Rewarding Learning

ADVANCED SUBSIDIARY (AS)
General Certificate of Education
2019

Chemistry

Assessment Unit AS 1

assessing

Basic Concepts in Physical and Inorganic Chemistry

[SCH12]

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

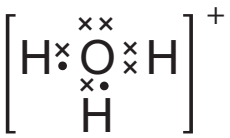
Section B

AVAILABLE MARKS

11 **(a)** Bent [1]

Two lone pairs and two bonding pairs [1]

(Shape adopted) minimises repulsion [1] [3]

(b) **(i)**  [2]

(ii) As there is only one lone pair [1]

No lone pair – lone pair repulsion/less lone pair – bond pair repulsion [1] [2]

(iii) Repulsion between positively charged ions [1] 8

12 **(a)** **(i)** The number of protons in (the nucleus of) an atom [1]

(ii) The (total) number (numbers) of protons and neutrons in (the nucleus of) an atom [1]

(iii) Atoms which have the same atomic number but a different mass number (contain the same number of protons but a different number of neutrons) [1]

(b) Tennessine [1]

177 neutrons [1] [2]

(c) Seven electrons in the outer energy level [1]

(d) **(i)** The mass of an atom of an isotope of an element relative to one-twelfth of the mass of an atom of carbon-12 [2]

(ii) 167.26 = [(161.93 × 0.14) + (163.93 × 1.60) + (165.93 × 33.50) +

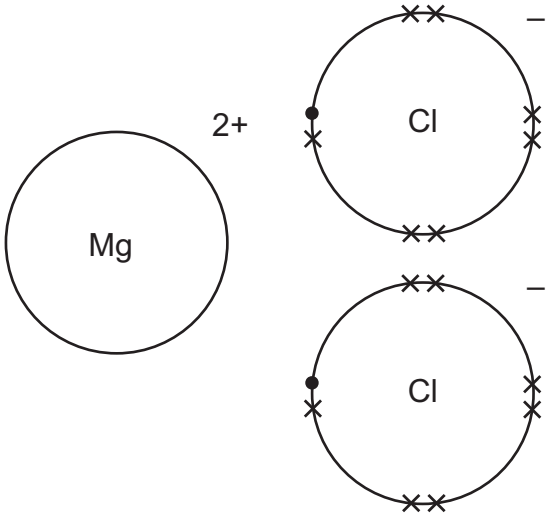
(RIM × 22.87) + (167.93 × 26.98) + (169.94 × 14.91)]/100

RIM = 166.94 [3] 11

			AVAILABLE MARKS
13	**(a)**	$Au + 3HNO_3 + 4HCl \rightarrow HAuCl_4 + 3NO_2 + 3H_2O$ [2]	
	(b)	**(i)** +3 [1]	
		(ii) Au 0 → +3 [1] Cl 0 → –1 [1] 0 to +3 oxidation and 0 to –1 reduction [1] [3]	
	(c)	**(i)** Small difference/similar in (electronegativity) between gold and chlorine/the elements [1]	
		(ii) white fumes/smoke/solid with stopper from bottle of concentrated ammonia solution/glass rod dipped in concentrated ammonia solution [2]	9
14	**(a)**	$1s^2 2s^2 2p^6 3s^1$ [1] Outer electron in an s orbital/sub-shell [1] [2]	
	(b)	**(i)** Number of atoms in 12.000 g of carbon-12 [1]	
		(ii) 6(.0)/58.5 = 0.103 $0.103 \times (6.02 \times 10^{23}) = 6.2 \times 10^{22}$ [2]	
	(c)	**(i)** High melting point [1] Unreactive [1] [2]	
		(ii) Cleans the wire [1] Helps the solid stick to the wire [1] Forms (volatile) chlorides [1] to a maximum of [2] [2]	
		(iii) Yellow/orange [1]	
	(d)	Dissolve the solid in water/dilute nitric acid [1] Add silver nitrate solution [1] White [1] precipitate [1] [4]	
	(e)	Add solid to a (named) dilute acid [1] (Bubble the) gas produced Limewater turns milky [3]	

AVAILABLE MARKS

(f) **(I)**



[2]

(ii) $Na_2CO_3 + MgCl_2 \rightarrow 2NaCl + MgCO_3$ [2]

(iii) Relative formula mass of magnesium carbonate = 84

Number of moles of magnesium carbonate = 1.4/84 = 0.0167

Number of moles of sodium carbonate = 0.0167

Relative formula mass of sodium carbonate = 106

Mass of sodium carbonate in the sample = 0.0167 × 106 = 1.77 g

Percentage of sodium carbonate in the sample

$= \frac{1.77}{6.0} \times 100 = 29.5 = 30\%$ error [–1] [6] 27

15 **(a)** Increase (across the period) [1]

Increasing nuclear charge/Atomic radius decreases [1]

Outer electron (in same shell) more strongly attracted to the nucleus [1] [3]

(b) **(i)** $P(g) \rightarrow P^+(g) + e^-$ [2]

(ii) P has half-filled p sub-shell [1]

Half-filled (p) sub-shells have stability increased [1] [2]

(c) Indicative Content – comments related to melting points

- Silicon – giant covalent
- Many strong covalent bonds to be broken
- P, S, Cl molecular
- Argon exists as individual atoms
- Comment on van der Waals between molecules
- van der Waals depend on RMM/RAM
- Comparison of any 2 of the elements P to Ar

Response	Mark
Candidates must use appropriate specialist terms to describe fully the trend in melting point from silicon to argon (using a minimum of 6 points of indicative content including reference to all three distinct parts of the trend). They use good spelling, punctuation and grammar and the form and style are of a high standard.	[5]–[6]
Candidates must use appropriate specialist terms to describe the trend in melting point from silicon to argon (using a minimum of 4 points of indicative content). They use satisfactory spelling, punctuation and grammar and the form and style are of a satisfactory standard.	[3]–[4]
Candidates briefly and partially describe the trend in melting point from silicon to argon (using a minimum of 2 points of indicative content). They use limited spelling, punctuation and grammar and they have made little use of specialist terms. The form and style are of a limited standard.	[1]–[2]

[6] 13

16 **(a)** $Pb(NO_3)_2 + 2KI \rightarrow PbI_2 + 2KNO_3$ [2]

(b) 75.6 mg = 0.0756 g

Moles lead iodide in 100 cm^3 = 0.0756/461 = 1.64×10^{-4}

Moles of iodide ions in 100 cm^3 = 3.280×10^{-4}

Molarity of iodide ions = $3.280 \times 10^{-4}/0.1 = 3.28 \times 10^{-3}$ M [4]

(c) **(i)** yellow/brown [1]

(ii) blue-black [1]

(d) **(i)** Any **three** from:
steamy/misty fumes
violet/purple vapour
smell of rotten eggs
yellow solid
grey-black solid (on the sides of the test-tube) [3]

(ii) Phosphoric acid is not an oxidising agent [1] 12

Section B **80**

Total **90**

AVAILABLE MARKS