

1. Increasing order of bond polarity:  $\text{H-I} < \text{H-Br} < \text{H-Cl} < \text{H-F}$

Reason: Fluorine is the most electronegative among the halogens

2. Direction of bond dipole

In C-Br the bond is polarized towards Br; However Si and Se have almost same electronegativities

3.  $\text{Sr}^{2+}$  is smaller than Sr

Reason: Loss of electrons from the valence shell causes reduction in size of the cation

4.  $Z = 89$ , is Bismuth: It forms more readily  $\text{Bi}^{3+}$

5.  $Z = 49$ , In

$Z = 51$ , Sb

The type I ionic compound would be InSb

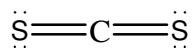
6. For  $Z = 21$ , the Sc attains its noble gas configuration as Ar in its  $\text{Sc}^{3+}$ , oxidation state.

For  $Z = 16$ , the sulfur attains its noble gas configuration in its  $\text{S}^{2-}$  state as Ar

7. The valence electrons are the most accessible to bonding than the electrons of inner shells.

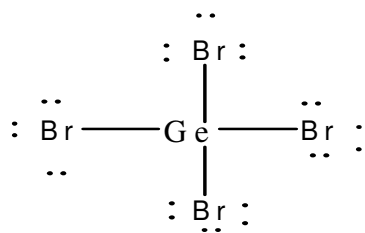
8.  $Z = 6$  is C,  $Z = 16$  is S

$\text{CS}_2$

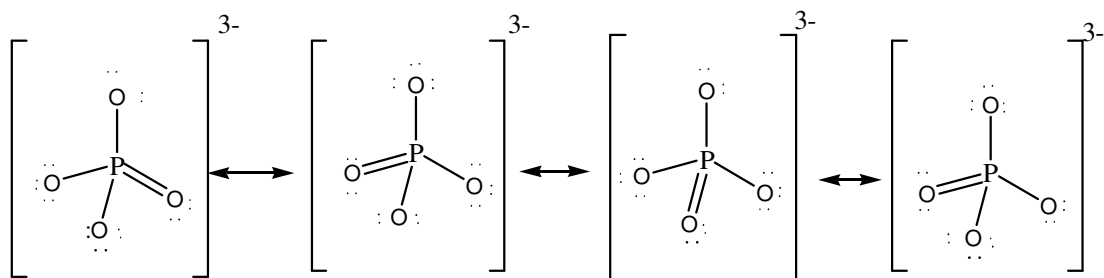


The  $\text{CS}_2$  structure is similar to the carbon dioxide structure, with the sulfur atoms possessing 2 lone pairs of electrons each.

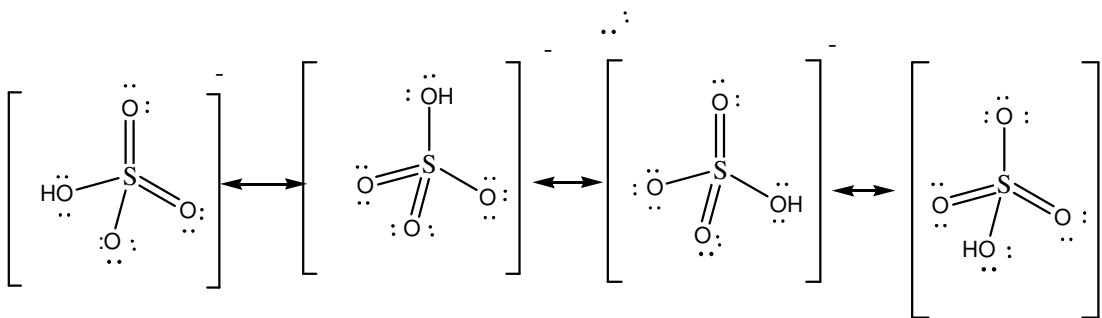
9. The lewis structure of  $\text{GeBr}_4$ . In this The central atom has 4 bond pair and no lone pair as follows. Bromine atoms have Octet configurations



