



## Chemistry JEE Solutions 2022

## Chemistry

1. Which of the following water soluble vitamin cannot be excreted easily

(1) B<sub>1</sub> (2) B<sub>2</sub>  
(3) B<sub>6+</sub> (4) B<sub>12</sub>

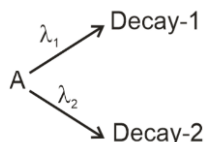
**Sol.** Answer (4)

Water soluble vitamins must be supplied regularly in diet because they are readily excreted in urine except vitamin B<sub>12</sub>

2. A nucleus has 2 types of radioactive decays. The half-life of 1<sup>st</sup> is 3.0 hours, and for the 2<sup>nd</sup> is 4.5 hours. Calculate the correct half-life of the nucleus.

(1) 0.56 hours (2) 3.75 hours  
(3) 2.23 hours (4) 1.80 hours

**Sol.** Answer (4)



$$\lambda_{\text{Net}} = \lambda_1 + \lambda_2$$

$$\Rightarrow \frac{\ln 2}{(t_{1/2})_{\text{net}}} = \frac{\ln 2}{(t_{1/2})_1} + \frac{\ln 2}{(t_{1/2})_2}$$

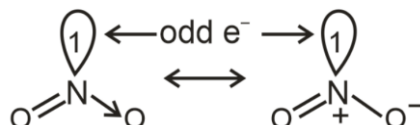
$$\Rightarrow \frac{1}{(t_{1/2})_{\text{net}}} = \frac{1}{3} + \frac{2}{9}$$

$$\Rightarrow (t_{1/2})_{\text{net}} = \left(\frac{9}{5}\right) \text{ hrs}$$

3. Select the nitrogen atom having odd number electron.

(1) N<sub>2</sub>O<sub>5</sub> (2) NO<sub>2</sub>  
(3) N<sub>2</sub>O (4) N<sub>2</sub>O<sub>4</sub>

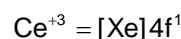
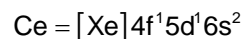
**Sol.** Answer (2)



4. Which of the following elements is most likely to deviate from +3 oxidation state

(1) La (2) Ce  
(3) Lu (4) Gd

**Sol.** Answer (2)



$\text{Ce}^{+3} = \text{Ce}^{+4} + 1e^-$  is also favoured due to noble gas configuration

5. Which of the following s-block elements does not give flame test?

(1) Be (2) Na  
(3) Li (4) Rb

**Sol.** Answer (1)

Be does not give flame test because of its high ionization energy.

6. Sum of radial nodes and angular nodes in 4S?

(1) 1 (2) 3  
(3) 2 (4) 4

**Sol.** Answer (2)

Number of radial node =  $n - l - 1$

For 4S,  $n = 4$ ,  $l = 0$

So number of radial node

$$= 4 - 0 - 1 = 3$$

So number of angular node = 0

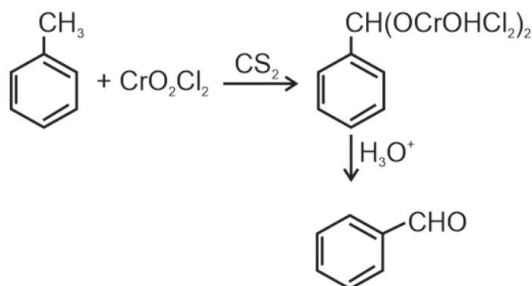
So total number of all node =  $3 + 0 = 3$

7. Toluene can be easily converted into benzaldehyde by which of the following reagents.

- (1) CO, HCl, Anny  $\text{AlCl}_3$   
 (2) Acetic acid,  $\text{CS}_2$   
 (3) (i)  $\text{CS}_2$ , chromyl chloride, (ii)  $\text{H}_3\text{O}^+$   
 (4)  $\text{H}_2$ , Pd,  $\text{BaSO}_4$

**Sol.** Answer (3)

It is an example of Etard reactions



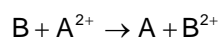
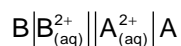
8. In an electrochemical cell  $E_{\text{A}^{+2}/\text{A}}^\circ = -0.33 \text{ V}$ ,

$E_{\text{B}/\text{B}^{+2}}^\circ = 0.50 \text{ V}$ , Find  $\Delta G^\circ$  ?

