SERIES 31 EXAMS

233/3
CHEMISTRY
PAPER 3
MARKING SCHEME

Q 1: Table 1 (5mks)

The marks are distributed as follows

A: Complete table (4mks)

(i) Complete table with 3 titration done. (1mk)

(ii) Incomplete table with 2 titration done. (½mk)

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

Penalties

(i)Wrong arithmetic (subtraction of the initial from final burette readings)

(ii) Inverted table

(iii) Burette reading beyond 50cm^3 unless explained e.g. 50.0cm^3 + 12.0cm^3 = 62.0cm^3

(iv)Unrealistic titre values i.e. hundred or below 1.0

Note

Penalize ½ mk for each to a maximum of ½ mk. i.e. penalize ½mk once

B Use of decimals (1mk)

(i) Accept only 1 or 2 decimal places used consistently otherwise penalize FULLY. i.e award 0 mk

(ii) If 2 decimal places are used, the second decimal place **must** be either a "0" or "5" otherwise penalize FULLY.

(iii) Accept inconsistency in the use of zeros as initial burette readings e.g 0, 0.0, 0.00

C: Accuracy (1mk)

Compare the candidate's titre values with school value (SV) and tick (✓) the chosen value earn a mark.

CONDITIONS

(i) If at least one value is within ± 0.10cm^3 of the S.V award 1mark.

(ii) If no value is within ± 0.10cm^3 of the school value, but at least one value is within ± 0.20cm^3 of the S.V award ½ mark

(iii) (iii) If no value is within ± 0.20cm^3 of the S.V award 0 mark

Note:

If there is arithmetic error in the table, compare the S.V with worked out correct value and award accordingly.

D. Principles of averaging (1mk)

Values averaged MUST be shown and MUST be within ± 0.20 of each other.

CONDITIONS:

(i) If 3 titration are done and consistent and averaged (1mk)

(ii) If 3 titrations are done and only two are consistent and averaged. (1mk)

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

(iv) If 3 titrations are possible but only 2 are averaged (0mk)

(vi) If only 2 titration done are inconsistent and are averaged. (0mk)

(vii) If only 1 titration done. (0mk)

PENALTIES

(i) Penalize ½mk for wrong arithmetic in average titre if error is outside $\pm$2 units in the 2nd decimal place.
(ii) Penalize ½mk if no working is shown but answer given is correct
(iii) Penalize FULLY if no working and answer given is wrong
(iv) Accept rounding off answer (average titre) to 2 decimal places e.g 12.6666 to 12.66 or 12.67, 21.3333 to 21.33. Otherwise penalize mk for rounding off to 1dp or a whole number.

Note:
(i) Accept answer (average titre) to 1dp or a whole if it works out exactly and credit FULLY.
(ii) Question 1 a (i) MUST be marked before the marking for averaging is awarded in table (1)

E. FINAL ANSWER (1mk)
(Tied to correct average titre)
Compare the candidates CORRECT AVERAGE TITRE in S.V. and
(i) If within $\pm$ 0.010 of the S.V (1mk)
(ii) If NOT within $\pm$ 0.10 of the S.V but within $\pm$ 0.20 then award ½mk
(iii) If beyond $\pm$ 0.20 of the S.V. (0mk)

Note:
(i) Where there are 2 possible pairs of titres(can be averaged, use the pair that is closed to the S.V. and credit accordingly e.g if S.V = 24.0 and the titres are 23.8, 23.6 and the candidate averages $\frac{23.8 + 23.6}{2}$

Pick $\frac{23.8 + 23.9}{2}$ = 23.85 so as to credit ½mk of the candidates titre which would score 0 mk .

Also if a candidates titre were 24.3, 24.1 and the same S.V = 24.0 and the candidate average $\frac{24.3 + 24.1}{2}$ = 24.2

Pick $\frac{24.1 + 23.9}{2}$ = 24.0cm^3 to credit 1mk

Instead of ½ mk, if the candidates averaging titre is used.
If wrong values are averaged pick the correct values (if any) following the principles of averaging, average then award according.

1 b) ($\frac{\text{Average titre} \times 0.2}{1000}$)✓½
= Ans. ✓½

c) Mole ratio 1:1✓½
= Ans. In b✓½

d) ($\frac{250\text{cm}^3 \times \text{Ans. In c}}{25}$) ✓½ or 40 x Ans. In c✓½
=Ans. ✓

e) ($\frac{1000 \times \text{Ans. In (d)}}{250}$) ✓or 4 x Ans. In (d) ✓
= Ans. ✓

f) $M_QV_Q = M_RV_R$
= M_Q x 25 = $\frac{\text{Ans. In (e)} \times 250}{25}$✓
= Ans. (e) x 10✓
=Ans. ✓

Q2. Award s a follows:
- Complete table (1mk)
- Decimal (accept whole numbers or 1 d.c.p. where decimal place is 5 or 0) for 1mk

- Accuracy (within ± 2 of school value) for 1 mk otherwise award 0mrk
- Trends (change in temperature must be positive) 1mk

a) $\frac{\text{Temp. of solution C + Temp. of solution D}}{2}$ ✓½ = Ans. 2(a) ✓½

b) $H^+_{(g)} + OH^-_{(G)} \quad H_2O$ ✓

c) DH = 100 x 4.2✓ x DT = Ans. ✓ 2 (c) KJ

d) $1000cm^3$ contains 2 moles

therefore $50cm^3$

$= \frac{50 \times 2}{1000}$ ✓½= 0.1moles ✓½

e) 0.1moles evolved Ans. 2 (c) KJ

Therefore 1 mole

$= \frac{1 \times 2 \text{ (c) KJ}}{0.1}$ ✓= Ans. ✓2 (e) KJ / mole

f)

✓

Energy

Reaction path

Q3. a)

Observations	Inferences
a) Solid partially dissolve to form <u>colourless filtrate</u>✓½ and white residue	- Absence of coloured ions Fe^{2+}, Fe^{3+}, cu. 3 ions mentioned✓ 2 ions "✓½ 1 ion "✓0
b) No white precipitate✓½	Absence of ions. Al^{3+},Zn^{2+}, Pb^{2+}, Mg^{2+}, Ca^{2+} Ba^{2+} - 3 ions mentioned✓ - 2 ion s "✓½ - 1 ion "✓0 **NB**: Mentioned presence of NH^{+}_{4}, Na^{+}, K^{+} does not contradict but does not earn a mark.
c) Whit✓½ ppt. which dissolve on warming. Penalize fully if heating mentioned for warming.	Presence of cl^{-}✓½
d) – Formation of a <u>colourless</u>✓½ gas which turn blue✓½ litmus paper red and red litmus paper remains red. ✓½ - Put off burning spirit✓½ - Yellow residue when hot. ✓½ - White residue when cold. ✓½	-CO_3^{2-} ✓½present - Zn^{2+} ✓½present
e) Effervescence✓½ / bubbles of a <u>colourless</u>✓½ gas formed.	Co^{2-}_{3}, SO^{2-}_{3} ✓ any for 1mk
(i) <u>white ppt</u>✓½. soluble excess✓½	Zn^{2+} Pb^{2+}, Al^{3+} ions present - 3 ions mentioned - 2 ions mentioned - 1 ion mentioned
(ii) White ppt. ✓½ soluble in excess✓½	Zn^{2+} ✓confirmed