JEE MAIN Sept. 2020

QUESTION PAPER WITH SOLUTION

CHEMISTRY _ 5 Sep. _ SHIFT - 2

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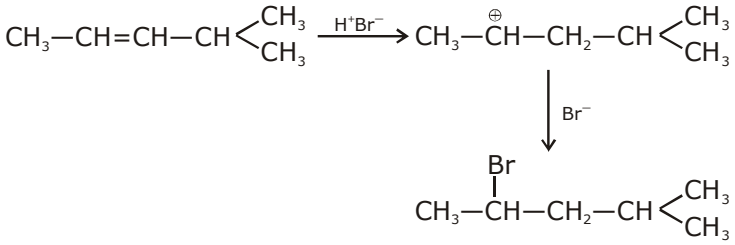
1. The major product formed in the following reaction is :
निम्न अभिक्रिया में निर्मित मुख्य उत्पाद है–

$$CH_3CH = CHCH(CH_3)_2 \xrightarrow{HBr}$$

(1) $CH_3CH(Br)CH_2CH(CH_3)_2$ (2) $CH_3CH_2CH_2C(Br)(CH_3)_2$
(3) $CH_3CH_2CH(Br)CH(CH_3)_2$ (4) $Br(CH_2)_3CH(CH_3)_2$

Sol. **1**



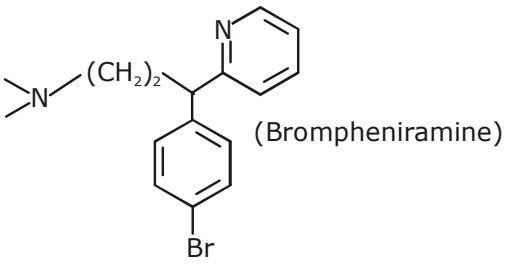
2. Hydrogen peroxide, in the pure state, is :
(1) Linear and blue in color (2) Linear and almost colorless
(3) Non-planar and almost colorless (4) Planar and bluein color
शुद्ध अवस्था में हाइड्राजन पेरोक्साइड होता है :
(1) रैखीय तथा नीले रंग में (2) रैखीय तथा लगभग रंगहीन
(3) असमतलीय तथा लगभग रंगहीन (4) समतलीय तथा नीले रंग में

Sol. **3**
H_2O_2 has openbook structure it is non planar

3. Boron and silicon of very high purity can be obtained through :
(1) Liquation (2) Electrolytic refining
(3) Zone refining (4) Vapour phase refining
बोरोन तथा सिलिकॉन को बहुत उच्च शुद्धता में, के माध्यम से प्राप्त कर सकते है :
(1) द्रावगलन परिष्करण (2) वैद्युत अपघटनी परिष्करण
(3) मंडल परिष्करण (4) वाष्प प्रावस्था परिष्करण

Sol. **3**
Fact

4. The following molecule acts as an :



(Brompheniramine)

(1) Anti-histamine (2) Antiseptic (3) Anti-depressant (4) Anti-bacterial

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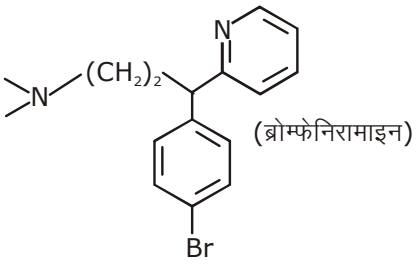
निम्न अणु के रूप में कार्य करता है–

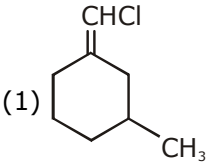


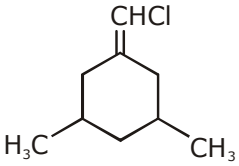
(ब्रोम्फेनिरामाइन)

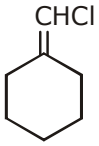
(1) प्रति-हिस्टामिन (2) प्रतिरक्षी (3) प्रति–अवसाद (4) प्रति-जीवाणु

