Atika School
Free Online Academy

CHEMISTRY PP3 MS

Table 1

	1	2	3
Final burette reading(cm^3)	24.5	24.5	24.5
Initial burette reading (cm^3)	0.0	0.0	0.0
Volume of acid used (cm^3)	24.5	24.5	24.5

Marking
- Complete table award; ✓
- Decimal consistency; ✓
- Accuracy ± 0.1;✓
- School value; ✓

Principles of averaging:
Average volume = $\frac{24.5 + 24.5 + 24.5}{3}$ = 24.5; ✓ (½ mark)
= 24.5 cm^3; ✓(½ mark)

(a) Moles of sodium hydroxide used
Molarity of solution:
Moles = $\frac{\text{Mass /litre}}{\text{RMM}}$
= $\frac{4}{40}$ = 0.1molar
If 1000 cm^3 → 0.1mole
Then 25 cm^3 → $\frac{25 \times 0.1}{1000}$ = 0.0025 moles;

(ii) Moles of hydrochloric acid
$NaOH_{(aq)} + HCl_{(aq)} \rightarrow NaCl_{(aq)} + H_2O_{(l)}$
Mole ratio = 1:1;
Thus moles of acid = 0.0025 moles;

(iii) Molarity of acid.
Volume of acid reacting = average titre in (a) e.g. 24.5 cm^3
If 24.5 cm^3 → 0.0025 moles
Then 1000 cm^3 → $\frac{1000 \times 0.0025}{24.5}$ = 0.1020 molar;

Table II
Marking:
Complete table ✓ - 1mark
Decimal consistency ✓- 1 mark
Accuracy ✓ - 1mark
School value ✓- 1mark
Expected titre = 28.3 cm^3

(c) Average volume
$\frac{28.3 + 28.3 + 28.3}{3}$ = 28.3 cm^3
All 3 values within 0.1 of each other and used – 1mark
Only 2 within 0.1 of each other and used – ½ mark
Inconsistent value used – 0 mark

(d) $\frac{\text{Answer in (b) (iii) x average volume}}{1000}$
Example:
Molarity of the acid calculated in (b) (iii) = 0.102 molar.
Thus 1000 cm^3 → 0.102 moles
28.3 cm^3 → $\frac{28.3 \times 0.102}{1000}$ = 0.0028866 moles;

(e) (i) Moles of carbonate that reacted:
Using mole ratio, 2 moles of acid reacts with 1 mole of carbonate
Thus moles of carbonate reacting = $\frac{\text{answer in (d) x 1}}{2}$
Example:
2 moles of acid → 1 mole of carbonate
Thus 0.0028866 moles of acid → $\frac{0.0028866 \times 1}{2}$
= 0.0014433 moles;

(ii) Molarity of carbonate
25 cm^3 of carbonate → 0.0014433
Then 1000 cm^3 → $\frac{1000 \times 0.001443}{25}$ = 0.057732 molar

(f) Mass of the salt mixture in gdm-3
250 cm^3 → 2.5g
1000 cm^3 → $\frac{1000 \times 2.5}{250}$ = 10g;

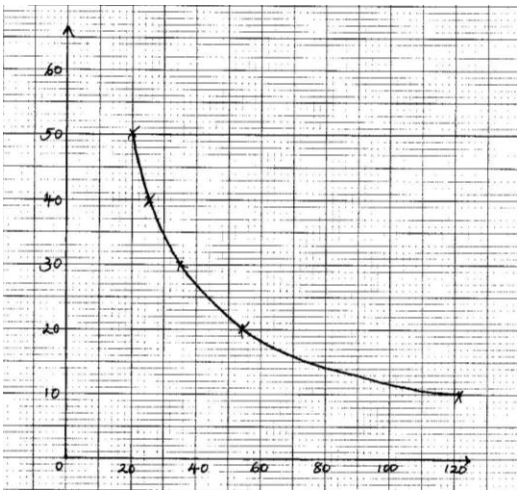
(g) Percentage of XCl in the mixture
Mass of X_2CO_3 in 1 litre
Molarity = 0.057732 molar / answer in (e) (ii).
Mass = 0.057732 x 106 = 6.119592g;
Mass of XCl = 10 – 6.119592
= 3.880408;
Percentage = $\frac{3.880408}{10}$ x 100
= 30.80408%
Note: Use school based values.

Question 2

SOLUTION	S3 (cm^3)	Water (cm^3)	Time (s)
A	50	0	20
B	40	10	25
C	30	20	35
D	20	30	53
E	10	40	103

Marking:
- Complete table✓
- Decimal consistency ✓
- Trend (increasing time) ✓
- School value ✓

Graph Trend:



Marking:
Scale – ½ mark
Axes – ½ mark
Plotting – 1mark
Curve – 1mark

(b) As the concentration decreases ,the time increases ✓

(c) To keep the column of solution constant through the experiment ✓

Question 3 (a)

	Observations	Inferences
(a)	Colourless gas with a pungent smell; Gas changes moist red litmus paper blue, moist blue litmus paper remains blue	NH_4^+ present;
(b)	Dissolves to form a colourless solution;	- Soluble salt present; Coloured ions absent // Fe^{2+}, Fe^{3+}, Cu^{2+} absent;
(c) (i)	White precipitate formed	SO_4^{2-} present;
(ii)	White precipitate that persists on warming;	Cl- absent;
(iii)	- White precipitate that dissolves in excess; - Colourless gas with a pungent smell on warming; Colourless gas changes moist red litmus paper to blue, blue litmus paper remains blue;	Zn^{2+} NH_4^+ present;
(e) (i)	Dissolves to forma colourless solution	Polar substance; R – OH present;
(ii)	No effervescence	R – COOH, H^+, H_3O^+ absent;
(iii)	Colour of acidified potassium dichromate (VI) changes from orange to green;	R – OH present;