BUNAMFAN MARKING SCHEME DECEMBER 2021 EXAMINATIONS
1.      Procedure 1: Table 1

(a) Complete table……………………………………………………… (1mk)
                (Tied to 1st column of temperature readings only)

**Conditions**
  ➢      Complete table with 4 readings              (1mk)
  ➢      Incomplete table with 2 – 3 readings  ( ½ mk)
  ➢      Incomplete table with less than 2 readings  ( 0 mks)

**Penalties**
  ➢       Penalise ½ mk once for unrealistic temperature readings i.e.  below
              $20^0C$ as initial reading.
  ➢       Penalize ½ mk if temperature readings are all the same.

b) Use of decimals      ……………………………………………… (1mk)
(tied to 1st column only)

**Conditions**
  ➢      Award 1mk for temperature readings given as whole numbers consistently.
  ➢      Award 1mk for temperature readings given to 1 d.p of .0 or .5 consistently.
  ➢      Award 1mk for temperature readings given to 2 d.p of .00, .25, .50 or .75
         consistently

*NB: Penalise fully if none of the above conditions are met.*

c) Accuracy    -          (tied to 1st reading only)………………………. (1mk)
Award 1mk if within + $2^0C$ to S.V otherwise penalize fully

d) Trend …………………………………… …………………….………..(1mk)
Award 1mk if continuous drop otherwise penalize fully

e) Solubility ……………………………………………………………….. (2mks)
( tied to 2nd column)
Award ½ mk for each reading
Condition/penalties
Penalise 1/2mk once for value given to less than 1 dp unless it works out   exactly

ii)      **Graph ………………………………………….** (3mks)

✓ labeling of axes ……………………………………………..½ mk

penalize fully for inverted axes

✓ scale ……………………………………………………( ½ mk)

Award ½ mk if plots occupy atleast half of the grid

✓ Plotting ……………………………………………..(1mk)

3 or 4 points correctly plotted - (1mk)

2 points correctly plotted - ( ½ mk)

Less than 2 points - ( 0mks)

✓ Curve…………………………………….. ……….(1mk)

Smooth curve of best fit otherwise penalize fully

iii) Correct showing on graph - ( ½ mk)

correct reading - ( ½ mk)

## Procedure II: Table II

a) Complete table ……………………………………………………………….(1mk)

Complete table with 3 titrations done – 1mk

In Complete table with 2 titrations done - 1mk

incomplete table with 1 titration done – 0mks

Penalize ½ mk once for
➢ Inverted table
➢ Wrong anthmetic
➢ Unrealistic titre values ( below 1 or above 50 unless explained)

b) Use of decimals………………………………………………………………..1mk
➢ Accept 1 or 2 d.p uses consistently otherwise penalize fully
➢ If 2 d.p used the $2^{nd}$ d.p should be either 0 or 5 otherwise penalize fully
➢

c) Accuracy ………………………………………………………………….1mk

Compare the candidates titre values with the S.V
➢ If any value is within +- 0.1 award 1mk
➢ If within + -0.2 award ½ mk
➢ If beyond +- 0.2 award zero mark

d) Principles of averaging ………………………………………………….1mk

1f 3 consistent titrations done and averaged 1mk

If 3 titrations done but only 2 are consistent and averaged (1mk)

If only two titrations done, are consistent and averaged (1mk)

If 3 titrations done and are consistent but only 2 are averaged ( 0mk)

If 3 inconsistent titres averaged ( 0mk)

1f 2 inconsistent titres averaged (0mk)

e) Final answer accuracy…………………………………………………………..1mk

Compare the candidates correct average titre with S.V
➢ If within +- 0.1 of S.V (1mk)
➢ If within +- 0.2 of S.V ( ½ mk)
➢ If beyond +- 0.2 of S.V ( 0mk)

Calculations

ii)      2moles _____ 1000cm3
        ?       _____ 25cm3

$$\frac{25 \times 2}{1000} \tfrac{1}{2} = 0.05 \text{ moles } \tfrac{1}{2}$$

iii)     0.05 moles _____ 250cm3
      ?       _____ 1000cm3

$$\frac{1000 \times 0.05}{250} \tfrac{1}{2} = 0.2 \text{ moles } 1 \text{ litre}$$

iv)     Mole of base
      0.2 moles _____ 1000cm$^3$
      ?       _____ 25cm$^3$

$$\frac{25 \times 0.2}{1000} = 0.005 \text{ moles}$$

v)      0.0025 _____ average volume
      ?      _____ 1000cm$^3$

$$\frac{0.0025 \times 1000}{\text{Average}} \tfrac{1}{2} = \text{correct answer } \tfrac{1}{2}$$

vi)     6.2g _____ 250cm3
      ?    _____ 1000cm3

$$\frac{6 \times 1000}{250} \left(\tfrac{1}{2}\right) = 24.8g \left(\tfrac{1}{2}\right)$$

Answr in (v) = $\frac{24.8g}{RFM}$

RFM = 24.8 ( $\tfrac{1}{2}$ ) = correct answer in (v) ( $\tfrac{1}{2}$ )

**Note:**
i)      Answer for moles should be given to at least 4 d.p unless it works out exactly other wise penalize ½ mk for rounding off to less than 4 d.p
ii)     Answer for concentration in moles per litre should be given to at least 3 d.p unless it works out exactly otherwise penalize ½ mk for rounding off to less than 3 d.p.
iii)    Units may or may not be given but if given must be correct otherwise penalize ½ mk for wrong units.
iv)    Average volume should be given to at least 2 d.p unless it works out exactly to less than 2 d.p otherwise penalize ½ mk for rounding off to less than 2 d.p.
v)     Answer for (vi) above should be between 121- 144 otherwise penalize ½ mk for answer outside this range.

