**CHEMISTRY**
**PAPER 3**
**233/3**

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**SERIES 14 EXAMS**

# MARKING SCHEME

Question 1
Procedure 1 and procedure 2
Table 1 and table 2                                    5mks
A      i)      Complete table          1mk
       ii)     Complete table with 3 + titration done          ½ mk
       iii)    Incomplete table with 1 titrations done          0mk
       **Penalties**
       i)      way anthnetic/ substraction
       ii)     Inverted table
       iii)    Burette readings beyond 50 $cm^3$, unless explain
       iv)     Unrealistic titre value of acid – 0.9 cm3 or titre values in Jou's.
       Penalise ½ mrk each to a natinum of ½ mrk is penalize ½ mrk once.
B.     Use of decimal (OP)
       -       Tied to $1^{st}$ and $2^{nd}$ rows only…….1mk
       (i)     Accept 1 or 2 dps used consistently, otherwise penalize fully i.e either 1
               mk or 0.
       (ii)    If 2 dp are used, $2^{nd}$ dp place must be a zeroes or a fire (5) otherwise
               penalize fully.
       (iii)   Ignore inconsistency in values of initial burette reading as 0,0.0,0.00.
C.     Accuracy..(1mk)
       -       Compare candidates correct titre value with school value (S.V) and tick
               the particular value choosen if it earns a mark.
       Conditions
       i)      If atleast 1 titre value is within $\pm$ 0.1 of school value (SV) then a ward
               (1mk). E.g if SV = 16.8, then score 16.8, 16.9, or 16.7.
       ii)     If there is no value within $\pm$ 0.1 of SV but there is atleast 1 value within $\pm$
               0.2, award. ½ mk.
       iii)    If no titre value is within $\pm$ 0.2 of SV, award 0mk
               NOTE
               If there was wrong arithmetic or substraction, compare the SV with the
               correct work for value and award according e.g.
       iv)     If no SV value is given or SV cannot be worked out. As the candidates
               average titre values are written down then the close further session.
       b)      However if candidates average titre values are too varied, ignore and use
               councils value as SV.

c) Principle of average…………91mk)

i) If 3 consistent value are average…..(1mk)
   i.e largest…. Smallest ≤ 0.2
ii) If 3 titrations done but only 2 are consistent and are averaged….(1mk) e.g
   19.6,19.0,19.0- averagable.
iii) But if only two titrations done but are consistent and averaged…..(1mk)
iv) If 3 titrations done but are inconsistent and are averaged..0mk
v) If 3 titrations are averaging but only 2 averaged award.0mk.
vi) If only 2 titrations are done and are inconsistent or are averaged
   award..0mk
vi) If only one titration done ….award 0mk
   - The working must be shown to give ½ and ½ for answer but
   transfer the mark to the table for PA.
   Penalise
i) Penalise ½ mk for wrong arithmetic if error is our side ± 2 only in the 2$^{nd}$
   dp of average value expected.
ii) Penalise ½ mk if no working is shown but answer given is correct.
iii) If no working is shown and given answer is shown then PA attracts-0mk.
iv) Accept rounding off or 21.67, otherwise penalize fully, if rounded off to 1
   dp or whole number e.g 21.70.
   NOTE - Accept answer if it works out exactly to 1 dp or whole
   number and credit accordingly.

E. Final accuracy FA…1mk
   Compare the candidates correct average titre with SV
   i) If within ± 0.1 of SV, award 1mk
   ii) If not within ± 0.1 but within ± 0.2 of SV, award ½ mk
   iii) If beyond ± 0.2, award 0mk
   NOTE - i) When there are 2 possible correct averagable titre
   values, use the one which is closer to the SV and credit accordingly.
   Eg 16.6,16.4,16.2 ,SV = 16.5

$$\frac{16.6+16.4}{2}=16.5$$
So

$$\frac{16.4+16.2}{2}=16.3$$
And not

   - Make a hek on the table value ,use to SV
   ii) If wrong titre values were average pick the correct values, if any following
   the principle of averaging, average and award accordingly.

a) i)

| Table 1 | 1 | 11 | 111 |
|---|---|---|---|
| Final burette reading (cm$^3$) | 28.0 | 28.0 | |
| Initial burette reading (cm$^3$) | 0.0 | 0.0 | 0.0 |
| Volume solution K (used) (cm$^3$) | 28.0 | 28.0 | 28.0 |

ii) Average volume of solution = $\dfrac{28+28+28}{3}=28cm^3$

b)    i)    Moles of solution K = $\dfrac{0.2 \times 28}{1000} = 0.0056 \; moles$      $\dfrac{0.2 \times titrevalue}{1000}$

mole ratio F : K = 1 : 2      = answer

mole % F = $\dfrac{1}{2} \times moles \; of \; K$      mole ration = ½ x

$\dfrac{1}{2} \times 0.0056 = 0.0028 \; moles$      answer 1

   ii)    Concentration of F      concentration of F

25 cm³ of F = 0.0028 moles      $= \dfrac{1000 \times answer}{25cm^3}$

$\therefore 1000 cm^3 \; if = ?$      = answer.

