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**SUBJECT CODE NO: - YY-2370**  
**FACULTY OF SCIENCE AND TECHNOLOGY**  
**B.Sc. (CBCGS)(Pattern 2022) S.Y (Sem-III)**  
**Examination April / May - 2024**  
**Physics-VIII Modern and Nuclear Physics**

[Time: 1:30 Hours]

[Max. Marks: 40]

Please check whether you have got the right question paper.

N. B

- 1) All questions are compulsory.
- 2) All questions carry equal marks.
- 3) Draw neat diagrams and give labels wherever necessary.
- 4) Figures to the right indicate full marks.

Q1 Explain in details photoemissive cell and phot-voltaic cell. 10

OR

Discuss the Meson Theory of Nuclear Forces and explain the shell model of atomic nucleus. 10

Q2 What is LASER? Explain the construction and working of Ruby-laser. 10

OR

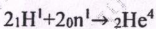
Explain the principle, construction and working of Cyclotron. 10

Q3 A) When light of wavelength  $2200 \text{ \AA}$  Falls on Cu, Photoelectrons are emitted from it. 05

Find (i) The threshold wavelength (ii) The stopping potential.

(Given :  $h = 6.626 \times 10^{-34} \text{ J.s}$ ,  $C = 3 \times 10^8 \text{ m/sec}$ ,  $\phi_0 = 4.65 \text{ eV}$ )

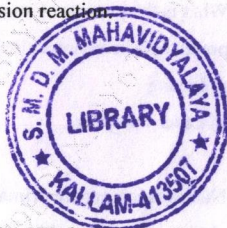
B) Calculate the energy released during the following fusion reaction. 05

Given: mass of  ${}_1\text{H}^1 = 1.00814 \text{ a.m.u.}$ mass of  ${}_2\text{He}^4 = 4.003424 \text{ a.m.u.}$ mass of  ${}_2\text{He}^4 = 4.003424 \text{ a.m.u.}$ 

OR

A) In  $\text{CO}_2$  Laser, the energy difference between the two LASER level is  $0.1 \text{ eV}$ . 05

Calculate the wavelength and frequency of the radiation.

Given:  $h = 6.63 \times 10^{-34} \text{ J.s}$ ,  $C = 3 \times 10^8 \text{ m/sec}$ .

- B) A cyclotron in which the flux density is  $1.4 \text{ weber/m}^2$  is employed to accelerate proton. How rapidly should be electric field between the dees be reversed? 05  
 (mass of proton =  $1.67 \times 10^{-27} \text{ kg}$  and charge =  $1.6 \times 10^{-19} \text{ C}$ ).

**Q4 Multiple choice questions (Each one mark)** 10

- 1) In the Compton experiment, what phenomenon was observed when X-rays were scattered by electrons?
 

a) Photoelectric effect	b) Refraction
c) Polarization	d) Wavelength increase
  
- 2) What is a common application of photoelectric cells in everyday life?
 

a) Solar panels	b) X-ray machines
c) Light bulbs	d) Electric heaters
  
- 3) Which of the following properties is associated with a laser beam?
 

a) Divergence	b) Incoherence
c) Low Intensity	d) Monochromaticity
  
- 4) What is the wavelength range of a ( $\text{CO}_2$ ) laser?
 

a) Ultraviolet	b) Visible
c) Infrared	d) X-ray
  
- 5) What is the process of supplying energy to the laser medium to achieve population inversion called?
 

a) Lasing	b) Optical Amplification
c) Laser Pumping	d) Light Generation
  
- 6) Nuclear reactors are primarily used for:
 

a) Generating electricity	b) Propelling Spacecraft
c) Purifying water	d) Synthesizing Chemicals





- 7) A chain reaction in a nuclear reactor involves:
- a) A single nuclear reaction
  - b) A continuous series of nuclear reactions
  - c) A chemical reaction
  - d) A decay of radioactive materials
- 8) A cyclotron accelerates charged particles by
- a) Linear acceleration
  - b) Circular acceleration
  - c) Sudden deceleration
  - d) Slowing down particles
- 9) The betatron is designed to accelerate electrons using:
- a) Electric fields
  - b) Magnetic fields
  - c) Gravitational forces
  - d) Chemical reactions
- 10) The Geiger-Muller Counter is a popular radiation detector known for its:
- a) High sensitivity to low levels of radiation.
  - b) Precision measurement of ionization events
  - c) Continuous operation without the need for batteries
  - d) Resistance to damage from radiation.

