SET 9

233/3 CHEMISTRY PAPER 3

CONFIDENTIAL

**Requirement for each candidate**

1. 150cm3 of solution A labelled A.
2. 100 cm3 of solution B labelled B.
3. 3 conical flasks.
4. 50ml butette.
5. 25ml pipette.
6. One pipette filler.
7. One complete retort stand.
8. 250ml volumetric flask.
9. A white tile.
10. 4 labels
11. 500ml distilled water in a wash bottle.
12. 250ml empty beaker.
13. 1 glass rod.
14. Methyl orange indicator in a bottle dropper. (freshly prepared)
15. Solid S in a stoppered boiling tube 2.5g
16. 4 boiling tubes.
17. 4 filter papers.
18. 6 test tubes in a test tube rack.
19. One filter funnel
20. 1 PH paper (if supplied in rolls, provide 1 piece 2cm long)
21. One PH chart.
22. 1g solid P.
23. One metallic spatula
24. One test tube holder
25. One red and one blue litmus papers
26. 50cm3 of solution C labelled C
27. Phenolphthalein indicator in a bottle dropper

Access to:-

* 2M sodium chloride solution supplied with a dropper
* 1M barium nitrate solution with dropper
* 2M ammonia solution supplied with a dropper
* 1M lead (ii) nitrate solution supplied with a dropper
* Acidified potassium dichromate (vi) solution supplied with a dropper.
* 1M calcium hydroxide solution (lime water) supplied with a dropper
* 2M Nitric (V) acid
* Source of heat
* 0.5M Barium nitrate solution supplied with a dropper.

**Preparations**

1. Solution A is made by dissolving 4.3cm3 of concentrated hydrochloric acid (1.18g/cm3) in 600cm3 distilled water and diluting to 1 litre.
2. Solution B is made by dissolving 0.96g of Sodium Hydroxide pellets in about 800cm3 of distilled water and diluting to 1 litre.
3. Solution C is made by dissolving 15.74g of hydrated Sodium Carbonate – Na2CO3.10H20 – in 800cm3 of distilled water and diluting to 1 litre solution.
4. Lime water is prepared by dissolving 4g of calcium metal in 100cm3 of distilled water or dissolving 74g calcium hydroxide in water and filtering to obtain colourless filtrate.
5. Solid S is a mixture of Zinc Sulphate and Zinc Carbonate in the ratio 1:5 by mass respectively.
6. Acidified Potassium Dichromate (VI) solution is made by dissolving 10g of Potassium Dichromate (VI) in 400cm3 of 2M Sulphuric (VI) acid and diluting to 1 litre.
7. Methyl Orange prepared by 1g in 1 litre distilled water then filter.
8. Solid P – Glucose monohydrate

**CHEMISTRY**

**PAPER 3**

**MARKING SCHEME**

1. Procedure (b)

Table 4 mks – Complete table – 2 mks

* Use of dec – 1 mk
* Accuracy:

c in 0.1 cm3 of 5.V – 1 mk

c in 0.2 cm3 of 5.v – ½ mk

Rej. – Unrealistic values i.e. beyond 50cm3.

- Wrong arithmetic

(a) (I) Average volume of solution A used.

✓½= \_\_\_\_\_\_\_\_ Ans ✓½

e.g = 12.0 cm3­ ( 1mk)

(II) No. of moles of NaOH in 25cm3 of solution B used = M = = n = MV

= (0.024 x ) ✓½ = 0.006 ✓½ mole

(III) Moles of acid in volume of Soln A used.

NaOH(aq) + HCl(aq)→ NaCl(aq) + H2O(l)

Mole ratio: NaOH : HCl is 1 : 1

Therefore moles of acid = Ans. In (II) above ✓½

i.e. 0.0006 mole ( 1 mk) (IV) Concentration of soln A moles/litre

= or = Ans ✓½

x 1000= 0.05 moles/l

Procedure C

Table 2: As for table 1. Total (4 mks)

(b) (i) (I) Average volume of solution A used.

