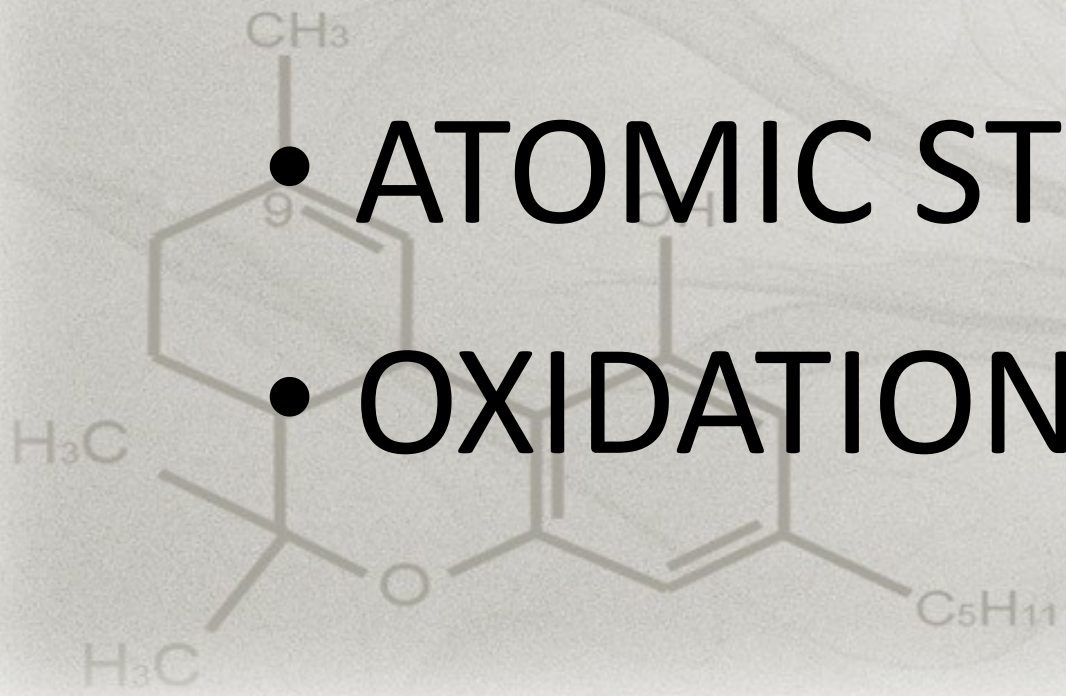
**Topics:**

- METALLURGY-1
- ATOMIC STRUCTURE
- OXIDATION NUMBER



# Metallugy-1

- Composition of different ores
- Methods of concentration of ore
- Calcination and roasting
- Pyrometallurgy
- Electrometallurgy
- Hydrometallurgy
- Different methods of refining

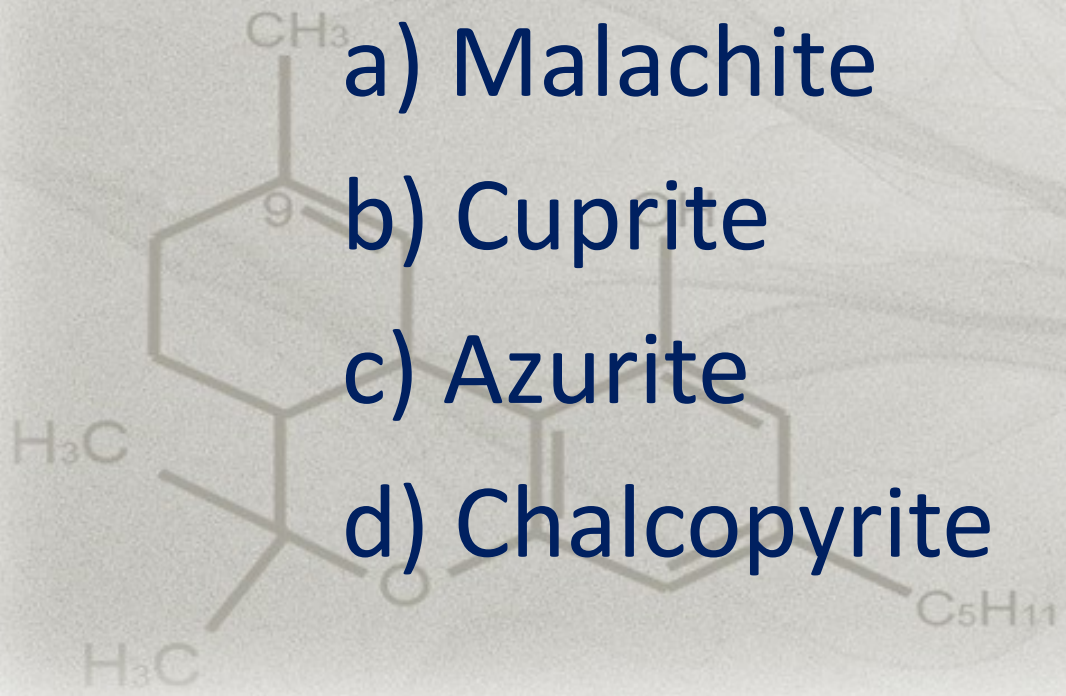
1.A cuprous ore among the following is

a) Malachite

b) Cuprite

c) Azurite

d) Chalcopyrite



a)Malachite $\longrightarrow$ $[CuCO_3.Cu(OH)_2]$

b)Cuprite $\longrightarrow$ $Cu_2O$

c)Azurite $\longrightarrow$ $[2CuCO_3.Cu(OH)_2]$

d)Chalcopyrite $\longrightarrow$ $CuFeS_2$

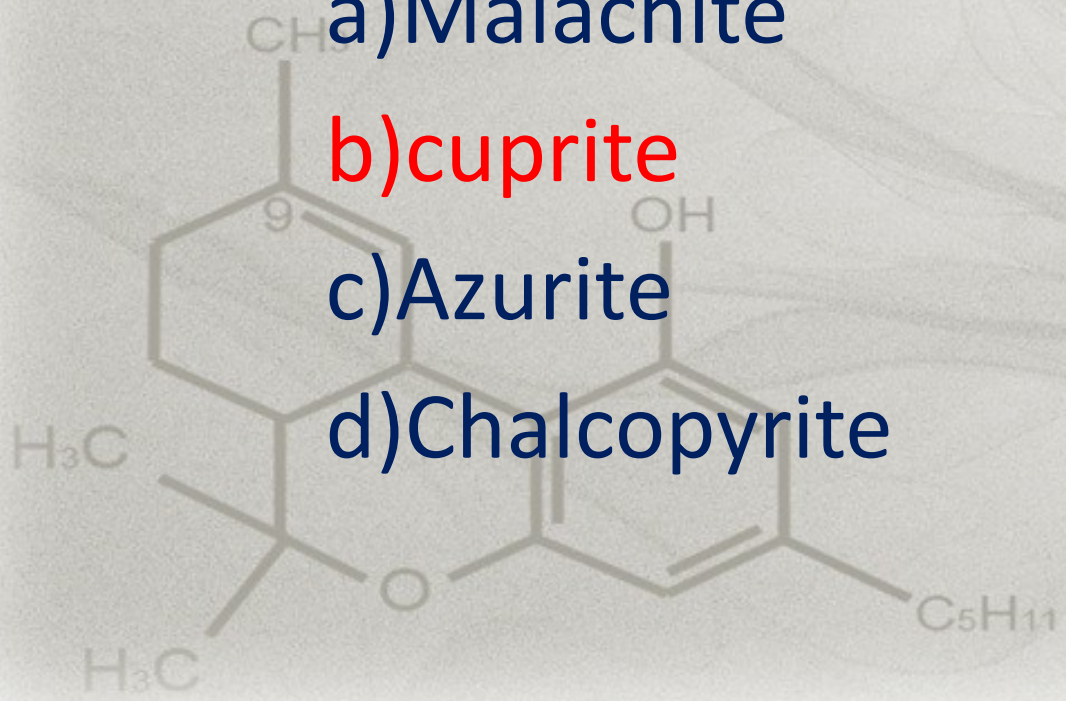
1.A cuprous ore among the following is

a)Malachite

b)cuprite

c)Azurite

d)Chalcopyrite



2.For an ore containing silicon impurities suitable flux is

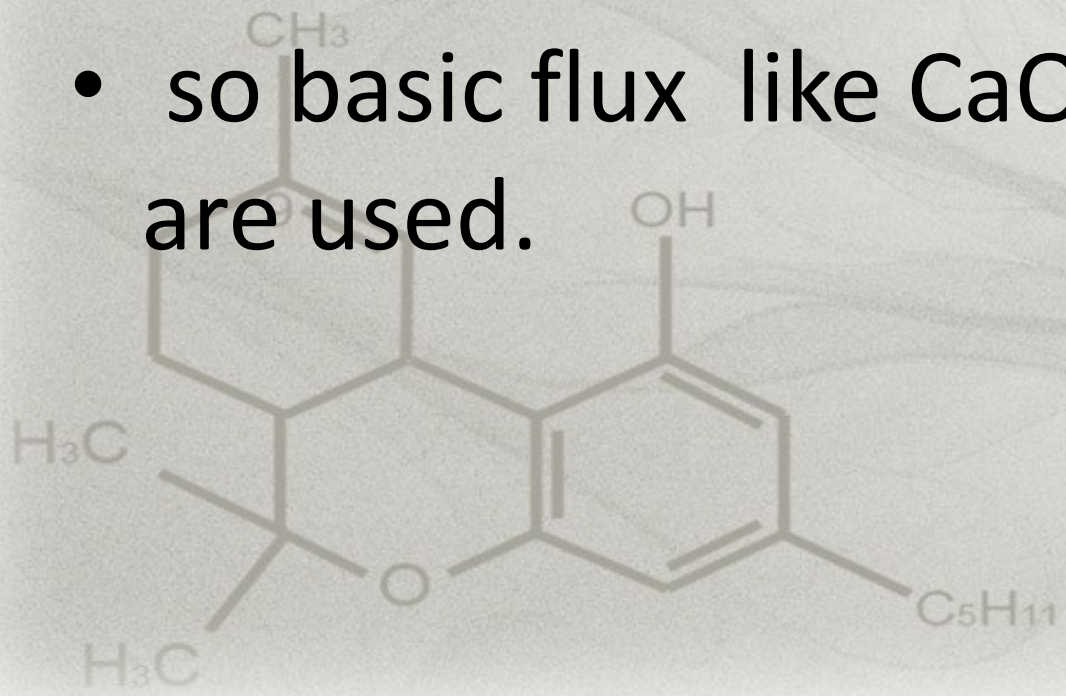
a) Silica

b) Phosphorous pentoxide

c) Manganese oxide

d) Calcined dolomite

- Silicon impurities are **acidic** in nature.
- so basic flux like CaO ,FeO and MgO are used.



2.For an ore containing silicon impurities suitable flux is

a)Silica

b)Phosphorous pentoxide

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d)calcined dolomite

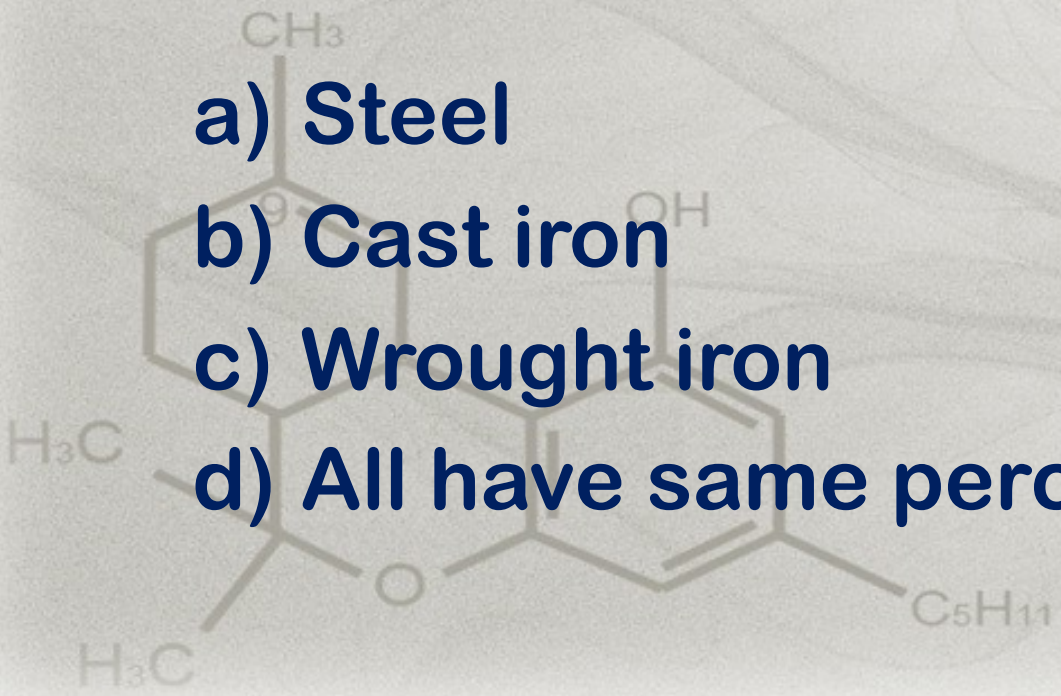
# 3.Which of the following has lowest percentage of carbon?

a) Steel

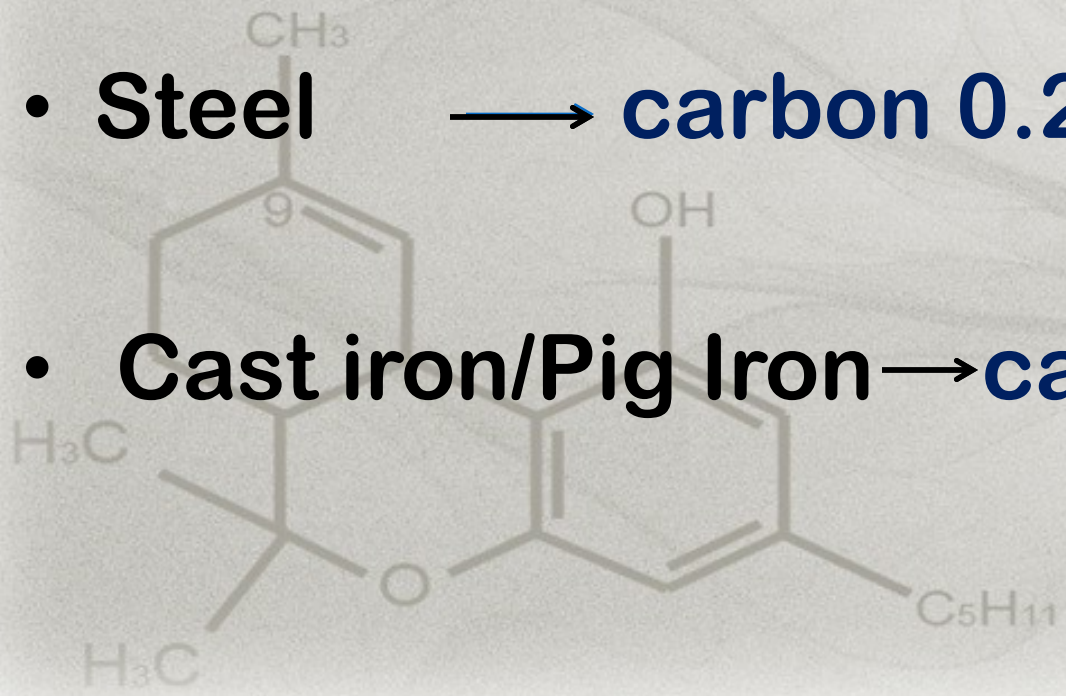
b) Cast iron

c) Wrought iron

d) All have same percentage



- Wrought iron ⟶ carbon 0.12 to 0.25%
- Steel ⟶ carbon 0.25 to 2.5%
- Cast iron/Pig Iron ⟶ carbon 2.5 to 4.5%



# 3.Which of the following has lowest percentage of carbon?

a) Steel

b) Cast iron

c) Wrought iron

d) All have same percentage

# 4. In Alumino Thermic Process, Thermite mixture contains

a) 3 parts $Fe_2O_3$ and 2 parts Al

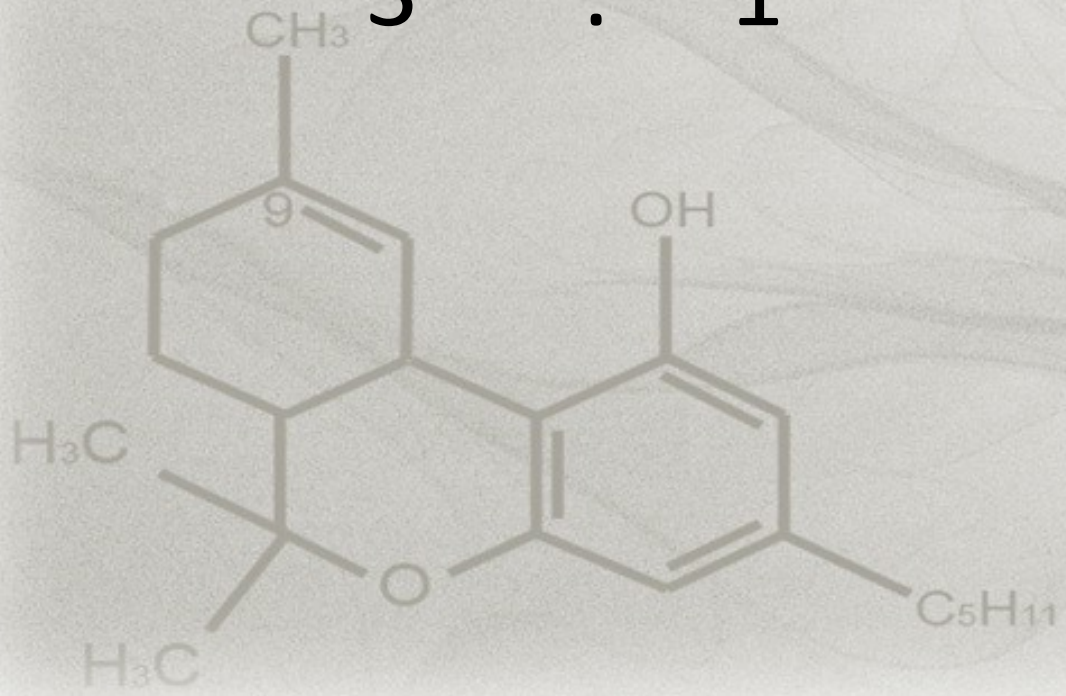
b) 3 parts $Al_2O_3$ and 4 parts Al

c) 1 part $Fe_2O_3$ and 1 part Al

d) 3 parts $Fe_2O_3$ and 1 part Al

$$Fe_2O_3 + 2Al \longrightarrow 2Fe + Al_2O_3$$

3 : 1



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c) 1 part $Fe_2O_3$ and 1 part Al

d) 3 parts $Fe_2O_3$ and 1 part Al

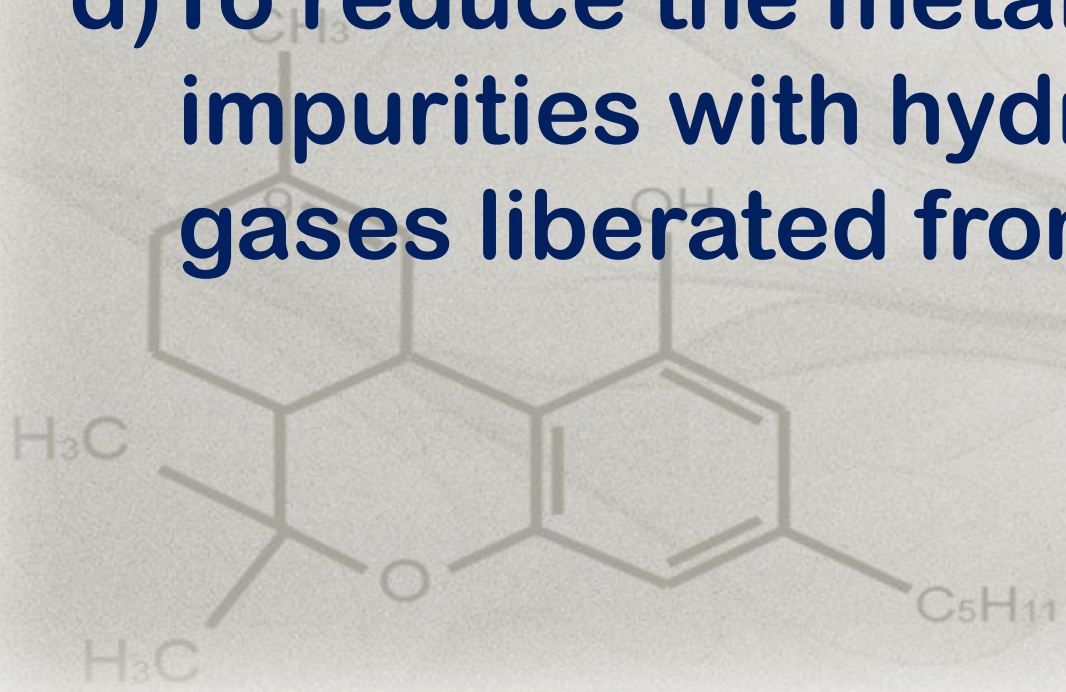
5. In order to refine blister copper, it is melted in a furnace and stirred with green logs of wood. The purpose is

a) To expel the dissolved gases present in blister copper.

