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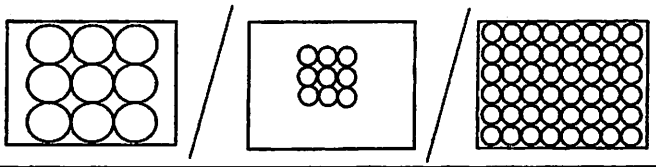
4541/2 CHEMISTRY *Paper* 2

SECTION A

1 (a)		Temperature at which a solid changes into a liquid		1
(b)		Molecule		1
(c)		Naphthalene is a flammable substance // Avoid the naphthalene from sublimate // To ensure that the naphthalene is heated evenly/uniformly		1
(d)		To ensure that the naphthalene is heated evenly/uniformly // Avoid super heating phenomenon		1
(e)	(i)	80 °C		1
	(ii)	heat energy loss to surrounding is	1	
		exactly balanced by the heat energy liberated as the particles / molecules attract one another to form solid.	1	2
	(iii)			1
(f)		Cannot	1	
		Boiling point of water 100 °C // Water will boil at 100 °C // Water bath cannot reached the melting point of sodium nitrate/ 310 °C// Melting point of sodium nitrate is higher than the boiling point of water.	1	2
		TOTAL		**10**

2 (a)	(i)	The **number of protons** found in the nucleus of an atom		1
	(ii)	The **total** number of **protons** and number of **neutrons** in the nucleus of an atom.		1
(b)		number of **electrons** = 10 number of **neutrons** = 10	1 1	2
(c)		Isotopes are different atoms of the same element that have the : ❖ **same proton number** but **different nucleon number** // ❖ **same** *number of protons* but **different** *number of neutrons*		1
(d)	(i)	T and V	1	

	(ii)	$^{35}_{17}T$ and $^{37}_{17}V$	1+1	2
(e)	(i)	2.8.2	1	
	(ii)	12	1	
	(iii)	3	1	...3
		TOTAL		**10**

3 (a)		Formula shows the actual number of atoms of each element that are present in a compound.		1
(b)		1. C = 6 2. H = 12 3. O = 6	1 1 1	3
(c)		CH_2O		1
(d)		360 g		1
(e)	(i)	0.5 mol	1	
	(ii)	3.01×10^{23}	1	2
(f)	(i)	0.88 g		1
	(ii)	11.2 dm^3		1
		TOTAL		**10**

4 (a)	(i)	$MgCl_2$		1
	(ii)	$(NH_4)_2CO_3$		1
(b)	(i)	Magnesium oxide		1
	(ii)	Copper(I) carbonate		1
(c)	(i)	$PbCO_3 \rightarrow PbO + CO_2$ 1. *Correct formula of reactant* 2. *Correct formula of product*	1+1	2
	(ii)	26.7 /267 mol or 0.1 mol		1
	(iii)	21.3 g	1	2
(d)	(i)	$2AgNO_3 + MgCl_2 \rightarrow 2AgCl + Mg(NO_3)_2$ 1. *Correct formula of reactant and product* 2. *Balance chemical equation*	1+1	2
	(ii)	11.2 dm^3		1
		TOTAL		**10**

5 (a)		Nucleon number	1	
(b)		2.7	1	
(c)	(i)	2	1	
	(ii)	Has 2 shell occupied with electron	1	
(d)	(i)	Fluorine atom smaller than Carbon atom	1	
	(ii)	Number of proton in fluorine atom more than carbon atom Attraction between proton and electron become stronger	1 1	
(e)		Advertising light bulbs // indicator light // [*suitable uses*]	1	
(f)		Ne Has stable/octet electron arrangement // have 8 electron valence	1 1	
		TOTAL		**10**

6	(a)	A Lavoisier// J W Dobereiner// J Newlands// L Meyer// Mendeleev// HJG Moseley		1
	(b)	Metal : Q/R/S Non-metal : P/T/U/V/W	1 1	2
	(c)	Group 17 Period 2		1
	(d)	2.8.5		1
	(e) (i)	Same/1 valence electron	1	
		R	1	2
	(f)	Coloured ions/compound Different oxidation numbers Form complex ions Acts as a catalyst [*any two*]	1 + 1	2
	(g)	$2Fe + 3U_2 \rightarrow 2FeU_3$		1
		TOTAL		**10**

SECTION B

7 (a) (i) Anything that occupies space and has mass. 1

(ii) Types of particle :
Atom 1
Ion 1
Molecule 1.....3

(b) Diffusion occurs. 1
Particles of the fried chicken move in between air particles 1
from first floor (higher concentration) to the second floor (lower concentration) 1.....3

(c)

	State I	State II
Arrangement of particles	The particles are **closely packed together in an orderly manner.** There are **very little spaces** between the particles.	The particles are **less closely packed.** They are **not in orderly arrangement.** There are **more spaces** between the particles.
Force of attraction between particles	The particles are attracted by **very strong** forces.	The particles are attracted by **moderately strong forces.**
Kinetic energy of particles	The particles have **very low energy.**	The particles have **moderately high energy.**

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(d) (i)

