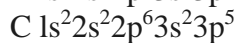
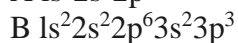
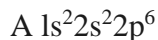




Class: XI	Department: SCIENCE SUBJECT :CHEMISTRY	Date of submission: 10.10.2020
Worksheet No: 06 with answers	Chapter: CHEMICAL BONDING AND MOLECULAR STRUCTURE	Note: A4 FILE FORMAT
NAME OF THE STUDENT	CLASS & SEC:	ROLL NO.

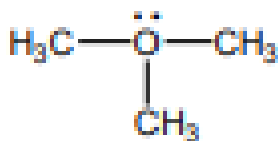
Questions 1 – 4 are paragraph-based questions.

The electronic configurations of three elements A, B and C are given below.



1. Stable form of A may be represented by the formula
 - a. A
 - b. A_2
 - c. A_3
 - d. A_4
2. Stable form of C may be represented by the formula
 - a. C
 - b. C_2
 - c. C_3
 - d. C_4
3. The molecular formula of the compound formed from B and C will be
 - a. BC
 - b. B_2C
 - c. BC_2
 - d. BC_3
4. The bond between B and C will be
 - a. ionic
 - b. covalent
 - c. hydrogen
 - d. coordinate
5. sp^3d^2 hybridization is present in SF_6 , find its geometry
 - a. octahedral geometry
 - b. square planar geometry
 - c. tetragonal geometry
 - d. tetrahedral geometry

6. Find the molecule with the maximum dipole moment
- CH₄
 - NH₃
 - CO₂
 - NF₃
7. Find the pair with sp² hybridisation of the central molecule
- NH₃ and NO₂⁻
 - BF₃ and CH₄
 - BF₃ and NO₂⁻
 - NH₂⁻ and H₂O
8. What is the formal charge on oxygen in the following structure?



- +1
 - 2
 - 1
 - 0
9. The correct decreasing order of boiling points of the following compounds is
- HF > H₂O > NH₃
 - H₂O > HF > NH₃
 - NH₃ > HF > H₂O
 - NH₃ > H₂O > HF

Assertion Reason type

10. **Assertion (A):** Though the central atom of both NH₃ and H₂O molecules are sp³ hybridised, yet H–N–H bond angle is greater than that of H–O–H.
- Reason (R):** This is because nitrogen atom has one lone pair and oxygen atom has two lone pairs.
- A and R both are correct, and R is the correct explanation of A.
 - A and R both are correct, but R is not the correct explanation of A.
 - A is true but R is false.
 - A and R both are false.
11. **Assertion (A):** ClF₃ has a bent T shape.
- Reason (R):** It has two lone pairs arranged at 180°.
- A and R both are correct, and R is the correct explanation of A.
 - A and R both are correct, but R is not the correct explanation of A.
 - A is true but R is false.
 - A and R both are false.

2 Marks

12. What is the total number of σ and π bonds in the following molecules?
a. C_2H_6 b. C_2H_4 c. $HCOOH$ d. CH_3COOH
13. Account for the following
a. The bond dissociation enthalpies of O-H bonds in H_2O are not the same.
b. The double bond in C_2 molecule consists of π bonds.
14. Amongst the following compounds, which do not obey the octet rule and why?
a. H_2O b. PCl_5 c. H_2SO_4 d. BeF_2
15. Arrange the following in the increasing order of bond length.
 C_2 , C_2^- , C_2^{2-}
16. Using the concept of hybridization explain the structures of PCl_5 and SF_6 .
17. CO_2 and SO_2 are triatomic molecules. Do they have the same dipole moment? Justify your answer.
18. When a magnet is lowered in liquid oxygen, some O_2 stick to it. No such behaviour is observed with liquid N_2 . Explain.

3 Marks

19. Draw the Lewis dot structures for
a. H_2SO_4 b. PCl_3 c. H_2S
20. Which is more covalent?
a. $NaCl$ or $MgCl_2$ b. NaF or NaI c. $HgCl_2$ or $CaCl_2$
21. a. Label the covalent radius and van der Waals radius (99 and 180 pm respectively) in the diagram of a chlorine molecule.
- b. Which species of each group is predicted to have the strongest bond?
i. O_2 , F_2 , N_2 ii. H_2 , H_2^- , H_2^+ iii. N_2 , N_2^+ , N_2^-

5 Marks

22. Complete the table

Molecule	Bond pairs	Lone pairs	Geometry	Shape	Hybridisation
CH_4					
NH_3					
SF_6					
BrF_5					
H_2O					
PF_5					
BCl_3					

23. Give reasons for the following statements
- The C-C bond length in ethane is 154 pm whereas in ethylene it is 134 pm.
 - H₂O is a liquid whereas H₂S is a gas.
 - PCl₅ is a reactive molecule.
 - The O-O bond lengths in O₃ are the same.
 - BF₃ is a non-polar molecule.

Answer key

- a
 - b
 - d
 - a
 - a
 - b
 - c
 - a
 - b
 - a
 - c
12. a. 7 σ bonds, 0 π bond
 b. 5 σ bonds, 1 π bond
 c. 4 σ bonds, 1 π bond
 d. 7 σ bonds, 1 π bond
13. a. Due to difference in the chemical environment.
 b. This is because of the presence of four electrons in two pi molecular orbitals.

