

Day : Tuesday
Date : 14/05/2019

S-2019-2528

Time : 10.00 AM TO 01.00 PM
Max: Marks : 60

N.B.

- 1) All questions are **COMPULSORY**.
- 2) Figures to the right indicate **FULL** marks.
- 3) Use of electronic pocket calculator is allowed.
- 4) Assume suitable data if necessary.

Constants:

$$e = 1.6 \times 10^{-19} \text{C}$$

$$m_e = 9.1 \times 10^{-31} \text{Kg}$$

$$h = 6.63 \times 10^{-34} \text{J-s}$$

$$m_p = 1.66 \times 10^{-27} \text{kg}$$

$$N_a = 6.025 \times 10^{23} \text{ atom/gm-mole}$$

- Q.1 a) What are thermonuclear reactions? Explain proton-proton cycle. (06)
- b) An electron starts from rest and moves freely in an electric field $E = 24 \text{ kV/m}$. Determine (a) the force on the electron (b) its acceleration. (04)

OR

- Q.1 a) Give principle, construction and working of Bainbridge mass spectrograph. (06)
- b) Protons in a cyclotron describe a circle of radius 0.4 m just before emerging from the dees. If the magnetic field intensity is 1.5 wb/m^2 , what is the maximum K.E. of the protons? (04)
- Q.2 a) Explain working of p-n junction diode on the basis of band theory of solids. (06)
- b) Give differences between type - I and type - II superconductors. (04)

OR

- Q.2 a) State and explain any six applications of superconductors. (06)
- b) Calculate the conductivity of pure silicon at room temperature when the concentration of carriers is $1.6 \times 10^{10}/\text{cm}^3$. Given : $\mu_e = 1500 \text{ cm}^2/\text{V-sec}$, $\mu_h = 500 \text{ cm}^2/\text{V-sec}$, (04)
- Q.3 a) What is entropy? Discuss the change in entropy in reversible and irreversible process. (06)
- b) Discuss the following properties on the nanoparticles i) magnetic ii) electrical. (04)

OR

- Q.3 a) Explain high energy ball milling method productivity nanoparticles. (06)
- b) State and explain third law of thermodynamics. (04)

P.T.O.

- Q.4 a) Explain the formation of Newton's rings. Derive the formula for dark ring in reflected system. (06)
- b) A slit of width 0.16 mm is illuminated by a light of wavelength 5600\AA . Find the half angular width of the central maximum. (04)

OR

- Q.4 a) State Rayleigh's criterion of resolution. Derive the formula for resolving power of a diffraction grating. (06)
- b) MgF_2 of refractive index 1.38 is coated on a glass plate in order to reduce the reflection from the glass surface using ARC. Calculate the thickness of ARC (Take, $\lambda = 5500\text{\AA}$). (04)
- Q.5 a) Width energy level diagram, explain construction and working of Ruby laser. (06)
- b) Give differences between positive and negative crystals. (04)

OR

- Q.5 a) What is retardation plate? Derive the formula for thickness of a quarter wave plate. (06)
- b) Write a short note on optical pumping. (04)
- Q.6 a) State requirements of acoustically good hall. (06)
- b) Assume that the uncertainty in the location of a particle is equal to its De Broglie wavelength. Show that the uncertainty in its velocity is equal to its velocity. (04)

OR

- Q.6 a) Derive the formula for energy eigen value and eigen function of a particle trapped in a potential well of an infinite depth. (07)
- b) Define reverberation and reverberation time. (03)

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