The focus for this week is revision of the 1C topic.

This document contains:

1. HW answers – Please mark your homework from last week

2. Revision questions – The best way to revise is to answer questions, this allows you to identify what you know, and where you need to focus your revision. There is no need to answer all the questions in this document. Choose the areas that you have found more challenging and focus on those questions. The answers to all the questions are at the end of the document.

Useful revision websites:

Acids and bases: https://www.bbc.co.uk/bitesize/guides/zsmgpbk/revision/1

The mole and concentration: https://www.bbc.co.uk/bitesize/guides/z7c6fg8/revision/1

Revision videos:

Mole calculations (nCV): https://www.youtube.com/watch?v=Fxfw1pk8n1o&list=PLpeedPxQgHa1f653KZE7YJ-XEhq9Uck7s&index=9

Both triangles: https://www.youtube.com/watch?v=ZK3UO4PDtDE&list=PLpeedPxQgHa1f653KZE7YJ-XEhq9Uck7s&index=10

Titration calculations: https://www.youtube.com/watch?v=1YYaJ3nwk7I&list=PLpeedPxQgHa1f653KZE7YJ-XEhq9Uck7s&index=12

Acids and bases: https://www.youtube.com/watch?v=ae2VT2Hmi2k&list=PLpeedPxQgHa1f653KZE7YJ-XEhq9Uck7s&index=28

Spectator ions: https://www.youtube.com/watch?v=uFOxstU57uM&list=PLpeedPxQgHa1f653KZE7YJ-XEhq9Uck7s&index=29

pH of oxides: https://www.youtube.com/watch?v=P9YczvydCAc&list=PLpeedPxQgHa1f653KZE7YJ-XEhq9Uck7s&index=42

Neutralisation: https://www.youtube.com/watch?v=j0sHWm7P4qk&list=PLpeedPxQgHa1f653KZE7YJ-XEhq9Uck7s&index=44

Again, there is no need to watch all these videos, but they're very useful summaries if you find those topics challenging.

Please mark last week's homework

Mole calculations and Titration calculations 27

1. What is the concentration of the following solutions?

(a) 0.1 mole of substance dissolved in 200 cm^3 of solution

$c = n / v = 0.1mol / 0.2\ l = 0.5\ mol\ l^{-1}$

(b) 0.2 mole of substance dissolved in 200 cm^3 of solution

$c = n / v = 0.2mol / 0.2\ l = 1\ mol\ l^{-1}$

(c) 0.15 mole of substance dissolved in 75 cm^3 of solution

$c = n / v = 0.15mol / 0.075\ l = 2\ mol\ l^{-1}$

2. How many moles of substance are dissolved in the following solutions?

(a) 250 cm^3 of 2 mol l^{-1}

$n = c \times v = 2\ mol\ l^{-1} \times 0.25\ l = 0.5\ mol$

(b) 300 cm^3 of 1 mol l^{-1}

$1\ mol\ l^{-1} \times 0.3\ l = 0.3\ mol$

(c) 500 cm^3 of 0.5 mol l^{-1}

$n = c \times v = 0.5\ mol\ l^{-1} \times 0.5\ l = 0.25\ mol$

(d) 400 cm^3 of 2 mol l^{-1}

$2\ mol\ l^{-1} \times 0.4\ l = 0.8\ mol$

3. Hydrochloric acid reacts with potassium hydroxide according to the equation:

$HCl + KOH \dashrightarrow KCl + H_2O$

What is the concentration of a solution of hydrochloric acid if 12·5 cm^3 of hydrochloric acid is neutralised by 20 cm^3 of a 0·1 mol l^{-1} solution of potassium hydroxide?

	KOH	HCl
MR	1 → (x 1)	→ 1
n (mol)	n = c x v = 0.1 mol l^{-1} x 0.02 l = 0.002mol → (x 1)	→ 0.002 mol
c (mol l^{-1})	0.1 mol l^{-1}	C =n/v = 0.002 mol / 0.0125 l **= 0.16 mol l^{-1}**
v (l)	20 cm^3 / 1000 = 0.02 l	12.5 cm^3 / 1000 = 0.0125 l

4. Sodium hydroxide reacts with sulphuric acid according to the equation:
$2NaOH + H_2SO_4 \dashrightarrow Na_2SO_4 + 2H_2O$

What is the concentration of sulphuric acid if 20 cm^3 of a solution of the acid is neutralised by 25 cm^3 of a 0·5 mol l^{-1} solution of sodium hydroxide?

