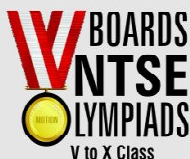


हमारा विश्वास... हर एक विद्यार्थी है स्वास

**JEE
MAIN
Sept.
2020**

QUESTION PAPER WITH SOLUTION

CHEMISTRY _ 2 Sep. _ SHIFT - 1

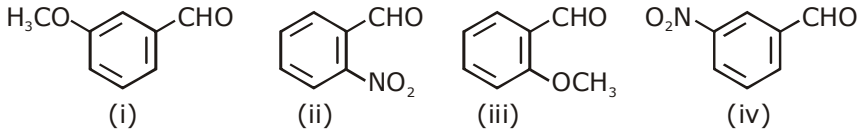


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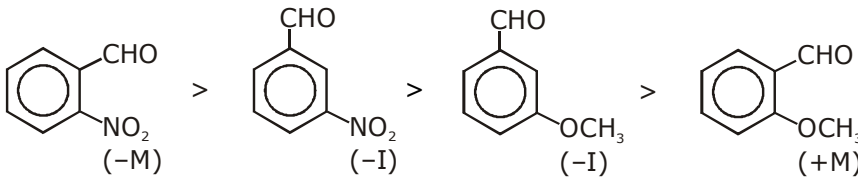
1. The increasing order of the following compounds towards HCN addition is:
निम्न यौगिकों का HCN के संकलन प्रति बढ़ता क्रम है :



- (1) (iii) < (i) < (iv) < (ii) (2) (iii) < (iv) < (i) < (ii)
(3) (i) < (iii) < (iv) < (ii) (4) (iii) < (iv) < (ii) < (i)

Sol. 1

In HCN, CN⁻ acts as nucleophile, attack first that -CHO group which has maximum positive charge. The magnitude of the (+ve) charge increases by -M and -I group. So reactivity order will be



So, option (1) is correct answer.

2. Which of the following is used for the preparation of colloids?
(1) Van Arkel Method (2) Ostwald Process
(3) Mond Process (4) Bredig's Arc Method

निम्न में से कौन कोलायड के तैयार करने में प्रयुक्त होता है ?

- (1) वैन अर्केल विधि (2) ओस्टवाल्ड प्रक्रम
(3) मॉड प्रक्रम (4) ब्रेडिग्स आर्क विधि

Sol. 4

Bredig's Arc method
Chapter name surface chemistry

3. An open beaker of water in equilibrium with water vapour is in a sealed container. When a few grams of glucose are added to the beaker of water, the rate at which water molecules:
(1) leaves the vapour increases (2) leaves the solution increases
(3) leaves the vapour decreases (4) leaves the solution decreases

एक पानी का खुला बीकर जो जल वाष्प के साम्य में है, एक बंद पात्र में रखा गया है। जब ग्लूकोज के कुछ ग्राम बीकर के पानी में डाला जाता है तो दर जिससे पानी के अणु :

- (1) वाष्प को छोड़ेंगे, बढ़ता है (2) विलयन को छोड़ेंगे, बढ़ता है
(3) वाष्प को छोड़ेंगे, घटता है (4) विलयन को छोड़ेंगे, घटता है

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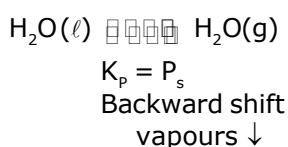
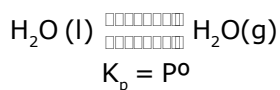
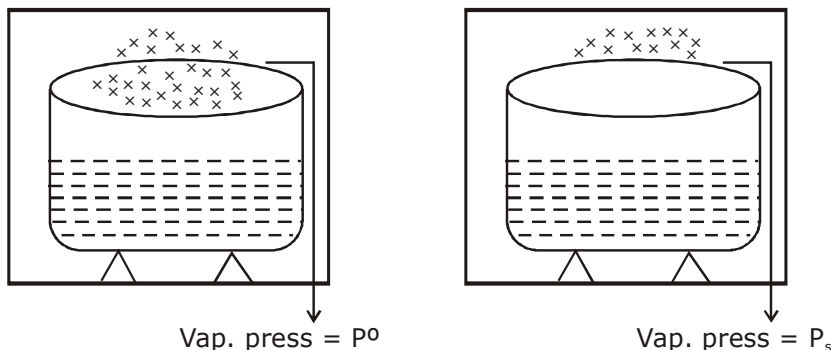
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Sol. 1



Hence Rate at which water molecules leaves the vap. increases.

