

CHEMISTRY DEPARTMENT 2024

S.5 BRAINSTORMING TEST ONE

TOPIC ; MATTER AND IT'S PARTICULATE NATURE

SUBTOPIC; DIFFUSION AND MASS SPECTROMETER

NAME.....COMBN.....

INSTRUCTIONS

Attempt all questions in this paper.

1. (a) Define the following terms

(i) Relative Atomic Mass. (01 mark)

.....

.....

(ii) Relative abundance (01 mark)

.....

.....

(iii) isotopes (01 mark)

.....

.....

(b) Copper, relative atomic mass of 63.5 has two isotopes of mass numbers 63 and 65. Calculate the percentage abundance of each isotope of copper.

(1½ marks)

.....

.....

.....

(c) Draw the mass spectrum of the above copper sample. (1½ marks)

(d) State one use of a mass spectrometer to a chemist. (1½ marks)

.....
.....

2. (a) A mass spectrum of chlorine shows molecular peaks at 70, 72 and 74.
Explain this observation. (02 marks)

.....
.....
.....
.....
.....
.....

(b) Chlorine has two isotopes **Cl-35** and **Cl-37**. State the formula of each ion of the respective molecular peak formed. (1 $\frac{1}{2}$ marks)

Molecular peak	Formula of the ion
70	
72	
74	

(c) State one advantage and one disadvantage of determining the relative atomic mass of an element using the mass spectrum

Advantage

(0 $\frac{1}{2}$ mark)

.....

Disadvantage

(0 $\frac{1}{2}$ mark)

.....

(d) State two methods that may be used to obtain ions in the mass spectrometer. (01 mark)

.....

.....

e) What property of the ions does the mass spectrometer measure? (01 mark)

.....

3. The table below shows the information from a mass spectrum sample

Isotope	Detector current (mA)
204	0.16
206	2.72
207	2.50
208	5.92

Calculate

(i) the relative abundance of the different isotopes of lead in the sample (02marks)

.....

.....

.....

(ii) Relative atomic mass of the element. (1½ marks)

.....

.....

.....

.....

4. (a) State Graham's law of diffusion. (01 mark)

.....

.....

.....

(b) A certain volume of oxygen diffused through a porous membrane in 120s. Under the same conditions, the same volume of a gas X diffused in 112s. Calculate the formula mass of X (02 marks)

.....

.....

.....

.....

.....

.....

.....

.....

(c) State one application of diffusion of gases (01mark)

.....

.....

5. (a) Nickel forms a carbonyl compound, $\text{Ni}(\text{CO})_n$. Deduce the value of n from the fact that carbon dioxide diffuses 2.46 times than the carbonyl compound. (03 marks)

.....

.....

.....

.....

.....

.....

b) Two plugs of cotton wool, one soaked in concentrated ammonia and the other in concentrated hydrochloric acid are inserted into opposite ends of a horizontal glass tube a white solid forms in the tube.

(i) Name the white solid formed. (0½ mark)

.....

(ii) Write an equation for the reaction that took place in the tube
..... (1½ marks)

.....

.....

b) If the glass tube is one metre long, determine how far from the ammonia plug is the solid deposited. (04½ marks)

.....

.....

.....

.....

.....

.....

.....

.....

.....

END.