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NAME	CLASS	INDEX NO.
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Parent's/Guardian's Signature : _____ Date: _____



ST. PATRICK'S SCHOOL MID-YEAR EXAMINATIONS 2016

SUBJECT : GENERAL SCIENCE

DATE : 11 MAY 2016

LEVEL : SECONDARY 1 EXPRESS

DURATION : 1 H 30 MIN

INSTRUCTIONS TO CANDIDATES

DO NOT OPEN THIS BOOKLET UNTIL YOU ARE TOLD TO DO SO.

1. Write your name, class and index number on the **Question Paper** and the **Optical Answer Sheet** in the spaces provided. It is also required that you **SHADE** your index number on the **Optical Answer Sheet**.
2. This paper consists of **Three (3) Sections: Section A, Section B and Section C.**
3. Answer **ALL** questions in **Section A** on the **Optical Answer Sheet** provided.
4. Answer **ALL** questions in **Section B** in the spaces provided.
5. Answer **ALL** questions in **Section C** in the writing paper provided. Start each question on a new sheet of paper.
6. Calculators may be used where necessary. Give answers to **three (3) significant figures.**
7. **DO NOT DETACH** any sections from this paper.
8. At the end of the examination, arrange your answers in Section C in order and tie with the string provided.
9. Submit the Optical Answer Sheet, this paper and answers to Section C **SEPARATELY.**

FOR EXAMINER'S USE ONLY

Section	A (20 m)	B (30 m)	C (20 m)	Total (70 m)	Grade	Target Grade
Score						

*This question paper consists of 17 printed pages, including this page.
A copy of the Periodic Table is provided on page 17.*

Section A [20 marks]:

Each question is provided with **four** possible answers (**A, B, C, and D**). Select the most appropriate answer and **shade** your choice in the **Optical Answer Sheet** provided.

- 1 Stephen Hawking is a famous theoretical physicist. Despite suffering from a motor neurone disease at a young age, he continued to make ground-breaking research on relativity and cosmology. What scientific attitude does he demonstrate?

A Integrity
B Curiosity
C Innovation
D Perseverance

- 2 The following skills are required in solving a scientific problem.

I Devise a method
II Collecting results
III Formulate hypothesis
IV Identifying the problem
V Evaluation and conclusion

What is the correct order of using these skills?

A III → I → IV → II → V	B III → IV → I → IV → II
C IV → I → II → III → V	D IV → III → I → II → V

- 3 Which of the following laboratory apparatus can be used to heat up a solid?

I Test tube
II Conical flask
III Measuring cylinder

A I only	B I and II only
C II and III only	D All of the above

- 4 In the laboratory, Cindy sees a substance in a bottle with the following hazard symbol:



What is a safety precaution she should take when handling this substance?

- A Wear rubber gloves
B Wear safety goggles
C Keep away from open flames
D Avoid breathing in vapours produced by the substance

- 5 Which one of the following physical quantities is correctly matched to its S.I. unit?

	<u>Physical Quantity</u>	<u>S.I. Unit</u>
A	Time	s
B	Mass	g
C	Speed	km/h
D	Density	g/cm ³

- 6 The distance from Jason's house to the school is 1.07 km. What is the distance in metres?

- A** 107 m **B** 170 m
C 1070 m **D** 1700 m

- 7 Spheres X and Y have the same mass but different volumes.



Therefore, sphere X has a _____ density than sphere Y because there is _____ mass per unit volume.

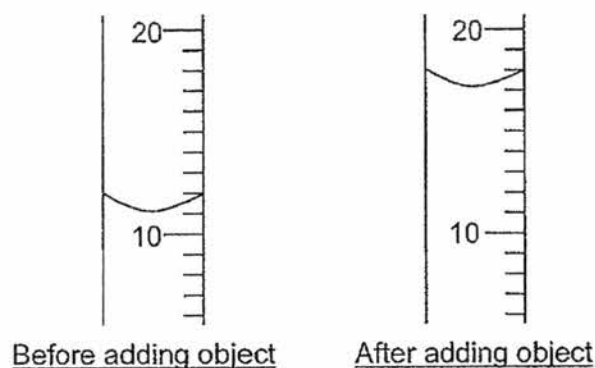
- A lower ; less
B lower ; more
C higher ; less
D higher ; more

8 What is the precision of a micrometer screw gauge?

- A 0.1 cm
C 0.1 mm

- B 0.01 cm
D 0.01 mm

9 A measuring cylinder was filled with water. The following diagram shows the level of water before and after an object was placed in it.