Sol. **1**
Anti-histamine

5. Among the following compounds, geometrical isomerism is exhibited by :
निम्न यौगिको में से किसके द्वारा ज्यामितीय समावयवता प्रदर्शित की जाती है :

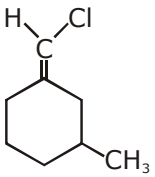
(1) 

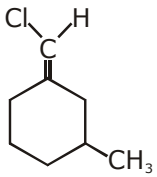
(2) 

(3) 

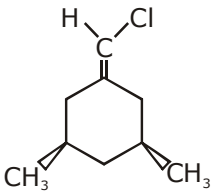
(4) 

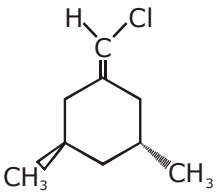
Sol. **1 & 2**



and 

are geometrical isomer



and 

are geometrical isomer

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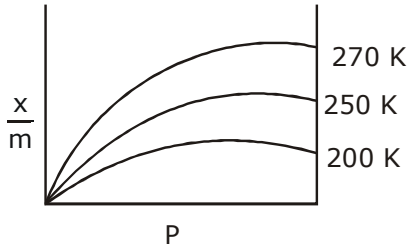
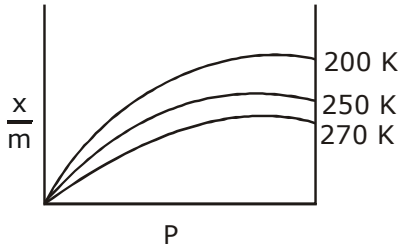
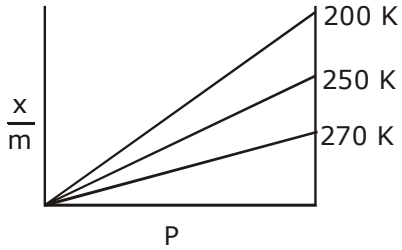
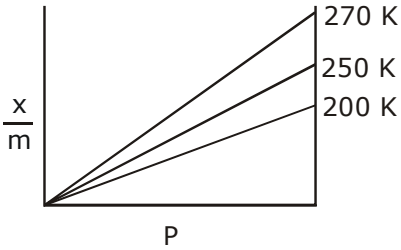
6. Adsorption of a gas follows Freundlich adsorption isotherm. If x is the mass of the gas adsorbed on mass m of the adsorbent, the correct plot of $\frac{x}{m}$ versus p is :

एक गैस के अवशोषण में फ्रेंडलिक अवशोषण समतापी रेखा का पालन होता है। यदि x अवशोषित पदार्थ के m द्रव्यमान पर अवशोषित गैस का द्रव्यमान है, तो p के सामने $\frac{x}{m}$ का सही क्षेत्र है:

(1)


(2)


(3)


(4)


Sol. **2**

As temp. increases extent of Adsorption decreases

Therefore correct option (2)

$\frac{x}{m} = KP^{1/n}$

$\frac{x}{m}$ v/s P $\rightarrow$ non linear curve

7. The compound that has the largest H–M–H bond angle (M=N, O, S, C) is :

यौगिक जिसका दीर्घतम H–M–H बन्ध कोण होता है (M=N, O, S, C) :

(1) CH_4 (2) H_2S (3) NH_3 (4) H_2O

Sol. **1**

CH_4	>	NH_3	>	H_2O	>	H_2S
$Sp^3(\ell p = 0)$		$Sp^3(\ell p = 1$		$Sp^3(\ell p = 2)$		$Sp^3(\ell p = 2)$
BA 107^o28^1		BA = 107^o		BA = 104^o5^1		BA =92^o