4. For octahedral Mn(II) and tetrahedral Ni(II) complexes, consider the following statements:

- (I) both the complexes can be high spin.
- (II) Ni(II) complex can very rarely be low spin.
- (III) with strong field ligands, Mn(II) complexes can be low spin.
- (IV) aqueous solution of Mn(II) ions is yellow in colour.

The correct statements are:

- (1) (I), (III) and (IV) only
- (2) (I), (II) and (III) only
- (3) (II), (III) and (IV) only
- (4) (I) and (II) only

अष्टफलकीय मैंगनीज (II) तथा चतुष्फलकीय निकल (II) संकुलों के लिये, निम्न कथनों पर विचार कीजिए :

- (I) दोनों संकुल उच्च प्रचक्रण वाले हो सकते हैं।
- (II) निकल(II) संकुल बहुत कम ही निम्न प्रचक्रण का हो सकता है।
- (III) प्रबल क्षेत्र लिगेण्ड के साथ मैंगनीज (II), निम्न प्रचक्रण का हो सकता है।
- (IV) मैंगनीज (II) का जलीय विलयन पीले रंग का होता है।

सही कथन है :

- (1) (I), (III) तथा (IV) मात्र
- (2) (I), (II) तथा (III) मात्र
- (3) (II), (III) तथा (IV) मात्र
- (4) (I) तथा (II) मात्र

Sol. 2

$\text{Mn}^{2+} [\text{Ar}]3d^5$ it can form low spin as well as high spin complex depending upon nature of ligand same of Ni^{2+} ion with coordination no 4. It can be dsp^2 or sp^3 i:e low spin or high spin depending open nature of ligand.

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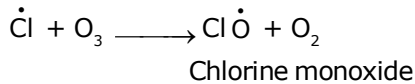
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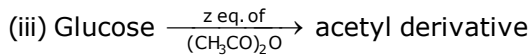
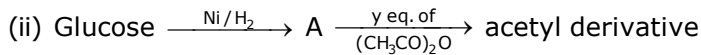
5. The statement that is not true about ozone is:
- (1) in the stratosphere, it forms a protective shield against UV radiation.
 - (2) in the atmosphere, it is depleted by CFCs.
 - (3) in the stratosphere, CFCs release chlorine free radicals (Cl) which reacts with O₃ to give chlorine dioxide radicals.
 - (4) it is a toxic gas and its reaction with NO gives NO₂.
- वह कथन जो ओजोन के बारे में सही नहीं है, है :
- (1) स्ट्रेटोस्फियर में यह UV विकरण के विरुद्ध एक सुरक्षा कवच बनाती है।
 - (2) वायुमण्डल में यह CFCs के द्वारा क्षीण होती है।
 - (3) स्ट्रेटोस्फियर में CFCs क्लोरीन मुक्त मूलक (Cl) निकालते हैं जो O₃ के साथ अभिक्रिया करके क्लोरीन डाइऑक्साइड मूलक देते हैं।
 - (4) यह एक जहरीली गैस है तथा यह NO के साथ अभिक्रिया करके NO₂ देती है।

Sol. 3



Hence option (3)

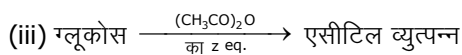
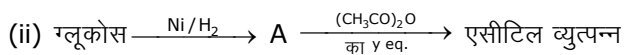
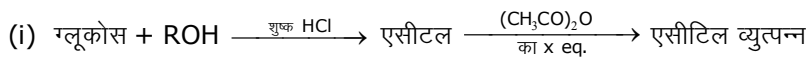
6. Consider the following reactions:



'x', 'y' and 'z' in these reactions are respectively.

- (1) 4, 5 & 5 (2) 5, 4 & 5
 (3) 5, 6 & 5 (4) 4, 6 & 5

निम्न अभिक्रियाओं पर विचार कीजिए :



