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SARDAR PATEL UNIVERSITY

M.Sc. Physics II[nd] Semester Examination

Wednesday, Date: 06/04/2016, Time: 10.30 a.m. to 01.30 p.m.

Subject: PHYSICS, Paper:PS02CPHY02

Title: Elements of Experimental Physics

Instruction:

(a) 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) _____ material is used as a gettering material in Getter ion pump.
(a) Titanium (b) Carbon (c) Tungsten (d) Germanium

(2) In sorption pump, the gas molecule removed from solid surface is called the process of _____.
(a) absorption (b) adsorption (c) adsorbent (d) desorption

(3) _____ material is used in the fluorescent screen to detect X-rays:
(a) ZnO (b) ZnSe (c) ZnTe (d) ZnS

(4) Characteristic X-ray wavelength depends on:
(a) target (b) cathode (c) high voltage (d) None of the above

(5) In electron diffraction, the wavelength of electron beam varies with
(a) V (b) I (c) $\frac{1}{\sqrt{V}}$ (d) V^2

(6) Structure factor:
(a) depends on both shape and size of a cell
(b) depends on shape but not on size
(c) independent of shape and size
(d) none of the above

(7) In a Ionization chamber, the cathode is made of _____.
(a)semiconductor (b) metal (c) Insulator (d) semi-metal

(8) The position of light guides at :
(a) top of the scintillator
(b) bottom of photomultiplier tube
(c) between scintillator and photomultiplier tube
(d) inside photomultiplier tube.

Q.2	Attempt any Seven of the followings: (i) Explain in brief why back streaming problem is encountered in diffusion pump. (ii) Describe linear scale method for calibration of McLeod gauge. (iii) Differentiate between structure factor of body centered and base centered cell. (iv) What is polarization factor? What are the factors it depends? (v) Write down the basic principle of DTA & TGA. (vi) Differentiate between coherent scattering and incoherent scattering. (vii) What is Histogram? Mention requirements of it. (viii) Explain Cerenkov detector in brief. (ix) Why spark chamber used in high energy experiments? Explain its working in brief.	[14]
Q.3(a)	Draw schematic diagram of rotary pump and explain its principle and working in detail.	[6]
Q.3(b)	Using the necessary structural diagram, discuss in detail the construction and operation of a cryosorption pump.	[6]
	OR	
Q.3(b)	With help of suitable diagram, explain the principle and working of bridge network used in Pirani gauge.	[6]
Q.4(a)	Obtain the general equation for scattering of X-rays by single electron. Interpret the result. What is Compton scattering?	[6]
Q.4(b)	Obtain the expression for scattered intensity from all the atoms of an orthorhombic cell. Extend it for f.c.c. crystal.	[6]
	OR	
Q.4(b)	What is neutron scattering? Explain slow neutron scattering in solids in detail.	[6]
Q.5(a)	Mention the full form of TGA, DTA, DSC, TMA and list the major applications each of them.	[6]
Q.5(b)	Mention the basic principle electron diffraction. Give the sketch of the experimental set up and working for recording electron diffraction from a polycrystalline specimen.	[6]
	OR	
Q.5(b)(i)	Mention the merits and demerits of X-ray diffraction, electron diffraction and neutron diffraction.	[3]
Q.5(b)(ii)	What is camera constant? Camera constant of a specific experiment is 31.4 mm , calculate the interplaner spacing for three consecutive rings with diameter 31.0 mm, 43.2 mm and 53.4 mm.	[3]
Q.6(a)	What is Gaussian distribution? Obtain the mean value of Gaussian distribution and also mention its properties.	[6]

Q.6(b) (i) **A company manufactures 80 resistors. The resistance of resistor at given frequency is given as:** [4]

The resistors (frequency) are 4, 15, 33, 21, 7 and the resistance (ohms) is 93-95, 96-98, 99-101, 102-104, 105-107 respectively.

Determine:

a. The arithmetic mean,

b. The median value,

c. The modal value and

d. Use empirical formula to calculate mode value and compare this value with that obtained in part c.

Q.6(b) (ii) **Show that the arithmetic mean is the best estimated true value of the data.** [2]

OR

Q.6(b) **With help of suitable diagram, explain high purity germanium detector and lithium doped germanium detector in detail.** [6]

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