**Conjugate acid/base pairs**

**2022**

Hydrogen iodide, HI, is a strong acid, whereas hydrofluoric acid, HF, is a weak acid.

Write equations to show their reactions with water, H2O(l).

**2021**

The hydrogen carbonate ion, HCO3–(*aq*), is an amphiprotic species because it can either accept or donate a

proton, acting as an acid or a base.

Write the equations for the reactions of the hydrogen carbonate ion, HCO3–(*aq*), with water.

**2020**

(i) Sodium hydrogen carbonate, NaHCO3, is a salt and will dissociate into ions when dissolved in water.

Write an equation for this process.

(ii) One of the ions formed from the dissociation is amphiprotic because it can either accept or donate a

proton. Write equations for each of these reactions.

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| **Acting as an acid** |  |
| **Acting as a base** |  |

**2019**

Nitric acid, HNO3(*aq*), and ethanoic acid, CH3COOH(*aq*), are both acids.

(i) Write equations to show their reactions with water, H2O(l).

(ii) Use these equations to explain why they are classified as acids.

**2018**

The hydrogen sulfate ion, HSO4–, is an amphiprotic species because it can both accept or donate a proton,

thus acting as an acid or base.

Write equations for the reactions of the hydrogen sulfate ion, HSO4–, with water.

**2017**

**(a)** Propanoic acid, C2H5COOH, is dissolved in water and the resulting solution has a pH of 4.2.

(i) Complete the equation by writing the formulae of the two products.

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(ii) Explain the proton, H+, transfer in this reaction, and identify the two conjugate acid-base pairs.

**(b)** Sodium ethanoate, CH3COONa(*s*), is a salt. When dissolved in water, it dissociates into ions.

Explain, including TWO relevant equations, whether a solution of sodium ethanoate is acidic or basic.

**2016**

(a) Water is an amphiprotic substance because it can accept or donate a proton, therefore acting as an acid or

a base. Complete the equations for the reactions of water, H2O, with ammonia, NH3, and the ammonium

ion, NH4+



(b) Sodium carbonate, Na2CO3(*s*), is a salt. When dissolved in water, it dissociates into ions. Explain

whether a solution of sodium carbonate would be acidic or basic. In your answer you should include TWO

relevant equations.

**(c)** The ionisation of water is represented by the equation:



Give an account of the extent of ionisation of water, given *K*w = 1 × 10–14.

**2015**

**(a) (i)** Ammonia solution, NH3(*aq*), is a common chemical in the school laboratory.

(i) Explain, using an equation, whether ammonia solution is acidic or basic.

(ii) Bottles of ammonia solution are often labelled ammonium hydroxide, NH4OH(*aq*).

Explain why both names, ammonia and ammonium hydroxide, are appropriate.

(b) The hydrogen carbonate ion, HCO3–, is an amphiprotic species because it can donate or accept a proton, therefore acting as an acid or base

Write equations for the reactions of HCO3– with water: one where it acts as an acid, and one where it acts as a base.



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