THE IONIC PRODUCT FOR WATER, K_W

1. a) Write the expression for K_W.

    b) What are the units for K_W?

    c) At a temperature a tiny fraction of a degree less than 25°C, the value for K_W is 1.00×10^{-14} (in the units you will have quoted in your last answer). Use this information to show why the pH of pure water is 7 at this temperature.

    d) At 30°C, K_W has a value of 1.471×10^{-14} (in the same units). Calculate the pH of pure water at this temperature. Is the water now acidic, alkaline, or still neutral? Explain your answer.

    e) As the temperature increases, the value of K_W increases. Use your knowledge of Le Chatelier's Principle to work out whether the ionisation of water is exothermic or endothermic:

    $$2H_2O_{(l)} \rightleftharpoons H_3O^+_{(aq)} + OH^-_{(aq)}$$

2. a) Define pK_W.

    b) What is the value of pK_W at 30°C? (Use the K_W value from Q1(d).)