JEE MAIN ANSWER KEY & SOLUTIONS

SUBJECT :- CHEMISTRY
CLASS :- 11th **PAPER CODE :- CWT-4**
CHAPTER :- CHEMICAL BONDING

ANSWER KEY

1.	(B)	**2.**	(A)	**3.**	(C)	**4.**	(D)	**5.**	(D)	**6.**	(A)	**7.**	(B)
8.	(B)	**9.**	(A)	**10.**	(B)	**11.**	(C)	**12.**	(C)	**13.**	(A)	**14.**	(D)
15.	(D)	**16.**	(B)	**17.**	(A)	**18.**	(C)	**19.**	(B)	**20.**	(D)	**21.**	4
22.	610	**23.**	8	**24.**	9	**25.**	412	**26.**	2	**27.**	1	**28.**	3
29.	10	**30.**	7										

SOLUTIONS

1. (B)

Sol. NaCl is ionic crystal so it is formed by Na^+ and Cl^- ions.

2. (A)

Sol. 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.

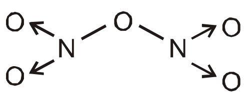
3. (C)

Sol. According to Fajan's rule as the size of cation increases their polarising power decreases and thus the covalent character decreases.

4. (D)

Sol. The maximum covalency of an element is equal to the actual number of s and p-electrons in the outermost shell, when formal charge is zero on it.

5. (D)

Sol. 

6. (A)

Sol. The nuber of e^- pair is same in resonating structure.

7. (B)

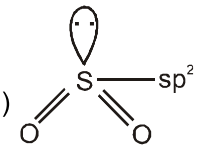
Sol. CaC_2 exists as Ca_2^+ and C_2^{2-} $[C \equiv C]^{2-}$ (π, π, σ).

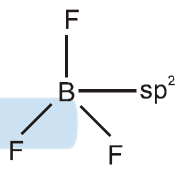
8. (B)

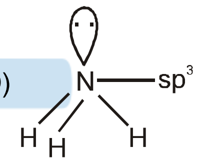
Sol. (A) σ bond is formed by axial over lapping.
(B) p-orbital have both axial and side ways over lapping

9. (A)

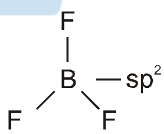
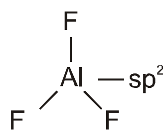
Sol. (A) S = C = S (linear)
sp

(B)  (bent)

(C)  (trigonal planar)

(D)  (trigonal pyramidal)

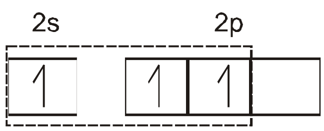
10. (B)

Sol. (B)  

(trigonal planar) (trigonal planar)

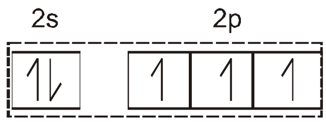
11. (C)

Sol. (a) Electronic configuration of boron in ground state is $1s^22s^22p^1$.

BCl_3 : 

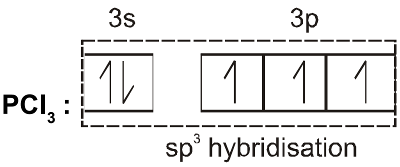
sp^2 hybridisation

(b) Electronic configuration of nitrogen in ground state is $1s^22s^22p^3$.

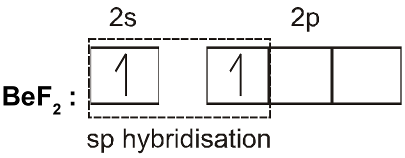
NH_3 : 

sp^3 hybridisation

(c) Electronic configuration of phosphorus in ground state is $1s^2 2s^2 2p^6 3s^2 3p^3$.

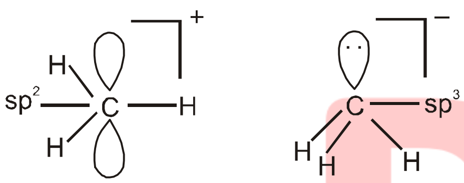


(d) Electronic configuration of boron in ground state is $1s^2 2s^2$.



12. (C)

Sol. $CH_3—CH_3 \longrightarrow \overset{+}{C}H_3 + \overset{-}{C}H_3$

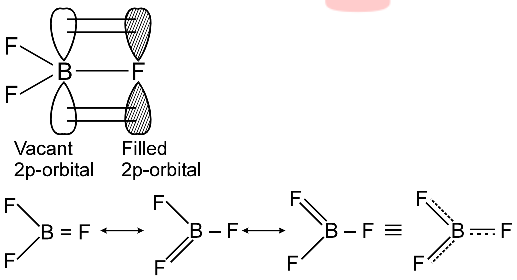


13. (A)

Sol. Steric number = 3 + 1 = 4 ; so the hybridization is sp_3 .

14. (D)

Sol.



Decrease in B–F bond length is due to delocalised pπ–pπ bonding between filled p-orbital of F atom and vacant p-orbital of B atom.

15. (D)

Sol. $He_2 : (\sigma 1s)_2 (\sigma^* 1s)_2$; bond order = $\frac{1}{2}(2-2) = 0$,

He_2 molecule is, therefore, unstable and does not exists.

16. (B)

Sol. B_2 bond order = 1 ; C_2 bond order = 2 ; F_2 bond order = 1 ; O_2^- bond order = 1.5

bond order $\propto$ 1/bond length.

17. (A)

Sol. (A) NO^- derivative of O_2 and isoelectronic with O_2.