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8. The correct statement about probability density (except at infinite distance from nucleus) is :
(1) It can be zero for 3p orbital (2) It can be zero for 1s orbital
(3) It can never be zero for 2s orbital (4) It can negative for 2p orbital
घनत्व प्रायिकता (नाभिक से अनन्त दूरी को छोड़कर) के बारे में सही कथन है–
(1) यह 3p कक्षक के लिए शून्य हो सकती है। (2) यह 1s कक्षक के लिए शून्य हो सकती है।
(3) यह 2s कक्षक के लिए शून्य कभी नही हो सकती है। (4) यह 2p कक्षक के लिए ऋणात्मक हो सकती है।

Sol. **1**

$\psi^2_{R/S} > 0$ always

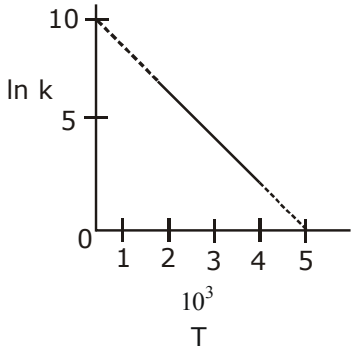
$\psi^2_{R/S}$ can be = 0; As '2s' has 1 Radial Node

ψ^2_{R} can never be negative

ψ^2_{R} (3P) can be = 0 as 3P has Radial Nodes

Ans. Option (1)

9. The rate constant (k) of a reaction is measured at differenct temperatures (T), and the data are plotted in the given figure. The activation energy of the reaction in kJ mol^{-1} is : (R is gas constant)
किसी अभिक्रिया के दर स्थिरांक (k) को विभिन्न तापमानों (T) पर मापा जाता है तथा दिये गये चित्र में ऑकड़ो को रखते है। अभिक्रिया की सक्रियण ऊर्जा kJ mol^{-1} में है। (R गैस स्थिरांक है)



(1) R (2) 2/R (3) 1/R (4) 2R

Sol. **4**

$$\ln(k) = \ln(A) - \frac{Ea}{R}\left(\frac{1}{T}\right)$$

$\ln(A) = 10$

$$\text{Slope} = \frac{-Ea}{R} \times 10^{-3} = -10/5$$

$E_a = 2000R$ J/mol
$E_a = 2R$ KJ/mol

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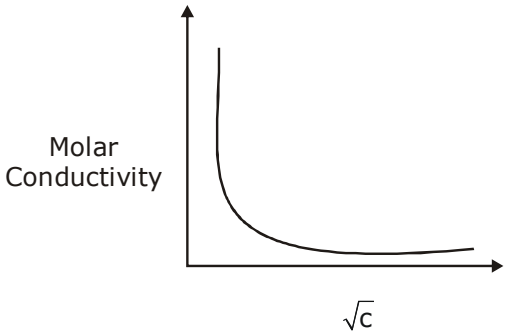
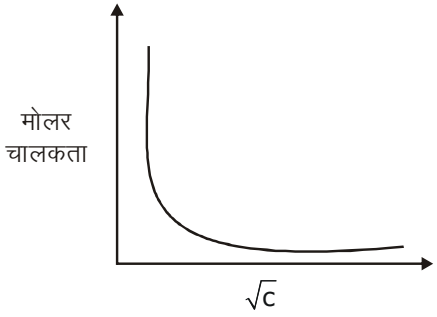
10. The variation of molar conductivity with concentration of an electrolyte (X) in aqueous solution is shown in the given figure.

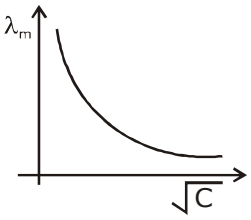


The electrolyte X is :
दिये गये चित्र में जलीय विलयन में किसी विद्युत अपघटय (X) की सान्द्रता के साथ मोलर चालकता परिवर्तन को दर्शाया गया है–