14. b, c, d

15. C₂

$$(\sigma 1s)^2 (\sigma^* 1s)^2 (\sigma 2s)^2 (\sigma^* 2s)^2 (\pi 2p_x^2 = \pi 2p_y^2)$$

$$\text{B.O} = \frac{1}{2} (8-4)$$

$$= 2$$

C₂⁻

$$(\sigma 1s)^2 (\sigma^* 1s)^2 (\sigma 2s)^2 (\sigma^* 2s)^2 (\pi 2p_x^2 = \pi 2p_y^2) (\sigma 2p_z^1)$$

$$\text{B.O} = \frac{1}{2} (9-4)$$

$$= 2.5$$

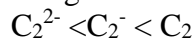
C₂²⁻

$$(\sigma 1s)^2 (\sigma^* 1s)^2 (\sigma 2s)^2 (\sigma^* 2s)^2 (\pi 2p_x^2 = \pi 2p_y^2) (\sigma 2p_z^2)$$

$$\text{B.O} = \frac{1}{2} (10-4)$$

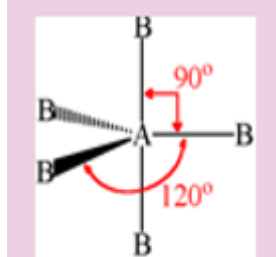
$$= 3$$

Increasing bond length



16. PCl_5

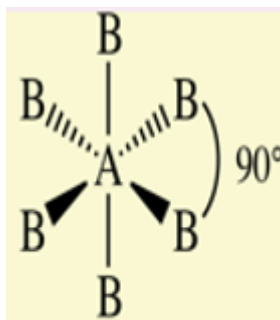
sp^3d explanation



Trigonal
bipyramidal

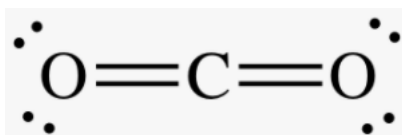
SF_6

sp^3d^2 explanation

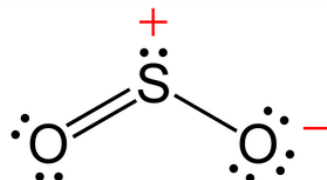


Octahedral

17. CO_2 (linear)



SO_2 (bent)



No, they don't have the same dipole moment.

In CO_2 , the dipoles cancel out and hence have zero dipole moment.

18. O_2 is paramagnetic (due to unpaired electrons). N_2 is diamagnetic (due to paired electrons)

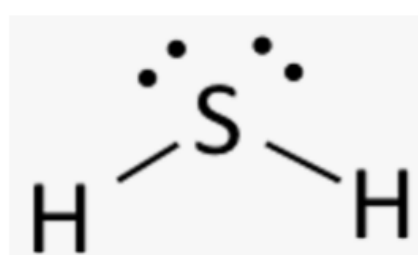
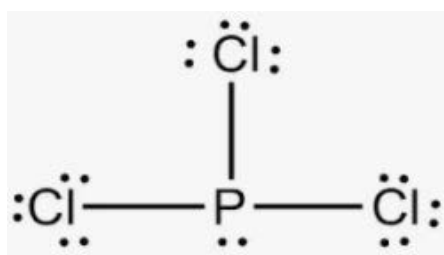
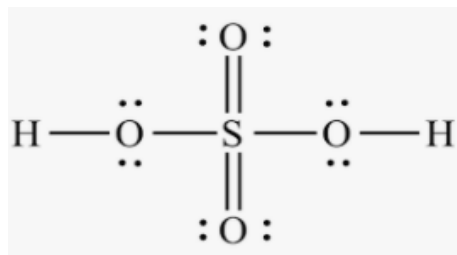
Electronic configurations of N_2 and O_2 .

19..

a. H_2SO_4

b. PCl_3

c. H_2S

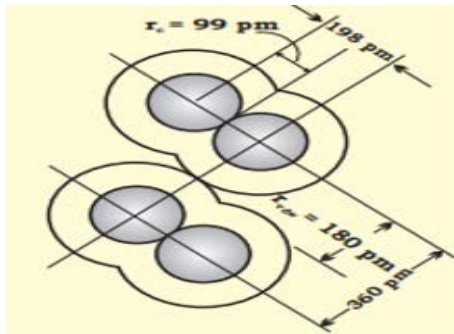


20. a. MgCl_2 , Mg^{2+} - smaller cation, greater charge- greater polarizing power.

b. NaI - I^- larger anion, greater polarisability

c. Hg^{2+} , transition element -greater polarizing power.

21. a.



b.

- i. N_2
- ii. H_2
- iii. N_2

22. Complete the table

Molecule	Bond pairs	Lone pairs	Shape	Hybridisation
CH_4	4	0	Tetrahedral	sp^3
NH_3	3	1	Trigonal pyramid	sp^3
SF_6	6	0	Octahedral	sp^3d^2
BrF_5	5	1	Square pyramid	sp^3d^2
H_2O	2	2	Bent	sp^3
PF_5	5	0	Trigonal bipyramid	sp^3d
BCl_3	3	0	Trigonal planar	sp^2

23.

a. Ethane is single covalent bonded, sp^3 hybridised.

Ethene is double bonded, sp^2 hybridisation, Thus shorter bond length.

b. H_2O molecules are associated to each other using strong H bonds. Since associated they are in liquid state. In H_2S there is no H bond.

c. Axial bonds are longer and weaker than equatorial bonds.

d. Resonance, partial double bond character

e. The resultant of 1st and 2nd dipoles cancel out the third dipole.

Prepared by Ms. Jasmin Joseph

Checked by : HOD - SCIENCE