CHEMISTRY
08 APRIL 2019 [Phase : II]
JEE MAIN PAPER ONLINE

1. 0.27 g of a long chain fatty acid was dissolved in 100 cm^3 of hexane. 10 mL of this solution was added dropwise to the surface of water in a round watch glass. Hexane evaporates and a monolayer is formed. The distance from edge to centre of the watch glass is 10 cm. What is the height of the monolayer ?
[Density of fatty acid = 0.9 g cm^{-3}; $\pi = 3$]
दीर्घ श्रृंखला वाले फैटी एसिड के 0.27 g को 100 cm^3 हेक्सेन में घोला गया। इस विलयन के 10 mL को एक गोलाकार वाच ग्लास में रखे जल की सतह पर बूँद बूँद करके गिराया गया। हेक्सेन वाष्पीकृत हो गई और एक एकल पर्त बन गई। वाच ग्लास के किनारे से उसके केन्द्र तक की दूरी 10 cm है। उस एकल परत की ऊँचाई क्या होगी?
[फैटी एसिड का घनत्व = 0.9 g cm^{-3}; $\pi = 3$]
(1) 10^{-8} m (2) 10^{-4} m (3) 10^{-2} m (4) 10^{-6} m

A. 4

sol. 0.27 gm in 100 ml of hexane
$\therefore$ in 10 ml of aqueous solution only 0.027 gm acid is present

$$\text{volume of } 0.027 \text{ g acid} = \frac{0.027}{0.9}\text{ml}$$

$$\therefore \quad \pi r^2 h = \frac{0.027}{0.9} (\text{given } r = 10\,\text{cm}, \pi = 3)$$

$\therefore$ $h = 10^{-4}$ cm
$= 10^{-6}$ m

2. The mond process is used for the :
(1) purification of Zr and Ti (2) Extraction of Mo
(3) Purification of Ni (4) Extraction of Zn
मॉन्ड प्रक्रम प्रयुक्त होता है :
(1) Zr तथा Ti के शोधन के लिए (2) Mo के निष्कर्षण के लिए
(3) Ni के शोधन के लिए (4) Zn के निष्कर्षण के लिए

A. 3

sol. Nickel is purified by Mond's process

$$\underset{\text{(impure)}}{\text{Ni}} + 4\text{CO} \xrightarrow{330-350\text{k}} \text{Ni(CO)}_4$$

$$\text{Ni(CO)}_4 \xrightarrow{450-470\text{k}} \underset{\text{(pure)}}{\text{Ni}} + 4\text{CO}$$

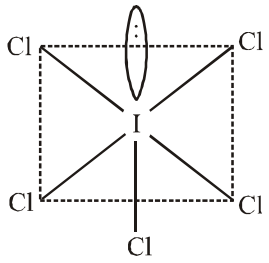
3. The correct statement about ICl_5 and ICl_4^- is :
(1) ICl_5 is square pyramidal and ICl_4^- is tetrahedral
(2) Both are isostructural
(3) ICl_5 is square pyramidal and ICl_4^- is square planar
(4) ICl_5 is trigonal bipyramidal and ICl_4^- is tetrahedral
ICl_5 तथा ICl_4^- के लिए सत्य कथन है :
(1) ICl_5 वर्ग पिरामिडी तथा ICl_4^- चतुष्फलकीय है।
(2) दोनों ही समसंरचनात्मक हैं।

