



INDIAN SCHOOL MUSCAT

CLASS :.....XII.....

SUBJECT:.....Physics.....



WORKSHEET

DATE :.....

TOPIC/SUB-TOPIC :.....Atoms and Nuclei

Section A Conceptual and application type questions

- 1 How do the neutron to Proton Ratio change during
i) β^+ ii) β^- iii) α emission? 1
- 2 Why it is difficult to detect to neutrinos and anti neutrinos ? 1
- 3 Define reproduction factor or multiplication factor or k factor ? 1
- 4 State displacement law for alpha decay . 1
- 5 What is the role of control rods in a nuclear reactor? Name the materials used in control rods . 2
- 6 State the limitations of Rutherford 's model. 2
- 7 State Bohr's quantization principle and frequency condition. 2
- 8 Define impact parameter and angle of scattering and give the relation between them. 2
- 9 What is enriched Uranium ? 2
- 10 What is the nuclear radius of ${}_{26}\text{Fe}^{125}$ if that of ${}_{13}\text{Al}^{27}$ is $3.6 F$? 3
- 11 Derive expression for the energy of electron in the n^{th} orbits. 3
- 12 Define the distance of closest approach of an alpha particle to a gold nucleus . 3
- 13 What is the role of a moderator in a nuclear reactor ? Explain the use of moderator in a nuclear reactor? 3

Section B Numerical problems

- 1 Calculate the binding energy and binding energy per nucleon of ${}_{26}\text{Fe}^{56}$ nucleus. Given, mass of ${}_{26}\text{Fe}^{56}$ nucleus = 55.9349 amu mass of 1 proton = 1.007825 amu mass of 1 neutron = 1.008665 amu. 2
- 2 Calculate the time required for 60% of a sample of radon to undergo decay. Given $T_{1/2}$ of radon = 3.8 days 2
- 3 The isotope ${}_{92}\text{U}^{238}$ successively undergoes three α -decays and two β -decays. What is the resulting isotope? 2
- 4 If 50% of a radioactive sample decays in 5 days, how much of the original sample will be left over after 20 days? 2
- 5 The radioactive isotope ${}_{84}\text{Po}^{214}$ undergoes a successive disintegration of two α -decays and two β -decays. Find the atomic number and mass number of the resulting isotope. 2
- 6 Calculate the time required for 60% of a sample of radon to undergo decay. Given $T_{1/2}$ of radon = 3.8 days 2
- 7 The Rydberg constant for hydrogen is $1.097 \times 10^7 \text{ms}^{-1}$. Calculate the short and long wavelength limits of Lyman series. 2
- 8 An α - particle is projected with an energy of 4 MeV directly towards a gold nucleus. Calculate the distance of its closest approach. Given : atomic number of gold = 79 and atomic number of α particle = 2. 2
- 9 Wavelength of Balmer first line is 6563\AA . Calculate the wavelength of second line. 2