

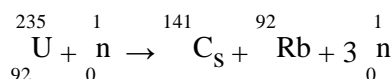
Attempt FIVE Questions in all. Select at least ONE question from each Section.
 All questions carry equal marks.

SECTION - A

- 1-a) What is meant by Doping? Discuss the preparation of N-type and P-type semiconductor materials. 1,3
 b) How is the width of depletion region affected by forward and reverse biasing? 2
 c) What is break down voltage? 1
- 2- a) What is a transistor? How current flows through n-p-n and p-n-p transistors? Explain. 1,2,2
 b) Write mathematical notation, symbol, circuit diagram and truth table of NOR gate. 2

SECTION - B

- 3- a) What is Compton effect? Give the experimental arrangement to study the effect. How Compton Effect was explained by Quantum Mechanics? Derive Compton shift in wavelength of scattered photon. 1,1,3
 b) Photons of wavelength 2.17 pm are incident on free electrons
 i) Find the wavelength of a photon that is scattered 35.0° from the incident direction.
 ii) Do the same if the scattering angle is 115.0° 2
- 4- a) What is Uncertainty Principle? Give its different forms.
 Describe single slit diffraction experiment to verify uncertainty principle. 1,1,3
 b) Find the uncertainty in location of a particle, in terms of its de-Broglie wavelength λ , so that uncertainty in its velocity is equal to velocity. 2
- 5- a) State basic postulates of quantum mechanics. 3
 b) Derive Schrödinger time independent wave equation for a single particle. 4
- 6- a) Describe four quantum numbers for hydrogen atom in detail. 4
 b) If an electron in hydrogen atom is in a state with $\ell = 5$, what is the smallest possible angle between L and L_z ? 2
 c) Differentiate between Excited State and Metastable State. 1
- 7- a) What are X-rays? Explain continuous spectrum and characteristics x-rays spectrum in detail. 4
 b) Explain how Moseley Law is used in determine the atomic number of an element? 3
- 8- a) What is Mass Spectrograph? Explain its principle, construction and working. 4
 b) What is the approximate density of the nuclear matter from which all the nuclear made? 3
- 9- a) Differentiate between Nuclear Fission and Nuclear Fusion Reactions.
 Discuss different types of Nuclear Reactors. 1,3
 b) Calculate the energy released in the Fission Reaction: 3



The needed atomic masses are
 ${}_{92}^{235}\text{U} = 235.043924\text{u}$, ${}_{36}^{141}\text{Cs} = 140.920006\text{u}$,
 ${}_{36}^{92}\text{Rb} = 91.919661\text{u}$, ${}_0^1\text{n} = 1.008665\text{u}$

- 10- Write notes on: 3½, 3½
 i) Full wave rectification ii) Hydroge Spectrum (Series)