1. What are the exceptions of the octet rule?
(a) The incomplete octet for central atom?
(b) An odd number of electrons on central atom
(c) Expanded octet of the central atom
(d) All of these.

2. In which of the following species the bond is non-directional?
(a) NCl_3 (b) RbCl (c) $BeCl_2$ (d) BCl_3

3. The correct sequence of bond length in single bond, double bond and triple bond of C is.
(a) $(C-C)=(C=C)=(C\equiv C)$
(b) $C\equiv C<C=C<C-C$
(c) $(C-C<C=C<C\equiv C)$
(d) $C=C<C\equiv C<C-C$

4. Which of the following statements is not true?
(a) Ionic bonds are non-directional while covalent bonds are directional.
(b) Formation of $\pi-$ bond shortens the distance between the two concerned atoms.
(c) Ionic bond is possible between similar and dissimilar atoms.
(d) Linear overlapping of atomic p-orbitals leads to a sigma bond.

5. Two elements X and Y combine to form a compound XY. Under what conditions the bond formed between them will be ionic?
(a) If the difference in electronegativities of X and Y is 1.7 .
(b) If the difference in electronegativities of X and Y is more than 1.7 .
(c) If the difference in electronegativities of X and Y is less than 1.7 .
(d) If both X and Y are highly electronegative.

6. Which of the following does not conduct electricity ?
(a) Molten NaOH (b) Molten KOH
(c) Solid NaCl (d) Aqueous NaCl

7. An ionic bond $A^+ B^-$ is most likely to be formed when :

(a) The ionization energy of A is high and the electron affinity of B is low
(b) The ionization energy of A is low and the electron affinity of B is high
(c) The ionization energy of A and the electron affinity of B is high
(d) The ionization energy of A and the electron affinity of B is low

8. Which forms a crystal of NaCl ?

(a) NaCl molecules (b) Na^+ and Cl^- ions
(c) Na and Cl atoms (d) None of these

9. Two element have electronegativity of 1.2 and 3.0. Bond formed between them would be :

(a) predominantely ionic (b) predominantely covalent
(c) co-ordinate (d) metallic

10. Which one of the following pairs of elements is most likely to form an ionic compound?

(a) B and Cl_2 (b) K and O_2
(c) O_2 and Cl_2 (d) Al and I_2

11. Which of the following shows the Lewis dot formula for CO_2 ?

(a) $:\ddot{O}::C::\ddot{O}:$ (b) $:\ddot{\underset{\cdot\cdot}{O}}:\ddot{C}::\ddot{O}:$

(c) $:\ddot{O}::C:\ddot{\underset{\cdot\cdot}{O}}:$ (d) $:\ddot{\underset{\cdot\cdot}{O}}:C:\ddot{\underset{\cdot\cdot}{O}}:$

12. In which of the following molecules octet rule is not followed?
(a) NH_3 (b) CH_4 (c) CO_2 (d) NO

13. How many number of electrons are involved in the formation of a nitrogen molecule?
(a) Three (b) Four (c) Eight (d) Six

14. Which of the following molecules does not show any resonating structures?
(a) NH_3 (b) CO_3^{2-} (c) O_3 (d) SO_3

15. Which of the following will be the strongest bond?
(a) F – O (b) O – Cl (c) N – H (d) O – H

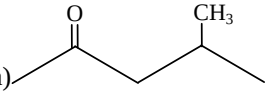
16. In a covalent bond formation,
(a) Transfer of electrons takes place
(b) Equal sharing of electrons between two atoms takes place
(c) Electrons are shared by one atoms only
(d) Electrons are donated by one atom and shared by both atoms.

