O

JURONGVILLE SECONDARY SCHOOL
PRELIMINARY EXAMINATION 2019
Secondary 4 Express / 5 Normal (Academic)

STUDENT NAME			
CLASS		INDEX NUMBER	

SCIENCE (PHYSICS/CHEMISTRY) 5076/01

Paper 1 Multiple Choice **30 August 2019**

1 hour

Additional Materials: Multiple Choice Answer Sheet.

READ THESE INSTRUCTIONS FIRST

Do not open this booklet until you are told to do so.

Write in soft pencil.
Do not use staples, paper clips, highlighters, glue, correction tape or correction fluid.
Write your name, index number and class in the spaces at the top of this page.

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 multiple choice answer sheet.

Each correct answer will score one mark. No mark will 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 16.
A copy of the Periodic Table is printed on page 17.
The use of an approved scientific calculator is expected, where appropriate.

Take acceleration due to gravity on Earth, g, to be 10 m / s^2 unless stated otherwise.

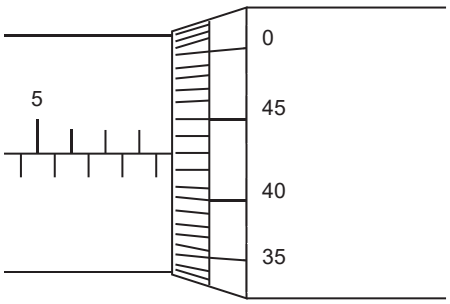
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40

Setter: Ms Toh P.B. & Ms Karine Nai

This document consists of **17** printed pages.

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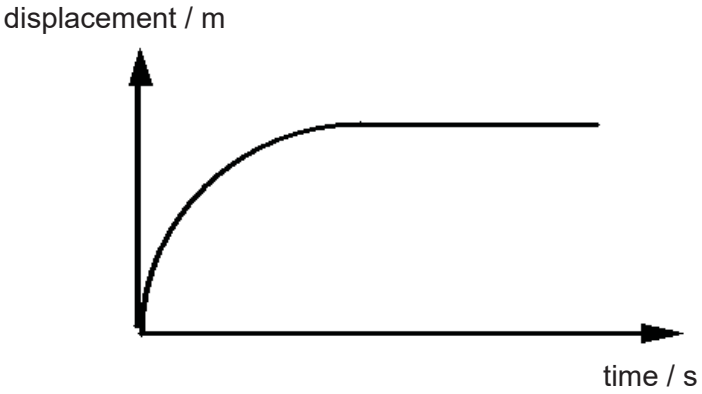
1 The diagram below shows part of a micrometer screw gauge used to measure the diameter of a ball bearing. It is known that the micrometer screw gauge has a zero error of – 0.02 mm.



What is the diameter of the ball bearing?

A 8.563 mm **B** 8.523 mm **C** 8.91 mm **D** 8.95 mm

2 The graph shows how the displacement of a car changes over time.



Which of the following statements is true?

A The car accelerates and then moves with a steady velocity.

B The car accelerates at a decreasing rate.

C The car decelerates then moves with a steady velocity.

D The car decelerates until it stops.

3 An elevator, with a mass of 500 kg, is moving upwards at a constant speed of 11 m / s. What is the tensional pulling force in the cable that is pulling the lift upwards? (Take g = 10 N / kg)

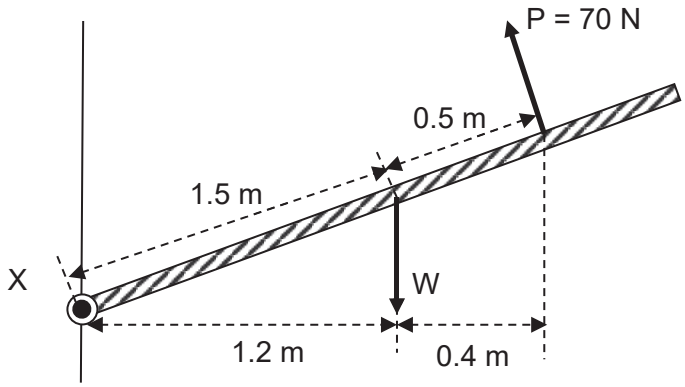
A 0 N **B** 500 N **C** 5000 N **D** 5500 N

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4 The table shows the mass and weight of some objects on the surface of four different planets. Which planet has the greatest gravitational field strength?

planet	mass / kg	weight / N
A	0.5	20
B	0.5	40
C	2.0	20
D	2.0	40

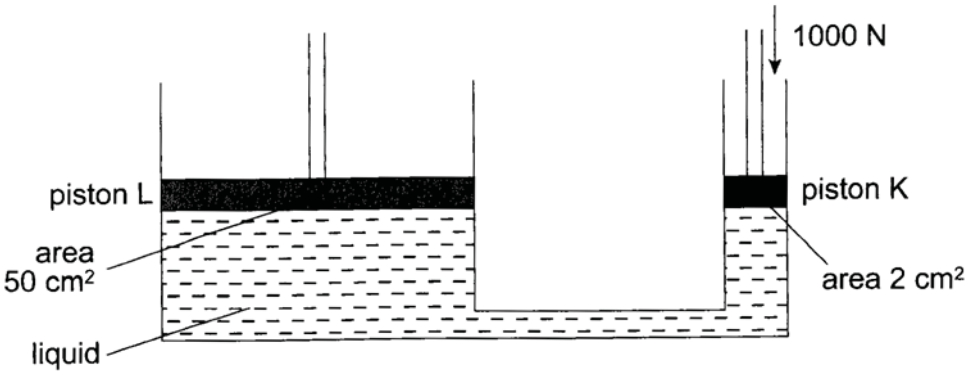
5 The diagram below shows a uniform wooden beam of weight W hinged at X. A force, P, of 70 N acts on it.



What is the weight, W, of the wooden beam?

A 74.7 N **B** 93.3 N **C** 117 N **D** 1170 N

6 The diagram shows a hydraulic system used to lift heavy loads in a workshop.



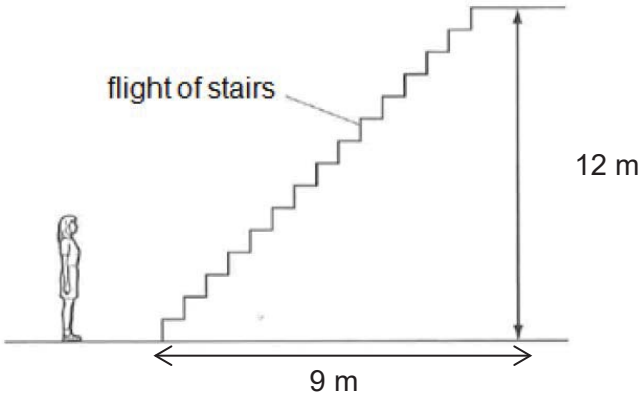
Given that the pressure throughout the liquid is constant, if a downward force of 1000 N is exerted on piston K, what will be the load supported by piston L?

A 40 N **B** 1000 N **C** 25000 N **D** 50000 N

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7 A woman of weight 490 N runs up a flight of stairs in 8 seconds. The vertical height of the stairs is 12 m. The horizontal distance that she covers is 9 m.



What is the average useful power developed by the woman?

A 735 W **B** 919 W **C** 4410 W **D** 5880 W

8 Why is the conduction of thermal energy generally slower in liquids than in solids?

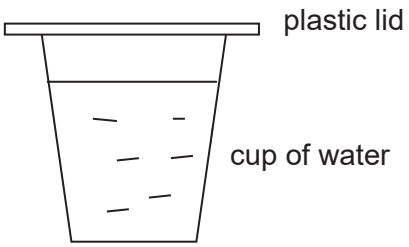
A Liquid molecules are larger than solid molecules.

B Liquids generally have higher densities than solids.

C The average distance between molecules in a liquid is larger than that in a solid.

D The speed of molecules moving in a liquid is slower than that in a solid.

9 Adam places a flat plastic lid over the cup to reduce the rate of evaporation from a cup of water, as shown below.



How does this help to reduce the rate of evaporation?

A The plastic lid creates a vacuum which prevents evaporation.

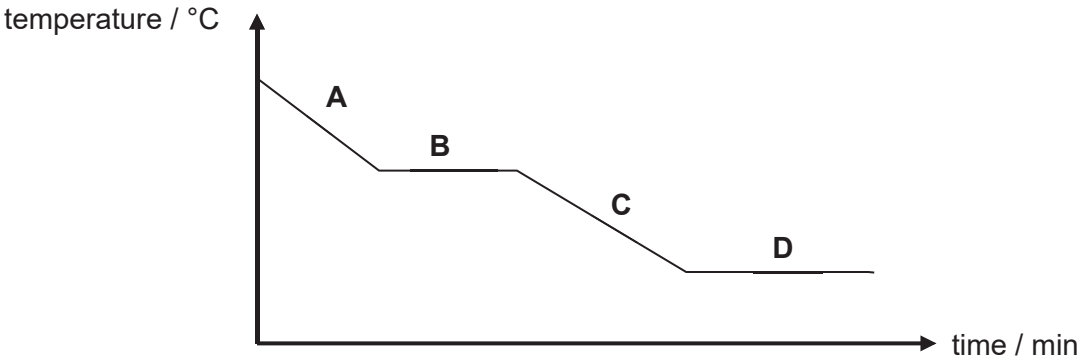
B The plastic lid helps to increase the boiling point of the water in the cup.

C The plastic lid is a good insulator of heat.

D The plastic lid reduces the wind moving across the water surface.

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10 The diagram below shows the temperature-time graph of a liquid placed into a refrigerator and cooled steadily.

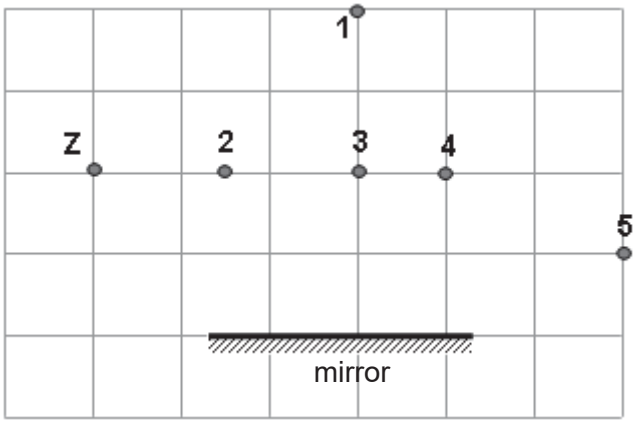


Which point would the substance be a mixture of solid and liquid?

