



CHE-503
M.Sc. 1st SEMESTER EXAMINATION, 2021-22
CHEMISTRY
(Main Group Elements)
Credit (4+0)
(CBCS Mode)

<u>Important Instruction :</u>	<u>महत्वपूर्ण निर्देश :</u>
The question paper is in two sections : Section-A (Descriptive) will be of 15 marks and Section-B (Objective) will be of 60 marks. Section-A will be deposited at the end of the examination and answer sheet (OMR) of Section-B will be deposited.	प्रश्न पत्र दो भागों में है : खण्ड-अ (व्याख्यात्मक) 15 अंकों का होगा एवं खण्ड-ब (बहुविकल्पीय) 60 अंकों का होगा। खण्ड-अ परीक्षा के अन्त में जमा कर लिया जायेगा एवं खण्ड-ब का उत्तर पत्रिका (OMR) जमा होगा।

खण्ड-अ (व्याख्यात्मक)
Section-A (Descriptive)

Time : 1 Hrs.
समय : 1 घण्टे

Max. Marks : 15
अधिकतम अंक : 15

अनुक्रमांक (अंकों में) :

Roll No. (In Figures)

अनुक्रमांक (शब्दों में) :

Roll No. (In Words) :

अभ्यर्थी का नाम :

Student Name :

कक्ष परिप्रेक्षक के हस्ताक्षर / Invigilator's Signature :

- Note : (i) Total No. of Questions are Six.
(ii) Answer three questions in all.
(iii) All Questions carry equal marks.
- नोट : (i) कुल छः प्रश्न दिए गये हैं।
(ii) किन्हीं तीन प्रश्नों के उत्तर दीजिए।
(iii) सभी प्रश्नों के अंक समान हैं।

1. What is the significance of hybridization energy in determining shape of simple molecules? Explain with suitable example.
2. What do you understand about crown ethers? Give structures of crown ether complexes of alkali metal and alkaline earth metal one for each.
3. Discuss the types, preparation and structure of saltlike carbides.
4. What are different classes of silicates? Discuss the structure of ring and chain silicates only.
5. Explain the process of umpolung.
6. Give the preparation routes for the organo metallic compounds of Al and Hg.

खण्ड-ब (बहुविकल्पीय)
Section-B (Objective)

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M.Sc. 1st SEMESTER EXAMINATION, 2021-22

CHEMISTRY

(Main Group Elements)

Credit (4+0)

(CBCS Mode)

AFFIX PRESCRIBED
RUBBER STAMP

Date (तिथि) : _____

Paper ID

(To be filled in the
OMR Sheet)

0286

अनुक्रमांक (अंकों में) :

Roll No. (In Figures)

अनुक्रमांक (शब्दों में) :

Roll No. (In Words) : _____

Time : 1½ Hrs.

समय : 1½ घण्टे

Max. Marks : 60

अधिकतम अंक : 60

नोट : पुस्तिका में 40 प्रश्न दिये गये हैं, सभी प्रश्न करने होंगे। प्रत्येक प्रश्न 1.5 अंक का होगा।

Important Instructions :

1. The candidate will write his/her Roll Number only at the places provided for, i.e. on the cover page and on the OMR answer sheet at the end and nowhere else.
2. Immediately on receipt of the question booklet, the candidate should check up the booklet and ensure that it contains all the pages and that no question is missing. If the candidate finds any discrepancy in the question booklet, he/she should report the invigilator within 10 minutes of the issue of this booklet and a fresh question booklet without any discrepancy be obtained.

महत्वपूर्ण निर्देश :

1. अभ्यर्थी अपने अनुक्रमांक केवल उन्हीं स्थानों पर लिखेंगे जो इसके लिए दिये गये हैं, अर्थात् प्रश्न पुस्तिका के मुख्य पृष्ठ तथा साथ दिये गये ओ०एम०आर० उत्तर पत्र पर, तथा अन्यत्र कहीं नहीं लिखेंगे।
2. प्रश्न पुस्तिका मिलते ही अभ्यर्थी को जाँच करके सुनिश्चित कर लेना चाहिए कि इस पुस्तिका में पूरे पृष्ठ हैं और कोई प्रश्न छूटा तो नहीं है। यदि कोई विसंगति है तो प्रश्न पुस्तिका मिलने के 10 मिनट के भीतर ही कक्ष परिप्रेक्षक को सूचित करना चाहिए और बिना त्रुटि की दूसरी प्रश्न पुस्तिका प्राप्त कर लेना चाहिए।

