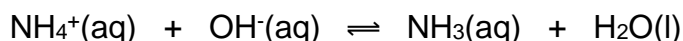
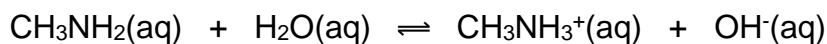
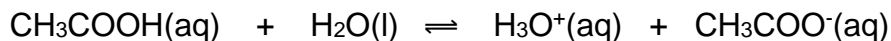


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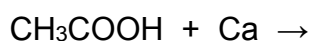
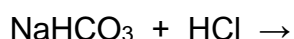
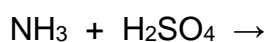
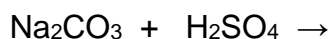
- 1 Define a Brønsted-Lowry acid
- 2 Define a Brønsted-Lowry base
- 3 Classify each of the species in the following reactions as Brønsted-Lowry acids and bases and identify conjugate acid-base pairs:



- 4 Identify the conjugate base of each of the following: H_2SO_4 HCO_3^- HPO_4^{2-}
- 5 Identify the conjugate acid of each of the following: HCOO^- H_2PO_4^- SO_4^{2-}
- 6 Explain the difference between the terms *amphoteric* and *amphiprotic*
- 7 Identify which of the following is/are amphiprotic?



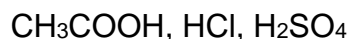
- 8 Complete the following equations:



- 9 State whether the neutralisation reaction between an acid and an alkali is exothermic or endothermic.
- 10 State the names of the acid and alkali needed to make each of the following salts using titration:
Potassium chloride Sodium bromide ammonium nitrate potassium sulfate
- 11 State the names of an acid and another substance that could be reacted to make each of the following salts:
Copper(II) nitrate calcium chloride barium chloride magnesium sulfate
- 12 Explain the difference between a strong acid and a weak acid.
- 13 Classify the following acids and bases as strong or weak:

| | | | |
|-------------------|--|--------------------------|--|
| Hydrochloric acid | | Sodium hydroxide | |
| Ethanoic acid | | Ammonia | |
| Sulfuric acid | | CH_3NH_2 | |
| Carbonic acid | | Potassium hydroxide | |
| Nitric acid | | Barium hydroxide | |

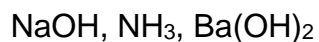
14 Write equations for the dissociation of the following acids:



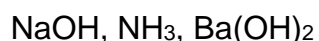
15 Arrange the following in order of decreasing conductivity of solutions of equal concentration:



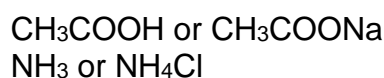
16 Write equations for the ionisation of the following bases:



17 Arrange the following in order of increasing conductivity of solutions of equal concentration:



18 Explain which of the following solutions of equal concentration conducts electricity better:



19 Explain two experimental procedures to distinguish between strong and weak acids and bases

20 Complete the following sentences:

A strong acid has a conjugate

A strong base has aconjugate

21 If methanoic acid is a stronger acid than ethanoic acid, explain whether the methanoate ion or the ethanoate ion is the stronger base.

22 Define pH

23 Complete the following table without using a calculator:

| pH | $[\text{H}^+(\text{aq})]/\text{mol dm}^{-3}$ | acidic/alkaline/neutral? |
|----|--|--------------------------|
| 4 | | |
| | 1.0×10^{-6} | |
| 7 | | |
| | 1.0×10^{-11} | |
| 13 | | |

24 Calculate the pH for each of the following solutions: 0.1 M HCl(aq) 0.020 M HNO₃(aq)

25 Deduce by how much does the pH changes when a solution of a strong acid with pH=3 is diluted by a factor of 10.

26 Calculate the relationship between the $[\text{H}^+(\text{aq})]$ in a solution of pH=2 and one of pH=6?

27 State two methods for measuring the pH of a solution.

28 Write an expression for the equilibrium that exists in any aqueous solution and for the ionic product constant of water.

29 State the value of K_w at 25 °C?

30 Complete the following table for aqueous solutions at 25 °C:

| $[\text{H}^+(\text{aq})]/\text{mol dm}^{-3}$ | $[\text{OH}^-(\text{aq})]/\text{mol dm}^{-3}$ | acidic/alkaline/neutral? |
|--|---|--------------------------|
| 1.0×10^{-6} | | |
| | 1.0×10^{-3} | |
| 2.5×10^{-5} | | |
| | 1.2×10^{-11} | |
| 3.6×10^{-12} | | |

31 Calculate $[\text{H}^+(\text{aq})]$ and $[\text{OH}^-(\text{aq})]$ for each of the following solutions:

0.1 M HCl, 0.01 M NaOH, 0.020 M $\text{Ba}(\text{OH})_2$.

32 Explain why rain is naturally acidic and state its approximate pH.

33 Explain what is meant by *acid deposition*

34 Identify 2 gases that can result in acid deposition and write an equation for the formation of each

35 State one source of each of the gases in 34

36 Write equations to show how HNO_2 , HNO_3 , H_2SO_3 and H_2SO_4 can be formed in the atmosphere.

37 Explain the difference between pre- and post-combustion methods for reducing SO_2 emissions.

State which method would be used

- (a) for producing fuels for cars
- (b) in a power station

38 Describe some of the problems associated with acid deposition.