2. You are provided with solid E.

(i) Add sodium hydroxide solution dropwise until in excess

| Observations | Inferences |
|---|---|
| No white ppt<br><br><br>(1/2 mark) | $Pb^{2+}$,✓ ½ $Zn^{2+}$ or $Al^{3+}$ ions absent ✓1mk<br>Only 2 correct…(1/2 mark)<br>Only 1 correct….. 0 mk<br>Ignore sodium ions<br>(1  mark) |

(ii) To the second position dip a clean glass rod and hold its tip in the non-luminous Bunsen burner flame.

| Observations | Inferences |
|---|---|
| Yellow flame<br><br>1 mark | $Na^+$ present<br>Ignore unsaturation.<br>1 mark |

i.     To the third portion add two drops of barium nitrate solution

| Observations | Inferences |
|---|---|
| White ppt<br><br><br><br><br>1 mark | $SO^{2-}_4$ ions, $CO^{2-}_3$, $SO^{2-}_3$ present✓1mk<br>Only 2 correct….……… (1/2 mark)<br>Only 1 correct….…………..0 mk<br>Penalize 1/2 mark for any contradictory ion upto max of 1 mk.<br>1 mark |

ii.    To the fourth portion add two drops of acidified potassium manganite (VII)

| Observations | Inferences |
|---|---|
| Purple potassium manganate (VII) is decolourised.<br>1 mark | $SO^{2-}_3$ present✓1mk<br>Penalize fully for any contradictory ion.<br>1 mark |

b. Put the residue in a boiling tube and add about 5 cm3 of dilute nitric (V) acid provided and shake thoroughly.

| Observations | Inferences |
|---|---|
| Bubbles<br><br><br><br><br>1/2 mark | $CO_3^{2-}$ and $SO_3^{2-}$ present…… 1mk<br>Only 1 correct….1/2 mk<br>Penalize ½ mk for ay contradictory ion upto a max of 1 mk.<br>1 mark |

Divide the solution into two equal portions.

i. To the first portion add sodium hydroxide solution dropwise until in excess

| Observations | Inferences |
|---|---|
| <br>White ppt soluble in excess<br><br>1 mark | $Pb^{2+}$,✓ ½ $Zn^{2+}$ or $Al^{3+}$ ions present.<br>Only 2 correct…………… 1/2 mark<br>Only 1 correct……………..0 mk<br>1 mark |

ii. To the second portion add two drops of sodium iodide solution.

| Observations | Inferences |
|---|---|
| <br>Yellow ppt<br>1/2 mark | $Pb^{2+}$ present.<br>Penalize fully for any contradictory ion.<br>1/2  mark |

3. You are provided with liquid L

   a) Place about 3 drops of liquid L on a watch glass and ignite using a Bunsen burner flame.

| Observations | Inferences |
|---|---|
| Burns with blue flame<br><br><br><br>1 mark | $\diagup C=C\diagdown$ Or $C \equiv C$ - absent… 1mk<br>Saturated organic compound present……1 mk<br>1 mark |

a) Divide the remaining liquid L into four portions in test tubes.

(i)    To the first portion, add about 6cm$^3$ of distilled water and shake well.

| Observations | Inferences |
|---|---|
| Miscible to form a colourless solution<br><br>½    mark | Polar liquid.<br><br>½    mark |

(ii)    To the second portion, add the sodium hydrogen carbonate solid provided.

| Observations | Inferences |
|---|---|
| No bubbles<br><br>½    mark | R – COOH  absent....1 MK<br><br>$H^+$ absent……….....................½    mark<br><br>1 mark |

(iii)    To the third portion, add two drops acidified potassium manganite   (VII) solution.

| Observations | Inferences |
|---|---|
| Purple potassium manganate (VII) turns colourless<br><br>½    mark | $\underset{}{\overset{}{C}}=C \ Or\ C \equiv C -$ ....½    mark<br>R-OH PRESENT....... ½    mark<br>Penalize ½    mark for any contradictory ion upto max of 1 mk |

(iv)    To the last portion, add two drops acidified potassium dichromate (VI) solution.

| Observations | Inferences |
|---|---|
| Orange potassium dichromate turns green<br><br>1 mark | R – OH…………1mk<br>Penalise fully for any other contradictory ion.<br>1 mark |