11 Visible light, X-rays and microwaves are all part of the electromagnetic spectrum. Which of the following shows these waves in order of increasing frequency?

	low frequency ⟶		high frequency
A	microwaves	visible light	X-rays
B	microwaves	X-rays	visible light
C	X-rays	microwaves	visible light
D	X-rays	visible light	microwaves

12 A person stands at a point **Z** as shown.



Which of the pin's (**1**, **2**, **3**, **4** or **5**) images will the person be able to see in the mirror?

A pins **1** and **3** only

B pins **2** and **4** only

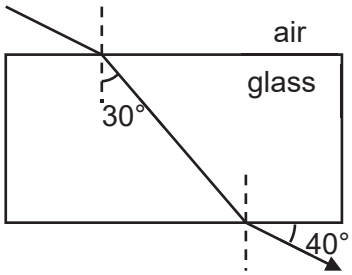
C pins **2**, **3** and **5** only

D pins **3**, **4** and **5** only

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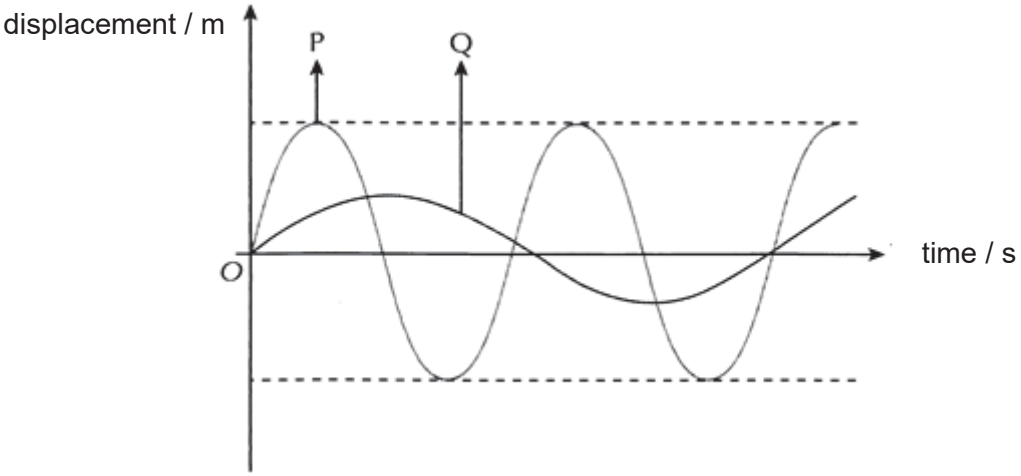
13 A ray of light is incident on a piece of glass block as shown below.



Which one of the following expressions should be used to calculate the refractive index of the glass block?

A $\frac{\sin 30°}{\sin 40°}$ **B** $\frac{\sin 30°}{\sin 50°}$ **C** $\frac{\sin 40°}{\sin 30°}$ **D** $\frac{\sin 50°}{\sin 30°}$

14 The graph illustrates the vibration of a molecule in the air caused by two sounds, P and Q.



Which statement about P and Q is correct?

A P has a higher pitch and is louder than Q.

B P has a lower pitch and is softer than Q.

C Q has a higher pitch and is softer than P.

D Q has a lower pitch and is louder than P.

15 A negatively charged rod repels a suspended rod. Which of the following statements about the suspended rod is correct?

A It is negatively charged.

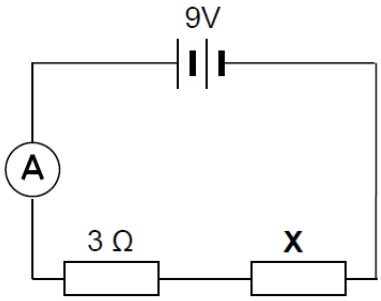
B It is positively charged.

C It is uncharged.

D It may be uncharged or negatively charged.

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16 In the circuit, the reading on the ammeter is 2 A.



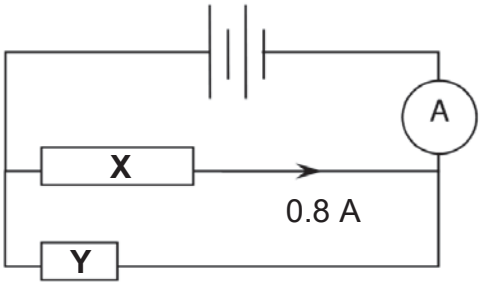
What is the value of the potential difference across resistor **X**?

A 1.5 V **B** 2 V **C** 3 V **D** 6 V

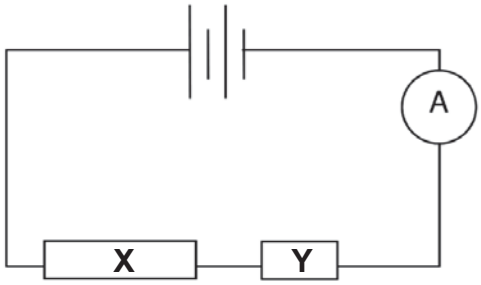
17 Which of the following appliances is likely to blow its fuse when connected to a 240 V supply?

	appliance	fuse rating
A	150 W lamp	1 A
B	1 kW vacuum cleaner	5 A
C	2.5 kW heater	10 A
D	3 kW electric fire	13 A

18 Two resistors, **X** and **Y**, are made of the same material. Resistors **X** and **Y** have the same cross-sectional area but **X** is twice as long as **Y**.



circuit 1



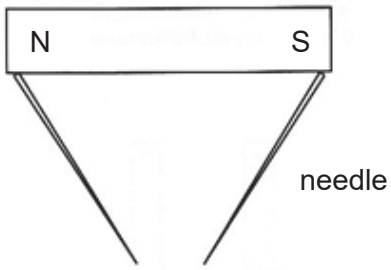
circuit 2

The two resistors are connected to the same power supply differently in the circuit 1 and circuit 2 shown above. What are the ammeter readings in circuit 1 and circuit 2?

	circuit 1	circuit 2
A	1.20 A	0.80 A
B	1.20 A	0.53 A
C	2.40 A	0.80 A
D	2.40 A	0.53 A

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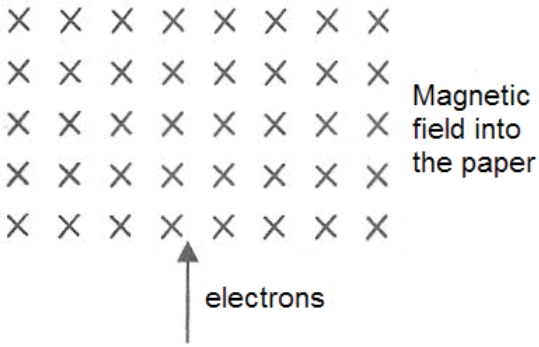
19 Two iron needles hanging from the ends of a bar magnet are observed as shown.



Which of the following statements best explains the observation?

A The ends of the needles are both north poles.
B The ends of the needles are both south poles.
C The needles are induced temporary magnets.
D The needles have become permanently magnetised.

20 An electron beam is directed into a uniform magnetic field that is flowing into the paper.



How would the electron beam be affected?

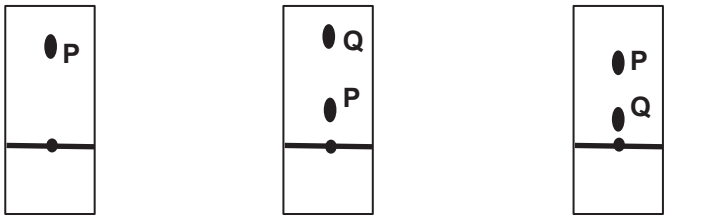
A It will deflect out of the paper.
B It will deflect to the left.
C It will deflect to the right.
D It will slow down but will not change direction.

21 Which apparatus is most appropriate to measure exactly 24.5 cm^3 of a liquid?

A beaker
B burette
C measuring cylinder
D pipette

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22 A scientist suspects that some canned drinks contain a mixture of two toxic dyes, **P** and **Q**. He analyses the mixtures using chromatography with three different solvents. The results of the analysis are shown below.



water as solvent ethanol as solvent acetone as solvent

What can you conclude about the solubility of **P** and **Q**?

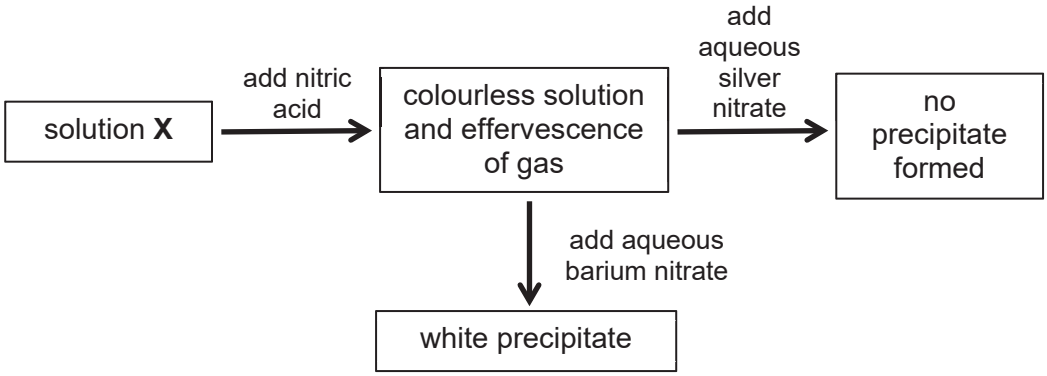
A **P** is insoluble in water but **Q** is soluble.

B **P** is more soluble in ethanol than in acetone.

C **Q** is soluble in ethanol but insoluble in acetone.

D **Q** is less soluble in acetone than in ethanol.

23 Solution **X** contains two anions. Tests were carried out as shown in the diagram below.



What are the two anions found in solution **X**?

