ACIDS AND BASES Core (SL & HL)

1. (a) Sulfuric acid, H_2SO_4 (aq) is a strong acid.

(i) What is the conjugate base of sulfuric acid?

[1]

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(ii) Calculate the pH of a 0.014 mol dm^{-3} solution of H_2SO_4 (aq).

[2]

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(iii) Write an equation to show the reaction between sulfuric acid and solid sodium carbonate. Include state symbols.

[2]

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(b) Ethanoic acid is a weak acid: CH_3CO_2H (aq) ⇌ $CH_3CO_2^-$ (aq) + H^+ (aq)

(i) Explain why ethanoic acid is considered to be a weak acid.

[1]

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(ii) State and describe the outcome of one way in which you might tell the difference between samples of ethanoic acid and sulfuric acid of equal concentrations. (No practical detail is required).

[2]

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2. (a) Carbonated water contains dissolved CO_2 which causes the water to be acidic:

$$CO_2\,(aq) + H_2O\,(l) \rightleftharpoons HCO_3^-\,(aq) + H^+\,(aq)$$

(i) State the formula for the conjugate acid of HCO_3^- (aq).

[1]

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(ii) Identify an amphiprotic species present in the reaction, and explain your reasoning.

[2]

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(iii) A sample of carbonated water has a pH of 4.5. Calculate the concentration of H^+ (aq) ions **and** the concentration of OH^- (aq) ions in the solution.

[3]

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3. (a) State a gas that generates acid deposition and write an equation to show how the gas reacts with water in the atmosphere.

[2]

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(b) State a problem that acid deposition causes and explain one way of preventing acid deposition.

[2]

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Total 18 marks (27 minutes)