2003N1659

Candidate's Seat No :_____

M.Sc. Semester-3 Examination

501

Physics

March-2024

Time : 2-30 Hours] **[Max. Marks : 70**

Q.1 (A) Write the names of properties of nucleus and discuss in details on nuclear density and nuclear particle density in detail. [07]

(B) Explain effect of external magnetic field on the hyperfine structure with necessary diagram. [07]

OR

Q.1 (A) Show that the nucleus can have non-zero electric quadrupole moment only if its spin $I \geq 1$. [07]

(B) State the types of molecular excitation and discuss molecular excitations of I from molecular band spectra in detail. [07]

Q.2 (A) Write the assumptions of the ground state of deuteron and derive an expression for depth potential V_0 and distance r_0 in square well potential. [07]

(B) Discuss: Meson theory of nuclear force. [07]

OR

Q.2 (A) Discuss the effective range theory in n-p scattering and derive the expression for differential scattering cross section. [07]

(B) State the difference between n-p scattering and p-p scattering and discuss p-p scattering at low energy in detail. [07]

Q.3 (A) Get Born condition in the case of Yukawa potential for high energy scattering. [07]

(B) Discuss Eikonal approximation and derive expression for scattering amplitude. [07]

OR

Q.3 (A) Briefly discuss optical theorem. Wherefore Born approximation violates such theorem? [07]

(B) Define the experimental setup for scattering. Find an expression for total scattering amplitude. [07]

Q.4 (A) Enlist desired characteristics of transducer and explain optical transducer. [07]

(B) Define noise power for an equipment. Prove that in a multistage amplifier, efforts should be made to minimize the noise power of the 1st stage amplifier. [07]

OR

Q.4 (A) What do you mean by transducer? Explain the working and applications of Piezoelectric transducer. [07]

(B) Discuss: LVDT transducer [07]

Q.5 Answer in brief **Any Seven**questions from the following: (Each question is of **two** mark). [14]

(i) Nucleus have negative as well as positive electrical quadruple moment then nucleus have _____,_____ structural shape.

(ii) Define isotope effect and Hyperfine structure.

(iii) Magnetic dipole moment of a nucleus in a definite parity state is ____ and electric dipole moment is _____.

(iv) Ground state of deuteron may have mixture of ___ and ___ states.

(v) Write the number of scattering depends on ____ and _____.

(vi) Define elastic scattering.

(vii) A positive scattering length specifies _____and a negative scattering length specifies _____. (bound state, no bound state)

(viii) Distinguish elastic and inelastic scattering.

(ix) State importance of the deviation function in 1st Born approximation.

(x) Write the principle of Lock-in-amplifier. State its applications.

(xi) For the measurement of 1200^0C temperature, which transducer will be used?

(xii) In context of transducer, differentiate between repeatability and reproducibility.

*** PAPER ENDS***