A carbonate ions and nitrate ions

B carbonate ions and sulfate ions

C chloride ions and nitrate ions

D chloride ions and sulfate ions

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24 A student uses his understanding of particles to explain the properties of solids, liquids and gases.

Which of his explanations is correct?

A Gases are less dense than liquids because the particles in a gas move randomly.

B Liquids flow because the particles in a liquid are closer than in a gas.

C Solids are rigid because the particles in a solid vibrate.

D Solids, liquids and gases become less dense when heated because the average separation between the particles increases.

25 Chlorine exists as isotopes, $^{35}_{17}Cl$ and $^{37}_{17}Cl$.

Which of the following is a property of the isotopes of chlorine?

A They have the same boiling point.

B They have the same density.

C They have the same solubility in a given solvent.

D They react chemically in the same way.

26 Which statement is true of a pure compound?

A A pure compound can be separated by distillation.

B A pure compound consists of one type of atoms chemically combined.

C A pure compound has a different property from the constituents it is made up of.

D A pure compound melts and boils over a range of temperature.

27 The equation shows the reaction between oxide of metal **M** and dilute sulfuric acid.

$$\mathbf{M}O\,(aq) + H_2SO_4\,(aq) \rightarrow \mathbf{M}SO_4\,(aq) + H_2O\,(l)$$

Which particles are responsible for the electrical conductivity in **M**, **M**O and **M**SO_4?

	metal **M**	**M**O	**M**SO_4
A	electrons	electrons	ions
B	electrons	ions	ions
C	ions	electrons	electrons
D	ions	ions	ions

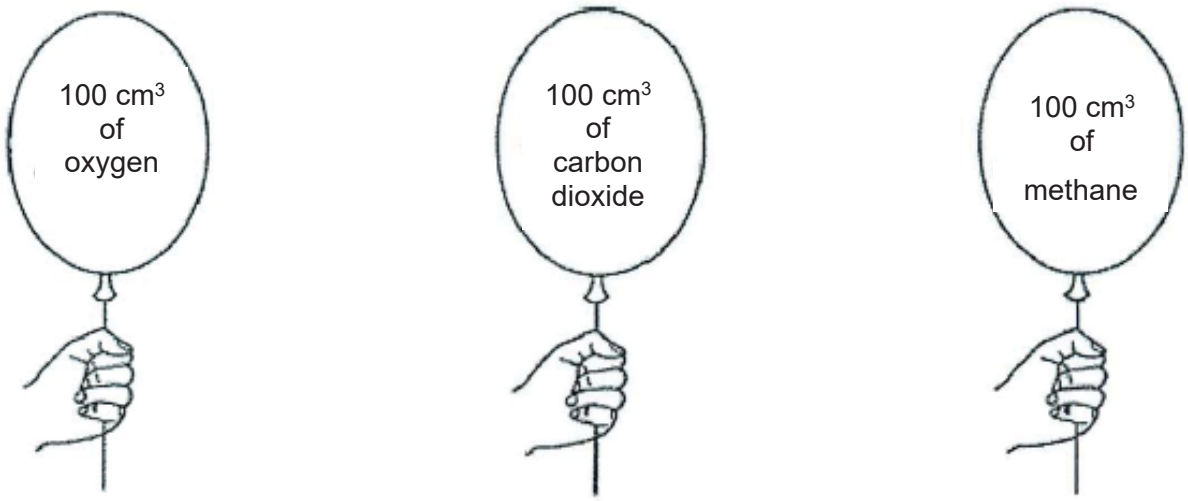
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28 An element **X** has an electronic structure of 2.8.8.1. Element **Y** has an electronic configuration of 2.8.6.

What type and formula of compound is formed when **X** and **Y** react?

	type of compound	formula of compound
A	covalent	$\mathbf{X_2Y}$
B	covalent	$\mathbf{XY_2}$
C	ionic	$\mathbf{X_2Y}$
D	ionic	$\mathbf{XY_2}$

29 The diagram shows three balloons filled with different gases.



Which statements are correct?

1 The mass of gases in the three balloons is different.
2 The number of moles of gases in the three balloons is the same.
3 The number of molecules in the three balloons is different.

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

30 Which reagent, when mixed and heated with ammonium sulfate would liberate ammonia?

A acidified potassium dichromate(VI)
B aqueous bromine
C dilute hydrochloric acid
D potassium hydroxide solution

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31 Most salts can be prepared by reacting a carbonate with an acid.

Which salt cannot be prepared by the above method?

A calcium nitrate

B lead(II) chloride

C potassium sulfate

D zinc chloride

32 How does the property change when going across a period of the Periodic Table from Group I to Group VII?

A acidic oxides to basic oxides

B less reactive to more reactive

C metallic characteristic to non-metallic characteristics

D negative ions to positive ions

33 **P**, **Q** and **R** are three metals that form cations $\mathbf{P}^{2+}$, $\mathbf{Q}^{2+}$ and $\mathbf{R}^{+}$ respectively.

Given the following information

$\mathbf{P}^{2+}$	+	**R**	→	no reaction		
$2\mathbf{R}^{+}$	+	**Q**	→	$\mathbf{Q}^{2+}$	+	$2\mathbf{R}$
$\mathbf{Q}^{2+}$	+	**P**	→	**Q**	+	$\mathbf{P}^{2+}$

Which of the following is the correct order of decreasing reactivity of the metals?

A **P**, **Q**, **R**

B **Q**, **P**, **R**

C **Q**, **R**, **P**

D **R**, **Q**, **P**

34 Metal **M** is placed between zinc and iron in the reactivity series.

Which prediction made about metal **M** is correct?

A Metal **M** displaces magnesium from an aqueous solution of a magnesium salt.

B Metal **M** forms a hydroxide which is soluble in water.

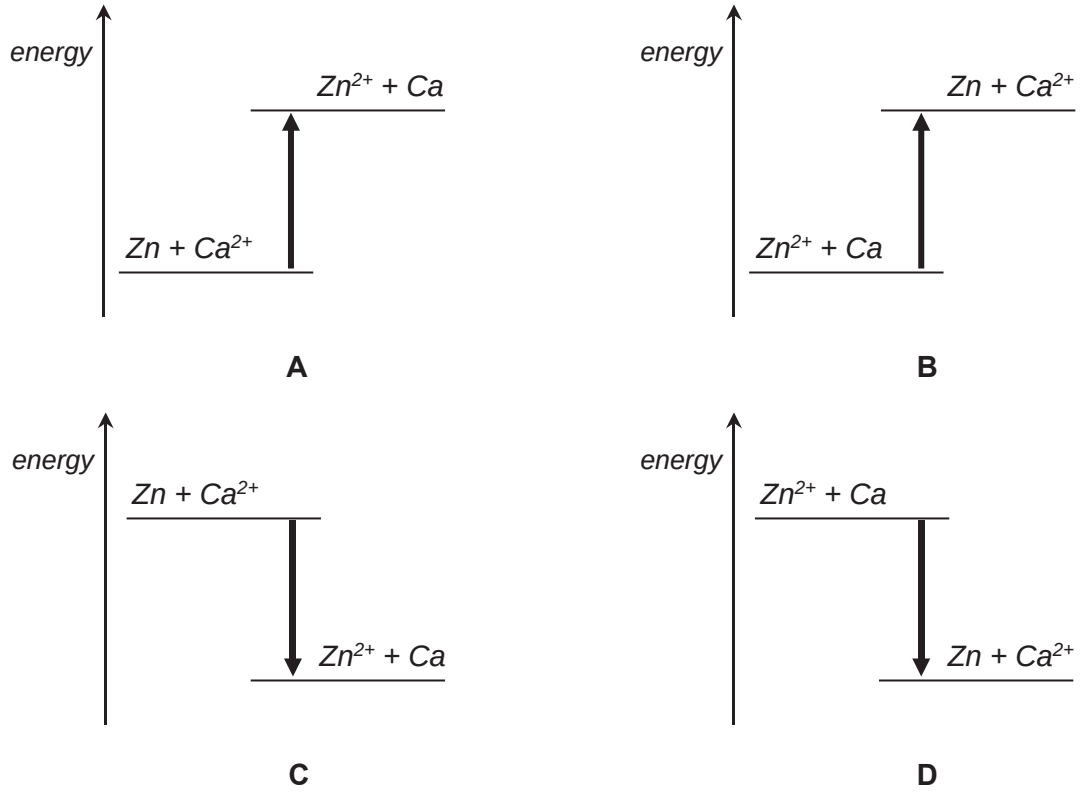
C Metal **M** is extracted from its ores by electrolysis.

D Metal **M** reacts with dilute hydrochloric acid to produce hydrogen.

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35 The reaction between calcium and aqueous zinc nitrate gives out heat energy.

Which energy level diagram accurately represents the reaction?



36 In which substance does carbon have the smallest oxidation number?

A C

B CO

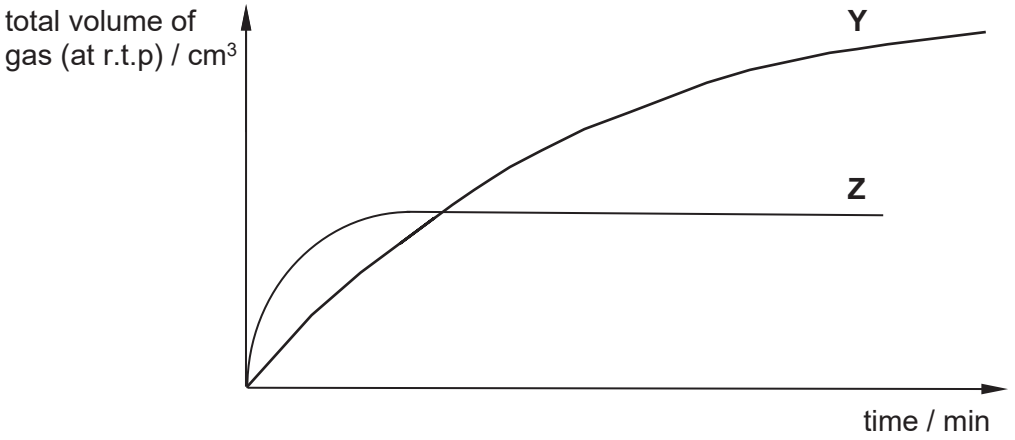
C CO_2

D $CaCO_3$

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37 In the graph shown below, curve **Y** represents the results of reacting excess of magnesium powder with 25 cm^3 of 1.0 mol / dm^3 sulfuric acid at 40 °C.



