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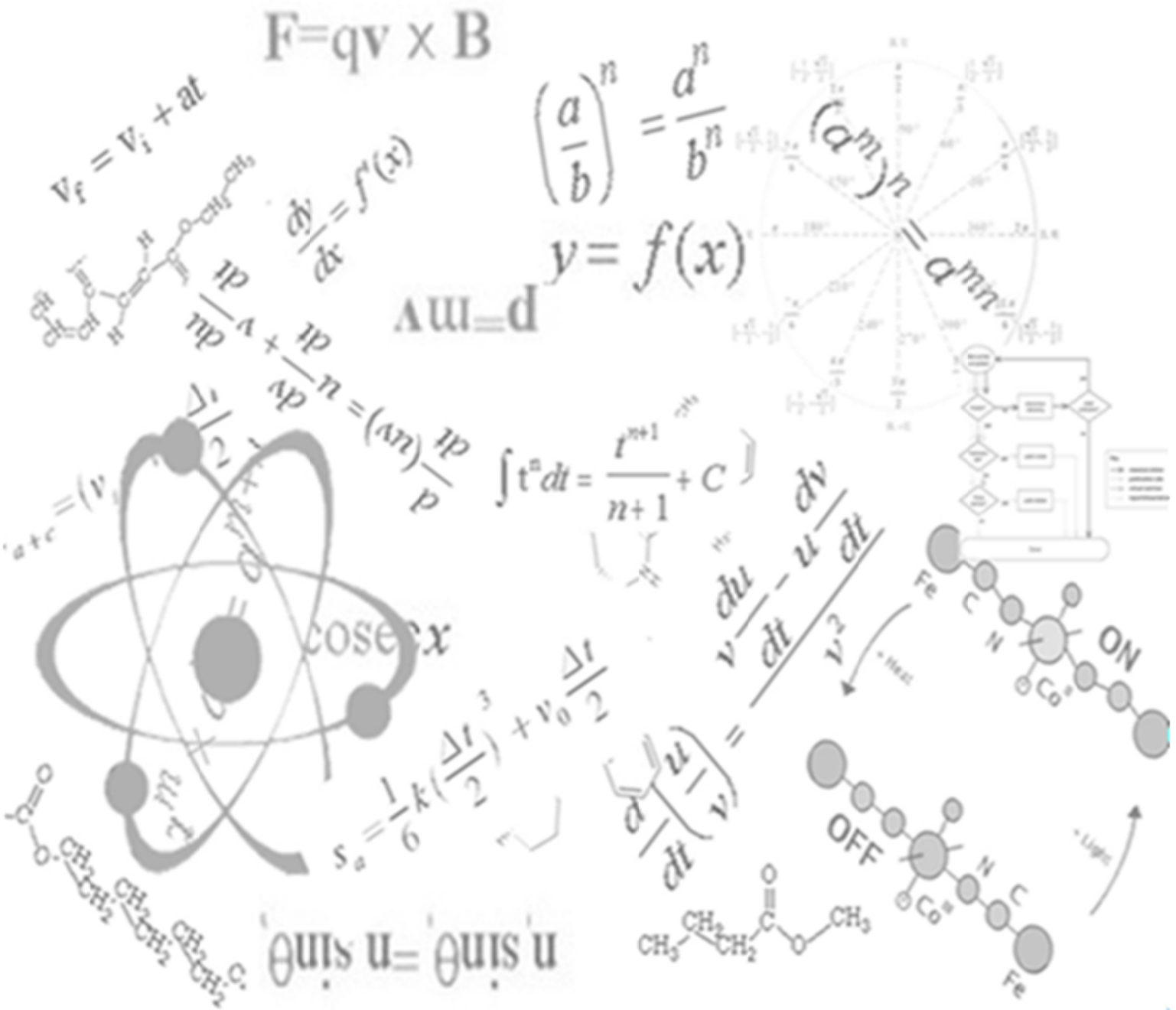
S4S coaching

Year 12- Chemistry

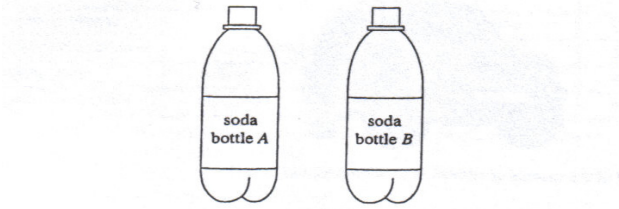
The Acidic Environment



Acidic environment exam 2 – Questions

1. **(4 marks)**

The following results were obtained during an investigation involving the decarbonating of two bottles of soda water. Each bottle was opened for a 24-hour period before re-sealing.



