

Year 3 Chemistry Supplementary Exercise

- Acids and Bases

There are four possible answers, **A**, **B**, **C** and **D**. Choose the **one** you consider correct and record your choice in the brackets provided.

- 1 The pH of an aqueous solution of hydrochloric acid is 2.

What will be the pH of the acid after the addition of 10 g of sodium chloride?

- A 1
- B 2
- C 7
- D 9

()

- 2 A 25 cm³ sample of dilute sulfuric acid contains 0.025 moles of the acid.

What is the hydrogen ion concentration in the solution?

- A 0.25 mol / dm³
- B 0.50 mol / dm³
- C 1.00 mol / dm³
- D 2.00 mol / dm³

()

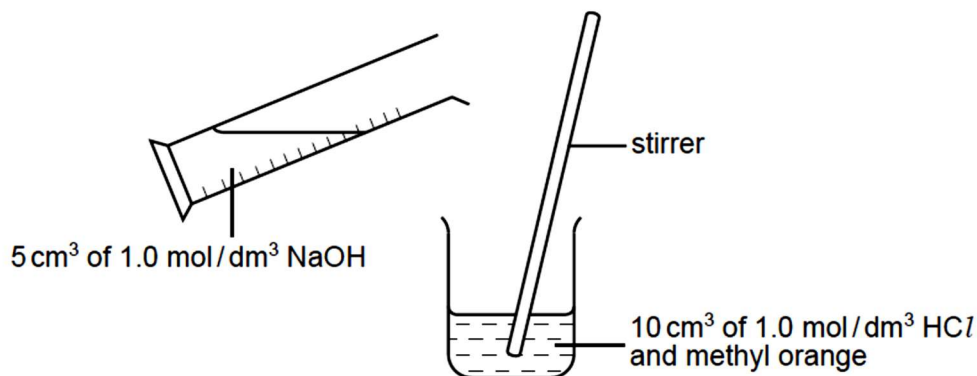
- 3 The following equations represent reactions of dilute sulfuric acid.

Which reaction is not 'typical' of a dilute acid?

- A $2\text{KOH}(\text{aq}) + \text{H}_2\text{SO}_4(\text{aq}) \rightarrow \text{K}_2\text{SO}_4(\text{aq}) + 2\text{H}_2\text{O}(\text{l})$
- B $\text{CuO}(\text{s}) + \text{H}_2\text{SO}_4(\text{aq}) \rightarrow \text{CuSO}_4(\text{aq}) + \text{H}_2\text{O}(\text{l})$
- C $\text{Pb}(\text{NO}_3)_2(\text{aq}) + \text{H}_2\text{SO}_4(\text{aq}) \rightarrow \text{PbSO}_4(\text{s}) + 2\text{HNO}_3(\text{aq})$
- D $\text{ZnCO}_3(\text{s}) + \text{H}_2\text{SO}_4(\text{aq}) \rightarrow \text{ZnSO}_4(\text{aq}) + \text{CO}_2(\text{g}) + \text{H}_2\text{O}(\text{l})$

()

- 4 In an experiment 5 cm^3 of 1.0 mol/dm^3 sodium hydroxide are gradually added to 10 cm^3 of 1.0 mol/dm^3 hydrochloric acid containing methyl orange.



Which change occurs in the mixture?

- A The concentration of the H^+ ions increases.
- B The methyl orange changes colour.
- C More water molecules are formed.
- D A precipitate is formed.

()

- 5 All ammonium salts on heating with sodium hydroxide produce ammonia gas.
From which ammonium salt can the greatest mass of ammonia be obtained?

- A $0.5\text{ mol } (\text{NH}_4)_3\text{PO}_4$
- B $0.5\text{ mol } (\text{NH}_4)_2\text{SO}_4$
- C $1.0\text{ mol } \text{NH}_4\text{Cl}$
- D $1.0\text{ mol } \text{NH}_4\text{NO}_3$

()

- 6 When aqueous sodium hydroxide was added to aqueous lead(II) nitrate, a white precipitate formed.
The precipitate dissolved when excess aqueous sodium hydroxide was added.

Which statement is **not** correct?

- A Aqueous lead(II) nitrate contains Pb^{2+} and NO_3^- ions.
- B Aqueous sodium hydroxide has a pH above 7.
- C The ionic equation for the formation of the precipitate is $\text{Pb}^{2+}(\text{aq}) + 2\text{OH}^-(\text{aq}) \rightarrow \text{Pb}(\text{OH})_2(\text{s})$.
- D The precipitate dissolved because an acid-base reaction occurred.

()

A toilet cleaner contains the acid salt, sodium dihydrogen phosphate, NaH_2PO_4 .

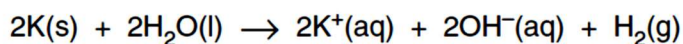
- (a) Explain why sodium dihydrogen phosphate is both an 'acid' and a 'salt'. [2]
- (b) Sodium dihydrogen phosphate can be made by reacting sodium hydroxide with phosphoric acid, H_3PO_4 .
- (i) Write an equation for the formation of sodium dihydrogen phosphate.
- (ii) Suggest the formula of **two** other salts formed from sodium hydroxide and phosphoric acid. [3]
- (c) The table shows information about other acidic compounds.

name	pH of a 0.5 mol/dm^3 solution	<div> <div>increasing acid strength</div> <div>↓</div> </div>
sodium dihydrogen phosphate	4.5	
ethanoic acid	3.8	
sulfuric acid	1.0	

- (i) Explain why sulfuric acid behaves as a *strong acid* but ethanoic acid behaves as a *weak acid*.
- (ii) Describe an experiment, other than measuring pH, that you could carry out to show that sulfuric acid is a strong acid but ethanoic acid is a weak acid.

State what measurements you would make and what results you would expect. [5]

- 8 (b) Potassium reacts with water as shown in the equation.



Describe what you would see when potassium reacts with water.

.....
.....
.....[2]

- (c) A sample of 0.195 g of potassium was added to 500 cm³ of cold water. When the reaction was finished, 100 cm³ of 0.100 mol/dm³ hydrochloric acid was added to form solution X.

- (i) Calculate the number of moles of hydroxide ions formed when the potassium was added to water.

- (ii) Calculate the number of moles of hydrogen ions in 100 cm³ of 0.100 mol/dm³ hydrochloric acid.

- (iii) Give an ionic equation to represent the neutralisation reaction.

.....

- (iv) Suggest a pH value for solution X.
Explain your answer.

.....

.....

[4]