**P3 CHEMISTRY MARKING SCHEME**

**233/3**

**PRACTICAL**

**TIME: 2 ¼ HOURS**

**FORM 4 END OF TERM 2 EXAMINATION 2021**

**INSTRUCTIONS**

**-Answer all the questions in the spaces provided**

**-You are not allowed to use the apparatus for the first 15 minutes of the 2 ¼ hours.**

**This time is to enable you to read the question paper and ensure you have all the chemicals and apparatus.**

**-All working must be clearly shown where necessary.**

**For Examiner’s use only**

|  |  |  |
| --- | --- | --- |
| **Question** | **Maximum score** | **Candidate’s score** |
| **1** | **18** |  |
| **2** | **14** |  |
| **3** | **8** |  |
| **TOTAL SCORE** | **40** |  |

You are provided with

* Anhydrous sodium carbonate solid X
* Distilled water
* 0.2M Hydrochloric acid solution A

You are required to determine molar heat of solution of solid X.

PROCEDURE 1

i) Place 50.0ml of water in 250 plastic beaker.

ii) Note the temperature of the water and record it in the table 1 below

iii) Add all the solid X provided to the water in the beaker, stir gently with the thermometer and record the final temperature of the solution in the table 1 below. Keep the resulting solution for procedure 2.

TABLE 1

|  |  |
| --- | --- |
| Final temperature (oC) | ( ½ mk) |
| Initial temperature (oC) | ( ½ mk) |
| Change in temperature (oC) | 2oC (1mk) |

(3mks)

1. What is the enthalpy change for the reaction? (Assume the density of solution is 1g/cm3, and specify heat capacity is 4.2jg-1 K-1)

(2mks)

Enthalpy change = -50 x 4.2 x 2R (1mk)

= -420J (1mk)

( ½ mk penalty for missing negative sign)

PROCEDURE II

Transfer the contents of the beaker into 250ml volumetric flask. Rinse both the beaker and the thermometer with distilled water and add this water into the solution in the volumetric flask.

Add more water to make up to the mark. Label this solution as solution X fill the burette with solution A. Using a pipette place 25.0ml of solution X into a conical flask. Add 3 drops of methl orange indicator and titrate with solution A. Record your readings in table II below. Repeat the titration two more times and complete the table.

TABLE II

|  |  |  |  |
| --- | --- | --- | --- |
| EXPERIMENT | I | II | III |
| Final burette reading (cm3) |  |  |  |
| Initial burette reading (cm3) |  |  |  |
| Volume of solution A used (cm3) |  |  |  |

(4mks)

(b) Calculate average volume of solution A used (1mk)

(c) Calculate the number of moles of solution A used. (2mks)

(d) The number of moles of solution X that reacted with the number of moles of solution A in (c) above. (2mks)

1:2

Na2Co3(aq) + 2Hcl (aq) 2Nacl(aq) + Co2(g) + H2O(l)

1:2 ( ½ mk)

No of moles of solution X that reacted in (c) above.

½ x 0.0046 moles = 0.0023 moles. ( ½ mk)

(e) The number of moles of solid X used in procedure 1 (2mk)

0.0023 moles 25 cm3

? 250 cm3 ( ½ mk)

f) Molar heat of solution of anhydrous sodium carbonate. (2mks)

0.023 moles -420J ( ½ mk)

1 mole J? ( ½ mk)

= -18260.86-J

= 18.2608 KJmol-1 (1mk)

2. You are provided with solid H. Carry out the tests below. Record your observations and inferences in the spaces provided.

-Place all the solid H in a boiling tube

-Add 10cm3 of distilled water and shake.

Divide the resulting solution into five portions.

(a)

|  |  |
| --- | --- |
| Observations | Inferences |
| Solid dissolves ( ½ mk) to a colouress ( ½ mk) liquid      (1mk) | -soluble solid ( ½ )  Cu2+ ,Fe 2+, Fe3+ absent ( ½ mk)    (1mk) |

(b) To the first portion, add dropwise 1cm3 of sodium hydroxide.

|  |  |
| --- | --- |
| Observations | Inferences |
| No white PPt  (1mk) | Zn2+, Al3+, Pb2+, Mg2+, Ca2+ absent  (2mk) |

(c) To the second portion add 2 to 3 drops of barium chloride solutions

|  |  |
| --- | --- |
| Observations | Inferences |
| No white PPt  (1mk) | SO32-, SO42-, CO32- absent    (2mk) |

(d) To the third portion add 2-3 drops of the chlorine water provided

|  |  |
| --- | --- |
| Observations | Inferences |
| Brown solution  (1mk) | Br- and 1- present  (1mk) |

(e)To the fourth portion add 2-3 drops of bromine water provided.

|  |  |
| --- | --- |
| Observations | Inferences |
| Brown solution, black ppt  (1mk) | Br- absent  1- Present  (1mk) |

(f) To the fifth portion add 2-3 drops of lead(II) nitrate solution.

|  |  |
| --- | --- |
| Observations | Inferences |
| Yellow ppt formed/ bright yellow ppt  (1mk) | 1- confirmed  (1mk) |

3. You are provided with solid Q. Carry out the following tests and record your observations and inferences in the spaces provided.

(a) Using a metallic spatula, take a third of solid Q and ignite it using a non-luminous Bunsen burner flame.

|  |  |
| --- | --- |
| Observations | Inferences |
| Burns with a yellow sooty flame  (1mk) | confirmed  C = C or C  **=** C present  (1mk) |

1. Place the remaining solid Q in a boiling tube and add 10cm3 of distilled water. Shake the mixture well until all the solid dissolves

|  |  |
| --- | --- |
| Observations | Inferences |
| Dissolves forming a colourless solution    (1mk) | Polar compound  (1mk) |

1. To about 4cm3 of the solution add 2 to 3 drops of acidified potassium manganite (VII) solution

|  |  |
| --- | --- |
| Observations | Inferences |
| Purple acidified potassium manganite(VII) turns colourless  (1mk) | R – OH, C = C or  C **=** C present (1mk) |

(d) To about 4cm3 of the solution add 2 to 3 drops of bromine water. Warm the mixture.

|  |  |
| --- | --- |
| Observations | Inferences |
| Orange/yellow bromine water turns colourless  (1mk) | C = C or – C **=** C Present  (1mk) |