Rewarding Learning

**ADVANCED**
**General Certificate of Education**
**2025**

# Chemistry

## Assessment Unit A2 3

*assessing*

## Further Practical Chemistry
## Practical Booklet B (Theory)

**[ACH32]**

**FRIDAY 20 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 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. The document 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.

**Where one response is required to gain a mark, candidates will not gain credit if a correct response is given alongside one or more incorrect responses. This is referred to as listing.**

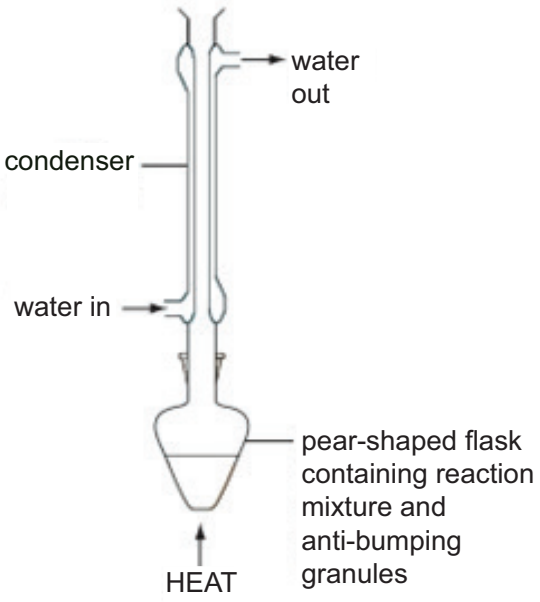
AVAILABLE MARKS

**1** **(a)** glucose is polar and water is polar/glucose forms hydrogen bonds with water [1]
hexane is non-polar/glucose cannot form hydrogen bonds with hexane [1] [2]

**(b)** **(i)** water [1]

**(ii)** carbon [1]

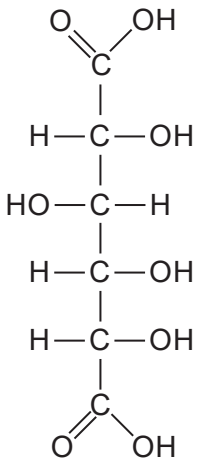
**(c)** **(i)** flask containing reaction mixture and anti-bumping granules
heat below flask
vertical condenser above flask open at top
water in at bottom and out at top




[3]

**(ii)** $C_6H_{12}O_6 + Cr_2O_7^{2-} + 8H^+ \rightarrow C_6H_{10}O_8 + 2Cr^{3+} + 5H_2O$ [2]

**(iii)**



[2]

**(iv)** aldehyde/CHO [1]

**(v)** blue solution [1] red precipitate forms [1] [2]

**(d)** **(i)** blue-black to colourless [1]

**(ii)** $2Na_2S_2O_3 + I_2 \rightarrow Na_2S_4O_6 + 2NaI$ [2]

AVAILABLE MARKS

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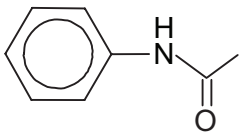
**2** **(a)**




[1]

**(b)** **(i)** mass of phenylamine = 3.5 × 1.02 = 3.57 g

moles of phenylamine = $\frac{3.57}{93}$ = 0.0384 [2]

**(ii)** mass of ethanoyl chloride = 1.5 × 1.1 = 1.65 g

moles of ethanoyl chloride = $\frac{1.65}{78.5}$ = 0.02102 [2]

**(iii)** limiting reactant is phenylamine

moles of N-phenylethanamide formed = $\frac{0.0384}{2}$ = 0.0192

mass of N-phenylethanamide = 0.0192 × 135 = 2.6 g [2]

**(c)** **(i)** suction filter the solid [1] from reaction mixture
dissolve impure crystals in the minimum volume of hot solvent [1]
filter when hot by gravity filtration [1]
allow filtrate to cool and crystallise [1]
filter crystals using suction filtration [1] [5]

**(ii)** place some solid in a capillary tube/melting point tube
sealed at one end [1]
heat slowly [1]
record temperature at which the solid starts and finishes melting [1] [3]

**(iii)** melts over a (wider) range [1]
melts at a lower temperature [1] [2]

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| | | | | AVAILABLE MARKS |
|---|---|---|---|---|
| **3** | **(a)** | $[Fe(H_2O)_6]^{3+}$ | [1] | |
| | **(b)** | $[Fe(H_2O)_6]^{3+} + 3OH^- \rightarrow [Fe(OH)_3(H_2O)_3] + 3H_2O$ | [1] | |
| | **(c)** | **(i)** chloride | [1] | |
| | | **(ii)** $[Ag(NH_3)_2]^+$ | [1] | |
| | **(d)** | carbon dioxide/$CO_2$ [1]<br>it is acidic/pH<7 [1] | [2] | |
| | **(e)** | $[Fe(H_2O)_6]^{3+} + SCN^- \rightarrow [Fe(H_2O)_5(SCN)]^{2+} + H_2O$ | [1] | |
| | **(f)** | **(i)** $6 \times 18 = 108$<br>$M_r = \frac{108}{39.93} \times 100 = 270.5$ | [2] | |
| | | **(ii)** $FeCl_3.6H_2O$ | [1] | 10 |
| **4** | **(a)** | **(i)** (method where) an excess of a reagent is reacted with a sample [1]<br>the unreacted reagent is then determined by titration [1] | [2] | |
| | | **(ii)** transfer the solution to a 250 $cm^3$ volumetric flask [1]<br>rinse beaker and glass rod with deionised water and add washings to the volumetric flask [1]<br>make up to mark with deionised water until the bottom of the meniscus is on the mark [1]<br>stopper the flask and invert to mix [1] | [4] | |
| | | **(iii)** phenolphthalein [1]<br>colourless to pink [1]<br>**or**<br>methyl orange [1]<br>red to yellow [1] | [2] | |
| | **(b)** | **(i)** rough titre/value not concordant | [1] | |
| | | **(ii)** initial moles of acid = $\frac{50.0 \times 2.00}{1000} = 0.1$ | [1] | |
| | | **(iii)** mean titre = 12.85 $cm^3$ (accept 12.9 $cm^3$)<br>moles of NaOH = $\frac{12.85 \times 0.100}{1000} = 1.285 \times 10^{-3}$<br>moles of HCl neutralised = $1.285 \times 10^{-3}$ | [2] | |
| | | **(iv)** $MO + 2HCl \rightarrow MCl_2 + H_2O$ | [1] | |
| | | **(v)** moles of acid in 250 $cm^3$ = 0.01285<br>moles of HCl reacting with MO = 0.1 – 0.01285 = 0.08715<br>moles of MO reacting = $\frac{0.08715}{2} = 0.043575$<br>RFM of MO = $\frac{2.44}{0.043575} = 56$ | [3] | 16 |
| | | | **Total** | **60** |