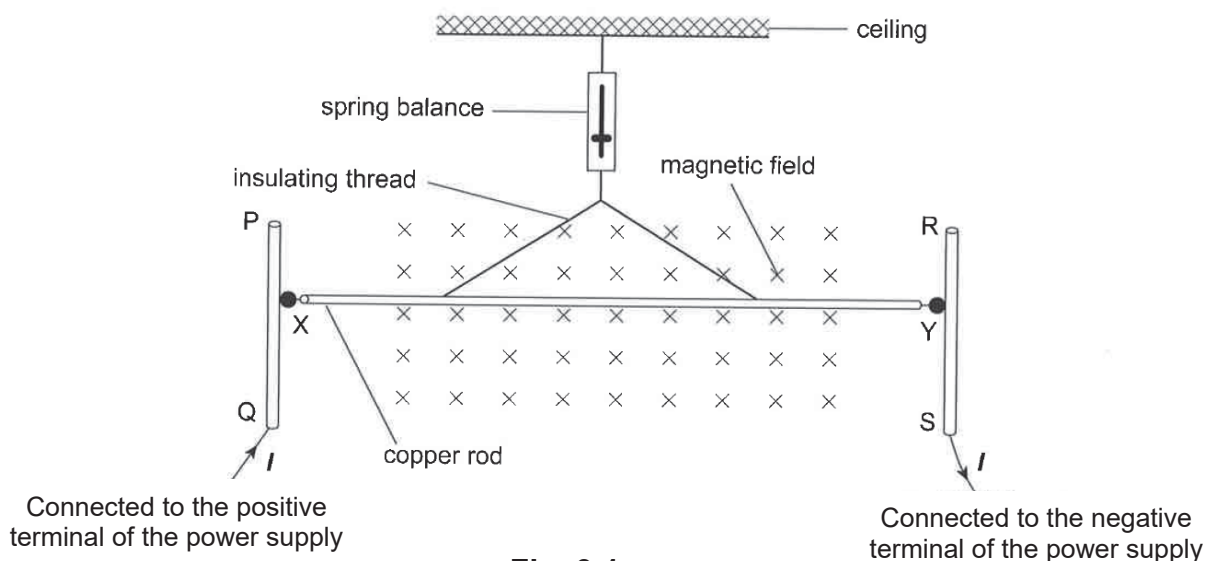


Fig. 9.1

- (a) On Fig. 9.1, indicate the direction of force acting on the copper rod due to the current flowing from **X** to **Y**. [1]
- (b) Suggest **one** way to increase the force acting on the copper rod.
[1]
- (c) The current supply is switched off. Fig. 9.2 shows the tensions in the insulating thread drawn to scale. Complete the vector diagram and calculate the weight of the copper rod.

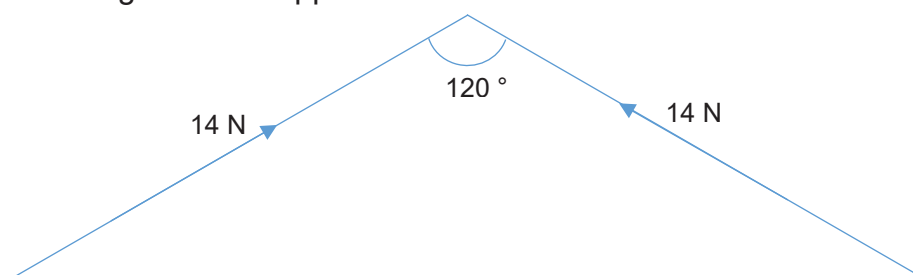


Fig. 9.2

weight of copper rod =[3]

Section B

Answer any **two** questions in this section.
Write your answers in the spaces provided.

10. (a) Fig. 10.1 shows a wire passing through a hole in a horizontal, plastic board.

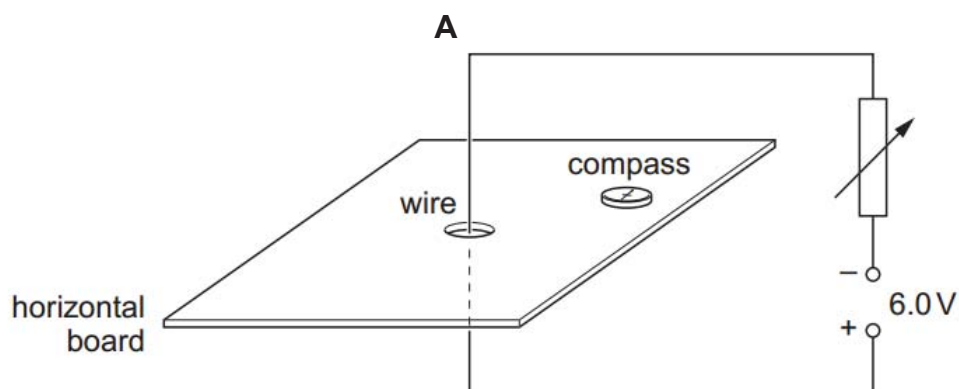


Fig 10.1

A student moves a small compass around the board and plots the magnetic field lines due to the current.