विद्युत अपघटय X है–
(1) HCl (2) CH_3COOH (3) NaCl (4) KNO_3

Sol. **2**



Such type of variation is always for weak electrolyte
Hence Ans (2) CH_3COOH

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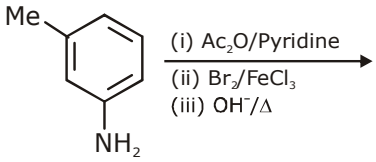
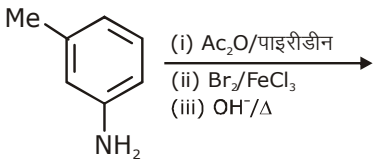
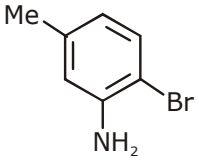
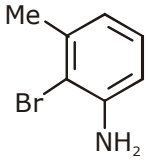
11. The final major product of the following reaction is :

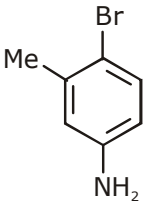


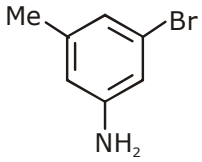
निम्न अभिक्रिया का अंतिम मुख्य उत्पाद है–



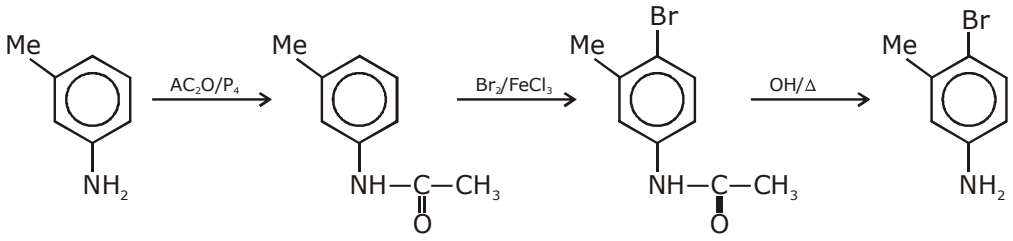
(1) 

(2) 

(3) 

(4) 

Sol. **3**



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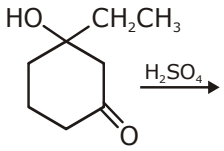
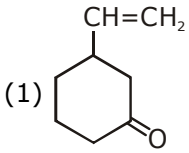
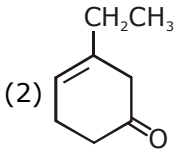
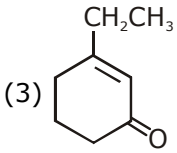
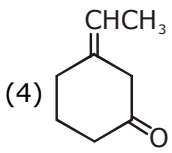
12. The major product of the following reaction is :
निम्न अभिक्रिया का मुख्य उत्पाद है–



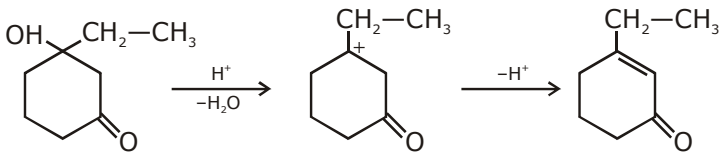
(1) 

(2) 

(3) 

(4) 

Sol. **3**



13. Lattice enthalpy and enthalpy of solution of NaCl are 788 kJ mol^{-1}, and 4 kJ mol^{-1}, respectively. The hydration enthalpy of NaCl is :
NaCl के विलयन की जालक एन्थैली तथा एन्थैली क्रमशः 788 kJ mol^{-1} तथा 4 kJ mol^{-1} है। NaCl की जलयोजन एन्थैल्पी है–
(1) –780 kJ mol^{-1} (2) 784 kJ mol^{-1}
(3) –784 kJ mol^{-1} (4) 780 kJ mol^{-1}

Sol. **3**
ΔH_{sol} = L.E. + ΔH_{hyd}
4 = 788 + ΔH_{Hyd}
ΔH_{Hyd} = – 784 KJ/mol Ans

