Rewarding Learning

ADVANCED SUBSIDIARY (AS)
General Certificate of Education
2017

Chemistry

Assessment Unit AS 1

assessing

Basic Concepts in Physical and Inorganic Chemistry

[AC112]

FRIDAY 26 MAY, MORNING

MARK SCHEME

General Marking Instructions

Introduction

Mark schemes are published to assist teachers and students in their preparation for examinations. Through the mark schemes teachers and students will be able to see what the examiners are looking for in response to questions and exactly where the marks have been awarded. The publishing of the mark schemes may help to show that examiners are not concerned about finding out what a student does not know but rather with rewarding students for what they do know.

The purpose of mark schemes

Examination papers are set and revised by teams of examiners and revisers appointed by the Council. The teams of examiners and revisers include experienced teachers who are familiar with the level and standards expected of students in schools and colleges.

The job of the examiners is to set the questions and the mark schemes; and the job of the revisers is to review the questions and mark schemes commenting on a large range of issues about which they must be satisfied before the question papers and mark schemes are finalised.

The questions and the mark schemes are developed in association with each other so that the issues of differentiation and positive achievement can be addressed right from the start. Mark schemes, therefore, are regarded as part of an integral process which begins with the setting of questions and ends with the marking of the examination.

The main purpose of the mark scheme is to provide a uniform basis for the marking process so that all the markers are following exactly the same instructions and making the same judgements in so far as this is possible. Before marking begins a standardising meeting is held where all the markers are briefed using the mark scheme and samples of the students' work in the form of scripts. Consideration is also given at this stage to any comments on the operational papers received from teachers and their organisations. During this meeting, and up to and including the end of the marking, there is provision for amendments to be made to the mark scheme. What is published represents the final form of the mark scheme.

It is important to recognise that in some cases there may well be other correct responses which are equally acceptable to those published: the mark scheme can only cover those responses which emerged in the examination. There may also be instances where certain judgements may have to be left to the experience of the examiner, for example where there is no absolute correct response – all teachers will be familiar with making such judgements.

Section A

		AVAILABLE MARKS
1 D		
2 C		
3 B		
4 D		
5 B		
6 B		
7 A		
8 C		
9 D		
10 D		
[2] for each correct answer	[20]	20
	Section A	**20**

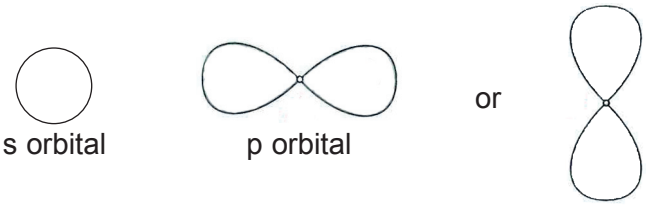
Section B

AVAILABLE MARKS

11 **(a)** s-block [1]
Outer electrons are in the s subshell [1] [2]

(b) **(i)** $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2$ [1]

(ii)



([1] each) [2]

(c) **(i)** The average (weighted mean) mass of an atom of an element relative to one-twelfth of the mass of an atom of carbon-12.
([–1] for each mistake) [2]

(ii) 3877.6 + 27.3 + 5.59 + 91.96 + 9.12 = 4011.57
4011.57/100 = 40.1157 = 40.12
(Must be two decimal places) [2]

(d) **(i)** Brick red [1]

(ii) Electrons (from low levels) excited to higher energy levels [1]
Lose energy and return to lower levels [1]
Emit (energy as) light [1] [3]

Quality of written communication [2] 15

AVAILABLE MARKS

12 **(a)** **(i)**

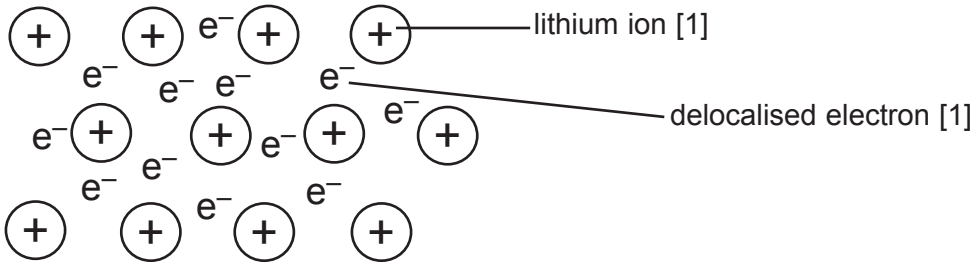
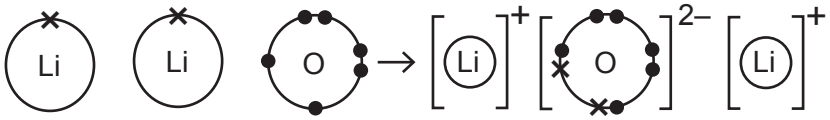


diagram [1]
(Must be labelled) [3]

