Kirkcaldy High School

Chemistry

Advanced Higher

Unit 4 – Researching Chemistry

TUTORIAL ANSWERS

(a) Weighing by difference and gravimetric analysis

1. 156.99 mg l^{-1}
2. 301.78 mg (301.8 mg or 302 mg)
3.

   (a)

   (i) 36.19% (36.2%)

   (ii) Allow the precipitate to settle then add 1 or 2 drops of HCl and look for cloudiness. No sign of cloudiness; precipitation is complete.

   (b) 16.19% (16.2%)

4.

   (a) Allow the precipitate to settle then add 1 or 2 drops of silver (I) nitrate solution and look for cloudiness. No sign of cloudiness; precipitation is complete and excess silver (I) nitrate solution had been added.

   (b) 74.22 %

   (c) 35 cm^3

5.

   (a) 7.95 g

   (b) x = $6H_2O$

6.

   (a) 0.005 moles

   (b) 62.75 %

   (c) Acid MnO_4^- will oxidise sulphite but not sulphate ions / is a good oxidising agent/ is sef-indicating (1) or (2) with (3)

7.

   (a) 19.77 %

   (b) Moles $CaSO_4$ = 0.0286

   Moles H_2O = 0.0583 therefore x = 2 (must be a whole number)

8. 5.72 g

9.

(a) Any soluble bromide, carbonate, chloride, iodide or phosphate

(b) No

(c) The analysis results would be lower than they should be

10.

(a) 46.5%

(b) Add more HCl no more precipitate should form/ no cloudiness

(c) 16.6%

(n) Using a separating funnel and solvent extraction

1. A
2. B
3.

   (a) Separating funnel

   (b) 2.75

(o) Stoichiometric Calculations

1.

(a) 50 % S, 50 % O
(b) 75 % C, 25 % H
(c) 60.5 % Mg, 9.5 % O
(d) 39.8 % Cu, 0.1 % S, 40.1 % O
(e) 57.5 % Na, .5 % H, 40.1 % O
(f) 44.8 % K, 18.4 % S, 36.8 % O
(g) 40 % Ca, 12 % C, 48 % O
(h) 7.8 % C, 92.2 % Cl

2.

(a) 21.2 % N
(b) 16.5 % N
(c) 35 % N richest in nitrogen

3. 350 g
4. 224 g
5. 378 g
6.

(a) 87 %
(b) The reaction has not gone to completion
Other reactions may have occurred which compete with the reaction
Separation of the desired product may be difficult
The product may be impure or some may be lost on purification

7. 7.3×10^{-5}
8. 2
9. 5.8 g
10. The reaction has not gone to completion
Other reactions may have occurred which compete with the reaction
Separation of the desired product may be difficult
The product may be impure or some may be lost on purification

11.

(a) CH_4
(b) CO_2
(c) NH_3
(d) C_2H_6O
(e) Na_2SO_4
(f) KCN

12.

(a) FeO
(b) MgO
(c) TiO_2
(d) CuO
(e) Cu_2O

13. PbO_2
14. Cu_2O
15. $C_6H_8O_4$

(p) Volumetric Analysis

1. B
2. D
3. B
4. A
5. D
6. D
7. D
8. B
9. A
10. B
11. D
12. C
13. D
14. 53.76 cm^3 (units not required)
15. 12.25 cm^3 (units not required)
16. 21.53 cm^3 (units not required)
17.

    (a) thiosulfate

    (b) add starch as indicator near the end point of the reaction

    (c) 2.48×10^{-3} moles

    (d) 59.88 % (59.70 % also acceptable)

18. 0.023 mol l^{-1}

19.

(a) Make a series of standard solutions of known concentrations of KMnO4 and measure their absorbances.

(b) 0.29 %

(c) chemical is available in a highly pure form / is stable in the atmosphere / is readily soluble / has a relatively high molecular mass

(d) Accurately weigh required mass of Na_2CO_3 into a beaker and dissolve in small volume of water. Transfer the solution to a standard flask, rinsing the beaker with deionised water and transfer the rinsing's to the flask.
Make up to the mark with deionised water, adding the last few drops with a dropper and stopper. Invert to mix.

20. Use a 50 cm^3 volumetric pipette to transfer the standard solution to a 250cm^3 standard flask. Add deionised water to make up to the mark, stopper and invert

21.

(a) 0.0932 mol l-1

(b) absorbs moisture (water)/ CO_2 from the atmosphere / low GFM

22.

(a) 4. Wash the beaker into the flask several times
5. Make up to the mark with deionised water

(b)

(i) Murexide indicator

(ii) Octahedral

(c) 5.72 g