What is the volume of the object?

- A 5.0 cm³
C 7.0 cm³

- B 6.0 cm³
D 8.0 cm³

The following table contains some properties of materials A, B, C and D. Use the information to answer questions 10 and 11.

Materials	Melting Point (°C)	Boiling Point (°C)	Conducts Electricity	Brittle
A	1400	1700	No	Yes
B	660	2500	Yes	No
C	-38	356	Yes	No
D	190	320	No	No

10 Which one of the materials is likely used to make clothes?

11 Which one of the materials is likely to be mercury?

12 Four spoons of different materials are placed in a beaker of hot water and their temperatures were measured. Which material is likely to show the largest increase in temperature?

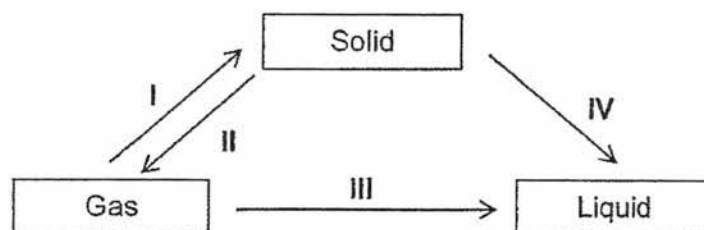
- A Clay
C Light plastic

- B Glass
D Stainless steel

13 Which statement best explains why liquids cannot be compressed?

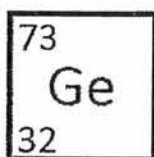
- A The particles are too close together.
- B The particles are moving too quickly.
- C The particles are in a disorderly arrangement.
- D The forces of attraction between particles are too strong.

14 The following diagram shows some processes I, II, III and IV during the changes of state.



Which of the process(es) will cause particles to move more quickly?

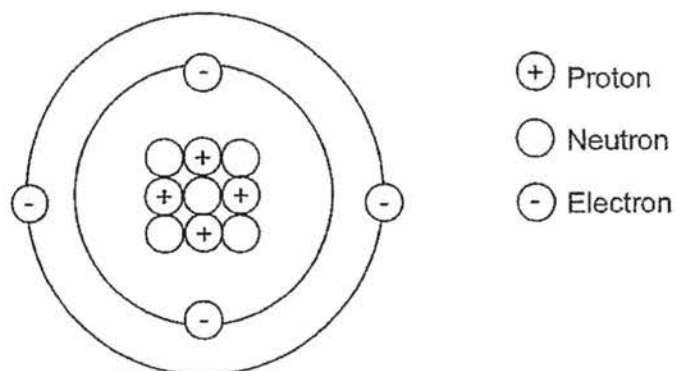
- A I only
 - B I and III only
 - C II only
 - D II and IV only
- 15 Which one of the following statements is true regarding the sub-atomic particles of an atom?
- A Protons have no mass.
 - B Electrons are stationary.
 - C Neutrons have no charge.
 - D There are always the same number of protons and neutrons.
- 16 The chemical symbol of germanium is shown in the diagram.



Which one of the following options shows the correct number of protons, neutrons and electrons in one atom of germanium?

	<u>Protons</u>	<u>Neutrons</u>	<u>Electrons</u>
A	32	32	41
B	32	41	32
C	41	32	41
D	41	41	32

- 17 The following diagram shows the arrangement of protons, neutrons, and electrons in an atom.



Using the Periodic Table provided, what is the identity of this atom?

- A Boron
B Helium
C Fluorine
D Beryllium
- 18 Chlorine and iodine are elements found in Group VII. Chlorine appears as a greenish-yellow gas while iodine is a dark purple solid at room temperature.



Chlorine gas

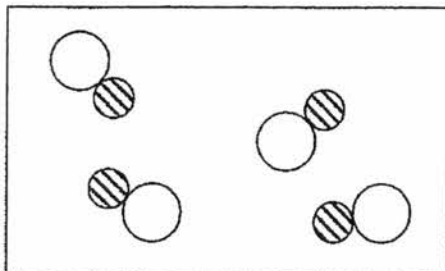


Solid iodine

What similarities do chlorine and iodine have?

- A Both are metalloids.
B Both have high boiling points.
C Both have similar chemical properties.
D Both have the same number of electrons.

- 19 The following diagram shows the particles in carbon monoxide. Carbon monoxide is a poisonous gas that is produced when fuels are burnt without sufficient oxygen.