(ii) Delocalised electrons can move [1]
and carry an (electric) current/charge [1] [2]

(iii) Magnesium has more/twice as many delocalised electrons [1]

(b) **(i)**



([–1] for each mistake) [3]

(ii) high melting point
high boiling point
conducts electricity when molten
conducts electricity when in solution
(any 2 to a maximum of [2]) [2]

(c) **(i)** (one) delocalised electron (from each carbon (can move)) [1]

(ii) all the outer electrons are involved in bonding/no delocalised electrons [1]

13

				AVAILABLE MARKS
13	**(a)**	A solution of known concentration	[1]	
	(b)	methyl orange/phenolphthalein [1] red to yellow/colourless to pink or red ([2] or [1] if correct colours are reversed)	[3]	
	(c)	(20 × 2)/1000 = 0.04 (22.4 × 0.1)/1000 = 0.00224 0.00224 0.0224 0.04 – 0.0224 = 0.0176 0.0176/2 = 0.0088 0.0088 × 197 = 1.7336 g ([–1] for each mistake, to a maximum of [5]) 1.7336/1.85 × 100 = 93.708 = 93.71 [5] or (1.734/1.85) × 100 = 93.73 %	[1]	
	(d)	Impurities in the Witherite do not react with the hydrochloric acid	[1]	11

AVAILABLE MARKS

14 (a) (i)

	fluorine	chlorine	bromine	iodine
appearance at room temperature		Green/ yellow-green/ green-yellow gas	Red-brown liquid	Grey-black/ black solid
boiling point / °C				
first ionisation energy / kJ mol^{-1}				

([–1] for each mistake) [3]

(ii) Atoms get heavier/more electrons (down the group) [1]
Greater/increased van der Waals forces [1] [2]

(iii) Outer electrons further from the nucleus/increased atomic radius/ increased shielding [1]
Nucleus has less attraction/pull/hold on the outer electron/outer electron easier to remove [1] [2]

(b) (i) $I_2 + 2OH^- \rightarrow I^- + IO^- + H_2O$ [2]

(ii) $3I_2 + 6OH^- \rightarrow 5I^- + IO_3^- + 3H_2O$ [2]

(c) Oxidation numbers: I in IO_3^- +5, in I^- –1 and in I_2 0 [2]
Oxidised from –1 to 0 and reduced +5 to 0 [1] [3]

(d) (i) $2Fe^{3+} + 2I^- \rightarrow 2Fe^{2+} + I_2$ [1]

(ii) yellow/orange to yellow/brown (yellow to yellow is not a change) [2]

(e) Misty gas/purple vapour/grey-black solid/yellow solid/smell of rotten eggs/ heat given out (to a maximum of 3) [3]

(f) (i) The addition of fluoride ions to the water supply [1]

(ii) Advantage: reduces tooth decay [1]
Disadvantage: mass medication/freedom choice or may cause a mottling effect on teeth [1] [2]

23

AVAILABLE MARKS

15 (a) (i) Atoms which have the same atomic number/number of protons but different mass numbers/numbers of neutrons [1]

(ii)

	114	114	114
	173	175	178
	114	114	114

([–1] for each mistake) [2]

(iii) There is no difference as they all have the same number of electrons [1]

(b) (i) Period 7 [1]

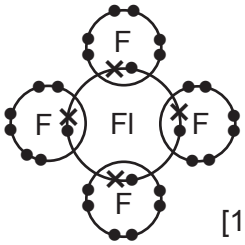
(ii) Group 4/iv [1]

(c) (i) $Fl + 2F_2 \rightarrow FlF_4$ [1]

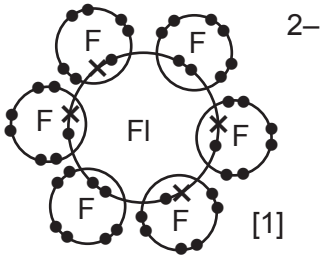
(ii) $FlH_4 \rightarrow FlH_2 + H_2$ [1]

(iii) $FlO + H_2O \rightarrow FlO_2^{2-} + 2H^+$ [1]

(iv)



[1]



[1]

[2]

(v) FlF_4: tetrahedral [1]

FlF_6^{2-}: octahedral [1] [2]

(d) (i) $Fl(g) \rightarrow Fl^+(g) + e^-$ [2]

(ii) E = hf or E/h = f

$823\,900/6.63 \times 10^{-34} = 1.243 \times 10^{39}$

$(1.243 \times 10^{39})/(6.02 \times 10^{23}) = 2.065 \times 10^{15}\ s^{-1}$

or

$$\frac{823.9 \times 10^3}{6.63 \times 10^{-34} \times 6.02 \times 10^{23}} = 2.06426 \times 10^{15}\ s^{-1}$$

[3] 18

Section B	**80**
Total	**100**