1. $d_{\pi} - p_{\pi}$ bonding is present in which of the followings:
(A) R_3NO
(B) R_3PO
(C) Me_3NO
(D) None of the above
2. Trisilylamine molecule has the following shape:
(A) Pyramidal
(B) Tetrahedral
(C) Planar
(D) Trigonal
3. During the formation of methane molecule, the promotion energy needed is:
(A) 406 kJ mol^{-1}
(B) 606 kJ mol^{-1}
(C) 806 kJ mol^{-1}
(D) 906 kJ mol^{-1}
4. More electronegative substituents prefer hybrid orbitals having less s-character and more electropositive substituent's prefer hybrid, orbitals having more s-character, this rule was given by:
(A) Bent
(B) Slater
(C) Pauling
(D) Hund
5. The tendency of more electronegative substituents to seek out the low electronegativity axial orbitals in TBP structure is termed as:
(A) Axialophilicity
(B) Apicophilicity
(C) Hydrophilicity
(D) None of the above

6. Who discovered the poly ethers in 1967?
 - (A) C. J. Pedersen
 - (B) D. G. Parson
 - (C) J. M. Lehn
 - (D) None of the above
7. Potassium permanganate dissolves in benzene in presence of:
 - (A) 18C6
 - (B) DB18C6
 - (C) DB24C6
 - (D) DB30C10
8. Chlorophils are the complexes of _____ metal with macrocyclic ligands derived from tetrapyrrole molecule in its alkanoid form:
 - (A) Mg
 - (B) Ca
 - (C) Sr
 - (D) Ba
9. Alkali metal anions can be stabilized by:
 - (A) Crown ethers
 - (B) Polyphosphazenes
 - (C) Polythiazyls
 - (D) None of the above
10. The grouping $\left[-N = \overset{\textstyle /}{P} - \right]$ is the basis of:
 - (A) Polyethylene
 - (B) Polythiazyl
 - (C) Polyphosphazene
 - (D) All the above

11. $n\text{PCL}_5 + n\text{X} \rightarrow (\text{NPCl}_2)_n + 4n\text{HCl}$, here X is:
- (A) NH_4NO_3
 - (B) $(\text{NH}_4)_2\text{CO}_3$
 - (C) NH_4Cl
 - (D) $(\text{NH}_4)_2\text{SO}_4$
12. In phosphazenes the coordination number of N and P are respectively:
- (A) 2 and 4
 - (B) 3 and 5
 - (C) 5 and 7
 - (D) None of the above
13. The lone pair of electrons at N atom in cyclic polyphosphazene are present in:
- (A) s – orbital
 - (B) p - orbital
 - (C) sp^2 – hybrid orbital
 - (D) d – orbital
14. Which one of the following is known as one dimensional metal?
- (A) Polythiazyl
 - (B) Disulphur Dinitrogen
 - (C) Tetra sulphur Dinitrogen
 - (D) Tetra sulphur Tetra nitrogen
15. S_4N_2 shows which of the following conformations?
- (A) Chair
 - (B) Boat
 - (C) Half Chair
 - (D) None of the above

16. Which silicate is used as blue colour pigment:
- (A) Zeolites
 - (B) Micas
 - (C) Clay
 - (D) Ultramarines
17. First compound containing bismuth poly cation coordinated to a transition metal was:
- (A) $[\text{Ru}_2 \text{Bi}_{14} \text{Br}] (\text{AlCl}_4)_4$
 - (B) $[\text{Ru}_2 \text{Bi}_{14} \text{Br}_4] (\text{AlCl}_4)_3$
 - (C) $\text{Bi}_{24} \text{Bi}_{14} \text{Br}_{20}$
 - (D) $\text{Bi}_{20} \text{Ru}_3 \text{Br}_{24}$
18. Structure of Bi_{10}^{8+} is:
- (A) Trigonal bipyramidal
 - (B) Gyro elongated square bipyramidal
 - (C) Square antiprismatic
 - (D) Tricapped trigonal prismatic
19. Structure of SbF_5 Polymer is:
- (A) Trans bridged
 - (B) Cis bridged
 - (C) Both A and B
 - (D) None of the above
20. $\text{Si}_2 \text{O}_7^{6-}$ ion is a:
- (A) Orthosilicate
 - (B) Pyrosilicate
 - (C) Ring silicate
 - (D) Chain silicate

