1. Which of the following will have lowest vibrational frequency?
(a) $^{1}H^{35}Cl$ (b) $^{2}H^{35}Cl$ (c) $^{3}H^{35}Cl$ (d) $^{3}H^{37}Cl$

2. N_2 does not show vibrational spectra because
(a) triple bond in N_2 is very strong.
(b) the dipole moment of N_2 does not change on vibration.
(c) both a and b.
(d) none of the above.

3. Which functional group will show absorption at highest IR frequency?
(a) Easter (b) Aldehyde (c) Ketone (d) Alcohol

4. Absorption of UV-Visible radiation due to n-->π* electronic transition is characteristic of which of the following compounds?
(a) Aromatic
(b) Unsaturated carbonyl
(c) Non-conjugated polyenes
(d) Conjugated polyenes

5. Which of the following is not expected to absorb in the visible region?
(a) $[Ni(CN)_4]^{2-}$ (b) $[Cr(NH_3)_6]^{3+}$ (c) $[Fe(H_2O)_6]^{2+}$ (d) $[Ni(H_2O)_6]^{2+}$

6. Of the following, which is diamagnetic?
(a) $[Ni(CN)_4]^{2-}$ (b) $[CuCl_4]^{2-}$ (c) $[CoF_6]^{3-}$ (d) $[NiCl_4]^{2-}$

7. Which of the following will exhibit minimum paramagnetic behaviour?
(a) $[Fe(H_2O)_6]^{2+}$ (b) $[Co(H_2O)_6]^{2+}$ (c) $[Cr(H_2O)_6]^{2+}$ (d) $[Mn(H_2O)_6]^{2+}$

8. Which of the following shows zero CFSE
(a) $[Fe(H_2O)_6]^{3+}$ (b) $[Co(H_2O)_6]^{2+}$ (c) $[Co(H_2O)_6]^{3+}$ (d) $[Mn(H_2O)_6]^{3+}$

9. $[Fe(H_2O)_6]^{2+}$ and $[Fe(CN)_6]^{4-}$ differ in
(a) geometry (b) hybridization (c) No. Of d electrons
(d) magnetic moment and colour.

10. Molar absorbtivities of compounds exhibiting charge transfer absorption are
(a) Small (b) Moderate (c) Large (d) Infinite.

(1X10)

11. Peaks resulting from $n \rightarrow \pi^*$ transitions are shifted to shorter wavelengths (*blue shift*) with increasing solvent polarity.
True or false? Give reason to support your answer.

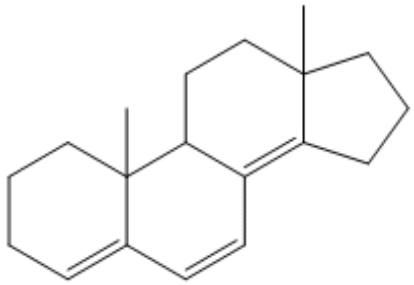
(2)

12. How will you distinguish the following based on IR spectra?
(i) CH_3OCH_3 and C_2H_5OH
(ii) CH_3COCH_3 and C_2H_5COH
(iii) Benzene-1,2-dicarboxylic acid and Benzene-1,4-dicarboxylic acid

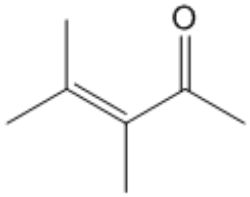
(1,1,2)

13. Using Woodward-Fieser's rule, calculate wavelengths of maximum UV absorption for following compounds:

(i)



(ii)



(2X2)

14. Which of the following pairs will have higher Δ_o value and why?

(a) $[Co(NH_3)_6]^{3+}$ and $[Co(CN)_6]^{3-}$

(b) $[Rh(H_2O)_6]^{3+}$ and $[Co(H_2O)_6]^{3+}$

(c) $[Fe(H_2O)_6]^{2+}$ and $[Fe(H_2O)_6]^{3+}$

(2X3)

15. Compare the ε value for $n \rightarrow \pi^*$ transitions and $\pi \rightarrow \pi^*$ transitions. Explain the reason.

(2)

16. Why, instead of SHO, we should use anharmonic oscillator to model a bond ?

(2)