- (1)  $-20 \text{ F}$  (2)  $-0.34 \text{ F}$   
 (3)  $-0.02 \text{ F}$  (4)  $-0.04 \text{ F}$

**Sol.** Answer (2)

Considering the cell as



$$E_{\text{cell}}^\circ = 0.5 - 0.33 = 0.17 \text{ V}$$

$$\Delta G^\circ = -nE^\circ \text{F}$$

$$= -2 \times 0.17 \text{ F}$$

$$= -0.34 \text{ F}$$

9. Which of the following is metalloid?

- (1) Bi (2) Sc  
 (3) Te (4) Hg

**Sol.** Answer (3)

Tellurium is metalloid

So option 3 is correct

Fact based

10. Match the following

- (i) invertase (a) starch to maltose  
 (ii) zymase (b) maltose to glucose  
 (iii) Maltase (c) sugar to ethanol  
 (iv) Diastase (d) inversion of cane sugar

- |            |            |
|------------|------------|
| i - d      | i - c      |
| (1) ii - c | (2) ii - d |
| iii - b    | iii - a    |
| iv - a     | iv - b     |
| i - b      | i - d      |
| (3) ii - a | (4) ii - a |
| iii - d    | iii - c    |
| iv - c     | iv - b     |

**Sol.** Answer (1)

(D) (i) Sucrose  $\xrightarrow{\text{invertase}}$  glucose + fructose

(C) (ii) Glucose  $\xrightarrow{\text{Zymase}}$   $\text{C}_2\text{H}_5\text{OH} + \text{CO}_2$

(B) (iii) Maltose  $\xrightarrow{\text{Maltase}}$  Glucose + Glucose

(A) (iv) Starch  $\xrightarrow{\text{Diastase}}$  Maltose

11. A solid  $\text{A}_x\text{B}_y$  has ccp structure. A forms ccp and B is present in all the octahedral voids. If atoms 'A' are removed from two opposite face then x will be

- (1) 1 (2) 3  
 (3) 8 (4) 6

**Sol.** Answer (2)

A forms ccp

B is present in all octahedral voids

$$\text{No. of atoms of A per unit cell. } \frac{1}{8} \times 8 + \frac{1}{2} \times 6 = 4$$

No. of atoms of B per unit cell = 4

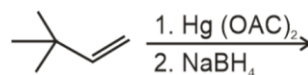
$$\Rightarrow \text{A}_4\text{B}_4$$

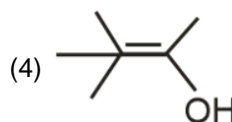
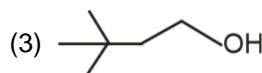
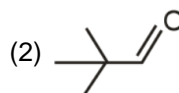
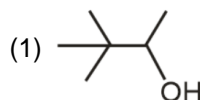
'A' atom is removed from 2 opposite face.

$$\text{No. of atoms of A} = \frac{1}{2} \times 4 + \frac{1}{8} \times 8 = 3$$

$$\Rightarrow \text{A}_3\text{B}_4 = \text{A}_x\text{B}_y$$

$$\Rightarrow x = 3$$

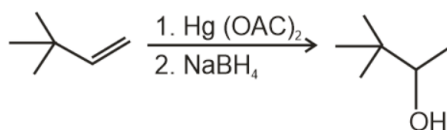
12. 



**Sol. Answer (1)**

Oxymercuration and Demercuration, there is no formation of carbocation intermediate so no rearrangement is allowed.

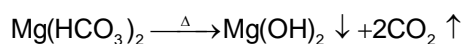
Markovnikov addition of -OH group.



