Rewarding Learning

ADVANCED SUBSIDIARY (AS)
General Certificate of Education
January 2014

Chemistry

Assessment Unit AS 1

assessing

Basic Concepts in Physical and Inorganic Chemistry

[AC112]

THURSDAY 9 JANUARY, 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	B		
2	D		
3	B		
4	C		
5	B		
6	B		
7	A		
8	C		
9	B		
10	A		
[2] for each correct answer		[20]	20
		Section A	**20**

Section B

AVAILABLE MARKS

11 Each mistake is [–1]

AgCl	white	ionic	yes	yes		
AgBr	cream	ionic	no	yes		
AgI	yellow	ionic	no	no	[4]	4

12 **(a)** **(i)** K = +1; Cl = +5; O = –2; S = 0 [1]

(ii) K = +1; Cl = –1; O = –2; S = +4 [1]

(iii) Cl oxidation number goes down and S oxidation number goes up [1]

(b) **(i)** $6KOH + 3Cl_2 \rightarrow KClO_3 + 5KCl + 3H_2O$ [2]

(ii) hot and concentrated (potassium hydroxide solution) [1]

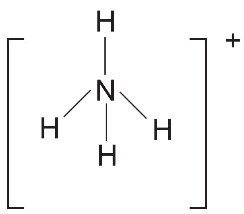
(c) **(i)** P_2S_3 [1]

(ii) covalent as both elements are non-metals/covalent as small difference in electronegativity between P and S [1]

(iii) phosphorus trioxide or pentoxide/phosphorus oxide [1]
sulfur oxide or sulfur dioxide [1] [2]

(d) **(i)** NH_4^+ [1]

(ii) tetrahedral [1]
109º/109.5° [1]



[1] [3]

(iii) $(NH_4)_3PO_4/PO_4(NH_4)_3$ [1]

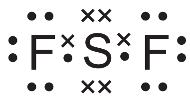
(iv) melting point which is high because of attraction between ions [1]
boiling point which is high because of attraction between ions [1]
electrical conductivity which is high in solution or molten because ions can move [1]
solubility, ions are surrounded by H_2O molecules [1]
3 from 4 [3]

Quality of written communication [2] 20

						AVAILABLE MARKS
13	(a)	$7s^1$			[1]	
	(b)	(i)	1		[1]	
		(ii)	LHS = 197 + 18 = 215 RHS = 210 + 5 × 1 = 215		[2]	
		(iii)	electrons have negligible mass/one two thousandth relative mass		[1]	
	(c)	(i)	the extent to which an atom attracts the bonding electrons in a covalent bond		[2]	
		(ii)	electronegativity increases across a period		[1]	
	(d)	(i)	sea of positive ions surrounded by electrons attraction between positive ions and electrons is weak	[1] [1]	[2]	
		(ii)	electrons move and conduct/carry electricity large radius of Fr means less attraction for electrons	[1] [1]	[2]	
	(e)	(i)	$Fr \rightarrow Fr^+ + e$		[1]	
		(ii)	$Cl_2 + 2e \rightarrow 2Cl^-$		[1]	
		(iii)	$2Fr + Cl_2 \rightarrow 2FrCl$		[1]	
		(iv)	regular arrangement of (francium and chloride) ions		[1]	16

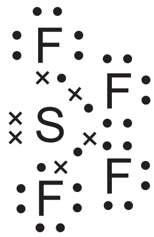
				AVAILABLE MARKS
14	**(a)**	E = hf E is energy, h is Planck's constant, f is frequency E in joules, h in J s, f in Hz or s^{-1}	[3]	
	(b)	**(i)** visible	[1]	
		(ii) infrared	[1]	
		(iii) the atom has ionised/lost the electron	[1]	
	(c)	**(i)** ↑ ⇅ ⇅ ⇅ ⇅ ⇅	[2]	
		(ii) yellow/orange	[1]	9
15	**(a)**	$Fe(s) + 2H^{+}(aq) \rightarrow Fe^{2+}(aq) + H_2(g)$	[2]	
	(b)	**(i)** $2Fe^{2+} + Cl_2 \rightarrow 2Fe^{3+} + 2Cl^{-}$	[1]	
		(ii) yellow/orange	[1]	
		(iii) yes, bromine is a sufficiently powerful oxidising agent	[1]	
	(c)	$FeCl_2$ = 56 + 2 × 35.5 = 127 69 g = 69/127 = 0.54 mol = 5.4 M	[3]	
	(d)	mass of iron(II) chloride = 14.1 – 6.5 = 7.6 moles of iron(II) chloride = 7.6/127 = 0.0598 moles of water = 6.5/18 = 0.36 ratio of moles = 0.36:0.0598 = 6.02 $FeCl_2.6H_2O$	[5]	13

16 **(a)** SF_2



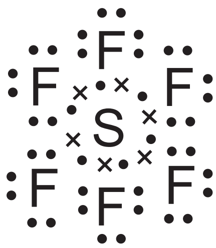
[1]

SF_4



[1]

SF_6

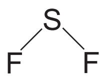


[1] [3]

(b) **(i)** when forming a compound an atom tends to gain, lose or share electrons in its outer shell to achieve 8 [2]

(ii) SF_2 yes; SF_4 no; SF_6 no, there are 10 and 12 electrons around S [2]

(c) shape



[1]

bent [1]
104.5° – 6° = 98.5° [1] [3]

(d) **(i)** 90° [1]

(ii) the six bonds repel each other [1]
as far apart from each other as possible [1] [2]

(iii) the molecule is symmetrical
or dipoles cancel [1]

(e) **(i)** sulfur tetrafluoride [1]

(ii) sulfur hexafluoride has the greatest mass hence the greatest van der Waals [1]

(iii) SF_4 is polar (SF_6 is non-polar) [1]
polar forces greater than van der Waals [1] [2]

AVAILABLE MARKS: 18

Section B **80**

Total **100**