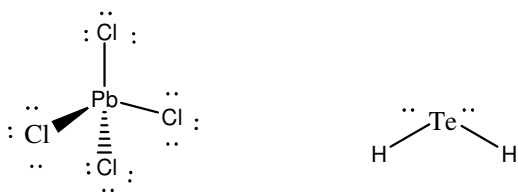
10. The Lewis and resonance structure of  $\text{PO}_4^{3-}$  is as follows



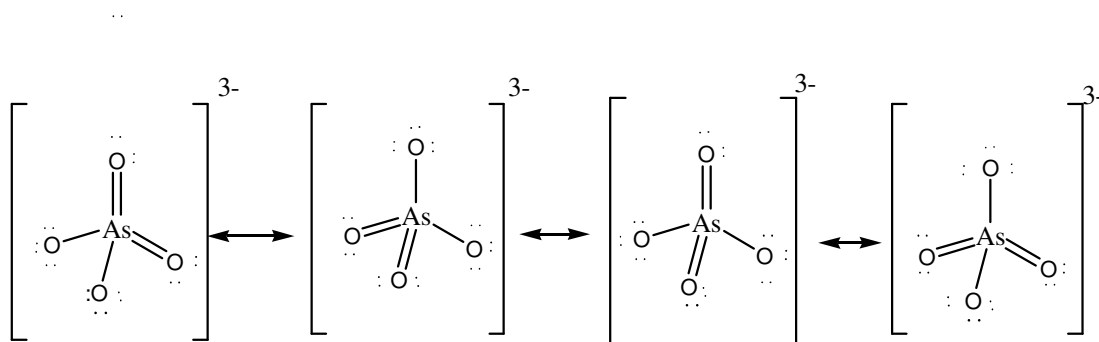
11. The lewis and possible resonance structure of hydrogen sulfate ion is as follows



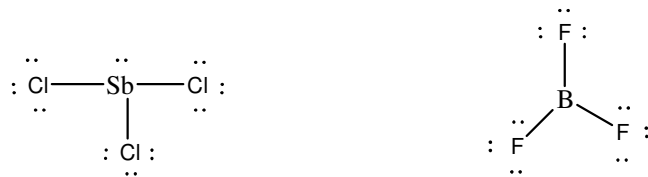
12. In  $\text{PbCl}_4$  there are 4 Bonding pair and 0 Lone pair. Therefore the structure is Tetrahedral. In  $\text{H}_2\text{Te}$ , there are two bond pair and two lone pair; Therefore the structure is bent



13.  $\text{AsO}_4^{3-}$  is tetrahedral and the resonance structure is shown as below



14. In  $\text{SbCl}_3$ , there are 3 bond pairs and one lone pair on the central atom; therefore the structure is T-shaped. In  $\text{BF}_3$  there are three lone pairs and no lone pair. Hence its shape is Trigonal planar

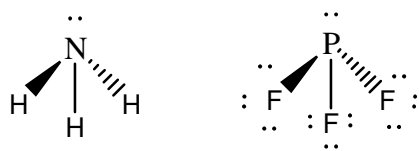


15. According to the VSEPR theory, the hydrogen carbonate has resonance stabilized trigonal planar structure therefore the bond angle is  $120^\circ$

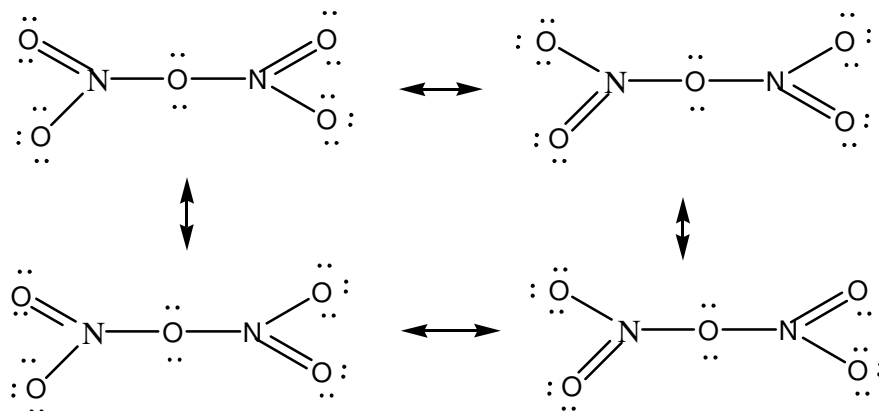
16. These are inter halogen compound. As the Fluorine is more electronegative than Cl, The I-F bond is more polar.