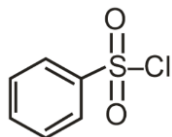
**13. Boiling of Hard water produces**

- (1)  $\text{CaCO}_3$  and  $\text{Mg(OH)}_2$
- (2)  $\text{Ca(OH)}_2$  and  $\text{MgCO}_3$
- (3)  $\text{CaCO}_3$  and  $\text{MgCO}_3$
- (4)  $\text{Ca(OH)}_2$  and  $\text{Mg(OH)}_2$

**Sol. Answer (1)**

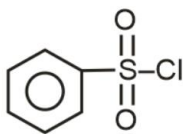


**14. Which of the following is not correct about this compound**

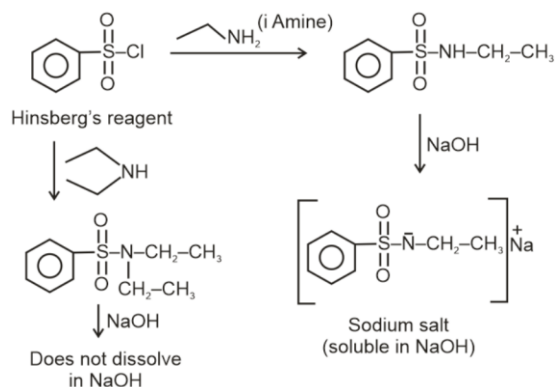


- (1) It is Hinsberg reagent
- (2) It is used to differentiate between 1°, 2° and 3° amine
- (3) After reaction with 2° amine it is soluble in NaOH
- (4) After reaction with i amine it is soluble in NaOH

**Sol. Answer (3)**



Hinsberg reagent



**15. Which water sample is most polluted?**

- (A) BOD = 5
- (B) BOD = 8
- (C) BOD = 10
- (D) BOD = 14
- (1) Sample A
- (2) Sample B
- (3) Sample C
- (4) Sample D

**Sol. Answer (4)**

BOD is the amount of oxygen required by bacteria to breakdown organic matter.

More is the organic matter, more amount of oxygen is required, and hence, more is the BOD value.

More organic matter  $\Rightarrow$  More polluted water

Sample D is most polluted

**16. BOD of A = 3**

$$B = 18$$

$$C = 27$$

$$D = 8$$

Then which water bodies given above have very high concentration of organic matter.

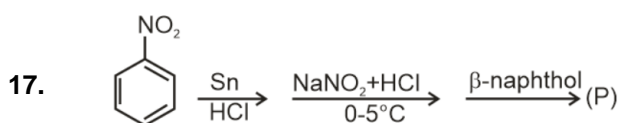
- (1) A and D
- (2) C and D
- (3) B and C
- (4) A and C

**Sol. Answer (3)**

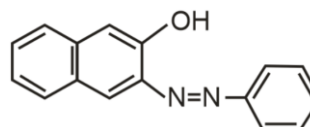
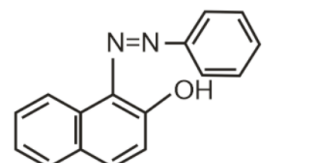
The amount of oxygen required by bacteria to break down the organic matter present in certain volume of sample of water is called BOD (biochemical oxygen demand)

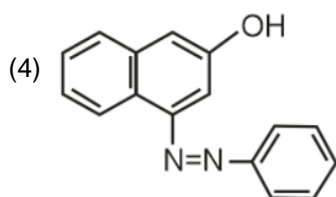
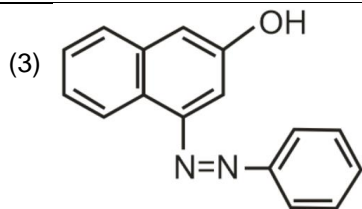
More is the organic matter present in water more would be the BOD.

Thats why option 3 is correct

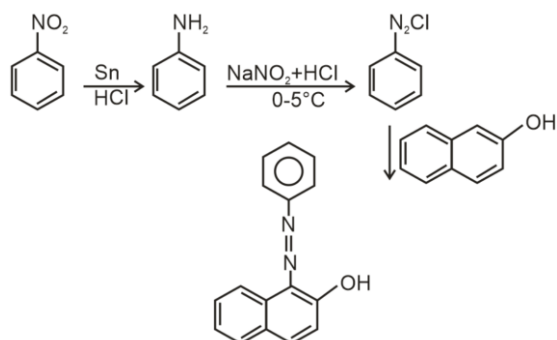


Identify the major product (P) formed in the above sequence of reactions.

