

4 Nitric acid, HNO_3 , and sulfuric acid, H_2SO_4 , are strong acids. Ethanoic acid, CH_3COOH , is a weak acid.

(a) One mole of each acid is added separately to 1000cm^3 of distilled water to form a dilute solution. All three acids dissociate in distilled water.

(i) State the formula of the common cation produced when each of the three acids dissociates in water.

..... [1]

(ii) Explain, in terms of dissociation, why:

- nitric acid is described as a strong acid

.....

- ethanoic acid is described as a weak acid.

..... [2]

(iii) State which of the three dilute acids will have the highest pH value.

..... [1]

(iv) State the colour of thymolphthalein in all three dilute acids.

..... [1]

(v) Give the formula of the anion formed when:

- sulfuric acid dissociates in water

.....

- ethanoic acid dissociates in water.

..... [2]

(vi) Name the **two** gaseous products formed during the electrolysis of dilute sulfuric acid using inert electrodes.

..... and [2]

(vii) Name the salt formed when calcium reacts with ethanoic acid.

..... [1]

(b) Aluminium nitrate, $\text{Al}(\text{NO}_3)_3$, is made when dilute nitric acid reacts with aluminium hydroxide, $\text{Al}(\text{OH})_3$.

(i) $\text{Al}(\text{OH})_3$ acts as a base in this reaction.

Define the term base.

..... [1]

(ii) $\text{Al}(\text{OH})_3$ is **not** an alkali.

State what this tells you about the solubility of $\text{Al}(\text{OH})_3$.

..... [1]

(iii) Name **one other** compound which forms aluminium nitrate when added to dilute nitric acid.

..... [1]

(iv) The oxidation number of the O atoms in $\text{Al}(\text{NO}_3)_3$ is -2 .

The formula of the aluminium ion in $\text{Al}(\text{NO}_3)_3$ is Al^{3+} .

Determine the oxidation number of the N atoms in $\text{Al}(\text{NO}_3)_3$.
Show your working.

oxidation number of N = [2]

[Total: 15]