Which changes could produce curve **Z**?

A Using 12.5 cm^3 of 1.0 mol / dm^3 sulfuric acid at 20 °C.

B Using 12.5 cm^3 of 1.0 mol / dm^3 sulfuric acid at 60 °C.

C Using 25 cm^3 of 1.0 mol / dm^3 sulfuric acid at 20 °C.

D Using 25 cm^3 of 1.0 mol / dm^3 sulfuric acid at 60 °C.

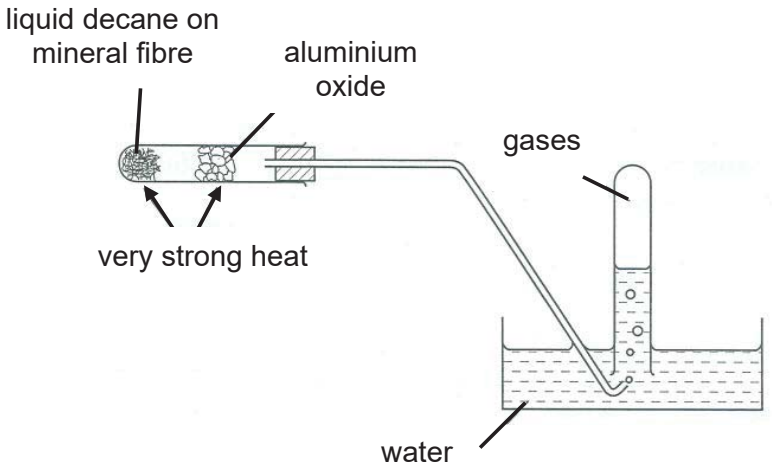
38 The table shows some gases found in polluted air and their possible effects.

Which row is not correct?

	gas	effect
A	CH_4	increases greenhouse effect
B	CO_2	leads to global warming
C	CO	prevents breathing in of oxygen
D	NO_2	forms acid rain

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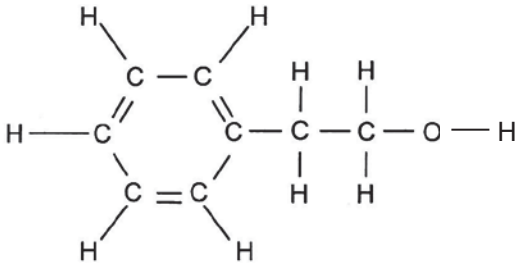
39 The apparatus shown below was set up and a sample of decane, $C_{10}H_{22}$, was heated strongly in the presence of aluminium oxide. The products obtained were a mixture of gaseous compounds and a diatomic gas.



Which row correctly indicates the process that occurred and the equation for the change that took place?

	process	equation
A	cracking	$C_{10}H_{22} \rightarrow 3C_2H_4 + C_4H_{10}$
B	cracking	$C_{10}H_{22} \rightarrow 3C_2H_4 + C_4H_8 + H_2$
C	reduction	$C_{10}H_{22} \rightarrow 2C_2H_4 + 2C_3H_6 + H_2$
D	subsitution	$C_{10}H_{22} \rightarrow 3C_2H_4 + C_4H_8 + H_2$

40 2-phenylethanol is responsible for the fragrance of roses. The structure of 2-phenylethanol is shown below.



Which statement about this molecule is correct?

A It can be oxidised by acidified potassium dichromate(VI).

B It can react with a metal carbonate to liberate carbon dioxide.

C It does not decolourise bromine water under any conditions.

D It is a saturated organic compound.

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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

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The Periodic Table of the Elements

Group																	
I	II											III	IV	V	VI	VII	0
							1 H Hydrogen 1										2 He Helium 4
3 Li Lithium 7	4 Be Beryllium 9		Key: proton (atomic) number; atomic symbol; name; relative atomic mass									5 B Boron 11	6 C Carbon 12	7 N Nitrogen 14	8 O Oxygen 16	9 F Fluorine 19	10 Ne Neon 20
11 Na Sodium 23	12 Mg Magnesium 24											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
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 226	89 – 103 actinoids	104 Rf Rutherfordium -	105 Db Dubnium -	106 Sg Seaborgium -	107 Bh Bohrium -	108 Hs Hassium -	109 Mt Meitnerium -	110 Ds Damstadtium -	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
actinoids	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 -

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

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PRELIMINARY EXAMINATION 2019
Secondary 4 Express/ 5 Normal (Academic)

STUDENT NAME			
CLASS		INDEX NUMBER	

SCIENCE(PHYSICS) 5076/02

Paper 2 **27 August 2019**

Candidates answer on the Question Paper. **1 hour 15 minutes**

READ THESE INSTRUCTIONS FIRST

Write your name, index number and class in the spaces at the top of this page.
Write in dark blue or black pen on both sides of the paper.
You may use a soft pencil for any diagrams, graphs, tables or rough working.
Do not use staples, paper clips, highlighters, glue, correction tape or correction fluid.
The use of an approved scientific calculator is expected, where appropriate.
Units should be stated in the answer where required.

There are two sections in this paper.

Section A:
Answer **ALL** the questions. Write your answers in the spaces provided on the question paper.

Section B:
Answer any **two** questions. Write your answers in the spaces provided on the question paper.
The number of marks is given in brackets [ ] at the end of each question or part question.
Take acceleration due to gravity on Earth, g, to be 10 m / s^2 unless stated otherwise.

DO NOT OPEN THE BOOKLET UNTIL YOU ARE TOLD TO DO SO

For Examiner's Use	
Section A	/ 45
Section B	
.....	/ 10
.....	/ 10
Total	/ 65

Setter: Mr Lam Seng Tat

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Section A (45 marks)

Answer all questions

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

1 Fig. 1.1 below shows an electric scooter used by Danial to travel from home to school. He accelerates uniformly from rest to 2.5 m / s in 3 s. He continues at this speed for 9 s on a straight horizontal path before decelerating uniformly in 5 s.



Fig. 1.1

(a) Draw on Fig. 1.2 the variation of speed of the electric scooter with time. [2]

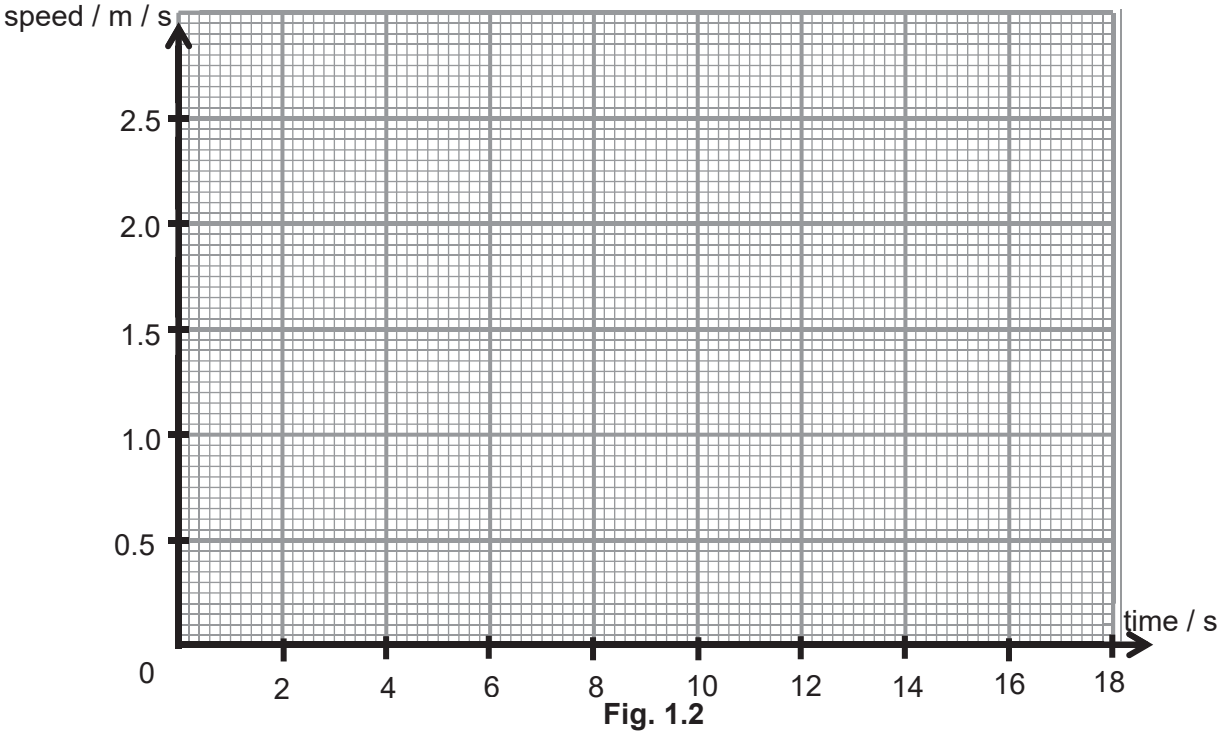


Fig. 1.2

(b) Calculate the average speed of the electric scooter for the journey.

average speed = ……m / s [2]

[Total: 4]

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2 Fig. 2.1 below shows a bobby, commonly found in ice skating rink to aid beginners in ice skating. Fig 2.2 shows the top view of two forces, **P** and **Q**, acting on the handle of the bobby. Magnitude of force **P** is 50 N while magnitude of force **Q** is 80 N.