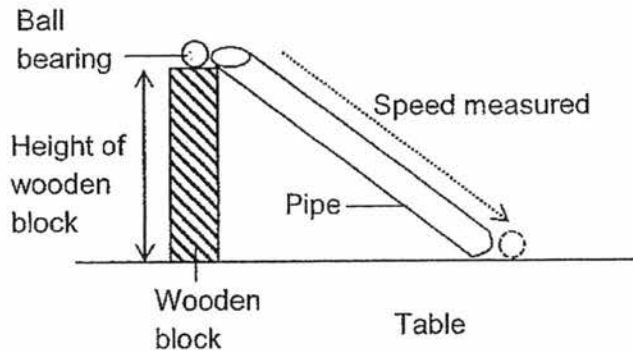
- Which one of the following statements is true about carbon monoxide?
- A It is a mixture because two types of elements are present.
 - B It is a compound because the elements are in a fixed ratio.
 - C It is a compound because each particle contains two atoms.
 - D It is an element because only one type of particle is present.
- 20 Some sugar crystals were added into a cup of water. What steps can be taken to help the sugar crystals dissolve faster?
- A Increase rate of stirring
 - B Using water of lower temperature
 - C Using larger blocks of sugar crystals
 - D Add sugar crystals slowly into the water

END OF SECTION A

Section B [30 marks]:

Answer **ALL** the questions. Show your working and your answers in the space provided.

- 1 Tim is conducting an experiment. The set-up for the experiment is shown in the diagram.



Tim pushes a ball bearing through the pipe and measures the speed of the ball bearing rolling down at the end of the pipe. He repeats the experiment using wooden blocks of different heights. The results are recorded in the table below.

Height of block (cm)	Speed (m/s)
10	1.37
20	1.88
30	2.21
40	2.65

- (a) (i) State the independent variable of this experiment.

..... [1]

- (ii) State the dependent variable of this experiment.

..... [1]

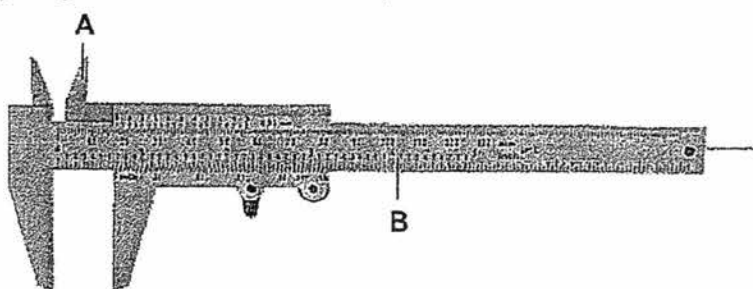
- (iii) State two constant variables of this experiment.

..... [2]
.....

- (b) Based on the experimental results, write down a possible conclusion to this experiment.

..... [1]

2 The following diagram shows a vernier caliper.



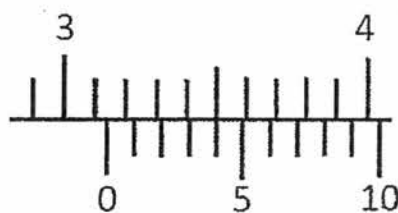
(a) Label the components A and B of the vernier caliper.

A: B: [2]

(b) State the function of component A.

..... [1]

(c) The vernier caliper was used to measure the length of a cube, as shown in the diagram.

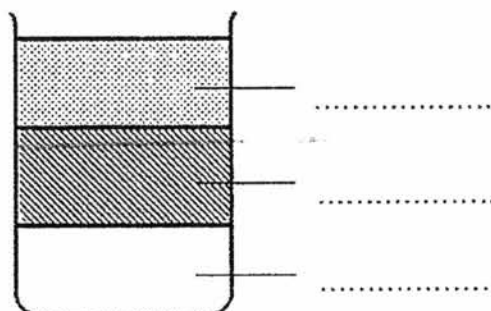


(i) State the reading on the vernier caliper.

..... cm [1]

(ii) Hence, calculate the volume of the cube. Show your working clearly.

- 3 Equal volumes of immiscible liquids E, F and G are poured into a beaker, as shown in the diagram.



The densities of the liquids are shown in the table.

Liquid	Density (g/cm^3)
E	4.10
F	2.88
G	4.85

- (a) Based on the information given, identify the liquids E, F and G in the beaker on the diagram. [2]

- (b) A sphere has a volume of 4.2 cm^3 and a mass of 6.43 g .

- (i) Calculate the density of the sphere. Show your working clearly.

