

53145



V SEMESTER B.Sc. EXAMINATION – MARCH/APRIL 2022

SCHEME: SEMESTER- CBCS

PHYSICS-PAPER-V

Relativity, Nuclear Physics and Wave Mechanics

038

Time: 03 Hours

Max Marks: 80

Instructions: Answer any Two questions from Part-A, Part-B & Part-C,

Three questions from Part-D and Ten questions from Part-E

PART-A

Answer any TWO questions.

2x8=16

1. With necessary theory, describe Michelson Morley experiment. Comment on its negative results. 8
2. a) Discuss classification of elementary particles. 6
b) What are quarks? Explain. 2
3. a) What are primary and secondary cosmic rays? Write their compositions. 4
b) Explain the principle of semiconductor detector. 4

PART-B

Answer any TWO questions.

2x8=16

4. Give the theory of successive disintegration and hence obtain the condition for secular equilibrium. 8
5. Describe the construction and working of cyclotron. 8
6. a) Give similarities between a liquid drop and atomic nucleus. 5
b) Write any three properties of a neutron. 3

PART-C

Answer any TWO questions.

2x8=16

7. Describe Davison and German experiment to prove wave nature associated with electron. 8
8. a) State and explain Heisenberg uncertainty principle. 3
b) Set up Schrödinger time dependent wave equation. 5
9. Obtain the energy eigen value and energy eigen function for a particle moving in one dimensional box of infinite height. 8

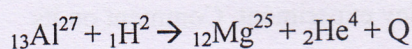
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PART-D

Answer any THREE questions.

3x4=12

10. A rod of one meter long is moving along its length with a velocity of 2.5×10^8 m/s. Calculate its length as it appear to an observer on the earth?
11. The distance between traces corresponding to mass 12 & 16 in an Aston's mass spectrograph is 4.8 cm. Calculate the mass of the particle whose trace is at a distance of 8.4 cm from the trace of mass 16.
12. Thorium 228 emits α -particle of energy 5.42 MeV. Calculate the α -Disintegration energy.
13. Determine Q-value of the following reaction.



mass of $\text{Al}^{27} = 26.9901$ amu, mass of ${}_1\text{H}^2 = 2.0147$ amu

mass of $\text{Mg}^{25} = 24.9936$ amu, mass of ${}_2\text{He}^4 = 4.0039$ amu

14. The position and momentum of 1 KeV electron are simultaneously determined. If its position is located within 0.4 nm, what is the percentage of uncertainty in its momentum?

PART-E

Answer any TEN questions.

10x2=20

15. a) Write two postulates of special theory of relativity.
- b) Write a note on cosmic ray showers.
- c) What is time dilation? Explain.
- d) What is the principle of bubble chamber.
- e) Write any two characteristics of Nuclear forces.
- f) State and explain Geiger-Nuttal law.
- g) What is stellar energy? Explain.
- h) Give an example for Nuclear reaction induced by i) Proton ii) Neutron.
- i) Why wave nature of matter is not apparent in our daily observation?
- j) Write a note on failure of classical mechanics to explain specific heat of solids.
- k) Explain Born's interpretation of wave function.
- l) What is zero point energy? Explain.