1. Which starred carbon atom in the following molecules does not show sp^2 hybridisation :

(A) CH_3C^*HO (B) CH_3C^*OCl (C) $(C^*H_3)_3N \rightarrow O$ (D) $CH_3C^*OCH_2C^*OOC_2H_5$

2. In which of the following 'N' atom is sp^2 hybridised

(A) NH_3 (B) NH_4^+ (C) $\overset{\ominus}{N}H_2$ (D) $B_3N_3H_6$

3. Carbon atoms in $C_2(CN)_2$ are :

(A) All sp-hybridised (B) sp^3, sp^2 ,sp—hybridised

(C) sp^2, sp, sp^3—hybridised (D) sp, sp^3 , sp^2—hybridised.

4. $BF_3 + F^- \rightarrow BF_4^-$

What is the hybridiation state of B in BF_3 and BF_4^- ?

(A) sp^2, sp^3 (B) sp^3, sp^3 (C) sp^2, dsp^2 (D) sp^2d, sp^2

5. In a change from $PCl_3 \longrightarrow PCl_5$, the hybrid state of P changes from

(A) sp^2 to sp^3 (B) sp^3 to sp^2 (C) sp^3 to sp^3d (D) sp^3 to dsp^2

6. In which of the following process hybridisation of the central atom changes -

(A) $H_2O + H^+ \longrightarrow H_3O^+$ (B) $NF_3 + F^+ \longrightarrow NF_4^+$

(C) $BF_3 + F^- \longrightarrow BF_4^-$ (D) $NH_3 + H^+ \longrightarrow NH_4^+$

7. Match the species in column (I) with that geometry in column (II)

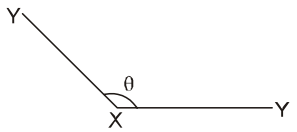
Column-I	**Column-II**
(P) BH_4^-	(1) 2 bond pair and 3 lone pair
(Q) ICl_2^+	(2) 4 bond pair and no lone pair
(R) ICl_2^-	(3) 3 bond pair and 1 lone pair
(S) ICl_4^-	(4) 2 bond pair and 2 lone pair
	(5) 4 bond pair and 2 lone pair

(A) P = 2; Q = 4; R = 3; S = 1 (B) P = 2; Q = 4; R = 1; S = 5

(C) P = 2; Q = 1; R = 5; S = 4 (D) P = 2; Q = 1; R = 3; S = 4

Dipole Moment.

10. Which bond angle θ would result in the maximum dipole moment for the triatomic molecule XY_2 shown below



(A) θ = 90° (B) θ = 120° (C) θ = 0° (D) θ = 180°

11. Which of the following molecule is/are non polar

(A) XeF_2 (B) PCl_3F_2 (C) XeF_4 (D) All

12. Which of the following molecule will not show zero dipole moment :

(A) CH_4 (B) CCl_4 (C) CO_2 (D) $CHCl_3$

13. The dipole moments of the given molecules are such that :

(A) $BF_3 > NF_3 > NH_3$ (B) $NF_3 > BF_3 > NH_3$ (C) $NH_3 > NF_3 > BF_3$ (D) $NH_3 > BF_3 > NF_3$.

14. Arrange in order of increasing dipole moment : BF_3, H_2S, H_2O.

15. In which type of molecule, the dipole moment may be non zero.

(A) AB_2L_2 (B) AB_2L_3 (C) AB_4L_2 (D) AB_4

Where A – Central atom, B – Bonded atom, L – Lone pair

16. A polar molecule AB have dipole moment 3.2 D (Debye) while the bond length is 1.6 Å. Find the percentage ionic character in the molecule.

(A) 31% (B) 41.6% (C) 39.6% (D) None of these

17.

Column–I	**Column–II**
(a) XeO_4^{2-}	(p) sp^3 with zero dipole moment
(b) PCl_2F_3	(q) sp^3d with nonzero dipole moment
(c) XeO_2F_2	(r) Shows resonance stability
(d) SO_4^{2-}	(s) No lone pair on central atom

18. Which of the following species is non polar with presence of polar bond and lone pair of electron on central atom.

(A) CO_2 (B) SF_4 (C) XeF_4 (D) CF_4

19. Which of the following molecule is planer as well as polar :

(A) PCl_3 (B) SF_4 (C) ClF_3 (D) None of thes

Hydrogen bond

20. The order of strength of hydrogen bond is :

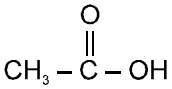
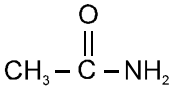
(A) Cl–H....Cl > N–H....N > O–H....O > F–H....F (B) N–H....N > Cl–H....Cl > O–H....O > F–H....F

(C) O–H....O > N–H....N > Cl–H....Cl > F–H....F (D) F–H....F > O–H....O > N–H....N > Cl–H....Cl

21. Which one among the following does not have hydrogen bonds ?

(A) boric acid (solid) (B) N_2H_4 (liquid) (C) H_2O_2 (liquid) (D) C_6H_6 (liquid)

22. Which of the following substances does not exhibit H-bonding with water ?

(A) CH_3CH_2OH (B)  (C) $CH_3 - CH_2 - CH_3$ (D) 

23. I. When ice is melted, hydrogen bond starts breaking, molecule of water come closer by moving into vacant space. As a result, density of water decreases upto 4°C.

