



**MAR IVANIOS COLLEGE (AUTONOMOUS)**  
**THIRUVANANTHAPURAM**

Reg. No. :.....

Name :.....

**Third Semester B.Sc. Degree Examination, November 2016**

**First Degree Programme under CBCSS**

**Core Course: Chemistry – II**

**AUCH341: Inorganic Chemistry II**

(for 2014 Admissions – *Improvement Only*)

Time: 3 Hours

Max. Marks: 80

**SECTION – A**

*Answer ALL questions in a word or one or two sentences.*

1. What is an *antineutrino* ?
2. Mention the type of hybridization at the carbon atoms of benzene and ethylene.
3. How will you calculate percentage ionic character in a molecule ?
4. Define the term *absorbance*.
5. How do the stars generate light energy ?
6. Mention a situation where you can use an isotope as a tracer.
7. Name the type of forces between molecules of benzene.
8. What is a dipole ?
9. What do you understand by the term *Lycurgus cup* ?
10. Define lattice energy.

**(10 × 1 = 10 Marks)**

**SECTION – B**

*Answer any EIGHT questions, not exceeding a paragraph.*

11. What do you mean by artificial transmutation of elements ? Give an example.
12. Define critical mass. What is its significance ?
13. Explain the structure of  $\text{XeF}_6$  on the basis of VSEPR theory.

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14. Write Born – Lande equation and explain the terms.
15. Distinguish between dipole – dipole and dipole – induced dipole interactions.
16. What is Beer – Lambert law ? What is its importance ?
17. What do you mean by the term *sol – gel synthesis* in material chemistry ?
18. The observed dipole moment of HCl is approximately 1.0 D. If the calculated value assuming an ionic structure is 6.0 D, find the percentage ionic character in HCl.
19. Explain the term *self – ionization of liquid ammonia*.
20. Arrange the following ions in the order of their size:  $\text{Na}^+$ ,  $\text{Mg}^{2+}$ ,  $\text{Si}^{4+}$ ,  $\text{Cl}^{7+}$ . Give justification for your answer.
21. The metallic character of Be is due to the overlap of 2s and 2p band. Is this statement true ? Explain your answer.
22.  $^{238}\text{U}$  disintegrates by a series of alpha and beta emissions to form  $^{230}\text{Th}$ . Find the number of alpha and beta particles generated in this case.

(8 × 2 = 16 Marks)

### SECTION – C

*Short essay type : Answer any SIX questions.*

23. Draw the MO diagram for CO molecule. Write its bond order.
24. Explain Born – Baber cycle. What is its significance ?
25. What are Fajan's rules ?
26. Define dipole moment. Which among the following molecules will have net non – zero dipole moment ? i).  $\text{NH}_3$  ii).  $\text{NF}_3$  iii).  $\text{HCHO}$  iv).  $\text{CO}_2$  v).  $\text{CCl}_4$  vi).  $\text{CH}_3\text{Cl}$
27. i). In the case of a radio isotope  $t_{1/2}$  and  $\lambda$  are found to be equal. Predict that value.  
ii). Mention the product of the reaction  $^{255}\text{Md}$  (alpha, 2n). Atomic number of Md is 101.
28. A scrap of paper taken from the Dead Sea Scrolls was found to have a  $^{14}\text{C} / ^{12}\text{C}$  ratio of 0.795 times that found in plants living today. Estimate the age of the scroll. (Hint: The half – life of carbon – 14 is known to be 5720 years.)
29. Write the basic principle of SEM.
30. Write notes on i). Carbon nanotubes ii). fullerenes
31. i). What will be the product when a hydrogen nucleus trap a neutron ?  
ii). Explain the type of hydrogen bonding in water. The boiling point of pure water in the Earth is 100 degree Celsius. Do you expect some miracles if there are no hydrogen bonds in aqueous systems ?

(6 × 4 = 24 Marks)

**SECTION – D**

*Long essay type : Answer any TWO questions.*

32. What do you mean by metallic bonding ? Briefly explain the band theory for metallic bonding.
33. i). Explain the term *neutron activation analysis*.  
ii). Write the basic principles of  $^{14}\text{C}$  dating.  
iii). Compare valence bond theory (VBT) and molecular orbital theory (MOT).
34. Explain the basic principles and applications of TG and DSC techniques.
35. Explain the major properties of nanoparticles.

**(2 × 15 = 30 Marks)**

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