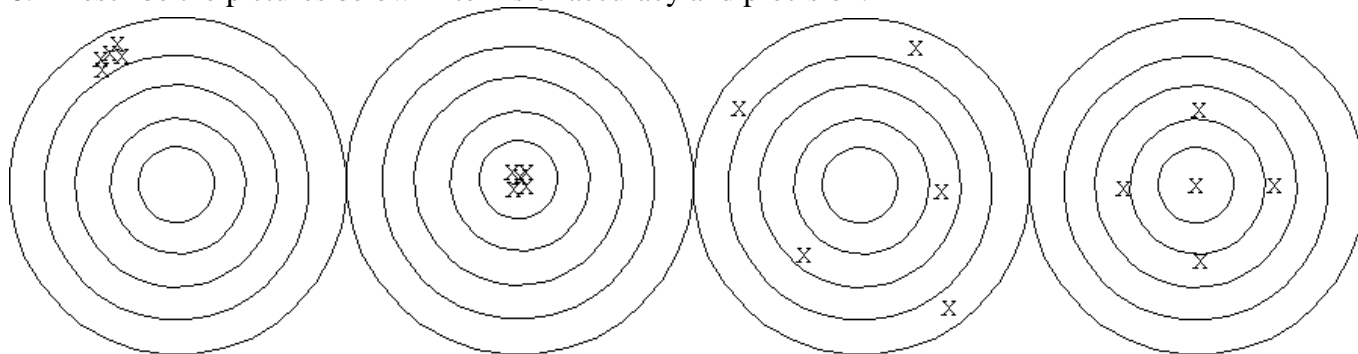


Stage 1 Chemistry

Mid-Year Exam Revision

Topic 1 – Chemistry Skills

1. In a lab report what do we write in the hypothesis?
2. What is the most effective way to record the results of an experiment?
3. How many significant figures are in the following
a) 3256000000 b) 0.000736 c) 135.16003
4. Write the above numbers to 3 significant figures.
5. Work out the following to a correct number of significant figures.
a) $5.2835 + 1.6$ b) 13.86×52.391
6. Describe what random and systematic errors are and give an example of each.
7. Define the terms accuracy and precision and state which errors (random or systematic) each are affected by.
8. Describe the pictures below in terms of accuracy and precision.



Topic 2 – Elemental Chemistry

1. Complete the following table.

Sub-Atomic Particle	Charge	Relative Mass	Where it is found
Proton			
Neutron			
Electron			

2. Complete the following table

Name	Symbol	Atomic Number	Mass Number	No of Protons	No of Neutrons	No of Electrons	Electron Config	Ion Formed	Electron Config of ion
					12		2,8,2		
		8	16						
	$^{23}_{11}\text{Na}$								
					7			N^{3-}	

3. Explain why electrons are not considered when determining the mass of an atom.

4. The electrons in the outer shell are known as what?

5. Explain what an isotope is.

6. By referring to the electronic configuration of potassium (2,8,8,1) explain how we can tell which group and period it is in.

7. Complete the following table using the words increases or decreases.

	Down a group	Across a period
Atomic Number		
Atomic Radius		
Metallic Nature		
Electronegativity		

8. Explain the term electronegativity and its effect on the reactivity of that substance.

9. Name two physical properties of metals and two chemical properties.

10. Explain in detail how both ionic and covalent bonds form.

11. Name two properties of ionic compounds and two of covalent ones.

12. Explain why ionic substances will conduct in a liquid form but not a solid one.

13. Draw the structure and name the shape of the following.

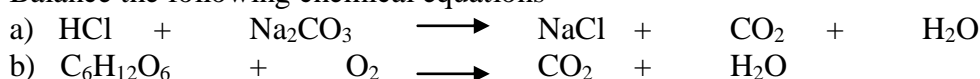
a) Hydrogen Sulfide (H_2S) b) Carbon dioxide (CO_2) c) methane (CH_4) d) Ammonia (NH_3)

14. Explain how polarity forms in molecules and use it to state which of the above have polar bonds and which are polar molecules.