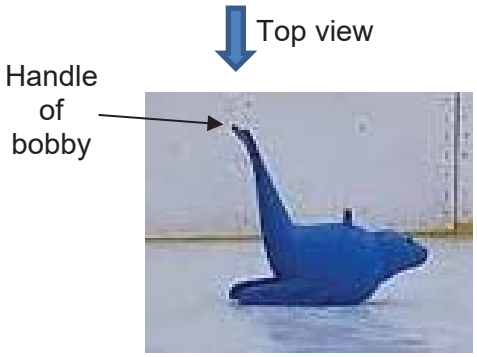


Fig. 2.1

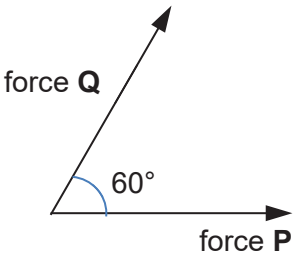


Fig. 2.2

(a) Draw a scaled vector diagram to determine the resultant force of **P** and **Q** acting on the bobby. [1]

scale of vector diagram: …… [1]

magnitude of resultant force = ……N [1]

(b) The mass of the bobby is 6 kg. If the friction acting against the bobby is negligible, determine the acceleration of the bobby due to the resultant force determined in **2(a)**.

acceleration = ……m / s^2 [2]

[Total: 5]

[Turn Over

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3 Fig. 3.1 and 3.2 below show Liang Qi jumping on a trampoline. Fig. 3.1 shows her at the lowest point on the trampoline while Fig. 3.2 shows her at the highest point.

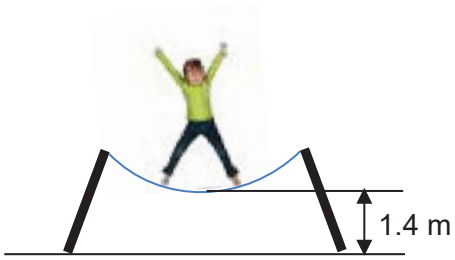


Fig. 3.1

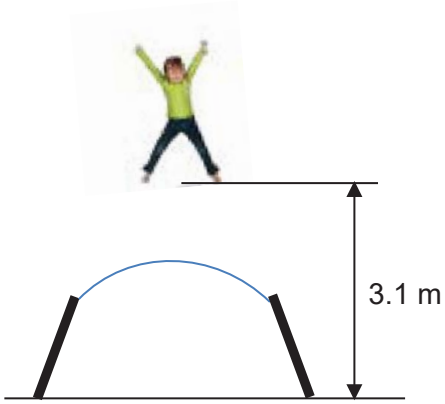


Fig. 3.2

(a) If Liang Qi has a mass of 48 kg, calculate the gain in her gravitational potential energy when she is jumping on the trampoline.

gain in gravitational potential energy = ……..….J [2]

(b) Explain, in terms of conversion of energy, why Liang Qi is momentarily stationary when she is at the highest point in Fig. 3.2.

……

……

……

……

……..….[2]

[Total: 4]

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4 Fig. 4.1 shows a fireman standing next to his fire engine. The fireman is wearing a mesh T-shirt and holding to his fire-protective jacket.

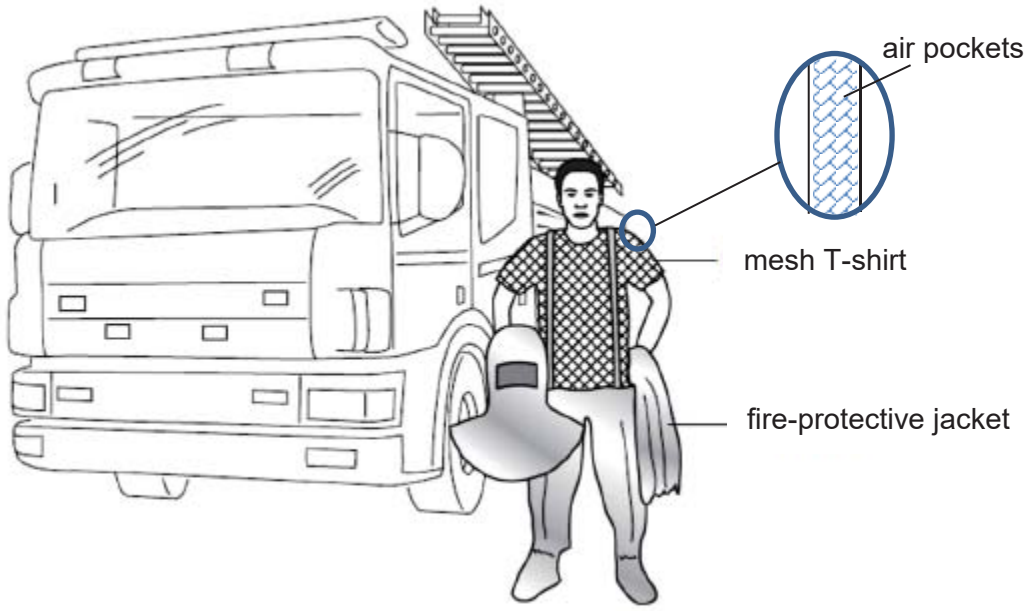


Fig. 4.1

(a) Describe and explain how the loosely woven mesh T-shirt helps to keep the fireman cool when he is close to the fire.

……

……

……

……

……[2]

(b) Describe the choice of colour for the fire-protective jacket to reduce thermal energy to the fireman. Explain your answer.

……

……

……

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……[2]

[Total: 4]

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5 Fig. 5.1 shows a cylinder with a movable piston. Air is trapped inside the cylinder by the piston.

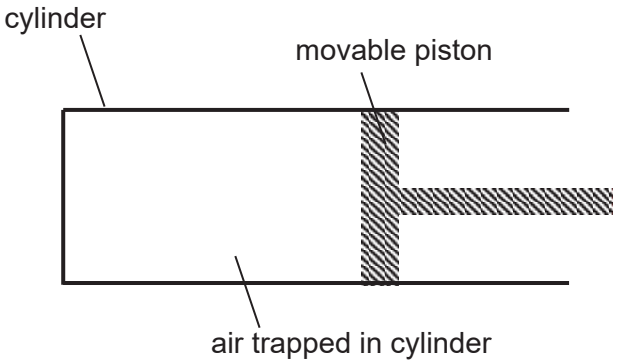


Fig. 5.1

(a) Describe the arrangement and motion of the molecules of the air in the cylinder.

……

……

……

……

……[2]

(b) State how, in terms of energy, the arrangement and motion of the molecules of air in the cylinder change when it is heated.

……

……

……

……

……[2]

[Total: 4]

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6 Fig. 6.1 shows a boy swimming inside a swimming pool. A light source at the bottom of the swimming pool shines light onto the surface of the water. The boy is able to see the light source as shown by the path of the light ray.

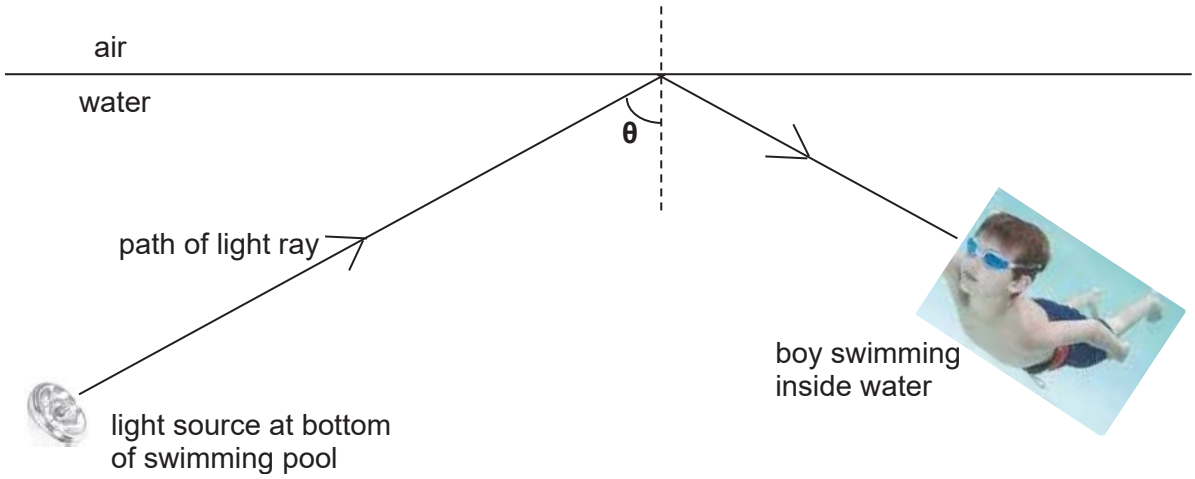


Fig. 6.1

(a) State the phenomenon which light is able to reach the boy inside the water

……[1]

(b) Describe the condition required for angle **θ** needed such that the boy can see the light source.

……

……[1]

(c) Given that the speed of light in water is 2.25 x 10^8 m / s, calculate the refractive index of water.

refractive index of water = …… [2]

(d) Mark on Fig. 6.1 with 'x' the position of the image of the light source as seen by the boy. [1]

[Total: 5]

[Turn Over

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7 Fig. 7.1 shows a thundercloud approaching a building with a lightning rod at the top of the building. The lightning rod is connected to the ground with a lightning conductor.

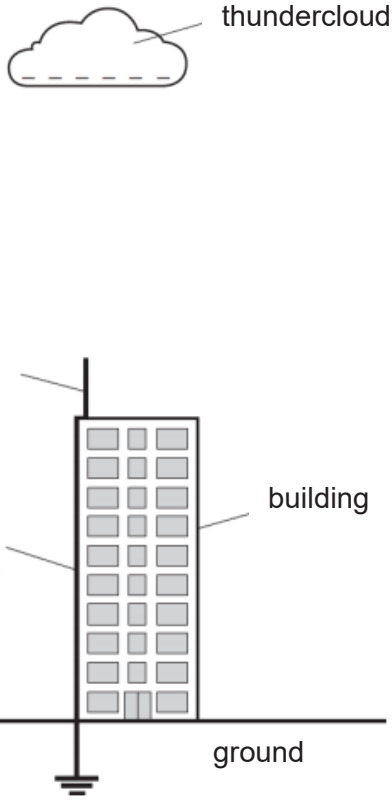


Fig. 7.1

(a) State the charge that will form at the top end of the lightning rod if the thundercloud is negatively charged. Explain your answer.

……

……

……

……

……[2]

(b) Describe, in terms of movement of charged particles, what will happen if lightning occurs between the thundercloud and the building.

……

……

……

……

……[2]

[Total: 4]

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8 Fig. 8.1 shows an electrical circuit with a fixed resistor and light bulb connected to a 20 V battery in parallel. The fixed resistor has a resistance of 100 Ω and the light bulb has resistance of 50 Ω.

