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CHEMISTRY

Unit 1

Trial Examination

SOLUTIONS BOOK

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SEMESTER 1

Use this page as an overlay for marking the multiple choice answer sheets. Simply photocopy the page onto an overhead projector sheet. The correct answers are open boxes below. Students should have marked their answers with a cross. Therefore, any open box with a cross inside it is correct and scores 1 mark.

1.	A	B	C	
2.	A	B	C	
3.	A		C	D
4.	A	B		D
5.		B	C	D
6.	A		C	D
7.	A	B	C	
8.	A	B		D
9.	A	B	C	
10.	A	B		D

11.	A		C	D
12.	A	B		D
13.	A		C	D
14.		B	C	D
15.	A	B		D
16.	A	B	C	
17.	A	B	C	
18.	A	B		D
19.	A	B	C	
20.	A	B		D

SECTION A (1 mark for each correct response)

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

SECTION B

Question 1

Material A could be a covalent network lattice or a covalent layer lattice. (1 mark)
Material B is covalent molecular. (1 mark)
Material C is ionic. (1 mark)
Material D is metallic. (1 mark)

Question 2

(a) (i) D (ii) Z (iii) E (iv) M (v) L

(vi) A (vii) T (as TCl_3) (7 marks)

(b) A_2Z (1 mark)

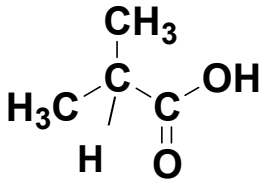
(c) (i) 2.8.3 (1 mark) (ii) 2.8 (1 mark) (iii) 2.8.8 (1 mark)

Question 3

(a) Isomers are molecules with the same molecular formula but a different structure. (1 mark)

(b) $CH_3CH_2CH_2COOH$ (2 marks)

(c)



(1 mark)

Question 4

MgS (1 mark)

iron(III) dichromate (1 mark)

$Cu(NO_3)_2$ (1 mark)

aluminium sulfite (1 mark)

$CH_3CHClCH_3$ (1 mark)

1-hexene (hex-1-ene) or 2-hexene (hex-2-ene) or 3-hexene (hex-3-ene) or cyclo-hexane (1 mark)

1-propanol or 2–propanol (1 mark)

$CH_3CH_2CH_2CH_2COOH$ (1 mark)

1-chloro-2-pentene or 1-chloropent-2-ene (1 mark)

Question 5

(a) 2.8.2 (1 mark)

(b) (i) A continuous network lattice of Mg^{2+}cations in a sea of delocalised valence electrons. (1 mark)

(ii) Electrostatic attraction between cations and valence electrons called 'metallic bonding'. (1 mark)

(c) Any of the following (1 mark each of two only): malleable, ductile, good conductor of heat, good conductor of electricity, lustrous (or shiny).

(d) examples include:

- malleable because the electrons move with any deformation and the bonding stays intact. (1 mark)
- good conductors of heat as the mobile valence electrons quickly transfer the heat energy from one side of the substance to the other. (1 mark)

(e) 2.7 (1 mark)

(f) (i) Fluorine is made up of discrete F_2 molecules. (1 mark)

(ii) A covalent bond exists between the two fluorine atoms **within** a molecule. (1 mark) In liquid fluorine, weak dispersion forces exist between molecules. (1 mark)

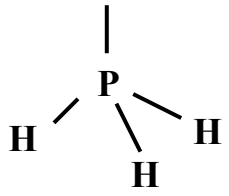
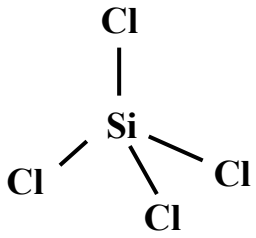
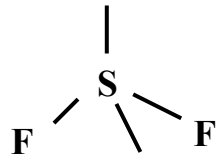
(g) (i) Every magnesium atoms loses two electrons to form Mg^{2+} with the electron configuration of 2.8 (1 mark). Each fluorine atoms gains one electron to form F^- with an electron configuration of 2.8 (1 mark).

