**CHEMISTRY**

**OPENER EXAMINATION TERM 3, 2022**

**FORM FOUR PAPER 3**

**MARKING SCHEME**

TABLE 1

**Complete table  ------------------1mk**

(i)Complete the table with 3 titrations done –(1mk)

(ii) Incomplete table with 2 titrations done ---(1/2mk)

(iii)Incomplete table with 1 titration done –(0mk)

                                 Penalties

1. Wrong table
2. Inverted table
3. Unrealistic value

Penalize ½ mark for each to a maximum of 1/2mk

**Decimals ---------------1mk**

(Tied to the first and second row only )

Conditions

Accept either 1or 2 decimals points used consistently

If the 2 nd decimal point is used . can only be o or 5

**Accuracy -------1mk**

Compare any titre value in the 3rd row with the school value (sv)

         Conditions

1. If within +0.1cm3 of  sv  ---1mk
2. If not within +0.1cm3 but within +0.2cm3of sv ---1/2 mk
3. Beyond +0.2cm3 of sv -----omk

NB/ if there is wrong arithmetic in the table compare the sv with the correct value and credit accordingly.

**Principle of averaging ----1mk**

Value average must be shown and must be within +0.2 cm3 of each other conditions.

1. 3 values averaged and consistent -1mk
2. 3 values done and only 2 possible averaged –1mk
3. 2 titrations done and averaged -1mk
4. 2 titrations done and inconsistent -0mk
5. 3 titrations done and consistent but only two averaged -0mr

**Final accuracy -1mk**

Compare with the (sv )

1. If within +\_0.1 of sv-1mk
2. If within +\_0.2 of sv -1/2mk
3. If beyond +\_0.2 of sv -0mk

NB// If the candidate  has averaged wrong values pick the correct value if any ,average and credit accordingly

(ii) 106g of Na2 CO3 =1 mole

    8 =                              8x1      ½

                                         106

                        =0.0755M Na 2 CO 3 ½

iii)In 1000cm3 of Na2CO3= answer in (ii)

   in 25 cm3      =25   x answer in (ii)      ½

                                     1000

                        = answer in (iii)    ½

iv) Na2 CO 3(aq) +Na2 CO3(aq))----------------------Na2SO4 (aq))+CO2(g) +H2O(l)

Ratio Na2CO3.H2 SO4

          1         :           1

answer in (iii) : answer in (iii)     ½

average titre in cm3= answer in (iii)

In 1000cm3=            1000x answer in (iii)     ½

      Average titre

                                             = answer in (iv) M    ½

v) Concentration of sulphuric (vi) acid

in 1000cm3 ………………………… answer in (iv)

250cm3 ………………………………..?

 answer in (iv) ×250       = answer in moles

              1000

                     in 25cm 3= answer in moles

                         in 1000cm3= ?

                                              answer in moles x1000= answer in (v) M ½

                                                                  25

**Alternatively**

M1V2 = M2V2

answer in (iv) X 250  =  M2 X 25

M2 = answer in (iv) X 250

                       25

 = answer in (V)

Conditions

1. If units given they should be correct however if not given ignore.
2. Molarity should be given to at least 3 decimals place otherwise penalize ½ marks for the answer.
3. Numbers of moles should be given to at least 4 decimal places, otherwise penalize ½ mark for answer.

TABLE II

 a) Complete table -2mrks

5-6 experiments done -2mks

3-4 experiments done -1 mark

Less than 3 experiments done -0mrk

                    b)   Penalties

1. Penalize ½ mark for inverted table
2. Penalize fully for unrealistic temperature readings i.e. Above500c or below   100c  .

    b)  Decimals -1mark

Must be 1 dp or whole numbers used uniformly.

 The first digit after the decimal must be a zero or 5 otherwise penalize fully.

Award either 1mk or zero. No half mark.

               C) Accuracy -1mark

Accuracy is pegged on the candidate initial temperature reading

Conditions

1. Award 1 mark if the candidate value is within +2units the school value.
2. The initial temperature reading should be the same for all the six experiments otherwise penalize fully.