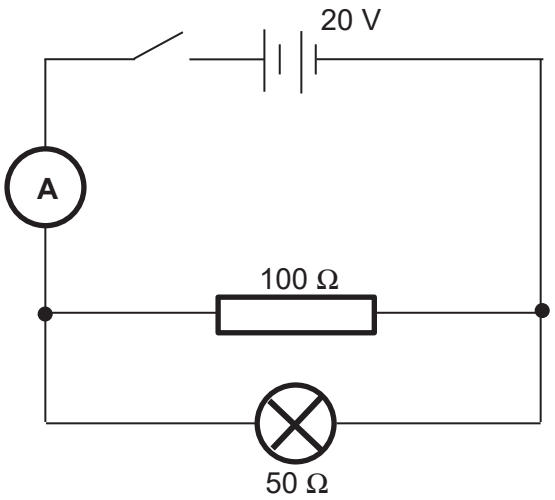


Fig. 8.1

(a) Calculate the effective resistance of the fixed resistor and light bulb connected in parallel.

effective resistance = …… Ω [1]

(b) Determine the reading of the ammeter when the electrical circuit is switched on.

ammeter reading = ……A [2]

(c) If the light bulb becomes spoilt and does not light up, state if the current will flow through the fixed resistor when the electrical circuit is switched on. Explain your answer.

……

……

……

……

……[2]

[Total: 5]

[Turn Over

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9 Fig. 9.1 shows a magnet and two iron nails attracted to the north pole of the magnet.



Fig. 9.1

(a) State the magnetic pole at the pointed end of the second iron nail. Describe what has occurred to the two iron nails.

……

……

……

……

……[2]

(b) Describe the difference in the magnetic effect if steel nails were used instead of iron nails.

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……

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……

……[2]

(c) Draw on Fig. 9.2 the magnetic field pattern between the two magnets. [2]

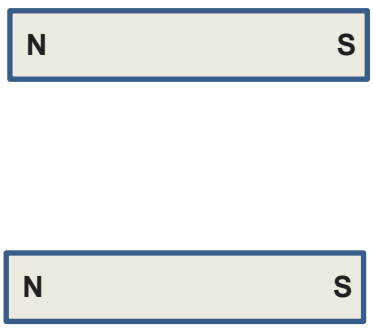


Fig. 9.2

[Total: 6]

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10 Fig. 10.1 shows an electrical circuit consisting of a straight conducting wire connecting a variable resistor with a battery.

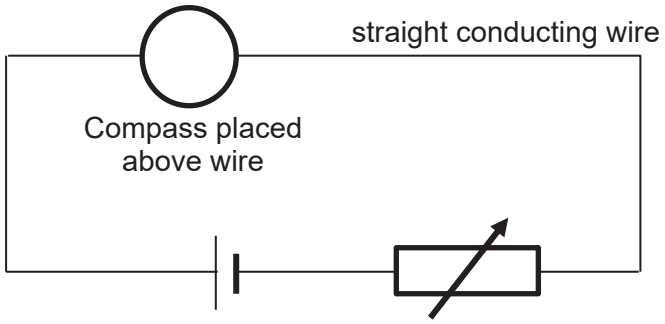


Fig. 10.1

(a) Draw the direction of the compass needle on Fig. 10.1 when current is flowing in the straight conducting wire. [1]

(b) Explain how the increase in variable resistor value will affects the magnetic field around the straight conducting wire.

……

……

……

……[2]

(c)

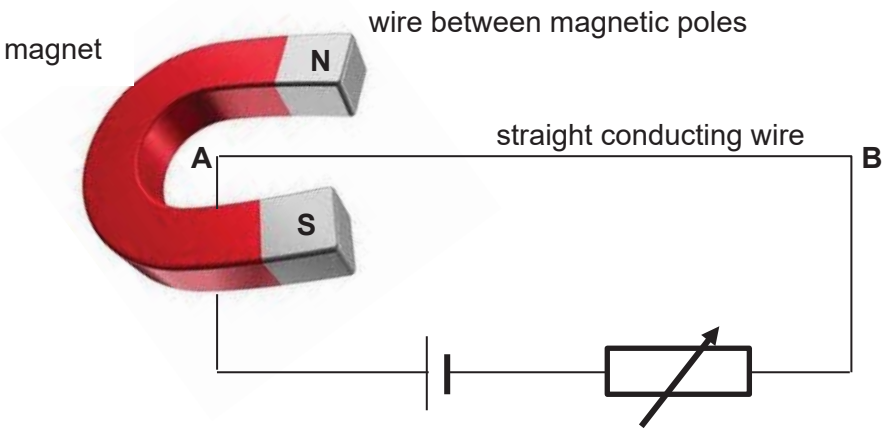


Fig. 10.2

Fig. 10.2 shows the same electrical circuit as in Fig. 10.1 but the compass has been replaced by a magnet. The poles of the magnet are placed between the straight conducting wire **AB**. Describe, if any, the force acting on the conducting wire between the poles of the magnet.

……

……

……[1]

[Total: 4]

[Turn Over

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Section B (20 marks)

Answer any <u>two</u> questions in the spaces provided.

11 Fig. 11.1 shows a face towel, a pair of jeans and a t-shirt. The face towel has a mass of 100 g. The pair of jeans has a mass of 1.2 kg while the mass of the t-shirt has a mass of 400 g.

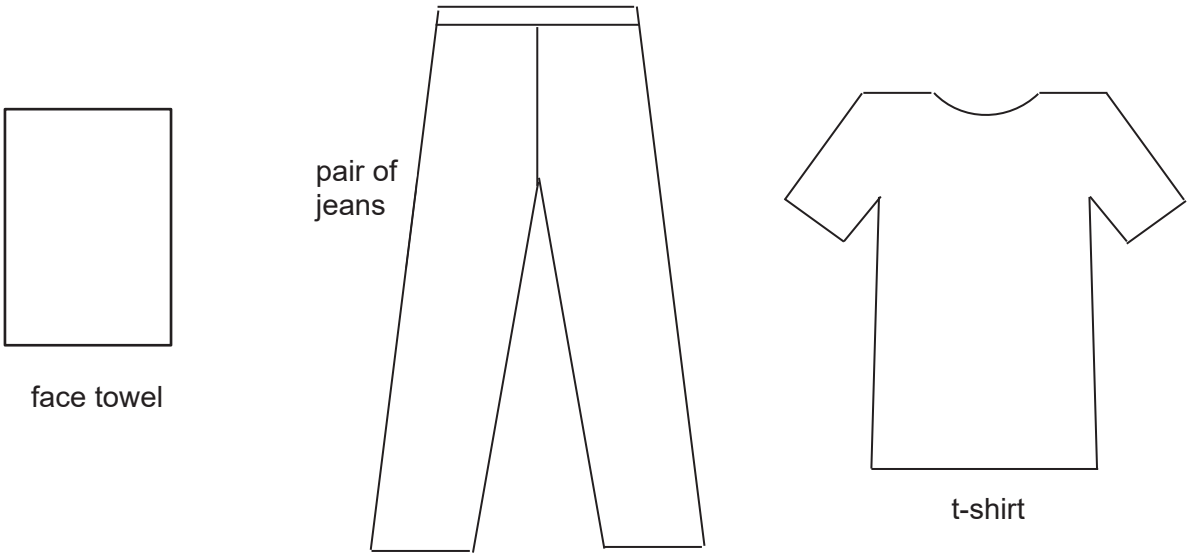


Fig. 11.1

(a) State which item has the greatest amount of inertia. Explain the reason for your answer.

……

……

……

……

……[2]

(b) Calculate the total weight of the three items.

total weight of the three items = …… [2]

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11 (c) Derrick was tasked to place the three items onto a bamboo pole for them to dry. Fig. 11.2 shows the arrangement of the three items on the bamboo pole. The position of the centre of gravity of the individual item to the left end of the pole is indicated.

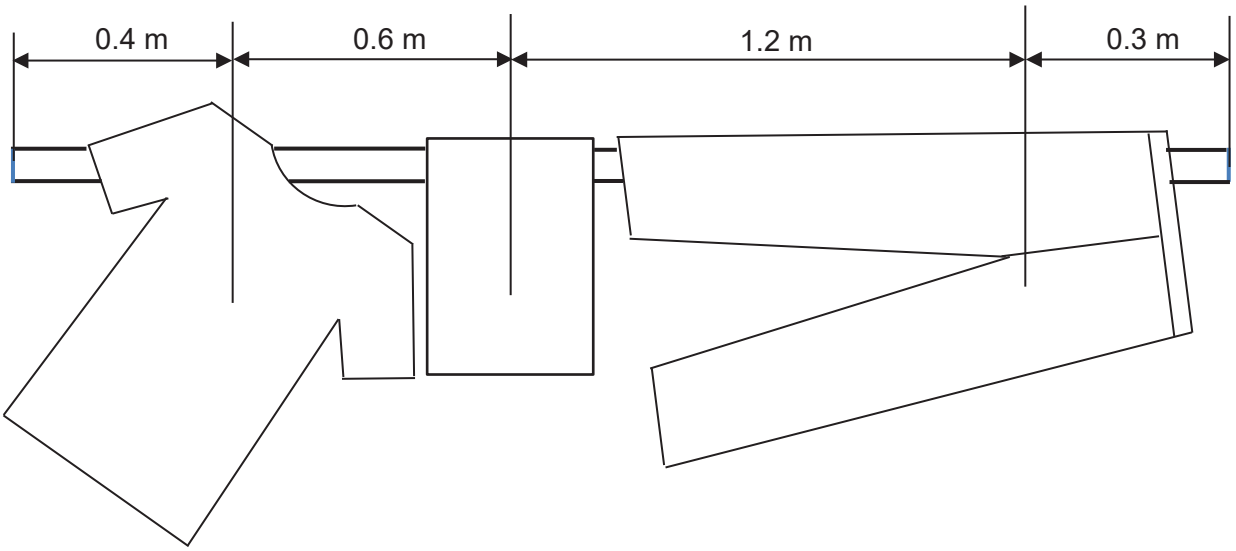


Fig. 11.2

(i) Explain what is meant by the *centre of gravity* of an object.

