SARDAR PATEL UNIVERSITY
M.Sc. Physics IInd Semester Examination
Wednesday, Date: 22/04/2015, Time: 10.30 a.m. to 01.30 p.m.
Subject: PHYSICS, Paper:PS02CPHY02
Title: Elements of Experimental Physics

Instructions:

(a)   Figure to the right indicates marks.   Total Marks: 70

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

(1) Turbo molecular pump works up to pressure

         (a) 10^{-9} torr   (b) 10^{-5} torr
         (c) 10^{-11} torr   (d) 10^{-3} torr

(2) Which of the following gauge depends on the principle of thermal
    conductivity of gases for its operation.

         (a) Mc Leod Manometer   (b) Bourdon gauge
         (c) thermocouple Gauge   (d) Bayard Alpert Gauge.

(3) The X-rays photons are _____.
         (a) Heavier than mass of ultra-violet ray photons
         (b) Lighter than mass of ultra-violet ray photons
         (c) of equal mass of ultra-violet ray photons
         (d) None of the above

(4) The equation of Moseley's is _____.
         (a) $v = C(z - \sigma)$ (b) $\sqrt[3]{v} = C(z - \sigma)$
         (c) $\sqrt{v} = C(z - \sigma)$ (d) $v^2 = C(z - \sigma)^2$

(5) The relationship between fluorescent power and higher concentration is
    _____.
         (a) liner   (b) non liner
         (c) exponential   (d) None of the above

(6) In TGA analysis, the current is proportional to the change in _____.
         (a) temperature of sample   (b) pressure of gas
         (c) weight of sample   (d) all of the above

(7) The number of observations that are falling within each class is called:
         (a) class mid point   (b) class frequency
         (c) frequency of polygon   (d) relative frequency

P.T.O.

(8) The time during which the electric field in the counter is too small to produce secondary ionization is known as the dead time of the G.M. counter.
    (a) relaxation time (b) recovery time (c) resolving time (d) dead time

Q.2   Attempt any Seven of the followings: [14]
(i) What is gattering process? Which material is generally preferred for gattering process?
(ii) " The Pirani gauge operates on the principle of thermal conductivity". Justify this statement.
(iii) Explain the terms X-ray filter and Absorption edge in brief.
(iv) What is short wavelength limit? A beam 35.0 keV electrons strikes a molybdenum (Mo) target, generating the X-rays spectrum. Find out the short wavelength λ_{SWL} of it?
(v) What is Fluorescent power?
(vi) Explain the basic principal of X-ray photoelectron spectroscopy.
(vii) Define: histogram, ogive, limiting frequency distribution and class mark.
(viii) How liquid scintillator can be prepared? Also mention its advantages.
(ix) Using necessary diagram describe working of ionization chamber in Brief.

Q.3(a)   Explain the classification of vacuum pumps on the basis of their principle of operation and pressure range. Discuss in detail the operation of molecular drag pump.   [6]

Q.3(b)   Draw the bridge structure used in Pirani gauge and explain its working.   [6]
<div align="center">OR</div>

Q.3(b)   Using necessary sketch, describe the construction, working, advantages and limitations of a penning gauge.   [6]

Q.4(a)   How X-rays are produced from Mo tube in laboratory? Discuss in detail the characteristics of X-ray spectrum obtained.   [6]

Q.4(b)   What do you mean by atomic scattering factor? Derive general expression for the structure factor all the atoms of a unit cell.   [6]
<div align="center">OR</div>

Q.4(b)   Explain Thomson's equations of X-ray scattering by an electron. Mention the merit and demerit of X-ray and Neutron diffractions?   [6]

Q.5(a)   Draw the schematic diagram of Thermogravimetric analyzer and discuss working, applications and uses of it.   [6]

Q.5(b)   Describe in detail differential thermal analysis and differential scanning calorimetry.   [6]
<div align="center">OR</div>

Q.5(b)   Discuss in detail the basics principal of X-ray fluorescence technique with diagram. Also mention its applications and limitations.   [6]

<div align="right">P.T.O.</div>

Q.6(a) Breaking strength of ten samples in tones were tested on testing machine   [6]
are:
4.6, 4.4, 4.6, 4.9, 4.5, 4.5, 4.2, 4.7, 4.5, 4.3
Calculate:
(a) The mean value of breaking strength, (b) Mean deviation,
(c) Standard deviation of the data, (d) Best estimate precision,
(e) Internal standard error and (f) The breaking strength of wire.

Q.6(b)   80 resistors have been manufacture by a company having resistance in ohms   [4]
(i)   is given below:
4 resistors having resistance between 93-95, 15 resistors having resistance
between 96-98, 33 resistors having resistance between 99-101, 21 resistors
having resistance between 102-104 and 7 resistors having resistance
between 105-107.
Determine: (a) The arithmetic mean, (b) The median value, (c) The modal
value and (d) using empirical formula calculate the modal value and
compare this value with that obtained in part (c).

Q.6(b)   The following results are obtained when two dice are rolled 200 times: [2]
(ii)   Number on dice: Number of occurrence

Number on dice	Number of occurrence
2	06
3	10
4	16
5	22
6	28
7	38
8	30
9	24
10	14
11	08
12	04

Calculate relative frequency distribution and show it graphically.

OR

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

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