	bottle *A*	bottle *B*
Initial mass of sealed bottle (g)	125.5	125.5
Final mass of sealed bottle (g)	125.1	124.8
Change in mass (g)	0.4	0.7
Room conditions	cold	warm
Volume of CO_2 released at 25°C and 100 kPa (mL)	225.3	

(a) Calculate the volume of carbon dioxide (CO_2) gas lost from bottle B at 25°C and 100kPa 1 mark

(b) In each bottle the following equilibrium process exists:

$$CO_{2\,(g)} + H_2O_{(l)} \Leftrightarrow H_2CO_{3(aq)} + \text{heat}$$

Explain the difference in the volume of the carbon dioxide lost from the two bottles in terms of Le Chatelier's Principle. 3 marks

2. **(3 marks)**

During the HSC Chemistry course you performed a first hand investigation in which you identified the pH of a variety of salt solutions. If solutions of NH_4Cl and Na_2CO_3 were used in this task, predict the acidic, basic or neutral nature that you would identify. Justify your prediction, including relevant equations in your answer. 3 marks

3. **(2 marks)**

One method of determining copper in solution is to add an excess of potassium iodide solution.

Iodine is liberated according to the equation:

$$2Cu^{2+}_{(aq)} + 4I^-_{(aq)} \rightarrow 2CuI + I_{2(aq)}$$

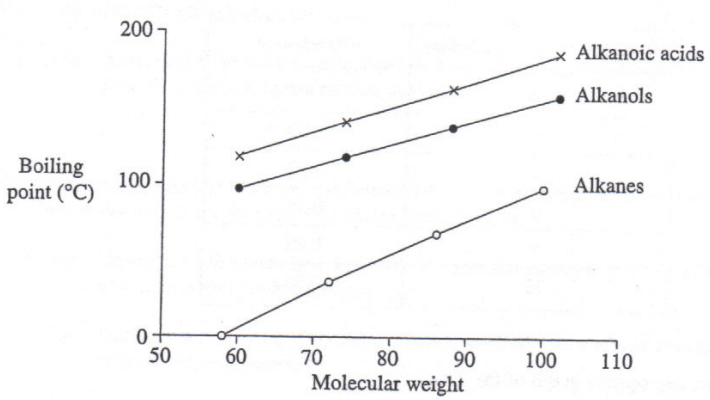
The liberated iodine is titrated with sodium thiosulfate solution

$$I_{2(aq)} + 2Na_2S_2O_{3(aq)} \rightarrow Na_2S_4O_{6(aq)} + 2NaI_{(aq)}$$

Calculate the no. of moles of copper in a solution requiring 32.5mL of $0.04molL^{-1}$ sodium thiosulfate to titrate the liberated iodine 2 marks

4. **(4 marks)**

Explain the trends in boiling points shown in the graph.



5. **(4 marks)**

Analyse the relationship between the position of elements in the Periodic Table, and the acid-base behaviour of their oxides.

6. **(4 marks)**

Potassium metabisulfite, K2S2O5 , is added to wine to prevent oxidation. It works by reacting with water and the acids in wine as follows –

$S_2O_5^{2-}(aq) + H_2O(l) \rightarrow 2HSO_3^-(aq)$

Then $HSO_3^-(aq) + H_3O^+(aq) \rightleftharpoons SO_2(aq) + 2H_2O(l)$

Use the above equations to explain how the addition of metabisulphite affects the pH of the 'wine'.

7. **(4 marks)**

A student made up 0.01 mol/L solutions of four acids - A, B, C and D. She measured the pH of the acids and found them to be 4.5, 6.5, 2.1 and 2.7 respectively.

(a) Arrange the acids in order of increasing strength, from weakest to strongest. 2 marks

(b) Are any of these acids completely ionised. Explain your answer. 2 marks

8. (2 marks)

A series of ten-fold dilutions was carried out on a solution of 0.01 mol/L HNO3

(a) What is the minimum concentration of H^+ (aq) that can be obtained by successive dilutions of the HNO3?

(b) What is the pH of the solution in (a)?

9. (4 marks)

The presence of pairs of chemicals eg CO_3^{2-}/HCO_3^{1-}, or, $H_2PO_4^{1-}/ HPO_4^{2-}$, in the blood is essential to the proper functioning of the body. Describe the action of these chemical pairs using equations. 4 marks

10. (6 marks)

Different theories of acids and bases were developed by Lavoisier, Davy, Arrhenius and Bronsted-Lowry. Sulfuric acid, H_2SO_4 was classified as an acid by all of these scientists. Explain how each of their theories predict that H_2SO_4 is an acid. Support your answer by using equations where appropriate. 6 marks