14. Reaction of ammonia with excess Cl_2 gives :
(1) NH_4Cl and N_2 (2) NH_4Cl and HCl
(3) NCl_3 and HCl (4) NCl_3 and NH_4Cl
Cl_2 के अधिक्य के साथ अमोनिया की अभिक्रिया कराने पर देता है–
(1) NH_4Cl तथा N_2 (2) NH_4Cl तथा HCl
(3) NCl_3 तथा HCl (4) NCl_3 तथा NH_4Cl

Sol. **3**
(1) $NH_3 + 3Cl_2 \xrightarrow[\text{(excess)}]{} NCl_3 + 3HCl$
(2) $8NH_3 + 3Cl_2 \xrightarrow[\text{(excess)}]{} 6NH_4Cl + N_2$

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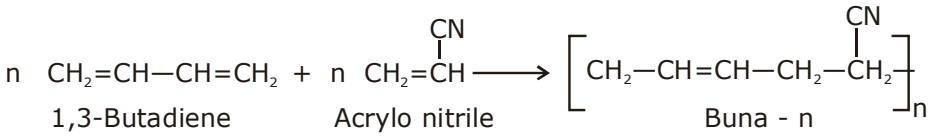
15. Which one of the following polymers is not obtained by condensation polymerisation ?
(1) Bakelite (2) Nylon 6
(3) Buna-N (4) Nylon 6, 6
निम्न मे से कौनसा एक बहुलक संघनन बहुलकीकरण द्वारा प्राप्त नही होता है–
(1) बेकैलाइट (2) नाइलॉन 6
(3) ब्यूना -N (4) नाइलॉन 6, 6

Sol. **2**



16. Consider the comples ions,
trans-$[Co(en)_2Cl_2]^+$ (A) and
cis-$[Co(en)_2Cl_2]^+$ (B)
The correct statement regarding them is :
(1) Both (A) and (B) can be optically active.
(2) (A) can be optically active, but (B) cannot be optically active.
(3) Both (A) and (B) cannot be optically active.
(4) (A) cannot be optically active, but (B) can be optically active.
संकुल आयनों पर विचार कीजिये–
विपक्ष-$[Co(en)_2Cl_2]^+$ (A) तथा
समपक्ष-$[Co(en)_2Cl_2]^+$ (B)
इनसे सम्बन्धित सही कथन है:
(1) (A) तथा (B) दोनो प्रकाशिक सक्रिय हो सकते है।
(2) (A) प्रकाशिक सक्रिय हो सकता है, लेकिन (B) नही।
(3) (A) तथा (B) दोनो प्रकाशिक सक्रिय नही हो सकते है।
(4) (A) प्रकाशिक सक्रिय नही हो सकता है लेकिन (B) हो सकता है।

Sol. **4**
Due to presence of Pos (A) cannot be optically active, but (B) can be optically active

17. An element crystallises in a face-centred cubic (fcc) unit cell with cell edge a. The distance between the centres of two nearest octahedral voids in the crystal lattice is :
एक तत्व कोष्ठिका कोर a के साथ फलक–केन्द्रित धनीय (fcc) एकक कोष्ठिका में क्रिस्टलीकरण करता है। क्रिस्टल जालक में दो निकटतम अष्टफलकीय रिक्तियों के केन्द्रो की मध्य दूरी है:

(1) a (2) $\frac{a}{2}$ (3) $\sqrt{2}a$ (4) $\frac{a}{\sqrt{2}}$

Sol. **4**
Nearest octahedral voids
One along edge center & other at Body centre

$$\text{Distance} = \sqrt{\left(\frac{a}{2}\right)^2 + \left(\frac{a}{2}\right)^2} = \sqrt{2}\,\frac{a}{2}$$