Constant values✓ ½

No. = cm3✓ ½

e.g22.1 + 22.0 + 21.9 = 22.0 cm3 1mk

3

(II) Moles of acid in the average volume of solution A used.

V = MV Ans. A(iv) above x ans bi (I) above

1000 1000 = \_\_\_ cm3

e.g 0.005 x 22.0 x 1/1000 = 0.0011 moles (1 mark)

(ii) Concentration in grammes /litre of carbonate.

Mass (g) = 15.7 or 15.7 x 1000✓ ½

Volume 250 ÷ 1000

= 62.9 g/l ✓½

(iii) Equation

NaCO3. xH2O (aq)→CO2 (g) + 2NaCL (aq) + (x + 1) H2O (l) (1mk)

(iv) I, No. of moles of carbonate in 25cm3 of solution D

Mole ratio: Carbonate: Acid 1:2

T herefore moles of carbonate used = x Ans✓ ½ (bi, II) above = \_\_\_\_\_\_\_\_ ans ✓ ½

e.g. x 0.0011 ✓½ = 0.0055✓½ moles

ANS 0.00055 mol

(II) Moles of carbonate in 250cm3 of solution D.

= Ans. B iv, I above x 250/25 = \_\_\_\_\_\_ans

e.g 0.00055 x 250/25 = 0.0055 moles

(III) Concentration of solution c ( moles /litre)

0.0055 moles = moles in 250ml of D = moles in 25 ml of C

Molarity = u/v

( ans in b iv,ii above x 1000/25) ½ mk = \_\_\_\_\_\_\_ans ½ mk

e.g 0.0055 x 1000/25 = 0.22 ½ moles /l

(iv) value of x in Na2CO3.xH20

Molar mass = 106 +18x

Mass used = ansIII above (106 + 18x) = ans (ii) above

= ans\_\_\_\_\_√ ½

e.g 0.22( 106 + 18x) = 62.9 √ ½

x = 39.64

3.96

= 10.01

≈ 10 √ ½

1. (a)

|  |  |
| --- | --- |
| Observation | inferences |
| Colourless filtrate  White residue ½ mk | Absence of coloured ins in the filtrate ½ mk |
| 1. No white ppt formed ½ mk | Zn2+, Al3+Ca2+,Ba 2+ (all ✓1 mk)  Acc Pb2+ absent |
| 1. White ppt formed   Soluble in excess 1mk | Zn2+present ½ mk |
| 1. No effervescence of colourless gas√   1mk | Cl-, SO42- present  Acc CO32-& SO32- absent 1mk |
| 1. Whit ppt formed insoluble on warming | SO42- present  AccCl- absent  Rej. SO32- present  N.B acc only if mentioned in (iii) above 1mk |
| 1. White ppt formed insoluble in HNO3 (aq) 1mk | SO42-confirmed present  Acc only if mentioned in ( iv) above ½ mk |

2 b.

|  |  |
| --- | --- |
| 1. Colourless gas given off with PH = 5.0 ½ mk   Yellow residue (hot) but white when (cold) | Zn2+ present ½ mk |
| 1. Effervescence of colourless gas which forms white ppt with lime water 1mk | SO32- or HCO-3 present ½ mk |

Acc – Accept

Rej – Reject

2c.

|  |  |
| --- | --- |
| Observation | inference |
| 1. Burns with a sooty/ luminous flame | C = C  - C = C -  Rej: C=C, C=C or their names |
| 1. Dissolves to form colourless solution |  |
| 1. Colour of damp blue litmus remains blue & that of red remains red . ½ mk | Neutral substance ½ |
| 1. Colour of H+/   K2Cr2O7 changed from orange to green  1 mk | C = C✓½ mk  - C = C – ✓½ mk  Rej: C=C, C=C or their names |