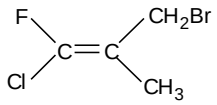
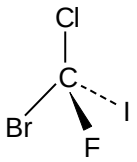
ASSIGNMENT

Atomic Structure, Bonding, General Organic Chemistry and Aliphatic Hydrocarbons
Core Course in Chemistry

Course Code: BCHCT-131
Assignment Code: BCHCT-131/TMA/2026
Maximum Marks: 100

Note: Attempt all questions. The marks for each question are indicated against it.

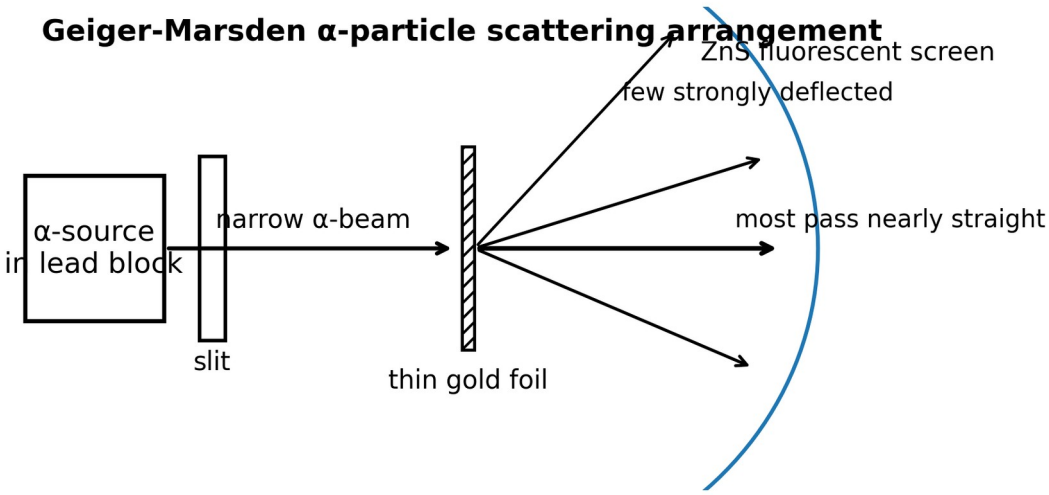
	PART-(A)		**(50)**
1.	Explain Geiger and Marsden's α-particle experiment using a suitable diagram.		(5)
2.	(a)	Name different lines exhibited in the atomic spectrum of hydrogen.	$\left(2\frac{1}{2}\right)$
	(b)	Write the de-Brogile relationship for dual nature of matter. Also define matter waves.	$\left(2\frac{1}{2}\right)$
3.	Briefly discuss photoelectric effect. Also give the explanation of this effect given by Einstein.		(5)
4.	(a)	List the applications of Schrodinger equation.	(3)
	(b)	Explain the significance of ψ and ψ^2.	(2)
5.	What are four quantum numbers? Give their significance.		(5)
6.	(a)	Explain the stability of half-filled and completely filled orbitals giving suitable examples.	(3)
	(b)	Give any two examples of atoms showing anomalous electronic configurations.	(2)
7.	State and illustrate Fajan's rules giving suitable examples.		(5)
8.	(a)	What is electronegativity? Arrange the following in the decreasing order of their electronegativities: K, F and I.	(3)
	(b)	Compare the characteristics of ionic and covalent compounds.	(2)
9.	(a)	Write the resonance structures of dimethylsulphone.	(2)
	(b)	Give the type of hybridisation in the following molecules: (i) BrF_5 (ii) XeF_2 (iii) $[Ni(CN)_4]^{2-}$	(3)
10.	(a)	Draw p_y-p_y combination of atomic orbitals to give the suitable molecular orbitals.	(3)
	(b)	Calculate the bond order of F_2 molecule from its molecular orbital configuration.	(2)
	PART-(B)		
11.	(a)	Assign the *E* or *Z* configuration to the following molecule giving the steps involved:  Also assign the priorities to the different groups.	(3)
	(b)	How will you distinguish maleic acid and fumaric acid?	(2)

12.	(a)	Assign *R/S* configuration to the following compound:  Also give the steps involved.	(3)
	(b)	Give example of a *meso* compound. Also comment on its optical activity giving reason.	(2)
13.	Draw the energy profile for various confirmations exhibited by cyclohexane. Also explain the relative energies of various conformations.		(5)
14.	Explain the relative stability of the following carbocations: (i) methyl carbocation (ii) a tertiary carbocation (iii) a primary carbocation (iv) a secondary carbocation		(5)
15.	(a)	Differentiate between the basicity and nucleophilicity giving suitable examples.	(3)
	(b)	Briefly explain the mechanism of β-elimination.	(2)
16.	(a)	Briefly explain Kolbe's electrolytic method for the synthesis of alkanes.	(5)
	(b)	What is aromatisation of gasoline? Illustrate giving appropriate reactions.	(2)
17.	(a)	State and explain Saytzeff rule giving a suitable example.	(3)
18.	(b)	Explain retro Diels-Alder reaction giving a suitable example.	(2)
19.	(a)	(i) State Markowinkoff's Rule. (ii) What is peroxide effect? Explain.	(3)
	(b)	Write the reactions for the hydroboration of propene followed by the oxidation by alkaline H_2O_2.	(2)
20.	(a)	How will you prepare 3-octyne from 1-hexyne? Write the steps involved.	(3)
	(b)	Write the products of oxidation of 2-hexyne using alkaline $KMnO_4$.	(2)

1. Explain Geiger and Marsden’s α-particle experiment using a suitable diagram. (5)

Answer

Geiger and Marsden tested how α-particles are scattered when they pass through a very thin metal foil. A radioactive α-source was kept inside a lead block so that only a narrow beam came out through a slit. The beam was directed on a very thin gold foil. A zinc sulphide fluorescent screen was placed around the foil. Whenever an α-particle struck the screen, a tiny flash or scintillation was observed through a microscope. The screen could be moved through different angles, so the number of particles scattered in different directions could be counted.



Main observations

- Most α-particles passed through the foil without any noticeable deflection.
- A small fraction were deflected through small angles, showing that they passed near a concentrated positive region.
- Very few particles were deflected through large angles, and an extremely small number even came back toward the source.

Rutherford concluded that an atom is mostly empty space. Almost all its positive charge and mass are concentrated in a very small, dense nucleus at the centre, while electrons occupy the much larger region around it. Large-angle scattering is rare because only a few α-particles come very close to the nucleus.