



CHE 503
M.Sc. Ist SEMESTER EXAMINATION, 2022-23
CHEMISTRY
(Main Group Elements)
(4+0)
(CBCS MODE)

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Date (तिथि) : _____

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(To be filled in the
OMR Sheet)

8448

अनुक्रमांक (अंकों में) :

Roll No. (In Figures)

अनुक्रमांक (शब्दों में) : _____

Roll No. (In Words) : _____

Time : 1 Hour

समय : 1 घण्टा

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 विरसंगति 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 :
 - (A) $N(SiH_3)_3$
 - (B) $(CH_3)_3PO$
 - (C) $N_7P_6Cl_9$
 - (D) All of the above
2. Why amine oxides decompose easily upon heating while phosphine oxides do not show this property ?
 - (A) Due to $d_{\pi} - p_{\pi}$ bonding
 - (B) Delocalized π bonds
 - (C) Both (A) and (B)
 - (D) None of the above
3. When C forms four covalent bonds, then _____ promotion energy is needed to promote the electron from $2s^2 2p^2 \rightarrow 2s^1 2p^3$.
 - (A) 206 k J mol⁻¹
 - (B) 306 k J mol⁻¹
 - (C) 406 k J mol⁻¹
 - (D) 506 k J mol⁻¹
4. Which energy is responsible for the tendency of some lone pairs to occupy s-orbitals rather than hybrid orbitals ?
 - (A) Hybridization
 - (B) Bond
 - (C) Activation
 - (D) None of the above
5. The hydrides of Group 15th and 16th elements have bond angles _____ as one proceeds from first element to the following ones.
 - (A) Enhanced
 - (B) Reduced
 - (C) No change
 - (D) None of the above

6. The s-rich orbitals are those having s-character _____.
- More than 25%
 - Less than 25%
 - Equal to 0%
 - None of the above
7. For on sp^3d hybrid orbital set, it may be considered to be a combination of :
- $sp_x p_y p_z$ and d_z
 - $p_x p_y p_z$ and sd_z
 - $sp_x p_y$ and $p_z d_z$
 - None of the above
8. According to Bent's rule more electronegative substituents prefer hybrid orbitals having _____ s-character.
- Less
 - High
 - Equal
 - All of the above
9. 'Apicophilicity' is associated with which type of structure ?
- Tetrahedral
 - Square planar
 - Trigonal bipyramidal
 - Octahedral
10. Crown ether compounds are cyclic polyethers with repeating unit of [-----]
- [----- $O - SiH_2 - SiH_2$ -----]
 - [----- $O - CH_2 - CH_2$ -----]
 - [----- $O - NH_2 - NH_2$ -----]
 - None of the above

11. Chlorophylls are complexes of _____ metal with macrocyclic ligands derived from parent tetrapyrrole (alkaloid form) molecule.
- (A) Be
(B) Mg
(C) Ca
(D) Sr
12. $KMnO_4$ dissolves in benzene in presence of following :
- (A) DB 18 C6
(B) DB 24 C6
(C) DB 30 C6
(D) 18 C6
13. The grouping of type $-N = \overset{\overset{R}{|}}{\underset{\underset{R}{|}}{P}} -$ is the basis of :
- (A) Polymers
(B) Polythiazyls
(C) Polyphosphazenes
(D) None of the above
14. Three centre islands of π -bonding are present in which of the following compounds ?
- (A) $(NPCl_2)_3$
(B) $N_7P_6Cl_9$
(C) $N_3P_3F_6$
(D) All of the above
15. The conformation shown by S_4N_2 is _____.
- (A) Half chair
(B) Chair
(C) Boat
(D) Half boat

16. $Al_2(CH_3)_6$ is an example of :
- (A) Electron deficient compound
 - (B) Ionic compound
 - (C) Covalent compound
 - (D) Complex compound
17. The number of carbon atoms conjugated to metal atom is known as :
- (A) Normality
 - (B) Scalarity
 - (C) Hapticity
 - (D) Nucleophilicity
18. Free radicals are formed in the case of :
- (A) Organolithium compounds
 - (B) Organotin compounds
 - (C) Organomercury compounds
 - (D) None of the above
19. The structure of organolithium compounds are generally :
- (A) Linear
 - (B) Distorted tetrahedral
 - (C) Octahedral
 - (D) None of the above
20. 'Umpolung' is shown by :
- (A) Organolithium compounds
 - (B) Organoaluminium compounds
 - (C) Both (A) and (B)
 - (D) None of the above