17.

18. In both,  $\text{NH}_3$  and  $\text{PF}_3$  there are three bond pairs and one lone pair; therefore the predicted structure is pyramidal.



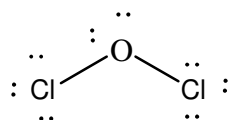
19. The resonance and lewis structures of the  $N_2O_5$  are given below



20. In  $BeF_2$ , there are two bond pairs and no lone pairs; therefore the structure is linear. But in case of  $H_2S$ , there are two lone pairs on the central atom and the structure is bent.



21. In  $OCl_2$  the central oxygen atom bears two lone pair of electrons; therefore the structure is bent and has distorted bond angle around  $105^\circ$



22. Second ionization energy of Rubidium is more than Strontium. Because Rb is an alkaline metal and attains noble gas configuration at the first ionization. However the second ionization destabilizes this state and therefore it is an undesirable event.

Whereas, in Sr attains the noble gas configuration only in its second ionization stage. Therefore the second ionization of Ru is more than Sr.

23. For  $Z=112$ , the nearest noble gas element is Rn. Hence the electron configuration is  $[\text{Rn}] 5f^{14}, 6d^{10} 7s^2$ .

24.  $Z=46$ , its Palladium, the electronic configuration is  $[\text{Kr}] 4d^{10}, 5s^0$  and NOT  $[\text{Kr}] 4d^8, 5s^2$ . Fully filled d orbitals are more preferred than the partial ones.

25.  $Z=83$ , Its Bismuth and a p-block element. It means that the p orbitals are filled last. The configuration is  $[\text{Xe}] 4f^{14}, 5d^{10}, 6s^2, 6p^2$ .

26. The electronic configurations of the elements given:

At –  $[\text{Xe}] 4f^{14}.5d^{10}.6s^2.6p^5$

Au –  $[\text{Xe}].4f^{14}.5d^{10}.6s^1$

Sn -  $[\text{Kr}].4d^{10}.5s^2.5p^2$

Pb -  $[\text{Xe}].4f^{14}.5d^{10}.6s^2.6p^2$

$\text{Au} > \text{Pb} > \text{At} > \text{Sn}$

Reason: Leaving the noble gases out, atoms get smaller as you go across a period.

The atoms get bigger as you go down a group.

27. Ionization energy increases in a period from left to right. The metallic elements are in the right side and are electropositive. Hence they possess much lower ionization energy than the nonmetallic elements.

28. In group 16 oxygen is more reactive than the others as it an oxidizing agent.

29. In group 2 the largest element is Radium Ra  $Z=88$ . This is because the atomic radi increases while descending in a group.

30.  $Z=49$ , its Indium. The electron configuration is  $[\text{Kr}], 4d^{10}, 5s^2, 5p^1$ .

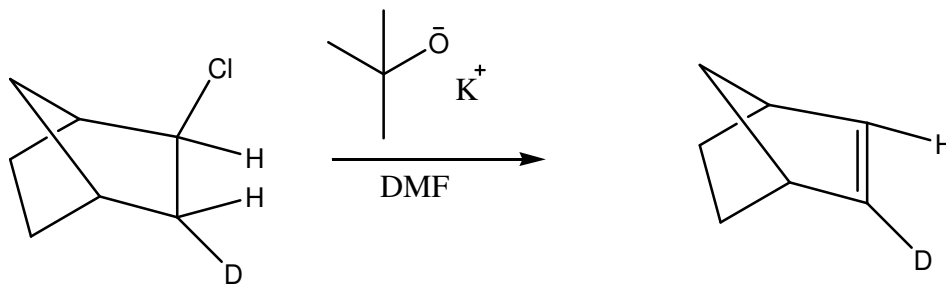
31.  $Z=50$ , its Sn, Its electronic configuration is  $[[\text{Kr}]4d^{10}, 5s^2, 5p^2]$ . The core electrons are therefore  $50-4=46$  electrons.  $Z=86$ , its Rn a noble gas element if one leaves the outer most  $6s^2$  and  $6p^6$  electrons the core electrons are  $86-8=78$ .