इन अभिक्रियाओं में 'x', 'y' तथा 'z' क्रमशः है।

- (1) 4, 5 तथा 5 (2) 5, 4 तथा 5
 (3) 5, 6 तथा 5 (4) 4, 6 तथा 5

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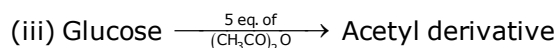
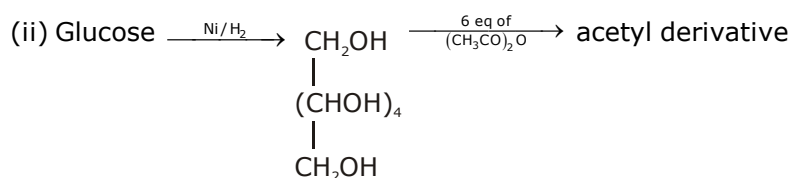
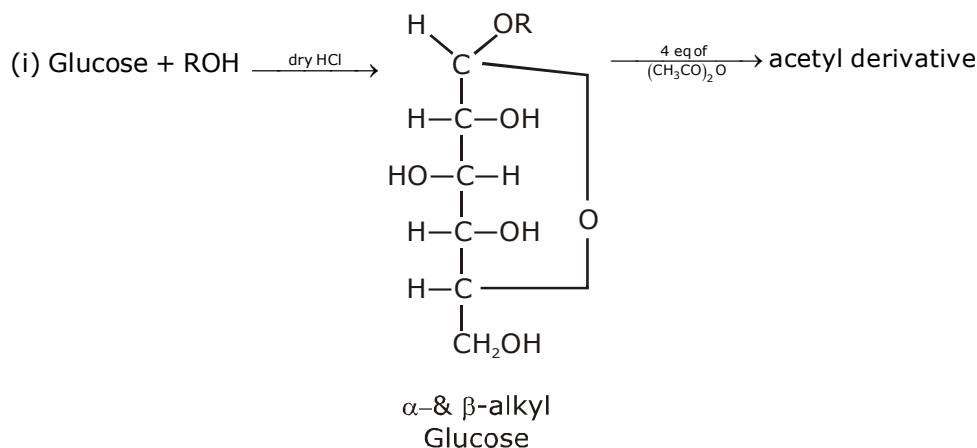
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Sol. 4



$(\text{CH}_3\text{CO})_2\text{O}$ reacts with -OH group to form acetyl derivative, so as the no. of -OH group no. of eq. of $(\text{CH}_3\text{CO})_2\text{O}$ will be used

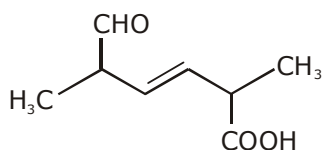
So, $x = 4$

$y = 6$

$z = 5$

So, option (4) will be correct answer.

7. The IUPAC name for the following compound is:



- (1) 2,5-dimethyl-5-carboxy-hex-3-enal (2) 2,5-dimethyl-6-oxo-hex-3-enoic acid
(3) 6-formyl-2-methyl-hex-3-enoic acid (4) 2,5-dimethyl-6-carboxy-hex-3-enal

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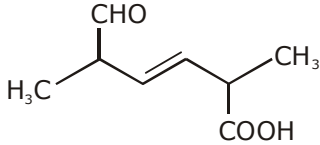
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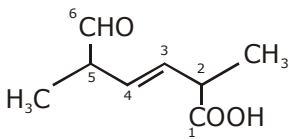
निम्न यौगिकों के IUPAC नाम होगा :



- (1) 2,5-डाइमेथिल-5-कार्बोक्सी-हेक्स-3-ईनल
(3) 6-फोर्मिल-2-मेथिल-हेक्स-3-इनोइक एसिड

- (2) 2,5-डाइमेथिल-6-ऑक्सो-हेक्स-3-इनोइक एसिड
(4) 2,5-डाइमेथिल-6-कार्बोक्सी-हेक्स-3-ईनल

Sol. 2



2,5-Dimethyl-6-oxohex-3-enoic acid

8. For the following Assertion and Reason, the correct option is

Assertion (A): When Cu (II) and sulphide ions are mixed, they react together extremely quickly to give a solid.

Reason (R): The equilibrium constant of $\text{Cu}^{2+}(\text{aq}) + \text{S}^{2-}(\text{aq}) \rightleftharpoons \text{CuS}(\text{s})$ is high because the solubility product is low.

- (1) (A) is false and (R) is true.
(2) Both (A) and (R) are false.
(3) Both (A) and (R) are true but (R) is not the explanation for (A).
(4) Both (A) and (R) are true but (R) is the explanation for (A).

