

A Level Chemistry A
H432/03 Unified chemistry

Question Set 4

1 This question is about weak acids.

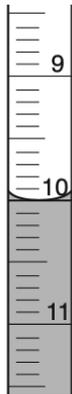
(a) Compound **A** is a weak monobasic acid.

A student is supplied with a 250.0 cm³ solution prepared from 2.495 g of **A**.

The student titrates 25.0 cm³ samples of this solution with 0.0840 mol dm⁻³ NaOH in the burette.

The student carries out a trial, followed by the three further titrations. The diagrams show the initial burette readings and the final burette readings for the student's three further titrations.

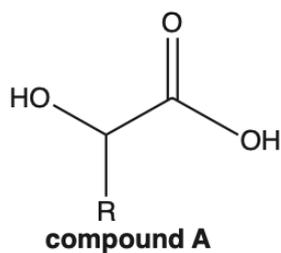
All burette readings are measured to the nearest 0.05 cm³.

Titration 1		Titration 2		Titration 3	
Initial reading	Final reading	Initial reading	Final reading	Initial reading	Final reading
					

(i) Record the student's readings and the titres in an appropriate format.

Calculate the mean titre that the student should use for analysing the results.

(ii) The structure of compound **A** is shown below.



Compound **A** has four optical isomers.

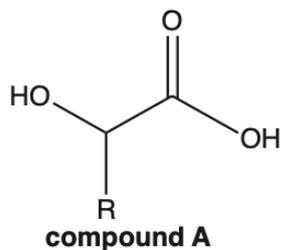
Using this information and the student's results, answer the following.

- Determine the molar mass of **A** and the formula of the alkyl group R.
- Draw the structure of compound **A** and label any chiral carbon atoms with an asterisk*.

Show all your working.

[6]

(b) The structural formula of compound **A** is repeated below.



Two reactions of compound **A** are carried out.

Suggest an equation for each reaction and state the type of reaction.

In your equations, draw structures for organic compounds.
You can use R for the alkyl group.

(i) Magnesium ribbon is added to a solution of compound **A**.
Gas bubbles are seen and the magnesium slowly dissolves.

Equation

Type of reaction

[3]

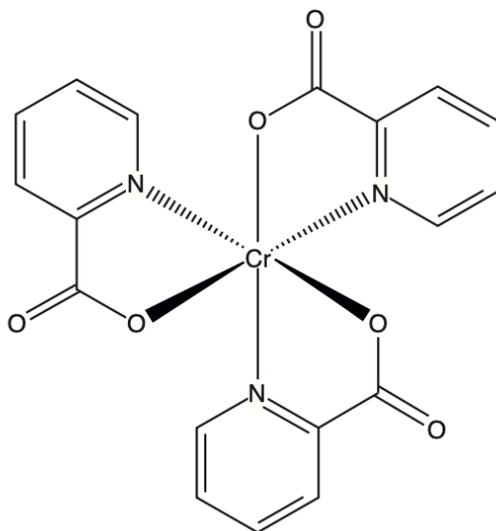
- (ii) Compound **A** is heated with a few drops of concentrated sulfuric acid as a catalyst.
A cyclic 'dimer' of compound **A** forms.

Equation

Type of reaction

[3]

- (c) Chromium(III) picolinate, shown below, is a neutral complex that can be prepared from the weak acid, picolinic acid.



Chromium(III) picolinate is used in tablets as a nutritional supplement for chromium.

- (i) Draw the structure of the ligand in chromium(III) picolinate. [1]
- (ii) A typical tablet of chromium(III) picolinate contains 200 μg of chromium.

Calculate the mass, in g, of chromium(III) picolinate in a typical tablet.
 $1 \mu\text{g} = 10^{-6} \text{g}$.

Give your answer to **three** significant figures. [2]

Total Marks for Question Set 4: 19

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