8.1 Theories & Reactions of Acids & Bases

Question Paper

Course	DP IB Chemistry
Section	8. Acids & Bases
Topic	8.1 Theories & Reactions of Acids & Bases
Difficulty	Easy

Time allowed: 30

Score: /24

Percentage: /100

Question 1a

a)
Define a *Brønsted–Lowry acid*.

[1]

[1 mark]

Question 1b

b)
Which species in the following reaction acts as a Brønsted-Lowry base.

$$HSO_4^-(aq) + H_3O^+(aq) \rightleftharpoons H_2SO_4(aq) + H_2O(l)$$

[1]

[1 mark]

Question 1c

c)
Which species in the following equation is acting as a Brønsted-Lowry acid.

$$CO_3^{2-}(aq) + H^+(aq) \rightleftharpoons HCO_3^-(aq)$$

[1]

[1 mark]

Question 1d

d)
Explain, using the Brønsted-Lowry theory, how water can act either as an acid or a base.

[2]

[2 marks]

Question 2a

a)
Describe the difference between an amphiprotic and amphoteric species.

[1]

[1 mark]

Question 2b

b)

Write an equation to show ammonia, NH_3, acting as both a Brønsted–Lowry base and a Brønsted–Lowry acid.

Brønsted–Lowry base: .....

Brønsted–Lowry acid: .....

[2]

[2 marks]

Question 2c

c)

The equations for two acid-base reactions are given below.

$$HCO_3^-(aq) + H_2O(l) \rightleftharpoons H_2CO_3(aq) + OH^-(aq)$$

$$HCO_3^-(aq) + H_2O(l) \rightleftharpoons CO_3^{2-}(aq) + H_3O^+(aq)$$

Identify two different amphiprotic species in the above reactions.

[1]

[1 mark]

Question 2d

d)

i) State what is meant by the term conjugate base.

[1]

ii) State the conjugate base of the hydroxide ion, OH^-

[1]

[2 marks]

Question 3a

a)
State an equation for the reaction of magnesium carbonate with dilute hydrochloric acid.

[1]

[1 mark]

Question 3b

b)
State an equation for the reaction of lithium oxide with dilute nitric acid.

[1]

[1 mark]

Question 3c

c)
Which acid and base would be required to produce ammonium sulfate, $(NH_4)_2SO_4$.

[2]

[2 marks]

Question 3d

d)
Nitric acid and calcium hydroxide react together.

i) State the type of reaction that takes place.

[1]

ii) State the formula of the products of the reaction.

[1]

iii) State the sign of the enthalpy change for this reaction.

[1]

[3 marks]

Question 4a

a)
Identify one conjugate acid-base pair in the reaction.

$$OCl^-(aq) + H_2O(l) \rightleftharpoons OH^-(aq) + HOCl(aq)$$

[1]

[1 mark]

Question 4b

b)
State an equation for the reaction of aluminium hydroxide with dilute sulfuric acid.

[1]

[1 mark]

Question 4c

c)
State an equation for the reaction of calcium hydrogencarbonate with dilute phosphoric acid, H_3PO_4.

[1]

[1 mark]

Question 4d

d) Write the formulae for the following:

i) Carbonic acid. [1]

ii) Ammonium sulfate. [1]

iii) Magnesium ethanoate. [1]

[3 marks]