निम्न कथन तथा कारण के लिए सही विकल्प हैं :

कथन (A): जब Cu (II) तथा सल्फाइड आयन मिलाये जाते हैं तो वे अत्यन्त जल्दी से अभिक्रिया करके एक ठोस देते हैं।

कारण (R): $\text{Cu}^{2+}(\text{aq}) + \text{S}^{2-}(\text{aq}) \rightleftharpoons \text{CuS}(\text{s})$ का साम्य स्थिरांक उच्च है क्योंकि विलेयता गुणनफल निम्न है।

- (1) (A) गलत है तथा (R) सत्य है।
(2) (A) तथा (R) दोनों ही गलत हैं।
(3) (A) तथा (R) दोनों सत्य हैं परन्तु (R), (A) की सही व्याख्या नहीं है।
(4) (A) तथा (R) दोनों सत्य हैं तथा (A) के लिए (R) सही व्याख्या है।

Sol. 4

- (A) is (B) true &
(R) is correct explanation of (A)

Ans. 4

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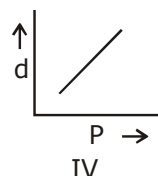
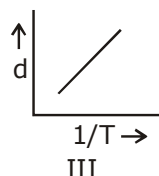
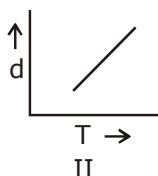
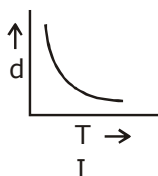
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9. Which one of the following graphs is not correct for ideal gas?

आदर्श गैस के लिए कौनसा ग्राफ सही नहीं है ?



$d = \text{Density}$, $P = \text{Pressure}$, $T = \text{Temperature}$

$d = \text{घनत्व}$, $P = \text{दाब}$, $T = \text{ताप}$

(1) I

(2) IV

(3) III

(4) II

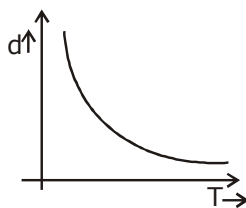
Sol.

4

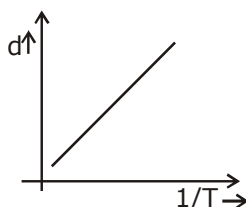
For ideal Gas

$$d = \frac{P \times M}{RT}$$

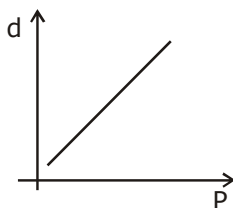
d v/s $T \rightarrow$ Hyperbolic



d v/s $\frac{1}{T} \rightarrow$ St. line



d v/s $p \rightarrow$ St line



\therefore 'II' Graph is incorrect
Ans (4)

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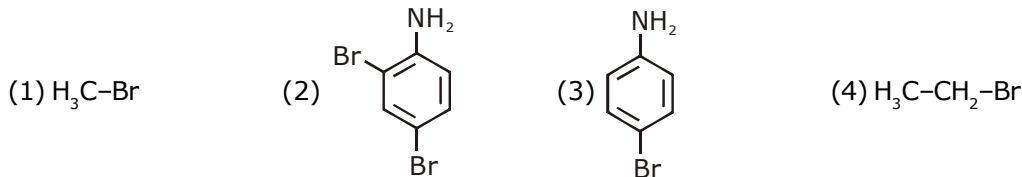
- 10.** While titrating dilute HCl solution with aqueous NaOH, which of the following will not be required?
 (1) Bunsen burner and measuring cylinder (2) Burette and porcelain tile
 (3) Clamp and phenolphthalein (4) Pipette and distilled water
 तनु HCl विलयन को जलीय NaOH के साथ अनुमापित करने में निम्न में से किसकी आवश्यकता नहीं पड़ेगी ?
 (1) बुन्सन बर्नर तथा मेजरिंग सिलिन्डर (2) ब्यूरेट तथा पोर्सलीन टाइल
 (3) क्लैम्प तथा फीनॉल्फथैलीन (4) पिपेट तथा आसुत जल

Sol. 1

Bunsen Burner & measuring cylinder are not Required. As titration is already on exothermic process

Ans.(1)

- 11.** In Carius method of estimation of halogen, 0.172 g of an organic compound showed presence of 0.08 g of bromine. Which of these is the correct structure of the compound?
 हैलोजन के आकलन के कैरिअस विधि में, एक कार्बनिक यौगिक का 0.172 g, 0.08 g ब्रोमीन की उपस्थिति प्रदर्शित किया। निम्न में से यौगिक की सही संरचना है ?



