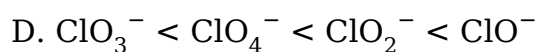
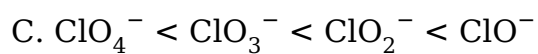
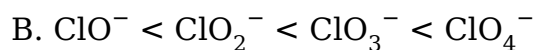
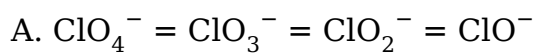

Question 42

Which of the following represents the correct order of Cl – O bond lengths in

ClO^- , ClO_2^- , ClO_3^- , ClO_4^- ?

Options:



Answer: C

Solution:

Solution:

The b.o in $\text{Cl} - \text{O}^-$ is 1

The b.o in $\text{O} = \text{Cl} - \text{O}^-$ is 1.5

The b.o. in $\text{O} = \underset{\text{O}^-}{\text{Cl}} = \text{O}$ is $\frac{5}{3} = 1.66$

The b.o. in $\text{O} = \overset{\text{O}}{\parallel} \underset{\text{O}}{\parallel} \text{Cl} - \text{O}^-$ is $\frac{7}{4} = 1.75$

The bond length increases as b.o. decreases.

Question 43

Which one of the following coordination compounds is used to inhibit the growth of tumours?

Options:

- A. Trans-platin
- B. EDTA complex of calcium
- C. $[(\text{Ph}_3\text{P})_3 \text{RhCl}]$
- D. Cis - platin

Answer: D

Solution:

Solution:

Cisplatin $[\text{Pt}(\text{NH}_3)_2 \text{Cl}_2]$ is used in cancer treatment.

Question 44

Aspirin is known as :

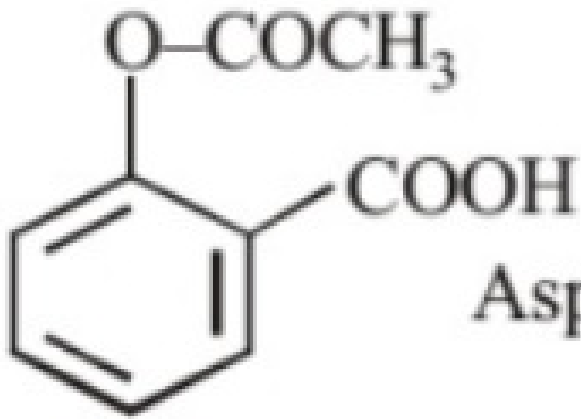
Options:

- A. acetyl salicylic acid
- B. phenyl salicylate
- C. acetyl salicylate
- D. methyl salicylic acid

Answer: A

Solution:

Solution:



Aspirin (Acetyl salicylic acid)

Question 45

In a 1st order reaction, reactant concentration C varies with time t as :

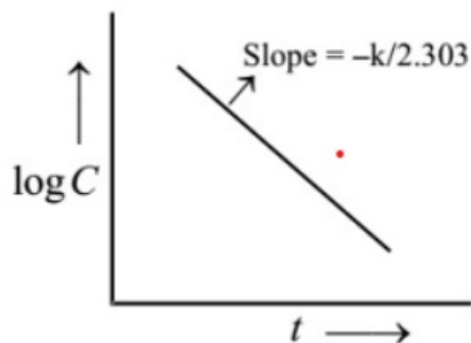
Options:

- A. $\frac{1}{C}$ increases linearly with t
- B. $\log C$ decreases linearly with t
- C. C decreases with $\frac{1}{t}$
- D. $\log C$ decreases with $\frac{1}{t}$

Answer: B

Solution:

Solution:



Question 46

Which of the following has the highest $p\pi - p\pi$ bonding tendency ?

Options:

- A. N
- B. P
- C. As
- D. Sb

Answer: A

Solution:

Solution:

Nitrogen due to small size is able to show $p\pi - p\pi$ lateral overlap forming $N \equiv N$, rest elements due to bigger size are not able to show $p\pi - p\pi$ lateral overlap.

Question 47

Identify the incorrect statement :

Options:

- A. The S - S - S bond angles in the S_8 and S_6 rings are the same.
- B. Rhombic and monoclinic sulphur have S_8 molecules.
- C. S_2 is paramagnetic like oxygen
- D. S_8 ring has a crown shape.

