AS Level Chemistry A)

H032/01 Breadth in chemistry

Question Set 11

1. Ethanoic acid, CH_3COOH, is the main dissolved acid in vinegar.

(a) Ethanoic acid is a weak acid.

What is meant by *acid* and *weak acid*?

[1]

1. a) acid : proton donor
weak acid : an acid that only partially dissociates into ions in solution

(b) Aluminum is reacted with ethanoic acid.

(i) The unbalanced equation for the reaction is shown below.

Balance the equation.

…2.. $Al(s)$ + …6.. $CH_3COOH(aq) \rightarrow$ ….2. $(CH_3COO)_3Al(aq)$ + ….3. $H_2(g)$ **[1]**

(ii) This reaction is a redox reaction.

Deduce which element has been oxidised and which element has been reduced, and state the changes in oxidation number.

[2]

b)ii) aluminium has been oxidised
$0 \longrightarrow +3$

hydrogen has been reduced
$+1 \longrightarrow 0$

(c) A student plans to determine the concentration, in $mol\,dm^{-3}$, of CH_3COOH in a bottle of vinegar. The student will carry out a titration with aqueous barium hydroxide, $Ba(OH)_2(aq)$.

The student's method is outlined below.

- Dilute $10.0\,cm^3$ of vinegar from the bottle with distilled water and make the solutionup to $250.0\,cm^3$.
- Add the diluted vinegar to the burette.
- Titrate $25.0\,cm^3$ volumes of $0.0450\,mol\,dm^{-3}$ $Ba(OH)_2$ with the diluted vinegar.

The mean titre of the diluted vinegar is $25.45\ cm^3$.

The reaction in the student's titration is shown below.

$2CH_3COOH(aq) + Ba(OH)_2(aq) \rightarrow (CH_3COO)_2Ba(aq) + 2H_2O(l)$

(i) Calculate the concentration, in mol dm^{-3}, of CH_3COOH in the original bottle of vinegar.

Show your working.

[4]

c) $2CH_3COOH(aq) + Ba(OH)_2(aq) \rightarrow (CH_3COO)_2Ba(aq) + 2H_2O(l)$

i)

c		0.045
v	0.02545	0.025
n	2.25×10^{-3}	$= 0.045 \times 0.025$ $= 1.125 \times 10^{-3}$

×2

$$[CH_3COOH] = \frac{2.25 \times 10^{-3}}{0.02545} = 0.0884086$$

$$= \underline{\underline{0.0884}} \text{ moldm}^{-3}$$

(ii) Suggest **one** assumption that the student has made that might mean that their calculated concentration of ethanoic acid in the vinegar is invalid.

Predict, with a reason, how the experimental result would differ from the actual concentration of CH_3COOH if the assumption were **not** correct.

[2]

ii) an assumption is that the vinegar contains no other acids

→ experimental result would be smaller than the calculated result if not true.

Total Marks for Question Set 11: 10

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