**CHOGORIA/MURUGI JOINT EXAMINATION**

**CHEMISTRY PAPER 3 MARKING SCHEME**

**Question 1**

**Procedure A**

**PROCEDURE II**

Table I

|  |  |  |  |
| --- | --- | --- | --- |
| Titration  | I | II | III |
| Final burette readings ( cm3) | 15.0 | 15.0 | 15.0 |
| Initial burette reading ( cm3) | 0.0 | 0.0 | 0.0 |
| Volume ]of solution R used ( cm3) | 15.0 | 15.0 | 15.0 |

* Complete table C.T 1mk
* Decimal point D.P 1mk
* Accuracy AC 1mk
* Principle averaging P.A 1mk
* Final Accuracy FA 1mk

 5mks

Complete table………………………………………………….(1 Mark)

**Conditions**

* penalize ½ mk for inversion
* penalize ½ mk for unrealistic reading of less than 0.1 and above 50
* penalize ½ mk for wrong arithmetic

N/B penalize once only for ANY or ALL the above.

**Decimal place** …………………………………………………..(1 Mark)

* All readings must be recorded to at least one decimal place used consistently or 2 decimal places used consistently.
* If 2 decimal places are used then the second decimal place Must be a zero or a five otherwise penalize fully.

**Accuracy** ……………………………………………………….. (1 Mark)

* If any of the titre values is within ± 0.1 of school value award 1mk
* If any of the titre values is within ± 0.2 of school value award ½ mk or otherwise penalize fully

**Principle of averaging** ………………………………………….. (1 Mark)

**N/B** – Only consistent values should be averaged

* The values averaged must be shown
* The averaged value should be recorded to at least 2dp unless it works out to exactly a whole number or 1 dp.

**Final answer**

* If the averaged value is within ± 0.1 of the school value – award 1mk
* If the average value is outside ± 0.1 but within ± 0.2 – award ½ mk
* If averaging is not done but there are consistent values average for the candidate credit accordingly.

( ii) **Number of moles of NaOH, solution B used** ( 1mks)

$$mols=\frac{0.03 ×25 }{1000}=0.00075mols$$

(iii) **Moles of acid solution A used in the reaction** ( 1mk)

NaOH : HCl is 1:1 thus mols of HCl=0.00075mols

(iv) concentration of acid solution A in mols/litre**.** ( 1mk)$$molarity of soln A=\frac{0.00075 ×1000 }{average titre}$$

**PROCEDURE B**

Table II

|  |  |  |  |
| --- | --- | --- | --- |
| Titration  | I | II | III |
| Final burette readings ( cm3) | 22.0 | 22.0 | 22.0 |
| Initial burette reading ( cm3) | 0.0 | 0.0 | 0.0 |
| Volume ]of solution R used ( cm3) | 22.0 | 22.0 | 22.0 |

* Complete table C.T 1mk
* Decimal point D.P 1mk
* Accuracy AC 1mk
* Principle averaging P.A 1mk
* Final Accuracy FA 1mk

 5mks

Complete table………………………………………………….(1 Mark)

**Conditions**

* penalize ½ mk for inversion
* penalize ½ mk for unrealistic reading of less than 0.1 and above 50
* penalize ½ mk for wrong arithmetic

N/B penalize once only for ANY or ALL the above.

**Decimal place** …………………………………………………..(1 Mark)

* All readings must be recorded to at least one decimal place used consistently or 2 decimal places used consistently.
* If 2 decimal places are used then the second decimal place Must be a zero or a five otherwise penalize fully.

**Accuracy** ……………………………………………………….. (1 Mark)

* If any of the titre values is within ± 0.1 of school value award 1mk
* If any of the titre values is within ± 0.2 of school value award ½ mk or otherwise penalize fully

**Principle of averaging** ………………………………………….. (1 Mark)

**N/B** – Only consistent values should be averaged

* The values averaged must be shown
* The averaged value should be recorded to at least 2dp unless it works out to exactly a whole number or 1 dp.

**Final answer**

* If the averaged value is within ± 0.1 of the school value – award 1mk
* If the average value is outside ± 0.1 but within ± 0.2 – award ½ mk
* If averaging is not done but there are consistent values average for the candidate credit accordingly.

(b)

(ii) **Moles of solution A that reacted with solution D** ( 1mks)

$$mols=\frac{Molarity of soln A ×average titre }{1000}$$

 $ $

(iii) **Moles of solution D used in the reaction** ( 1mk)

Reacting ratio of Na2CO3 : HCl is 1:2 thus moles of D

$$mols=\frac{mols of HCl\left(soln A\right) used}{2}$$

(iv) **Moles of solution D present in 250ml.** ( 1mk)

$mols=\frac{mols in \left(iii\right) above ×250}{25}$

(v) **Concentration of carbonate soln C in moles per litre** ( 1mks)

$molarity=\frac{mols in \left(iv\right)above ×1000}{250}$

(vi) **Concentration of carbonate soln C in grams per litre** ( 1mks)

$$mols=\frac{15.74×1000 }{250}=62.96g/l$$

(vii) Value of **X** in Na2CO3. **X**H2O. (H=1.0, C=12.0, O=16.0 Na=23.0) (1mk)

2. **Solid M is aluminium sulphate, Al2SO4**

|  |  |  |
| --- | --- | --- |
|  i) | Dissolves to form a colourless solution 🗸 1  | Soluble salt 🗸 1 or Cu2+, Fe2+, Fe3+ absent ✓½ |
|  ii | white ppt which dissolves in excess NaOH 🗸 1  | Pb 2+, Al 3+, Zn 2+ present 🗸 1  |
|  iii | Forms a white ppt insoluble in excess NaOH 🗸 1  | Pb 2+, Al 3+ present 🗸 1  |
|  iv | No white precipitate is formed 🗸 1  | Al 3+ present 🗸 1  |
|  v | No effervescence/no bubbles 🗸 1  | CO32-, HCO3-, SO32-  absent 🗸 1  |
|  vi | white precipitate insoluble on warming 🗸 1  | SO42- present 🗸 1  |

3. **Solid G is maleic acid.**

|  |  |  |
| --- | --- | --- |
| a | Melts and burns with a yellow sooty flame 🗸 1  |  \ / C = C or –C ≡ C- present 🗸 1  / \ |
| b | Purple KMnO4 is decolourised🗸 1  |   \ / C = C , –C ≡ C- or R –OH present 🗸 1  / \  |
| c | Yellow bromine water is decolurised 🗸 1  |  \ / C = C or –C ≡ C- present 🗸 1  / \  |
| d | Accept pH= 2 to 3 🗸 1  | Strongly acidic substance |
| e | Effervescence occurs / bubbles are produced ✓½ |  H+ , - COOH present ✓½ |