Name of the Student:_____
Max. Marks : 18 Marks **Time : 18 Minutes**

Q1.

This question is about several Brønsted–Lowry acids and bases.

(a) Define the term *Brønsted–Lowry* acid.

_____

_____

(1)

(b) Three equilibria are shown below. For each reaction, indicate whether the substance immediately **above** the box is acting as a Brønsted–Lowry acid (**A**) or a Brønsted–Lowry base (**B**) by writing **A** or **B** in each of the six boxes.

(i) CH_3COOH + H_2O ⇌ CH_3COO^- + H_3O^+

(1)

(ii) CH_3NH_2 + H_2O ⇌ $CH_3NH_3^+$ + OH^-

(1)

(iii) HNO_3 + H_2SO_4 ⇌ $H_2NO_3^+$ + HSO_4^-

(1)

(c) A 25.0 cm^3 sample of 0.0850 mol dm^{-3} hydrochloric acid was placed in a beaker. Distilled water was added until the pH of the solution was 1.25.

Calculate the total volume of the solution formed. State the units.

_____

Downloaded from www.merit-minds.com

(3)

(d) At 298 K, the value of the acid dissociation constant (K_a) for the weak acid HX in aqueous solution is 3.01×10^{-5} mol dm^{-3}.

(i) Calculate the value of pK_a for HX at this temperature.
Give your answer to 2 decimal places.

(1)

(ii) Write an expression for the acid dissociation constant (K_a) for the weak acid HX.

(1)

(iii) Calculate the pH of a 0.174 mol dm^{-3} solution of HX at this temperature.
Give your answer to 2 decimal places.

(3)

(e) An acidic buffer solution is formed when 10.0 cm^3 of 0.125 mol dm^{-3} aqueous sodium hydroxide are added to 15.0 cm^3 of 0.174 mol dm^{-3} aqueous HX.
The value of K_a for the weak acid HX is 3.01×10^{-5} mol dm^{-3}.

Calculate the pH of this buffer solution at 298 K.
Give your answer to 2 decimal places.

Downloaded from www.merit-minds.com

(6)

(Total 18 marks)

Downloaded from www.merit-minds.com