- (1) 
- (2) 



**Sol.** Answer (2)

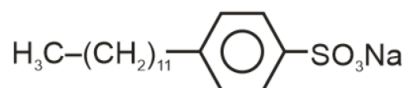
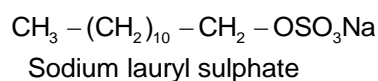


**18.** Which of the following is not a synthetic detergent.

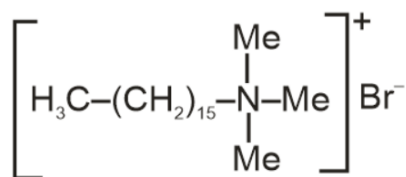
- (1) Sodium lauryl sulphate
- (2) Sodium dodecyl benzene sulphonate
- (3) Cetyl trimethyl ammonium bromide
- (4) Sodium stearate

**Sol.** Answer (4)

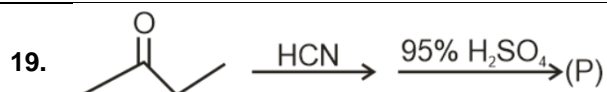
Soaps are sodium or potassium salt of long chain Fatty acid, so sodium stearate which is  $C_{17}H_{35}COONa$  is soap and not a synthetic detergent.



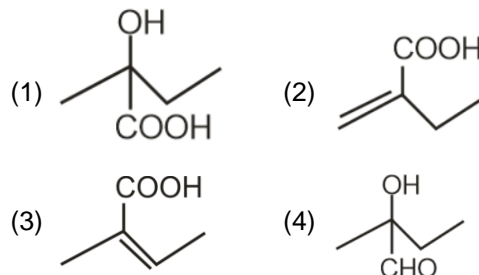
Sodium dodecyl benzene sulphonate



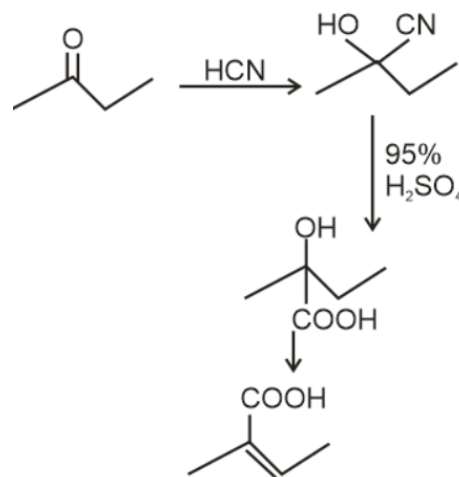
Cetyl trimethyl ammonium bromide



Identify the major product (P) in the above sequence of reactions



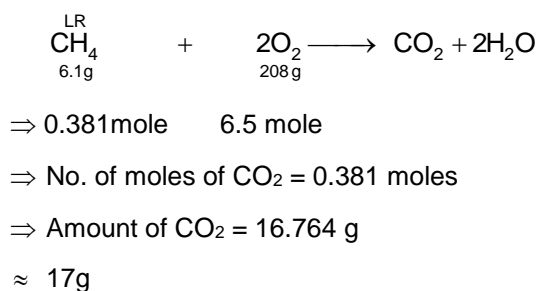
**Sol.** Answer (3)



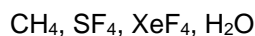
**20.** 6.100 gm of CNG is supplied with 208 gm of oxygen.  $CO_2$  &  $H_2O$  is produced with a lot of heat. How much  $CO_2$  is produced? (Consider CNG as methane)

[Round off to nearest integer]

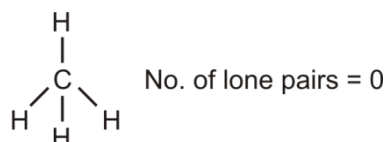
**Sol.** Answer (17)