32. As the principal energy of an electron increases, the nuclear attraction on them decreases. This means that the electrons farther from the nucleus experience lesser attraction exerted by the nucleus. This decrease is attributed to the distance between the nucleus and the electron and the screening effects of orbitals. f orbital has the least screening effect while the s orbital has the most.

33. This electronic configuration is not possible because the electron prefers to fully occupy the 4s level that has lower energy than 3d as  $4s^2$  and not as  $4s^1$ . The correct configuration is  $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^1$

34. Element X could be Aluminum and element Y could be Ga. The answer can be justified with the sudden jump of over five times at the fourth ionization level in both the elements. Since they belong to group 13, this kind of a jump is expected.

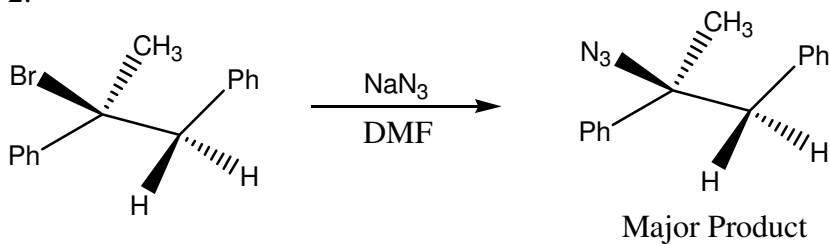
1. a)



b)

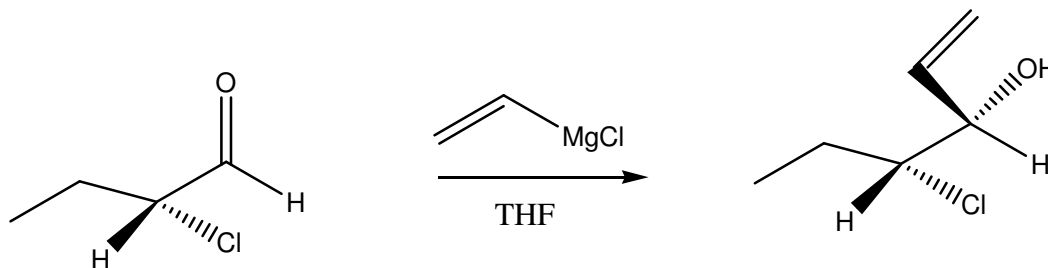
According to the Bredt's rule, no matter what the mechanism, a double bond does not go to a bridgehead, unless the ring sizes are large enough  
The deuterium is not eliminated but H, as it follows a *syn*-elimination mechanism.

2.



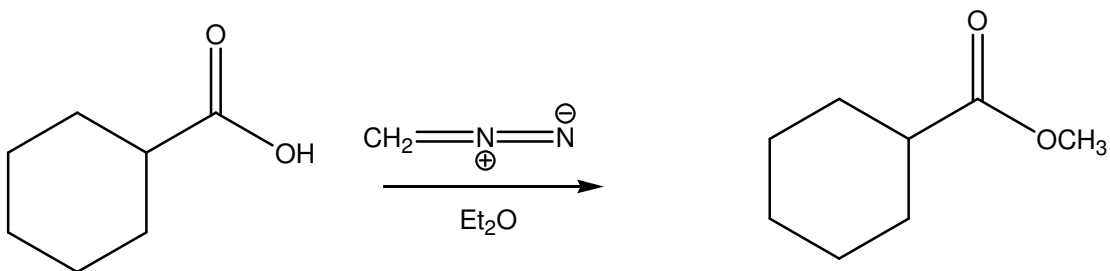
- Substitution product is formed. Azide ion isn't so strong to effect elimination on the substrate.
- $\text{S}_{\text{N}}1$  product is formed: the substrate is a benzylic tertiary alkyl bromide, in which only  $\text{S}_{\text{N}}1$  is possible.

3.



4.





MECHANISM:

