Questions

1. Which of the following is the most paramagnetic in nature?
a) N_2
b) BC
c) NO
d) O_2

2. Identify the increasing order of spectrochemical series
a) $I^- < Br^- < S^{2-} <$ en $< NO_2^- < CN^- <$ CO
b) **$I^- < Br^- < S^{2-} <$ en $< NO_2^- <$ CO $< CN^-$**
c) CO$> CN^- > NO_2^- >$ en $> I^- < Br^- < S^{2-}$
d) $I^- < Br^- < S^{2-} =$ en $= NO_2^- = CN^- <$ C

3. Calculate the number of fundamental vibrations for CO_2 and HCl molecules
a) 1 and 3
b) 4 and 1
c) 0 and 1
d) 3 and 4

4. What happens to the vibrational frequency of molecule upon increasing bond strength
a) Decreases
b) Remains same
c) Increases
d) No dependence

5. What happens to the absorbance of the sample upon increasing the path length (from 0.1 to 1 cm) of the sample tube?
a) Decreases
b) No change
c) Increases
d) Sample's absorbance and path length are independent

6. Which among the following doesn't show rotational spectrum?
a) HCl
b) O2
c) HBr
d) H2O

7. The 1H NMR spectrum of ethanol consists of
a) 0 signals
b) 1 signal
c) 3 signals
d) 4 signals

8. The order of increasing ionic radius of the following is

a) K+ < Li+ < Mg2+ < Al3+

b) K+ < Mg2+ < Li+ < Al3+

c) Li+ < K+ < Mg2+ < Al3+

d) $Al^{3+} < Mg^{2+} < Li^{+} < K^{+}$

9. According to Fajan`s rule, covalent bond is favoured by___

a) Large cation and small anion

b) Large cation and large anion

c) Small cation and large anion

d) Small cation and small anion

10. The miller indices of crystal planes which cut through the crystal axes at (2a,3b,2c) are:

(a) (326), **(b) (323)**, (c) (232), (d) (626)

11. In the Born-Oppenheimer approximation, which is the correct order?

Ans: **(a) $E_{el} > E_{vib} > E_{rot} > E_{tr}$**, (b) $E_{tr} > E_{rot} > E_{vib} > E_{el}$

(c) $E_{vib} > E_{rot} > E_{el} > E_{tr}$, (d) $E_{rot} > E_{vib} > E_{el} > E_{tr}$

12. A compound shows an NMR peak at 240 Hz downfield from the TMS peak in the spectrometer operating at 60 MHz.

The chemical shift (in ppm) is:

(a) 1, (b) 2, (c) 3, **(d) 4**

13. In X-ray diffraction, how the interplanar distance (d) and the angle between incident and transmitted beam (2θ) are related?

(a) d increases with increase in 2θ

(b) **d decreases with increase in 2θ**

(c) No relation between d and 2θ

14. The order for the electron affinity is:

(a) **Ne<N < C<O<F**, (b) C < N<O<F<Ne, (c) F< C < N<O<Ne, (d) Ne<F<O<N<C

15. How many signals are observed in the proton NMR of $(CH_3)_2CHCH_2CH_3$ and $C_6H_5CH_3$, respectively

(a) 5 and 2, (b) 5 and 3, **(c) 4 and 2**, (d) 3 and 2