II. Due to open cage like structure, ice has a relatively large volume for a given mass of liquid water.

III. In ice, there are four water molecules attached tetrahedrally.

Which of the above statement is/are true.

(A) I, II and III (B) I and III (C) II and III (D) II only

24. Which of the following conditions is required for the formation of the hydrogen bond

(A) Hydrogen atom should be bonded to a highly electronegative atom

(B) The size of electronegative atom should be small

(C) There should be a lone pair of electron on the electronegative atom.

(D) All of the above

25. ***Assertion :-*** Acetylene is not soluble in H_2O but is highly soluble in acetone.

Reason :- Acetylene forms intermolecular H-bond with acetone easily but not with H_2O as water molecules themselves are highly associated through intermolecular H-bonding.

(A) A (B) B (C) C (D) D

26. Match the column :-

Column–I	**Column–II**
(a) Chloral hydrate	(P) Form Zig-zag chain
(b) HF	(Q) Form 2–D–sheet structure
(c) H_3BO_3	(R) Have low volatility
(d) H_2SO_4	(S) Intramolecular H-bond
	(T) Inter molecular H-bond

27. The maximum possible number of hydrogen bonds in which H_2O_2 molecule can participate:-

(A) 6 (B) 4 (C) 5 (D) 8

28. ***Statement 1 :-*** Boiling point of HF is lesser than water.

Statement 2 :- Hydrogen bond strength is stronger in water.

(A) Statement-1 and Statement-2 are true, Statement-2 is a correct explanation of Statement-1.

(B) Statement-1 and Statement-2 are true, Statement-2 is not the correct explanation of Statement-1.

(C) Statement-1 is true and Statement-2 is false.

(D) Statement-1 is false and Statement-2 is true.

29. Which of following statement is incorrect :-

(A) Boiling point of H_2O_2 is greater than that of H_2O

(B) Ethylene glycol is less viscous than glycerol

(C) o–nitrophenol can be separated from its meta and para isomer using its steam volatile property

(D) In ice each 'O' atom is tetrahedrally arranged by four H-atom which are all covalently bonded.

31. When two ice cubes are pressed over each other, they unit to form one cube. Which of the following force is responsible for holding them together

(A) Vander Waal's forces (B) Hydrogen bond

(C) Covalent attraction (D) Dipole-dipole attraction.

32. Arrange the following gases in the increasing order of their intermolecular forces of attraction (CO_2 , H_2O , H_2):

(A) $H_2 < CO_2 < H_2O$ (B) $H_2O < CO_2 < H_2$ (C) $CO_2 < H_2O < H_2$ (D) $H_2O < H_2 < CO_2$.

33. Which is **<u>incorrect</u>** order for net dipole moment -

(A) HF > HCl > HBr > HI (B) $CH_3 – F > CD_3 – F$

(C) $SO_3 > SO_2$ (D) $CH_3 – CH = CHCl$ (cis) $> CH_3 – CH = CHCl$ (trans)

34. Classsify the type of force of attraction existing in the sample of following compounds :

(i) $CH_3 — O — CH_3$	(ii) sugar	(iii) ice	(iv) $CH_3 CO CH_3$
(v) $CH_3 — OH$	(vi) $N(CH_3)_3$	(vii) gold	(viii) $CH_3 — NH_2$
(ix) H_2S	(x) (aq.) Na^+	(xi) CCl_4	(xii) diamond
(xiii) Cl_2	(xiv) NH_4Cl	(xv) HCl and Cl_2	(xvi) Ar

Answers

RACE # 14

1. (C) **2.** (D) **3.** (A) **4.** (A) **5.** (C) **6.** (C) **7.** (B) **10.** (C) **11.** (D) **12.** (D)
13. (C) **14.** $H_2O > H_2S > BF_3$ **15.** (A) **16.** (B) **17.** a–qr, b–qs, c–q, d–prs **18.** (C) **19.** (C)
20. (D) **21.** (D) **22.** (C) **23.** (C) **24.** (D) **25.** (A) **26.** a–S, b–p, c–Q, d–TR **27.** (B)
28. (C) **29.** (D) **31.** (B) **32.** (A) **33.** (A)

34. (i) diple-dipole (ii) H-bonding (iii) H-bonding (iv) dipole-dipole
(v) H-bonding (vi) dipole-dipole (vii) Metallic (viii) H-bonding
(ix) dipole-dipole (x) ion-dipole (xi) London-forces (xii) co-valent bond
(xiii) London forces (xiv) Ionic (xv) dipole-induced dipole (xvi) London forces