

SEAT No. _____

No. of printed pages: 02

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SARDAR PATEL UNIVERSITY

M.Sc. Physics IInd Semester Examination

Wednesday, Date: 11/04/2018, Time: 02:00 p.m. to 05:00 p.m.

Subject: PHYSICS, Paper: PS02CPHY02

Title: Elements of Experimental Physics

Instruction:

Figures to the right indicate marks.

Total Marks: 70

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

(i) The space around us contains _____ molecules per every c.c.

- (a) 2.5×10^{18} (b) 2.5×10^{19} (c) 2.5×10^{20} (d) 2.5×10^{21}

(ii) The unknown pressure can be calculated using Pirani gauge by _____ equation.

(a) $P_x = \frac{I^2 R(I + \alpha \Delta T) + b \Delta T - \sigma(T^4 - T_a^4)}{c \Delta T}$ (b) $P_x = \frac{I^2 R(I + \alpha \Delta T) - b \Delta T + \sigma(T^4 - T_a^4)}{c \Delta T}$
(c) $P_x = \frac{I^2 R(I + \alpha \Delta T) - b \Delta T - \sigma(T^4 - T_a^4)}{c \Delta T}$ (d) $P_x = \frac{I^2 R(I + \alpha \Delta T) + b \Delta T + \sigma(T^4 - T_a^4)}{c \Delta T}$

(iii) If the fast moving electrons rapidly decelerate, then _____ are produced.

- (a) Alpha rays (b) Beta rays (c) Gamma rays (d) X-rays

(iv) _____ factor is independent of size and shape of the unit cell.

- (a) Temperature (b) Multiplicity (c) structure (d) Lorentz-polarization

(v) The energy of the emitted X-rays depends upon the atomic number of the atom and their intensity depends upon the _____

- (a) sample (b) mass number
(c) concentration of atoms (d) concentration of molecules

(vi) _____ equation represents Bragg's law for X-ray diffraction.

- (a) $n\lambda = 2d\sin\theta$ (b) $n\lambda = -2d\sin\theta$ (c) $n\lambda = 1/2d\sin\theta$ (d) $n\lambda = -1/2d\sin\theta$

(vii) In a histogram, the minimum _____ class interval is required

- (a) 2 (b) 3 (c) 5 (d) 6

(viii) The number of observations are falling within each class is called:

- (a) class mark (b) class frequency (c) frequency of polygon (d) ogive

Q.2 Attempt any Seven of the followings:

[14]

(i) Mention advantages of molecular drag pump.

(ii) Why activated charcoal is used as sorbent in sorption pump?

(iii) Distinguish between elastic and coherent scattering.

(C.P.T.O.)

- (iv) Explain characteristics of X-rays in brief.
- (v) Describe basic principle of phosphorescence spectroscopy.
- (vi) Discuss in brief differential scanning calorimetry.
- (vii) Describe working of Cloud chamber used for detection of particles.
- (viii) Explain in brief Cherenkov detector.
- (ix) Distinguish between discrete quantities and continuous distributed quantities.

- Q.3(a) With the help of necessary diagram explain principle, construction and working of roots pump to create lower pressure inside the chamber. [6]
- Q.3(b) What is diffusion? Describe in detail the working of diffusion pump using necessary diagram. Also mention the advantages and disadvantages of mercury over other oil used in this pump. [6]
- OR
- Q.3(b) Draw the suitable diagram of Magnetron gauge and describe its construction and working in detail. [6]
- Q.4(a) With the help of necessary schematic diagram explain principle, construction and working of transmission electron microscope. [6]
- Q.4(b) What are X-rays? Explain X-ray sources and X-ray absorbers in detail. [6]
- OR
- Q.4(b) What is neutron scattering? Describe in detail slow neutron scattering in solid. [6]
- Q.5(a) Differentiate between thermo gravimetric analysis and differential thermal analysis. Discuss thermo gravimetric analysis using suitable diagram. [6]
- Q.5(b) What is photoluminescence? Describe the photoluminescence intensity related to the concentration. [6]
- OR
- Q.5(b) Write a short note on X-ray fluorescence spectroscopy. [6]
- Q.6(a) Draw schematic diagram of scintillation spectrometer and describe its working in detail. [6]
- Q.6(b) Ten samples of steel wires are tested to measure breaking strength of this wire in tones are : 4.2, 4.3, 4.4, 4.5, 4.5, 4.5, 4.6, 4.6, 4.7 & 4.9. [6]
Calculate:
- (a) Mean value of breaking strength, (b) Mean deviation,
 - (c) Standard deviation of the data, (d) Best estimated precision,
 - (e) Internal standard error and (f) Breaking strength of wire.
- OR
- Q.6(b) What is Gaussian distribution? Determine mean value and the standard deviation for Gaussian distribution. [6]

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