	NaOH	H_2SO_4
MR	1 ——— X 2 ———→	2
n (mol)	n = c x v = 0.5 mol l^{-1} x 0.025 l = 0.0125mol ——— X 2 →	0.025 mol
c (mol l^{-1})	0.5 mol l^{-1}	C =n/v = 0.025 mol / 0.02 l **= 1.25 mol l^{-1}**
v (l)	25 cm^3 / 1000 = 0.025 l	20 cm^3 / 1000 = 0.02 l

5. 1mole of oxalic acid neutralises 2 moles of sodium hydroxide.

What volume of a 0·5 mol l^{-1} solution of oxalic acid neutralises 100 cm^3 of a 2 mol l^{-1} solution of sodium hydroxide?

	Sodium hydroxide	Oxalic acid
MR	2 ——— X 0.5 ———→	1
n (mol)	n = c x v = 2 mol l^{-1} x 0.1 l = 0.2mol ——— X 0.5 →	0.1 mol
c (mol l^{-1})	2 mol l^{-1}	0.5 mol l^{-1}
v (l)	100 cm^3 / 1000 = 0.1 l	v = n / c = 0.1 mol / 0.5 mol l^{-1} **= 0.2 l**

1C Revision

Topic 1

Success Criteria	Self-Assessment
I can state what is meant by the term pH	☹ 😐 ☺
I can explain what the pH scale is used to measure.	☹ 😐 ☺
I can describe how indicators work.	☹ 😐 ☺
I can state the pH of acids, alkalis and neutral substances.	☹ 😐 ☺

1. What does pH stand for?
2. How can the pH of a solution be measured?
3. What colour does pH paper turn in acid solutions?
4. What is the pH of acids?
5. What colour does pH paper turn in basic solutions?
6. What is the pH of bases?
7. What colour do neutral solutions turn pH paper?
8. What is the pH of neutral solutions?
9. Substance A has a pH of 3.8, substance B has a pH of 5.6. Which substance is more acidic?
10. Substance C has a pH of 11.7, substance D has a pH of 13.9. Which substance is more alkaline?

Topic 2

Success Criteria	Self-Assessment
I can state the concentration of hydrogen and hydroxide ions present in acidic, alkaline and neutral solutions.	☹ 😐 ☺
I can write the ionic formula of acids and alkalis.	☹ 😐 ☺

1. Describe the concentration of hydrogen ions compared to hydroxide ions in acidic solutions.
2. Describe the concentration of hydrogen ions compared to hydroxide ions in alkaline solutions.
3. Describe the concentration of hydrogen ions compared to hydroxide ions in neutral solutions.
4. What happens to the concentration of hydrogen ions in acidic solutions as the pH increases?
5. What happens to the concentration of hydroxide ions in alkaline solutions as the pH increases?
6. Write the ionic formula for hydrochloric acid.
7. Write the ionic formula for sulfuric acid.
8. Write the ionic formula for nitric acid.
9. Write the ionic formula for sodium hydroxide.
10. Write the ionic formula for calcium hydroxide.

Topic 3

Success Criteria	Self-Assessment
I can state the equation for the dissociation of water.	☹ 😐 ☺
I can explain why pure water is a poor conductor of electricity.	☹ 😐 ☺

1. What is the formula for water?
2. What type of bonding is present in water?
3. Calculate the mass of one mole of water.
4. What is the shape of a water molecule?
5. What is the pH of distilled water?
6. Why is distilled water neutral?
7. Write an equation for the dissociation of water.
8. What two ions are present in very small concentrations in distilled water?
9. Is salt water or distilled water a better conductor of electricity?
10. Is tap water or distilled water a better conductor of electricity?

