SERIES 33 EXAMS

233/3 - CHEMIISTRY MARKING SCHEME PAPER 3

Question I

TABLE I

Test tube	A	B	C	D	E
Time	0	1	2	3	4
Final burette reading	10.0	18.9	27.2	35.2	43.0
Initial burette reading	0.	10.0	18.9	27.2	35.2
Volume of NaOH used	10.0	8.9	8.3	8.0	7.8

Table I Award 6 marks distributed as follows:
Complete table ---------- (3mks)

- Penalize ½ mark for any blank space.
- Where all volumes of NaOH used are constant mark the first and reject all the rest.
- Penalize ½ mark for each volume greater than 12cm³.

Decimal ---------- (1mk)
Allow consistent use of either 1 or 2 D.P.
Otherwise penalize fully for inconsistent use or whole numbers

Accuracy:
Award 1 mark if first student value is within 0.2 of school value.

Trend
Award 1 mark if volume are decreasing with.
No increase from + = 0min

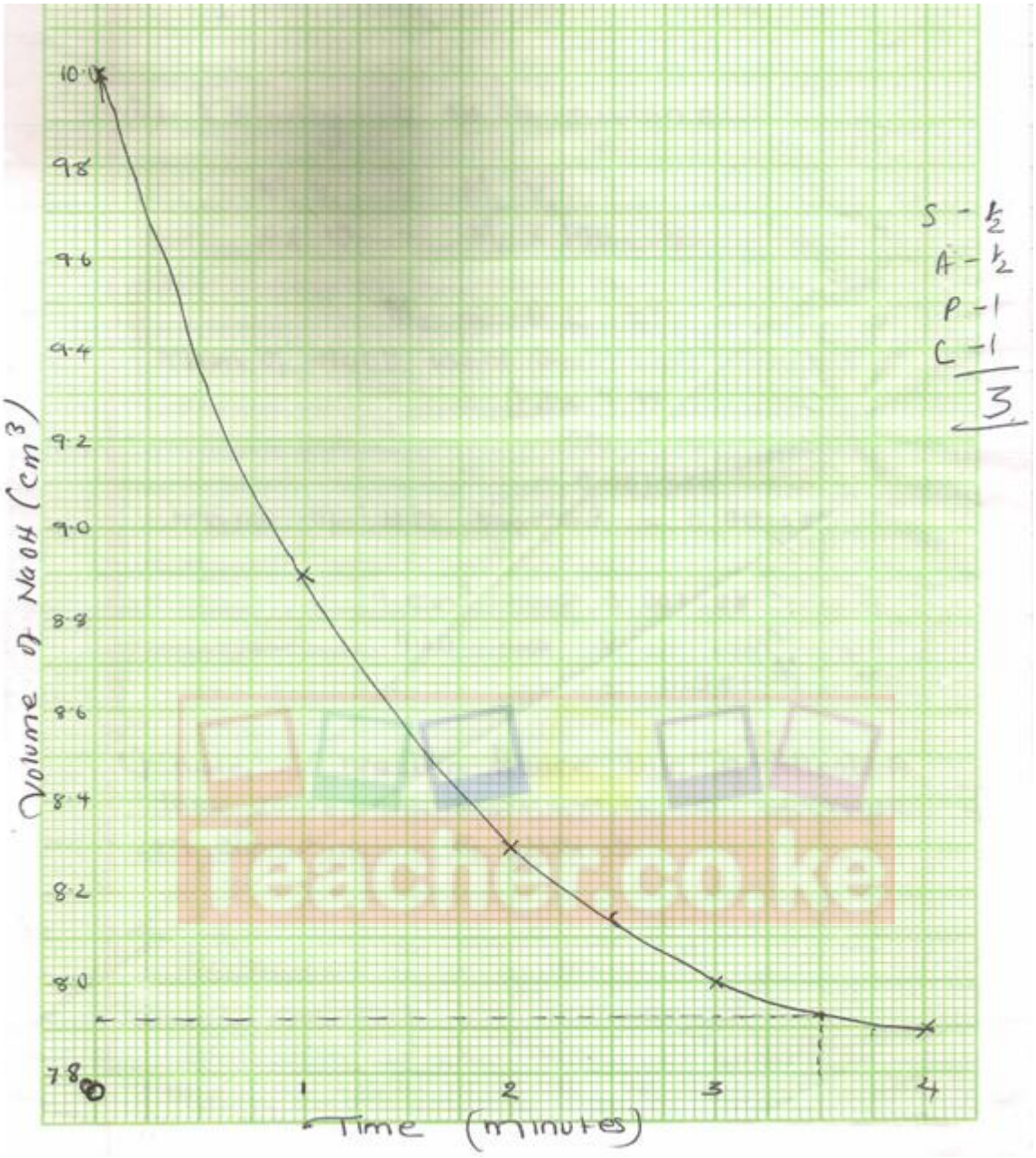
(a) Graph
Award 3 marks distributed as follows:
Scale ---------- (1mk)
- Must accommodate all the 5 point even if not plotted.
- Must cover the least ½ of the paper.