Sol. 3

carius method

$$\text{mass \% of 'Br'} = \frac{0.08}{0.172} \times 100 = \frac{8000}{172} = 46.51\%$$

$$\text{option (1) mass \%} = \frac{80}{95} \times 100$$

$$\text{(2) mass \%} = \frac{2 \times 80 \times 100}{252}$$

$$\text{(3) mass \%} = \frac{1 \times 80 \times 100}{80 + 72 + 6 + 14} = \frac{8000}{172} \%$$

$$\text{(4) mass \%} = \frac{1 \times 80 \times 100}{109} \%$$

Option (3) matches with the given mass percentage value

Ans (3)

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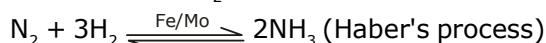
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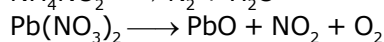
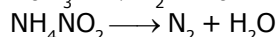
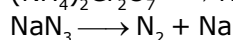
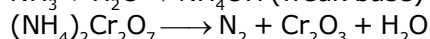
12. On heating compound (A) gives a gas (B) which is a constituent of air. This gas when treated with H_2 in the presence of a catalyst gives another gas (C) which is basic in nature. (A) should not be: यौगिक (A) के गर्म करने पर एक गैस (B) प्राप्त होती है जो वायु का ही एक अवयव है। इस गैस को जब एक उत्प्रेरक की उपस्थिति में H_2 के साथ अभिकृत किया जाता है तो एक दूसरी गैस (C) प्राप्त होती है जिसकी प्रकृति क्षारीय है। (A) को नहीं होना चाहिए :
- (1) $(NH_4)_2Cr_2O_7$ (2) NaN_3 (3) NH_4NO_2 (4) $Pb(NO_3)_2$

Sol. 4

The gas (B) is N_2 which is found in air

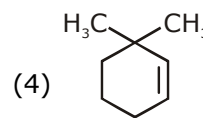
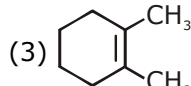
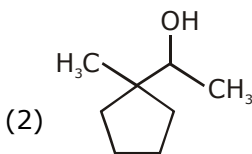
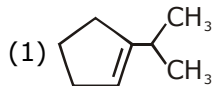
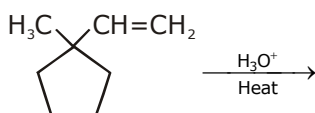


(Basic in nature)

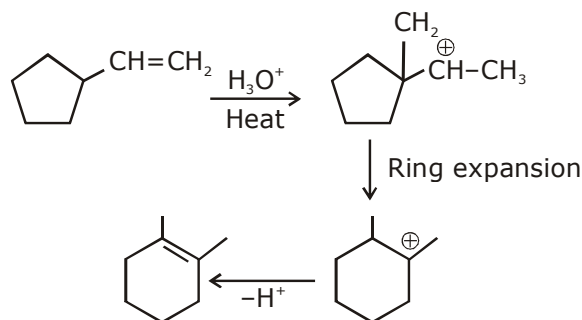


13. The major product in the following reaction is:

निम्न अभिक्रिया में मुख्य उत्पाद है :



Sol. 3



Option (3) is correct answer.

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14. In general, the property (magnitudes only) that shows an opposite trend in comparison to other properties across a period is:

- (1) Ionization enthalpy (2) Electronegativity
(3) Atomic radius (4) Electron gain enthalpy

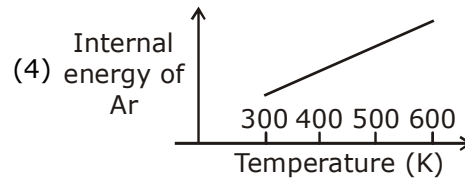
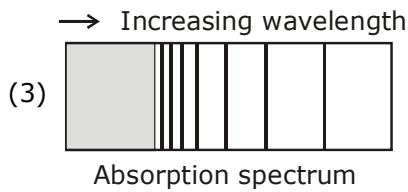
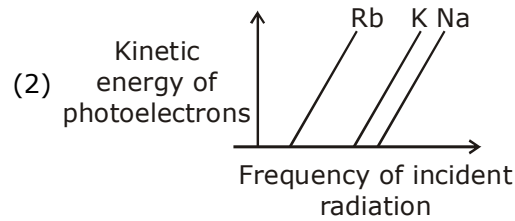
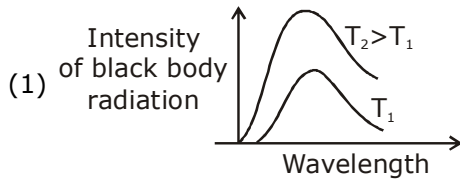
आमतौर से, वह गुणधर्म, (केवल परिमाण) जो एक आवर्त में अन्य गुणधर्मों की तुलना में विपरीत प्रवृत्ति दर्शाता है, है :

- (1) आयनन एन्थैल्पी (2) इलेक्ट्रॉन ऋणात्मकता
(3) परमाणु त्रिज्या (4) इलेक्ट्रॉन लब्धि एन्थैल्पी

