

C 30321

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Name.....

Reg. No.....

**FIFTH SEMESTER B.Sc. DEGREE EXAMINATION, NOVEMBER 2017**

(CUCBCSS—UG)

Chemistry

CHE 5B 08—PHYSICAL CHEMISTRY—II

Time : Three Hours

Maximum : 80 Marks

**Section A**

*Answer all questions.*

*Each question carries 1 mark.*

1. The radiation absorbed in vibrational spectroscopy is \_\_\_\_\_.
2. The number of fundamental modes of vibration in  $\text{CH}_3\text{Cl}$  is \_\_\_\_\_.
3. What is the point group of  $\text{H}_2\text{O}$  molecule ?
4. Solutions with same osmotic pressure is called \_\_\_\_\_.
5. Mention the number of phases present in mixture of  $\text{H}_2$ ,  $\text{O}_2$  and  $\text{N}_2$ .
6. The unit of first order reaction is :
7. Name a non-radiative transition.
8. Give an example for a symmetric top molecules.
9. Decrease in the intensity of an absorption band is called :
10. The minimum vibrational energy of a molecule is :

(10 × 1 = 10 marks)

**Section B**

*Answer any ten questions.*

*Each question carries 2 marks.*

11. Explain the term gold number.
12. Crystalline  $\text{Na}_2\text{CO}_3 \cdot 10 \text{H}_2\text{O}$  on keeping in air become white powder. Why ?
13. What is congruent melting point ? Give one example.
14. Explain Hardy Schulze rule with suitable example.
15. Rotation-reflection axis is also called improper axis. Why ?
16. Explain the term  $R_f$  value.

Turn over

17. Explain an auxochrome with a suitable example.
18. Distinguish between order and molecularity
19. What is meant by zero order reaction ? Give one example.
20. What is meant by critical solution temperature ?
21. The half life time of a first order reaction is 450 s. Calculate the rate constant for the reaction.
22. Derive the rate expression for a first order reaction.

(10 × 2 = 20 marks)

### Section C

*Answer any five questions.*

*Each question carries 6 marks.*

23. Construct the multiplication table for  $C_{2v}$  point group.
24. Derive Langmuir adsorption isotherm. Discuss its features.
25. Explain ion exchange chromatography with a suitable example.
26. Explain briefly the origin of rotational spectrum.
27. What is zeta potential ? What is its significance ?
28. Explain with example the terms phase, number of components and degrees of freedom.
29. Write a note on photochemistry of Hydrogen-Chlorine reaction.
30. Derive an expression for a first order reaction.

(5 × 6 = 30 marks)

### Section D

*Answer any two questions.*

*Each question carries 10 marks.*

31. (a) Explain the theory of NMR spectroscopy.
- (b) Write a note on the factors influencing rate of a reaction.

(5 + 5 = 10 marks)

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32. (a) Discuss the principles of thin layer chromatography.  
(b) Discuss the phase diagram of water.  
(c) State and explain Stark-Einstein's law of photochemical equivalence. What is its significance ?
- (3 + 4 + 3 = 10 marks)
33. (a) Write a note on preparation and purification of colloids.  
(b) The frequency separation of successive lines in the rotational spectrum of HCl is  $21.18 \text{ cm}^{-1}$ . Calculate the bond length.
- (5 + 5 = 10 marks)
34. (a) Discuss the Lindemann theory of unimolecular reactions.  
(b) Write a note on gel permeation chromatography.  
(c) Write a note on chemiluminescence.
- (5 + 3 + 2 = 10 marks)  
[2 × 10 = 20 marks]