



BRAINWARE UNIVERSITY

Term End Examination 2022
Programme – M.Sc.(BT)-2022
Course Name – Optical Instrumentation
Course Code - MBTC104
(Semester I)

Full Marks : 60

Time : 2:30 Hours

[The figure in the margin indicates full marks. Candidates are required to give their answers in their own words as far as practicable.]

Group-A

(Multiple Choice Type Question)

1 x 15=15

1. Choose the correct alternative from the following :

- (i) A boy uses spectacles of focal length -50 cm. Name the defect of the vision he is suffering from
 - a) Astigmatism
 - b) Hypermetropia
 - c) Myopia
 - d) Presbyopia
- (ii) As the focal length is negative, the lens used is concave. When a person is prescribed a concave lens, then the person is considered to be suffering from myopic. Therefore, the boy is suffering from myopia.
 - a) Two times
 - b) Four times
 - c) Eight times
 - d) Sixteen times
- (iii) A fly is sitting on the objective of a telescope. What will be its effect on the final image of the distant object?
 - a) Reduces
 - b) Increases
 - c) Remains constant
 - d) Indefinite
- (iv) Two lenses of focal lengths 5 cm and 50 cm are to be used for making a telescope. Which lens will you use for the objective?
 - a) Both
 - b) Neither
 - c) 5 cm
 - d) 50 cm
- (v) Which of the following is used to increase the range of a telescope?
 - a) Increasing the focal length
 - b) Decreasing the focal length
 - c) Increasing the diameter of the objective
 - d) Decreasing the diameter of the objective
- (vi) Which can see objects in the ultra-violet light while human beings cannot do so. Identify X
 - a) Penguin
 - b) Bees
 - c) Bees
 - d) Tiger
- (vii) How does the magnifying power of a telescope change on increasing the diameter of its objective?

- a) Independent
c) Halved
- b) Doubled
d) Becomes zero
- (viii) The approximate value of methyl proton in NMR is
a) 1.3
c) 0.9
- b) 1.5
d) 2.5
- (ix) In NMR spectrum the nuclei in up field resonate at
a) High frequency
c) It is constant throughout the spectrum
- b) Low frequency
d) It doesn't depend on chemical shift
- (x) The nuclei that does not give NMR signal is
a) ^{15}N
c) ^{19}F
- b) ^{11}B
d) ^{31}P
- (xi) Chemical shift is equal to
a) $(\text{Reference-Sample}) \times 10^6$
c) $(\text{reference} + \text{sample}) \times 10^6$
- b) $(\text{sample} - \text{reference}) \times 10^6$
d) $\text{ref} / \text{sample}$
- (xii) Coupling constant of two nuclei is defined as
a) Δ Ratio of chemical shifts
c) Difference of chemical shifts
- b) Distance between splitted peaks in Hz
d) Ratio of absorption frequencies
- (xiii) Compared with vinylic protons, aromatic protons will have
a) Low chemical shift
c) No NMR signal
- b) High chemical shift
d) High splitting
- (xiv) For aqueous samples, the useful standard in NMR is
a) Tetramethyl silane
c) Dimethyl silapentane sulfonate sodium
- b) Dimethylchloro silane
d) Squalene
- (xv) Electron Microscope can give a magnification up to
a) 400,000X
c) 15000X
- b) 100,000X
d) 100X

Group-B

(Short Answer Type Questions)

3 x 5=15

- Judge the relationship between theta and ellipticity of the polarization and state the definition of ellipticity of the polarization. (3)
- Justify the theory of NMR and states its three principles. (3)
- Generalise the theory of Spin Energy of a magnetic field? (3)
- Analyze the equation of $I_0 = I_r + I_a + I_t$ and introduce the parameters. (3)

OR

- Classify the types of Transition excitation. (3)
- Measure the experimental limitations of CD? (3)

OR

- Validate the differentiation between scanning electron microscopy and transmission electron microscopy. (3)

Group-C

(Long Answer Type Questions)

5 x 6=30

- What is meant by Stokes shift and anti Stokes shift and Stokes fluorescence? (5)
- Distinguish between elastic and inelastic collision or scattering with equation study. (5)
- Write the phenomenon of differential interface contrast (DIC) of microscopy. (5)
- Analyse the sum and calculate this: The wavelength of the X-rays is 0.071 nm which is diffracted by a plane of salt with 0.28 nm as the lattice constant. Determine the glancing angle (5)

for the second-order diffraction. Assume the value of the salt plane to be 110, and the given salt is rock salt.

11. Evaluate the sum and solve this with Braggs equation: The wavelengths of first-order X-rays are 2.20 angstrom... at 27angstrom. Find the distance between the adjacent Miller planes. (5)
12. Justify J coupling Hamiltonian and Decoupling in order to NMR? (5)

OR

Write the Frank Condon's Principal and state the salient features of it and design a schematic representations ? (5)