[2]

- (ii) The sphere is dropped into the beaker containing liquids E, F and G. Based on your answer in (i), draw where you would expect the sphere to be on the diagram in (a). [1]

- 4 Fats and oils are a small but important part of our diets. Fats and oils that contain a higher percentage of saturated fatty acids tend to have a higher melting point.

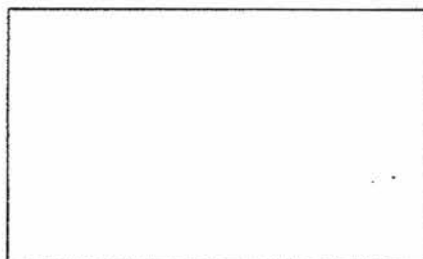
For example, whole butter contains 60% saturated fatty acids and has a melting point of 36°C . However, peanut oil contains only 17% saturated fatty acids and has a melting point of -2°C .



- (a) Predict the state of butter and peanut oil at 20°C .

Butter: Peanut oil: [2]

- (b) (i) Draw the arrangement of particles in butter in solid state in the box below. Draw only **EIGHT** particles.



[1]

- (ii) Describe the movement of the particles in butter in solid state.

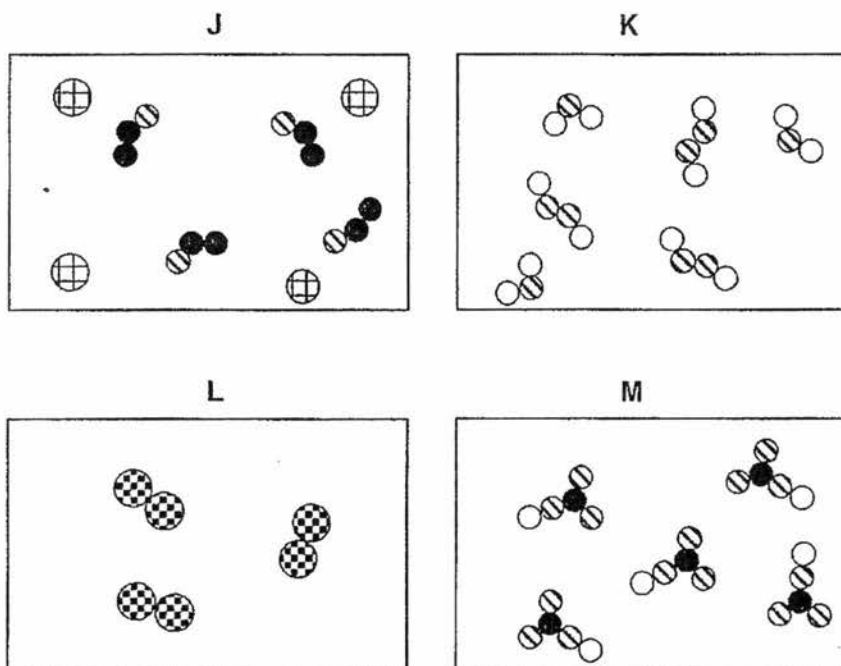
..... [1]

- (c) Brand H margarine contains 40% saturated fatty acids. Predict the melting point of the margarine.

..... [1]

- 5 The diagrams show the arrangement of particles of substances J, K, L and M.

Using only information from the diagrams, choose **ONE** substance (J, K, L or M) that best fits the descriptions. Each substance can be used once, more than once or not at all.



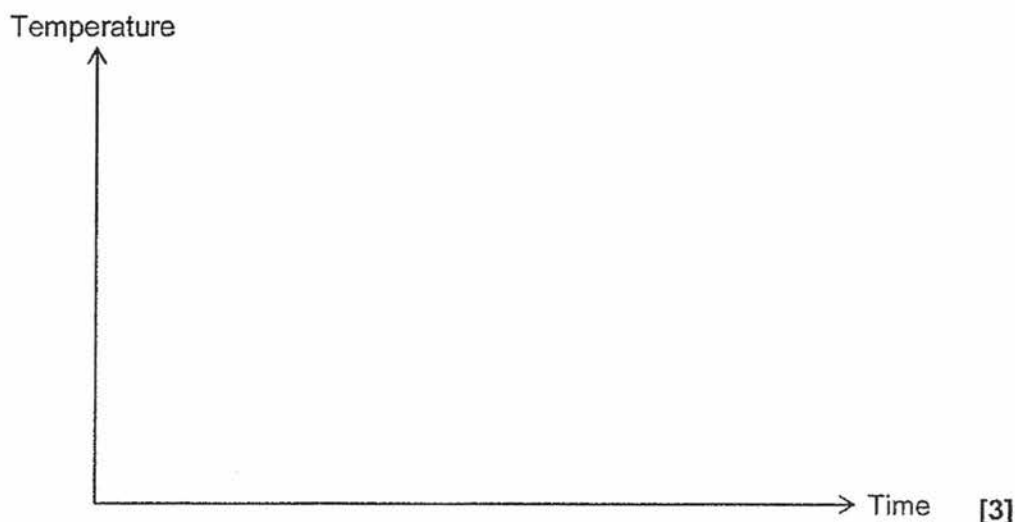
- (a) This substance is an element. [1]
- (b) This substance represents chlorine gas. [1]
- (c) This substance is a mixture of two compounds. [1]
- (d) This substance contains some monoatomic particles. [1]