……

……

……[1]

(ii) Calculate the moment of the three items on the bamboo pole about the left end of the pole. State the unit.

moment about the left end of pole = …… [3]

(iii) Describe and explain how the items can be arranged on the bamboo pole such that the moment about the left end of the pole is the smallest.

……

……

……

……

……[2]

[Total: 10]

[Turn Over

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12 (a) Fig. 12.1 shows a pressure-time graph of a sound wave.

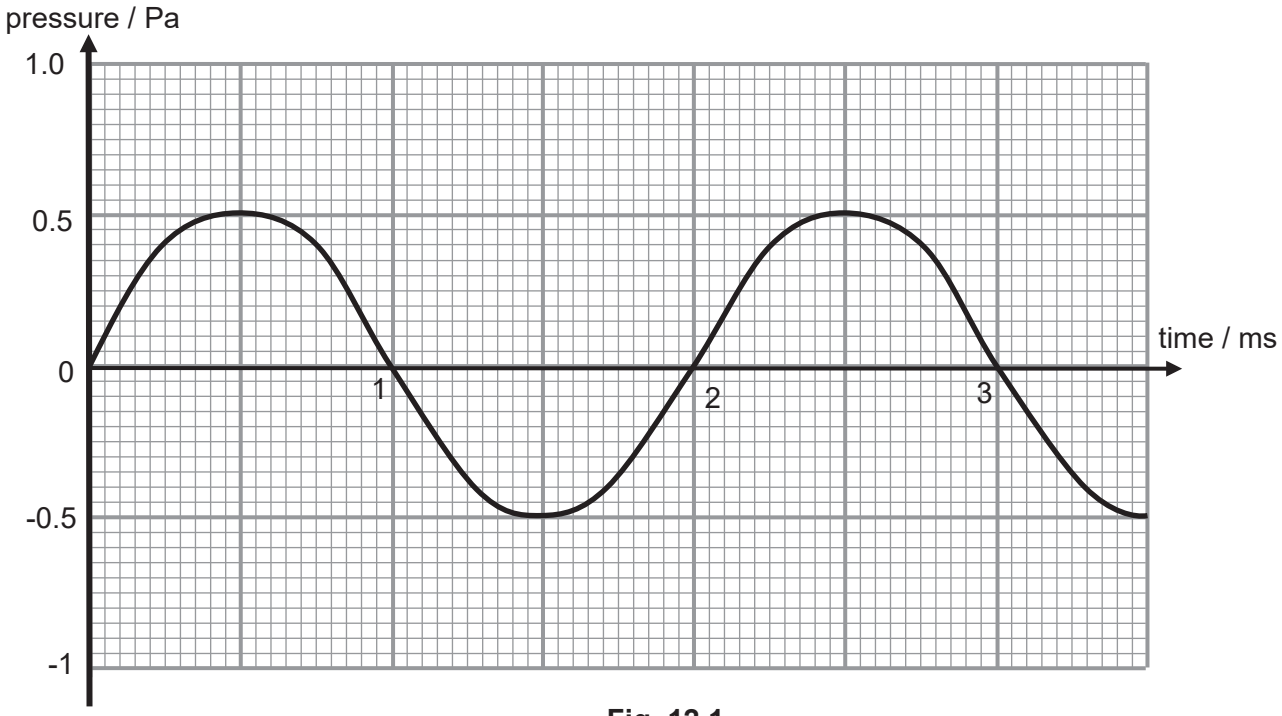


Fig. 12.1

(i) From the graph, state the period of the sound wave. Hence determine the frequency of the wave.

period of wave = ……[1]

frequency of wave = ……[1]

(ii) Draw on Fig.12.1 another wave that has the same frequency but twice as loud. [2]

(iii) Describe the relationship between pressure of the wave in terms of compression and rarefaction.

……

……

……[1]

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12 **(b)** Fig. 12.2 shows a portable counterfeit currency detecting device.



Fig. 12.2

(i) State the electromagnetic wave used by the device to detect counterfeit currency.

……

……[1]

(ii) The electromagnetic wave given out by the device has a wavelength of 2×10^{-7} m and frequency of 1.48×10^{15} Hz. Calculate the speed of the wave.

speed of wave = ……[2]

(iii) State two property differences between the electromagnetic wave and sound wave.

Difference 1:……

……

……

Difference 2:……

……

……[2]

[Total: 10]

[Turn Over

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13 Fig. 13.1 shows an electrical circuit for an oven and a toaster connected to 240 V supply. The oven has a power rating of 2500 W while the toaster has a power rating of 1 kW.

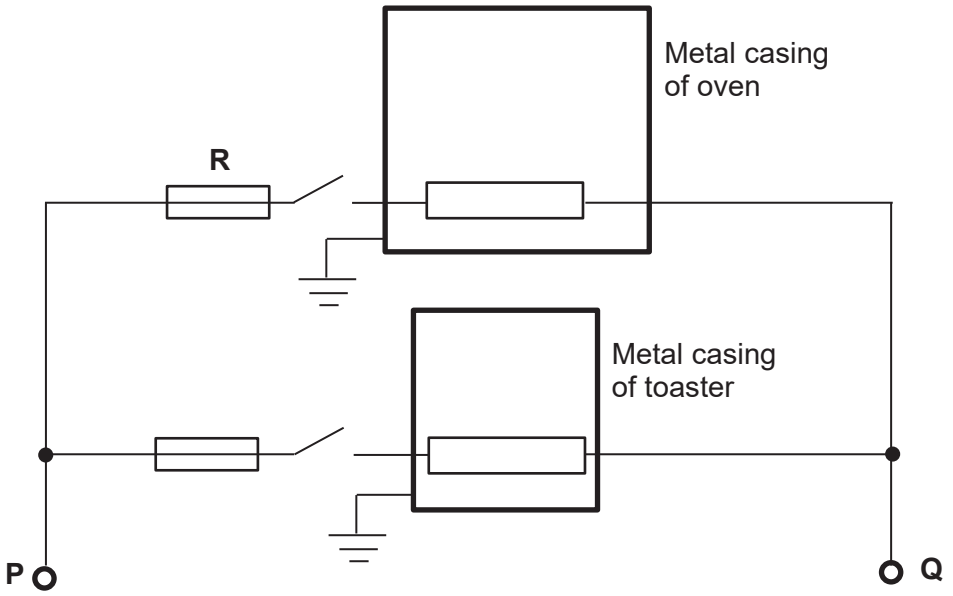


Fig. 13.1

(a) State the name for wires **P** and **Q**. Explain how you deduce your answer.

……

……

……

……

……[2]

(b) Determine the current flowing through the oven when it is switched on. Hence select a suitable fuse at **R**. Available fuse are 3 A, 5 A, 10 A and 13 A.

current flowing through oven = ……..[1]

suitable fuse at **R** = ……..[1]

(c) Explain why the oven and toaster are connected in parallel in the circuit.

……

……

……[1]

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13 (d) Describe the function of the fuse as a safety device.

……

……

……

……

……[2]

13 (e) (i) The oven was switched on for five hours while the toaster was switched on for two hours. Calculate the electrical energy consumed for both oven and toaster.

electrical energy consumed for oven and toaster = ……[2]

(ii) Hence calculate the cost of electricity used by the oven and toaster if each unit of electrical energy cost $0.30.

total cost of electricity for oven and toaster = ……[1]

[Total: 10]

End of paper

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Jurongville Secondary School
Science Department 2019
Marking Scheme & Marker's Report

Assessment: Prelim Examination **Level:** Sec 4E / 5N

PAPER 1

Qn	Ans	Qn	Ans	Qn	Ans	Qn	Ans	Qn	Ans	Qn	Ans	Qn	Ans	Qn	Ans	Qn	Ans	Qn	Ans
1	D	2	D	3	C	4	B	5	C	6	C	7	A	8	C	9	D	10	B
11	A	12	D	13	D	14	A	15	A	16	C	17	C	18	D	19	C	20	C
21	B	22	D	23	B	24	D	25	D	26	C	27	B	28	C	29	A	30	D
31	B	32	C	33	A	34	D	35	D	36	A	37	B	38	C	39	B	40	A

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Jurongville Secondary School
Science Department 2019
Marking Scheme & Marker's Report

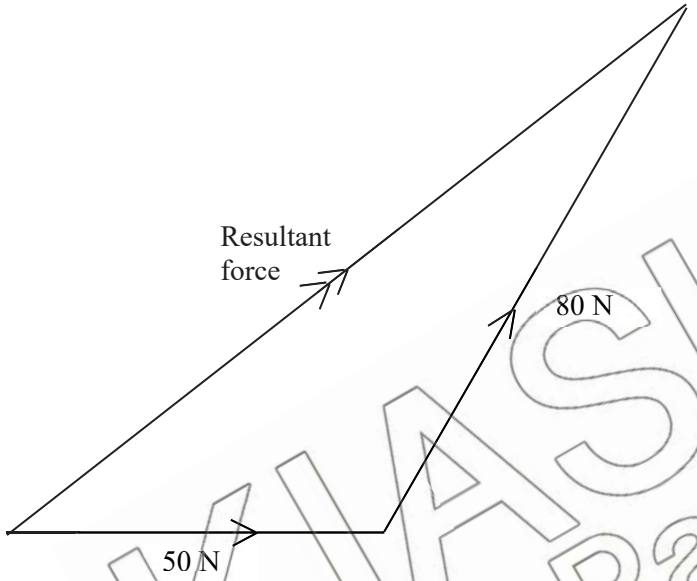
Assessment: Preliminary Examination Sc(Physics) (5076) **Level:** 4 Express / 5NA

Paper 2

Qn	Marking Scheme	Remarks	Marks	Marker's Report
Section A				
1a		Correct straight lines Correct time duration	B1 B1	Most were able to get the correct graph. A few students did not read the question carefully and drew with wrong time.
1b	Distance travelled = 1/2 (9 +17) (2.5) = 32.5 m Average speed = 32.5 / 17 = 1.91 m / s	Correct distance with working. Correct average speed with working	Allow for ecf in (a) B1 B1	Most were able to calculate total distance and average speed. A few students made careless mistakes in using 18 s instead of 17 s.