Draw a diagram of the board as seen from above (point **A**) and mark on it the magnetic field lines due to the current. [2]



- (b) Ryan designed a simple doorbell as shown in Fig. 10.2. When the switch **S** is pressed and then released, two notes are produced.

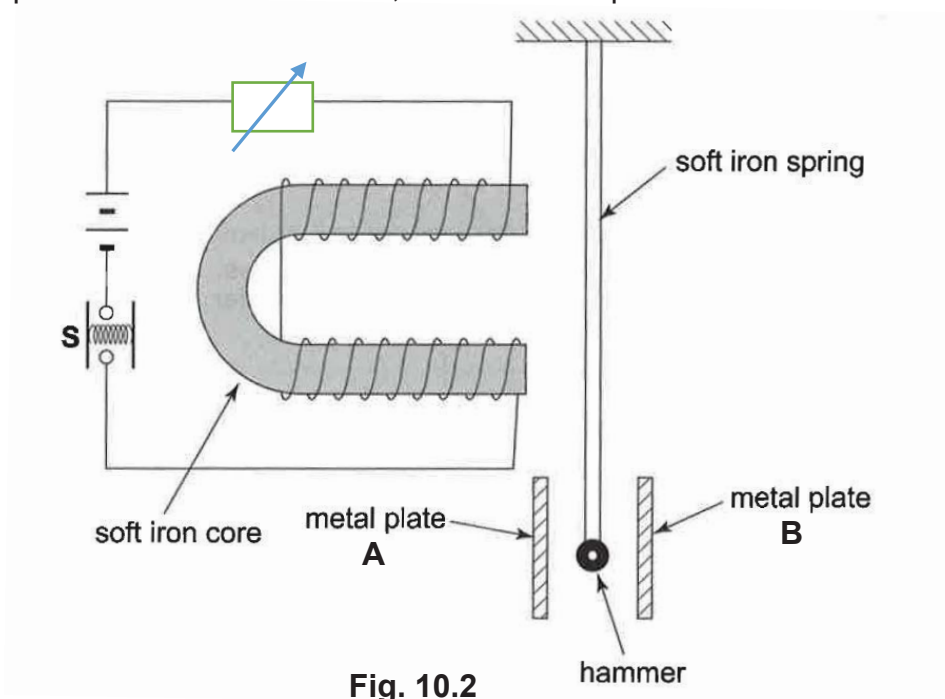


Fig. 10.2

- (i) Explain why the two notes are produced when the switch is pressed and then released.

.....

.....

.....

.....

.....[4]

- (ii) The two metal plates are of different thickness. When the metal plate **A** is hit, it has more vibrations per second than metal **B**.

State and explain the difference in the sound heard when Plate **A** and Plate **B** are hit.

.....

.....[2]

- (iii) When Ryan pressed the bell, Nigel who was in the house heard the sound 70 ms later. The speed of sound is 330 m/s.

Calculate Nigel's distance from the doorbell.

distance=m [2]

11. Fig. 11.1 shows a rheostat. Terminal **Y** is connected to a moving contact, which rests on a circular carbon resistance track.

Terminals **X** and **Y** are connected to an external circuit.

The resistance between **X** and **Y** (R_{XY}) changes with the angle through which the shaft has been turned (θ). When the moving contact is at **Z**, it corresponds to an angle of 300° .

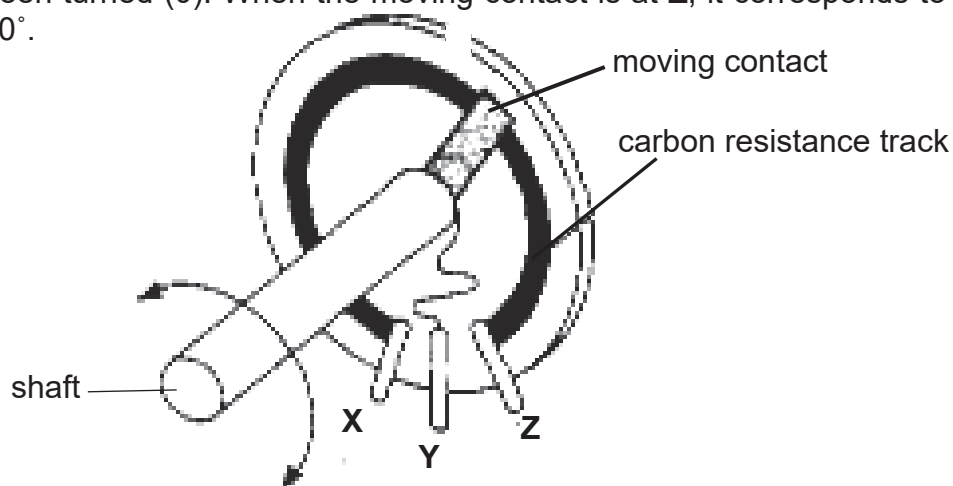


Fig. 11.1

Fig. 11.2 shows the graph of R_{XY} , against the entire range of θ (angle between **X** and **Y**).