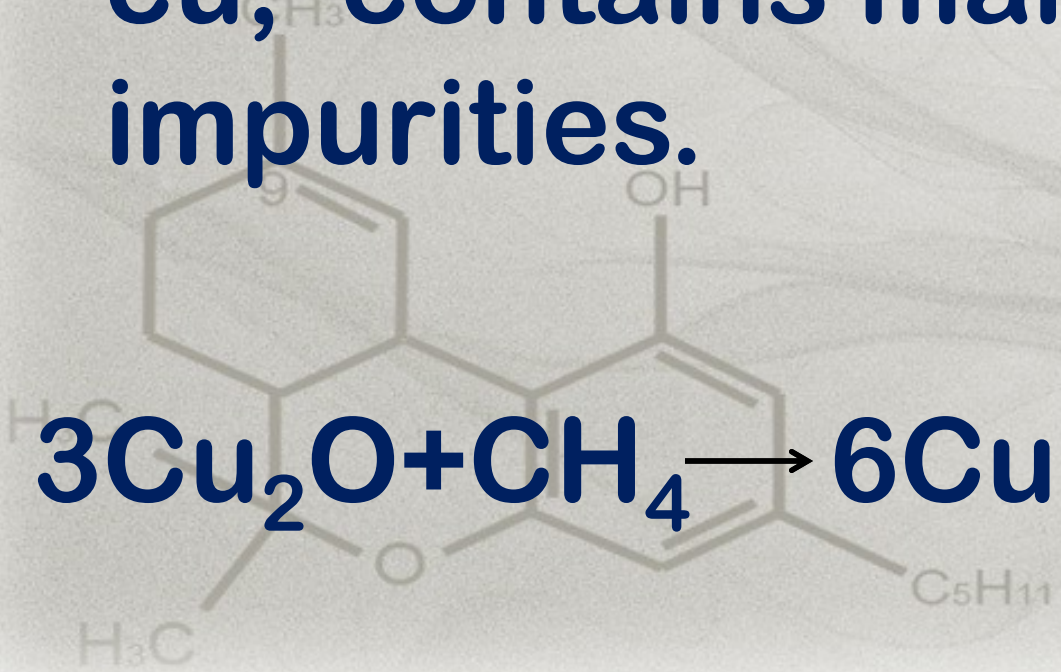
b) To bring the impurities to the surface and oxidise them.

c)To increase the carbon content of copper.

d)To reduce the metallic oxide impurities with hydrocarbon gases liberated from the wood.



Blister copper means 98% of cu, contains mainly oxide impurities.



$$3Cu_2O + CH_4 \longrightarrow 6Cu + 2H_2O + CO$$

a) To expel the dissolved gases present in blister copper.

b) To bring the impurities to the surface and oxidise them.

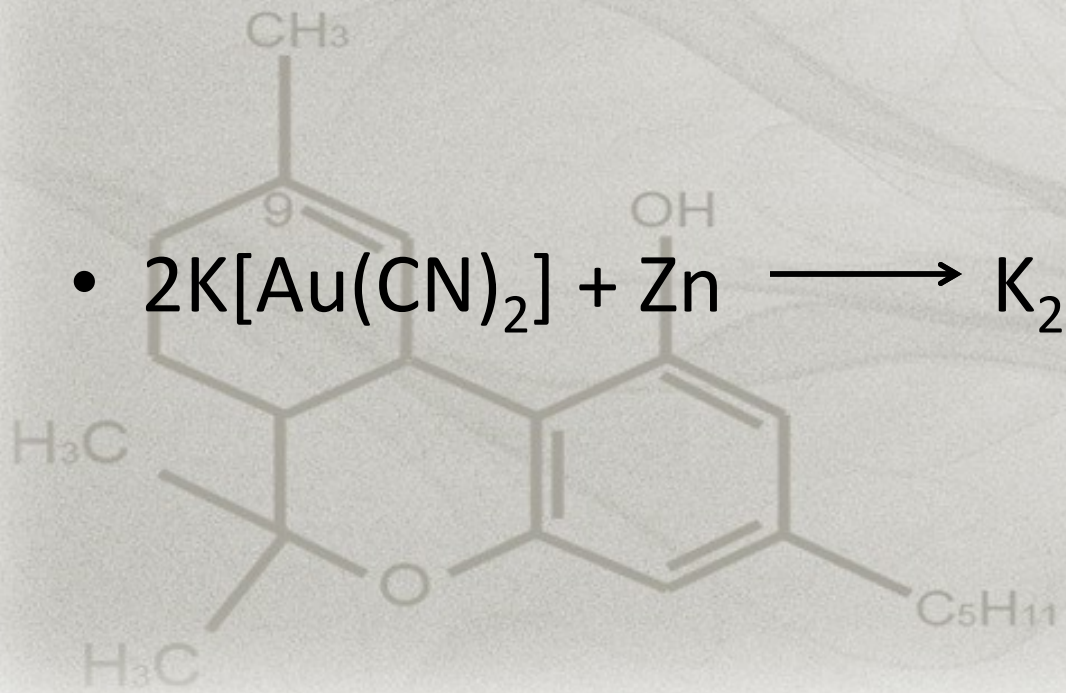
c) To increase the carbon content of copper.

d) To reduce the metallic oxide impurities with hydrocarbon gases liberated from the wood.

6. Gold is extracted by Hydrometallurgical process based on it's property

a) Of being electropositive
b) Of being less reactive
c) To form salts which are water soluble
d) To form complexes which are water soluble.

- $4Au + 8KCN + 2H_2O + O_2 \longrightarrow 4K[Au(CN)_2 + 4KOH$




- $2K[Au(CN)_2] + Zn \longrightarrow K_2[Zn(CN)_4] + Au$

# 6. Gold is extracted by Hydrometallurgical process based on it's property

a) Of being electropositive
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d) To form complexes which are water soluble.

7. In which of the following ore, calcination is not applicable

a) $CaCO_3$

b) $Al_2O_3 2H_2O$

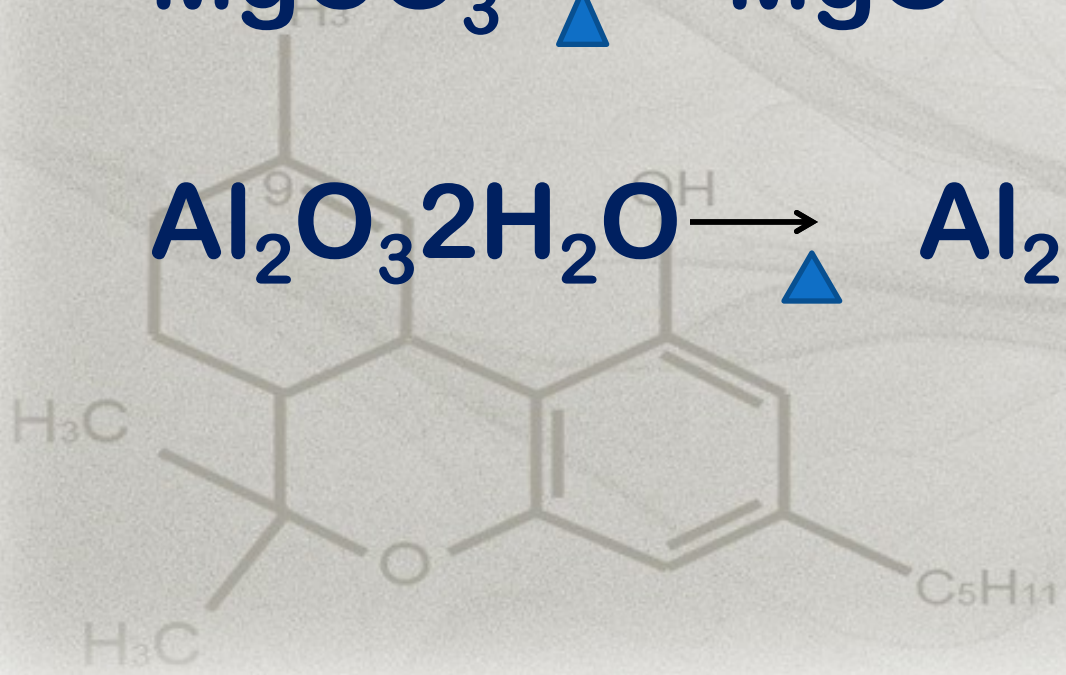
c) PbS

d) $CaCO_3MgCO_3$

$$CaCO_3 \xrightarrow{\Delta} CaO + CO_2$$

$$MgCO_3 \xrightarrow{\Delta} MgO + CO_2$$

$$Al_2O_3 2H_2O \xrightarrow{\Delta} Al_2O_3 + 2H_2O$$



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a) $CaCO_3$

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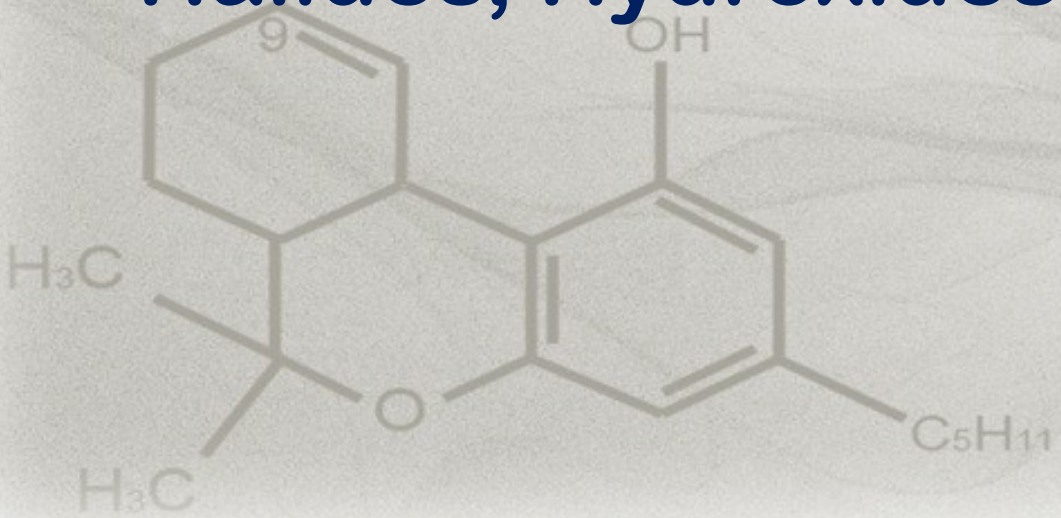
c) PbS

d) $CaCO_3MgCO_3$

8.Which of the following process is used in the extractive metallurgy of magnesium?

a) Fused salt electrolysis
b) Self reduction
c) Aqueous solution electrolysis
d) Thermite reduction

- For electropositive metals like Na, K, Ca, Mg, Al etc. are extracted by electrolysis of fused salts like Halides, Hydroxides  oxides etc.



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# Atomic structure

- Constituents of atom
- Electromagnetic spectrum
- Plank's quantum theory of radiation
- Line or atomic spectrum
- Bohr's atomic model and its limitations
- Dual nature of electron
- Quantum numbers and Shape of orbital
- Rules for writing the electronic configuration of elements.

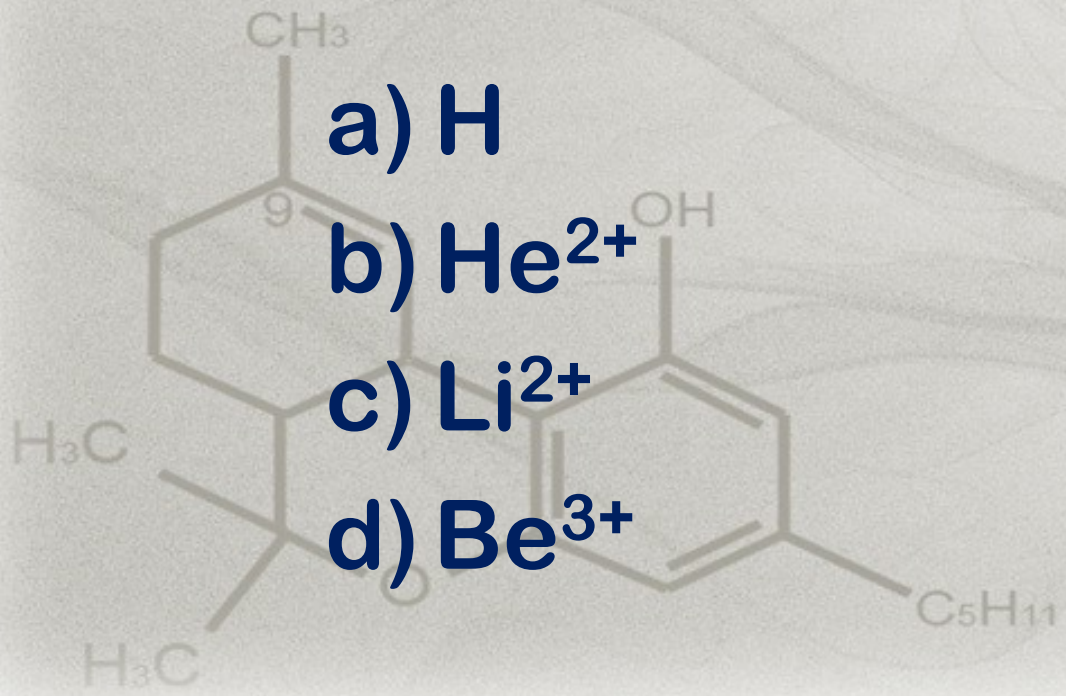
9. For which of the following species, Bohr's theory is not applicable?

a) H

b) $He^{2+}$

c) $Li^{2+}$

d) $Be^{3+}$

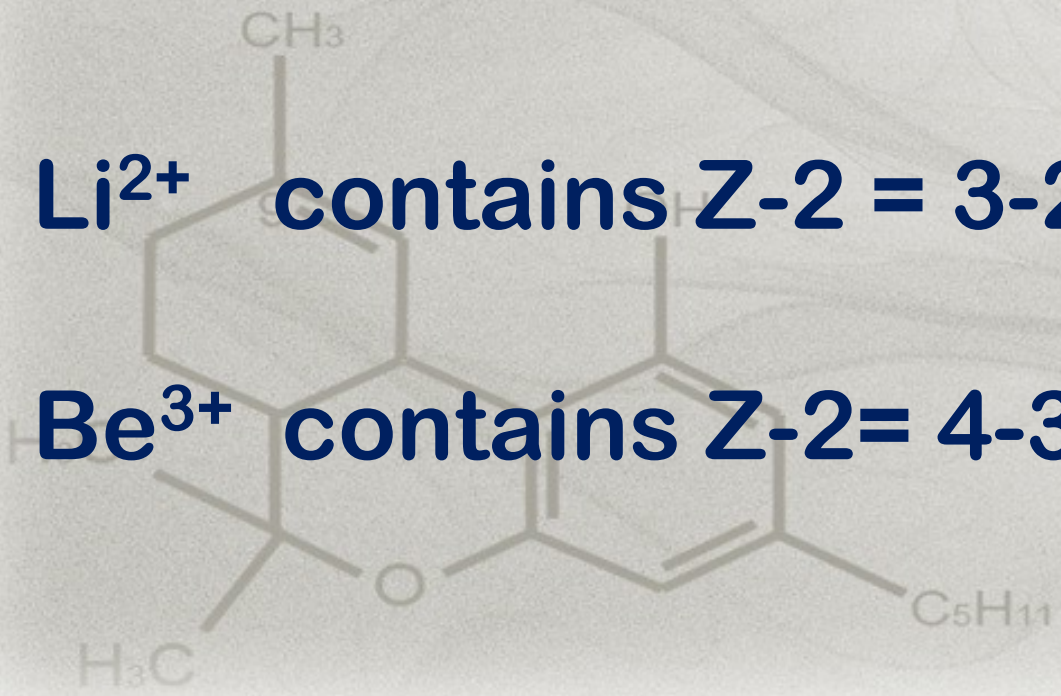


H contains Z=1 electron

$He^{2+}$ contains Z-2 = 2-2 = 0 electron

$Li^{2+}$ contains Z-2 = 3-2 = 1 electron

$Be^{3+}$ contains Z-2= 4-3 = 1 electron



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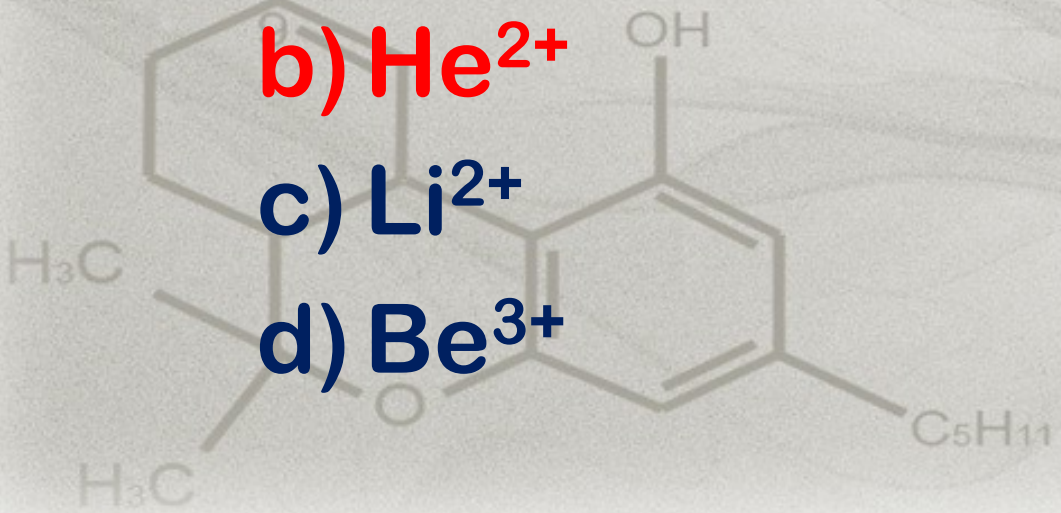


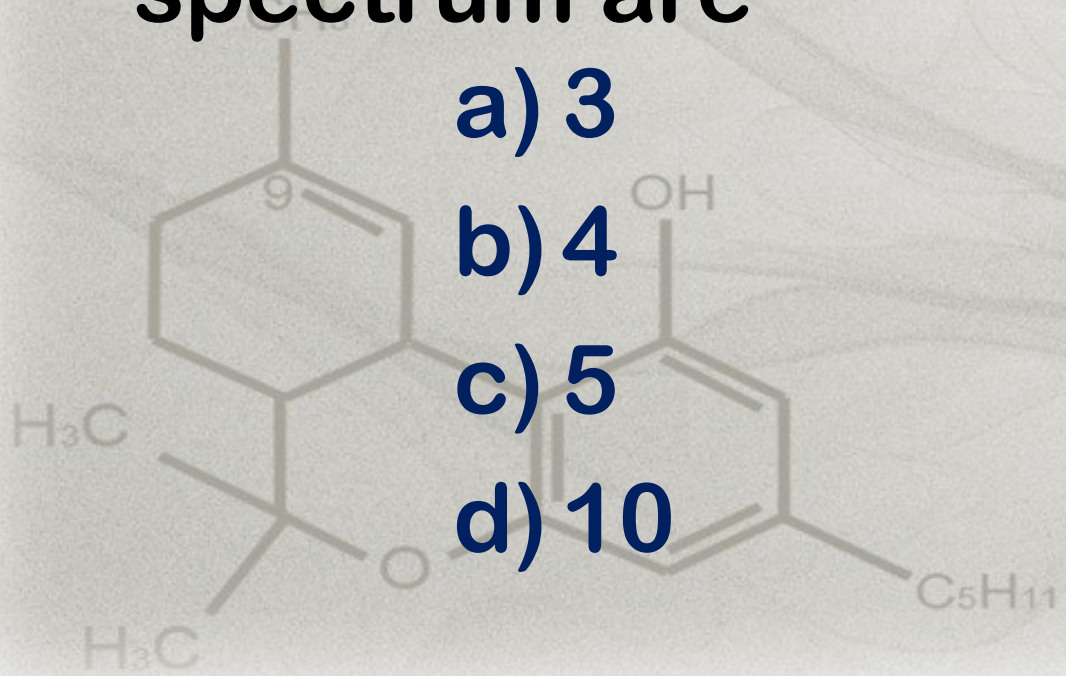
10. Number of visible lines observed when an electron jumps back from 5$^{th}$ orbit to ground state hydrogen spectrum are

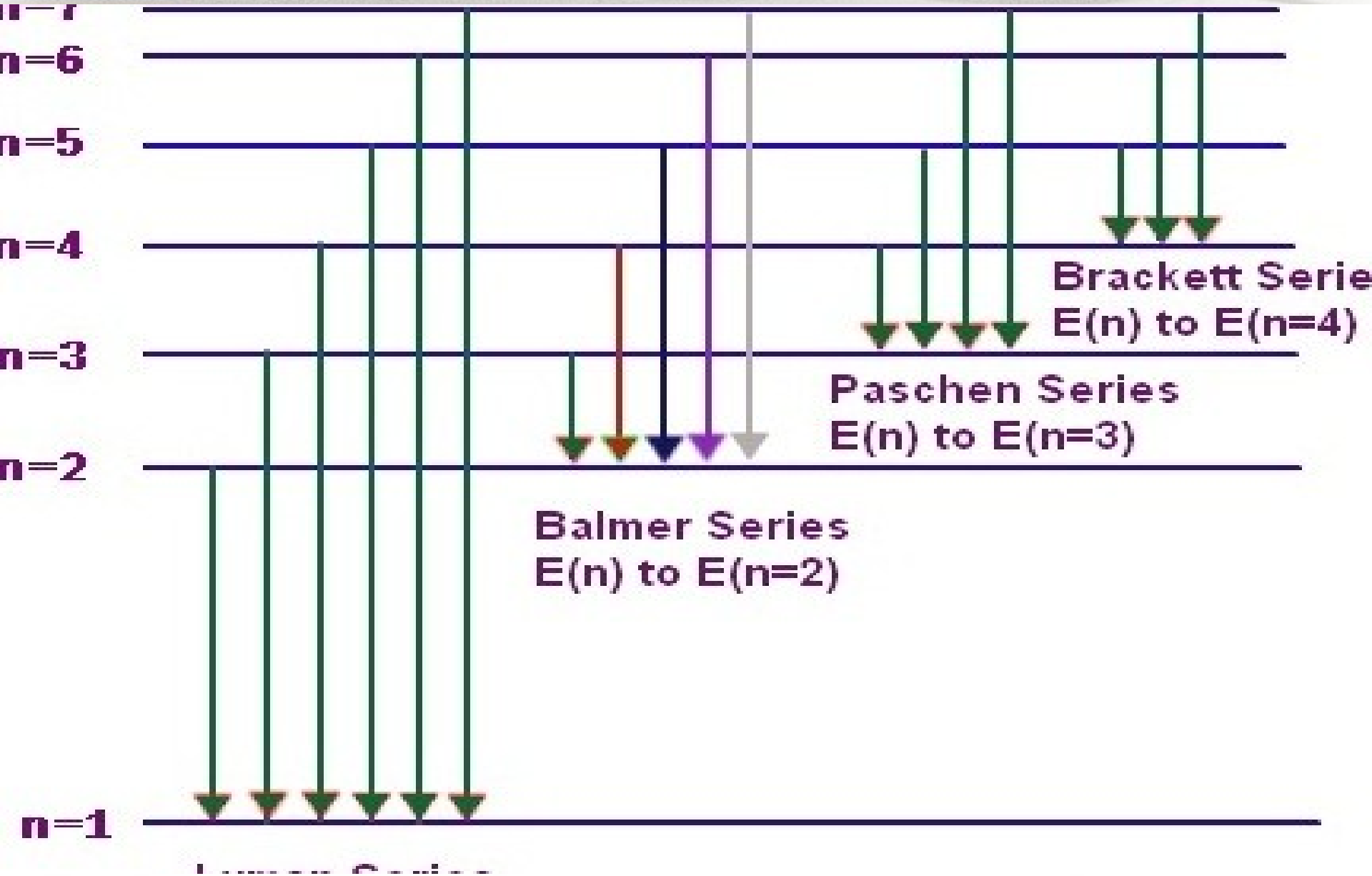
a) 3

b) 4

c) 5

d) 10




n=6
n=5
n=4
n=3
n=2
n=1
Brackett Serie
E(n) to E(n=4)
Paschen Series
E(n) to E(n=3)
Balmer Series
E(n) to E(n=2)