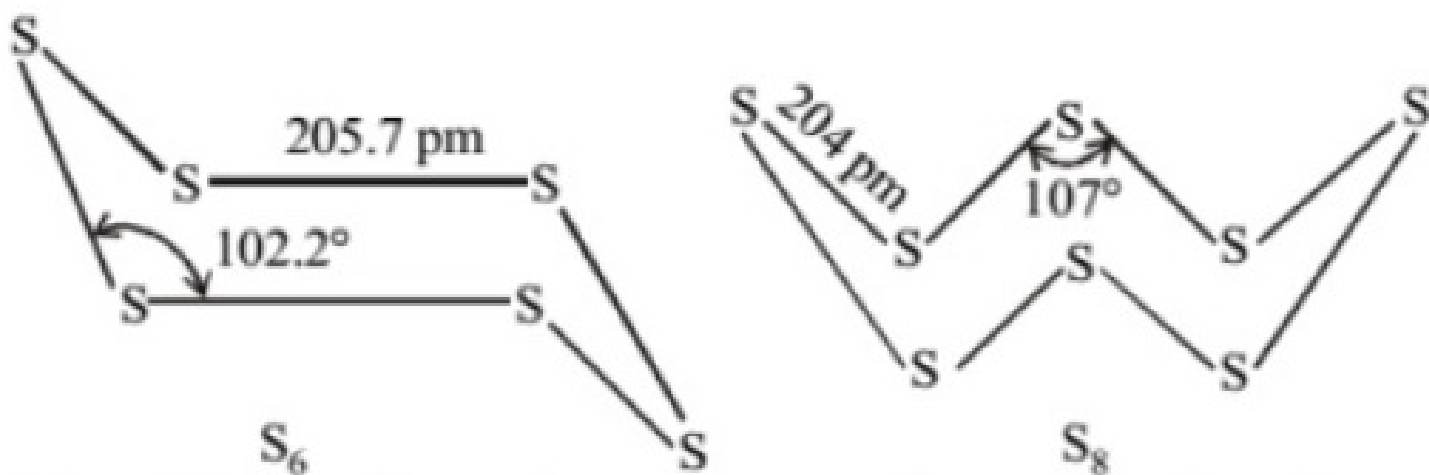
Answer: A

Solution:

Solution:

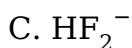
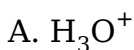
The S_6 molecule has a chair-form hexagon ring with the approx. same bond length as that in S_8 , but with some what smaller bond angles i.e.

bond lengths are approx. same but bond angles are different.

**Question 48**

Which of the following does not contain any coordinate bond?

Options:



Answer: C

Solution:

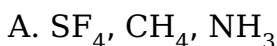
Solution:

HF_2^- is the only compound among the given options which does not contain any coordinate bond because it has hydrogen bonding.

**Question 49**

Which of the following set contains species having same angle around the central atom?

Options:



B. NF_3 , BCl_3 , NH_3

C. BF_3 , NF_3 , AlCl_3

D. BF_3 , BCl_3 , BBr_3

Answer: D

Solution:

Solution:

BF_3 , BCl_3 , BBr_3 are sp^2 hybridised. So, all have same structure and bond angle i.e. 120° .

Question 50

Liquids A and B form an ideal solution in the entire composition range. At 350K, the vapor pressures of pure A and pure B are 7×10^3 Pa and 12×10^3 Pa, respectively. The composition of the vapour is in equilibrium with a solution containing 40 mole percent of A at this temperature is:

Options:

A. $x_A = 0.37$; $x_B = 0.63$

B. $x_A = 0.28$; $x_B = 0.72$

C. $x_A = 0.4$; $x_B = 0.6$

D. $x_A = 0.76$; $x_B = 0.24$

Answer: B

Solution:

Solution:

$$P_A^\circ = 7 \times 10^3$$

$$P_B^\circ = 12 \times 10^3$$

$$x'_A = 0.4; x'_B = 1 - 0.4$$

$$x'_B = 0.6$$

$$\begin{aligned} P_{\text{total}} &= P_A^\circ x'_A + P_B^\circ x'_B \\ &= 7 \times 10^3 \times 0.4 + 12 \times 10^3 \times 0.6 \\ &= (7 \times 0.4 + 12 \times 0.6) \times 10^3 = 10^4 \end{aligned}$$

$$x_A = \frac{P_A^\circ x'_A}{P_{\text{total}}} = \frac{7 \times 10^3 \times 0.4}{10^4}$$

$$\therefore x_A = 0.28, x_B = 1 - 0.28 = 0.72$$

Question 51

Hydrolysis of NCl_3 gives NH_3 and X .

Which of the following is X ?

Options:

A. HClO_4

B. HClO_3

C. HOCl

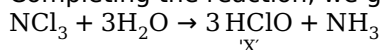
D. HClO_2

Answer: C

Solution:

Solution:

Completing the reaction, we get



Question 52

Element 'B' forms ccp structure and 'A' occupies half of the octahedral voids, while oxygen atoms occupy all the tetrahedral voids. The structure of bimetallic oxide is :

Options:

A. A_2BO_4

B. AB_2O_4

C. $\text{A}_2\text{B}_2\text{O}$

D. $\text{A}_4\text{B}_2\text{O}$

Answer: B

Solution:

Solution:

No. of lattice points = No. of octahedral voids = $\frac{1}{2} \times$ No. of tetrahedral voids in ccp structure

\therefore No. of atoms of B = 4

No. of atoms of A = $\frac{1}{2} \times$ No. of octahedral voids

$$= \frac{1}{2} \times 4 = 2$$

No. of atoms of O = All tetrahedral voids = $2 \times$ No. of lattice points = $2 \times 4 = 8$

Hence, A : B : O = 1 : 2 : 4

Therefore, the formula of the compound is AB_2O_4

Question 53

$[\text{Fe}(\text{en})_2(\text{H}_2\text{O})_2]^{2+} + \text{en} \rightarrow \text{complex (X)}$. The correct statement about the complex (X) is -

Options:

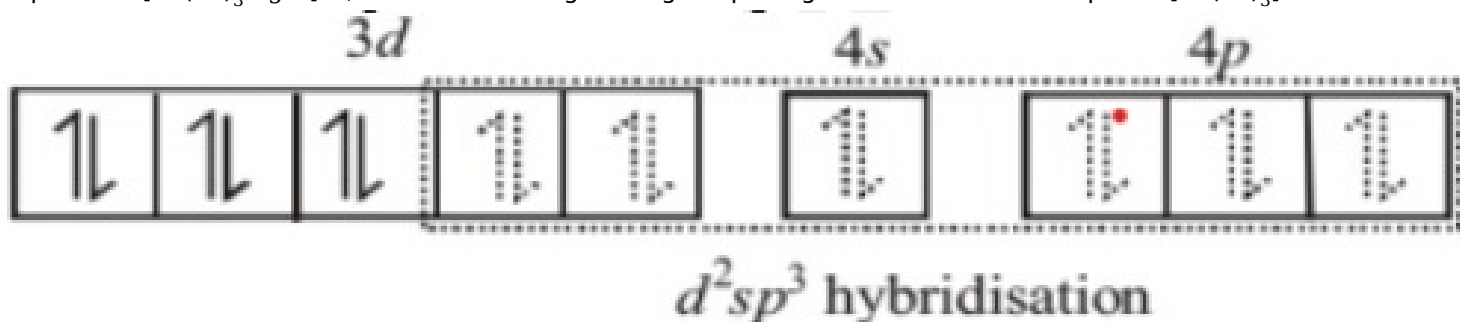
- A. it is a low spin complex
- B. it is diamagnetic
- C. it shows geometrical isomerism
- D. (a) and (b) both

Answer: D

Solution:

Solution:

Complex X is $[\text{Fe}(\text{en})_3]^{2+}$; as 'en' is a strong field ligand pairing of electrons will take place. $[\text{Fe}(\text{en})_3]^{2+}$:



Hence, hybridisation is d^2sp^3 and complex is diamagnetic. As it has 3 bidentate symmetrical 'en' ligands so it will not show geometrical isomerism.

Question 54

The frequency of radiation emitted when the electron falls from $n = 4$ to $n = 1$ in a hydrogen atom will be (Given : ionization energy of $\text{H} = 2.18 \times 10^{-18} \text{J atom}^{-1}$ and $h = 6.625 \times 10^{-34} \text{Js}$)

Options:

- A. $1.54 \times 10^{15} \text{s}^{-1}$
- B. $1.03 \times 10^{15} \text{s}^{-1}$
- C. $3.08 \times 10^{15} \text{s}^{-1}$
- D. $2.00 \times 10^{15} \text{s}^{-1}$

Answer: C

Solution:

Solution:

$$v = \frac{1}{h} \times IE \times \left[\frac{1}{n_1^2} - \frac{1}{n_2^2} \right]$$
$$= \frac{2.18 \times 10^{-18}}{6.625 \times 10^{-34}} \times \left[\frac{1}{1} - \frac{1}{16} \right] = 3.08 \times 10^{15} \text{s}^{-1}$$

Question 55

Cetyltrimethyl ammonium bromide is a popular

Options:

- A. anionic detergent
- B. cationic detergent
- C. non-ionic detergent
- D. sweetener

Answer: B

Solution:

Solution:

Cetyltrimethyl ammonium bromide which is a germicide, is a popular cationic detergent.

Question 56

Which of the following chemicals can be added for sweetening of food items at cooking temperature and does not provides calories?

Options:

- A. Sucrose
- B. Glucose
- C. Aspartame
- D. Sucralose

Answer: D

Solution:

Solution:

Sucralose is trichloro derivative of sucrose. It is stable at cooking temperture. It does not provide calories.