$\dfrac{1000 \times 0.0028}{25} = 0.112 M$

   iii)    Molarity $= \dfrac{gl-1}{RMF}$      RFM $= \dfrac{15.3}{answer \, in \, bii)}$

$0.112 = \dfrac{15.3}{RFM}$      = amswer.

$RFM = \dfrac{15.3}{0.112} = 136.6$

   iv)    2G+60+18 = 136.6      2G+60+18 =
2G+78= 136.6      answer biii).
2G = 136.6- 78      G = answer.
2G = 58.6
G= 29.3

Procedure II

Q2. Table II

1.    Complete table…..2 readings recorded…. ½ mk

Penalties.

i)    penalize fully for any space not filled.

2.    Use of decimal…… ½ mk

Accept temperature readings for ½ mk of consistently given either.

-    Compare candidates temperature reading at initial temperature reading to school value atherwise penalize fully, indicate on the SV on the

Questions

a)    DT₁ = 21.5-18.5 = 3⁰C

Penalties

- Ignore formular for working DH1 but if given dh must be correct otherwise penalise ½ mk when formular is wrong.
- Penalise ½ mark for wrong units or omission of unity on the answer.
- Accept correct transfer of DT, even if rejected in (a) above.
- Penalise 1 mk for wrong arithmetic error.

ii)    Number of moles $-\dfrac{g}{RFM}=\dfrac{1.89}{1.26}=0.015$

Penalties
-    Penalise ½ mk for wrong units used otherwise ignore if omitted.
iii)    Molar heat of solution.

$$DH_1 = \dfrac{378}{0.015} \; or \; \dfrac{answer\,in(b)(i)}{answer\,in\,b(ii)}$$

= + 25200J mole$^{-1}$

Or 25.2 KJ mol$^{-1}$ = answers

Penalties
-    Penalise ½ mk for transfer of either b(i) or b(ii), otherwise penalize fully for strange values.

Table III

1.    Complete table ½ mk
Penalties
i)    Penalise fully for any space not filled
2.    Use of decimal….. ½
-    Accept temperature readings for ½ mk if constantly given either as whole numbers or 1 decimal place of either (0) or S1 otherwise penalize fully.
3.    Accuracy…. ½ mk
-    Compare candidates temperature reading of initial temperature reading to the school value (SV)- award ½ mk, if the reading is within $\pm\;2^0$C of school value otherwise penalize fully.
Questions
b)    $DT_2$ = 24.5-21.0=3.5 $^0$C
Pena;ties
-    Penalise ½ mark for strange values substance
-    Penalies ½ mark for wrong units
NB- ½ mark to be penalized once.
c)    i)    $DH_2 = MCDT_2$                    $DH_2 = MCDT_2$
60g x 4.25 g $^{-1}$ $^0$C x 3.5 $^0$C         60 gx 4.2 Jg$^{-1}$ $^0$C$^{-1}$x
= 882 J                         answer2

Penalties
-    Ignore formular for $DH_2$ but if given $DH_1$ must be correct otherwise penalize ½ mk when formular is wrong.
-    Penalise ½ mark for wrong unit or omission of unity on the answer.
-    Accept correct transfer of DT1 even if rejected in (a) above
-    Penalise 1mk for wrong arithmetic error.

ii)    No of moles = $\dfrac{0.5 \times 30}{1000}=0.015$

Penalties
-    Penalise ½ mark for wrong unity used otherwise ignore if omitted.
iii)    Molar heat of solution

$$\Delta H_2 so\ln = \frac{882}{0.015}$$

$$= 58,800\,KJmol^{-1}$$

$$= -58,8KJmol^{-1}$$

$$= \frac{Answer\,in\,c(i)}{Answer\,in\,c(ii)} = answer$$

Pending:-

- Penalise ½ mark for wrong transfer of either c(i) or c(ii); otherwise penalize fully for storage values.

d)

$$\Delta H_3 = \Delta H_1 + \Delta H_2$$

$$= +25.2 + -58.8$$

$$= -33.6KJmole^{-1}$$

OR

DH3 = answer in b(iii) + answer c(iii)= answer.

Penalties

- Penalise ½ mark for wrong transfer of either b(iii) or c(iii), otherwise penalize fully for storage figure.

- Penaliser ½ mark in the correct answer if either correct sign (-ve) or correct unit are missing or both are wrong missing.

Q3.    a)

| Observations | Inferences |
|---|---|
| - Red litmus changes blue<br>- Blue litmus remains blue<br>b) i) observation | $NH^+_4$ present |
| Green ppt formed<br>ii) observation | $Fe^{2+}$ present<br>Inference |
| Green ppt formed<br>iii) observation | $Fe^{2+}$ present<br>Inference |
| White ppt formed<br>iv) Observation | $SO_4{}^{2-}$ presen`t |
| white ppt formed<br>v) observation | $SO_4{}^{2-}$ present<br>Inference |
| - Light green solution to yellow solution<br>- Brown ppt formed | $Fe^{3+}$ present |