

Test: Acids and Bases

1. Write balanced equations for these reactions:

(a) H_2SO_4 reacting with KOH

_____ (2)

(b) iron (II) hydrogencarbonate reacting with hydrochloric acid

_____ (2)

(c) CaO reacting with water

_____ (2)

(d) P_4O_{10} reacting with water

_____ (2)

2. When ammonia (NH_3) reacts with acidic solution (hydronium ions), the products formed are water and ammonium ions.

(a) Identify the base in this reaction.

_____ (1)

(b) Identify the conjugate acid in this reaction.

_____ (1)

(c) State whether this reaction is exothermic or endothermic.

_____ (1)

3. Citric acid, found in lemons, is a weak acid, and hydrochloric acid is a strong acid.



Compare and explain the concentration of hydrogen ions in a 1.0 mol L^{-1} solution of citric acid and a 1.0 mol L^{-1} solution of hydrochloric acid.

_____ (2)

4. When carbon dioxide reacts with water, carbonic acid is formed.

(a) State the name for acids formed by reaction of oxides with water.

_____ (1)

(b) Draw the structural formula for carbonic acid.

(2)

(c) On the structure drawn in part (b), label the area(s) which will react during an acid-base reaction. (1)

(d) Hence classify carbonic acid as monoprotic, diprotic, or triprotic.

_____ (1)

(e) Carbonic acid is found in natural rain water. State the pH of natural rain water.

_____ (1)

5.

(a) Calculate the hydrogen ion concentration of a solution with a pH of 5.

_____ (2)

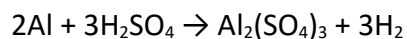
(b) State whether a pH of 10 is acidic, neutral or basic.

_____ (1)

6. Explain, using at least one equation, how acid rain forms and one negative effect acid rain can have on the environment.

_____ (3)

7. Consider an investigation in which 0.704 g of Al reacts exactly with 14.0 mL of an unknown concentration of H_2SO_4 according to this chemical equation:



- (a) Calculate the number of moles of Al present.

(2)

- (b) State the reacting mole ratio $\frac{n(\text{Al})}{n(\text{H}_2\text{SO}_4)}$.

(1)

- (c) Hence calculate the number of moles of H_2SO_4 that reacted.

(1)

- (d) Hence calculate the concentration, in mol/L, of the H_2SO_4 .

(2)

- (e) Convert this concentration into a %w/v.

(3)

BONUS QUESTION

Calculate the volume of 0.176 mol L⁻¹ HCl required to exactly react with 0.912 g of Mg