Question 57

In XeF_2 , XeF_4 , XeF_6 the number of lone pairs on Xe are respectively

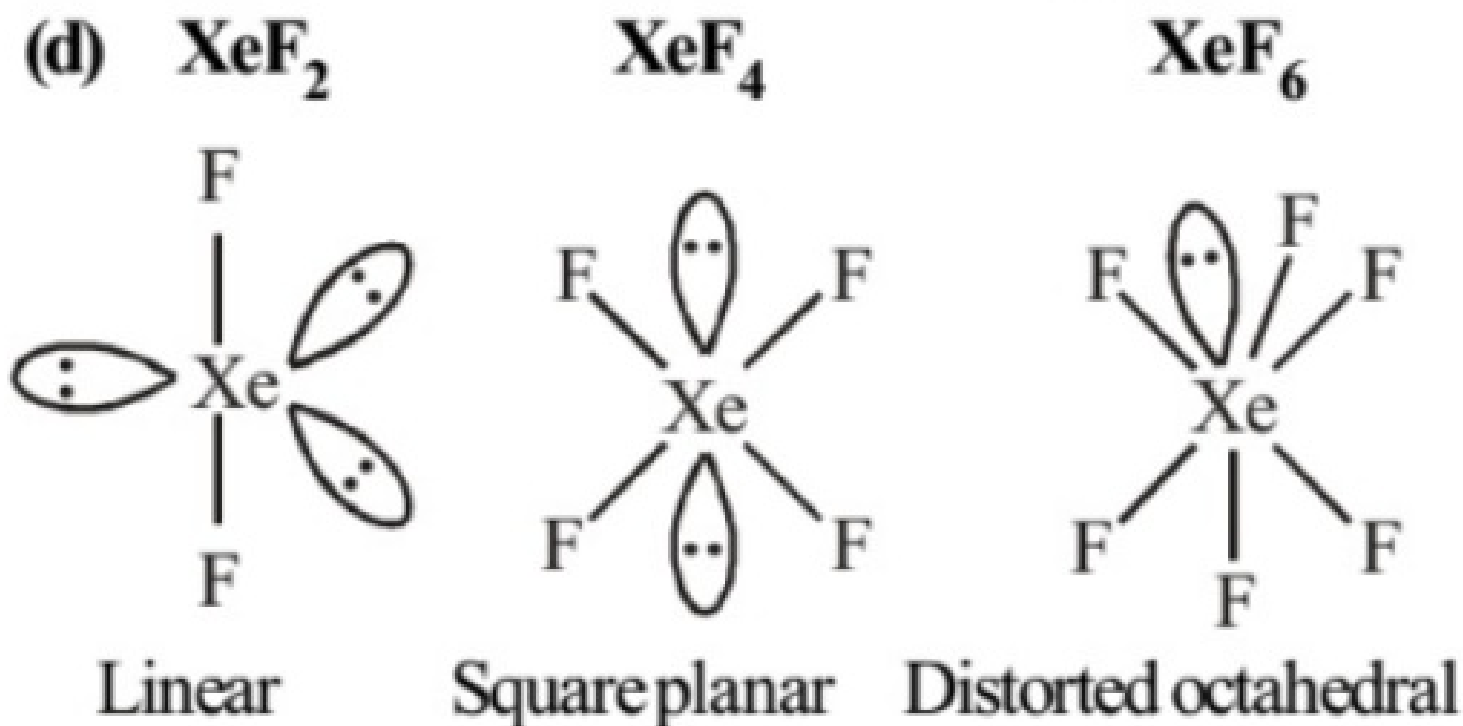
Options:

- A. 2, 3, 1
- B. 1, 2, 3
- C. 4, 1, 2
- D. 3, 2, 1.

Answer: D

Solution:

Solution:



Question 58

Which one of the following molecules will form a linear polymeric structure due to hydrogen bonding?

Options:

- A. NH_3
- B. H_2O
- C. HCl

D. HF

Answer: D

Solution:

Solution:

HF form linear polymeric structure due to hydrogen bonding.

Question 59

Arsenic containing medicine used for the treatment of syphilis, is

Options:

A. erythromycin

B. ofloxacin

C. tetracycline

D. salvarsan

Answer: D

Solution:

Solution:

Question 60

The difference in the number of unpaired electrons of a metal ion in its high-spin and low-spin octahedral complexes is two. The metal ion is:

Options:

A. Ni^{2+}

B. Fe^{2+}

C. Co^{2+}

D. Mn^{2+}

Answer: C

Solution:

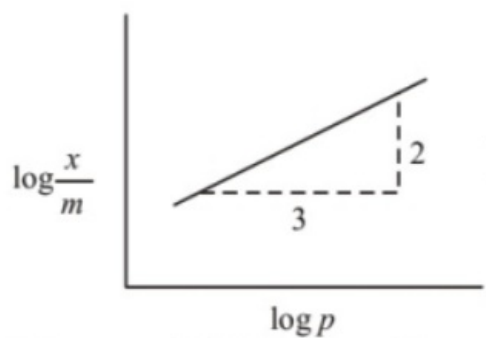
Solution:

Metal ion	No. of unpaired elec.		Difference in the unpaired electrons
	High spin	Low spin	
$\text{Ni}^{2+} (3d^8)$	2	2	0
$\text{Mn}^{2+} (3d^5)$	5	1	4
$\text{Fe} (3d^6)$	4	0	4
$\text{Co}^{2+} (3d^7)$	3	1	2

Question 61

Adsorption of a gas follows Freundlich adsorption isotherm. x is the mass of the gas adsorbed on mass m of the adsorbent. The plot of $\frac{x}{m}$ versus $\log p$ is shown in the given graph.

$\frac{x}{m}$ is proportional to :



Options:

- A. $p^{2/3}$
- B. $p^{3/2}$
- C. p^3
- D. p^2

Answer: A

Solution:

Solution:

According to Freundlich adsorption isotherm

$$\frac{x}{m} \propto p^{\frac{1}{n}}; \frac{x}{m} = kp^{\frac{1}{n}}$$

$$\text{Slope} = \frac{2}{3}$$

$$\log \frac{x}{m} = \log k + \frac{1}{n} \log p$$

$$\text{Slope} = \frac{1}{n} = \frac{2}{3}$$

$$\frac{x}{m} \propto p^{\frac{2}{3}}$$

Question 62

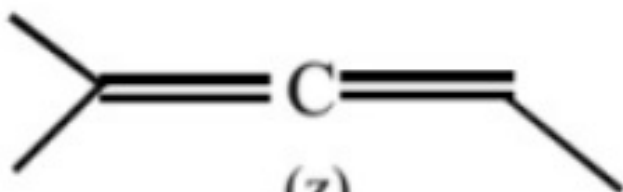
The correct stability order of following species is -



(x)



(y)



(z)



(w)

Options:

A. $x > y > w > z$

B. $y > x > w > z$

C. $x > w > z > y$

D. $z > x > y > w$

Answer: C

Solution:

Solution:

x has a conjugated diene system, w an isolated diene system, z a cumulated diene system, and y an antiaromatic system.