Labelling ---------- (½mk)
Penalize ½mk for wrong units/or interchanged axes.

Plotting ---------- (1mk)
- March only plots in the correct scale interval.

Correct plots	4 - 5	3 - 2	1
Marks awarded	1	½	0

Curve ---------- (1mk)



(b) (i) 7.94cm³ ---------- (1mk)

- Award ½mk for showing on correct graph and ½mk for correct reading.
- If NOT shown mark out of ½mk

(ii) Molarity of NaOH solution C

$M_1V_1 = M_2V_2$

$2 \times 10 = M_2 \times 100$ ✓½

$M_2 = 0.2$ ✓½\

Moles of NaOH used $= \dfrac{0.2 \times 7.94}{1000}$

$= 0.001588$ ✓½

Moles of HCl required = 0.001588

$1cm^3 \rightarrow 0.001588$

$1000 \rightarrow ?$

$= 1.588M$ ✓½

2

(c) Rate of reaction hence the gradient ✓½ of the curve decreases ✓½ with a decrease I in concentration of HCl. ✓½

Procedure II

Table II	I	II	III
Final burette reading	17.1	34.1	17.2
Initial burette reading	0.0	17.1	0.0
Volume of solution C use (cm^3)	17.1	17.0	17.2

Award 5 marks distributed as follows.
Complete table ---------- (1mk)
- Penalize ½mk once for, incomplete table, inversion, unrealistic value or arithmetic error.
- If only 1 titration done penalize fully.

Decimals ---------- (1mk)
Penalize fully for inconsistent use of either 1 or 2d.p. and/or for whole numbers unless on zero.

Principle of averaging ---------- (1mk)
- Penalize ½mk if working NOT shown or answer rounded to less than 2d.p.
- Penalize fully if inconsistent values averaged or consistent values are not averaged.

Accuracy ---------- (1mk)
- Compare student value with school value and award 1mk if within 0.1 of school value and ½ if within 0.2 otherwise 0mks.

Final answer
- Compare school value with correct/corrected student's value and subject to condition for accuracy above.

(i) Moles of NaOH used

$$= \frac{2 \times 17.1}{1000}$$

= 0.0342 ✓½

Moles of HCl in $25cm^3$ of solution P

= 0.0342 ✓½

- Penalize fully if average volume is Not transferred intact.
- Penalize ½mk for wrong transfer of average titre (17.1) unless it is strange.
- Ignore units unless wrong units are given.
- Answer must be in 4d.p. unless it works out to exactly less than 4 otherwise penalize ½mk.

(ii) 0.0342 moles → 25
? ← $100cm^3$
= 0.1368 moles
- Answer must as expected otherwise penalize ½ for rounding.

(ii) Moles of HCl in original solution

$$= \frac{2 \times 100}{1000}$$

= 0.2
Moles used = 0.2 – 0.1368
= <u>0.0632 moles</u>
- Answer must be as expected otherwise penalize ½mk for rounding off.

2. (a)

Observation	Inference
Glowing splint relit Solid turns from black to red ten yellow. (1mk)	Oxygen gas produced (1mk)

(b) (i) .

Observation	Inference
Colourless filtrate produced No bubbles Yellow residue (1mk)	(1mk)

(ii)

Observation	Inference
White ppt formed White ppt dissolves in excess (1mk)	Pb^{2+}, Zn^{2+}, Al^{3+} All 3 mentioned – 1mk 2 mentioned ½mk 1 mentioned 0mk (1mk)

(iii)

Observation	Inference
White ppt formed White ppt persists in excess (1mk)	Pb^{2+}, Al^{3+} (1mk)

(iv)

Observation	Inference
White ppt formed No bubbles (1mk)	Pb^{2+} For part (i) + 0(iii) reject it. Formulae are wrong Ions written in names. (1mk)

3. (a)

Observation	Inference
Colourless liquid forms on cooler part of the test tube. Dense white fumes forms. Glass rod covered with a white soild. Copper (II) oxide turns from block to mixture glows red. (2mks)	Solid contains carbon and hydrogen// H is organic. (1mk)

(b) (i)

Observation	Inference
Purple potassium manganate (VII) decolourized. (1mk)	R – OH C = C - C ≡ C - **NB**: No joining of letters. Each carbon must form 4 bonds i.e. reject C = C. Penalize fully for any contradictory functional group. (1mk)

(ii)

Observation	Inference
Orange potassium chromate (VI) remains orange. (1mk)	C = C - C ≡ C - Reject akene/alkyne written in words. Accept for ½mk R – OH absent. (1mk)

(iii)

Observation	Inference
pH 5	Solution is weakly acidic

Reject – pH greater than 6 - Range - hanging figures e.g. 1, 2, 3 (1mk)	H^+ ions present R – COOH present (1mk)