(3) ICl_5 वर्ग पिरामिडी तथा ICl_4^- वर्ग समतलीय है।

(4) ICl_5 त्रिसमनताक्ष द्विपिरामिडी तथा ICl_4^- चतुष्फलकीय है।

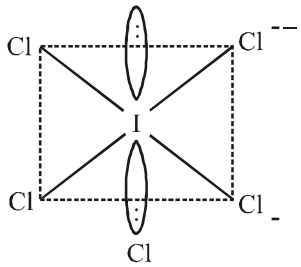
A. 3

sol. ICl_5 is sp^3d^2 hybridised (5 bond pairs, 1 lone pair)



square pyramidal

ICl_4^- is sp^3d^2 hybridised (4 bond pairs, 2 lone pair)



square planar

4. For the following reactions, equilibrium constants are given :

$S(s) + O_2(g) \rightleftharpoons SO_2(g)$; $K_1 = 10^{52}$

$2S(s) + 3O_2(g) \rightleftharpoons 2SO_3(g)$; $K_2 = 10^{129}$

The equilibrium constant for the reaction,

$2SO_2(g) + O_2(g) \rightleftharpoons 2SO_3(g)$ is :

नीचे दी गई अभिक्रियाओं के लिए साम्य स्थिरांक दिये गये हैं :

$S(s) + O_2(g) \rightleftharpoons SO_2(g)$; $K_1 = 10^{52}$

$2S(s) + 3O_2(g) \rightleftharpoons 2SO_3(g)$; $K_2 = 10^{129}$

अभिक्रिया $2SO_2(g) + O_2(g) \rightleftharpoons 2SO_3(g)$ का साम्य स्थिरांक होगा :

(1) 10^{154} (2) 10^{25} (3) 10^{77} (4) 10^{181}

A. 2

sol. eqⁿ 1 $S + O_2 \rightleftharpoons SO_2$ $S(s) + O_2(g) \rightleftharpoons SO_2(g)$ $K_1 = 10^{52}$

eqⁿ 2 $2S + 3O_2 \rightleftharpoons 2SO_3$ $2S(s) + 3O_2(g) \rightleftharpoons 2SO_3(g)$ $K_2 = 10^{129}$

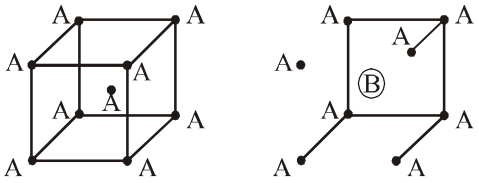
eqⁿ 3 $2SO_2 + O_2 \rightleftharpoons 2SO_3$ $2SO_2(g) + O_2(g) \rightleftharpoons 2SO_3(g)$

eqⁿ 3 = eqⁿ 2 – 2 (eqⁿ 1)

$$= \frac{10^{129}}{(10^{52})^2} = 10^{25}$$

5. Consider the bcc unit cells of the solids 1 and 2 with the position of atoms as shown below. The radius of atom B is twice that of atom A. The unit cell edge length is 50% more in solid 2 than in 1. What is the approximate packing efficiency in solid 2 ?

ठोस 1 तथा 2 परमाणुओं की स्थिति के साथ, जैसा कि नीचे दर्शाया गया है, की बी.सी.सी. (का.कं.घ.) एकक कोष्ठिका पर विचार कीजिए। परमाणु B की त्रिज्या परमाणु A की त्रिज्या की दुगुनी है। ठोस 1 की एकक कोष्ठिका की कोर लम्बाई से ठोस 2 की एकक कोष्ठिका की कोर लम्बाई 50% ज्यादा है। ठोस 2 में लगभग संकुलन दक्षता क्या है?



Solid 1 Solid 2

(1) 45% (2) 65% (3) 75% (4) 90%

A. 4

sol. Volume occupied by atoms in solid 2

$$=\frac{4}{3}\pi r^3+\frac{4}{3}\pi(2r)^3=12\pi r^3$$

relationship between edge length (a) and radius of atom (r)

$$2(2r)+2r=6r=\sqrt{3}\,a \Rightarrow a=\frac{6r}{\sqrt{3}}$$

$$\text{packing efficiency}=\frac{12\pi r^3}{\left(\frac{6r}{\sqrt{3}}\right)^3}\times 100=90\%$$

6. The compound that inhibits the growth of tumors is :

वह यौगिक जो टयूमर की वृद्धि को रोकता है, है :

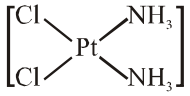
(1) cis-$[Pt(Cl)_2(NH_3)_2]$ (2) trans-$[Pt(Cl)_2(NH_3)_2]$

(3) cis-$[Pd(Cl)_2(NH_3)_2]$ (4) trans-$[Pd(Cl)_2(NH_3)_2]$

A. 1

sol. Cis-platin is used as an anti-cancer drug.

