New Specification

Rewarding Learning

ADVANCED SUBSIDIARY (AS)
General Certificate of Education
2017

Chemistry

Assessment Unit AS 1

assessing

Basic Concepts in Physical and Inorganic Chemistry

[SCH12]

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

Section B

AVAILABLE MARKS

11 **(a)** **(i)** $H_2S_2O_3 + 2H_2O \rightarrow 2H_3O^+ + S_2O_3^{2-}$

or

$H_2S_2O_3 \rightarrow 2H^+ + S_2O_3^{2-}$ [2]

(ii) HSO_4^- [1]

(b) **(i)** $(NH_4)_2SO_4$ [1]

(ii) oppositely charged ions are held together by electrostatic forces of attraction error [–1] [2]

(c) NH_4^+: warm with (dilute) sodium hydroxide solution [1]
(the gas produced) gives white fumes with (a glass rod dipped in) concentrated HCl [1]
SO_4^{2-}: add a solution of barium chloride [1]
a white precipitate forms [1] [4] 10

12 **(a)** (attraction) between positive sodium ions [1] and delocalised electrons [1] [2]

(b) increase in charge of metal ion/aluminium ion has 3+ compared to 1+ in sodium [1]
increase in the number of electrons in delocalised cloud/sea [1] [2]

(c) **(i)** $Na(g) \rightarrow Na^+(g) + e^-$ [2]

(ii) 1st and 2nd values [1]
large gap between [1] [2]

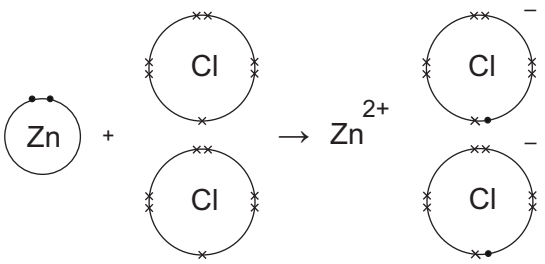
(iii) A region within an atom that can hold up to two electrons [1] with opposite spin [1]. [2]

(d) **(i)** (Electrostatic) attraction between a shared pair of electrons and the nuclei of bonded atoms. [2]

(ii) $2Al + 3Cl_2 \rightarrow 2AlCl_3$ [1]

(iii) When forming a compound, an atom tends to gain, lose or share electrons [1] to achieve eight in its outer shell. [1]
Aluminium has six electrons in the outer shell } [1]
Chlorine has eight
[3] 16

13 (a)



Outer shell of zinc could show ten electrons [2]

(b) (i) 3.85 ÷ 161 = 0.024/0.0239 [1]

(ii) 5.65 – 3.85 = 1.80 g [1]

(iii) 1.80 ÷ 18 = 0.1/0.10 [1]

(iv) 0.0239 : 0.10
1 : 4.18/4.2/4.0/4
X = 4.18/4.2/4.0/4 [1]

(c) Indicative content

- (Weigh out) 7.18 g of zinc sulfate *
- in a beaker/suitable container
- Dissolve the solid in a small amount (50–100 cm^3) of distilled/deionised water
- Transfer the solution/with washings
- to the 250.0 cm^3 volumetric flask *
- and make up to the mark
- Stopper and invert the flask

* essential for [6] in Band A
If either * missing max [5]

Band	Response	Mark
A	Candidates must use appropriate specialist terms to fully explain the preparation of the standard solution using 6 points of indicative content. They must use good spelling, punctuation and grammar and the form and style are of an excellent standard.	[5]–[6]
B	Candidates must use appropriate specialist terms to explain the preparation of the standard solution using a minimum of 4 points of indicative content. They must use satisfactory spelling, punctuation and grammar and the form and style are of a good standard.	[3]–[4]
C	Candidates must partially explain the preparation of the standard solution using a minimum of 2 points of indicative content. They use limited correct spelling, punctuation and grammar and the form and style are of a basic standard.	[1]–[2]
D	Response not worthy of credit.	[0]

[6]

AVAILABLE MARKS

12

14 **(a)** $N_2 + 3H_2 \rightleftharpoons 2NH_3$ [2]
([–1] each error)

(b) **(i)** $P_4 + \mathbf{3}NaOH + \mathbf{3}H_2O \rightarrow \mathbf{3}NaH_2PO_2 + PH_3$ [1]

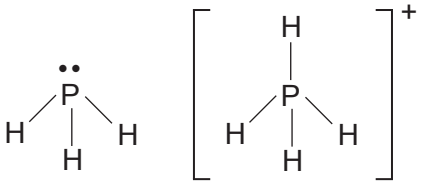
(ii) $P_4 = 0$ [1]
$NaH_2PO_2 = +1$ [1]
$PH_3 = -3$ [1] [3]

(iii) 0 to +1 is oxidation; 0 to –3 is reduction [1]
oxidation and reduction of the same element [1]
in the same reaction [1] [3]

(c) Between molecules of NH_3 there are van der Waals' forces and H-bonds [1]
Between molecules of PH_3 there are only van der Waals' forces [1]
Hydrogen bonds are stronger and require more energy to break. [1] [3]

(d) **(i)** dative covalent/co-ordinate bond [1]

(ii)

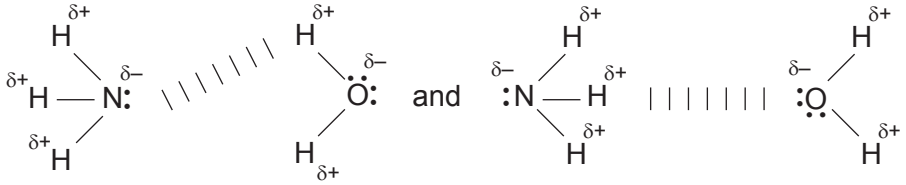


[2]

pyramidal tetrahedral [2]

(iii) PH_3 has one lone pair/3 bond pairs [1]
greater repulsion between lone pair–bond pair [1]
pushes bond pairs closer together/reduces bond angle [1] [3]

(e)



[2] [2] [4]

AVAILABLE MARKS

24

				AVAILABLE MARKS
15	**(a)**	**(i)**	$6.8 \times 1000 = 6800\,g$ $6800 \div 17 = 400$ $NH_3 : O_2$ $4 : 5$ Moles of $O_2 = 500$ ([–1] each error) [3]	
		(ii)	$NO : NO_2$ $1 : 1$ Moles of $NO_2 = 400$ [2]	
		(iii)	$400 \times (\frac{2}{3}) = 266.6667$ Concentration $= 266.667 \div 50 = 5.33$ mol dm^{-3} $5.33 \times 63 = 336$ g dm^{-3} ([–1] each error) [3]	
	(b)	**(i)**	Methyl orange [1] Yellow [1] to red [1] [3]	
		(ii)	$\frac{(21.30 + 21.40)}{2} = 21.35\ cm^3$ [1]	
		(iii)	$0.05 + 0.05 = 0.1\ cm^3$ [1]	
		(iv)	$\frac{(21.35 \times 0.100)}{1000} = 2.135 \times 10^{-3}$ $NH_3 : HNO_3$ $1 : 1$ moles of diluted ammonia in 25 $cm^3 = 0.002135$ moles of diluted ammonia in 250 $cm^3 = 0.02135$ concentration of diluted ammonia $= 0.02135 \div 0.25 = 0.0854$ concentration of undiluted ammonia $= 0.0854 \times 10 = 0.854$ mol dm^{-3} ([–1] each error) [5]	18
			Section B	**80**
			Total	**90**