

WEAK FORCES

1. **Statement-1** : The melting point of noble gases increases as its atomic mass increases.
Statement-2 : Instantaneous dipole induced dipole attraction increases with increase in atomic mass of noble gases.
- (A) Statement-1 is true, statement-2 is true and statement-2 is correct explanation for statement-1.
 (B) Statement-1 is true, statement-2 is true and statement-2 is NOT the correct explanation for statement-1
 (C) Statement-1 is true, statement-2 is false.
 (D) Statement-1 is false, statement-2 is true.
2. The critical temperature of water is higher than that of O_2 because the H_2O molecule has :
 (A) fewer electrons than O_2 (B) two ionic bonds
 (C) V-shape (D) dipole moment B T CH
3. Which of the following boiling point order is correct -
 (A) $He > T_2 > D_2$ (B) $He < T_2 < D_2$ (C) $T_2 > He > D_2$ (D) $He < D_2 < T_2$
4. Which is the incorrect match for the energy distance function for following interaction -
 (A) Debye force : r^{-6} (B) Ion-induced dipole interaction : r^{-2}
 (C) London force : r^{-6} (D) Keesom force : r^{-3}
5. Identify the incorrect order of boiling point in the following pair.
 (A) $B(OH)_3 < B(OCH_3)_3$ (B) $NF_3 < N(CH_3)_3$
 (C) $BF_3 < B(CH_3)_3$ (D) $C_2H_6 < C_2F_6$

BENT'S RULE AND DRAGO'S

6. C-H bond distance is the longest in:
 (A) C_2H_2 (B) C_2H_4 (C) C_2H_6 (D) $C_2H_2Br_2$
7. The bond angle and hybridization in ether (CH_3OCH_3) is:
 (A) $106^\circ 51'$, sp^3 (B) $104^\circ 31'$, sp^3 (C) 110° , sp^3 (D) None of these
8. Which of the following has been arranged in order of decreasing bond length ?
 (A) $P-O > Cl-O > S-O$ (B) $P-O > S-O > Cl-O$
 (C) $S-O > Cl-O > P-O$ (D) $Cl-O > S-O > P-O$
9. Which is correct statement ?
 As the s-character of a hybrid orbital decreases
 (I) The bond angle decreases (II) The bond strength increases
 (III) The bond length increases (IV) Size of orbital increases
 (A) (I), (III) and (IV) (B) (II), (III) and (IV)
 (C) (I) and (II) (D) All are correct

10. Among the following, the correct statement is :
 (A) Between NH_3 and PH_3 , NH_3 is a better electron donor because the lone pair of electrons occupies spherical 's' orbital and is less directional
 (B) Between NH_3 and PH_3 , PH_3 is a better electron donor because the lone pair of electrons occupies sp^3 orbital and is more directional
 (C) Between NH_3 and PH_3 , NH_3 is a better electron donor because the lone pair of electrons occupies sp^3 orbital and is more directional
 (D) Between NH_3 and PH_3 , PH_3 is a better electron donor because the lone pair of electrons occupies spherical 's' orbital and is less directional

SBG STUDY

11. In which of the following molecule C—C bond length will be highest?
 (A) $\text{CF}_3 - \text{CF}_3$ (B) $\text{F}_2\text{CH} - \text{CHF}_2$ (C) $\text{FCH}_2 - \text{CH}_2\text{F}$ (D) $\text{CH}_3 - \text{CF}_3$
12. In BClBrI molecule the maximum % s-character provided from the central atom is in bond:
 (A) B - I (B) B - Cl (C) B - Br (D) Can not predict

13. Find out the % p-character in the orbital occupied by lone pairs in H_2O .

$[\text{HOH} = 104.5^\circ \text{ and } \cos(104.5) = -0.25]$

- (A) 80 % (B) 20 % (C) 70 % (D) 75 %

14. Which of the following order is correct for increasing p-character in orbital used for bonding by central atom

- (A) $\text{SiH}_4 > \text{CH}_4$ (B) $\text{H}_2\text{S} > \text{H}_2\text{O}$ (C) $\text{PH}_4^+ > \text{PH}_3$ (D) $\text{NH}_3 > \text{PH}_3$

BACK BONDING

15. Boron forms BX_3 type of halides. The correct increasing order of Lewis-acid strength of these halides is

- (A) $\text{BF}_3 > \text{BCl}_3 > \text{BBr}_3 > \text{BI}_3$ (B) $\text{BI}_3 > \text{BBr}_3 > \text{BCl}_3 > \text{BF}_3$
 (C) $\text{BF}_3 > \text{BI}_3 > \text{BCl}_3 > \text{BBr}_3$ (D) $\text{BF}_3 > \text{BCl}_3 > \text{BI}_3 > \text{BBr}_3$

16. Select species which is planar at nitrogen:

- (A) $(\text{CH}_3)_3\text{N}$ (B) $(\text{SiH}_3)_3\text{N}$ (C) NF_3 (D) NH_3

17. Type of back bonding in $(\text{SiH}_3)_2\text{O}$ is:

- (A) $p\pi - d\pi$ (B) $p\pi - p\pi$ (C) $d\pi - d\pi$ (D) None of these

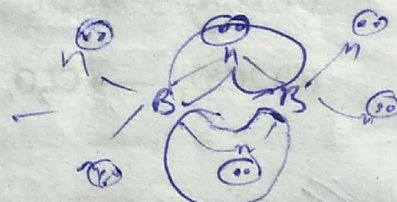
MULTICENTERED BOND

18. The type of overlap in the bridge bond existing in $\text{Al}_2(\text{CH}_3)_6$ is:-

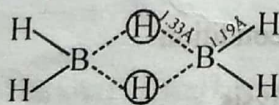
- (A) $sp^3 - sp^3 d - sp^3$ (B) $sp^3 - sp^2 - sp^3$ (C) $sp^3 - s - sp^3$ (D) $sp^3 - sp^3 - sp^3$

19. Which one of the following statement is not true regarding diborane?

- (A) It has two bridging hydrogens and four perpendicular to the rest.
 (B) When methylated, the product is $\text{Me}_4\text{B}_2\text{H}_2$
 (C) The bridging hydrogens are in a plane perpendicular to the rest.
 (D) All the B-H bond distances are equal.



20. The molecular shape of diborane, is shown:



Consider the following statements for diborane:

- (1) Boron is approximately sp^3 hybridised
 (2) B-H-B angle is 180°
 (3) There are two terminal B-H bonds for each boron atom
 (4) There are only 12 bonding electrons available

Of these statements:

- (A) 1, 3 and 4 are correct (B) 1, 2 and 3 are correct
 (C) 2, 3 and 4 are correct (D) 1, 2 and 4 are correct

SILICATE

21. The number of corners or O-atoms shared per tetrahedron for pyroxene chain silicate is -
 (A) 3 (B) 2 (C) 2.5 (D) 1

22. The mineral $\text{Na}_2\text{Fe}_3^{II}\text{Fe}_2^{III}[\text{Si}_8\text{O}_{22}](\text{OH})_2$ (chrocidolite) is a :

- (A) Pyroxene chain silicate (B) Sheet silicate
 (C) Amphiboles chain silicate (D) 3D-silicate

23. The silicate anion in the mineral kunoite is a chain of three SiO_4 tetrahedral those share corners with adjacent tetrahedral. The mineral also contains Ca^{2+} ions, Cu^{2+} ions, and water molecules in a 1:1:1 ratio mineral is represented as :

- (A) $\text{CaCuSi}_3\text{O}_{10}\cdot\text{H}_2\text{O}$ (B) $\text{CaCuSi}_3\text{O}_{10}\cdot 2\text{H}_2\text{O}$
 (C) $\text{Ca}_2\text{Cu}_2\text{Si}_3\text{O}_{10}\cdot 2\text{H}_2\text{O}$ (D) none of these

ODD ELECTRON SPECIES

24. Hybridisation related to NO_2 molecule is -

- (A) sp^3 (B) sp
 (C) sp^3d (D) sp^2

25. In which of the following processes, the magnetic behaviour of the species is changed :-

- (A) $2\dot{\text{C}}\text{H}_3 \longrightarrow \text{C}_2\text{H}_6$ (B) $2\text{NO}_2 \longrightarrow \text{N}_2\text{O}_4$
 (C) $2\text{ClO}_3 \longrightarrow \text{Cl}_2\text{O}_6$ (D) All of these

HYDROLYSIS

26. Which of the following statement is correct ?

- (A) BCl_3 is not hydrolysed while SiCl_4 can be hydrolysed
 (B) CCl_4 is hydrolysed under ordinary condition
 (C) XeF_2 produces $\text{Xe}(\text{OH})_2$ on hydrolysis
 (D) hydrolysis of XeF_2 is a redox reaction

27. Statement-1 : Between SiCl_4 and CCl_4 only SiCl_4 reacts with water at room temperature.

Statement-2 : SiCl_4 is ionic and CCl_4 is covalent.

- (A) Statement-1 is true, statement-2 is true and statement-2 is correct explanation for statement-1.
 (B) Statement-1 is true, statement-2 is true and statement-2 is NOT the correct explanation for statement-1
 (C) Statement-1 is true, statement-2 is false.
 (D) Statement-1 is false, statement-2 is true.

IONIC COMPOUND

33. The dissolution of ionic compounds involves :
- (A) Evolution of heat (B) Weakening of attractive forces
(C) Dissociation into ions (D) All of these
34. Select correct order out of given options :
- (A) $\text{BeCO}_3 < \text{BaCO}_3$: Covalent character (B) $\text{BeO} > \text{SrO}$: lattice energy
(C) $\text{Be}^{2+} < \text{Li}^+$: Hydration energy (D) $\text{Be}^{2+}(\text{aq.}) > \text{Li}^+(\text{aq.})$: Ionic mobility
35. The polarizability of the following ions is/are in the order of
- (A) $\text{I}^- > \text{Br}^- > \text{Cl}^- > \text{F}^-$ (B) $\text{I}^- > \text{Br}^- > \text{F}^- > \text{Cl}^-$
(C) $\text{I}^- < \text{Br}^- < \text{Cl}^- < \text{F}^-$ (D) $\text{I}^- < \text{Br}^- < \text{F}^- < \text{Cl}^-$
36. Which of the following equilibria would have the highest value of K_p at a common temperature?
- (A) $\text{MgCO}_3 \rightleftharpoons \text{MgO} + \text{CO}_2$ (B) $\text{CaCO}_3 \rightleftharpoons \text{CaO} + \text{CO}_2$
(C) $\text{SrCO}_3 \rightleftharpoons \text{SrO} + \text{CO}_2$ (D) $\text{BaCO}_3 \rightleftharpoons \text{BaO} + \text{CO}_2$
37. Which of the following set of characteristics lead to the increase in solubility of ionic substances?
- (A) High dipole moment, strong attraction by an ion towards solvent and large solvation energy
(B) Low dipole moment, weak attraction by an ion towards solvent and high solvation energy
(C) High dipole moment, strong attraction by an ion towards solvent and low solvation energy
(D) High dipole moment, weak attraction by an ion towards solvent and large solvation energy
38. The solubility of anhydrous AlCl_3 and hydrated AlCl_3 in diethyl ether are S_1 and S_2 respectively. Then
- (A) $S_1 = S_2$ (B) $S_1 > S_2$ (C) $S_1 < S_2$ (D) $S_1 < S_2$ but not $S_1 = S_2$
39. **Statement-1** : Among alkali metal cations, $\text{Li}^+(\text{aq.})$ has highest electrical conductance.
Statement-2 : $\text{Li}^+(\text{aq.})$ is largest alkali metal cation because of greater degree of hydration.
- (A) Statement-1 is true, statement-2 is true and statement-2 is correct explanation for statement-1.
(B) Statement-1 is true, statement-2 is true and statement-2 is NOT the correct explanation for statement-1
(C) Statement-1 is true, statement-2 is false.
(D) Statement-1 is false, statement-2 is true.
40. **Statement-1** : $\text{Al}(\text{OH})_3$ is amphoteric in nature.
Statement-2 : Al-O and O-H bonds can be broken with equal ease in $\text{Al}(\text{OH})_3$.
- (A) Statement-1 is true, statement-2 is true and statement-2 is correct explanation for statement-1.
(B) Statement-1 is true, statement-2 is true and statement-2 is NOT the correct explanation for statement-1
(C) Statement-1 is true, statement-2 is false.
(D) Statement-1 is false, statement-2 is true.

MOLECULAR ORBITAL THEORY

41. The bond energy order of He_2^+ and HeH^+ is
- (A) $\text{He}_2^+ > \text{HeH}^+$ (B) $\text{HeH}^+ = \text{He}_2^+$ (C) $\text{HeH}^+ > \text{He}_2^+$ (D) Can't be predicted
42. Among KO_2 , AlO_2^- , BaO_2 and NO_2^+ unpaired electron is present in :
- (A) KO_2 only (B) NO_2^+ and BaO_2 (C) KO_2 and AlO_2^- (D) BaO_2 only
43. During the formation of a molecular orbital from atomic orbitals, probability of electron density is
- (A) minimum in the nodal plane (B) maximum in the nodal plane
(C) zero in the nodal plane (D) zero on the surface of the lobe

44. Pick out the **incorrect** statement ?

- (A) N_2 has greater dissociation energy than N_2^+
(B) O_2 has lower dissociation energy than O_2^+
(C) Bond length in N_2^+ is less than N_2
(D) Bond length in NO^+ is less than in NO

45. A simplified application of MO theory to the hypothetical molecule 'OF' would give its bond order as :

- (A) 2 (B) 1.5 (C) 1.0 (D) 0.5

46. Which of the following is true ?

- (A) With increasing Bond order, Bond length decreases & Bond energy increases
(B) With increasing Bond order, Bond length increases & Bond energy decreases
(C) With increasing Bond order, Bond length decreases & Bond energy decreases
(D) With increasing Bond order, Bond length increases & Bond energy increases

47. Which of the following has fractional bond order :

- (A) O_2^{2+} (B) O_2^{2-} (C) F_2^{2-} (D) H_2^-

48. **Statement-1:** H_2 molecule is more stable than He-H molecule.

Statement-2: The antibonding electron in He-H molecule decreases the bond order and there by the stability.

- (A) Statement-1 is true, statement-2 is true and statement-2 is correct explanation for statement-1.
(B) Statement-1 is true, statement-2 is true and statement-2 is NOT the correct explanation for statement-1
(C) Statement-1 is true, statement-2 is false.
(D) Statement-1 is false, statement-2 is true.

49. **Statement-1:** Super oxide ion is paramagnetic whereas peroxide ion is diamagnetic.

Statement-2: Super oxide ion has one unpaired electron whereas peroxide ion has no unpaired electron.

- (A) Statement-1 is true, statement-2 is true and statement-2 is correct explanation for statement-1.
(B) Statement-1 is true, statement-2 is true and statement-2 is NOT the correct explanation for statement-1
(C) Statement-1 is true, statement-2 is false.
(D) Statement-1 is false, statement-2 is true.

50. **Statement-1:** π_b and π^* orbitals obtained from 2p orbital are lying in the same plane.

Statement-2: Bonding M.O's are formed by constructive interference while antibonding M.O's are formed by destructive interference.

- (A) Statement-1 is true, statement-2 is true and statement-2 is correct explanation for statement-1.
(B) Statement-1 is true, statement-2 is true and statement-2 is NOT the correct explanation for statement-1
(C) Statement-1 is true, statement-2 is false.
(D) Statement-1 is false, statement-2 is true.