15. State the correct chemical formula for the following substances.

a) Sodium Oxide b) Aluminium Oxide c) Phosphorous Chloride

16. Balance the following chemical equations



Topic 3 – Acids and Bases

1. State three properties of acids and three of bases.
2. Explain why you should never add water to acid, only the other way.
3. Explain why you should never clean up a strong base with a strong acid. Suggest what you could use to clean up a strong base.
4. Define acids and bases according to Bronsted-Lowry theory.
5. Explain why a hydrogen ion is considered to be a proton.
6. Identify the acid and base in the following reaction
$$\text{HPO}_4^{2-} + \text{NH}_4^+ \longrightarrow \text{NH}_3 + \text{H}_2\text{PO}_4^-$$
7. Identify the conjugate acid-base pairs above.
8. If H_2PO_4^- in the equation above is a strong base, what can you say about the conjugate acid?
9. Define an amphoteric substance.
10. Show water is an amphoteric substance by showing its reaction with ammonia and hydrochloric acid.
11. Explain why sulfuric acid is classed as a diprotic acid.
12. The ionisation of sulfuric acid in water occurs in two steps. Write these equations and explain why it must occur in two steps.
13. Are all concentrated acids strong acids? Clearly explain your choice.
14. Is a solution pH 4 twice as acidic as one of pH 2? Clearly explain your choice.
15. Calculate the pH of a solution with a $[\text{H}_3\text{O}^+] = 3 \times 10^{-5}$
16. Calculate the $[\text{H}_3\text{O}^+]$ if the pH = 9.2
17. A solution has a pH = 2.3. If we dilute it to make it 1000 times less acidic state the new pH.
18. Does the colour of an indicator always change according to whether the solution is acidic or basic? Explain.

19. Complete the following equations

SO_3	+	NaOH	\longrightarrow
H_2SO_4	+	Ca(OH)_2	\longrightarrow
K_2CO_3	+	CH_3COOH	\longrightarrow
HCl	+	Ca	\longrightarrow
$\text{Ca(HCO}_3)_2$	+	HNO_3	\longrightarrow
K_2O	+	HCl	\longrightarrow

Topic 4 – Analytical Techniques

1. Explain the difference between qualitative and quantitative analysis.

2. Calculate the molar mass of the following substances

- a) Na_2CO_3 b) $\text{Ca}(\text{OH})_2$ c) $\text{C}_6\text{H}_{12}\text{O}_6$ d) H_2SO_4

3. Complete the following two tables

n	m	M
0.25	14	
1.1		92
	25	58
	9	7

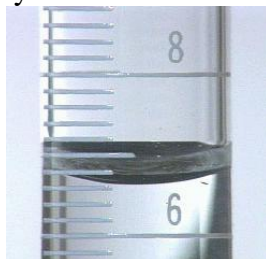
n	c	v
	0.2	.5
	2	
0.4	0.025	
3.4		0.08

4. What is the meaning of concordant titres?

5. Why do we need to use an indicator when performing titrations?

6. The rinsing procedure is a very important part of all titrations, why is it so important and explain how we should wash the burette, pipette and conical flask.

7. For the picture shown what is the liquid line called and where should we take the measurement from? What is the reading on this measuring cylinder?



8. What mass of sodium hydroxide is required to neutralise a 5 L spill of 1M sulfuric acid?

9. Below are the results of a titration in which a 20 mL pipette was used to transfer 0.5 M hydrochloric acid to a conical flask and sodium hydroxide of an unknown concentration was added to the pipette. Phenolphthalein was used as the indicator.

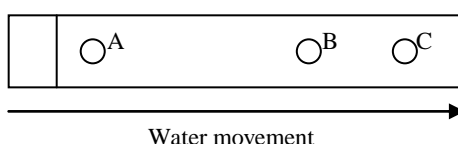
	Rough	1	2	3
Final	38.0	36.6	35.6	43.3
Initial	2.1	2.5	1.7	9.3
Titre				

- Complete the table.
- Determine the concentration of the sodium hydroxide solution.
- What would be the colour change at the end point?

10. Explain the difference between absorption and adsorption.

11. Explain the terms mobile phase and stationary phase. For paper chromatography using water as the solvent state the mobile and stationary phases.

12. For the picture shown state which was the most polar component A, B, or C given that it is using water as the mobile phase, giving clear reasons for your choice.



Exam Style Question

Hydrochloric acid which is made from hydrogen chloride gas, is a very common acid commonly found in the stomach but also used for applications such as cleaning brick work.

- a) Draw the structure of a hydrogen chloride molecule clearly showing any bond polarity
- b) Describe the shape of a hydrogen chloride molecule and use this to determine whether it is a polar molecule, give clear reasons for your choice.
- c) What is the pH of a solution of hydrochloric acid that has $[H^+] = 3.07 \times 10^{-2} \text{ mol L}^{-1}$
- d) Calculate the volume of HCl that could be produced with the concentration above if we start with 3.8 mol of hydrogen chloride gas.
- e) If the 20 mL of the hydrochloric acid solution above was titrated with 0.2 M calcium hydroxide, what would be the expected titre value
- f) Name the apparatus that would be used to transfer the hydrochloric acid
- g) If you perform the experiment and all your results are within 0.2 mL of each other but they are 6 mL from the calculated value, comment upon the accuracy and precision of your result.
- h) Has your experiment been effected more by random or systematic errors? Give a reason for your choice.
- i) Hydrochloric acid is a strong acid define the terms “strong” and “acid”.
- j) Explain why water is a liquid at room temperature but hydrogen chloride is a gas.