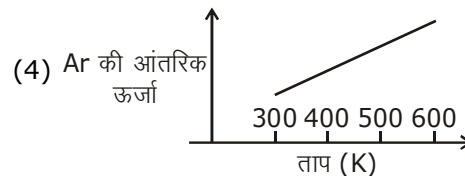
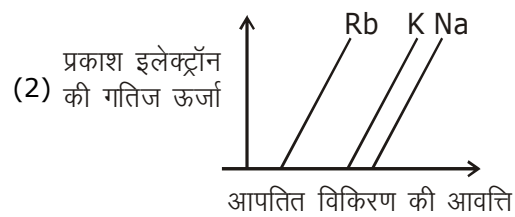
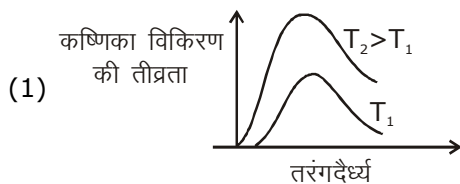
Sol. 3

Ionisation energy, electronegativity & electron gain enthalpy increase across a period but atomic radius decreases

15. The figure that is not a direct manifestation of the quantum nature of atoms is:



चित्र जो परमाणु के क्वाण्टम प्रकृति की सीधी अभिव्यक्ति नहीं है, हैं :



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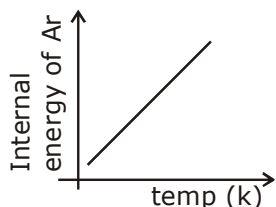
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Sol. 4

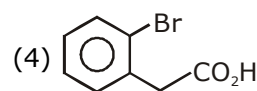
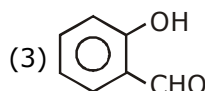
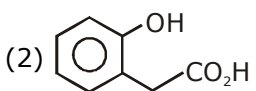
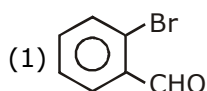
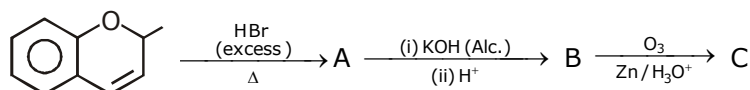
Internal energy of 'Ar' or any gas, has nothing to do with Quantum nature of atom hence



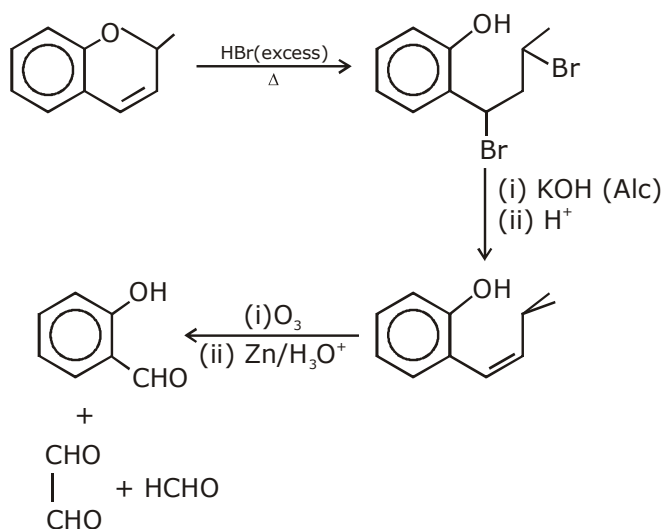
Ans. option (4)

16. The major aromatic product C in the following reaction sequence will be :

निम्न अभिक्रिया अनुक्रम में मुख्य ऐरोमैटिक उत्पाद C होगा :



Sol. 3



Option (3) is correct answer.

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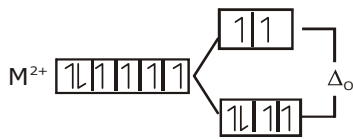
17. Consider that a d^6 metal ion (M^{2+}) forms a complex with aqua ligands, and the spin only magnetic moment of the complex is 4.90 BM. The geometry and the crystal field stabilization energy of the complex is:

- (1) tetrahedral and $-0.6\Delta_t$ (2) tetrahedral and $-1.6\Delta_t + 1P$
 (3) octahedral and $-1.6\Delta_0$ (4) octahedral and $-2.4\Delta_0 + 2P$

