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Ex/SC/PHY/PG/CBS/TH/401/2023

M. Sc. PHYSICS EXAMINATION, 2023

(2nd Year, 2nd Semester)

(3rd Year, 2nd Semester)

BIOPHYSICS (II)

PAPER – 401

Time : 2 hours

Full Marks : 40

Use separate answer script for each part.

Part – A

Answer **any two** questions taking one each from Q. No. 1 & 2 and Q. No. 3 & 4 : 10×2=20

1. Describe the Huckel's approximations in the theory of linear conjugated systems. Determine the normalized wave functions and energies of an allyl system (3 carbon atoms) by Huckel's theory. 3+7
2. Show that the entropy production in an open system is the product of some energy flow and generalized affinity of the flow. Derive entropy production of a system consists of a chemical machine performing some irreversible process. 6+4
3. a) Discuss the importance of hydrogen in H-NMR instrument. What is shielded and de-shielded hydrogen.

- b) Explain the characteristic of NMR spectroscopy of shielded and de-shielded hydrogen with suitable example. 5+5
4. a) What is electron gun? Name any two sources of electrons used in the Scanning Electron Microscope.
- b) Discuss about the energies and particles produced when the incident electron beam strikes the sample in Scanning Electron Microscope. Also discuss about the important activities of these energies and particles. 5+5

Part – B

Answer **Four** questions (any **two** from Q.1 to Q.3 and any **two** from Q.4 to Q.6) : 4×5=20

1. What are the factors which affects the x-ray beam used in the medical x-ray Instrument? 5
2. What is F-fluorodeoxyglucose (FDG)? Which organs have high FDG uptake and why? 5
3. Explain with suitable diagram the working principle of glucometer. 5
4. How conservation of energy principle holds well in a biological system? 5
5. Why photons of the UV-Visible region are so important for the biological system? Justify your answer. 5
6. Derive the normalized molecular wave function of a cyclic conjugated system by simple Huckel's theory. 5

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