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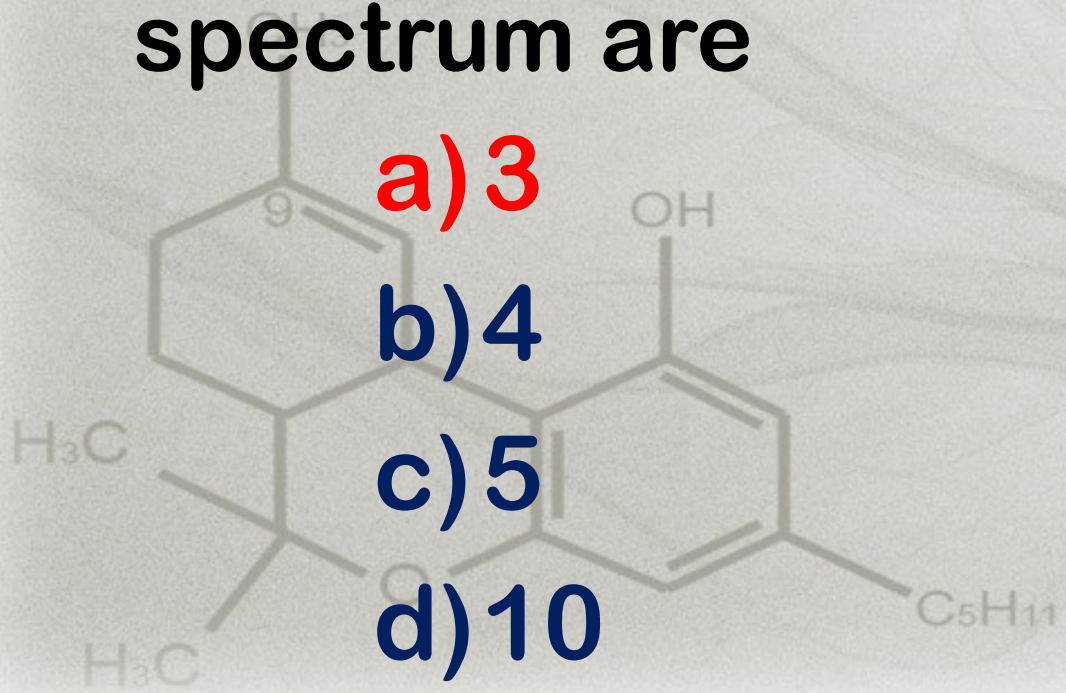


11. Which of the following electron transitions in a hydrogen atom will require large amount of energy?

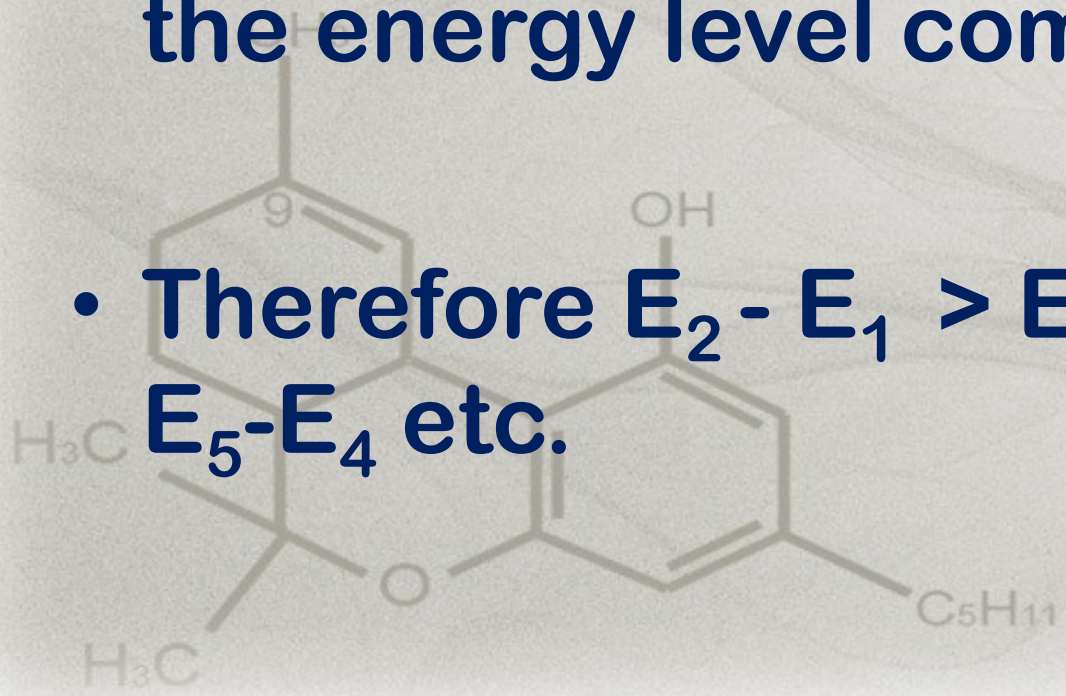
a) From n=1 to n=2

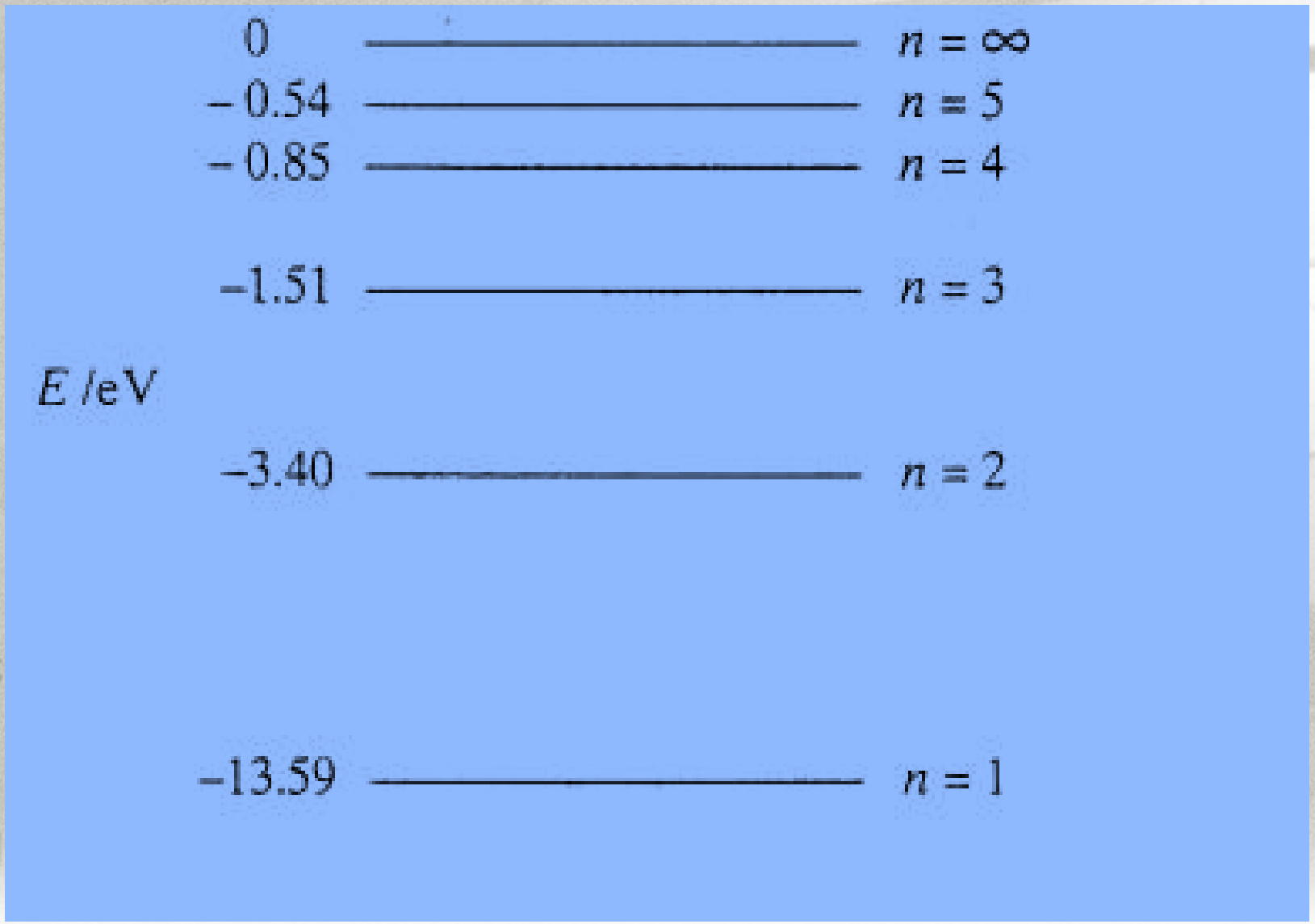
b) From n=2 to n=3

c) From n=∞ to n=1

d) From n=3 to n=4

- As we go away from the nucleus, the energy level comes closer.
- Therefore $E_2 - E_1 > E_3 - E_2 > E_4 - E_3 > E_5 - E_4$ etc.




0
n = ∞
−0.54
n = 5
−0.85
n = 4
−1.51
n = 3
E /eV
−3.40
n = 2
−13.59
n = 1

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12. The wave length of radiation emitted, when in a H atom electron falls from infinity to stationary state-1 would be (R =1.097X10$^{7}$ m$^{-1}$)

a) 406nm
b) 192nm
c) 91nm
d) 9.1X10$^{-8}$nm

$$\frac{1}{\lambda} = R\left(\frac{1}{n_1^2} - \frac{1}{n_2^2}\right)$$

$$= 1.097 \times 10^7 \left(\frac{1}{1} - \frac{1}{\infty}\right) m^{-1}$$

$$= 1.097 \times 10^7 (1-0) m^{-1}$$

$$= 1.097 \times 10^7 m^{-1}$$

$$\lambda = \frac{1}{1.097 \times 10^7}$$

$$= 0.91 \times 10^{-7} m$$

$$= 91 \times 10^{-9} m \quad = 91 nm$$

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c) 91nm
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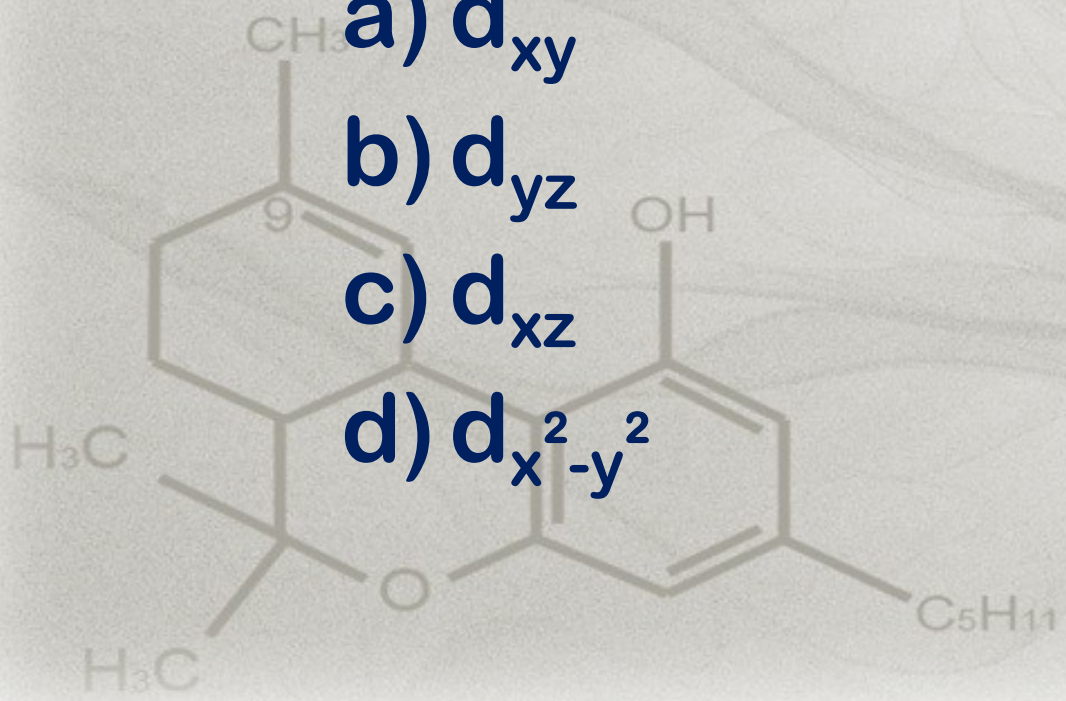
# 13. Which d orbital has lobes directed along the axis?

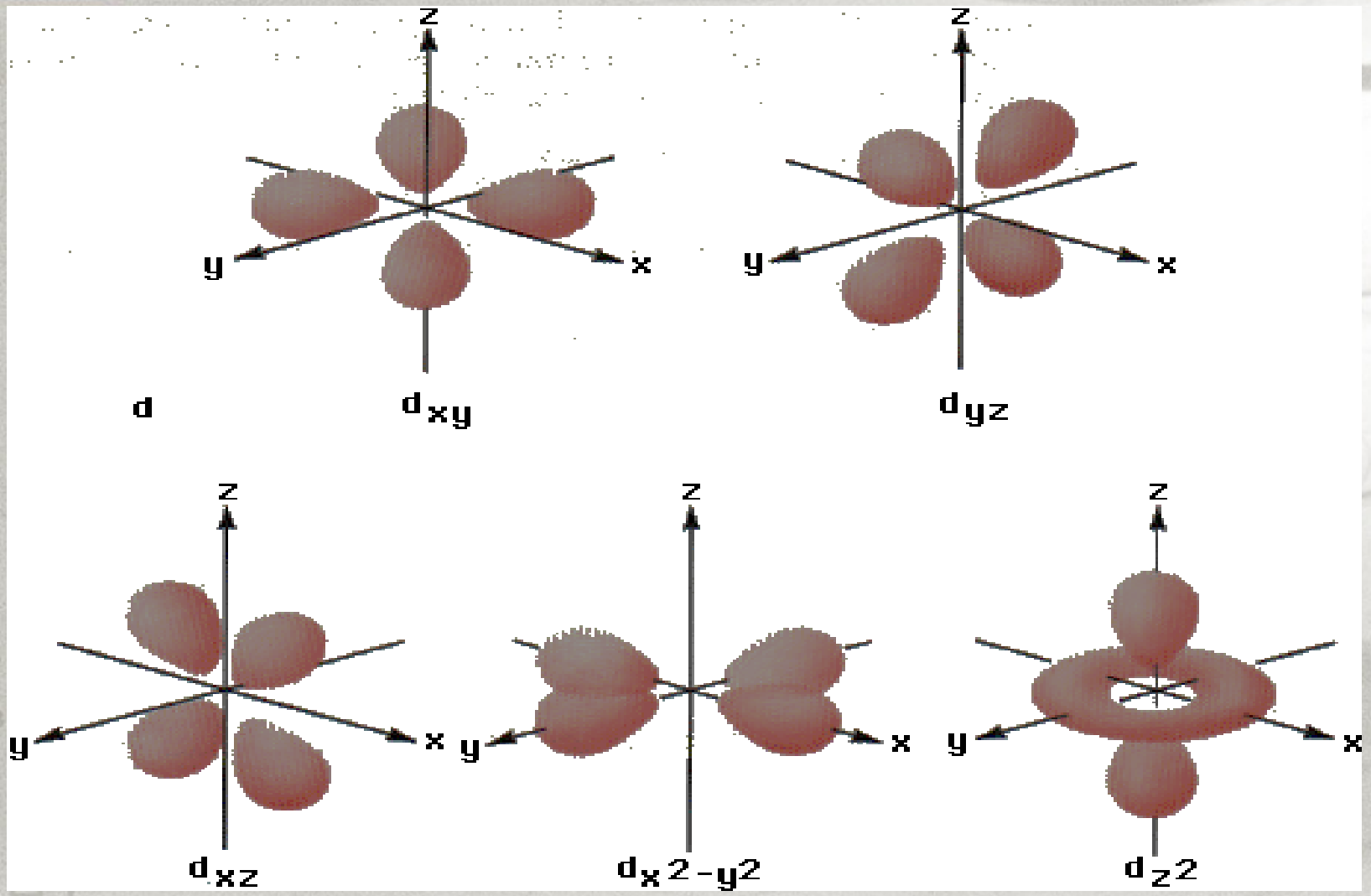
a) $d_{xy}$

b) $d_{yz}$

c) $d_{xz}$

d) $d_{x^2-y^2}$




z
y
x
d
$d_{xy}$
$d_{yz}$
$d_{xz}$
$d_{x^2-y^2}$
$d_{z^2}$

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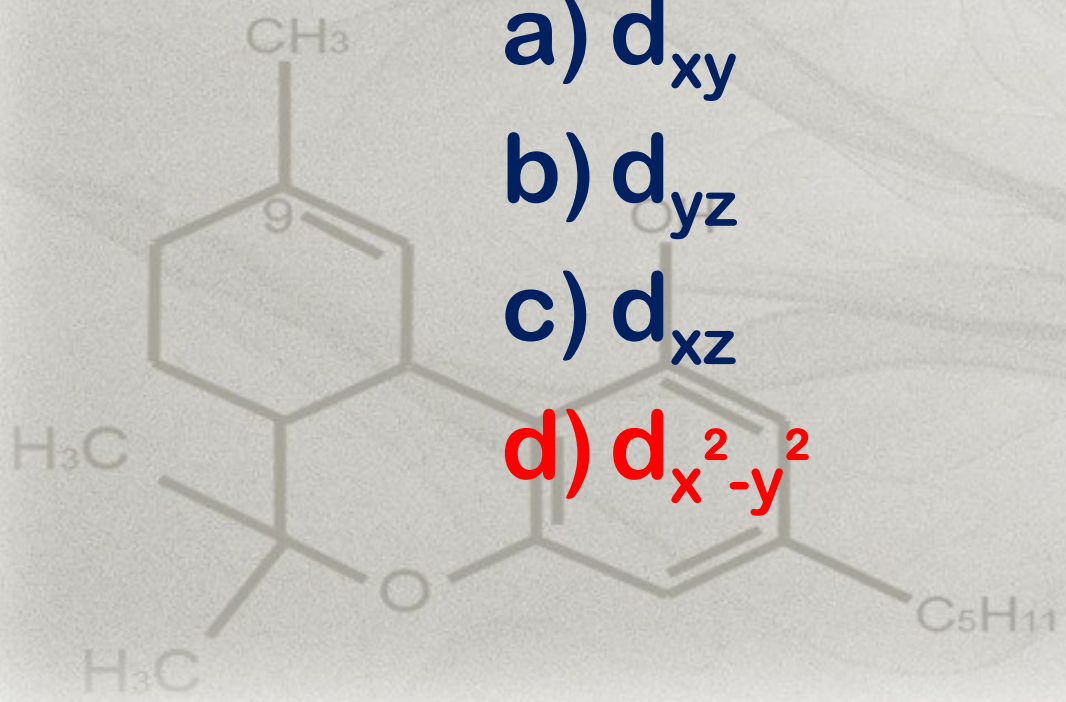



a) $d_{xy}$

b) $d_{yz}$

c) $d_{xz}$

d) $d_{x^2-y^2}$

14. Consider the ground state of Cr atom(z=24). The number of electrons with the azimuthal quantum number l=1 and l=2 are respectively

a) 16 and 4
b) 12 and 5
c) 12 and 4
d) 16 and 5

- Electronic configuration of Cr(Z=24)
  is $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 4s^1\ 3d^5$
- when l=1, it is p sub shell
  so 6+6=12 electrons
- When l=2, it is d sub shell
  so 5 electrons

