

2020
(CBCS)
(6th Semester)
CHEMISTRY
NINTH PAPER (CHEM/6/CC/361)
(Inorganic Chemistry - III)

A. Multiple choice questions [25 (5 from each unit)]

1. What is the oxidation state of Pd in Pd(PPh₃)₄?
 - a) 0
 - b) 1
 - c) 2
 - d) 3
2. Which of the following complexes has the highest metal oxidation state?
 - a) (η⁶-C₆H₆)₂Cr
 - b) Mn(CO)₅Cl
 - c) Na₂[Fe(CO)₄]
 - d) K[Mn(CO)₅]
3. An organometallic bond is defined as the bond between
 - a) a metal and an organic compound
 - b) a metal and a carbon
 - c) a metal and an oxygen
 - d) a metal and a hydrogen
4. How many M — M bonds are present in [Cp Mo(CO)₃]₂? (Cp = C₅H₅)
 - a) 0
 - b) 1
 - c) 2
 - d) 3
5. Among the following metal carbonyls, C — O bond order is lower in
 - a) [Mn(CO)₆]⁺
 - b) [Fe(CO)₅]
 - c) [Cr(CO)₆]
 - d) [V(CO)₆]⁻

6. The ligand system present in Vitamin B₁₂ is?
 - a) porphyrin
 - b) corrin
 - c) peptidase
 - d) crown ether

7. Pernicious anaemia is an obvious symptom of deficiency of
 - a) cobalt
 - b) zinc
 - c) iron
 - d) magnesium

8. Which of the following sets represent micronutrients?
 - a) Na, Ca, P, Cl, Fe
 - b) Mn, Cu, Zn, Mo, Se
 - c) Ca, Fe, Mo, Mn, Zn
 - d) Mn, Ca, P, Zn, Fe

9. Which of the following are biological functions of Mg²⁺?
 - a) helps in photosynthesis
 - b) osmotic balance
 - c) blood transport
 - d) oxygen transport

10. Which of the following is a copper-containing enzyme?
 - a) carbonic anhydrase
 - b) urease
 - c) catechol dioxygenase
 - d) galactose oxidase

11. Which of the following statements is incorrect about the Lanthanides?
 - a) in general, ionic radii decrease with increase in atomic number
 - b) Ln(III) compounds are generally colourless
 - c) Ln(III) hydrides are usually basic in character
 - d) Ln(III) compounds show ionic bonding in general

12. Lanthanide contraction is caused due to
 - a) the appreciable shielding on outer electrons by 4f electrons from the nuclear charge
 - b) the appreciable shielding on outer electrons by 5d electrons from the nuclear charge
 - c) the same effective nuclear charge from Ce to Lu
 - d) the imperfect shielding on outer electrons by 4f electrons from the nuclear charge

13. Actinides show larger variation of oxidation states than Lanthanides because
- 4f orbitals are more diffused than 5f orbitals
 - lesser energy difference between 5f and 6d than between 4f and 5d orbitals
 - greater energy difference between 5f and 6d than between 4f and 5d orbitals
 - more reactive nature of actinides than lanthanides
14. The most common oxidation state of Lanthanide is
- II
 - III
 - IV
 - V
15. Which among the Lanthanides has the smallest atomic radius
- Cerium
 - Lutetium
 - Europium
 - Gadolinium
16. A paramagnetic substance is attracted into a magnetic field with
- a force directly proportional to the field strength times the field gradient
 - a force inversely proportional to the field strength times the field gradient
 - a force directly proportional to the field strength minus the field gradient
 - a force inversely proportional to the field strength plus the field gradient
17. The spin magnetic moment of one free electron is
- 1.75 B.M.
 - 1.73 B.M.
 - 1.71 B.M.
 - 1.69 B.M.
18. The magnitude of diamagnetism does not vary with
- Bonding
 - Quantum numbers
 - Pressure
 - Temperature
19. Paramagnetic substances have
- Negative susceptibilities
 - Zero susceptibilities