So $(\sigma 1s)^2 (\sigma^* 1s)^2 (\sigma 2s)^2 (\sigma^* 2s)^2 (\sigma 2p_z)^2 (\pi 2p^2_x = \pi 2p^2_y) (\pi^* 2p_x^1 = \pi^* 2p^1_y)$ and 2 unpaired electrons.

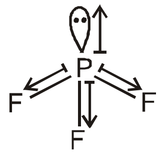
(B) O_2^{2-} : $(\sigma 1s)^2 (\sigma^* 1s)^2 (\sigma 2s)^2 (\sigma^* 2s)^2 (\sigma 2p_z)^2 (\pi 2p^2_x = \pi 2p^2_y) (\pi^* 2p_x^2 = \pi^* 2p^2_y)$ and no unpaired electrons.

(C) CN^- is derivative of and isoelectronic with N_2 : $(\sigma 1s)^2 (\sigma^* 1s)^2 (\sigma 2s)^2 (\sigma^* 2s)^2 (\pi 2p^2_x = \pi 2p^2_y) (\sigma 2p_z)^2$ and no unpaired electron.

(D) CO is derivative of and isoelectronic with N_2 : $(\sigma 1s)^2 (\sigma^* 1s)^2 (\sigma 2s)^2 (\sigma^* 2s)^2 (\pi 2p^2_x = \pi 2p^2_y) (\sigma 2p_z)^2$ and no unpaired electron.

18. (C)

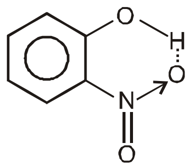
Sol.



$\mu \neq 0$; SiF_4 , BF_3 and PF_5 are symmetrical molecules thus $\mu = 0$.

19. (B)

Sol. It has intramolecular H-bonding



20. (D)

Sol. London forces are extremely short range in action and the weakest of all attractive forces. The order of strength of bonds/ forces is ionic bond > covalent bond > hydrogen bond > london force.

21. 4

Sol. $(\sigma 1s)^2 (\sigma^* 1s)^2 (\sigma 2s)^2 (\sigma^* 2s)^2 (\pi 2p2x = \pi 2p2y) (\sigma 2pz)^2$; number of anti bonding electrons in N_2 is 4.

* represents antibonding molecular orbitals.

22. 610

Sol. $\frac{1}{2}Cl_{2(g)} \rightarrow Cl_{(g)}$

$\Delta H_1 = \frac{1}{2}\Delta_{diss}H^{\circ}_{Cl_2} = \frac{240}{2} = Cl_{2(g)} \rightarrow Cl_{(g)} kJmol^{-1}$

$Cl_{2(g)} \rightarrow Cl^-_{(g)} ; \Delta H_2 = \Delta_{eg}H^{\circ}_{Cl} = -349 \, kJmol^{-1}$

$Cl^-_{(g)} + aq \rightarrow Cl^-_{(aq)}$;

$\Delta H_3 = \Delta_{hyd}H^{\circ} = -381 \, kJmol^{-1}$

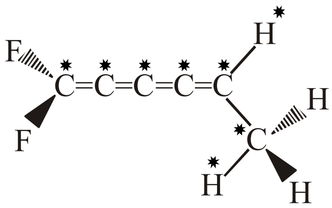
The required reaction is $\frac{1}{2}Cl_{2(g)} \rightarrow Cl^{-}_{(aq)}; \Delta H = ?$

Then $\Delta H_1 = \frac{1}{2}\Delta_{diss}H^\circ + \Delta_{eg}H^\circ + \Delta_{hyd}H^\circ$

= 120 + (–349) + (–381) = –610 kJ mol^{-1}]

23. 8

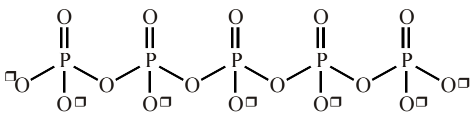
Sol.



Atoms are in same plane.]

24. 9

Sol.



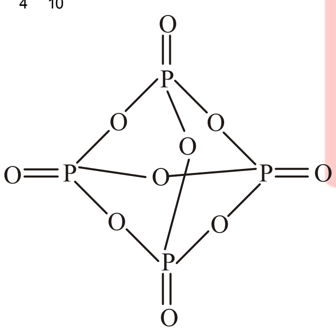
No. of P = O bonds 5

No. of P – O – P bonds = 4

hence their total = 5 + 4 = 9]

25. 412

Sol. P_4O_{10}



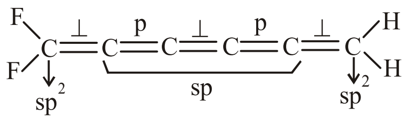
P = O $\Rightarrow$ 4

(P – O) $\Rightarrow$ 12

linkanges]

26. 2

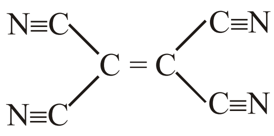
Sol.



The π bonds formed planar will have nodal plane perpendicular to the molecular plane thus they are two.]

27. 1

Sol.



σ bonds $\rightarrow$ nine

π bonds $\rightarrow$ nine

$\frac{\sigma}{\pi} = \frac{9}{9} = 1$]

28. 3

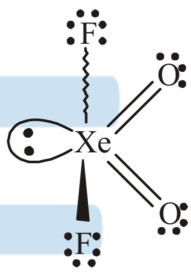
Sol. NH_4Cl

NH_4NO_3

$MgSO_4$]

29. 10

Sol.

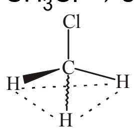


lone pair on central atom = one

lone pair on overall molecule = 10]

30. 7

Sol. $CH_3Cl \rightarrow sp^3$ tetrahedral



One according to above structure

6 – along the faces

Total = 6 + 1 = 7]