- 6 Ethyl acetate is a chemical compound. It has a chemical formula of $C_4H_8O_2$. It is colourless and has a characteristic sweet smell found in fruit wines. It has a melting point of $-83\text{ }^{\circ}\text{C}$ and a boiling point of $77\text{ }^{\circ}\text{C}$.

(a) How many atoms are there in one molecule of ethyl acetate?

..... [1]

- (b) A beaker of ethyl acetate is cooled from $100\text{ }^{\circ}\text{C}$ to $20\text{ }^{\circ}\text{C}$. Draw the cooling curve of ethyl acetate in the axes given. Label the essential temperatures on the temperature axis.



- (c) Explain why the temperature of ethyl acetate remains constant when it undergoes boiling.

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

END OF SECTION B

Section C [20 marks]:

Each question carries 10 marks. Answer **ALL** questions and show your working on the writing paper provided.

- 1 Metals are widely used in all aspects of our daily life. Different types of metals are used for different purposes according to their properties.

(a) Aluminium is widely used in the building of airplanes. State two properties of aluminium that makes it a suitable material and explain why. [4]

(b) Duralumin is a metal alloy used to make aircraft engines. It is made with aluminium, magnesium and copper. It has a high melting point of 650 °C. Suggest why this is necessary. [1]

(c) Many metals are also good electrical conductors. The following table shows the electrical conductivity of several types of metals.

Metal	Electrical Conductivity ($\times 10^7$ S/m)
Aluminium	3.50
Copper	5.98
Gold	4.52
Zinc	1.68

The S.I. unit for electrical conductivity is Siemens per metre (S/m). A good electrical conductor has a larger value of electrical conductivity.

(i) Explain what is meant by the term "electrical conductivity". [1]

(ii) Arrange the metals in an ascending order according to their electrical conductivity. [1]

(iii) Silver has an electrical conductivity of 6.30×10^7 S/m. Even though it is a better electrical conductor than copper, copper is still more widely used for making electrical wires. Suggest **two** reasons why this is so. [2]

(d) In recent years, there is increased effort to conserve materials, particularly metals. Explain why this is necessary. [1]

- 2 An experiment was conducted to investigate on the solubility of substances X, Y and Z.

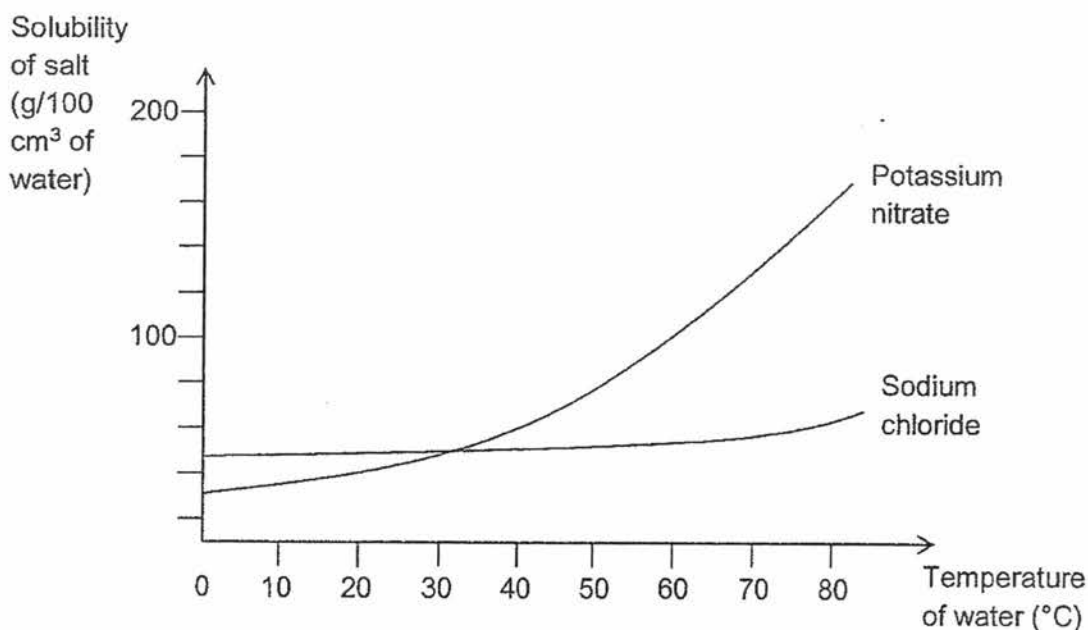
- (a) 15 g of each substance was poured into separate beakers, each containing 50 cm³ of water at 25 °C. The mixtures were stirred vigorously and their appearances were recorded in the following table.

Mixture	X + water	Y + water	Z + water
Appearance	Clear	Cloudy	Clear

- (i) State whether the mixtures of (X + water) and (Y + water) are solutions or suspensions. [1]
- (ii) State two similarities between a solution and a suspension. [2]
- (b) Substance X was identified as sodium chloride (common table salt). Substance Z was identified as potassium nitrate (a type of food preservative). Potassium nitrate has a chemical formula of KNO₃.

State the number of elements found in potassium nitrate. [1]

- (c) The solubility of sodium chloride and potassium nitrate in water is shown in the following graph.



- (i) State the solute and the solvent in the mixture of sodium chloride and water and in the mixture of potassium nitrate and water. [2]
- (ii) Estimate the solubility of sodium chloride and potassium nitrate at 70 °C. State which substance is more soluble in water at 70 °C. [3]
- (iii) Based on the graph, explain how the solubility of the two substances changes as the temperature of the solvent increases. [1]

END OF PAPER

The Periodic Table of the Elements

Group																	
I	II											III	IV	V	VI	VII	0
1 H hydrogen 1																	
7 Li lithium 3	9 Be beryllium 4											11 B boron 5	12 C carbon 6	14 N nitrogen 7	16 O oxygen 8	19 F fluorine 9	20 Ne neon 10
23 Na sodium 11	24 Mg magnesium 12											27 Al aluminium 13	28 Si silicon 14	31 P phosphorus 15	32 S sulfur 16	35.5 Cl chlorine 17	40 Ar argon 18
39 K potassium 19	40 Ca calcium 20	45 Sc scandium 21	48 Ti titanium 22	51 V vanadium 23	52 Cr chromium 24	55 Mn manganese 25	58 Fe iron 26	59 Co cobalt 27	59 Ni nickel 28	64 Cu copper 29	65 Zn zinc 30	70 Ga gallium 31	73 Ge germanium 32	75 As arsenic 33	79 Se selenium 34	80 Br bromine 35	84 Kr krypton 36
85 Rb rubidium 37	88 Sr strontium 38	89 Y yttrium 39	91 Zr zirconium 40	93 Nb niobium 41	96 Mo molybdenum 42	- Tc technetium 43	101 Ru ruthenium 44	103 Rh rhodium 45	106 Pd palladium 46	108 Ag silver 47	112 Cd cadmium 48	115 In indium 49	119 Sn tin 50	122 Sb antimony 51	128 Te tellurium 52	127 I iodine 53	131 Xe xenon 54
133 Cs caesium 55	137 Ba barium 56	139 La lanthanum 57	178 Hf hafnium 72	181 Ta tantalum 73	184 W tungsten 74	186 Re rhenium 75	190 Os osmium 76	192 Ir iridium 77	195 Pt platinum 78	197 Au gold 79	201 Hg mercury 80	204 Tl thallium 81	207 Pb lead 82	209 Bi bismuth 83	- Po polonium 84	- At astatine 85	- Rn radon 86
- Fr francium 87	- Ra radium 88	- Ac actinium 89															