विचार कीजिए कि एक d^6 धातु आयन (M^{2+}) एक्वा लिगण्ड्स के साथ एक संकुल बनाता है तथा संकुल का प्रचक्रण मात्र चुम्बकीय आघूर्ण 4.90 BM हैं। संकुल की ज्यामिति तथा क्रिस्टल क्षेत्र स्थायीकरण ऊर्जा है :

- (1) चतुष्फलकीय तथा $-0.6\Delta_t$ (2) चतुष्फलकीय तथा $-1.6\Delta_t + 1P$
 (3) अष्टफलकीय तथा $-1.6\Delta_0$ (4) अष्टफलकीय तथा $-2.4\Delta_0 + 2P$

Sol. 1

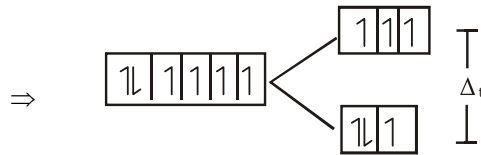


$$\mu_{\text{spin}} = 4.9 \text{ BM}$$

$$\text{CFSE} = -0.4 \times 4\Delta_0 + 0.6 \times 2\Delta_0$$

$$= [1.6 + 1.2] \Delta_0$$

$$= -0.4 \Delta_0$$



$$\text{CFSE} = -0.6 \times 3\Delta_t + 0.4 \times 3\Delta_t$$

$$= -1.8 \Delta_t + 1.2 \Delta_t$$

$$= -0.6 \Delta_t$$

18. If AB_4 molecule is a polar molecule, a possible geometry of AB_4 is:
 (1) Square planar (2) Tetrahedral
 (3) Square pyramidal (4) Rectangular planar

यदि AB_4 अणु एक ध्रुवी अणु है तो AB_4 की सम्भव ज्यामिति होगी :

- (1) वर्ग समतली (2) चतुष्फलकीय
 (3) वर्ग पिरैमिडी (4) आयतीय समतली

Sol. 1

Incorrect question Option 1 is more appropriate with respect to given option
 (Chemical bonding)
 (Options are incorrect)

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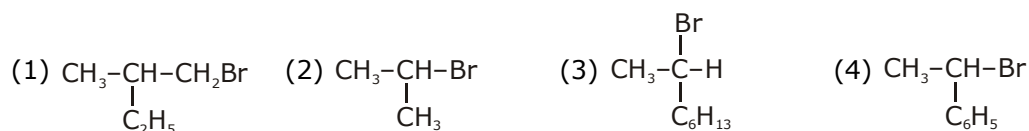
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19. Which of the following compounds will show retention in configuration on nucleophilic substitution by OH⁻ ion?

निम्न में से कौनसा यौगिक OH⁻ आयन द्वारा नाभिक स्नेही प्रतिस्थापन पर विन्यास में धारण प्रदर्शित करेगा ?



Sol. 1

In $\text{CH}_3-\underset{\text{C}_2\text{H}_5}{\text{CH}}-\text{CH}_2\text{Br}$ attack of OH⁻ is not on chiral carbon, it is adjacent to chiral carbon, so configuration of chiral carbon remains constant.

20. The metal mainly used in devising photoelectric cells is:

प्रकाशविद्युत सेल (फोटोइलेक्ट्रिक सेल) के बनाने में मुख्यतया प्रयुक्त धातु है :



Sol. 2

'Cs' is used in photoelectric cell as its ionisation energy is lowest
Hence Ans (2)

21. The mass of gas adsorbed, x, per unit mass of adsorbate, m, was measured at various pressures, p.

A graph between $\log \frac{x}{m}$ and $\log p$ gives a straight line with slope equal to 2 and the intercept equal to 0.4771. The value of $\frac{x}{m}$ at a pressure of 4 atm is: (Given $\log 3 = 0.4771$)

अधिशोष्य, m के प्रति इकाई द्रव्यमान पर अधिशोषित गैस के द्रव्यमान, x को विभिन्न दाबो p पर मापा गया। $\log \frac{x}{m}$ तथा $\log p$ के बीच का ग्राफ एक सीधी रेखा है जिसकी ढाल 2 के बराबर तथा अंतः खण्ड 0.4771 के बराबर है, 4atm के दाब पर $\frac{x}{m}$ का मान होगा:

(दिया है $\log 3 = 0.4771$)