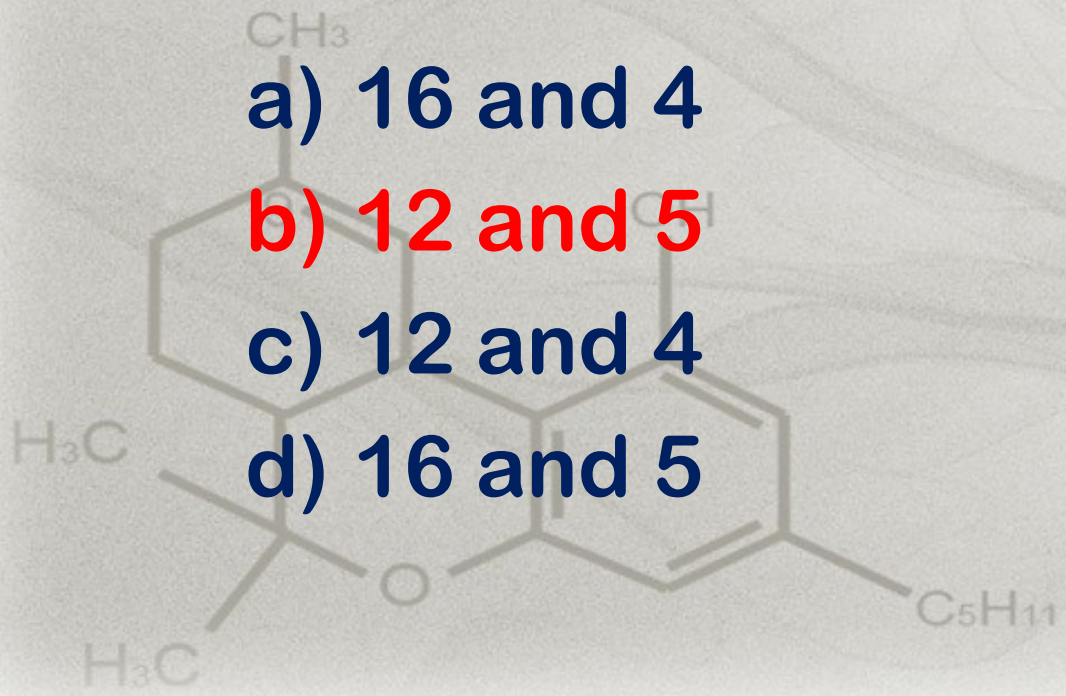
14. Consider the ground state of Cr atom(z=24). The number of electrons with the azimuthal quantum number l=1 and l= 2 are respectively

a) 16 and 4

b) 12 and 5

c) 12 and 4

d) 16 and 5



15. What is the wave length associated with an electron moving with velocity of $10^6$ m/s (Given h=6.63X$10^{-34}$Js and m=9.11X$10^{-31}$Kg)

a) 7.27nm

b) 72.7nm

c) 0.727nm

d) None of the above

$$\lambda = \frac{h}{mv}$$

$$\lambda = \frac{6.63X10^{-34}\ Kgm^2S^{-1}}{9.11X10^{-31}KgX10^{6}m/s}$$

$$= 0.728X10^{-9}\ m$$

$\lambda$ = **0.728** nm

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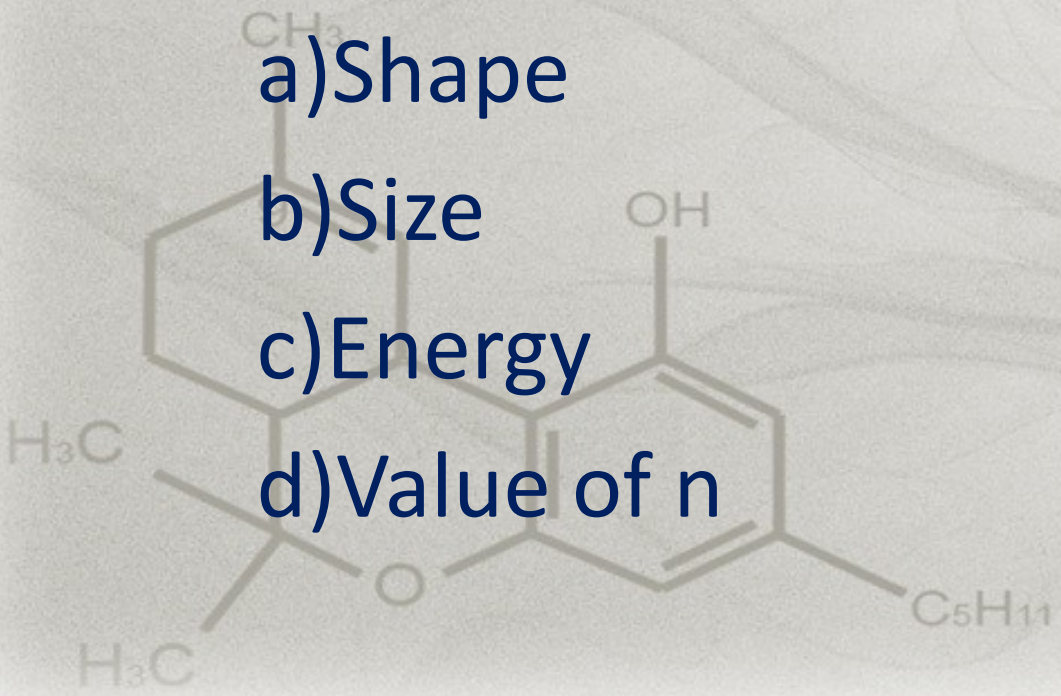
16.There is no difference between 2p and 3p orbital regarding

a)Shape

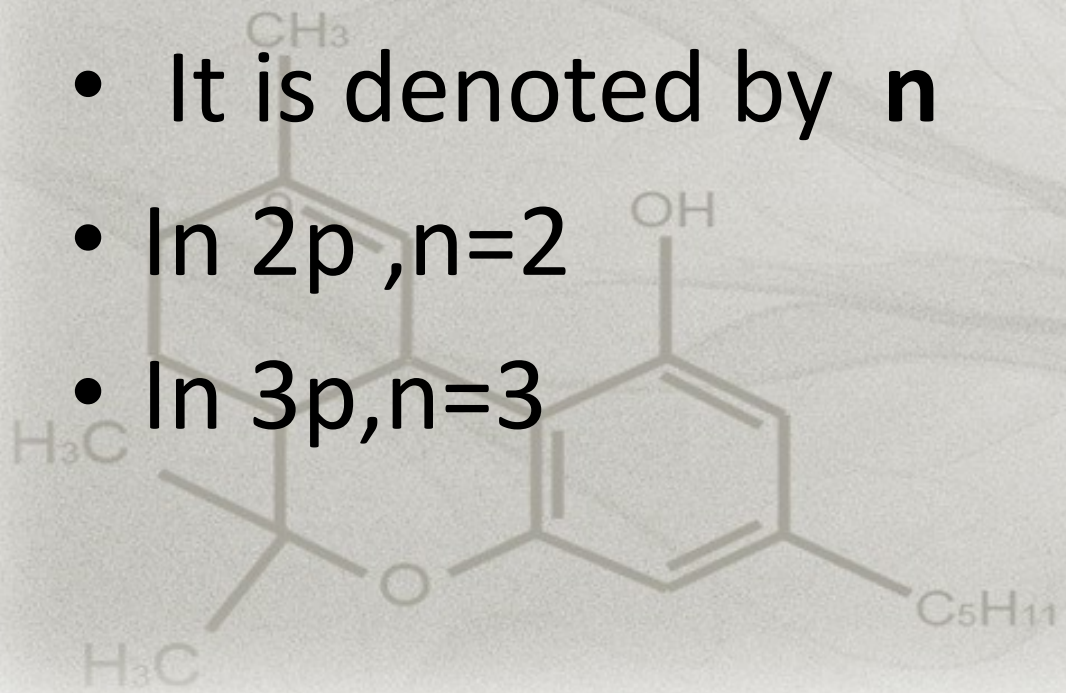
b)Size

c)Energy

d)Value of n



- The principal quantum number gives **energy** and **size** of orbit.
- It is denoted by **n**
- In 2p ,n=2
- In 3p,n=3



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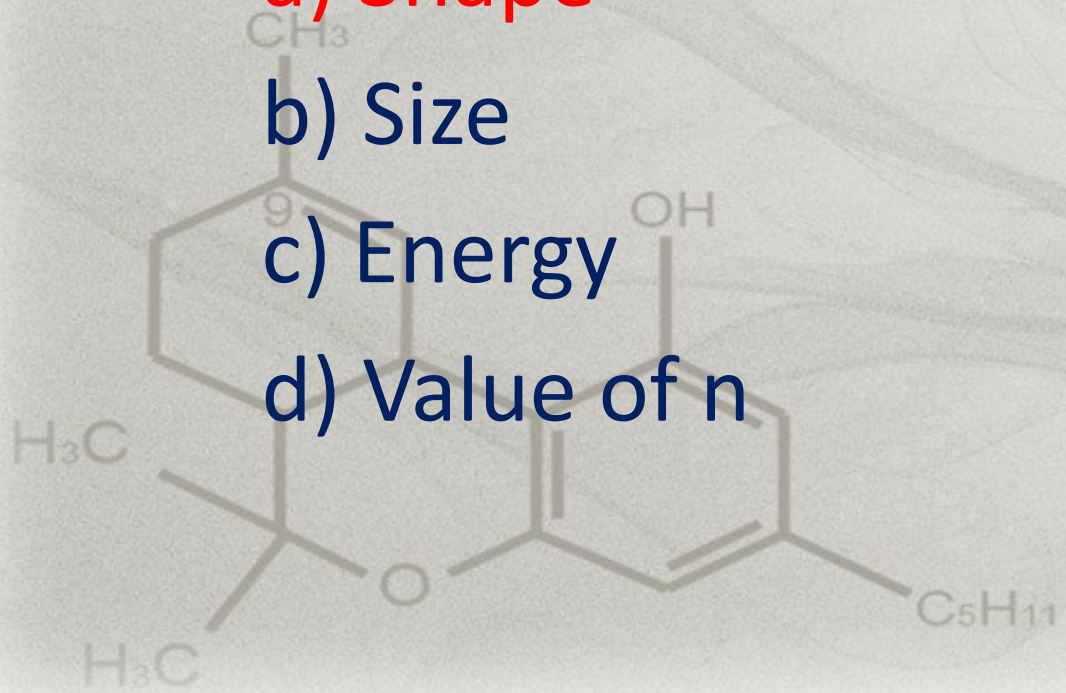


# Oxidation number

- Electronic concept of oxidation and reduction
- Calculation of Oxidation number by some arbitrary rules
- Exceptional cases of Oxidation numbers
- Redox reactions
- How to balance redox reaction?
- Calculation of equivalent mass of an oxidising and redusing agents.

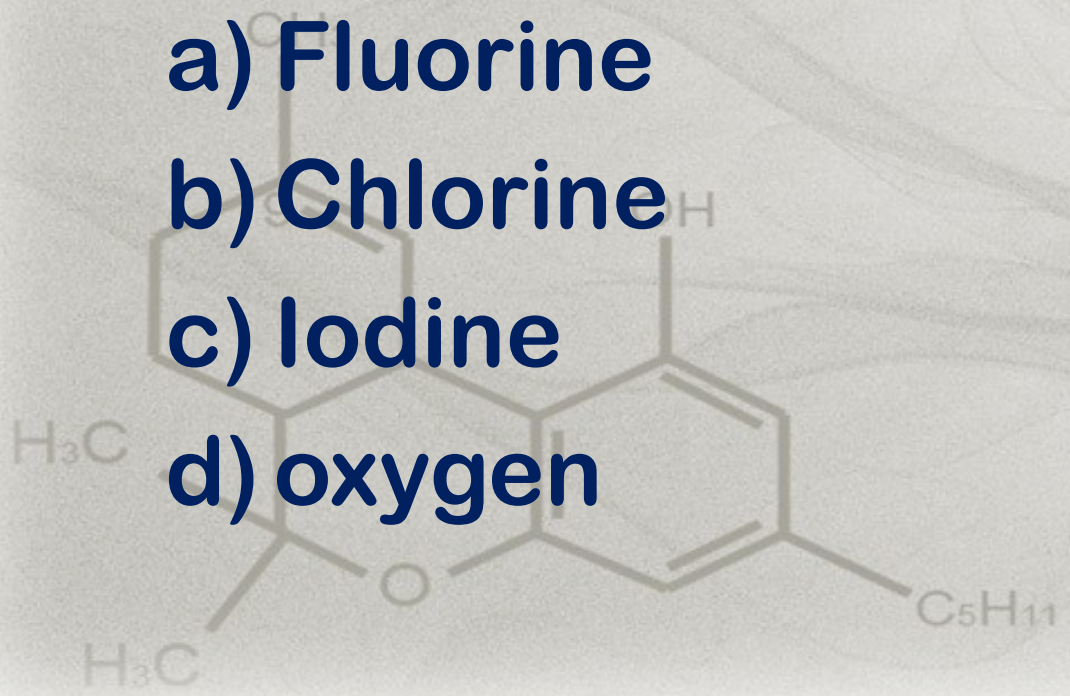
17. Oxidation is removal of electrons.Therefore strongest oxidizer is

a) Fluorine

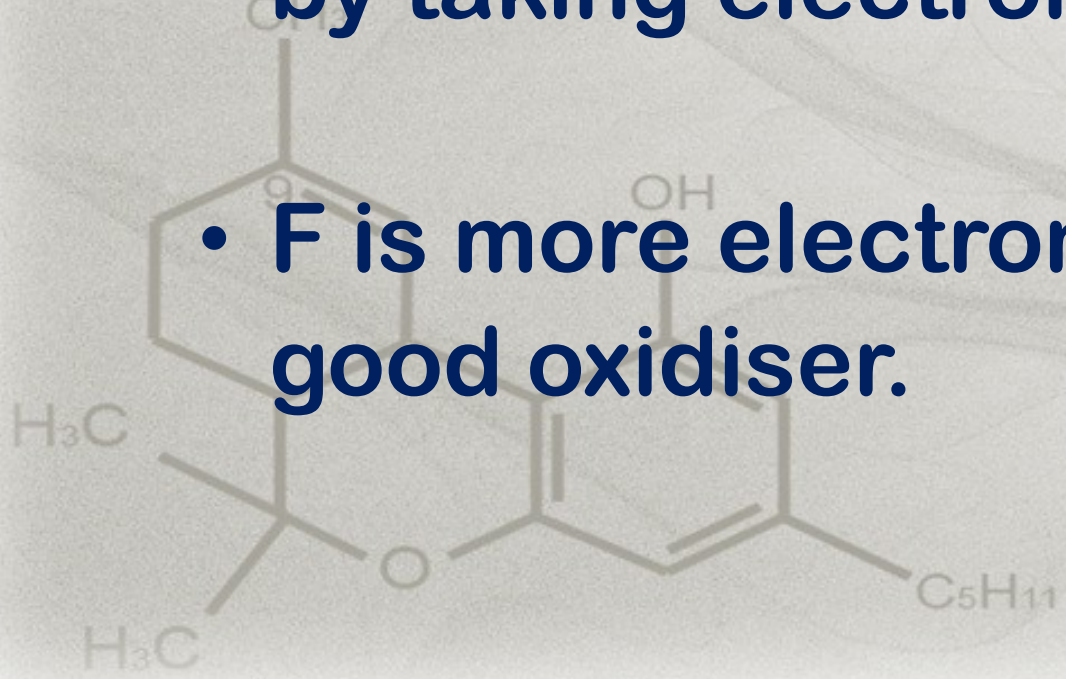
b) Chlorine

c) Iodine

d) oxygen



- Oxidiser helps for oxidation by taking electrons.
- F is more electronegative so good oxidiser.



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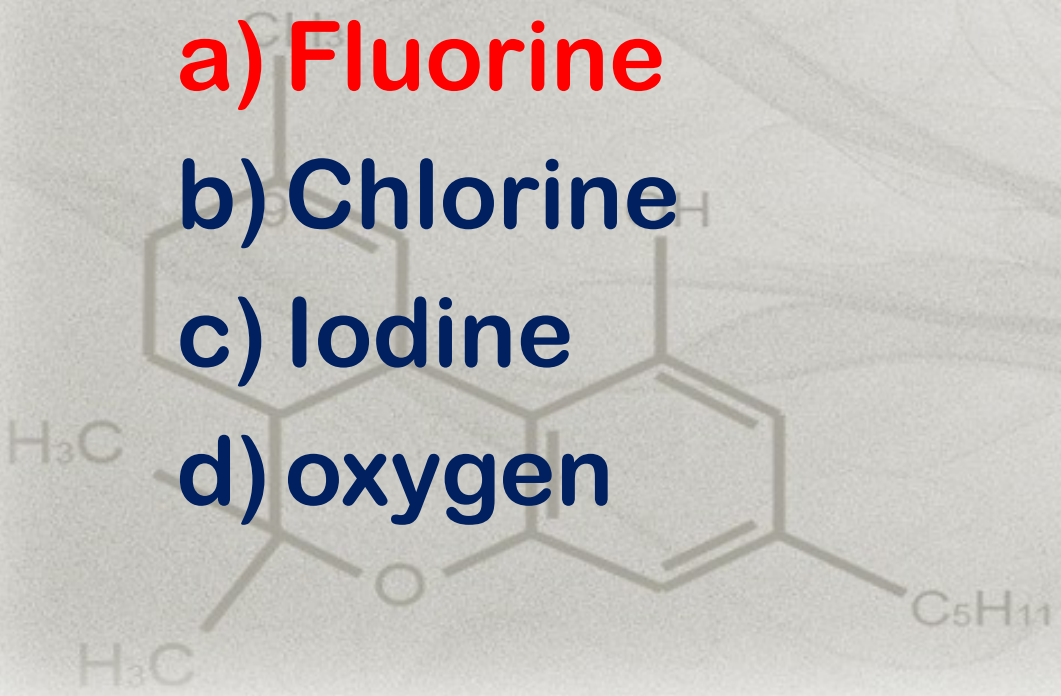


18. The oxidation number and electronic configuration of sulphur in $H_2SO_4$ is

a) +4 : $1s^2\ 2s^2\ 2p^6\ 3s^2$

b) +6 : $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^4$

c) +3 : $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^1$

d) +6 : $1s^2\ 2s^2\ 2p^6$

- O.N of S in $H_2SO_4$ is

  $2(+1)+1(x)+4(-2)=0$
- Therefore x=+6
- In +6 state, S has Z-6=16-6=10 electrons.
- Therefore $1s^2\ 2s^2\ 2p^6$

18. The oxidation number and electronic configuration of sulphur in $H_2SO_4$ is

a) +4 : $1s^2\ 2s^2\ 2p^6\ 3s^2$

b) +6 : $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^4$

c) +3 : $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^1$

d) +6 : $1s^2\ 2s^2\ 2p^6$

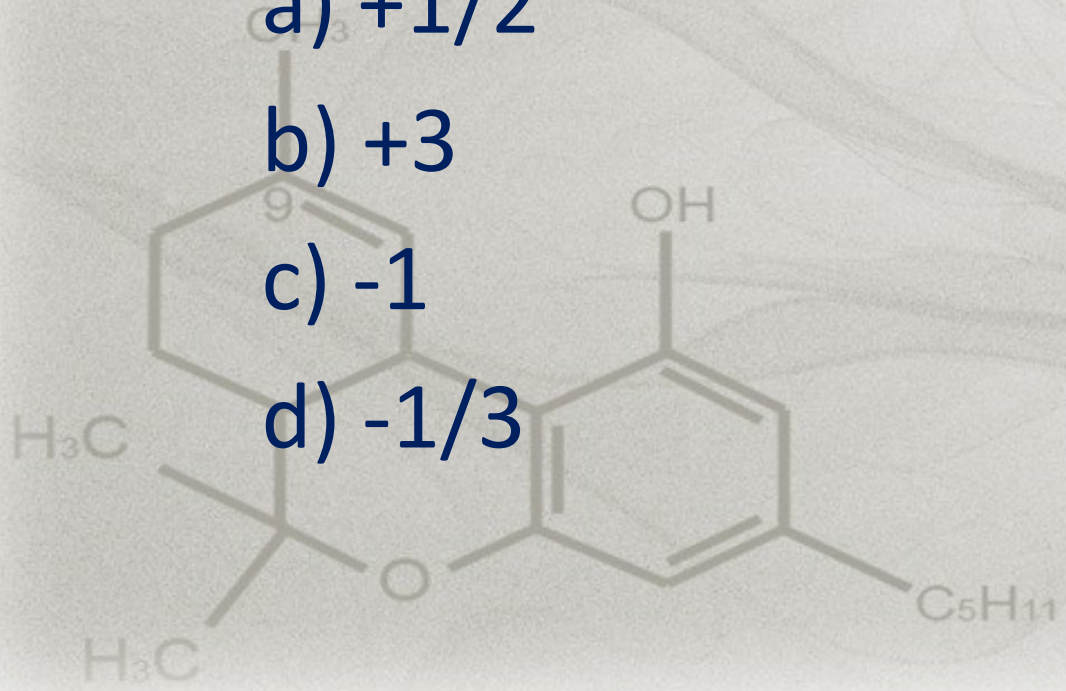
19.The oxidation number of nitrogen in $N_3H$ is

a) +1/2

b) +3

c) -1

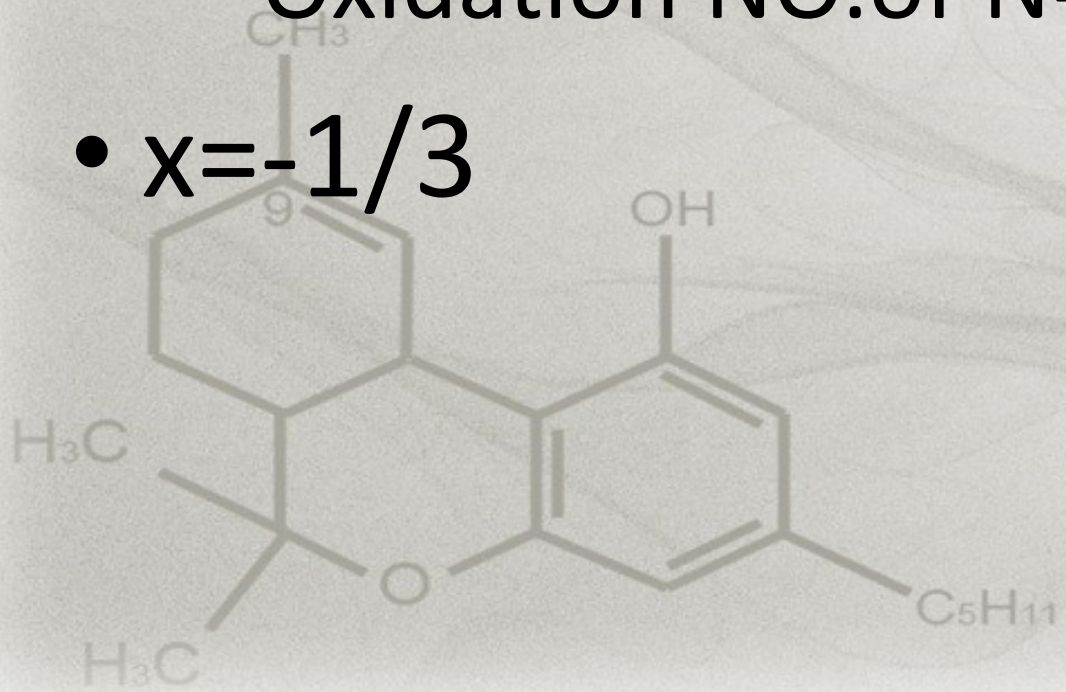
d) -1/3



- In $N_3H$,

  Oxidation NO.of N= 3(x)+1(+1)=0:

- x=-1/3



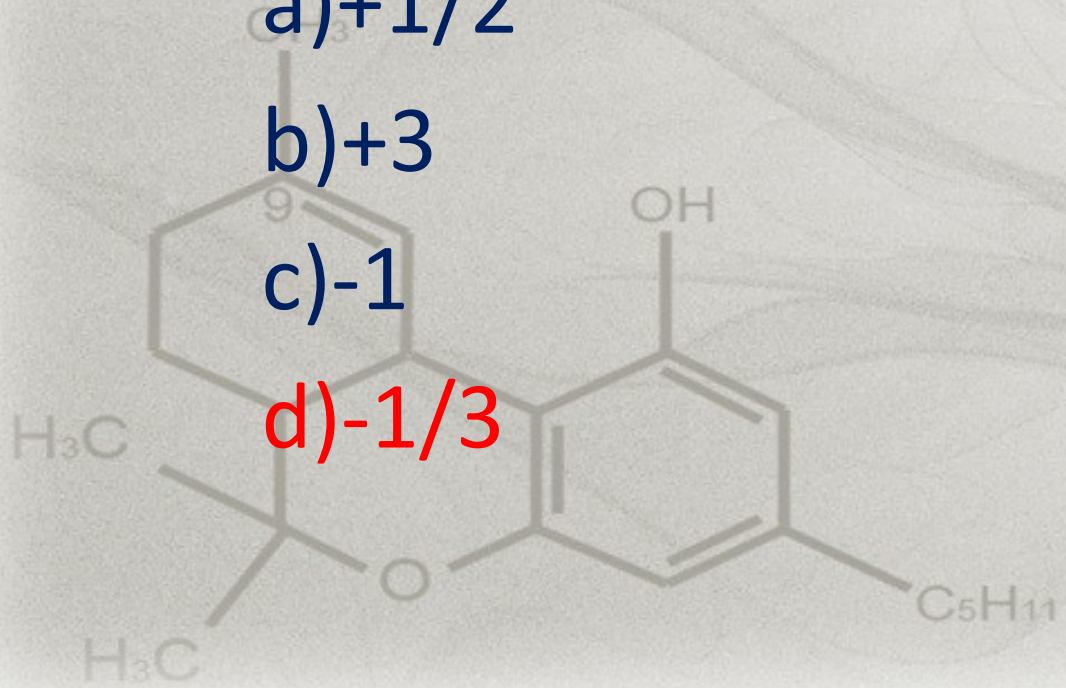
19.The oxidation number of nitrogen in $N_3H$ is

a)+1/2

b)+3

c)-1

d)-1/3



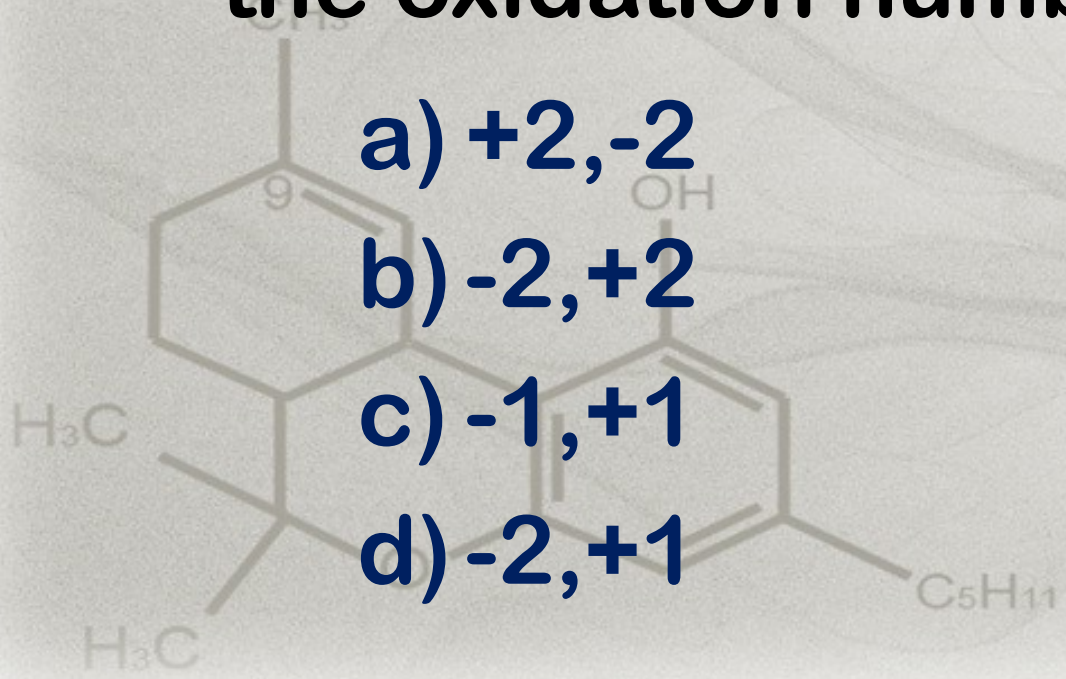
20. On the basis of structure, two Cl atoms in bleaching powder have the oxidation number respectively

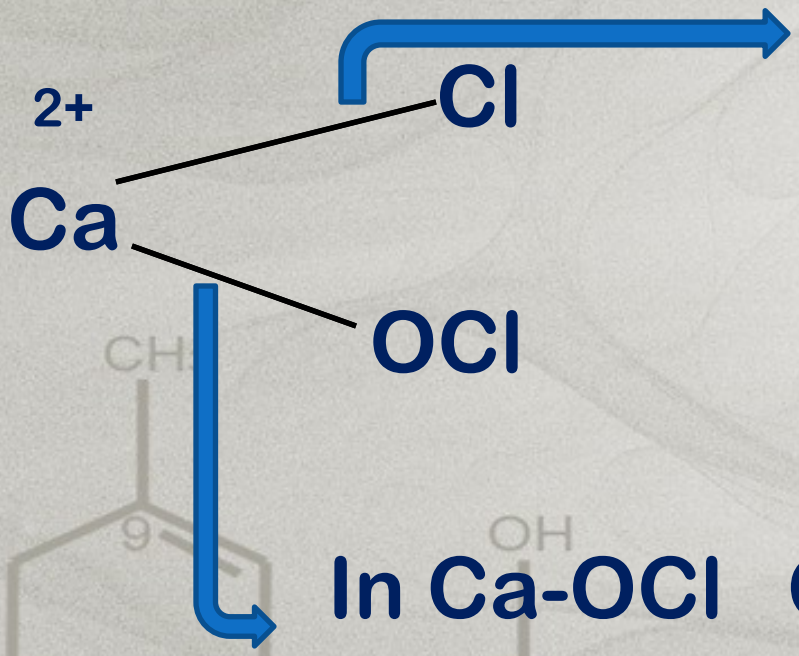
a) +2,-2

b) -2,+2

c) -1,+1

d) -2,+1






In Ca-Cl O.N of is

In Ca-OCl O.N of Cl is -2+x=-1

Therefore x=+1

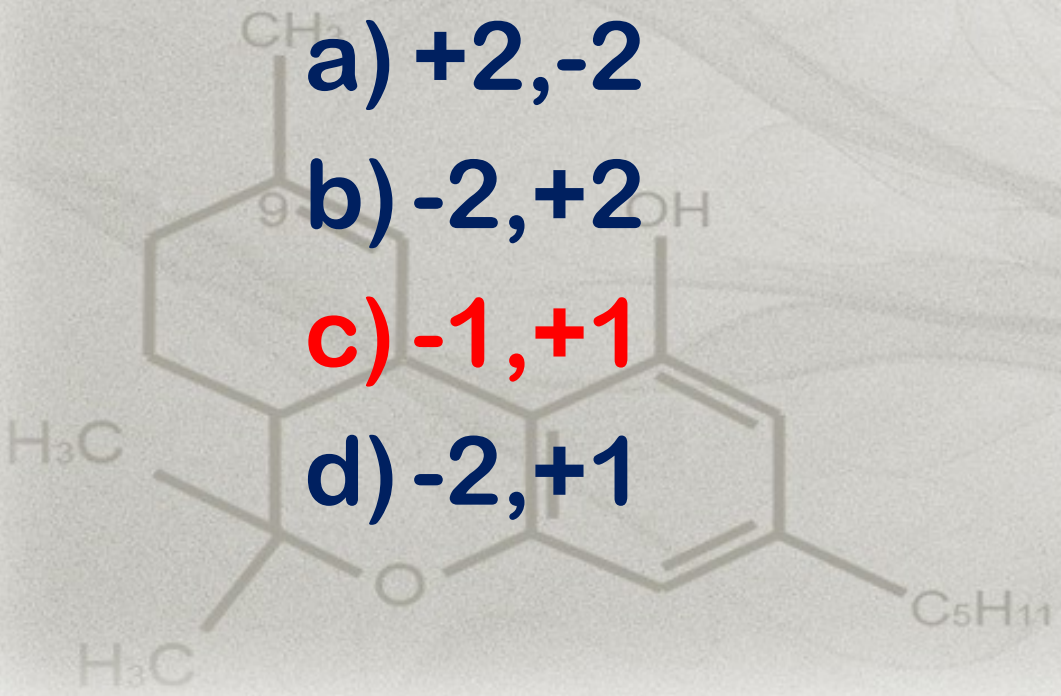
20. On the basis of structure, two Cl atoms in bleaching powder have the oxidation number respectively

a) +2,-2

b) -2,+2

c) -1,+1

d) -2,+1



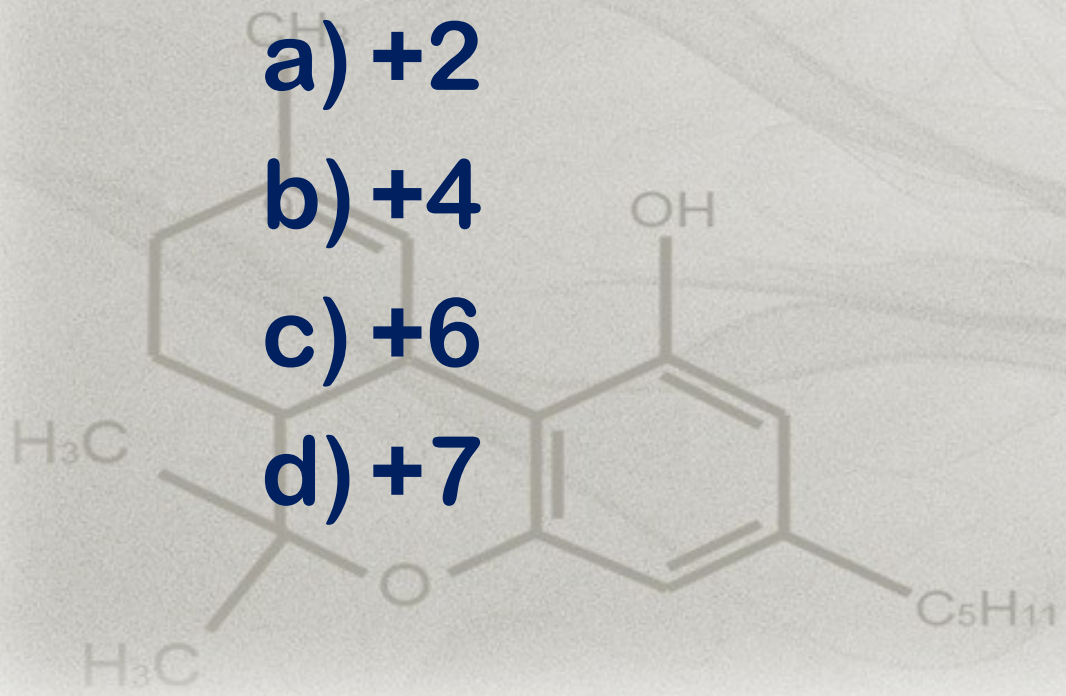
21. Oxidation number of S in $H_2S_2O_8$ is

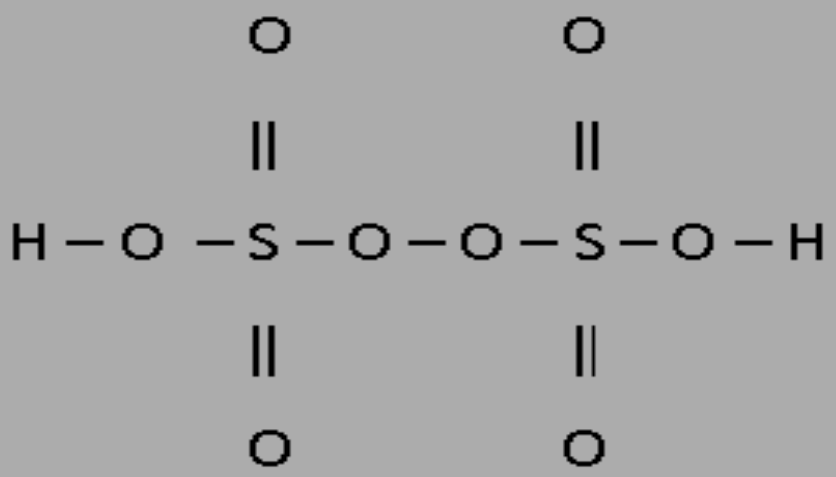
a) +2

b) +4

c) +6

d) +7





- Here 2 oxygen atoms shows peroxide linkage hence their oxidation number is -1.
- 2(+1) + 2(x) + 2(-1) +6(-2) =0

  H atom S atom O – O linkage O atom

  Therefore x=+6

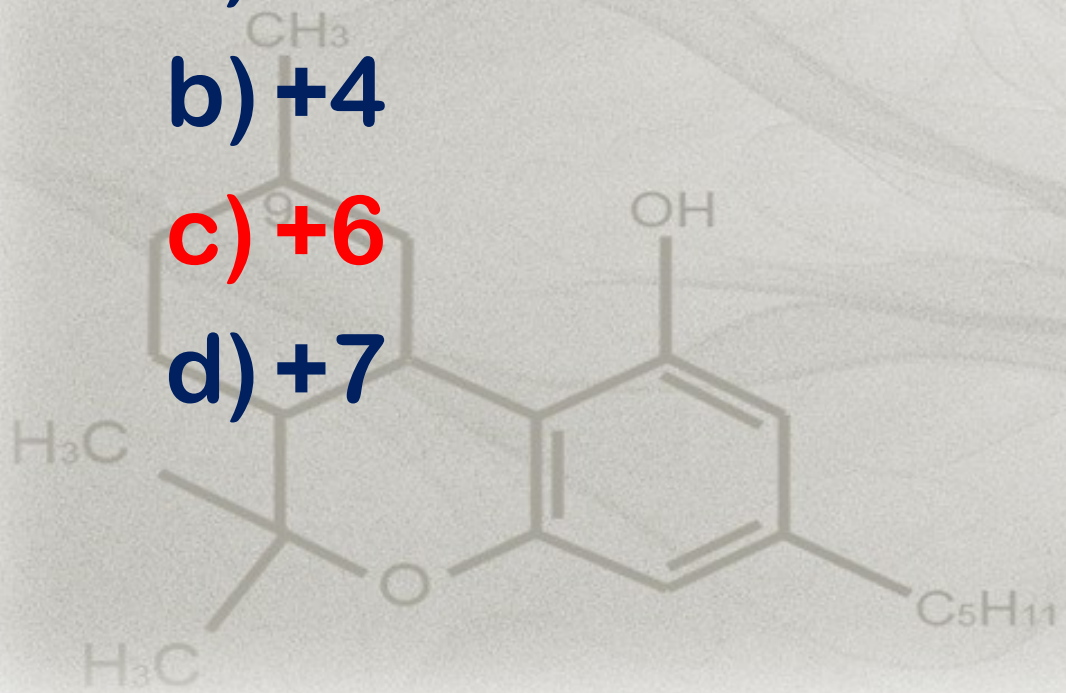
21. Oxidation number of S in $H_2S_2O_8$ is

a) +2

b) +4

c) +6

d) +7



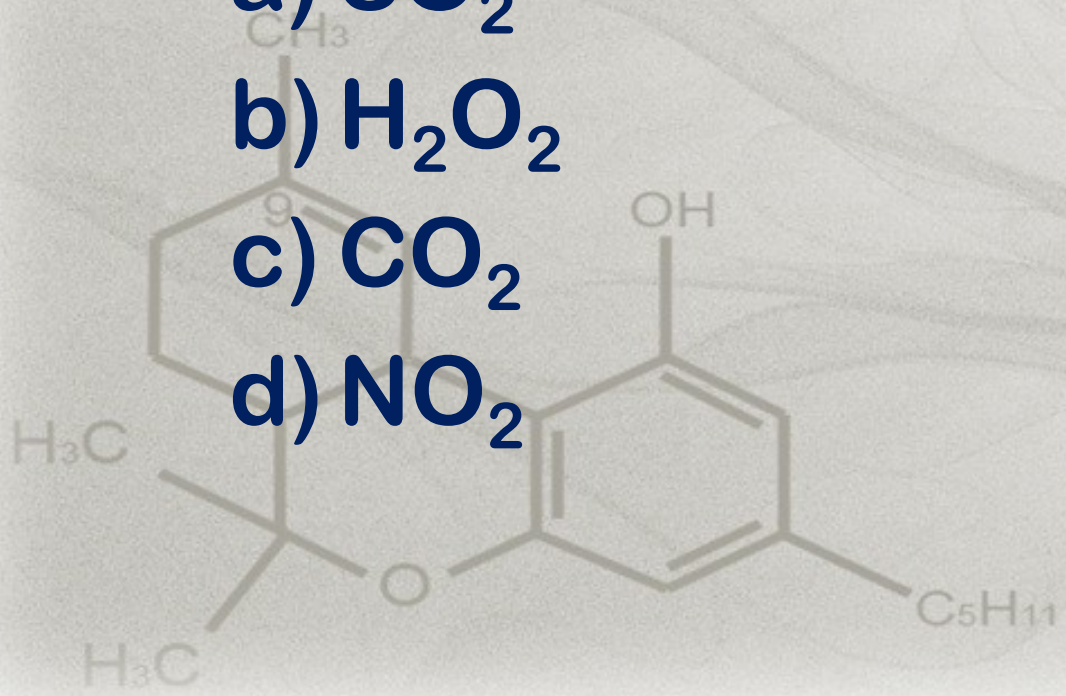
22. Which of the following is not a reducing agent?

a) $SO_2$

b) $H_2O_2$

c) $CO_2$

d) $NO_2$



- In reducing agent element is in lowest possible oxidation states. During reduction it gives electrons to enter highest oxidation number.
- O.N of S in $SO_2$ = +4
- O.N of O in $H_2O_2$ = -1
- O.N of C in $CO_2$ = +4
- O.N of N in $NO_2$ = +4

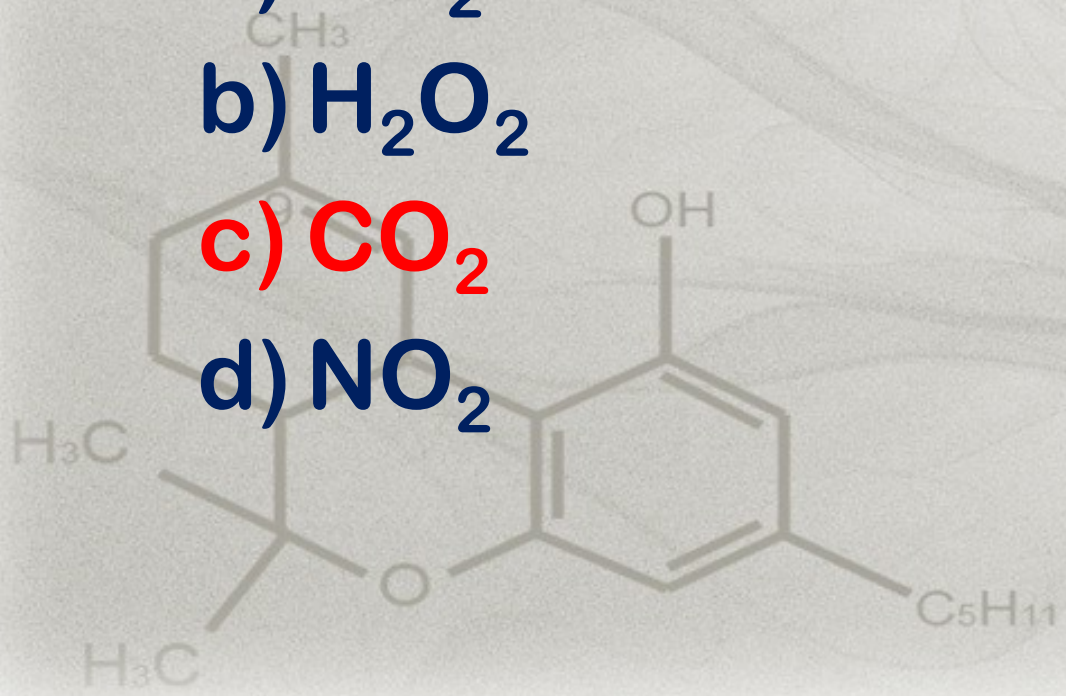
22. Which of the following is not a reducing agent?

a) $SO_2$

b) $H_2O_2$

c) $CO_2$

d) $NO_2$



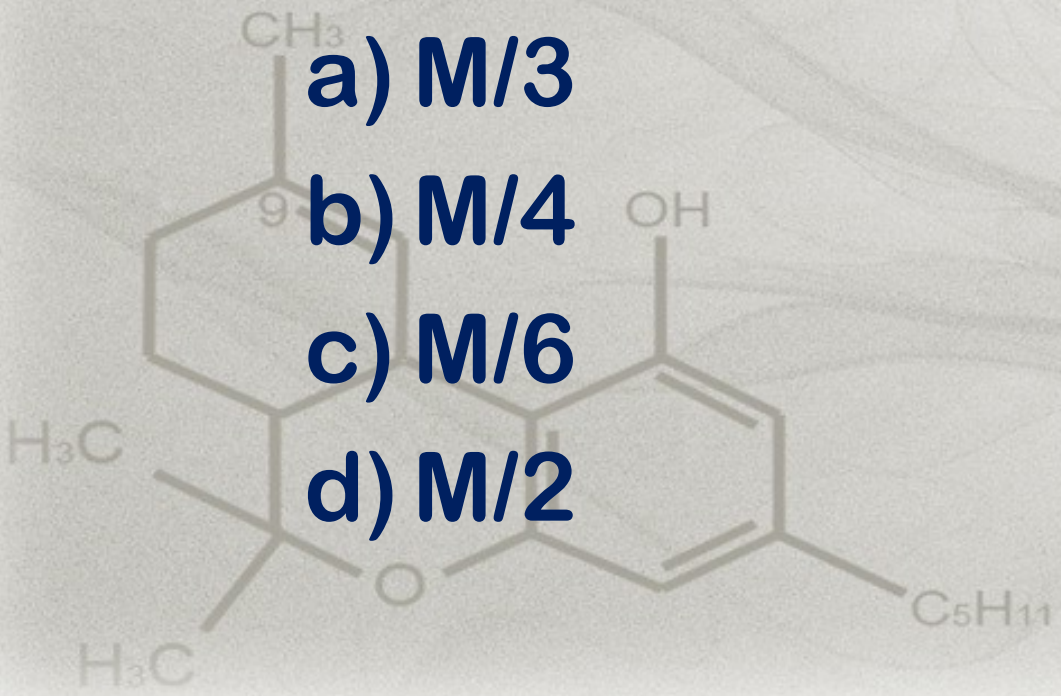
23. In acid medium, the equivalent mass of $K_2Cr_2O_7$ (molecular mass M) is

a) M/3

b) M/4

c) M/6

d) M/2



Eq. mass of reducing / oxidising agent =

$$\frac{\text{Molecular mass}}{\text{change in oxidation number per molecule}}$$

- $K_2Cr_2O_7 + 4H_2SO_4 \rightarrow K_2SO_4 + Cr_2(SO_4)_3 + 4H_2O + 3(O)$

+6 +3

- $K_2Cr_2O_7 \longrightarrow Cr_2(SO_4)_3$
- Change in ON =3.
- But there are two Cr atoms in a molecule.
- Therefore O.N per molecule = M/6