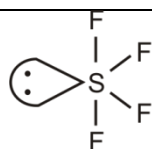


**21.** Number of molecules having two lone pairs on the central atom among the following is

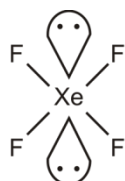


**Sol.** Answer (2)

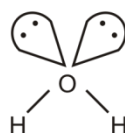




No. of lone pairs = 1



No. of lone pairs = 2

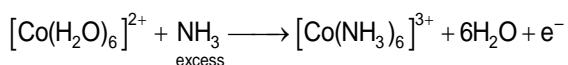


No. of lone pairs = 2

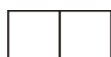
2 molecules  
have  
2 lone pairs

22. Number of electrons in  $t_{2g}$  orbital of compound by reacting  $[\text{Co}(\text{H}_2\text{O})_6]^{2+}$  with excess of  $\text{NH}_3$  is

**Sol.** Answer (6)

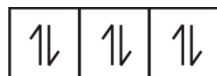


Electronic configuration of  $\text{Co}^{+3} = [\text{Ar}]3d^6 4s^0$



$e_g$

$\therefore$  No of  $e^-$  in  $t_{2g}$  Orbital = 6



$t_{2g}$

23. A metal is irradiated with light of wavelength  $6640\text{\AA}$  and its stopping potential is  $0.4\text{V}$ . The threshold frequency ( $\nu_0$ ) of the metal is  $3.55 \times 10^x \text{ Hz}$ .

The value of  $x$  is,

**Sol.** Answer (14)

$$\text{K.E} = 1.6 \times 10^{-19} \times 0.4 \text{ J}$$

$$E = w + \text{K.E}$$

$$\frac{hc}{\lambda} = w + \text{K.E}$$

$$\frac{6.63 \times 10^{-34} \times 3 \times 10^8}{6640 \times 10^{-10}} = w + 1.6 \times 10^{-19} \times 0.4$$

$$w = 2.99 \times 10^{-19} - 0.64 \times 10^{-19}$$

$$w = 2.35 \times 10^{-19} = h\nu_0$$

$$\Rightarrow \nu_0 = \frac{2.35 \times 10^{-19}}{6.63 \times 10^{-34}}$$

$$\nu_0 = 0.355 \times 10^{15}$$

$$= 3.55 \times 10^{14}$$

$$\Rightarrow x = 14$$

24. Find the osmotic pressure (in atm) of a mixture in which 2g of protein (having molar mass 6 kg) is present in 2 ml solution at  $27^\circ\text{C}$ .

[Round off to the nearest integer]

**Sol.** Answer (4)

$$n_{\text{protein}} = \frac{w}{M} = \frac{2}{6000} = \frac{1}{3000}$$

$$M_{\text{protein}} = \frac{n_{\text{protein}}}{V(L)} = \frac{1}{3000 \times 2} \times 1000$$

$$M_{\text{protein}} = \frac{1}{6}$$

$$T = 27^\circ\text{C} = 27 + 273 = 300\text{K}$$

$$\pi = CRT$$

$$\pi = \frac{1}{6} \times 0.0821 \times 300$$

$$= 4.105 \text{ atm}$$

$$\approx 4 \text{ atm}$$

25. Consider the following reaction at  $383\text{K}$



Given  $\Delta H = 41.1 \text{ kJ/mol}$

$$R = 8.314 \text{ J K}^{-1} \text{ mol}^{-1}$$

Then value of  $\Delta U$  (in kJ/mol) is

[Round off to the nearest integer]

**Sol.** Answer (38)



$$\Delta H = \Delta U + \Delta n_g RT$$

$$\Delta n_g = 1$$

$$41.1 \text{ kJ mol}^{-1} = \Delta U + \frac{1 \times 8.314 \times 383}{1000}$$

$$\Delta U = 41.1 - \frac{8.314 \times 383}{1000}$$

$$\Delta U = 37.92 \text{ kJ mol}^{-1}$$

$$\Delta U \approx 38 \text{ kJ mol}^{-1}$$