21. $\text{Al}_2(\text{CH}_3)_6$ is an example of:
- (A) Electron deficient compound
 - (B) Ionic compound
 - (C) Covalent compound
 - (D) Complex compound
22. Organolithium compounds may be prepared by:
- (A) Direct method
 - (B) Trans metallatcion
 - (C) (A) and (B) both
 - (D) None of the above
23. The number of carbon atoms conjugated to metal atom is known is:
- (A) Normalty
 - (B) Scalarity
 - (C) Hapticity
 - (D) Multiplicity
24. Free radicals are formed in the case of:
- (A) Organotin compounds
 - (B) Organolithium compounds
 - (C) Organmercury compounds
 - (D) None of the above
25. The structure of organolithium compounds are generally:
- (A) Linear
 - (B) Distorted Tetrahedral
 - (C) Octahedral
 - (D) None of these

26. Formula of Kaolinite (China clay) is:

- (A) $\text{Al}_2\text{O}_3, 2\text{SiO}_2, 3\text{H}_2\text{O}$
- (B) $\text{Al}_2\text{O}_3, 2\text{SiO}_2, \text{H}_2\text{O}$
- (C) $\text{Al}_2\text{O}_3, 2\text{SiO}_2, 2\text{H}_2\text{O}$
- (D) $\text{Al}_2\text{O}_3, 2\text{SiO}_2, 4\text{H}_2\text{O}$

27. Aluminosilicate used as molecular sieves is:

- (A) Ultramarines
- (B) Mica
- (C) Cl_2
- (D) Zeolite

28. When SbF_6^- octahedra forms a tetramer it is represented as:

- (A) $(\text{SbF}_6)_4$
- (B) $(\text{SbF}_5)_4$
- (C) $(\text{SbF}_7)_4$
- (D) $(\text{SbF}_4)_4$

29. Which carbide is extremely hard:

- (A) B_4C
- (B) TaC
- (C) WC
- (D) All of the above

30. Carbides used in making cutting tools are:

- (A) WC
- (B) CaC_2
- (C) Al_4C_3
- (D) All of the above

31. Which carbide has NaCl type structure:
- (A) CaC_2
 - (B) WC
 - (C) TaC
 - (D) Al_4C_3
32. Limiting radius for interstitial carbides is:
- (A) $1.35 \text{ \AA}$
 - (B) $1.25 \text{ \AA}$
 - (C) $1.28 \text{ \AA}$
 - (D) $1.33 \text{ \AA}$
33. Replacing one quarter of the Si^{4+} ions in SiO_2 with Al^{3+} gives:
- (A) $(\text{AlSi}_3\text{O}_8)^-$
 - (B) $(\text{AlSi}_3\text{O}_8)^{2-}$
 - (C) $(\text{AlSi}_3\text{O}_7)^-$
 - (D) $(\text{AlSi}_3\text{O}_7)^{2-}$
34. The basic unit of double chain Structure is:
- (A) $(\text{Si}_3\text{O}_{11})^{6-}$
 - (B) $(\text{Si}_4\text{O}_{12})^{6-}$
 - (C) $(\text{Si}_4\text{O}_{11})^{6-}$
 - (D) $(\text{Si}_5\text{O}_{12})^{6-}$
35. Thortveitite is an example of:
- (A) Orthosilicate
 - (B) Pyrosilicate
 - (C) Cyclic Silicate
 - (D) Chain Silicate

36. Water soluble silicate is:
- (A) Sodium Silicate
 - (B) Magnesium Silicate
 - (C) Calcium Silicate
 - (D) Potassium Silicate
37. Which Polyanion of bismuth does not follow the predictions of USEPR theory:
- (A) $[\text{BiCl}_6]^{3-}$
 - (B) $[\text{BiO}_5]^{2-}$
 - (C) Both (A) and (B)
 - (D) None of the above
38. Structure of Bi_9^{5+} is :
- (A) Trigonal bipyramidal
 - (B) Gyroelongated square bipyramidal
 - (C) Square Antiprismatic
 - (D) Tricapped trigonal prismatic
39. The 'Styx code' of diborane is:
- (A) 2002
 - (B) 2202
 - (C) 2022
 - (D) 2222
40. During linear combination of atomic orbitals in boranes, subtractive combination:
- (A) Increases energy
 - (B) Decreases energy
 - (C) Energy remains constant
 - (D) Varies energy randomly
