Subject : CHEMISTRY
Paper Name : Inorganic Chemistry-III
Paper No. : IX (Ninth)
Semester : VI (Sixth)

A. Multiple Choice Questions:

1. Which one of the following is not organometallic compound?
   (a) $Mg(CH_3)_2$
   (b) $(CH_3)_2SnCl_2$
   (c) $(C_2H_5)_4Pb$
   (d) CH_3COONa

2. Reaction of Grignard reagent and aldehyde will produce
   (a) 1^o alcohol
   (b) 2^o alcohol
   (c) 3^o alcohol
   (d) Carboxylic acid

3. In the bonding of metal-alkene complexes as explained by Dewar-Chatt-Duncanson model, back bonding occurs from
   (a) metal *d* orbital into the empty C=C π^* orbital
   (b) metal *d* orbital into the empty C=C π orbital
   (c) C=C π^* orbital into the empty metal *d* orbital
   (d) C=C π orbital into the empty metal *d* orbital

4. The hybridisation of iron in $Fe(CO)_5$ molecule is
   (a) sp^3d^2
   (b) d^2sp^3
   (c) sp^3d
   (d) dsp^3

5. The total number of bridging carbonyl group in the structure of $Co_2(CO)_8$ molecule in the solid state is
   (a) 0

(b) 2

(c) 4

(d) 8

6. Formation of a cross-linked silicone by the polymerisation of many molecules of $RSi(OH)_3$ is an example of

(a) Condensation polymerization

(b) Addition polymerization

(c) Coordination polymerization

(d) Grafting polymerization

7. Which one of the following silanols is used for termination of the chain during polymerisation?

(a) $RSi(OH)_3$

(b) $R_2Si(OH)_2$

(c) R_3SiOH

(d) All of these

8. In deoxyhemoglobin, iron exists as

(a) high spin Fe(III)

(b) low spin Fe(III)

(c) high spin Fe(II)

(d) low spin Fe(II)

9. Which one of the following statements is correct with regard to the magnetic character of hemoglobin?

(a) Both oxyhemoglobin and deoxyhemoglobin are paramagnetic.

(b) Both oxyhemoglobin and deoxyhemoglobin are diamagnetic

(c) Deoxyhemoglobin is paramagnetic while oxyhemoglobin is diamagnetic.

(d) Deoxyhemoglobin is diamagnetic while oxyhemoglobin is paramagnetic.

10. Carbonic anhydrase, the zinc ion is bonded to the epoenzyme by

(a) three nitrogen atoms of three imidazole rings of histidine groups.

(b) three nitrogen atoms of the two imidazoles of histidine and a glutamic acid residue.

(c) four nitrogen atoms of the three imidazoles of histidine group and a glutamic acid group.

(d) salt bridges.

11. In the inner-transition elements, the differentiating electron enters

(a) valence shell

(b) penultimate shell

(c) antipenultimate shell

(d) innermost shell

12. The valence shell electronic configuration of Gadolinium (Z=64) is

(a) $4f^7\ 5d^1\ 6s^2$

(b) $4f^7\ 5d^2\ 6s^1$

(c) $4f^8\ 5d^1\ 6s^1$

(d) $4f^8\ 5d^0\ 6s^2$

13. The principal oxidation state shown by the lanthanides is

(a) +2

(b) +3

(c) +4

(d) +5

14. Which one of the following ion is expected to be colourless?

(a) Np^{3+}

(b) Pu^{3+}

(c) Cm^{3+}

(d) Am^{3+}

15. The highest oxidation state seen in the actinide series is

(a) +3

(b) +4

(c) +5

(d) +6

16. The permeability of paramagnetic substance is
    (a) zero
    (b) small and negative value
    (c) small and positive value
    (d) large and positive value

17. The temperature at which a transition between ferromagnetic and paramagnetic phases occurs for certain materials is called
    (a) Neel temperature
    (b) Peak temperature
    (c) Absolute temperature
    (d) Curie temperature

18. The magnetic susceptibility of antiferromagnetic substance is the maximum at
    (a) Absolute zero of temperature
    (b) Neel temperature
    (c) Curie temperature
    (d) very high temperature

19. A d^6 ion in high spin octahedral complex will show spin-only magnetic moment of
    (a) 0 BM
    (b) 1.73 BM
    (c) 2.83 BM
    (d) 4.90 BM

