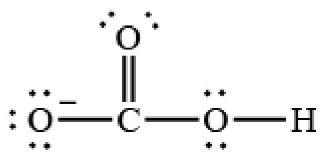
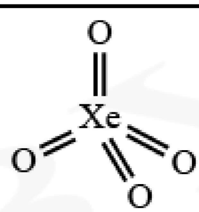
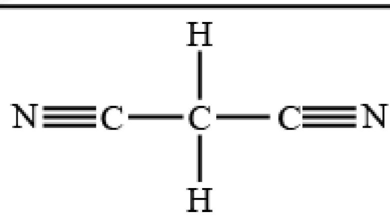
1. Which of the following species contains equal number of σ- and π- bonds?

A. HCO_3^-

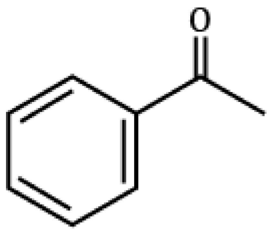
B. XeO_4 ✔

C. $(CN)_2$

D. $CH_2(CN)_2$

Structure	σ and π
	σ bond - 4 π bond - 1
	σ bond - 4 π bond - 4
	σ bond - 3 π bond - 4
	σ bond - 6 π bond - 4

2. How many π bonds are present in acetophenone.



A. 4

B. 16

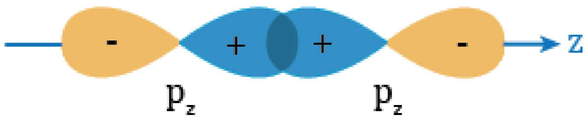
C. 10

D. 6

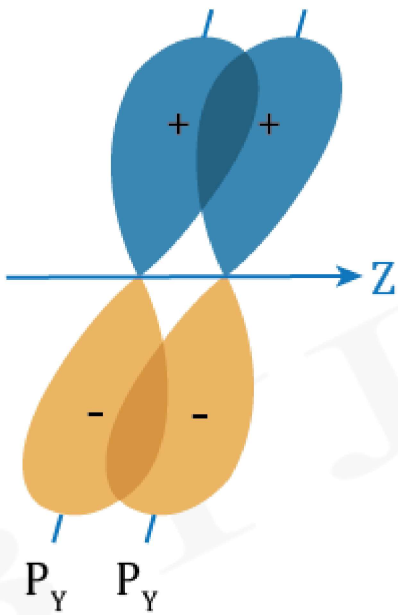
Single bonds contain 1 σ bond.
Double bonds contain 1 σ and 1 π bond.
From the structure of acetophenone, it has 4 double bonds (3 in the benzene ring and 1 of carbonyl)
So, the total number of π bonds are 4.

3. Which of the following orbital overlaps are not allowed?

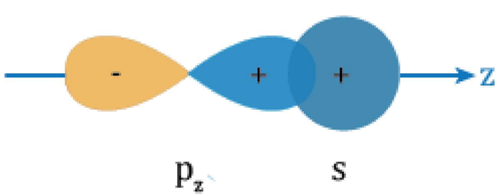
A.



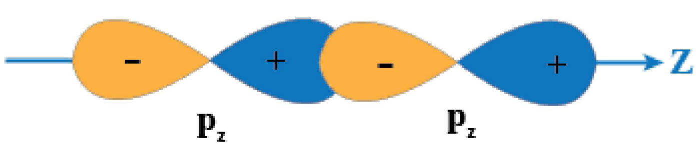
B.



C.

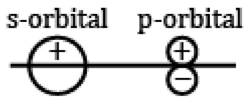


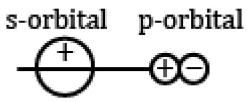
D.

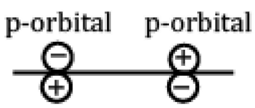


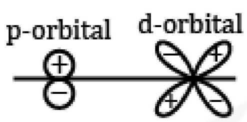
Overlap of the lobes of same sign (phase) is called as positive overlap.
They lead to attractive interactions between orbitals.
Overlap of lobes of opposite sign is called as negative overlap.
Option (a), (b) and (c) are positive overlaps and are allowed.
Option (d) is not allowed since the overlaping lobes have different phase.

4. Which of the following leads to bonding?

A. 

B. 

C. 

D. 

Orbitals forming a bond should have the same sign (phase) and orientation in space.
Also, the orbitals should have the same or nearly the same energy and the same symmetry around the molecular axis for proper orbital overlapping to take place. Hence, only s and p_z (considering z-axis as internuclear axis) will lead to formation of σ bond.

5. An element A has an outer electronic configuration $2s^2\ 2p^4$. The number of covalent bonds in A_2 is:

A. 1

B. 2

C. 3

D. 4

Based on the outer electronic configuration, the element needs two electrons to attain stable electronic configuration. The element is oxygen and hence it shares two electrons and forms a covalent double bond in A_2.