Model	Scientist
1	Dalton
2	Thomson
3	Rutherford
4	Bohr
5	Chadwick

.....5

(d) (ii)

Subatomic particle	Model 3	Model 5
electron	Elentrons move in a space that is larger than the space occupied by the nucleus.	Elentrons in an atom move in shells around the nucleus.
neutron	No neutron	Existence of neutrons

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8	(a) (i)	Urea consists of carbon , oxygen , nitrogen and hydrogen There are 2 atoms of Nitrogen , 4 atoms of Hydrogen1 atom of carbon and 1 atom of oxygen	1 1.....2
		Molar mass **Compound** / **Molar mass** Ammonium nitrate: 2(14)+4(1)+3(16) = 80 Ammonium sulphate: 2(14+4) +32+4(16) = 132 Urea: 12+16+2(14+2) = 60	1 1 1
		Percentage by mass of nitrogen **Compound** / **% of nitrogen by mass** Ammonium nitrate: $\frac{2(14)}{80} \times 100 = 35.0\ \%$ Ammonium sulphate: $\frac{2(14)}{132} \times 100 = 21.2\ \%$ Urea: $\frac{2(14)}{60} \times 100 = 46.7\ \%$	1 1 1.....6
		Urea Highest percentage of nitrogen	1 1.....2
	(b) (i)	C: $\frac{48.6}{12}$ = 3 ; H: $\frac{8.2}{1}$ = 6 ; O: $\frac{43.2}{16}$ = 2 $C_3H_6O_2$ n[3(12) +6(1) +2(16)] = 74 n= 1 Molecular formula $C_3H_6O_2$	1 1 1 1 1 1....max 5
	(b) (ii)	$2C_3H_6O_2 + 7O_2 \rightarrow 6CO_2 + 6H_2O$ *Chemical formulae of product* *Balanced*	1 1 2
		Number of moles of X = $\frac{9.25}{74}$ // 0.125 1 mol of X produce 3 mol of CO_2 //0.125 mol X produce 3 x 0.125 / 0.375 mol of CO_2 Volume of CO_2 = 0.375 x 24 dm^3 // 9.00 dm^3	1 1 1.....3
		TOTAL	**20**

9	(a)	Group 17 Valence electron 7 Period 3 3 shell occupied with electron	1 1 1 1	4
	(b) (i)	$V_2 + 2NaOH \rightarrow NaV + NaOV + H_2O$ *Chemical formula of reactants* *Chemical formula of products* *Balanced*	 1 1 1	3
	(ii)	V is more reactive Atomic size of V is smaller Attraction force between nucleus and the valence electron becomes stronger V is easier to gain electron	1 1 1 1	4
	(c)	Procedure 1 Pour water into a beaker/basin 2 A small piece of A is cut using a knife 3 The oil on the surface of A is removed using filter paper 4 A is then placed slowly on the surface of water in the beaker/basin 5 The experiment is repeated using D Observation A moves slowly on the surface of water D moves rapidly/faster/vigorously on the surface of water Equations $2A + 2H_2O \rightarrow 2AOH + H_2$ // $2D + 2H_2O \rightarrow 2DOH + H_2$ [*Correct formulae of reactants and products*] [*Balanced equation*]	 1 1 1 1 1 1 1 1 1	9
		TOTAL		**20**

10	(a)	Reactants :HCl and Mg Products : $MgCl_2$ and H_2 //HCl react with Mg to produce $MgCl_2$ and H_2 HCl, aqueous solution, Mg, solid, $MgCl_2$ aqueous solution and H_2, gas **2 mole of HCl react with 1 mole of Mg to produce 1 mole of $MgCl_2$ and 1 mole of H_2.**	1 1 1 1	4
	(b) (i)	Copper(II)oxide Carbon dioxide $CuCO_3 \rightarrow CuO + CO_2$	1 1 1	3

	(ii)	Yellow precipitate $2KI + Pb(NO_3)_2 \rightarrow PbI_2 + 2KNO_3$ *Formula of reactants and products are correct* *Balance*	1 1 1..... 3
	(c)	1. A crucible with its lid is weighed 2. About [4-12 cm] of magnesium tape is cleaned with sandpaper 3. The crucible , its lid and magnesium are weighed 4. The crucible is heated strongly until magnesium lights up 5. As soon as the magnesium starts to burn , the crucible is closed using its lid. 6. The heating is continued and the the crucible lids is opened and shut rapidly once in a while to prevent white smoke from being released into the surroundings. 7. When the magnesium tape is no longer blazing , the lid is removed and the crucible is heated strongly to ensure the complete burning of the magnesium. 8. The crucible and its contents are left to cool and weighed again 9. The crucible and its contents are heated , cooled and weighed again until a constant mass is obtained. 10. results Mass of crucible + lid = a g Mass of crucible + lid + magnesium = b g Mass of crucible + lid + magnesium oxide = c g Calculation Mg O Mass (g) b-a c-b Number of moles $\frac{b-a}{24} = x$ $\frac{c-b}{16} = y$ Empirical formula = Mg_xO_y	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1..max 10
		TOTAL	**20**