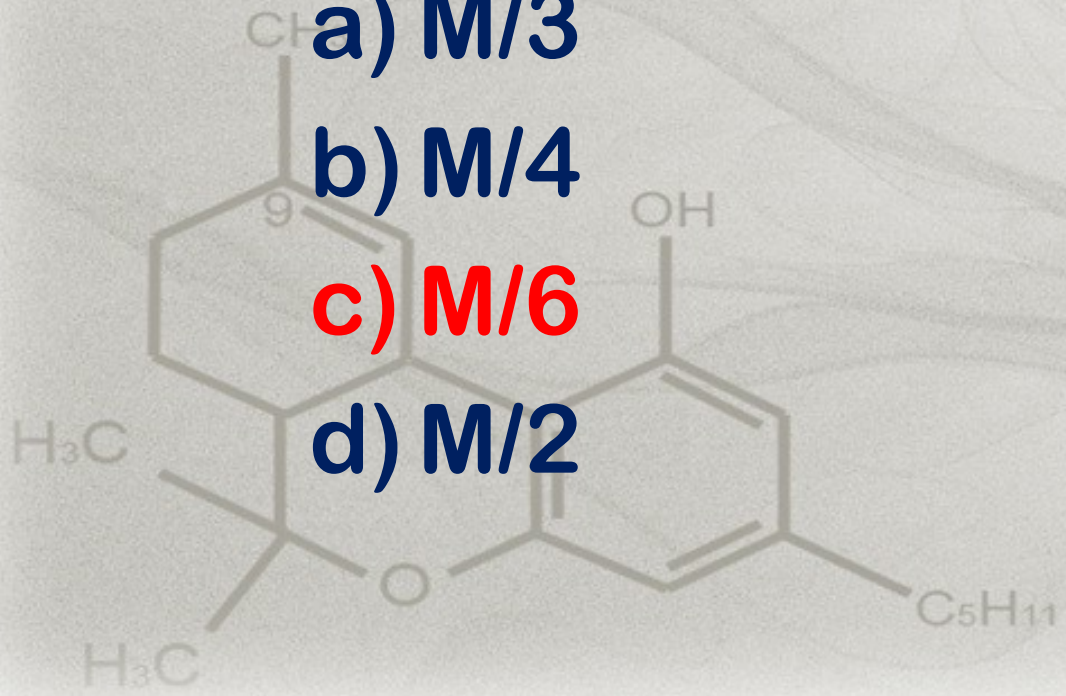
23. In acid medium, the equivalent mass of $K_2Cr_2O_7$ (molecular mass M) is

a) M/3

b) M/4

c) M/6

d) M/2



24. In the balanced equation:

$H_2SO_4 + xHI \longrightarrow H_2S + yI_2 + zH_2O$,

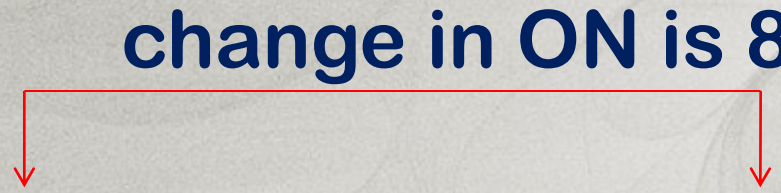
the value of x, y and z are

a) X=3, y=5, z=2

b) X=4, y=8, z=5

c) X=8, y=4, z=4

d) X=5, y=3, z=4




- $H_2SO_4 + x\,HI \rightarrow H_2S + y\,I_2 + zH_2O$


- Increase in ON for reducing agent = Decrease in ON for oxidising agent.
- Therefore $H_2SO_4 + 8HI \rightarrow H_2S + 4I_2 + 4H_2O$

24. In the balanced equation:
$H_2SO_4 + xHI \rightarrow H_2S + yI_2 + zH_2O$,
the value of x,y and z are

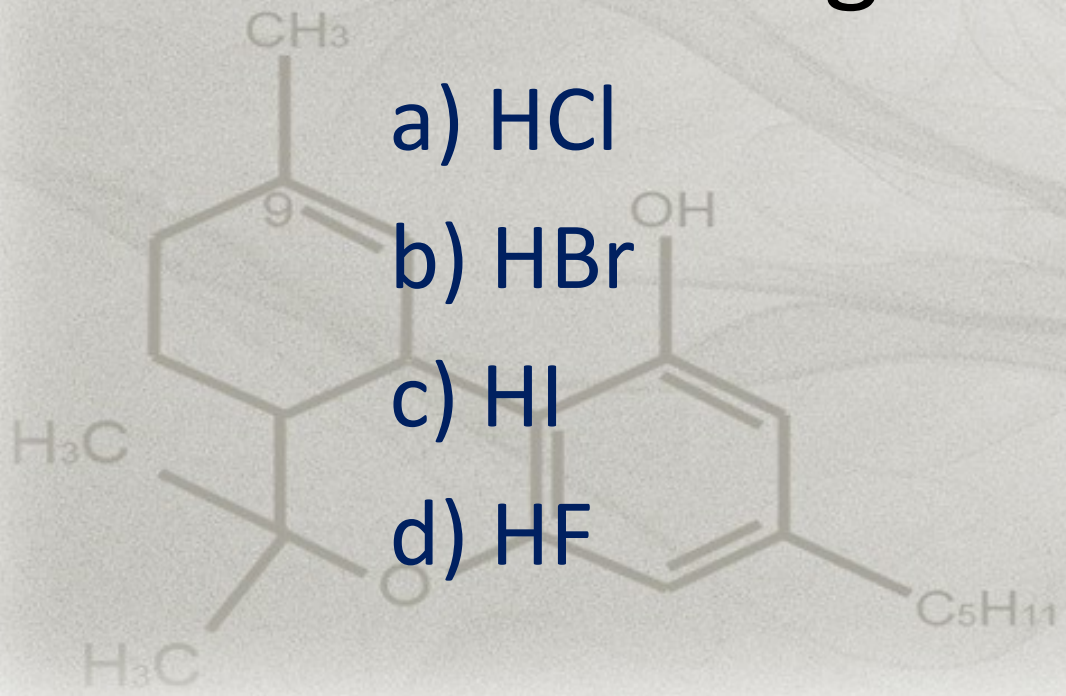
a) X=3 , y=5, z=2

b) X=4, y=8, z=5

c) X=8, y=4, z=4

d) X=5, y=3, z=4

# 25.Which of the following halogen acids is the strongest reducing agent?



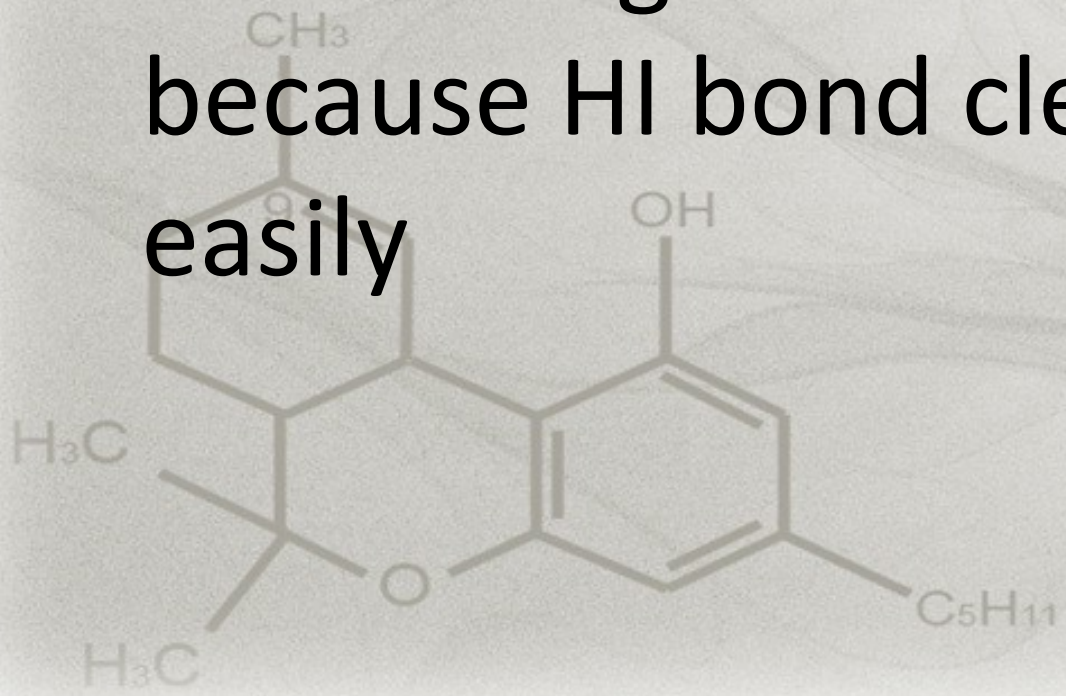

a) HCl

b) HBr

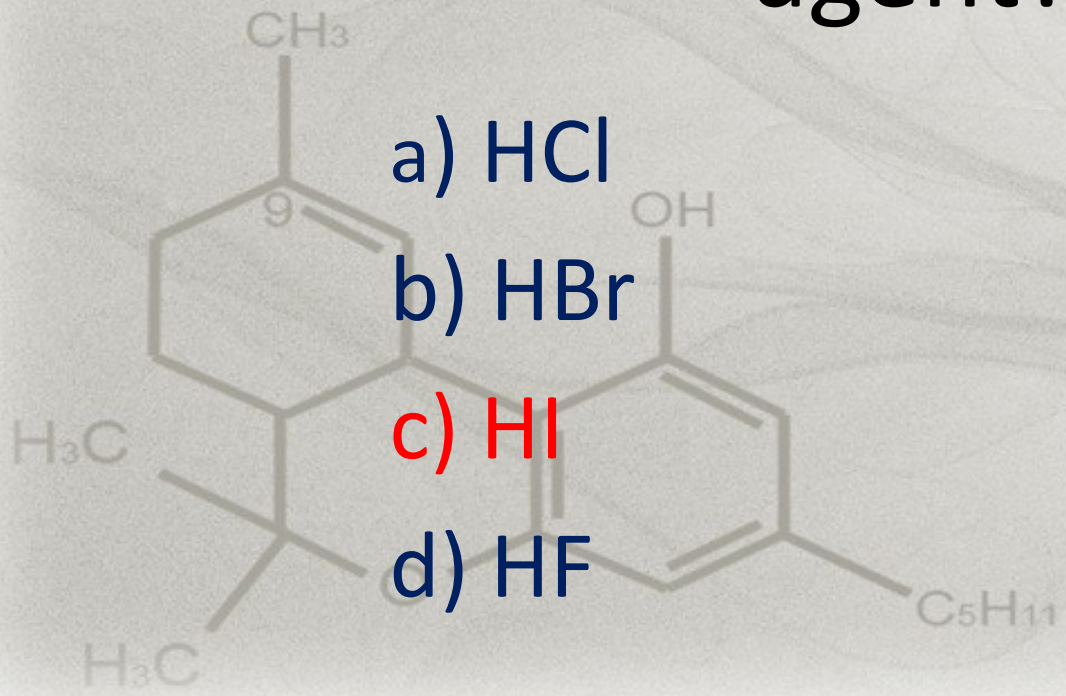
c) HI

d) HF

- HI is stronger reducing agent because HI bond cleaves most easily



# 25.Which of the following halogen acids is the strongest reducing agent?




a) HCl

b) HBr

c) HI

d) HF

# 26.Which of the following is a redox reaction?

a) $H_2SO_4$ with NaOH

b) In atmosphere $O_3$ forms $O_2$ by lightning

c) Nitrogen oxide from nitrogen and oxygen by lightning

d) Evaporation of water

$$\overset{0}{N_2} + \overset{0}{O_2} \longrightarrow \overset{+2\ -2}{2NO}$$

- It involves both gain and loss of electrons

26.Which of the following is a redox reaction?.

a) $H_2SO_4$ with NaOH

b) In atmosphere $O_3$ with $O_2$ by lightning

c) Nitrogen oxide from nitrogen and oxygen by lightning

d) Evaporation of water

27. In the reaction,

$4Fe + 3O_2 \longrightarrow 4Fe^{3+} + 6O^{2-}$

which of the following statement is incorrect?.

a) Redox reaction

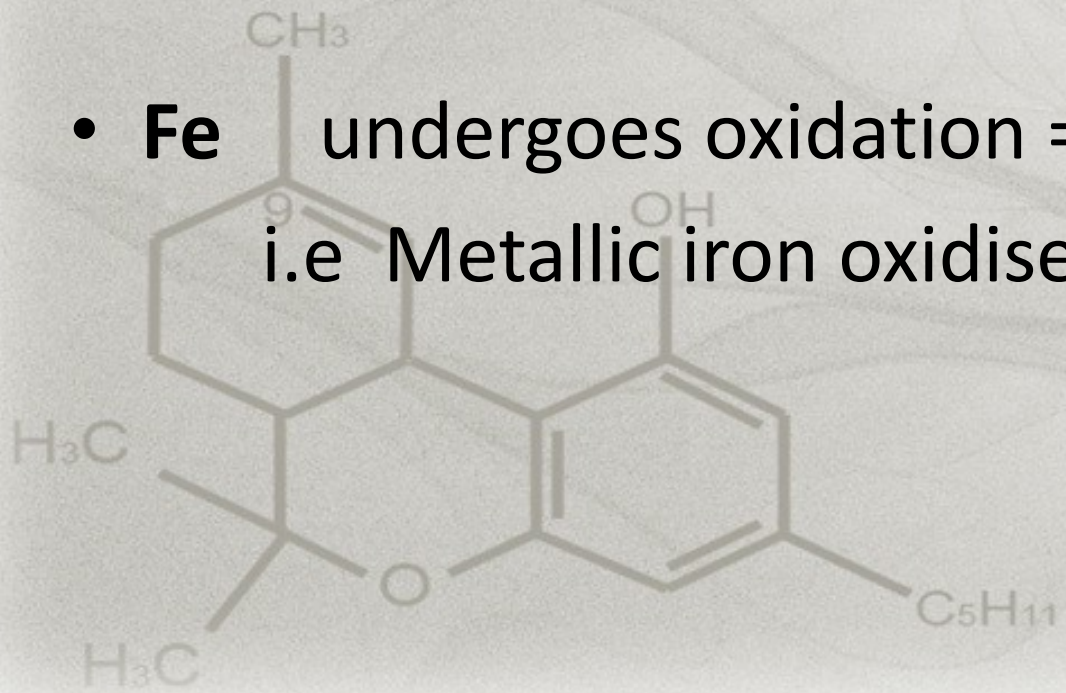
b) Metallic iron is a reducing agent

c) $Fe^{3+}$ is an oxidising agent

d) Metallic iron is reduced to $Fe^{3+}$

- 0 0 +3 -2
- $4Fe + 3O_2 \longrightarrow 4Fe^{3+} + 6O^{2-}$
- **Fe** undergoes oxidation =redusing agent

  i.e Metallic iron oxidised to $Fe^{3+}$



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which of the following statement is incorrect?

a) Redox reaction

b) Metallic iron is a reducing agent

c) $Fe^{3+}$ is an oxidising agent

d) Metallic iron is reduced to $Fe^{3+}$

28.The colour of $K_2Cr_2O_7$ changes from orange red to yellow on treatment with aqueous KOH because of

a) Oxidation

b) Reduction

c) Neither oxidation nor reduction

d) Partial oxidation and reduction

$$\overset{+6}{K_2Cr_2O_7} + 2KOH \longrightarrow \overset{+6}{2K_2CrO_4} + H_2O$$

**(Orange red)** **(Yellow)**

- Here oxidation number of Cr remains +6 in both side.
- So it is not a redox reaction

28.The colour of $K_2Cr_2O_7$ changes from orange red to yellow on treatment with aqueous KOH because of

a) Oxidation

b) Reduction

c) Neither oxidation nor reduction

d) Partial oxidation and reduction

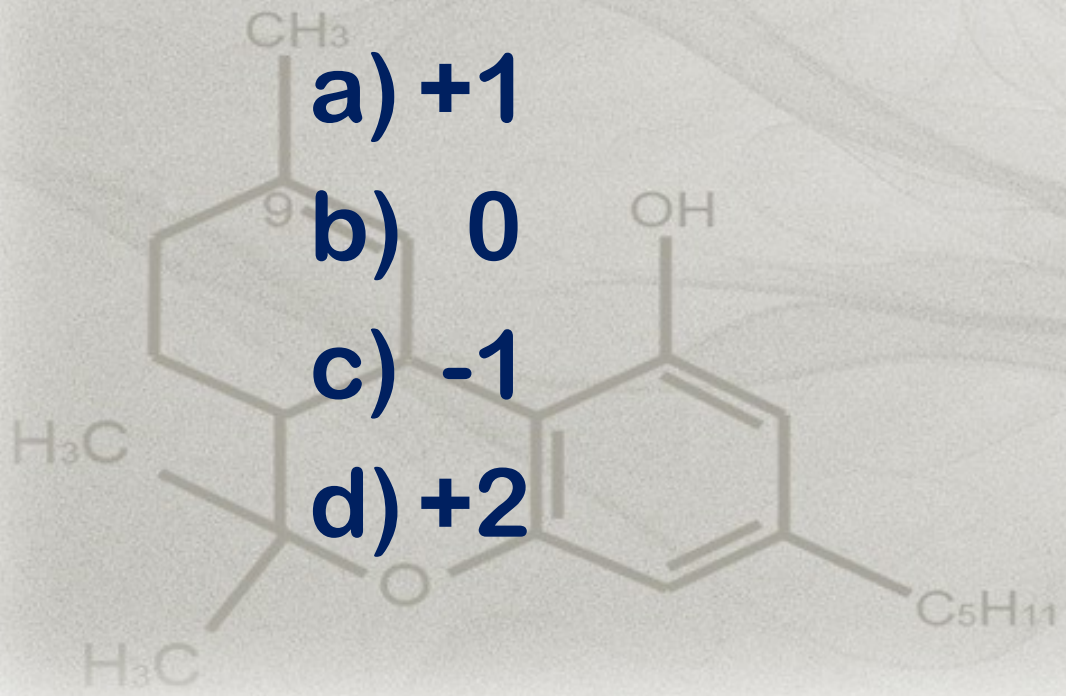
29. Oxidation number of Silver in silver amalgam is

a) +1

b) 0

c) -1

d) +2



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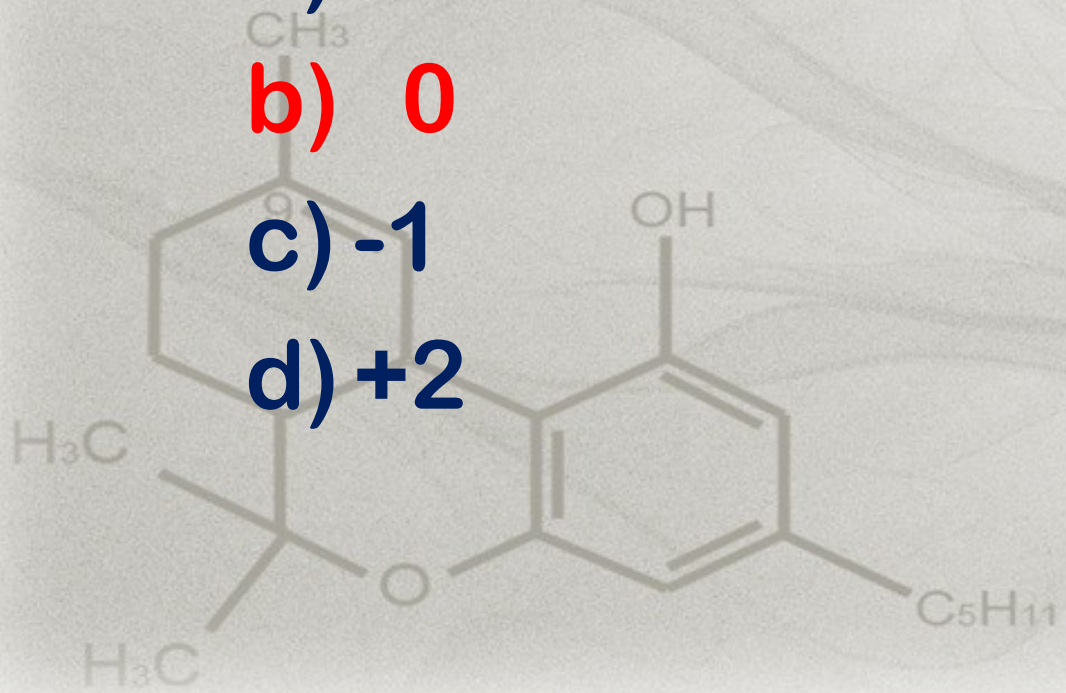


30. The nitride ion in lithium nitride is composed of

a) 7 protons + 10 electrons

b) 10 protons + 10 electrons

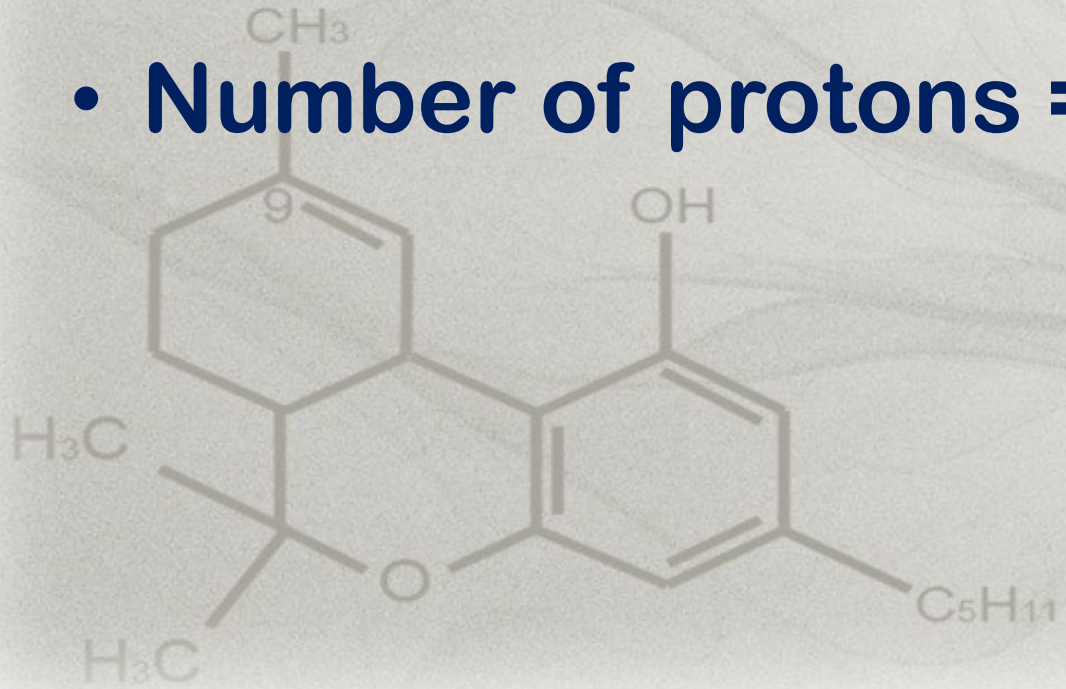
c) 7 protons + 7 electrons

d) 10 protons + 7 electrons

- Nitride contains ($N^{3-}$ )