Question 63

Nitrogen is obtained by the thermal decomposition of:

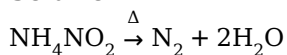
Options:

- A. NH_4NO_2
- B. NH_4NO_3
- C. AgNO_3
- D. $\text{Pb}(\text{NO}_3)_2$

Answer: A

Solution:

Solution:



Question 64

Calculate the wavelength (in nanometer) associated with a proton moving at $1.0 \times 10^3 \text{ ms}^{-1}$.

(Mass of proton = $1.67 \times 10^{-27} \text{ kg}$ and $h = 6.63 \times 10^{-34} \text{ Js}$)

Options:

- A. 0.40 nm
- B. 2.5 nm
- C. 14.0 nm
- D. 0.32 nm

Answer: A

Solution:

Solution:

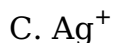
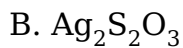
$$\begin{aligned} \lambda &= \frac{h}{mv} = \frac{6.63 \times 10^{-34}}{1.67 \times 10^{-27} \times 1 \times 10^3} \\ &= 3.97 \times 10^{-10} \text{ meter} = 0.397 \text{ nanometer} \approx 0.40 \text{ nm} \end{aligned}$$

Question 65

The solubility of silver bromide in hypo solution involves the formation of:

Options:

- A. Ag_2SO_3

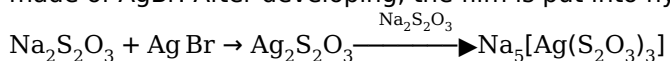


Answer: B

Solution:

Solution:

Hypo solution is $\text{Na}_2\text{S}_2\text{O}_3$ solution which is used in photography for fixing films & prints. Photographic emulsions are made of AgBr . After developing, the film is put into hypo solution. This forms soluble complex with Ag .



Question 66

Fructose reduces Tollen's reagent due to:

Options:

A. enolisation of fructose followed by conversion to glucose (having aldehydic group) by the base present in Tollen's reagent

B. asymmetric carbons

C. primary alcoholic group

D. secondary alcoholic group

Answer: A

Solution:

Solution:

Question 67

When C_2H_2 , CH_4 and C_2H_4 pass through a test tube which has ammonical Cu_2Cl_2 , find out which gas comes out unaffected from test tube?

Options:

A. C_2H_2 and CH_4

B. C_2H_2 and C_2H_4

C. C_2H_4 and CH_4

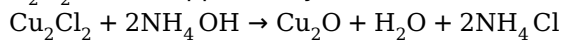
D. C_2H_2

Answer: C

Solution:

Solution:

C_2H_2 forms copper acetylide with ammonical Cu_2Cl_2



Question 68

Which of the following acts as an antioxidant in edible oils

Options:

A. Vitamin B

B. Vitamin C

C. Vitamin D

D. Vitamin E

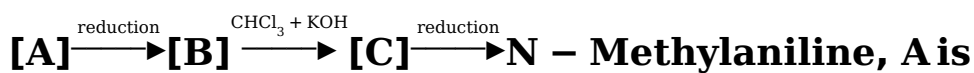
Answer: D

Solution:

Solution:

Vitamin E is an antioxidant present in edible oils.

Question 69



Options:

A. Formaldehyde

B. Trichloromethane

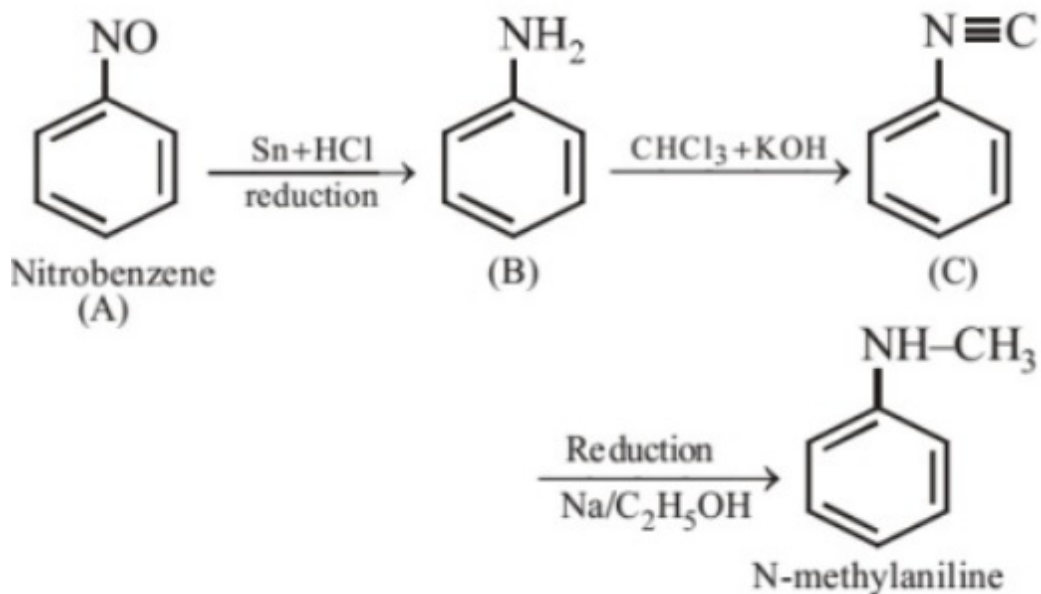
C. Nitrobenzene

D. Toluene

Answer: C

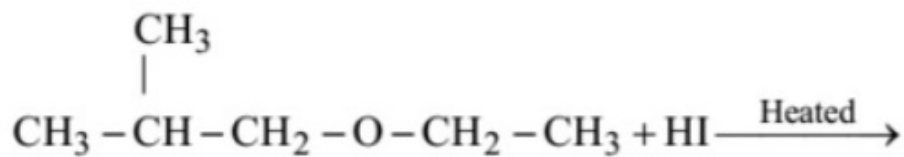
Solution:

Solution:



Question 70

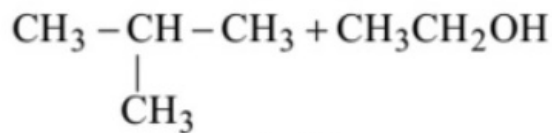
In the reaction:



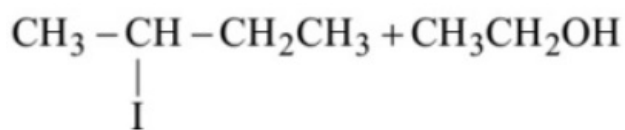
Which of the following compounds will be formed?

Options:

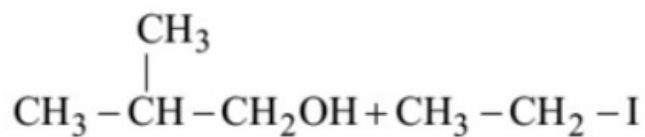
A.



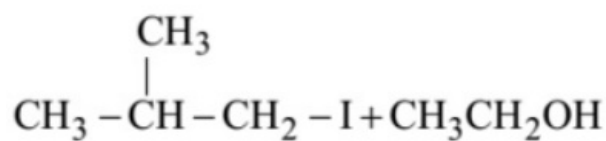
B.



C.



D.



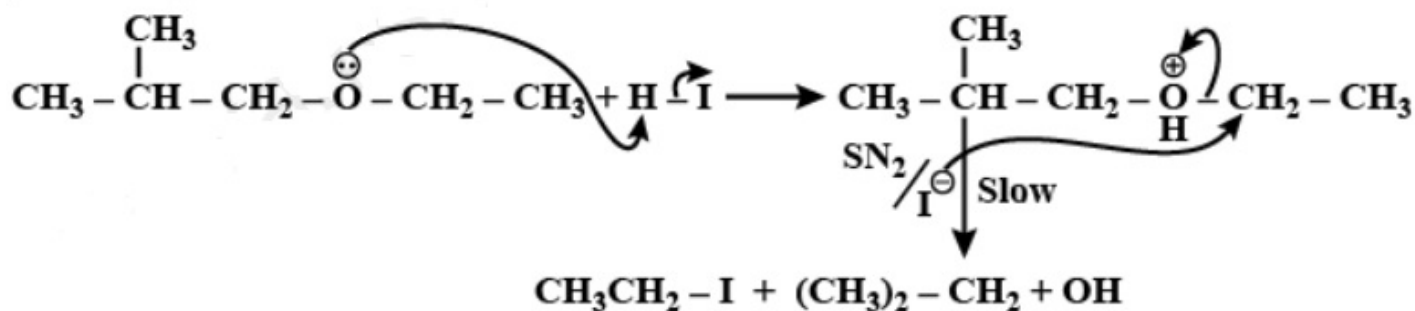
Answer: C

Solution:

Solution:

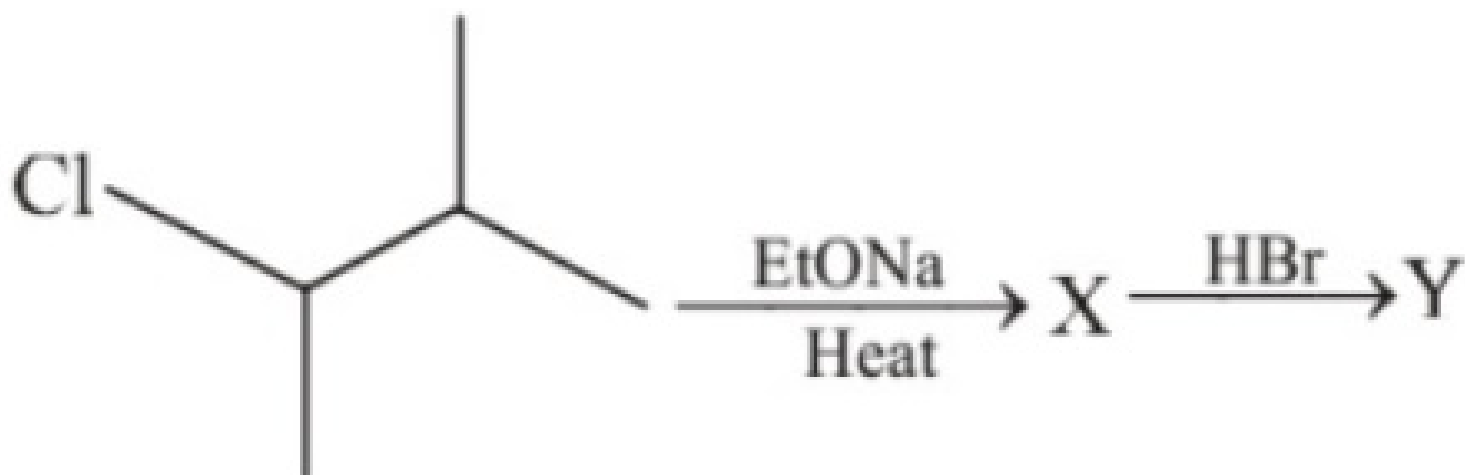


Mechanism



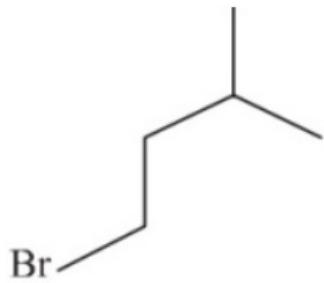
Question 71

The major product ' Y ' in the following reaction is :

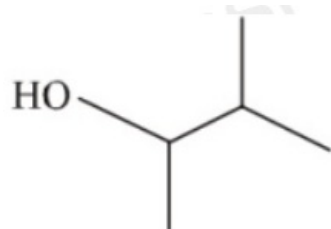


Options:

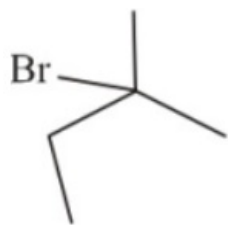
A.



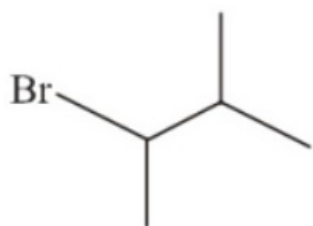
B.



C.



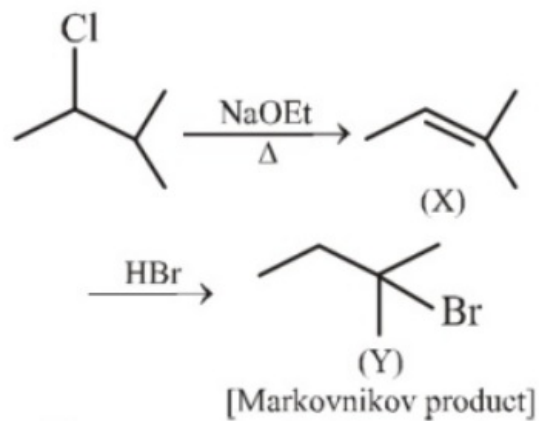
D.



Answer: C

Solution:

Solution:



Question 72

Biochemical oxygen demand(BOD) value can be a measure of water pollution caused by the organic matter.

Which of the following statements is correct?

Options:

- A. Polluted water has BOD value higher than 10 ppm
- B. Aerobic bacteria decreases the BOD value
- C. Anaerobic bacteria increases the BOD value
- D. Clean water has BOD value higher than 10 ppm

Answer: A

Solution:

Solution:

Clean water has BOD value less than 5 ppm. Polluted water has BOD value higher than 10 ppm.

Question 73

Which of the following has minimum melting point?

Options:

- A. CsF
- B. HCl
- C. HF
- D. LiF

Answer: B

Solution:

Solution:

Ionic compounds have high melting point. Greater the ionic character, more is melting point. HCl has least ionic character because of maximum electronegativity difference between the two constituent elements, (H and Cl) among CsF, HCl, HF and LiF

∴ HCl has minimum melting point.

Question 74

X mL of H₂ gas effuses through a hole in a container in 5 seconds. The time taken for the effusion of the same volume of the gas specified below under identical conditions is :

Options:

- A. 10 seconds : He
- B. 20 seconds: O₂
- C. 25 seconds: CO
- D. 55 seconds : CO₂

Answer: B**Solution:****Solution:**

Under identical conditions, $\frac{r_1}{r_2} = \sqrt{\frac{M_2}{M_1}}$

As rate of diffusion is also inversely proportional to time, we will have, $\frac{t_2}{t_1} = \sqrt{\frac{M_2}{M_1}}$

(a) Thus, For He, $t_2 = \sqrt{\frac{4}{2}}(5s) = 5\sqrt{2}s \neq 10s$;

(b) For O₂, $t_2 = \sqrt{\frac{32}{2}}(5s) = 20s$

(c) For CO, $t_2 = \sqrt{\frac{28}{2}}(5s) \neq 25s$;

(d) For CO₂, $t_2 = \sqrt{\frac{44}{2}}(5s) \neq 55s$

Question 75

Work out the heat change (cal) when 40g of He gas at 27°C undergoes isothermal and reversible compression from initial pressure of 1 atm to 10 atm (R = 2 cal K⁻¹ mol⁻¹) .