$$= \frac{a}{\sqrt{2}} \text{ Ans.}$$

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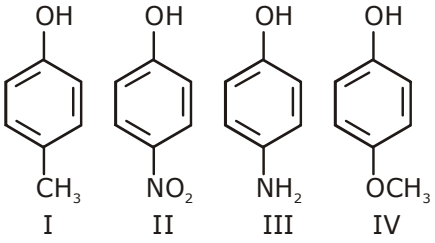
18. The correct order of the ionic radii of O^{2-}, N^{3-}, F^-, Mg^{2+}, Na^+ and Al^{3+} is :
O^{2-}, N^{3-}, F^-, Mg^{2+}, Na^+ तथा Al^{3+} की आयनिक त्रिज्या का सही क्रम है–
(1) $N^{3-} < O^{2-} < F^- < Na^+ < Mg^{2+} < Al^{3+}$ (2) $N^{3-} < F^- < O^{2-} < Mg^{2+} < Na^+ < Al^{3+}$
(3) $Al^{3+} < Na^+ < Mg^{2+} < O^{2-} < F^- < N^{3-}$ (4) $Al^{3+} < Mg^{2+} < Na^+ < F^- < O^{2-} < N^{3-}$

Sol. **4**
all are Isoelectronic

(1) $\frac{N^{3-}O^{2-}F^-Na^+Mg^{2+}Al^{3+}}{Z\uparrow, Zeff\uparrow, Ionic\,Radii\downarrow}$

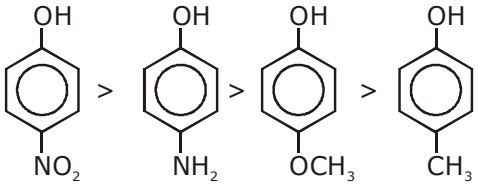
(2) $Al^{3+} < Mg^{2+} < Na^+ < F^- < O^{2-} < N^{3-}$

19. The increasing order of boiling points of the following compounds is :
निम्न यौगिको के क्वथनांको का घटता क्रम है–



(1) I < III < IV < II (2) IV < I < II < III
(3) I < IV < III < II (4) III < I < II < IV

Sol. **3**



20. The one that is NOT suitable for the removal of permanent hardness of water is :
(1) Ion-exchange method (2) Calgon's method
(3) Treatment with sodium carbonate (4) Clark's method
पानी की स्थायी कठोरता को दूर करने के लिए जो उपयुक्त नही है वह है:
(1) आयन-विनिमय विधि (2) कैलगन विधि
(3) सोडियम कार्बोनेट के साथ (4) क्लार्क की विधि

Sol. **4**
Clark's method is used for Removal of Temporary hardness
$Ca(HCO_3)_2 + Ca(OH)_2 \rightarrow 2CaCO_3\downarrow + 2H_2O$
$Mg(HCO_3)_2 + 2Ca(OH)_2 \rightarrow 2CaCP_3 + Mg(OH)_2\downarrow + 2H_2O$

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21. For a reaction $X + Y \rightleftharpoons 2Z$, 1.0 mol of X, 1.5 mol of Y and 0.5 mol of Z were taken in a 1 L vessel and allowed to react. At equilibrium, the concentration of Z was 1.0 mol L^{-1}. The equilibrium constant of reaction is _____ $\frac{x}{15}$. The value of x is _____.

अभिक्रिया $X + Y \rightleftharpoons 2Z$ के लिए, X के 1.0 mol, Y के 1.5 mol तथा Z के 0.5 mol को 1 L पात्र मे लेते है तथा उन्हे क्रिया करने देते है। साम्य पर Z की सान्द्रता 1.0 mol L^{-1} थी अभिक्रिया का साम्य स्थिरांक है _____ $\frac{x}{15}$। x का मान है

Sol. **16**

	$x +$	$y \rightleftharpoons$	$2Z$	
t = 0	1mol	$\frac{3}{2}$mol	$\frac{1}{2}$mol	
t_{eq}	–	–	1 mol	$2x = \frac{1}{2}$
t_{eq}	$1-x$	$\frac{3}{2}-x$	$\frac{1}{2}+2x$	$x = \frac{1}{4}$
t_{eq}	$\frac{3}{4}$mol	$\frac{5}{4}$mol	1 mol	

$$K_{eq} = \frac{(1)^2}{\frac{5}{4}\times\frac{3}{4}} = \frac{16}{15}$$

x = 16 Ans.