Number of electrons= Z+3=7+3=10

- Number of protons = Z=7



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a) 7 protons + 10 electrons

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c) 7 protons + 7 electrons

d) 10 protons + 7 electrons

# 31.Which is not correct?

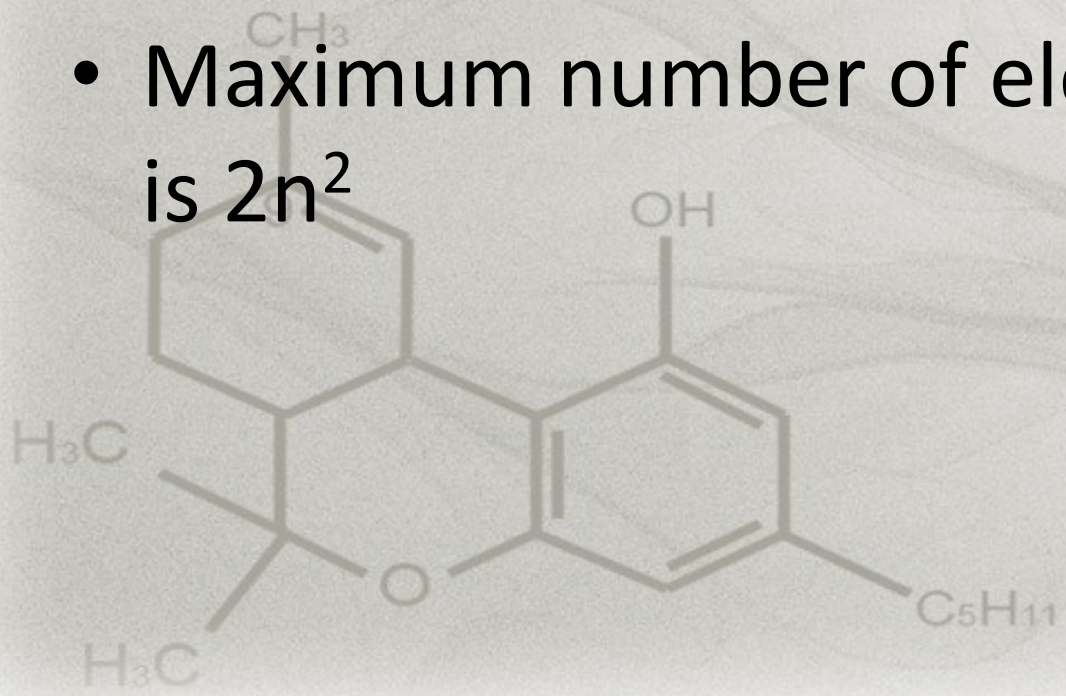
a) Maximum number of electrons in a subshell is $4l+2$

b) Maximum number of orbitals in a shell $=n^2$

c) Spin quantum number cannot be derived from Schrödinger wave equation

d) Maximum number of electrons in a shell $=2l+1$

- Maximum number of electrons in a shell is $2n^2$



# 31.Which is not correct?

- a)Maximum number of electrons in a subshell is 4l+2
- b) a)Maximum number of orbitals in a shell =n2
- c)Spin quantum number cannot be derived from shrodinger wave equation
- d)Maximum number of electrons in a shell =2l+1

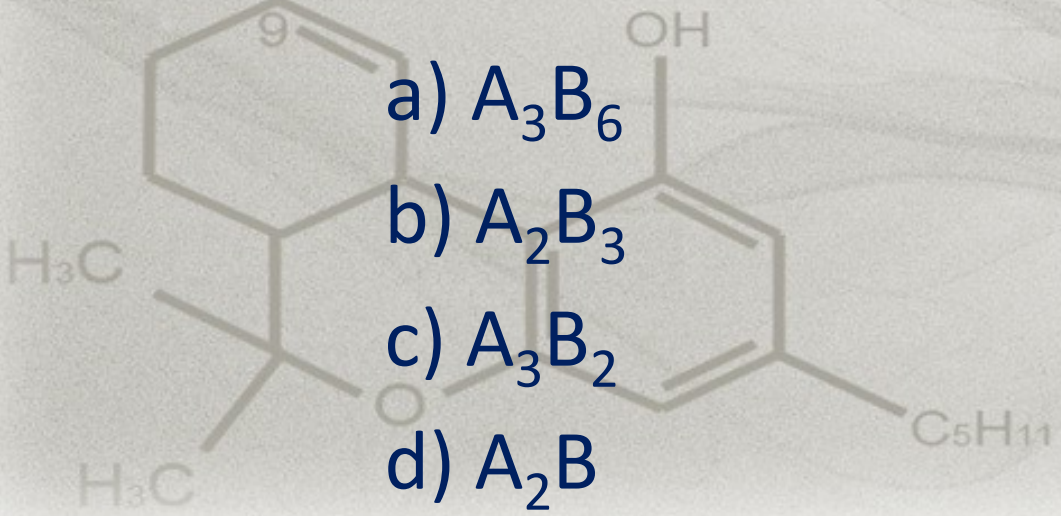
32.An atom of an element A has three electrons in its outer most orbit and that of B has 6 electrons in its outermost orbit the formula of the compound between these two will be

a) $A_3B_6$

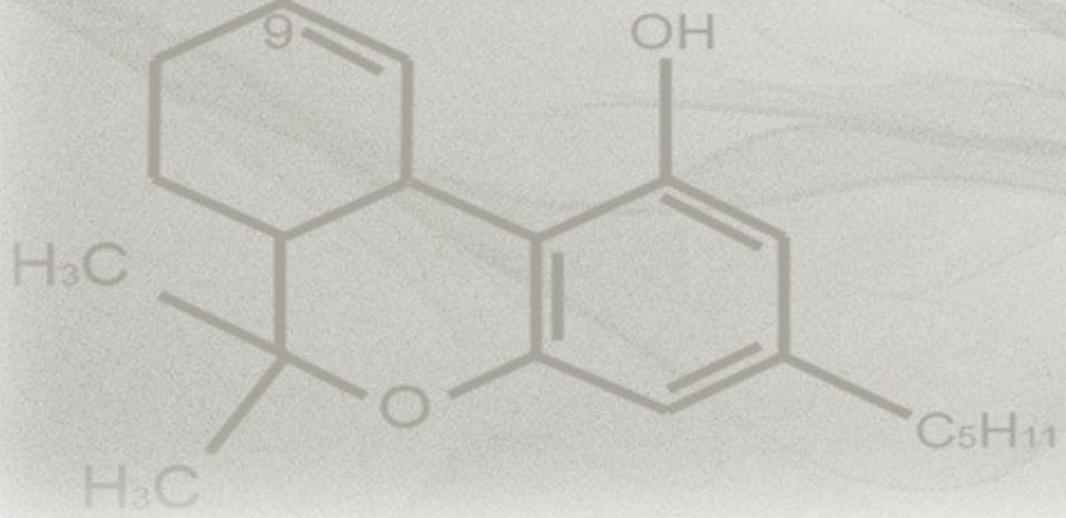
b) $A_2B_3$

c) $A_3B_2$

d) $A_2B$



$$A^{3+} + B^{2-} \longrightarrow A_2B_3$$



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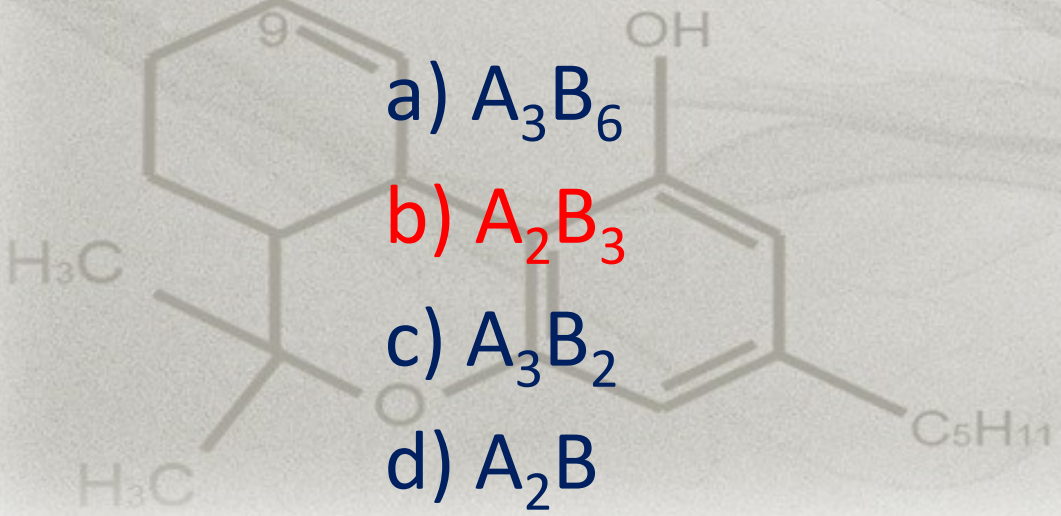
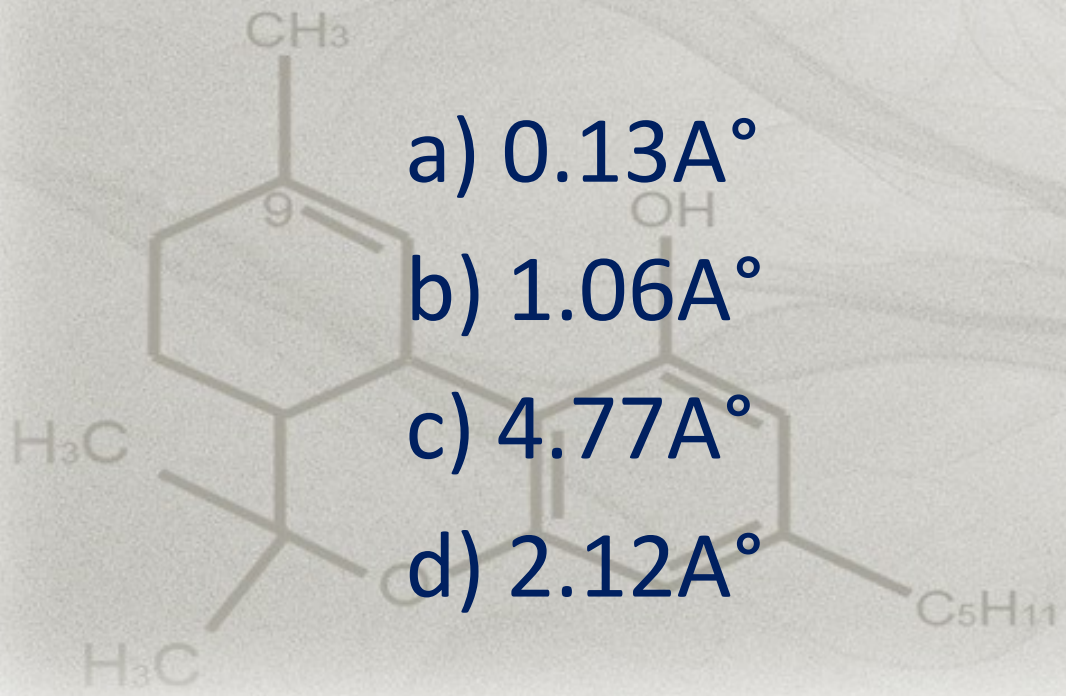
d) $A_2B$



33.Bohr's radius for the H atom (n=1) is approximately 0.53A$^{o}$.The radius of the I exited state (n=2)orbit is




a) 0.13A°

b) 1.06A°

c) 4.77A°

d) 2.12A°

- Radius of an orbit in hydrogen and hydrogen like species

$$r_n = 0.529 \text{ X } \frac{n^2}{Z}$$

$$=0.53 \text{ X } \frac{2^2}{1}$$

$$=0.53 \text{ X } 4$$

$$=2.12A°$$

33.Bohr's radius for the H atom (n=1) is approximately 0.53A$^{o}$.The radius of the I exited state (n=2)orbit is

a) 0.13A°

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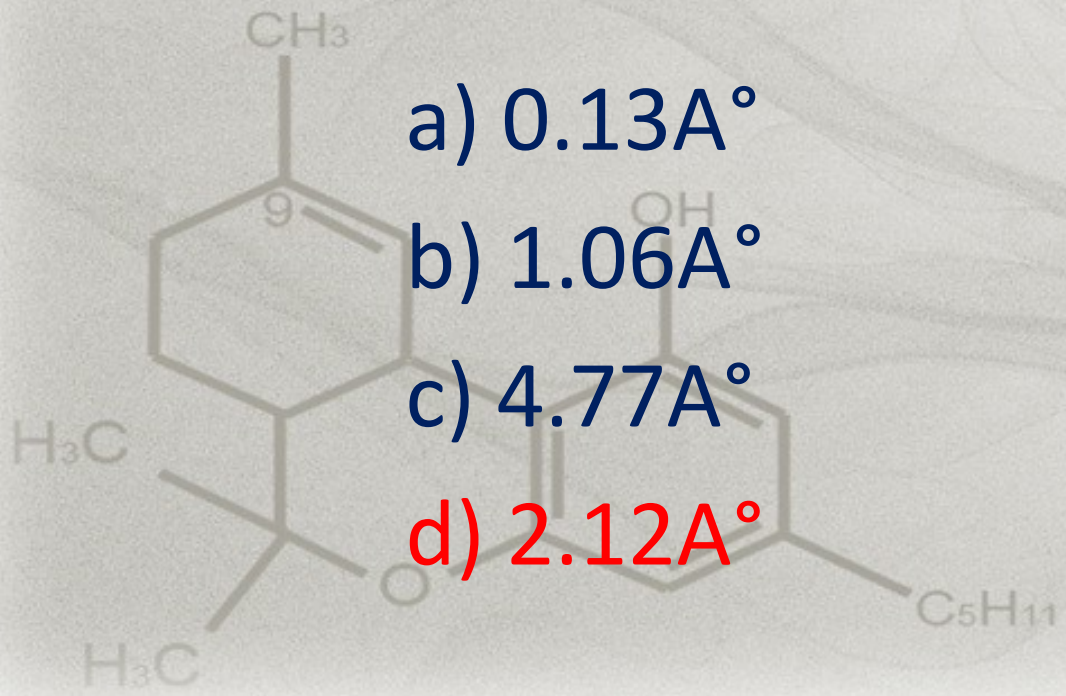


# 34. Which is Incorrect?

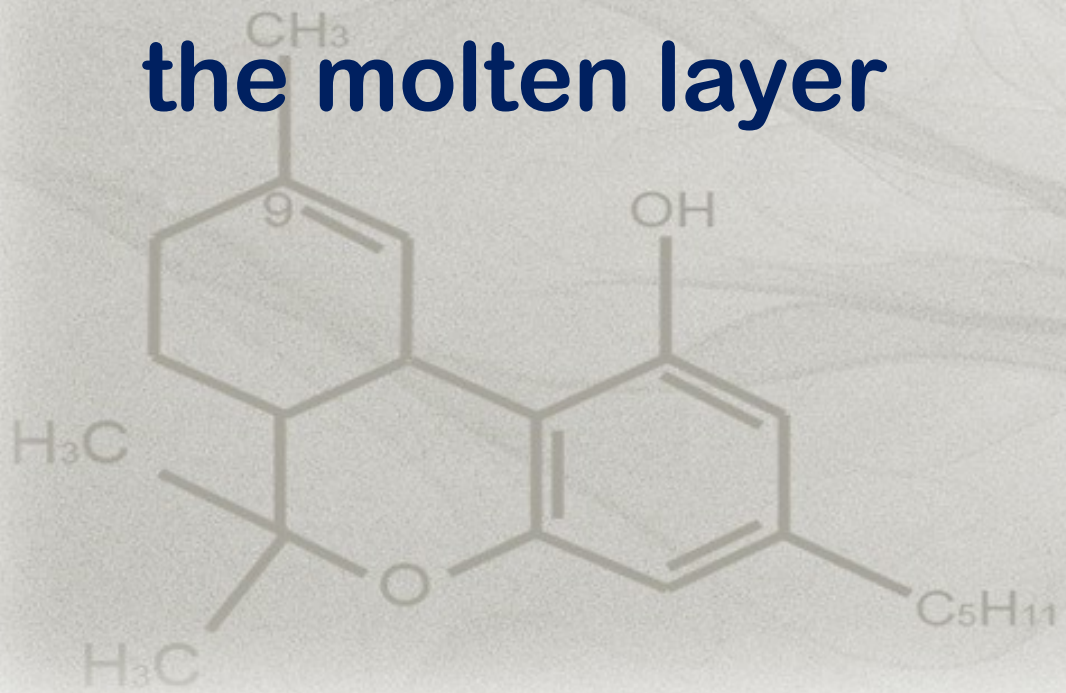
a) During roasting, air holes of reverberatory furnace are kept open

b) A Slag has a low melting point and is heavier than the metal

c) Flux is used to remove the non fusible impurities present in ores as slag

d) Refractory materials are used for making furnaces as they can with stand high temp

- Slag is a light material and form a separate layer over the molten layer



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35. If the nitrogen atom had electronic configuration $1s^7$ it would have energy lower than that of normal ground state configuration $1s^2\ 2s^2\ 2p^3$, because the electron would be closer to the nucleus. Yet $1s^7$ is not observed because it violates

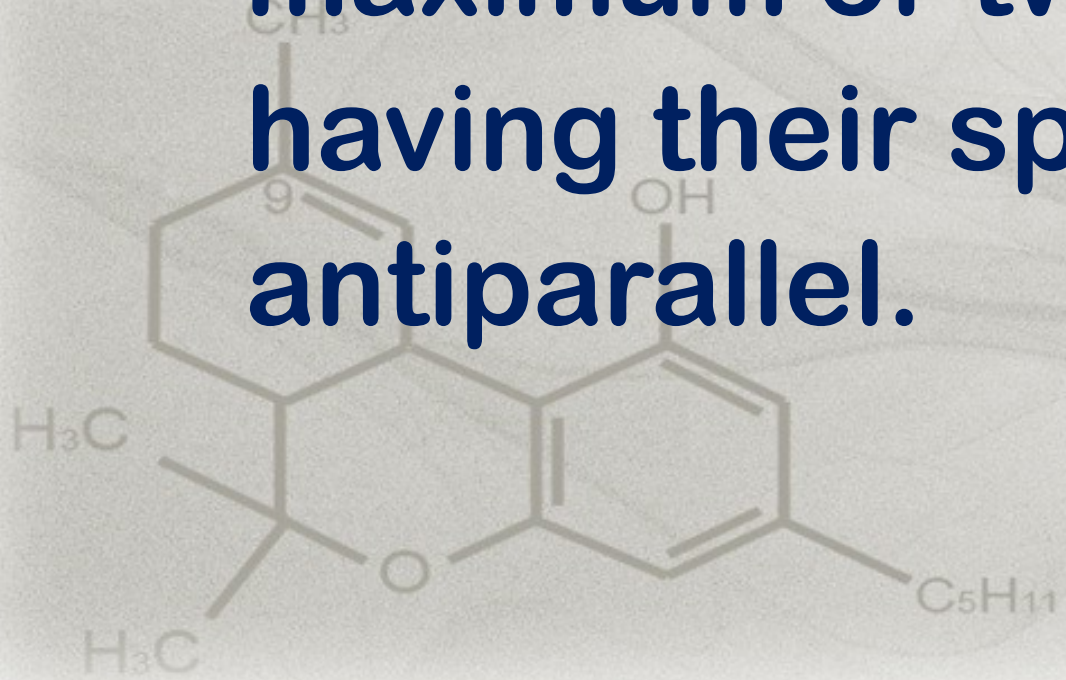
a) Heisenberg uncertainty principle

b) Hund's rule

c) Pauli's exclusion principle

d) Bohr's postulates of stationary orbits

- An orbital can have a maximum of two electrons having their spins antiparallel.



