



ASSESSMENT and
QUALIFICATIONS
ALLIANCE

Mark scheme

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GCE

Chemistry

Unit CHM6/P

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Exercise 1 Skill assessed **Implementing (2)**1. Points assessed by supervisor during the practical examination

- | | | |
|------------------------------------|---|--|
| (a) (i) test tube reactions | 1 uses appropriate quantities
2 no spillages
3 shakes mixture | 7 scoring points |
| (ii) use of the water bath | 4 water bath set up correctly
5 appropriate volume of water | any 6 including
safety = 2 marks
any 4 = 1 mark |
| (iii) general | 6 does not require additional sample | |
| (iv) safety | 7 works safely - eye protection, water bath etc | |

2. Points assessed from candidate's written report.

- | | | |
|--|---------------------------------------|---------|
| (b) the recording of results | results recorded clearly in the table | 1 mark |
| (c) The accuracy of the observations. | 26 scoring points | |
| | 22 - 26 points | 5 marks |
| | 17 - 21 points | 4 marks |
| | 12 - 16 points | 3 marks |
| | 7 - 11 points | 2 marks |
| | 1 - 6 points | 1 mark |

Exercise 2

Skill 3 Analysing

- (a) **plotting a pH graph** pH on the y axis, volume of alkali on the x axis 7 scoring points
uses sensible scale for y axis any 6 = 2 marks
uses sensible scale for x axis any 4 = 1 mark
labels the axes
plots the points correctly
line through the points is smooth
best fit
- (b) **using graph to find K_a** identifies endpoint $24.2 \text{ cm}^3 \pm 0.2$ 5 scoring points
identifies half-equivalence point **half of the above** **all 5 = 2 marks**
pH at half-equivalence point 3.0 ± 0.2 any 3 = 1 mark
evidence of working
correctly calculates value for K_a 3.1 gives 7.94×10^{-4}
- (c) **identify acid** **chloroethanoic acid** **1 mark**
- (d) **precision** quotes either volume to 1 or 2 decimal places 3 scoring points
pH reading to 1 place of decimals any 2 = 1 mark
 K_a value to 2 or 3 significant figures
- (e) **estimation of errors** estimates error in using pipette (**0.2%**) 4 scoring points
estimates error in using burette (using 24.2, **0.62%**) any 3 = 1 mark
estimates error in using pH meter (using 3.0, **3.33%**)
calculates the overall apparatus error (**4.2%**)
- (f) **nomenclature** clear graph with sharp trace 3 scoring points
explains calculations clearly & logically, with sensible layout **all 3 = 1 mark**
uses terminology accurately e.g. K_a not confused with pK_a

Total 8 marks

Exercise 2

Skill 4 Evaluating

0. ignores anomalous result at 23 cm^3 in plotting graph **1 mark**
1. calculation of difference $1.3 \times 10^{-3} - 1 \times 10^{-3} = 3 \times 10^{-4}$ **1 mark**
a 23% difference **1 mark**
2. appreciates discrepancy > maximum apparatus error **1 mark**
4. repeat the experiment
or more readings **or** use datalogger
or smaller burette additions near endpoint any 2 = 2 marks
-
- thermostat the mixture **or** constant temperature any 1 = 1 mark
-
- calibrate meter
use pH meter which is more accurate **or** more decimal places **or** digital

Total 6 marks

Exercise 3 Skill assessed **Planning (1)**

- (a) the **scale** of working used (s) **max 4** scoring points
equation $\text{HOC}_6\text{H}_4\text{COOH} + (\text{CH}_3\text{CO})_2\text{O} \rightarrow \text{CH}_3\text{COOC}_6\text{H}_4\text{COOH} + \text{CH}_3\text{COOH}$
calculates theoretical mass of acid to make 5g aspirin (3.83g)
calculates likely mass of acid to make 5g aspirin (5.11g)
calculates mass of ethanoic anhydride needed (3.78g)
- (b) (i) **apparatus** (a) **max 3** scoring points
measuring cylinders **or** pipettes
flask or other suitable
balance
named filtration apparatus eg Buchner or filter funnel and filter paper
condenser
- (ii) the **method** used (m) **max 5** scoring points
mixes reagents
adds a few drops of acid
care **or** cool if necessary
reflux 15 minutes
add water
care / a little at a time
filter
- (c) **recrystallisation** (r) **max 5** scoring points
dissolves in the minimum quantity
of hot water
cools hot solution
filters crystals
dries crystals
weighs dry sample
purity check
- (d) **safety** (h) **max 3** scoring points
ethanoic anhydride / phosphoric acid corrosive
potential fire hazard with organics **or** no naked flames
avoid skin contact **or** flood affected areas **or** gloves
use fume cupboard
eye protection

Grading	20 scoring points	18 - 20	scores	8 marks
		16 - 17	scores	7 marks
		14 - 15	scores	6 marks
		12 - 13	scores	5 marks
		9 - 11	scores	4 marks
		6 - 8	scores	3 marks
		3 - 5	scores	2 marks
		1 - 2	scores	1 mark

Total 8 marks

Question 1

 Co^{2+} Fe^{2+} Cu^{2+} Zn^{2+} Mn^{2+}

Test	Observation with Compound A	Observation with Compound B	Observation with Compound C	Observation with Compound D	Observation with Compound E
1. Addition of sodium hydroxide solution	pink or blue ppt (1) insoluble in excess (1)	green ppt (1) insoluble in excess (1)	blue ppt (1) insoluble in excess (1)	white ppt (1) soluble in excess or colourless solution (1)	white / pale brown/ buff ppt (1) insoluble in excess (1)
2. Heating the mixture from Test 1	darkens or turns pink or turns brown or turns grey (1)	darkens or turns dark green or turns red-brown or turns orange (1)	ppt turns black or brown (1)	no visible change (1)	darkens or turns brown or turns black (1)
3. Addition of potassium thiocyanate solution	no visible change (1)	yellow /orange (solution) (1)	green (solution) (1) white ppt (on standing) (1)	no visible change (1)	no visible change (1)
4. Addition of potassium hexacyanoferrate(II) solution	green ppt (1)	blue ppt (1)	brown ppt (1)	white ppt (1)	white ppt (1)