



Reg. No. :

Name :



VI Semester B.Sc. Hon's (Mathematics) Degree (Supple.)
Examination, April 2021
(2014 – 2015 Admissions)
BHM 603 : TOPOLOGY

Time : 3 Hours

Max. Marks : 80

Answer **all** the **10** questions. (10×1=10)

1. Let X be an infinite set and d be the discrete metric on X . Is the metric space (X, d) is compact ? Justify.
2. If in a metric space we have $B(x, r) = B(x, s)$ does it mean that $r = s$?
3. What is the closure of \mathbb{Z} in \mathbb{R} with respect to discrete topology on \mathbb{R} ?
4. Define metrizable topology.
5. Define semi open interval topology on \mathbb{R} .
6. Does there exist a countable dense subset of \mathbb{R} with cofinite topology ?
7. Define normal space.
8. Give an example of path connected topological space.
9. "Continuous image of a Hausdorff space need not be Hausdorff" – Give an example.
10. Let $X = \{a, b\}$ and $\tau = \{\emptyset, X, \{a\}\}$. Check whether (X, τ) is a T_2 -space.

Answer **any 10** short answer questions out of 14. (10×3=30)

11. Show that discrete metric space (X, d) is Hausdorff.
12. Let A and B are two subsets of a topological space (X, d) .
 - i) Is $\text{int}(A) \cup \text{int}(B) = \text{int}(A \cup B)$?
 - ii) Is $\text{int}(A) \cap \text{int}(B) = \text{int}(A \cap B)$?
 Justify your answer.



11. What is meant by diffusion current ?
12. What is an inversion center ?
13. What is micro emulsion method ?
14. What do you mean by meta stable ion ?
15. Write two advantages of Raman spectra over IR spectra.
16. Identify the mirror planes present in BF_3 .
17. Give the point group of NH_3 and N_2O_4 .
18. Explain the effect of hybridization on the frequency of vibra. (2×7=14)

SECTION – C

(Answer any 4 questions. Each question carries 3 marks.)

19. Using Woodward Feiser rule calculate λ_{max} for :
 - a) 3,4-dimethylpent-3-ene-2-one.
 - b) p-chloroacetophenone.
20. Discuss two chemical methods for nano particle synthesis.
21. What are the advantages of amperometric titration ?
22. What are the factors affecting chemical shift ?
23. Give three applications of carbon nanotubes.
24. Explain the terms proper and improper rotation with suitable example.
25. Explain the Mc Lafferty rearrangement.
26. Discuss the significance of group frequency concept in IR spectroscopy. (3×4=12)



SECTION – D

(Answer any 2 questions. Each question carries 5 marks.)

27. a) Explain the selection rules for Raman spectroscopy.
b) Discuss the quantum theory of Raman scattering.
28. Explain the different kinds of symmetry elements and symmetry operations.
29. Describe the theory and instrumentation of spectrophotometry.
30. Explain the construction and working of dropping mercury electrode. What are the advantages of it ?
31. Discuss any two methods for the characterisation of nanoparticles.
32. a) Explain the term force constant on the basis of simple harmonic oscillator model of a diatomic molecule.
b) The force constant of HI is 283.4 N m^{-1} . Calculate the fundamental frequency in cm^{-1} . [$H=1.008$; $I=126.9$]. (5×2=10)