D) Trend -1mrk (tied to ΔT)

1. Award1mark for a continuous rise followed by continuous drop.
2. Award 1mark for a continuous rise, a constant then followed by continuous drop

GRAPH-3mks

a) Labeling – ½ mrk

The vertical and horizontal axis must be correctly labeled with correct unit otherwise penalize fully

b).Scale – ½ mark

The actual plot must cover at least eight big squares on the vertical axis and at least 8 ½ big squares on the horizontal axis, otherwise penalize fully.

 c) Plotting

5-6 correct plotted points -1mark

4 correctly plotted points- ½ mark

Less than 4 points plotted – 0mark

d).Line -1mrk

A straight line showing a continuous rise followed by a line showing a continuous drop.

Condition the two lines must be extrapolated above the last point.

I i) The Δt must be read from a correctly drawn graph.

 ii) ΔT is correctly shown on the graph but not read correctly, award accordingly ½ mk.

The graph must be extrapolated above the last point.

II The volume of X must be read from a correctly drawn graph .

-The reading must be shown on the graph. Without showing, penalize fully.

(iii) I    Answer in (ii) above x answer (v) in procedure I   ½

                                                            1000

                                                                     =correct answer 1 ½

II           a)    Δ H=mcΔT

                       =16x4.2xΔT (answer (ii)I above )1 ½

                        1000

=correct answer  ½

               b)            =    1 x correct answer above  ½

                                       Answer (iii)I above

                              =correct answer ½  in kJmol-1

Penalize ½ mk if wrong/no units or lack of –ve signs. Reject KJ

QUESTION 2-SOLID T

|  |  |
| --- | --- |
| OBSERVATIONS | INFERENCES |
| (i) No white precipitate    1mk | Zn2+, Al3+, Pb2+ , Ca2+, Mg2+, Ba2+absent, award 1 mk |
| (ii) burns with a yellow flame  1/2mk | Na+ present     1/2mk |
| (iii) white precipitate                 1mk | CO32--, SO32--, SO42—present  3 ions    1mk  2 ions ½ mk  1 ion 0mk  Penalize ½ mk for any contradictory ion to a maximum of 1mk |
| (iv) white precipitate dissolves / effervescence/ bubbles of a colourless gas.      1mk | CO32--, SO32—present  2 ions  -  1mk  1 ion – 1/2 mk  SO42-- absent, award ½ mk.  Penalize ½ mk for any contradictory ion to a max of 1mk |
| (iv) orange colour of acidified K2Cr2O7 changes to green      1mk  Candidate must mention original and final colour and the name of solution, otherwise penalize fully. | SO32- present                 1mk (must be inferred in iv above) otrherwise award omk  Penalize fully for any contradictory ion |
|  |  |

**QUESTION 3-Solid G**

|  |  |
| --- | --- |
| a) Burns with a yellow luminous /sooty/ smoky flame    1mark              ̀ | ̦̀C=C̦΄ or -C=C-  present 1mk or  - unsaturated organic compound 1mk or  hydrocarbon with high C:H ratio 1mk or  -aromatic organic cpd |
| b) Effervescence /bubbles/ fizzing ½  reject: hissing/fizzling/sizzling | R –COOH/ H+ / H3O+present ½       Penalize fully for any contradictory ion |
| ii) pH= 4or 5 | **Weakly acidic** |
| iii)purple KMnO4 turns colourless | ̦̀C=C̦΄ or -C=C- ½ mk present , ROH 1/2 mk |
| (iv) orange colour of acidified K2Cr2O7 remained      1mk | ̦̀C=C̦΄ or -C=C- 1 mk  Accept for ½ mk ROH absent |

**OBSERVATIONS                                                                          INFERENCES**

a) Burns with a yellow luminous /sooty/ smoky flame    1mark              ̦̀C=C̦΄ or -C=C-  present 1mk

                      unsaturated organic compound mk

      hydrocarbon with high C:H ratio 1mk

  b) Effervescence /bubbles/ fizzing ½                                          R –COOH/ H+ / H3O+present ½

reject: hissing/fizzling/sizzling       Penalize fully for any contradictory ion

   ii)    pH=4 or 5       ½ mrk                                                                        Weakly acidic           ½ mrk

   ii)    Purple KMnO4 turns colourless /                                                 = C=C= ,-C=C- present

          purple colour is decolourised           1mk Penalize ½ mk for any contradictory

reject: turns colourless functional group

  iii) Orange colour of K2 Cr2 O7 persists/ is retained   1mk                 R-OH absent        1mrk

NB//1 Penalize fully for- C=C- and C= or H-C=C-H and H-C=C-H

         2 The pH value should not be a range of values e.g. 4-5

         3 Penalize fully for weak acid in the inference of b(ii)