Topic 4

Success Criteria	Self-Assessment
I can describe how acids are formed.	☹ 😐 ☺
I can describe how gases released contribute to acid rain.	☹ 😐 ☺
I can describe how acid rain can affect the environment.	☹ 😐 ☺
I can describe how alkalis are formed.	☹ 😐 ☺
I know the difference between an alkali and a base.	☹ 😐 ☺

1. A soluble non-metal oxide was added to water. Would the solution formed be acidic, alkaline or neutral?
2. A soluble metal oxide was added to water. Would the solution formed be acidic, alkaline or neutral?
3. An insoluble metal oxide was added to water. Would the solution formed be acidic, alkaline or neutral?
4. Which two gases contribute to acid rain?
5. What are the main sources of these gases?
6. State two negative effects that acid rain can have on the environment.
7. In the electrolysis of acids, which gas is always produced at the negative electrode?
8. Can potassium hydroxide be classified as an alkali?
9. Can copper(II) oxide be classified as an alkali?
10. Can magnesium carbonate be classified as an alkali?

Topic 5

Success Criteria	Self-Assessment
I can explain what happens to the pH of acids when they are diluted.	☹ 😐 ☺
I can explain what happens to the pH of alkalis when they are diluted	☹ 😐 ☺

1. What does dilution mean?
2. What happens to the pH of an acid when it is diluted?
3. What happens to the pH of an alkali when it is diluted?
4. What happens to the conductivity of an acid when it is diluted?
5. What happens to the conductivity of an alkali when it is diluted?
6. What happens to the hydrogen ion concentration when an acidic solution is diluted?
7. What happens to the hydroxide ion concentration when an alkali is diluted?
8. Sodium chloride dissolves in water to produce salt water. Identify the solute, solvent and the solution.
9. Calculate the GFM of sodium chloride
10. Salt water solution is neutral. State the pH of neutral solutions.

Topic 6

Success Criteria	Self-Assessment
I can name the products formed when a metal oxide neutralises an acid.	☹ 😐 ☺
I can name the products formed when a metal hydroxide neutralises an acid.	☹ 😐 ☺
I can name the products formed when a metal carbonate neutralises an acid.	☹ 😐 ☺
I can name the salts produced in neutralisation reactions.	☹ 😐 ☺
I can name the salts formed when carboxylic acids are neutralised.	☹ 😐 ☺
I can describe the method of how soluble salts are produced.	☹ 😐 ☺

1. What are the products of all neutralisation reactions?
2. Name the products produced when nitric acid reacts with sodium hydroxide.
3. Name the products produced when sulfuric acid reacts with magnesium oxide.
4. Name the products produced when hydrochloric acid reacts with copper(II) carbonate.
5. Name the products produced when ethanoic acid reacts with calcium hydroxide.
6. Draw the full structural formula of ethanoic acid
7. What ion do all acids contain?
8. What acid would be used to produce the salt lithium methanoate?
9. What gas is produced when a metal carbonate neutralises an acid?
10. Is calcium sulfate an acid, alkali or a salt?

Topic 7

Success Criteria	Self-Assessment
I know what spectator ions are and can identify them in equations.	☹ 😐 ☺
I can rewrite equations without the spectator ions.	☹ 😐 ☺

1. What is a spectator ion?
2. Identify the spectator ions: $Na^+(aq) + OH^-(aq) + H^+(aq) + Cl^-(aq) \rightarrow Na^+(aq) + Cl^-(aq) + H_2O(l)$
3. Rewrite the equation in Q2 without the spectator ions.
4. Identify the spectator ions: $Mg(s) + 2H^+(aq) + 2NO_3^-(aq) \rightarrow Mg^{2+}(aq) + 2NO_3^-(aq) + H_2(g)$
5. Rewrite the equation in Q4 without the spectator ions.
6. Identify the spectator ions: $2Li^+(s) + CO_3^{2-}(s) + 2H^+(aq) + Cl^-(aq) \rightarrow 2Li^+(aq) + 2Cl^-(aq) + H_2O(l) + CO_2(g)$
7. Rewrite the equation in Q6 without the spectator ions.
8. Identify the spectator ions:
   $Ca^{2+}(aq) + 2OH^-(aq) + 2H^+(aq) + SO_4^{2-}(aq) \rightarrow Ca^{2+}(aq) + SO_4^{2-}(aq) + 2H_2O(l)$
9. Rewrite the equation in Q8 without the spectator ions.
10. Write the ionic formula for magnesium carbonate.

Topic 8

Success Criteria	Self-Assessment
I can calculate concentration when given the moles and volume.	☹ 😐 ☺
I can calculate the number of moles when given the concentration and volume.	☹ 😐 ☺
I can calculate the volume when given the concentration and number of moles.	☹ 😐 ☺
I can calculate the concentration from the mass by using both mole triangles.	☹ 😐 ☺

1. What is the concentration of a solution of hydrochloric acid containing 0.75 mol in $500cm^3$?
2. How many moles are there in 250 cm^3 of sodium hydroxide solution, concentration 0.15 mol l^{-1}?
3. What is the volume of a sodium carbonate solution, concentration 1.5 mol l^{-1}, contains 0.5 mol?
4. Write the formula for calcium carbonate
5. Calculate the GFM of calcium carbonate
6. How many moles are there in 25 g of calcium carbonate?
7. 25 g of calcium carbonate was dissolved in 400 cm^3 of water. What is the concentration of the solution?
8. Write the formula for nitric acid.
9. How many moles are there in 300 cm^3 of nitric acid solution, concentration 1.5 mol l^{-1}?
10. Write the formula for sulfuric acid.

Topic 9

Success Criteria	Self-Assessment
I know how titrations are carried out.	☹ 😐 ☺
I can identify a pipette, burette and pipette filler.	☹ 😐 ☺
I know what concordant results are.	☹ 😐 ☺
I can carry out a titration calculation.	☹ 😐 ☺

1. What word is used to describe words that are within ±0.2 cm^3 of each other?
2. What is the concentration of hydrochloric acid if 25cm^3 of it is exactly neutralised by 25cm^3 of a 0.1 mol l^{-1} NaOH solution? HCl + NaOH -> NaCl + H_2O
3. What is the concentration of hydrochloric acid if 25cm^3 of it is exactly neutralised by 50cm^3 of a 0.1 mol l^{-1} NaOH solution? HCl + NaOH -> NaCl + H_2O
4. What is the concentration of hydrochloric acid if 25cm^3 of it is exactly neutralised by 25cm^3 of a 0.2 mol l^{-1} $Ca(OH)_2$ solution? $2HCl + Ca(OH)_2 \rightarrow CaCl_2 + 2H_2O$
5. What is the concentration of sulfuric acid if 25 cm^3 of it is exactly neutralised by 50 cm^3 of a 0.1 mol l^{-1} LiOH solution? $H_2SO_4 + 2LiOH \rightarrow Li_2SO_4 + 2H_2O$

Answers

Topic 1

1. Power of hydrogen.
2. Using an indicator e.g. universal indicator or pH paper
3. Red.
4. Less than 7.
5. Blue.
6. More than 7
7. Green
8. 7.0
9. A
10. D

Topic 2

1. There is a higher concentration of hydrogen ions compared to hydroxide ions in acidic solutions.
2. There is a lower concentration of hydrogen ions compared to hydroxide ions in alkaline solutions.
3. There are equal concentrations of hydrogen ions and hydroxide ions in neutral solutions.
4. The concentration of hydrogen ions decreases.
5. The concentration of hydroxide ions increases.
6. H^+Cl^-
7. $(H^+)_2SO_4^{2-}$
8. H^+NO^{3-}
9. Na^+OH^-
10. $Ca^{2+}(OH^-)_2$

Topic 3

1. H_2O
2. Covalent molecular.
3. (2 x 1g) + (1 x 16 g) = 18 g
4. Angular
5. 7.0
6. It has equal concentrations of hydrogen and hydroxide ions
7. $H_2O(l) \rightleftharpoons H^+(aq) + OH^-(aq)$
8. $H^+ + OH^-$
9. Salt water
10. Tap water

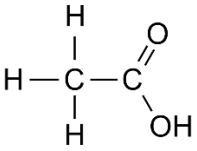
Topic 4

1. Acidic
2. Alkaline
3. Neutral
4. Sulfur dioxide and nitrogen dioxide
5. Sulfur dioxide – burning of fossil fuels. Nitrogen dioxide – sparking of air in car engines.
6. Acid rain damages buildings made from carbonate rock, and causes steel structures to rust faster than normal. Acid rain also damages plant and animal life.
7. Hydrogen gas
8. Yes – it's soluble in water
9. No - insoluble so it's a base
10. No – insoluble so it's a base

