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SARDAR PATEL UNIVERSITY

M.Sc. Physics IInd Semester Examination

Tuesday, Date: 25/10/2016, Time: 10.00 a.m. to 01.00 p.m.

Subject: PHYSICS, Subject Code: PS02CPHY02

Title: Elements of Experimental Physics

Instruction:

Figure to the right indicates marks.

Total Marks: 70

Q.1 Write answer of all questions by showing your choice against the question number. [8]

- (1) In a vacuum, 1 Torr = _____ atm.
(a) 760 (b) 1/760 (c) -1/760 (d) -760
- (2) In a thermocouple gauge, the thermocouple is made up of _____.
(a) Chromel - iron (b) chromel - silver
(c) chromel - Alumel (d) chromel - Nickel
- (3) Diffraction from crystalline solid occurs at values θ following the Bragg's law $n\lambda = 2d\sin\theta$, where 'd' is :
(a) distance between two lattice points
(b) distance between two planes
(c) distance between two parallel plates
(d) distance between two unit cell
- (4) The intensity of X-ray diffraction depends upon:
(a) Any electron shell of the atom
(b) The scattering from nuclei
(c) The electrons of outermost shell of the atom
(d) The electrons of innermost shell of the atom
- (5) _____ is used in fluorescent screen for detection of X-rays.
(a) ZnO (b) CdSe (c) CdTe (d) ZnS
- (6) The $\text{CuK}\alpha$ (Ni) X-rays are due to the :
(a) Cu as cathode & Ni as anode (b) Cu as cathode & Ni as filter
(c) Cu as anode & Ni as filter (d) Cu as anode & Ni as cathode
- (7) For detection of nuclear particle, the spark chamber is filled with _____ at atmospheric pressure.
(a) Carbon (b) Argon (c) Nitrogen (d) Oxygen
- (8) _____ factor determined by total number of ion pairs divided by ions produced by primary ionization.
(a) Structure (b) Gas multiplication (c) polarization (d) Fano

- Q.2 Attempt any Seven of the followings: [14]
- (i) What is gettering process? Which material is generally preferred for gettering process?
 - (ii) Describe square scale method for calibration of McLeod gauge.
 - (iii) Explain in brief slow neutron scattering in solid.
 - (iv) Describe continuous and characteristic X-rays in brief
 - (v)) What is thermo gravimetric analysis?
 - (vi) Explain differential thermal analysis.
 - (vii) Distinguish between organic and inorganic scintillator? Describe the process to prepare plastic scintillator.
 - (viii) Describe the photographic emulsion technique used for detection of charged particle.
 - (ix) Define: Histogram, class mark, class frequency and frequency of polygon.
- Q.3(a) With the help of necessary diagram explain principle and working of diffusion pump in detail. Also explain what is back streaming. [6]
- Q.3(b) Explain the classification of vacuum pumps on the basis of their principle of operation and pressure range. Discuss in detail the operation of roots pump. [6]
- OR
- Q.3(b) Sketch the diagram of a penning ionization gauge and explain its working. Also mention its pressure range of operation. [6]
- Q.4(a) Explain Thomson's equations of X-ray scattering by an electron. Mention the merit and demerit of X-ray and Neutron diffractions? [6]
- Q.4(b) Draw schematic diagram of Transmission Electron Microscope and describe its principle and working in detail. [6]
- OR
- Q.4(b) What is elastic scattering? Explain in detail elastic scattering from polycrystalline material. [6]
- Q.5(a) What is photoluminescence? Describe photoluminescence intensity related to the concentration. [6]

Q.5(b) With the help of necessary diagram, describe X-ray photoelectron spectroscopy in detail. [6]

OR

Q.5(b) Using suitable diagram, explain X-ray fluorescence spectroscopy in detail. [6]

Q.6(a) Draw schematic diagram of photomultiplier tube and explain its principle and working in detail. [6]

Q.6(b) Using necessary diagram, explain principle, construction and working of Guiger - Muller counter. [6]

OR

Q.6(b) What is Gaussian distribution? Obtain the equation of standard deviation from Gaussian distribution and also mention its properties. [6]

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