Sol. 48

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

$$\log (x / m) = \log_{(k)} + \frac{1}{n} \log(p)$$

$$y = c + mx$$

$$\text{Intercept } C = \log_k = 0.4771$$

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$$\text{slop} = \frac{1}{n} = 2, k = 3$$

$$\frac{x}{m} = k(P)^{1/n} \quad \text{at } P = 4 \text{ atm}$$

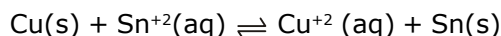
$$= 3(4)^2$$

$$\frac{x}{m} = 3 \times 16 = 48 \text{ Ans}$$

- 22.** The Gibbs energy change (in J) for the given reaction at $[\text{Cu}^{2+}] = [\text{Sn}^{2+}] = 1 \text{ M}$ and 298 K is:
 दिये गये अभिक्रिया के लिए गिब्स ऊर्जा परिवर्तन (J में) $[\text{Cu}^{2+}] = [\text{Sn}^{2+}] = 1 \text{ M}$ तथा 298 K पर होगी :
 $\text{Cu(s)} + \text{Sn}^{2+}(\text{aq.}) \rightarrow \text{Cu}^{2+}(\text{aq.}) + \text{Sn(s)}$

$$(E_{\text{Sn}^{2+}|\text{Sn}}^{\circ} = -0.16\text{V}, E_{\text{Cu}^{2+}|\text{Cu}}^{\circ} = 0.34\text{V}, \text{ Take } F = 96500 \text{ C mol}^{-1})$$

Sol. **96500**



$$E_{\text{cell}}^{\circ} = -0.16 - 0.34$$

$$= -0.50$$

$$\Delta G^{\circ} = -nF E_{\text{cell}}^{\circ}$$

$$= -2 \times 96500 \times (-0.5)$$

$$= +96500$$

$$\Delta G = \Delta G^{\circ} + RT \ln Q$$

$$= 96500 + \frac{25}{3} \times 298 \times 2.303 \log (1)$$

$$\Delta G = 96500 \text{ Joules}$$

- 23.** The internal energy change (in J) when 90 g of water undergoes complete evaporation at 100°C is _____.

$$(\text{Given: } \Delta H_{\text{vap}} \text{ for water at } 373 \text{ K} = 41 \text{ kJ/mol}, R = 8.314 \text{ JK}^{-1} \text{ mol}^{-1})$$

जब 90 g पानी का 100°C पर पूर्णरूप से वाष्पीकरण हो जाये तो आंतरिक ऊर्जा परिवर्तन (J में) होगी _____.

(दिया गया है : 373 K पर पानी के लिये $\Delta H_{\text{vap}} = 41 \text{ kJ/mol}$ तथा $R = 8.314 \text{ JK}^{-1} \text{ mol}^{-1}$)

Sol. $\text{H}_2\text{O} (\ell) \longrightarrow \text{H}_2\text{O} (\text{g})$

$$\Delta E_{\text{vap}} = \Delta H_{\text{vap}} - \Delta n g R T$$

$$= 41000 \times 5 - 5 \times 8.314 \times 373$$

$$= 189494.39$$

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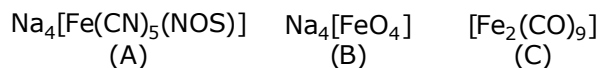
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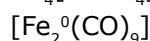
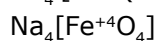
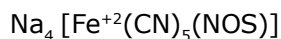
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24. The oxidation states of iron atoms in compounds (A), (B) and (C), respectively, are x, y and z. The sum of x, y and z is _____.

यौगिक (A), (B) तथा (C) में आयरन परमाणुओं की ऑक्सीकरण अवस्थाएँ क्रमशः x, y तथा z हैं। x, y तथा z का योग होगा _____.

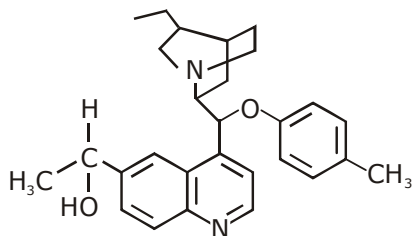


Sol. 6

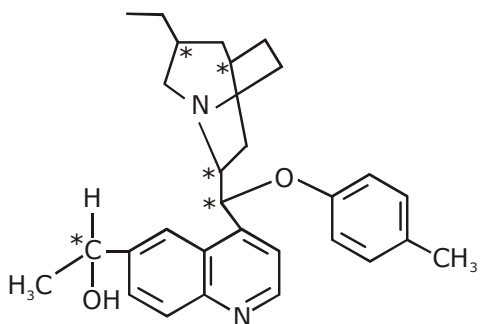


25. The number of chiral carbons present in the molecule given below is _____.

नीचे दिये गये अणु में उपस्थित काइरल कार्बनों की संख्या है _____ ।



Sol. 5



Total chiral carbon = 5

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