Topic 5

1. To add water
2. Increases towards 7
3. Decreases towards 7
4. Decreases
5. Decreases
6. Decreases
7. Decreases
8. Sodium chloride – solute, water – solvent, salt water – solution
9. 1 x Na + 1 x Cl = 23 g + 35.5 g = 58.5 g
10. pH 7.0

Topic 6

1. Salt and water
2. Sodium nitrate + water
3. Magnesium sulfate + water
4. Copper(II) chloride + water + carbon dioxide
5. Calcium ethanoate + water
6. 

7. Hydrogen ions
8. Methanoic acid
9. Carbon dioxide
10. Salt

Topic 7

1. Ion present in the reaction mixture that doesn't take part in the reaction.
2. $Na^+ + Cl^-$
3. $OH^-(aq) + H^+(aq) \rightarrow H_2O(l)$
4. $2NO_3^-$
5. $Mg(s) + 2H^+(aq) \rightarrow Mg^{2+}(aq) + H_2(g)$
6. $Li^+ + Cl^-(aq)$
7. $CO_3^{2-}(s) + 2H^+(aq) \rightarrow H_2O(l) + CO_2(g)$
8. $Ca^{2+} + SO_4^{2-}$
9. $2OH^-(aq) + 2H^+(aq) \rightarrow 2H_2O(l)$
10. $Mg^{2+}CO_3^{2-}$

Topic 8

1. $C = n/V = 0.75 \text{ mol} / 0.5 \text{l} = 1.5 \text{ mol l}^{-1}$
2. $n = C \times V = 0.15 \text{ mol l}^{-1} \times 0.25 \text{ l} = 0.0375 \text{ mol}$
3. $V = n / C = 0.5 \text{ mol} /$ concentration $1.5 \text{ mol l}^{-1} = 0.33 \text{ l}$
4. $CaCO_3$
5. $40 \text{ g} + 12 \text{ g} + (3 \times 16 \text{ g}) = 100 \text{g}$
6. $n = m/ GFM = 25 \text{ g} / 100 \text{ g} = 0.25 \text{ mol}$
7. $C = n / v = 0.25 \text{ mol} / 0.4 \text{ l} = 0.625 \text{ mol l}^{-1}$
8. HNO_3
9. $n = C \times V = 1.5 \text{ mol l}^{-1} \times 0.3 \text{ l} = 0.45 \text{ mol}$
10. H_2SO_4

Topic 9

1. Concordant
2. $n = C \times V = 0.1 \text{ mol l}^{-1} \times 0.025 \text{ l} = 0.0025 \text{ mol}$
   1 NaOH : 1 HCl
   0.0025 mol: 0.0025 mol
   $C = n / V = 0.0025 \text{ mol} / 0.025 \text{ l} = 0.1 \text{ mol l}^{-1}$
3. $n = C \times V = 0.1 \text{ mol l}^{-1} \times 0.05 \text{ l} = 0.005 \text{ mol}$
   1 NaOH : 1 HCl
   0.005 mol: 0.005 mol
   $C = n / V = 0.005 \text{ mol} / 0.025 \text{ l} = 0.2 \text{ mol l}^{-1}$
4. $n = C \times V = 0.2 \text{ mol l}^{-1} \times 0.025 \text{ l} = 0.005 \text{ mol}$
   2 $Ca(OH)_2$: 1 HCl
   0.005 mol: 0.0025 mol
   $C = n / V = 0.0025 \text{ mol} / 0.025 \text{ l} = 0.1 \text{ mol l}^{-1}$
5. $n = C \times V = 0.1 \text{ mol l}^{-1} \times 0.05 \text{ l} = 0.005 \text{ mol}$
   2 LiOH : 1 H_2SO_4
   0.005 mol: 0.0025 mol
   $C = n / V = 0.0025 \text{ mol} / 0.025 \text{ l} = 0.1 \text{ mol l}^{-1}$