(ii) MgF_2 (1 mark)

(h) Ionic (1 mark)

Question 6

(a) (1 mark for the valence structure, 1 mark for the name of the shape)

Molecule	Valence Structure	Name of Shape
PH_3		Triangular pyramid (pyramidal)
$SiCl_4$		Tetrahedral
SF_2		V-shaped or angular

(b) PH_3 Non-polar: There is no electronegativity difference between the bonded atoms. (1 mark)

$SiCl_4$ Non-polar: Although (bond) dipoles exist due to the electronegativity difference between the Si and Cl atoms, the molecule is symmetrical and bond dipoles effectively sum to zero. (1 mark)

SF_2 Polar: Significant (bond) dipoles exist due to the electronegativity difference between the S and F atoms and the molecule is not symmetrical. (1 mark)

Question 7

(a) The water expands as it freezes (1 mark) and the pipes could crack.

(b) Water is different to most liquids as it expands when it freezes. The water molecules are arranged in an open lattice structure (1 mark) with slightly less nearest neighbours than in the liquid (1 mark), giving ice a lower density.

(c) (i) $Zn(NO_3)_2(aq) + Na_2CO_3(aq) \rightarrow ZnCO_3(s) + 2NaNO_3(aq)$

(3 marks ; ½ mark for each correct formula and 1 mark for balance)

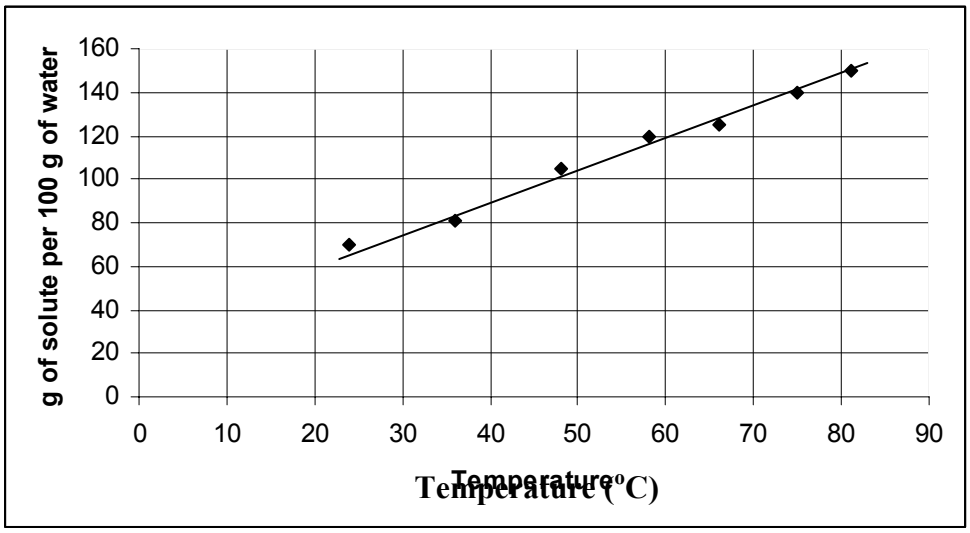
(ii) $Zn^{2+}(aq) + CO_3^{2-}(aq) \rightarrow ZnCO_3(s)$ (1 mark)

Question 8

(a) (i)

Temperature (°C)	g (solute) per 100g solvent
24	**70**
36	**81**
48	**105**
58	**120**
66	**125**
75	**140**
81	**150**

Table completed correctly (1 mark)



Axes labelled (1 mark) Graph drawn correctly (1 mark)

(ii) Approximately 120 ± 3 g per 100 g
Therefore the mass is 600 ± 15 g in 500 g of solution. (1 mark)

(b) 5%(m/v) is 5 g per 100 mL,
In 400 mL, must be a mass of 20 g of hydrogen peroxide (1 mark)
Hence 20 g in final 8.0 L of diluted solution
20 g per 8000 mL
20/80 g per 100 mL = 0.25 % (m/v) (1 mark)

Question 9

(a) $C_5H_{12}(g) + 8O_2(g) \rightarrow 5CO_2(g) + 6H_2O(g)$

(b) $4Cr(s) + 3O_2(g) \rightarrow 2Cr_2O_3(s)$

(In each equation, 1 mark is given for correct identification of products and 1 mark for correct balance. 1 mark overall is to be awarded for consistent use of states. This gives a total of 5 marks for this question.)

END OF SUGGESTED SOLUTIONS