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a) Heisenberg uncertainty principle

b) Hund's rule

c) Pauli's exclusion principle

d) Bohr's postulates of stationary orbits

# 36. Froth flotation process is used for the metallurgy of?

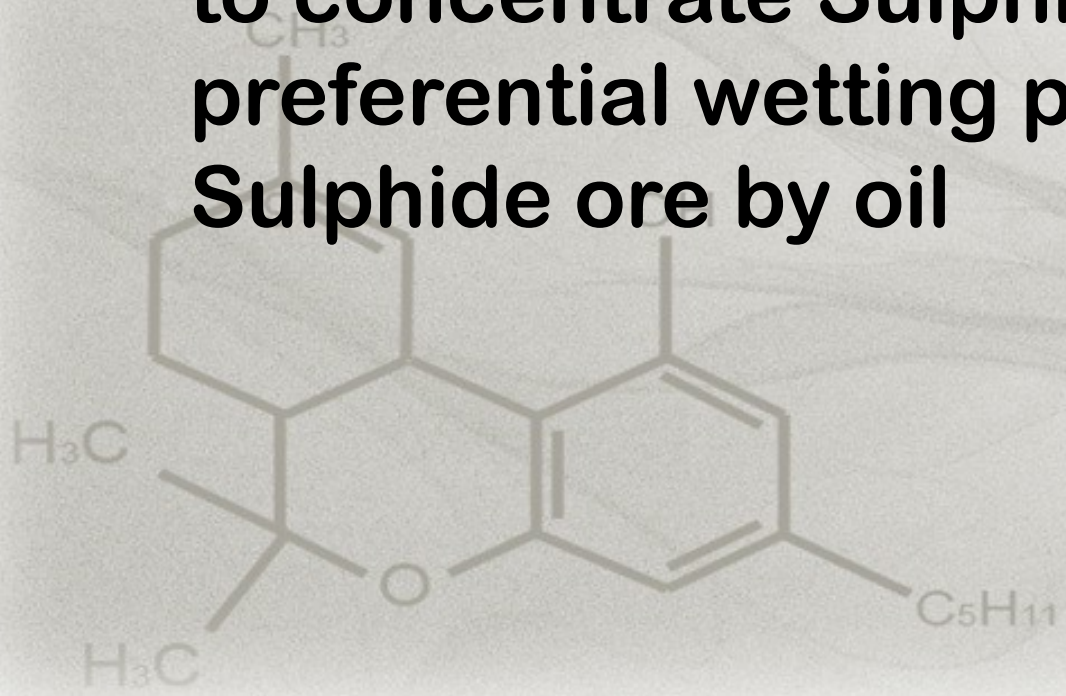
a) Chloride ores

b) Amalgams

c) Oxide ores

d) Sulphide ores

- Froth flotation process is mainly used to concentrate Sulphide ore due to the preferential wetting properties of Sulphide ore by oil



# 36. Froth flotation process is used for the metallurgy of?

a) Chloride ores

b) Amalgams

c) Oxide ores

d) Sulphide ores

# 37. Electrolysis of molten sodium chloride leads to the formation of

a) Sodium and oxygen

b) Sodium and hydrogen

c) Hydrogen and oxygen

d) Sodium and chlorine

$$NaCl \longrightarrow Na^{+} + Cl^{-}$$

At cathode: $Na^{+} + e^{-} \longrightarrow Na$

At anode: $Cl^{-} - e^{-} \longrightarrow 1/2Cl_2$

# 37. Electrolysis of molten sodium chloride leads to the formation of

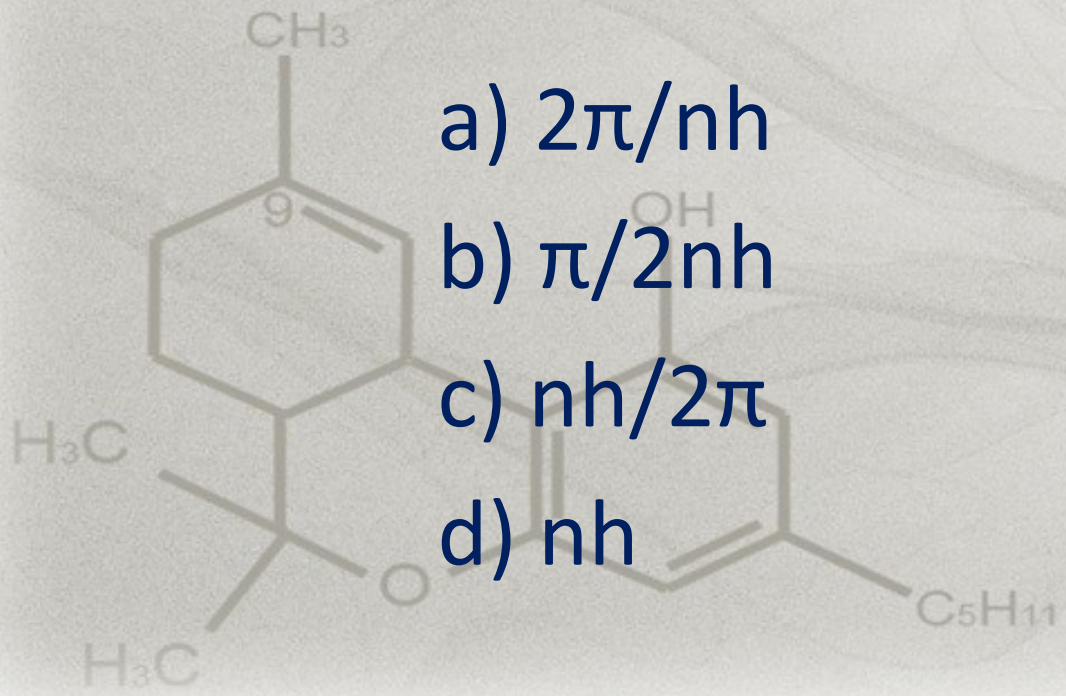
a) Sodium and oxygen

b) Sodium and hydrogen

c) Hydrogen and oxygen

d) Sodium and chlorine

38.Angular momentum of an electron in the $n^{th}$ orbit of hydrogen atom is given by




a) $2\pi/nh$

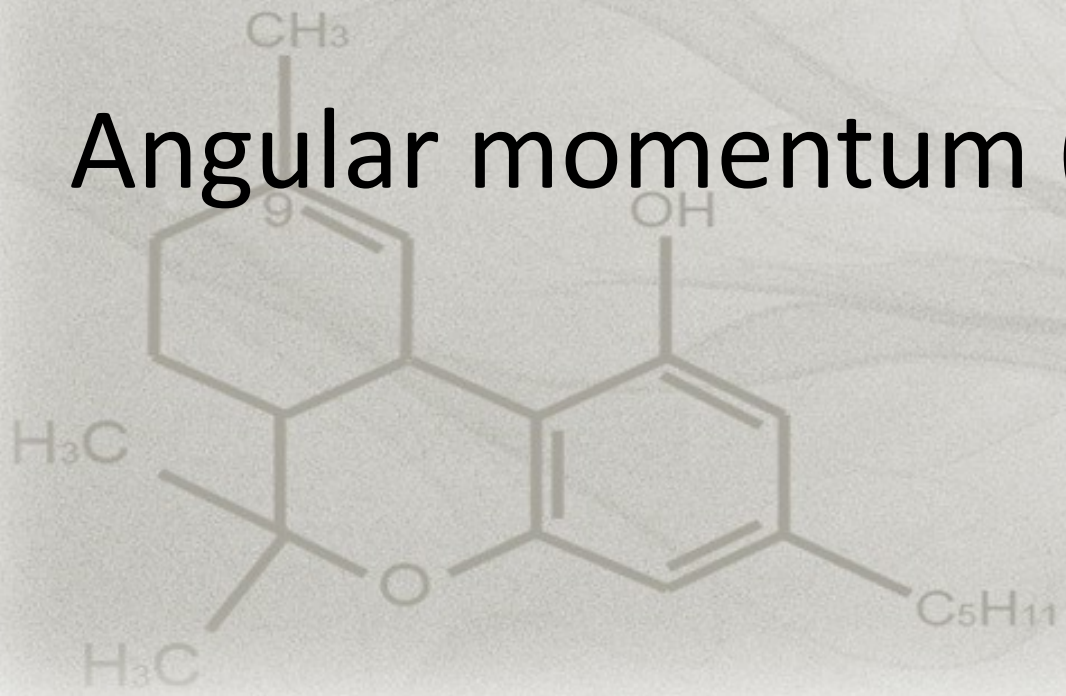
b) $\pi/2nh$

c) $nh/2\pi$

d) $nh$

- According to the Bohr's postulate

Angular momentum (mvr)= nh/2π



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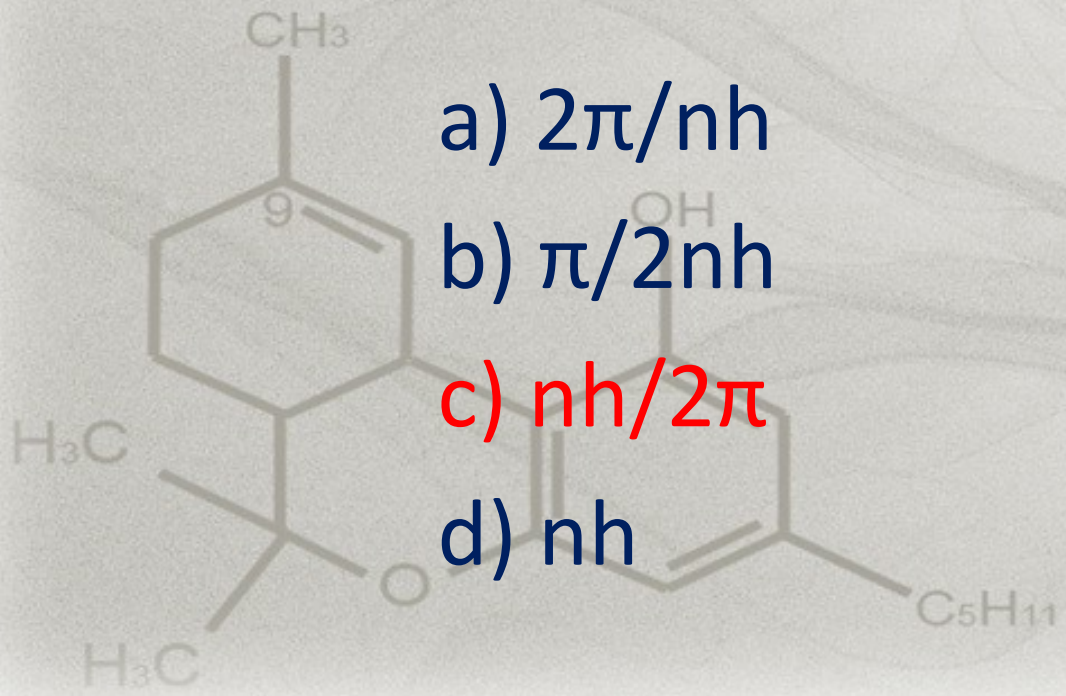



a) $2\pi/nh$

b) $\pi/2nh$

c) $nh/2\pi$

d) $nh$

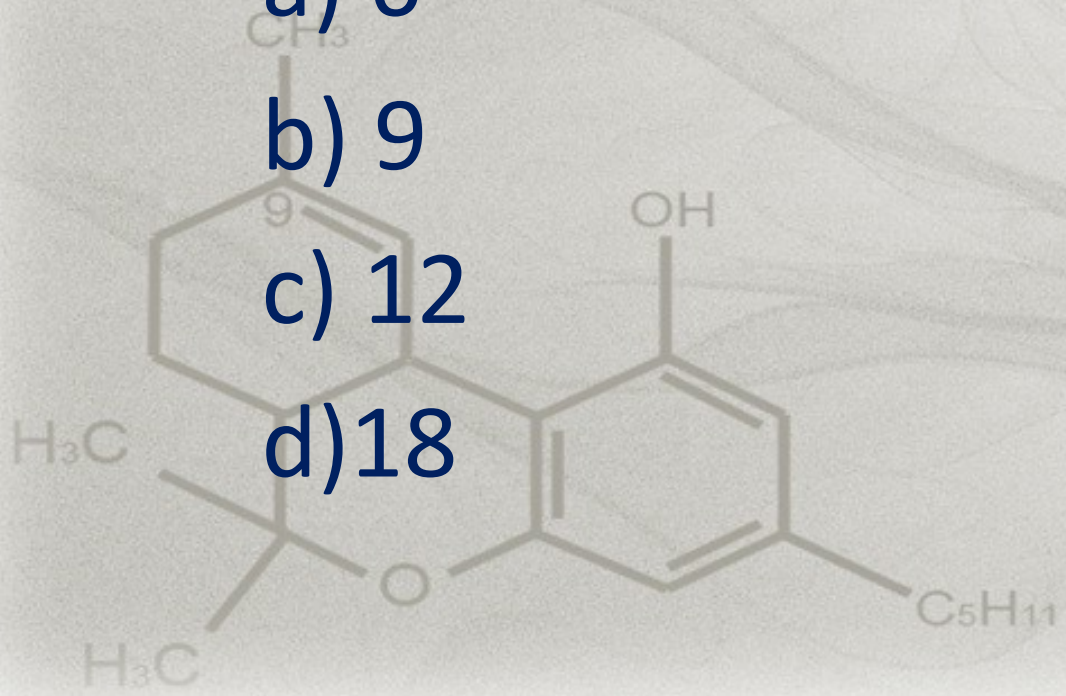
39. The number of electrons of same spin with n+l =5 are

a) 6

b) 9

c) 12

d)18



- subshells having n+l=5 are 5s, 4p and 3d.
- No. electrons in 5s,4p and3d are 2+6+10= 18.
- So the number of electrons with **same** spin =9

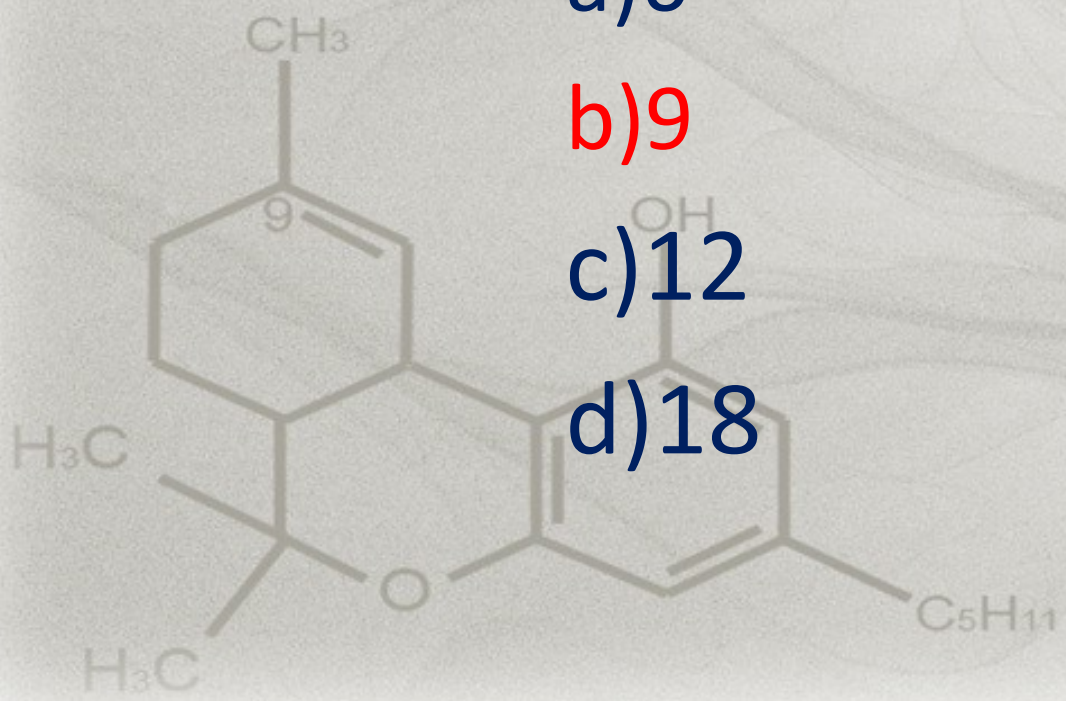
# 39. The number of electrons of same spin with n+l =5 are

a)6

b)9

c)12

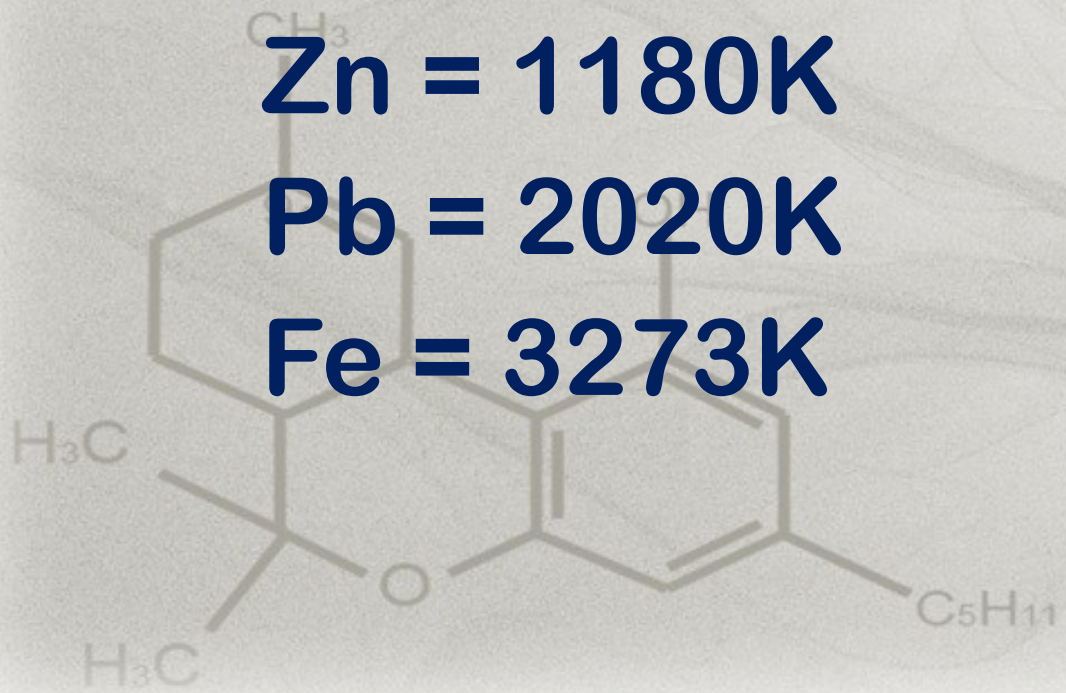
d)18



40. Zinc spleter contains impurities of Cd, Pb, Fe and Zn. When molten impure zinc is distilled, which is distilled first?

a) Molten Zn
b) Molten Cd
c) Molten Pb
d) Molten Fe

- **Boiling points of**
  - **Cd = 1040K**
  - **Zn = 1180K**
  - **Pb = 2020K**
  - **Fe = 3273K**



40. Zinc spleter contains impurities of Cd, Pb, Fe and Zn. When molten impure zinc is distilled, which is distilled first?

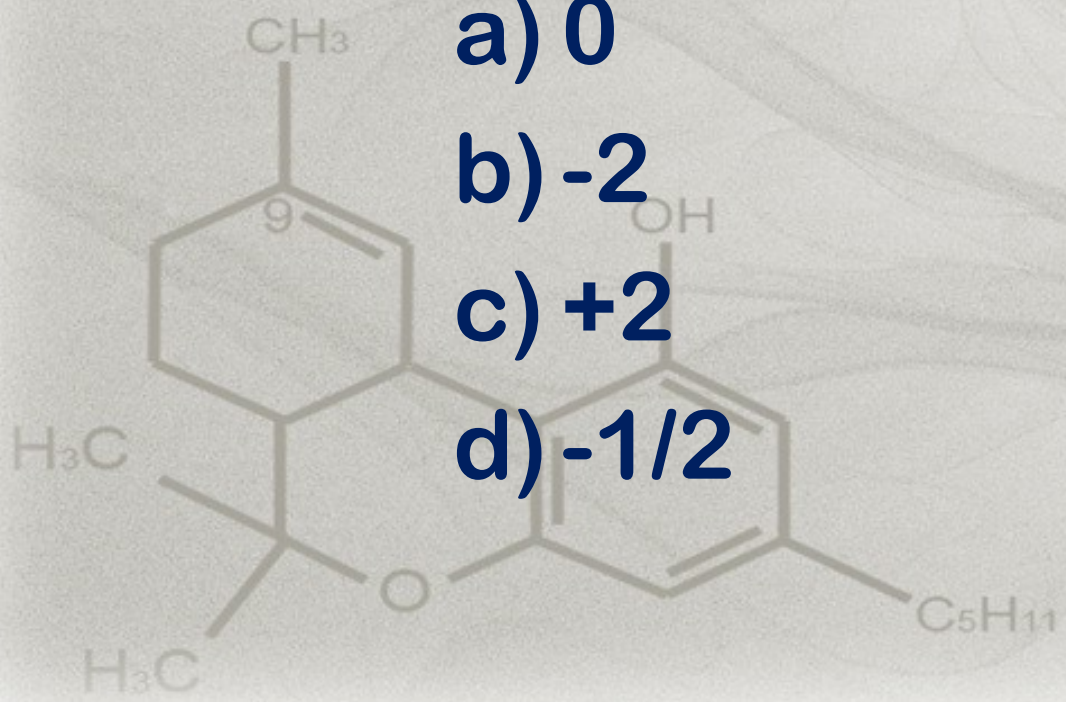
a) Molten Zn

b) Molten Cd

c) Molten Pb

d) Molten Fe

41. Oxidation number of nitrogen atom in $N_2$ molecule is




a) 0

b) -2

c) +2

d) -1/2

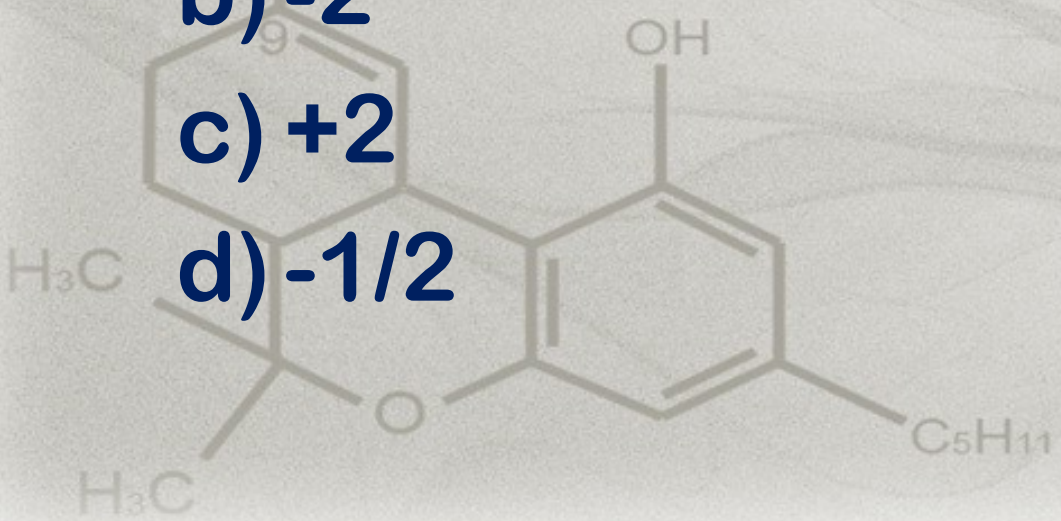
41. Oxidation number of nitrogen atom in $N_2$ molecule is

a) 0

b) -2

c) +2

d) -1/2



42. The energy of 2nd Bohr's orbit of hydrogen atom is -328KJmol$^{-1}$,hence the energy of 4th Bohr's orbit would be

a) -41 KJmol$^{-1}$

b) -82 KJmol$^{-1}$

c) -164 KJmol$^{-1}$

d) -1312 KJmol$^{-1}$

Energy of electron in any orbit of hydrogen or hydrogen like species

$E_n = \frac{-1312\ Z^2}{n^2} kJmol^{-1} = -\frac{kZ^2}{n^2}$

For Hydrogen, Z=1.

n=2 for 2nd orbit and n=4 for 4th orbit.

So, $E_2 = \frac{-k}{n^2}$ or $k = -E_2 \times n^2$ or $k = -328 \times 4$

$E_4 = \frac{-328\ X\ 4}{4^2}$ $= -82\ kJmol^{-1}$

42. The energy of 2nd Bohr's orbit of hydrogen atom is -328KJmol$^{-1}$. hence the energy of 4th Bohr's orbit would be

a)-41 KJmol$^{-1}$

b)-82 KJmol$^{-1}$

c)-164 KJmol$^{-1}$

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