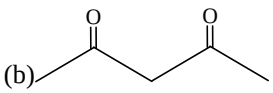
17. Which of the following elements forms predominantly covalent compounds as compared to other elements which form ionic compounds?
(a) Be (b) Mg (c) Ca (d) Sr

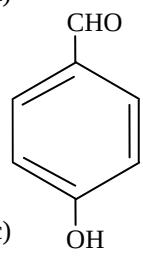
18. Arrange the following in increasing order of covalent character NaCl, $MgCl_2, AlCl_3$
(a) $NaCl < MgCl_2 < AlCl_3$
(b) $MgCl_2 < NaCl < AlCl_3$
(c) $AlCl_3 < MgCl_2 < NaCl$
(d) $NaCl < AlCl_3 < MgCl_2$

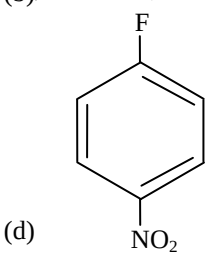
19. In which of the following molecule/ion all the bonds are not equal?
(a) XeF_4 (b) BF_4^- (c) C_2H_4 (d) SiF_4

20. In which of the following species intramolecular H-bonding can be exhibited in the aqueous solution ?

(a) 

(b) 

(c) 

(d) 

21. The bond angle between two covalent bonds is maximum in
(a) H_2O (b) CH_3^+ (c) CO_2 (d) SO_2

22. $SnCl_4$ is a covalent liquid because :
(a) Electron clouds of the Cl^- ions are weakly polarized to envelop the cation.
(b) Electron clouds of the Cl^- ions are strongly polarized to envelop the cation.
(c) Its molecules are attracted to one another by strong van der Waals forces.

(d) Sn shows inert pair effect.

23. Which o f the following has the minimum heat of dissociation of N → B bond ?

(a) $[(CH_3)_3N \rightarrow BF_3]$ (b) $[(CH_3)_3N \rightarrow B(CH_3)F_2]$

(c) $[(CH_3)_3N \rightarrow B(CH_3)_2F]$ (d) $[(CH_3)_3N \rightarrow B(CH_3)_3]$

24. Example of super octet molecule is :

(a) SF_6 (b) PCl_5

(c) IF_7 (d) All of these

25. The number of electrons involved in the bond formation in N_2 molecule is :

(a) 2 (b) 4

(c) 10 (d) 6

26. The octet rule is not obeyed in :

(a) CO_2 (b) BCl_3

(c) PCl_5 (d) (b) and (c) both

27. For the formation of covalent bond the difference in the value of electronegativity should be :

(a) 1.7 (b) More than 1.7

(c) 1.7 or more (d) equal to or less than 1.7

28. The covalency of nitrogen in HNO_3 is :

(a) 0 (b) 3

(c) 4 (d) 5

29. Which of the following species are hypervalent ?

1. ClO_4^-, 2. BF_3, 3. SO_4^{2-}, 4. CO_3^{2-}

(a) 1, 2, 3 (b) 1, 3

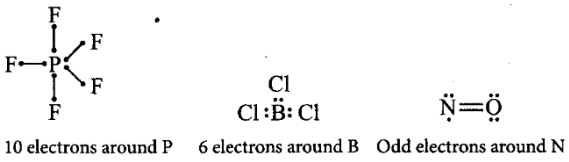
(c) 3, 4 (d) 1, 2

30. Which of the following is the electron deficient molecule?

(a) C_2H_6 (b) SiH_4

(c) PH_3 (d) $BeCl_2$(g)

1. (d) : According to octet rule, the central atom must have 8 electrons but in some compounds the number of electrons is more than 8, or less than 8 or an odd number of electrons is left on the central atom e.g., PCl_5 BF_3, NO



10 electrons around P 6 electrons around B Odd electrons around N

2. (b) : RbCl is an electrovalent compound.

3. (b) : Bond order

$$\propto \frac{1}{\text{Bond length}}$$

4. (c) : Ionic bond cannot be formed between two similar atoms.

5. (b) : For the formation of an ionic bond, the electronegativities of two atoms should differ by more than 1.7 .

6. **(c)**
In solid state, ionic compounds are bad conductor of electricity

7. (b) The conditions required for the formation of an ionic bond are :

(i) ionization enthalpy [$M(g) \rightarrow M^+(g) + e^-$] of electropositive element must be low.
(ii) negative value of electron gain enthalpy [$X(g) + e^- \rightarrow X^-(g)$] of electronegative element should be high.

8. (b) NaCl is ionic crystal so it is formed by Na^+ and Cl^- ions.

9. (a) Electronegativity difference between two combining elements must be greater than 1.7 for ionic compound and it is the essential condition for the formation of ionic compounds. It is ionic because electronegativity difference between two combining elements is 1.8.

10. (b) K on account of lower IE1st can easily form K+ ion losing one electron.

K dh IE1st ds de gksus ds dkj.k ,d bysDVªkWu R;kx dj ljyrk ls K+ vk;u cukrk gSA

11. (a) : Step I : Skeleton OCO
Step II : A = 1 × 4 for C + 2 × 6 for O = 4 + 12 = 16 electrons
Step III : Total no. of electrons needed to achieve noble gas configuration (N)
N = 1 × 8+ 2 ×8 = 24
Step IV : Shared electrons, S = N – A = 24 -16 =8 electrons
Step V : O :: C :: O
Step VI : :Ö :: C :: Ö :=: Ö = C = Ö :

12. (d) : $\ddot{N} = \ddot{O}$

For NO, the octet rule is not followed due to the present of odd electrons on N.

13. (d) : :N⋮⋮N:
Number of electrons involved in bonding is 6.

14. (a) : NH_3 does not show any resonating structure due to the absence of double bond.

15. (d) : Bond strength $\propto$ Difference in electronegativity of atom

16. (b) Equal sharing of electrons between two atoms takes place.

17. (a) : Smaller the size of the cation, more is the covalent character.

18. (a) : Cation size is decreasing in the order :

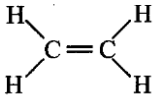
$Na^+ > Mg^{2+} > Al^{3+}$

Al^{3+} has maximum polarization effect and Na^+ has minimum polarization effect.

The covalent nature is in the order:

$AlCl_3 > MgCl_2 > NaCl$

19. (c) : In C_2H_4



There are two types of bonds C = C and C – H bonds which are not equal.

20. D

21. **(c)**

CO_2 sp $\Rightarrow$ B.A $= 180^0$

$H_2O\, sp^3 \Rightarrow$ B.A. $= 104^0 5'$

22. **(b)**

Because of high charge density on Sn^{4+} it has high polarising power and thus leads to greater polarisation of anion i.e., greater distortion of electron clouds of the Cl^- ions. So $SnCl_4$ is most covalent.

23. **(d)**

Boron trimethyl is a weaker Lewis acid than the boron trihalides or monoborane. The electron donating effect of the methyl groups hinders the complex formation with trimethyl amine. Hence the bond N $\rightarrow$ B is weakest in $[(CH_3)_3 N \rightarrow B(CH_3)_3]$. Me_3N as donor (capacity). $BBr_3 > BCl_3 > BF_3 \sim BH_3 > BMe_3$.

24. (d) In SF_6, PCl_5 and IF_7 the valence shell has 12, 10 and 14 electrons. As all contain more than 8 electrons in their valence shell they are example of super octet molecules.

25. (d) In N_2 molecule each nitrogen atom contributes three electrons so total number of electrons are 6.

26. (d) In BCl_3 and PCl_5, B and P contain 6 and 10 electrons respectively in their valence shell. Therefore they violate octet rule.

27. (d) Covalent bond is formed when electronegativity difference of two atom is equal to 1.7 or less than 1.7.

28. (c) It has 5 electrons in valence shall and further it can not exceed covalency beyound five due to absence of d-orbitals in nitrogen.

29. (b) The species in which central atoms has higher valencies than their normal valencies are called as hypervalent species.

30. (d)