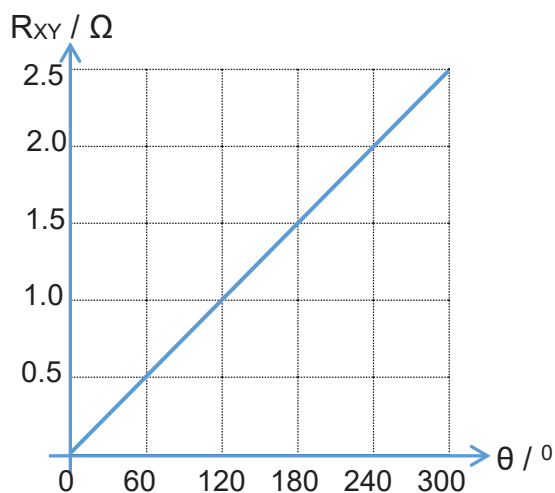


Fig. 11.2

- (a) The angle of the shaft is placed at 180° . The current that flows through the rheostat is 0.3 A. Calculate the amount of thermal energy generated in the rheostat in 20 minutes.

energy =J [3]

- (b) The rheostat is used to control the volume of a radio. Explain how by turning the shaft, the volume of the radio can be changed.

.....

.....[2]

- (c) The radio has a power rating of 4 W. It is used for 16 hours a day. The cost of electricity is 28 cents per kilowatt hour.

Calculate the cost of using the radio for 30 days.

cost = cents [2]

- (d) Some radios use two pins plugs while others use three pins plug. Explain the purpose of the additional pin.

.....

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.....[3]

12. Fig. 12.1 shows a hollow iron cylinder containing air, floating in a pond.

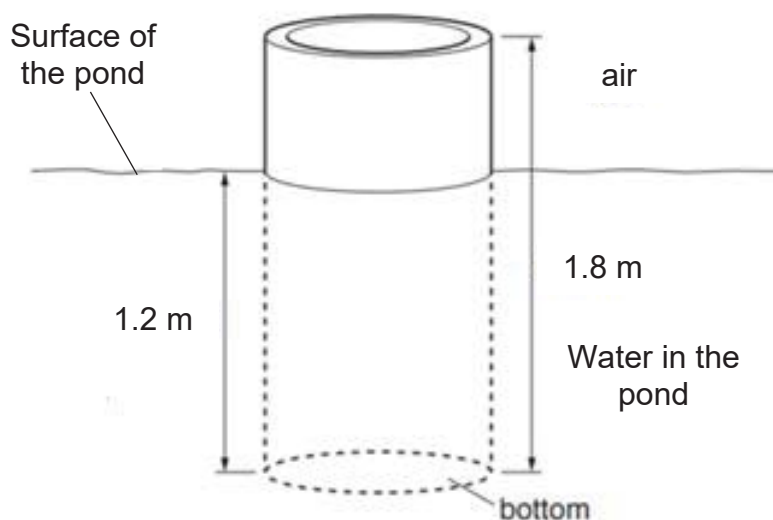


Fig. 12.1

The cylinder has a length of 1.8 m. It floats with 1.2 m submerged in water in the pond. The bottom of the cylinder has an area of 0.60 m^2 . The pressure exerted on the bottom of the cylinder due to the depth of seawater is $12\,240 \text{ Pa}$.

- (a) Calculate the force exerted on the bottom of the cylinder.

force = N [1]

- (b) Deduce the total weight of the cylinder and the air in it. Explain your answer.

.....
[2]

- (c) Calculate the average density of the cylinder.

density = kg/m^3 [2]

- (d) Explain why the cylinder floats.

.....[1]

- (e) A wave passes through the water. Explain by the movement of the cylinder why the wave is a transverse wave.

.....

.....[1]

- (f) The period of the wave produced is 20 ms. The distance between two crests as shown in Fig. 12.2 is 30 cm.

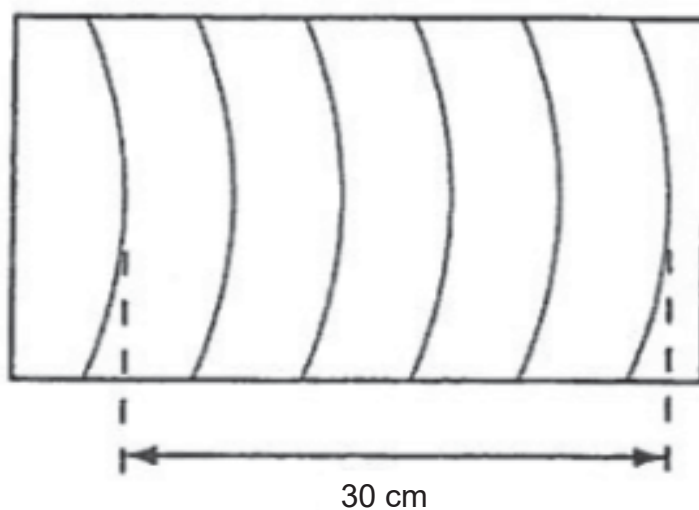


Fig. 12.2

Calculate the speed of the wave in the pond.

speed of the wave = m/s [3]

- End of paper -