58-71 Lanthanoid series
90-103 Actinoid series

140 Ce cerium 58	141 Pr praseodymium 59	144 Nd neodymium 60	- Pm promethium 61	150 Sm samarium 62	152 Eu europium 63	157 Gd gadolinium 64	159 Tb terbium 65	162 Dy dysprosium 66	165 Ho holmium 67	167 Er erbium 68	169 Tm thulium 69	173 Yb ytterbium 70	175 Lu lutetium 71
232 Th thorium 90	- Pa protactinium 91	238 U uranium 92	- Np neptunium 93	- Pu plutonium 94	- Am americium 95	- Cm curium 96	- Bk berkelium 97	- Cf californium 98	- Es einsteinium 99	- Fm fermium 100	- Md mendelevium 101	- No nobelium 102	- Lr lawrencium 103

a = relative atomic mass
X = atomic symbol
b = proton (atomic) number

Key
a X b

*58-71 Lanthanoid series
*90-103 Actinoid series

Key
a = relative atomic mass
X = atomic symbol
b = proton (atomic) number



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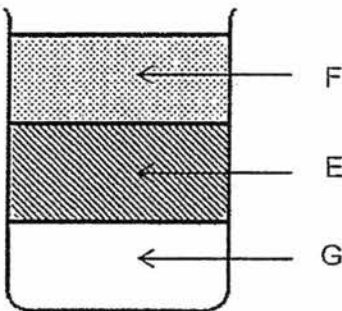
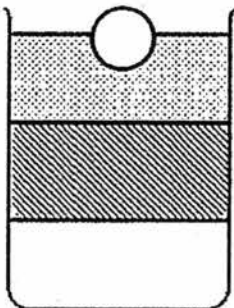
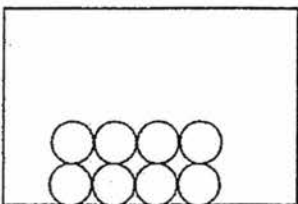
DURATION : 1 H 30 MINS

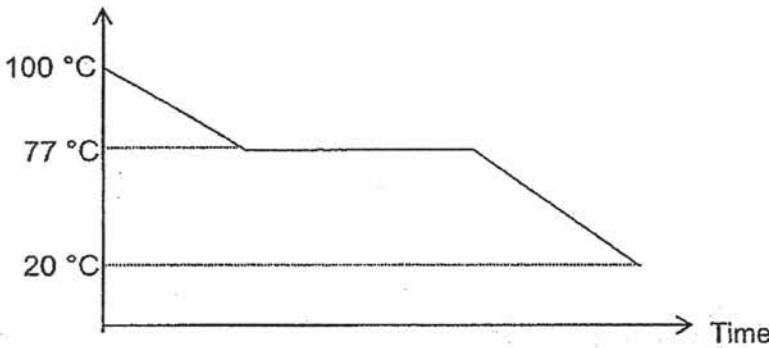
SECTION A MCQ: [20 MARKS]

1	2	3	4	5	6	7	8	9	10
D	D	A	C	A	C	D	D	B	D
11	12	13	14	15	16	17	18	19	20
C	D	A	D	C	B	D	C	B	A

SECTION B STRUCTURED QUESTIONS: [30 MARKS]

Qn	Answers	Total Marks
1(a)(i)	Height of the block / Vertical height of the pipe	[1]
(ii)	Speed of the ball	[1]
(iii)	Size of the ball / mass of the ball / type of ball / shape of ball (Accept only one characteristic of the ball) Length of pipe Amount of force used to push down the ball Type of pipe / surface of pipe / material of the pipe (accept only one) (Any two – [1] each)	[2]
(b)	The higher the wooden block, the faster the speed of the ball bearing rolling down. or: The lower the wooden block, the slower the speed of the ball bearing rolling down.	[1]
2(a)	A: Inner jaw [1] B: Main scale [1]	[2]
(b)	Measure the <u>internal diameter</u> of objects	[1]

(c)(i)	3.14 cm	[1]
(ii)	Volume of cube = $3.14 \text{ cm} \times 3.14 \text{ cm} \times 3.14 \text{ cm}$ [1] $= 31.0 \text{ cm}^3$ [1] <i>Deduct [0.5] for wrong units, [0.5] for wrong s.f. Maximum deduction of [0.5]</i>	[2]
3(a)	 1 / 2 correct – [1] 3 correct – [2] All same substance (e.g. F, F, F) - 0	[2]
(b)(i)	Density = $6.43 \text{ g} \div 4.2 \text{ cm}^3$ [1] $= 1.53 \text{ g/cm}^3$ [1] <i>Deduct [0.5] for wrong units, [0.5] for wrong s.f. Maximum deduction of [0.5]</i>	[2]
(ii)	 <i>Note: Sphere should be partially above the surface of the liquid.</i> <i>Give ECF mark based on (b)(i)</i> <i>Give 0 marks if totally above surface</i>	[1]
4(a)	Butter: <u>Solid</u> [1] Peanut oil: <u>Liquid</u> [1]	[2]
(b)(i)	 -Orderly arrangement -Little gaps in between particles -No overlapping particles give [0] -Deduct [0.5] if not 8 particles	[1]
(ii)	<u>Vibrating about fixed positions</u> (both parts must be present, partial response no marks)	[1]