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Qn	Marking Scheme	Remarks	Marks	Marker's Report
2a	Scale 1 cm rep 10 N 114 N ± 1 N Info – direction is 38° anticlockwise from horizontal  	Correct vector diagram Correct scale Correct magnitude	B1 B1 B1	Most were able to draw vector diagram correctly. A few students did not draw orientation of forces correctly and were penalized. A few students drew wrong direction arrows and were also penalized. Common mistake was to write scale as 1cm = 10 N which was penalized. Another error was to write as scale as 10 N : 1 cm which was also not accepted. Magnitude out of range was rejected.
2b	Resultant force = mass x acceleration 114 = 6 x a a = 19 m / s^2	Accept ecf from a Correct answer with working.	C1 A1	Most were able to do this question. A few students left this blank.
3a	Gain in gravitational potential energy = 48 x 10 x (3.1 – 1.4) = 816 J	Correct answer with working.	C1 A1	Most students were able to do this. A few students did not include g in calculation. A few use either 3.1 m or 1.4 m height instead of the difference.
3b	As she rises from the trampoline, the **kinetic energy decreases and is converted to gravitational potential energy**. At the **highest point, all the kinetic energy has been converted to gravitational potential energy. Thus she is momentarily stationary at the highest point**.	OWTTE	B1 B1	Some students wrote that gravitational potential energy has converted to kinetic energy instead. A few students stated Principle of Conservation of energy without applying to this situation.

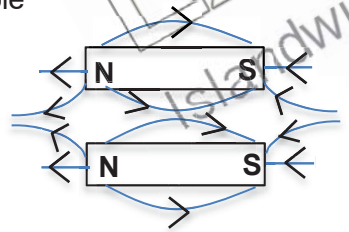
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Qn	Marking Scheme	Remarks	Marks	Marker's Report
4a	The loosely woven mesh T-shirt **traps air which is a bad thermal conductor**. This **reduces the transfer of thermal energy by conduction from the fire to the fireman's body and thus keeping him cool**.	OWTTE	B1 B1	Many students did not state that air is a bad conductor. Many wrote that air cools the fireman down without explaining correctly.
4b	The fireman's jacket should be **silver** in colour as silver colour is a **bad absorber of thermal energy** and thus reduces transfer of thermal energy by radiation.	Accept white. OWTTE	B1 B1	Some students wrote bright and shiny colour. Accepted shiny as BOD.
5a	The **molecules of air in the cylinder are far apart from each other** and **moving randomly at high speed**.	OWTTE	B1 B1	Some students did not state that air particles are far apart from each other. Some students also did not state that the air particles are moving at high speed.
5b	**When air is heated, the air molecules gain kinetic energy**. This would cause the **air molecules to move even further apart and move even faster**.	OWTTE	B1 B1	Some students wrote about energy needed to break the intermolecular bonds and was penalized.
6a	Total internal reflection	CAO	B1	A few students wrote 'reflection'. A few wrote 'total internal refraction'.
6b	The **angle θ must be greater than critical angle of water**.	OWTTE	B1	A few students wrote 'lesser'.
6c	Refractive index of water = $3 \times 10^8 / 2.25 \times 10^8$ = 1.33	Correct calculation. Must show speed of light in air.	C1 A1	Most students were able to do this question.
6d	Position of 'x' at same distance perpendicularly above the surface of water as the light source is at distance below the surface of water.	Accept tolerance of 5 mm	B1	Most were not able to answer this. Some students placed the image at point on water surface at normal.
7a	Since the cloud is negatively charged, the **top end of the lightning rod should be positively charged**. This is because the **electrons on the lightning rod would be repelled by the electrons on the thundercloud leaving protons behind**.	OWTTE	B1 B1	Many students wrote that the lightning rod is negatively charged. Some thought that negatively charged rod will repel the thundercloud. Only a few students can explain correctly.
7b	If lightning occurs, the **electrons in the thundercloud would travel through the air and hit the building at the lightning rod**. The **electrons would transfer to the ground through the lightning conductor**	OWTTE	B1 B1	Most students did not mention the electrons from the thundercloud flowing to the ground through the lightning conductor. A few students were penalized for not stating clearly

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Qn	Marking Scheme	Remarks	Marks	Marker's Report
				that electrons flow from thundercloud to lightning rod.
8a	Effective resistance = $(1/100 + 1/50)^{-1} = 33.3\ \Omega$	Correct working and answer	B1	Some students did not write working correctly and were penalized. Some students made wrong calculation. Some wrote 100 + 50.
8b	Ammeter reading = 20 / 33.3 = 0.6 A Or Ammeter reading = (20/100) + (20/50) = 0.2 + 0.4 = 0.6 A	Allow for ecf in (a) Correct working and answer	B1 B1	Most students were able to do this. A few students used the wrong formula.
8c	The **current in the fixed resistor will still flow** because the **fixed resistor and light bulb are connected in parallel and current flow would not be affected by the spoilt light bulb**.	OWTTE	B1 B1	Most students can answer correctly. But a few students left this blank.
9a	The pointed end of the **second nail is north pole** since the iron nails has **become induced magnets**. The **magnetic domains in the iron nail has aligned itself with north pole pointing away from the north pole of the magnet**.	OWTTE	B1 B1	Most students can identify that the pole is North. But only some students correctly stated the iron nails becoming induced magnets. Some wrote that the iron nails had become electromagnets.
9b	**Iron nails are easily magnetized but lose its magnetism easily** while **steel nails are not as easily magnetized but does not lose its magnetism easily**.	OWTTE	B1 B1	Some students wrote that steel is not a magnetic material and thus will not be attracted to the magnet. Some students were confused by stating steel is stronger magnet because it is used as permanent magnet. Some students were penalized for not stating the difference between magnetic effect of iron and steel.
9c	Correct pattern of magnetic field lines with arrows pointing from north to south pole 	Correct arrow Correct pattern	B1 B1	Most students indicated the correct direction of arrow. But most students are not able to draw the pattern of magnetic field lines correctly.

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Qn	Marking Scheme	Remarks	Marks	Marker's Report
10a	Compass needle with arrow pointing downwards using right-hand grip rule.	Correct direction of needle arrow	B1	Most students indicated arrow direction to the right in the direction of current. Need to revise such questions with students.
10b	By increasing the variable resistor value, the **current in the circuit will decrease**. This will cause the **magnetic effect around the straight conducting wire to decrease**.	OWTTE	B1 B1	Most students answered correctly. A few students did not state that current had decreased.
10c	The force will be acting into the paper.	OWTTE Reject 'downwards'	B1	Many students wrote downwards and was penalized.
11a	The **pair of jeans has the greatest amount of inertia because inertia is dependent on mass of object.**	OWTTE Accept if student state jeans has 'greatest mass'.	B1 B1	Most students answered jeans correctly. But only some students stated that inertia is dependent on mass of object.
11b	Total weight = (0.1 + 1.2 + 0.4) x 10 = 17 N	Convert g to kg Correct answer	C1 A1	Many students did not multiply by g. Many students wrote kg instead of N.
11ci	Centre of gravity **is the point where the whole weight of object appears to act.**	OWTTE	B1	Many students wrote about balance or equilibrium.
11cii	Moment = (0.4 x 10 x 0.4) + (0.1 x 10 x 1.0) + (1.2 x 10 x 2.2) = 1.6 + 1.0 + 26.4 = 29 N m	Allow for ecf in (b) Correct working with answer Correct unit	C1 A1 B1	Most students are not able to calculate this as they did not use the correct distance from the left end. Many students did not write the correct unit.
11ciii	The **jeans should be placed nearest to the left end. The t-shirt is placed in the centre while face towel is place furthest from the left end**. This is because **the heaviest item is nearest to the pivot while the lightest is furthest from the pivot to reduce the moment about the left end.**		B1 B1	Many students left this blank. Some students did not explain why moment is smallest.
12ai	Period = 2 ms = 0.002 s Frequency = 1 / 0.002 = 500 Hz	Accept 2 ms Correct working with answer. Correct unit	B1 B1	Most students did not write the correct unit for period. Most students did calculate frequency correctly.
12aii	Same period but with twice the amplitude	Correct amplitude Correct period	B1 B1	Most students were able to answer this correctly.
12aiii	The higher pressure is the compression region while the lower pressure region is the rarefaction region.	OWTTE	B1	Many students are not able to answer this correctly. Need to revise this.

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Qn	Marking Scheme	Remarks	Marks	Marker's Report
12bi	Ultraviolet radiation	CAO	B1	Many students are not able to answer this correctly. Need to revise this.
12bii	Speed = $1.48 \times 10^{15} \times 2 \times 10^{-7}$ $= 2.96 \times 10^{8}$ m/s	Correct working with answer. Correct unit	C1 A1	Most students can calculate this. Some students did not write the unit.
12biii	Electromagnetic waves are transverse waves while sound waves are longitudinal waves. Electromagnetic waves can travel through vacuum but sound waves cannot travel through vacuum.	Any suitable answer	B1 B1	Many students wrote that electromagnetic waves are longitudinal and sound is transverse. Some students describe longitudinal and transverse waves as second difference.
13a	P is the live wire while Q is the neutral wire. This is because the fuse and switch are on the live wire.	OWTTE	B1 B1	Some students wrote that Q is earth wire. Most students were able to state that fuse and switch is on the live wire.
13b	Current flowing through oven = 2500 / 240 = 10.4 A Suitable fuse would be 13 A fuse	Correct answer and unit with working.	B1 B1	Most students can answer this. A few students selected the lower rating fuse.
13c	The oven and toaster are connected in parallel so that if there is a fault in the oven or toaster, the appliance will still work.	OWTTE	B1	Most students answered this correctly. A few gave wrong answers like current being shared to prevent overheating.
13d	The **fuse consist of a thin wire which will melt when it excess the amount of current allowed in the fuse rating**. This will **cut current flow to the appliance thus protecting it**.	OWTTE	B1 B1	Most students can answer this question.
13ei 13eii	Electrical consumption for oven = (2.5 x 5) + (1 x 2) = 14.5 kWh Total cost of electrical consumption = 14.5 x 0.3 = $4.35	Correct answer and unit with working. Correct unit Correct answer and unit with working	C1 A1 B1	Most students are able to answer this question.

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