Answers to worksheet questions

Chapter 12

Worksheet 12.1

1

Add sodium hydroxide solution to a solution of the salt	Add concentrated ammonia solution to a solution of the salt	Carry out a flame test	Metal ion present in salt
nothing observed		lilac	**a** *K^+ present*
white precipitate produced, insoluble in excess alkali		brick red	**b** *Ca^{2+} present*
c *brown precipitate produced, insoluble in excess alkali*		**d** *nothing observed*	Fe^{3+} present
white precipitate produced which dissolved in excess alkali	white precipitate produced which dissolved in excess alkali	nothing observed	**e** *Zn^{2+} present*
light green precipitate produced which slowly turns reddish-brown		nothing observed	**f** *Fe^{2+} present*
g *nothing observed*		**h** *yellow*	Na^+ present

2

Add dilute acid	Add sodium hydroxide solution and warm	Add sodium hydroxide solution and warm – then add aluminium	Flame test	Substance
nothing observed	nothing observed	gas evolved, turns damp red litmus blue after aluminium added	yellow	**a** ***sodium nitrate***
fizzing, gas turns limewater milky	gas evolved turns damp red litmus blue	nothing observed	nothing observed	**b** ***ammonium carbonate***
c ***fizzing, gas turns limewater milky***	**d** ***nothing observed***	**e** ***nothing observed***	**f** ***brick red***	calcium carbonate

Worksheet 12.2

Factors that need to be kept constant: volume of water / temperature of water / processing of sample.

Use three beakers containing 100 cm^3 of water kept in a thermostatically controlled water bath at 30 °C.
Test each fertiliser in turn.
Add fertiliser while stirring until solution is just saturated.
Filter off the undissolved solid using a Buchner filter and suction.
Take the solution and evaporate to dryness in a pre-weighed beaker.
Weigh again to find the mass of the dissolved fertiliser.

Repeat the procedure for other fertilisers and compare the masses dissolved.

Worksheet 12.3

1 mass of the acid used in the experiment = 1.51 g

2 a pipette

3 **a** pink **b** colourless

4

Titration number	1	2	3
Final reading / cm^3	25.2	31.1	48.3
Initial reading / cm^3	0.0	6.8	23.8
Volume of hydrochloric acid used / cm^3	25.2	24.3	24.5
Best titration results (✔)		✓	✓

The calculated average volume of hydrochloric acid required = 24.4 cm^3

5 number of moles of hydrochloric acid = $(0.1/1000) \times 24.4 = 2.44 \times 10^{-3}$ moles

6 number of moles of sodium hydroxide present in 25.0 cm^3 of solution **B** = 2.44×10^{-3} moles

7 number of moles of sodium hydroxide in 250 cm^3 of solution **B** = $2.44 \times 10^{-3} \times 10$
= 0.0244 moles

8 number of moles of sodium hydroxide in the original 50.0 cm^3 of 1.00 mol/dm^3 sodium hydroxide
= $(1.00/1000) \times 50$ = 0.05 moles

9 number of moles of sodium hydroxide that reacted with the original sample of the organic acid, **A** = 0.05 − 0.0244 = 0.0256 moles

10 number of moles of **A** in the sample = 0.0256/2 = 0.0128 moles

11 relative molecular mass of the acid **A** = 1.51/0.0128 = 118

12 $x = 2$ and $y = 4$
formula is $HOOCCH_2CH_2COOH$

Worksheet 12.4

1 test: add to a solution of potassium manganate(VII)

result: purple solution goes colourless

2 Test the solution with Universal Indicator paper – paper turns orange – or use a pH meter.

3 Sulfur dioxide kills bacteria.

4 A reducing agent will remove oxygen from another compound.

5 by filtration and collection of the residue

6 a grey-green precipitate of chromium(III) hydroxide; $Cr(OH)_3$

7 Chromium(III) hydroxide re-dissolves in excess sodium hydroxide.

Worksheet 12.5

1 **a** a colourless solution

b a solid formed when two solutions are mixed / or a gas is passed into a solution

c silver chloride

2 **a** sodium chloride + silver nitrate → silver chloride + sodium nitrate

b (aq)

c (s)

d $NaCl(aq) + AgNO_3(aq) \rightarrow AgCl(s) + NaNO_3(aq)$

3 **a**

Solution	Observation	Observation after leaving in sunlight	Halide present? / Name of any precipitate
A	no reaction	no change	✘ *no reaction*
B	pale yellow precipitate	went dark	✓*silver bromide*
C	yellow precipitate	went dark	✓ *silver iodide*

b a photochemical reaction

c photography – both in forming the image on a film and printing the image on photographic paper