Name of the Student:_____
Max. Marks : 18 Marks **Time : 18 Minutes**

Mark Schemes

Q1.

(a) pH on the *y*-axis, volume of alkali on the *x*-axis

If axes unlabelled use data to decide that pH is on y-axis.

1

Uses sensible scales

*Lose this mark if plotted paths do not cover **half** of the paper.*
Lose this mark if the graph plot goes off the squared paper.

1

Labels the axes

Allow mark for axes labelled 'pH' and 'volume'.

1

Plots all of the points correctly

1

Line through the points is smooth and has the correct profile

Ignore 0–5 cm^3 section of the graph.
Lose this mark if graph is kinked or not a single line.

1

Line ignores the point at 12 cm^3

Lose this mark if point clearly not treated as an anomaly.

1

(b) (i) 24.4 cm^3 ± 0.2

If no answer in (i) allow answer written on the graph.
*Allow this answer **only**.*
Do not penalise precision.

1

(ii) 12.2 cm^3 ± 0.1

If no answer in (ii), allow answer written on the graph.
Allow answer to (i) divided by 2.
Do not penalise precision.

1

(iii) 3.9 ± 0.2

If no answer in (iii), allow answer written on the graph.
Consequential marking from (ii)
Lose this mark if answer not given to 1 dp.

1

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(c) $pK_a = -\log K_a$ or $K_a = 10^x$, where $x = -$ (answer to b(iii))

1

1.26×10^{-4}

3.7 to 4.1 gives $K_a = 7.9 \times 10^{-5}$ to 2.0×10^{-4}

Consequential marking from b(i).

Correct answer without working scores 1 mark only.

Do not penalise precision.

1

(d) Methanoic acid

Consequential marking from (c).

$pK_a = 3.7$ gives methanoic acid.

$pK_a = 4.1$ gives ethanoic acid.

No lucky guesses – candidates must apply answer from (c).

Do not allow answers based on data given in (f).

1

(e) Error in using pipette is 0.2% **and**
Error in using burette is 0.15 × 100 / (answer to b(i))

Using 24.4 for burette gives 0.6%

Do not penalise precision.

Allow if errors are given without working.

Lose mark if the burette error is not calculated on b(i).

*If the error being calculated is **not** stated, allow **if** the calculations are in the same order as in the question (pipette, burette).*

1

(f) Difference is $1.6 \times 10^{-4} - 1.26 \times 10^{-4} = 0.34 \times 10^{-4}$

Allow consequential answer from (c).

Do not penalise precision.

$0.34 \times 100 / 1.6$ is a 21% error

Correct final answer without working scores 1 mark.

Using 1.9×10^{-4} gives 0.3×10^{-4} and 18.8%.

1

(g) Calibrate meter **or** thermostat the mixture **or** maintain constant temperature

Do not allow 'repeat experiment'.

1

(h) Mixture is a <u>buffer</u>

1

[16]

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Q2.

(Calibrate) meter with solution(s) of known pH/buffer(s)

Do not accept 'repeat reading'

1

Adjust meter/plot calibration curve

1

[2]

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