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SEAT No. _____



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Sardar Patel University Vallabh Vidyanagar

B.Sc. [Semester- VI]

Subject Physics Course Code No: US06CPHY23

Subject/Course Title: Solid State and Nuclear Physics

Date: 06 - 04-2022

Time: 3-00 pm to 5-00 pm

Total Marks-70

Wednesday

Q-1 Multiple Choice Questions: [Attempt all]

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- (1) Penetration power of X-rays is _____ electrons.
(a) Same as (b) more than
(c) less than (d) not comparable to
- (2) In Bragg's law equation, $2d\sin\theta = n\lambda$, λ refers to _____
(a) wavelength of laser (b) wavelength of sound waves
(c) wavelength of X rays (d) wavelength of electron
- (3) In which method of x-ray diffraction, a single crystal is used?
(a) Crystal rotation method (b) Laue method
(c) Powder method (d) all the three
- (4) Drude model corresponds to _____ conductivity of metals.
(a) thermal (b) electrical
(c) magnetic (d) none of above.
- (5) The heat capacity of free electron fermi gas $C_{(\text{electron})}$ is _____
(a) $(\pi^2/2).nk(T/T_f)$ (b) $(3R/2)$
(c) $3/2 (nkT)$ (d) $3/2(nk)$
- (6) In Weizsacher's semi empirical formula Asymmetry term arises from
(a) neutrons -protons difference (b) Mass difference
(c) charge difference (d) all of above
- (7) Which of the following is a wave mechanical property of a nucleus?
(a) Angular momentum (b) Charge
(c) Magnetic moment (d) Parity
- (8) In a stripping nuclear reaction, which particle gains mass?
(a) Projectile (b) Target
(c) Both (d) None
- (9) Which gas is commonly used in cloud chamber??
(a) Carbon Dioxide (b) Oxygen
(c) chlorine (d) Water vapor
- (10) What is required to detect very weak light output?
(a) GM counter (b) Cloud chamber
(c) Scintillation Counter (d) Cock Croft generator



Q.2 Do as directed

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- 1 The average velocity achieved during drift motion is called _____ .
- 2 In powder pattern method, _____ x-rays are used.
- 3 _____ mass spectrometer uses both, electric and magnetic fields.
- 4 Bohr Magneton is the unit of _____ magnetic moment.
- 5 In x-ray powder pattern, poly crystal is used. (True/False)
- 6 Electrical conductivity is reciprocal of electrical resistivity. (True/False)
- 7 Mass defects in nuclei appear as binding energy. (True/False)
- 8 Betatron accelerates electrons. (True/False)

(1)

(P.T.O.)



Q-3 Answer any ten questions in short.

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- 1 Enlist the properties of K space.
- 2 State four steps for construction of reciprocal lattice.
- 3 What is X-ray crystallography?
- 4 Explain why condensed matter is transparent to conduction electrons?
- 5 Why the interaction among conducting electrons in solids is weak?
- 6 Define Hall effect.
- 7 Measurement of nuclear radius by Masonic x ray method.
- 8 By any method, prove that electron can not exist inside nucleus.
- 9 Show with example, the difference between Isotopes and Isobars.
- 10 Define dead time of GM counter.
- 11 State the Principle of Cloud chamber.
- 12 Draw the schematic diagram of Spark Chamber.

Q.4. Long Questions (Answer any 4)

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- 1 Explain in detail, the x-ray powder pattern method.
- 2 Write a detailed note on geometrical construction of reciprocal lattice.
- 3 Discuss free electron gas in three dimension.
- 4 Describe the phenomenon of Hall effect.
- 5 Explain construction and working of Aston's mass spectrograph.
- 6 Derive Q equation for a nuclear reaction and solve it for endoergic reaction.
- 7 Discuss working of Cock Craft and Van de Graaff generator
- 8 Principle and working of ionization chamber.