22. The volume, in mL, of 0.02 M $K_2Cr_2O_7$ solution required to react with 0.288 g of ferrous oxalate in acidic medium is _____.
(Molar mass of Fe= 56 g mol^{-1})
अम्लीय माध्यम में 0.288 g फेरस ऑक्सलेट के साथ क्रिया करने के लिए आवश्यक 0.02 M $K_2Cr_2O_7$ विलयन का आयतन mL मे है _____.
(Fe का मोलर द्रव्यमान = 56 g mol^{-1})

Sol. **50 ml**

$K_2Cr_2O_7 + FeC_2O_4 \rightarrow Cr^{3+} + Fe^{3+} + CO_2$

$$\frac{0.02\times vol\times 6}{1000} = 3\times\frac{0.288}{144}\times 100$$

$$Vol. = \frac{200}{4} = 50 \text{ ml Ans.}$$

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23. Considering that $\Delta_0 > P$, the magnetic moment (in BM) of $[Ru(H_2O)_6]^{2+}$ would be _____.
विचार कीजिए कि $\Delta_0 > P$, $[Ru(H_2O)_6]^{2+}$ का चुम्बकीय आघूर्ण (BM में) होगा _____.

Sol. **0**

$[Ru(H_2O)_6)^{2+}$
$Ru^{2+} = 3d^6$ ($\Delta_0 > P$)
$= t_2g^6\ eg^o$
$n = 0,\ u = 0$

24. For a dimerization reaction, $2A(g) \rightarrow A_2(g)$ at 298 K, $\Delta U^{\ominus} = -20$ kJ mol^{-1}, $\Delta S^{\ominus} = -30$ kJ mol^{-1}, then the $\Delta G^{\ominus}$ will be _____ J.
द्विलकीकरण अभिक्रिया $2A(g) \rightarrow A_2(g)$ के लिए 298 K पर $\Delta U^- = -20$ kJ mol^{-1}, $\Delta S^- = -30$ kJ mol^{-1} है तो ΔG^- होगा will be _____ J.

Sol. **−13538 J**

$2A \longrightarrow A_2$

$\Delta U^{\ominus} = -20$ kJ

$\Delta H^{\ominus} = -20000 + (-1)\ R \times 298$

$\Delta G^{\ominus} = -20000 - 298R + 30 \times 298$

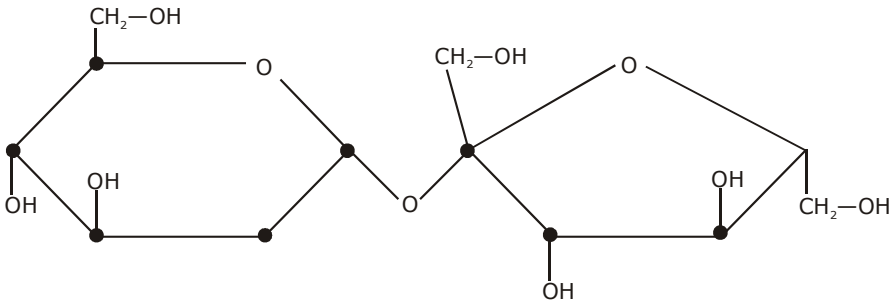
$$\Delta G^{\ominus} = -20{,}000 + 298\left(\frac{90-25}{3}\right)$$

$$\Delta G^{\ominus} = 20{,}000 + \frac{298 \times 65}{3}$$

$\Delta G^{\ominus} = -13538$ J

25. The number of chiral carbons present in sucrose is _____.
सुक्रोस मे उपस्थित किरैल कार्बनो की संख्या है_____.

Sol. **9**



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