(c)	Accepted range: Above -2°C but less than 36°C	[1]
5(a)	L	[1]
(b)	L	[1]
(c)	K	[1]
(d)	J	[1]
6(a)	14 atoms	[1]
(b)	Temperature  Shape of graph (downward sloping with horizontal line in the middle) – [1] Label at horizontal line of 77°C – [1] Label at start of graph (100°C) and end of graph (20°C) – [0.5] each Deduct [0.5] in total for temperatures not labelled on the temperature axis	[3]
(c)	Heat energy [0.5] is needed to <u>overcome forces of attraction</u> [0.5] between particles	[1]

SECTION C FREE RESPONSE QUESTIONS: [20 MARKS]

Qn	Answers	Total Marks												
1(a)	<table><tr><th>Property</th><th>Reason</th></tr><tr><td>Lightweight / low density</td><td>Allows plane to light enough to fly</td></tr><tr><td>Corrosion resistant / durable / strong</td><td>Prevents structural damage to plane</td></tr><tr><td>High melting point</td><td>Prevents plane parts from melting due to heat generated</td></tr><tr><td>Malleable</td><td>Able to shape into different parts of the plane</td></tr><tr><td>Waterproof</td><td>Prevents passengers or parts being wet</td></tr></table> [1] for property, [1] for reason Any two property + reason Reason should be correctly linked to the property. If not, no marks awarded for reason	Property	Reason	Lightweight / low density	Allows plane to light enough to fly	Corrosion resistant / durable / strong	Prevents structural damage to plane	High melting point	Prevents plane parts from melting due to heat generated	Malleable	Able to shape into different parts of the plane	Waterproof	Prevents passengers or parts being wet	[4]
Property	Reason													
Lightweight / low density	Allows plane to light enough to fly													
Corrosion resistant / durable / strong	Prevents structural damage to plane													
High melting point	Prevents plane parts from melting due to heat generated													
Malleable	Able to shape into different parts of the plane													
Waterproof	Prevents passengers or parts being wet													
(b)	Must <u>not melt</u> from the heat generated from engines.	[1]												
(c)(i)	Measures how easily electricity can pass through a substance	[1]												
(ii)	Zinc → Aluminium → Gold → Copper	[1]												
(iii)	Copper is cheaper. Copper is more ductile / flexible / bends easily Copper is more commonly found/ more abundant than silver. Copper is less dense / lighter. [1] for each reason Any two reasons	[2]												
(d)	There a limited amount of metal. Metals are non-biodegradable. Metals cause harmful fumes / toxic waste when incinerated. Any one reason	[1]												
2(a)(i)	(X + water) → Solution [0.5] (Y + water) → Suspension [0.5]	[1]												
(ii)	Both are mixtures Both can be separated through physical methods. Both contain more than one type of substance.	[2]												

	The components are not in fixed proportions Components are not chemically combined. <i>Any two reasons, [1] each</i>										
(b)	Number of elements = 3	[1]									
(c)(i)	<table border="1"> <tr> <td>Mixture</td><td>Potassium nitrate + water</td><td>Sodium chloride + water</td></tr> <tr> <td>Solute</td><td>Potassium nitrate</td><td>Sodium chloride</td></tr> <tr> <td>Solvent</td><td>Water</td><td>Water</td></tr> </table> <i>[1] for each correct set of solute and solvent</i>	Mixture	Potassium nitrate + water	Sodium chloride + water	Solute	Potassium nitrate	Sodium chloride	Solvent	Water	Water	[2]
Mixture	Potassium nitrate + water	Sodium chloride + water									
Solute	Potassium nitrate	Sodium chloride									
Solvent	Water	Water									
(ii)	Sodium chloride: 50 – 59 g/100 cm³ [1] Potassium nitrate: 125 – 135 g/100 cm³ [1] Potassium nitrate is more soluble in water at 70 °C [1] <i>Deduct [0.5] for wrong units or no units</i>	[3]									
(iii)	The solubility of the two substances <u>increases</u> as the temperature of the solvent increases.	[1]									