W—89—2018

FACULTY OF SCIENCE

B.Sc. (Sixth Semester) EXAMINATION

OCTOBER/NOVEMBER, 2018

PHYSICS

Paper XIV (PHY-304)

(Atomic Molecular and Nuclear Physics)

(Saturday, 20-10-2018)   **Time : 10.00 a.m. to 12.00 noon**

Time—2 *Hours*   *Maximum Marks*—40

N.B. :— (*i*)   *All* questions are compulsory.

       (*ii*)   Figures to the right indicate full marks.

       (*iii*)   Symbols have their usual meaning.

1.   Solve any *four* :   8

   (*a*)   Give the expression for the reduced mass 'μ' of a diatomic molecule.

   (*b*)   Which regions lie below visible region in an electromagnetic spectrum when it is plotted in the increasing order of their wavelength.

   (*c*)   Write down the expression for the frequency of a rotational line in a diatomic spectra.

   (*d*)   When do we say that a nuclear reactor is critical ?

   (*e*)   What is nuclear fission ?

   (*f*)   State four factor formula used in designing a reactor.

2.   (*a*)   Explain the quantum numbers associated with vector atom model.   8

   (*b*)   Explain the intensity rules of the lines occurring in an atomic spectra.

Or

   (*x*)   Explain in detail L-S and J-J coupling schemes.

   (*y*)   Explain normal and anomalous Zeeman effect.

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3. (*a*) In case of the rotational spectrum of a diatomic molecules, show that the rotational lines are equally spaced. 8

   (*b*) Explain Stark effect and its experimental setup.

   Or

   (*x*) Give the theory of rotation vibration spectra of a diatomic molecule.

   (*y*) Explain Raman effect and comment on the occurrence of Stokes' and antistokes lines.

4. Derive Q value equation in nuclear reaction kinematics. 8

   Or

   Explain various types of nuclear reactions.

5. Write notes on (any *two*) : 8

   (*a*) Conservation laws in nuclear reactions

   (*b*) Nuclear Fission as a source of energy

   (*c*) Experimental setup of Raman effect

   (*d*) Selection rules for the lines occurring in an atomic spectra.