Mahila Vikas Sanstha's

INDRAPRASTHA NEW ARTS COMMERCE & SCIENCE COLLEGE, AT POST NALWADI, DIST. WARDHA (M.S.)

INACSC

Accredited 'B' by NAAC

Approved by government of Maharashtra

Affiliated to Rashtrasant Tukadoji Maharaj Nagpur University, Nagpur

Recognised by U.G.C New Delhi under section 2 (f) & 12 (b) of UGC act 1956

Bsc Physic Sem - VI

Paper 1 (Relativity, Nuclear physics and Bio Physics)

Question Bank

Unit 1

1. Derive the expression for kinetic energy of a particle moving at relativistic velocity:

     i. $E = \sqrt{p^2c^2 + m_0^2c^4}$

   where the letters have their usual meaning. Hence, obtain the energy and momentum of a particle with zero rest mass.

2. Derive the laws of relativistic addition of velocities.

3. Show that the mass of particle moving with speed v is given by,

   $$m = \frac{m_o}{\sqrt{1 - \frac{v^2}{c^2}}}$$

4. Obtain Lorentz transformation equations.

5. Calculate the speed of an electron at which its relativistic energy is 1.25 times the rest energy.

6. Derive the expression for time dilation.

7. Define :
     a. Inertial frame of reference
     b. Non-inertial frame of reference.

8. Describe Michelson-Morely experiment and obtain the expression for fringe shift.

9. Obtain Einstein's mass energy equivalence relation.

10. With what velocity should a rocket move so that every year spent on it corresponds to 4 years on earth ?

11. Obtain Lorentz transformations for space and time co-ordinates.

12. What is frame of reference ? Explain inertial and non-inertial frames of reference with examples.

13. Derive the equation $E = mc^2$ from Special theory of relativity. Show that a particle with zero rest mass can travel with velocity of light.

14. What is time dilation? 'A clock in motion ticks slower than a stationary clock', explain.

15. Derive the equations for relativistic addition of velocities from Lorentz transformations.

16. How fast must a space craft travel relative to the earth so that one day on the earth corresponds

with 2 days on the space craft?

17. Discuss the concept of length contraction in relativity.

18. Obtain Lorentz transformation equation for space and time coordinates.

Unit 2

1. Explain the terms mass defect and packing fraction.

2. What is nuclear fission ? Explain with an example.

3. What are the characteristics of shell model of the nucleus.

4. What is a nuclear reaction ? Obtain an expression for Q-value of nuclear reaction.

5. Discuss in detail the construction and working of a G.M. counter. What is dead time and recovery time ?

6. Define mass defect. Explain binding energy per nucleon.

7. Explain construction and working of Wilson Cloud Chamber.

8. Obtain an expression for cyclotron frequency.

9. Explain nuclear fission on the basis of the liquid drop model.

10. What is chain reaction ? Discuss different types of chain reaction. Discuss nuclear power react or with schematic diagram.

11. Explain the working of G.M. counter. Define dead time and recovery time.

12. Explain the working of a Linear accelerator.

13. If the frequency of the oscillator connected to the dees' of a cyclotron is 9 MHz, what should be the magnetic flux density B required to accelerate □-particles?

14. Explain construction and working of Wilson Cloud Chember.

15. Define Q-value of nuclear reaction. Explain exo-ergaic and end oergic nuclear reaction.

Unit 3

1. What is □-particle tunnelling ? Explain Gamow's theory of □-decay and derive the expression for transmission probability p_T

2. What is □-decay ? State the characteristics of □-decay process.

3. Explain the experimental determination of range of □-particle.

4. What are neutrinos ? What are their properties?

5. Explain the magnetic spectrometer method for the measurement of energy of beta particles

6. Explain experimental determination of range of □-particle.

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7. Find energy equivalence in MeV for a gamma ray of frequency 6.7×10^{20} Hz.

8. What is □-decay ? Explain the measurement of energy of a beta particle by a magnetic spectrograph. What is end point energy ?

9. Write a short note on Geiger-Nuttal law and discuss its importance.

10. A nucleus X^{24} undergoes □⁻ and then □-decay process. Find the atomic and mass numberof the final daughter nuclei after successive beta and alpha decay.

11. Explain Pauli's neutrino hypothesis and state the properties of a neutrino.

12. What is □-decay ? Obtain an expression for Q-value in □-decay process.

13. What is □ -decay ? Explain each mode with suitable example through which □ -decay occurs. Explain the energy of □ □ particle by mass spectrometer.

14. What is range of an alpha particle ?How it is determined experimentally?

15. State and explain Geiger-Nuttall law.

16. Discuss Pauli's neutrino hypothesis.

17. What is gamma decay? Explain energy emission of gamma ray photon with energy level diagram

Unit 4

1. Explain principle and working of electrocardiogram with the help of neat block diagram.
2. What is spectrophotometer ? Explain the working of spectrophotometer.
3. A light is passed through a cell containing solution whose transmittance is 30%.Calculate the absorption of the solution.
4. What are the different brain waves ? Explain the function of each block of EEG recording.
5. What is centrifugation ? Explain different types of centrifuge.
6. Explain construction and working of a colorimeter
7. Discuss in detail electrocardiogram for heart with block diagram. State its uses.
8. What is the principle of working of centrifuge ? Obtain an expression for Relative Centrifugal Force (RCF).
9. The relative centrifugal force is 20,000 and the rpm speed of the rotor is 7500 rpm.Find the radius of the rotor.
10. Explain the construction and working of colorimeter
11. What is Electro retino graphy (ERG) ? Explain its different components.
12. Discuss the Electroencephalogram (EEG) for brain.
13. What is electro cardiogram ?With suitable block diagram explain the working of ECG.
14. The molar extinction coefficient of a substance is 16000. When light is passed through the cell containing the substance of 2 cm thickness if 75% of light is absorbed, find concentration of the solution.
15. Explain the construction and working of Calorimeter.
16. Explain the construction and working of pH meter.