21. 'Catenation' is found in :
- (A) Zeigler Natta catalyst
 - (B) Organolithium compounds
 - (C) Organomercury compounds
 - (D) Organotin compounds
22. Organoaluminium compounds may be prepared by :
- (A) Buck ton's method
 - (B) Wurtz methods
 - (C) Both (A) and (B)
 - (D) Direct method
23. Organomercury compounds are generally :
- (A) Linear
 - (B) Hexagonal
 - (C) Pyramidal
 - (D) None of the above
24. Organotin compounds can behave as :
- (A) Lewis acid
 - (B) Lewis base
 - (C) Both (A) and (B)
 - (D) None of the above
25. Water soluble silicate is :
- (A) Sodium Silicate
 - (B) Potassium Silicate
 - (C) Calcium Silicate
 - (D) Magnesium Silicate

26. The electronegativity difference between O and Si is :
- (A) 1.4
 - (B) 1.5
 - (C) 1.6
 - (D) 1.7
27. Garnets have general formula :
- (A) $M_2^{II}[SiO_4]$
 - (B) $M^{IV}[SiO_4]$
 - (C) $M_3^{II} M_2^{III}[SiO_4]$
 - (D) $[M^{III} M^I(SiO_4)_3]$
28. Which of the following metal can replace Mg^{2+} in isomorphous replacements ?
- (A) Zn^{2+}
 - (B) Be^{2+}
 - (C) Ni^{2+}
 - (D) Mn^{2+}
29. Silicates having deep blue colour is :
- (A) Zeolite
 - (B) Ultramarine
 - (C) Pyroxene
 - (D) Amphibole
30. Which of the following is acetylide ?
- (A) CuC_2
 - (B) Ag_2C_2
 - (C) CaC_2
 - (D) All of the above

31. The limiting radius of metal atom to accommodate carbon atom in interstitial carbide is :
- (A) 1.34 Å
 - (B) 1.35 Å
 - (C) 1.36 Å
 - (D) 1.37 Å
32. Which one of the following is the example of covalent carbide ?
- (A) CH_4
 - (B) CS_2
 - (C) CCl_4
 - (D) None of the above
33. Carbides used as a shield against radioactive radiations is :
- (A) Silicon Carbide
 - (B) Boron carbide
 - (C) Calcium carbide
 - (D) Tungsten carbide
34. Most unstable borane is :
- (A) Closo-
 - (B) Nido-
 - (C) Arachno-
 - (D) Hypho-
35. Styx code of B_6H_{10} is :
- (A) 3112
 - (B) 4222
 - (C) 4220
 - (D) 4022

36. $B_{10}H_{10}^{2-}$ is a :
- (A) Closo borane anion
 - (B) Nido borane anion
 - (C) Arachno borane anion
 - (D) Hypo borane anion
37. In 3c-2e bonding present in boranes, there is formation of :
- (A) 2 bonding, 2 non bonding and 2 anti bonding MOs
 - (B) 1 bonding, 1 non bonding and 1 anti bonding MOs
 - (C) 2 bonding, 1 non bonding and 1 anti bonding MOs
 - (D) 1 bonding, 2 non bonding and 2 anti bonding MOs
38. Square antiprismatic structure is suggested for :
- (A) $[Bi_5]^{3+}$
 - (B) $[Bi_6]^{2+}$
 - (C) $[Bi_8]^{2+}$
 - (D) $[Bi_9]^{5+}$
39. Which of the following has polymeric chains of cis-bridged octahedral ?
- (A) $[SbF_5]$
 - (B) $[Sb_2F_8]^{2-}$
 - (C) $[Sb_3F_{16}]^-$
 - (D) $[SbF_5]^{2-}$
40. "More electronegative substituents prefer hybrid orbitals having less s-character and more electropositive substituents prefer hybrid orbitals having more s-character," this rule was given by :
- (A) Bent
 - (B) Slater
 - (C) Pauling
 - (D) Hund