Options:

- A. 13.818 kcal
- B. -13.818 kcal
- C. 55.272 kcal
- D. -55.272 kcal

Answer: B**Solution:****Solution:**

$$q = -w_{\text{rev}} = - \left(-2.303 nRT \log \frac{P_1}{P_2} \right)$$
$$= 2.303 \times \frac{40}{4} \times 2 \times 300 \log \frac{1}{10} = -13.82 \text{ kcal}$$

Question 76

PCl_5 is dissociating 50% at 250°C at a total pressure of P atm. If equilibrium constant is K_p , then which of the following relation is numerically correct -

Options:

A. $K_p = 3P$

B. $P = 3K_p$

C. $P = \frac{2K_p}{3}$

D. $K_p = \frac{2P}{3}$

Answer: B

Solution:

Solution:



Moles at equilibrium	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$
----------------------	---------------	---------------	---------------

Mole fraction at equilibrium	$\frac{1}{3}$	$\frac{1}{3}$	$\frac{1}{3}$
------------------------------	---------------	---------------	---------------

Partial pressure at equilibrium	$\frac{P}{3}$	$\frac{P}{3}$	$\frac{P}{3}$
---------------------------------	---------------	---------------	---------------

$$K_p = \frac{\frac{P}{3} \times \frac{P}{3}}{\frac{P}{3}} = \frac{P}{3}$$

Question 77

For the reaction: $\text{NH}_3 + \text{OCl}^- \rightarrow \text{N}_2\text{H}_4 + \text{Cl}^-$ in basic medium, the coefficients of NH_3 , OCl^- and N_2H_4 for the balanced equation are respectively

Options:

A. 2, 2, 2

B. 2, 2, 1

C. 2, 1, 1

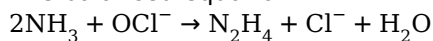
D. 4, 4, 2

Answer: C

Solution:

Solution:

The balanced equation :



Question 78

Two elements A and B have similar chemical properties. They don't form solid hydrogencarbonates, but react with nitrogen to form nitrides. A and B, respectively, are :

Options:

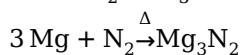
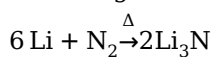
- A. Na and Rb
- B. Na and Ca
- C. Cs and Ba
- D. Li and Mg

Answer: D

Solution:

Solution:

Li and Mg do not form solid bicarbonate, but react with N_2 to give nitrides.



Question 79

Diborane (B_2H_6) reacts independently with O_2 and H_2O to produce, respectively;

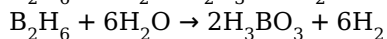
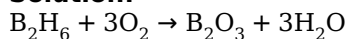
Options:

- A. B_2O_3 and H_3BO_3
- B. B_2O_3 and $[\text{BH}_4]^-$
- C. H_3BO_3 and B_2O_3
- D. HBO_2 and H_3BO_3

Answer: A

Solution:

Solution:



Question 80

At 25°C, the molar conductance at infinite dilution for the strong electrolytes NaOH, NaCl and BaCl₂ are 248×10^{-4} , 126×10^{-4} and $280 \times 10^{-4} \text{Sm}^2\text{mol}^{-1}$ respectively. $\Delta_m^0 \text{Ba(OH)}_2$ in $\text{Sm}^2\text{mol}^{-1}$ is

Options:

A. 52.4×10^{-4}

B. 524×10^{-4}

C. 402×10^{-4}

D. 262×10^{-4}

Answer: B

Solution:

Solution:

$$\Delta_{\text{Na}^+}^\circ + \Delta_{\text{OH}^-}^\circ = 248 \times 10^{-4} \text{Sm}^2\text{mol}^{-1}$$

$$\Delta_{\text{Na}^+}^\circ + \Delta_{\text{Cl}^-}^\circ = 126 \times 10^{-4} \text{Sm}^2\text{mol}^{-1}$$

$$\Delta_{\text{Ba}^{2+}}^\circ + \Delta_{2\text{Cl}^-}^\circ = 280 \times 10^{-4} \text{Sm}^2\text{mol}^{-1}$$

Now,

$$\Delta_{\text{Ba(OH)}_2}^\circ = \Delta_{\text{BaCl}_2}^\circ + 2\Delta_{\text{NaOH}}^\circ - 2\Delta_{\text{NaCl}}^\circ$$

$$\Delta_{\text{Ba(OH)}_2}^\circ = 280 \times 10^{-4} + 2 \times 248 \times 10^{-4} - 2 \times 126 \times 10^{-4}$$

$$\Delta_{\text{Ba(OH)}_2}^\circ = 524 \times 10^{-4} \text{Sm}^2\text{mol}^{-1}$$