- c) Positive susceptibilities
 - d) Absolute susceptibilities
20. The complex $K_3[Fe(CN)_6]$ is
- a) Paramagnetic complex
 - b) Diamagnetic complex
 - c) Ferromagnetic complex
 - d) Antiferromagnetic complex.
21. When radiations with frequency range less than 100 cm^{-1} are absorbed by a substance,
- a) Molecular rotation takes place in the substance
 - b) Atomic rotation takes place in the substance
 - c) Nuclear rotation takes place in the substance
 - d) None of the above
22. Molecular vibration is observed in a sample when
- a) Radiation of energy range 10^4 to 10^2 cm^{-1} passed through it
 - b) Radiation of energy range 10^4 to 10^2 cm^{-1} passed through it
 - c) Radiation of energy range 10^6 to 10^2 cm^{-1} passed through it
 - d) Radiation of energy range 10^6 to 10^4 cm^{-1} passed through it
23. The IR spectrum of a molecule results due to the transitions between
- a) Two different vibrational energy levels
 - b) Two different rotational energy levels
 - c) Two different molecular energy levels
 - d) Two different atomic energy levels
24. Transitions from the ground state ($V=0$) to the first excited state ($V=1$) absorb light strongly and give rise to intense band called
- a) Overtones
 - b) Primary bands
 - c) Secondary bands
 - d) Fundamental bands
25. The number of fundamental bands is related to
- a) the degree of freedom in a molecule
 - b) the stretching frequency of electrons in a molecule
 - c) the bending frequency of electrons in a molecule
 - d) the Raman frequency of electrons in a molecule

B. Fill up the blanks [15 (3 from each unit)]

1. The bond between the metal and the carbon atom in organometallic compound is often highly _____ in nature.
2. The reaction of an organic halide with magnesium produce a reagent called _____.
3. In an organometallic compound, when the metal donates back an electron density to the ligand or organic molecule, the phenomenon is called _____.
4. Inorganic polymers are polymers with a skeletal structure that does not include _____ atoms in the backbone.
5. In Polydimethylsiloxane, the repeating unit is _____.
6. Transportation of oxygen from lungs to various body parts is done by _____ in the blood.
7. Elements with atomic numbers 89 to 103 of the periodic table are called _____ series.
8. The major product in the reaction of Actinium (III) hydroxide with hydrofluoric acid is _____.
9. The ionic radius of actinides monotonically decreases with increase in _____.
10. An electron traveling in a closed path around a nucleus will produce a magnetic _____.
11. Weak paramagnetism that is independent of temperature that arose by coupling of the ground state of the system with excited states of high energy under the influence of the magnetic field is called _____.
12. Ferromagnetism is related to a certain temperature called _____.
13. Raman spectroscopy is a spectroscopic technique typically used to determine _____ of molecules
14. Raman spectroscopy relies upon _____ scattering of photons.
15. The _____ of carbon dioxide is IR active because there is a change in the net molecular dipole

Key Answers

A. Multiple choice questions [replace x]

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|-------|-------|-------|--------|--------|--------|
| 1. c. | 2. c. | 3. b. | 4. a. | 5. b. | 6. b. |
| 7. a. | 8. b. | 9. a. | 10. d. | 11. b. | 12. d. |

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|--------|--------|--------|--------|--------|--------|
| 13. b. | 14. b. | 15. a. | 16. a. | 17. b. | 18. d. |
| 19. c. | 20. a. | 21. a. | 22. b. | 23. a. | 24. d. |
| 25. a. | | | | | |

B. Fill up the blanks [replace x]

1. Covalent
2. Grignard reagent
3. Backbonding
4. carbon
5. $-\text{[O-Si(CH}_3)_2\text{]}_n-$ or dimethyl siloxane
6. haemoglobin
7. Actinides
8. Actinium flouride
9. Atomic number
10. Moment
11. Temperature independent Paramagnetism (TIP)
12. Curie Temperature.
13. Vibrational modes
14. Inelastic
15. Asymmetric stretching