20. The complex ion, $[Fe(CN)_6]^{3-}$ is
    (a) paramagnetic with μ_s = 1.73 BM
    (b) paramagnetic with μ_s = 3.87 BM
    (c) paramagnetic with μ_s = 5.92 BM
    (b) diamagnetic

21. What is the number of normal vibrational modes of H_2O?
    (a) 2
    (b) 3

(c) 4

(d) 5

22. Which one of the following is expected to show the highest stretching frequency?

(a) $[FeCl_4]^-$

(b) $[FeBr_4]^-$

(c) $[FeCl_4]^{2-}$

(d) $[FeBr_4]^{2-}$

23. Choose the correct one with regard to the trend of bridging MX stretching frequencies [$\nu(MX_b)$] and terminal MX stretching frequencies [$\nu(MX_t)$].

(a) $\nu(MX_b)$ are always larger than $\nu(MX_t)$

(b) $\nu(MX_b)$ are always same as $\nu(MX_t)$

(c) $\nu(MX_b)$ are always lower than $\nu(MX_t)$

(d) $\nu(MX_b)$ may be lower or higher than $\nu(MX_t)$

24. The symmetric stretching mode of CO_2 molecule is

(a) Raman inactive but IR active

(b) Raman active but IR inactive

(c) Both Raman and IR active

(d) Both Raman and IR inactive

25. The frequency difference between the incident excitation radiation and the Raman scattered radiation is called as

(a) Rayleigh scattering

(b) Stokes scattering

(c) Excitation frequency

(d) Raman shifts.

B. Fill up the blanks:

1. The product of the reaction, $R_2BH + CO \xrightarrow{H_2O_2}$? is_____
2. The hybridisation of carbon in the bridging carbonyl group is _____.

3. In the reaction: $Fe + 5CO \xrightarrow{?} Fe(CO)_5$; the required reaction condition is _____.
4. The major product formed on heating (at 300°C) a mixture of CH_3Cl and Si in the presence of Cu catalyst is _____.
5. _____ is also called Inorganic rubber.
6. The major alkali metal cation present in the extracellular fluids of animals is _____.
7. The lanthanide contraction is due to _____and gradual increase in the nuclear charge.
8. Actinides have _____ tendency to form complexes in comparison to lanthanides.
9. In the ion-exchange separation of lanthanides, the eluent used is _____.
10. The ratio of the intensity of magnetisation of the specimen of the material and the strength of the magnetic field applied is called _____.
11. When suspended freely in a uniform magnetic field, a ferromagnet aligns itself _____ to the direction of the magnetic field.
12. Curie Weiss law can be represented as, χ_M = _____.
13. The intensity of the Stoke's lines is always _____ than the corresponding anti-Stoke's lines.
14. For a molecular vibration to be Raman active, the vibration must cause a change in _____ of the molecule.
15. If the same vibration appears in both IR and Raman spectra, the molecule lacks a _____ according to the mutual exclusion principle.

Key Answers

A. Multiple Choice Questions:

1. (d) CH_3COONa
2. (b) 2^o alcohol
3. (a) metal *d* orbital into the empty C=C π^* orbital
4. (d) dsp^3
5. (b) 2
6. (a) Condensation polymerization

7. (b) $R_2Si(OH)_2$
8. (c) high spin Fe(II)
9. (c) Deoxyhemoglobin is paramagnetic while oxyhemoglobin is diamagnetic.
10. (a) three nitrogen atoms of three imidazole rings of histidine groups.
11. (c) antipenultimate shell
12. (a) $4f^7\ 5d^1\ 6s^2$
13. (b) +3
14. (c) Cm^{3+}
15. (d) +6
16. (c) small and positive value
17. (d) Curie temperature
18. (b) Neel temperature
19. (d) 4.90 BM
20. (a) paramagnetic with μ_s = 1.73 BM
21. (b) 3
22. (a) $[FeCl_4]^-$
23. (c) $\nu(MX_b)$ are always lower than $\nu(MX_t)$
24. (b) Raman active but IR inactive
25. (d) Raman shifts.

B. Fill up the blanks:

1. R_2CO
2. sp^2
3. 200^{o}C, 100 atm.
4. $(CH_3)_2SiCl_2$
5. Polyphosphonitrilic chloride
6. Na^+
7. poor shielding effect of 4f electron
8. greater
9. citric acid-ammonium citrate buffer
10. magnetic susceptibility.
11. parallel
12. $\chi_M = \frac{C}{T-\theta}$

13. greater
14. polarizability
15. centre of symmetry