Rewarding Learning

ADVANCED SUBSIDIARY (AS)
General Certificate of Education
2013

Chemistry

Assessment Unit AS 2

assessing

Module 2: Organic, Physical and Inorganic Chemistry

[AC122]

WEDNESDAY 19 JUNE, 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 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 this 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

1 B

2 A

3 C

4 C

5 A

6 B

7 D

8 C

9 B

10 B

[2] for each correct answer [20] 20

Section A **20**

Section B

11 (a) (i) $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 4s^2$ [1]

(ii) Highest energy electron in an s-subshell [1]

(iii) $Ca(g) \rightarrow Ca^+(g) + e^-$ [2]

(iv) Decreases [1]
Electron further from nucleus/higher in energy [1]
More shielded [1] [3]

(b) (i) $Mg + 2HCl \rightarrow MgCl_2 + H_2$ [2]

(ii) Magnesium gets smaller/disappears
Heat produced
Bubbles/fizz/effervescence
Any **two** from three [2]

(iii) Barium chloride (**or** silver nitrate) (aq) [1]

(iv) White precipitate with magnesium sulfate [1]
No precipitate with magnesium chloride [1] [2]
(**or** opposite way round with silver nitrate)

(v) $Ba^{2+}(aq) + SO_4^{2-}(aq) \rightarrow BaSO_4(s)$
Or $Ag^+(aq) + Cl^-(aq) \rightarrow AgCl(s)$ [2]

(c) (i) $Ba(OH)_2$ [1]

(ii) $BaSO_4$ [1]

(iii) Increases [1]
Cation gets bigger/charge density of cation decreases [1] [2]

(iv) $Mg(OH)_2 \rightarrow MgO + H_2O$ [1]

(d) (i) Increases [1]

(ii) $Ba + 2H_2O \rightarrow Ba(OH)_2 + H_2$ [2] 24

12 (a) Peak shifts to right and peak is lower [2]
Other drawing errors [–1]

(b) Number of molecules with energy greater than E_a [1]
increases [1] [2]

(c) Catalyst provides an alternative route [1]
of lower activation energy E_a [1]
More molecules have energy greater than E_a [1]
Number/frequency of successful collisions (between SO_2 and O_2 molecules) increases [1] [4]

Quality of written communication [2] 10

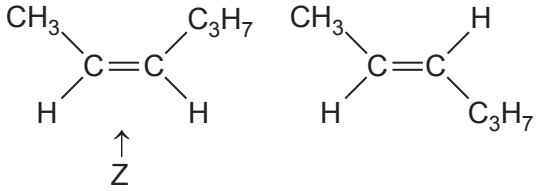
13 **(a)** Same molecular formula [1]
Different structural formula [1] [2]

(b) Correct structure, e.g. $CH_2{=}CH_2(CH_2)_3CH_3$ [1]
Correct name, e.g. hex-1-ene [1] [2]

(c) **(i)** Same structural formula [1]
Non-superimposable/different 3D spatial arrangement [1] [2]

(ii) e.g. hex-2-ene, hex-3-ene, 3-methylpent-2-ene, 4-methylpent-2-ene [1]

(iii) Restricted rotation about C=C [1]
Both carbons in the C=C have two different atoms/groups attached [1] [2]

(iv) 

[2]
Correct identification of Z isomer [1] [3]

(d) CH_2 [1] 13

14 **(a)** Rate of forward reaction = rate of backward reaction [1]
Amount of any given reactant or product remains constant [1] [2]

(b) Bonds broken 3192
Bonds formed 3234
Enthalpy change $-42\ kJ\,mol^{-1}$ [3]

(c) **(i)** Increases [1]
2 moles of gas on LHS, 1 mole of gas on RHS [1] [2]

(ii) Decreases [1]
Reaction is exothermic [1] [2]

(iii) No effect [1]

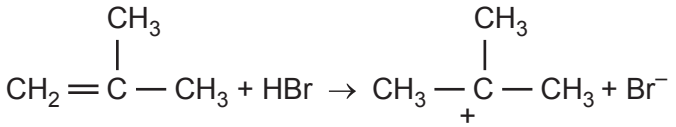
(d) 330 °C/(300–400 °C) [1]
60 atm/(50–75 atm) [1]
Phosphoric acid/H_3PO_4 [1] [3]

(e) Moles of ethanol = 10 000 moles (actual yield)
Moles of ethene = 12 500 moles (theoretical yield)
Mass of ethene = 350 kg units needed [3]
Each error [–1] 16

15 (a) (i) $\delta^+ \quad \delta^-$
H—Br [1]

(ii) C═C centre of high electron density [1]
H end of HBr is electrophilic [1] [2]

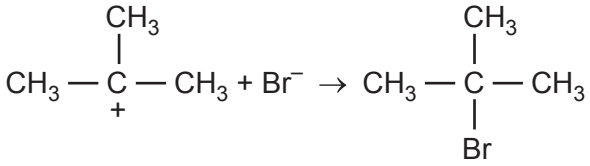
(b) (i)



[1]

Correct structure for carbocation [1] [2]

(ii)



[1]

(iii) Electrophilic addition [1]

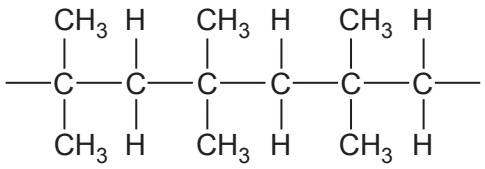
(iv) 1-bromo-2-methylpropane [1]

(c) (i) Contains hydrogen and carbon only [1]
Contains a C═C/C≡C [1] [2]

(ii) Moles of methylpropene = $\frac{4.2}{56} = 0.075$
Moles of hydrogen = 0.075
Volume of hydrogen = 1.8 dm^3 [3]
each error [–1]

(d) (i) Addition [1]
polymerisation [1] [2]

(ii)



[2] 17

Section B **80**

Total **100**