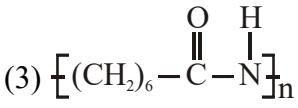
Cis $[PtCl_2(NH_3)_2]$

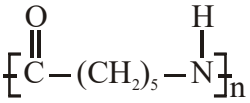


7. The structure of Nylon-6 is :

नाइलॉन-6 की संरचना है :

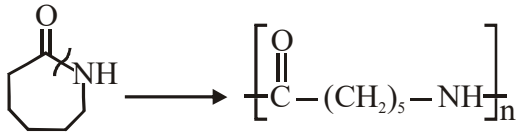
(1) $\left[(CH_2)_4-\overset{\overset{O}{\|}}{C}-\overset{\overset{H}{|}}{N}\right]_n$ (2) $\left[\overset{\overset{O}{\|}}{C}-(CH_2)_6-\overset{\overset{H}{|}}{N}\right]_n$

(3) 

(4) 

A. 4

sol. Nylon-6 is produced from caprolactam



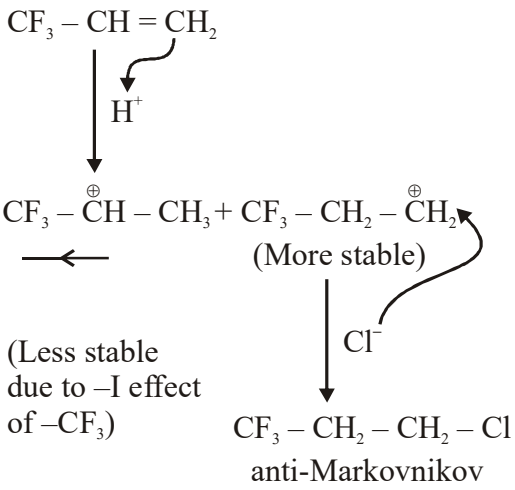
Nylon-6

8. Which one of the following alkenes when treated with HCl yields majorly an anti Markovnikov product ?
निम्नलिखित ऐल्कीनों में से कौन–सा एक HCl के साथ अभिक्रिया करके मुख्यतः एक प्रति मार्कोनीकॉफ उत्पाद देता है?

(1) $F_3C–CH=CH_2$ (2) $CH_3O–CH=CH_2$ (3) $H_2N–CH=CH_2$ (4) $C\mathit{l}–CH=CH_2$

A. 1

sol.



9. The strength of 11.2 volume solution of H_2O_2 is [Given that molar mass of H = 1 g mol^{-1} & O=16 g mol^{-1}]
11.2 V H_2O_2 विलयन की सामर्थ्य क्या होगी – [दिया गया है H का मोलर द्रव्यमान = 1 g mol^{-1} तथा O का मोलर द्रव्यमान = 16 g mol^{-1}]

(1) 13.6% (2) 1.7% (3) 3.4% (4) 34%

A. 3

sol. 11.2 V of H_2O_2

$$H_2O_2 \longrightarrow H_2O + \frac{1}{2}O_2$$

11.2 L of O_2 at STP = 0.5 mol
It means 1 L of given H_2O_2 solution consist 1 mole of H_2O_2 (i.e., 34 g)

$$\text{strength} = \frac{34}{1000} \times 100 = 3.4\%$$

10. The covalent alkaline earth metal halide (X = C*l*, Br, I) is :
सहसंयोजी क्षारीय मृदा धातु हैलाइड (X = C*l*, Br, I) है :

(1) BeX_2 (2) SrX_2 (3) CaX_2 (4) MgX_2

A. 1

sol. According to Fajan's rule, graeter the polarising power of cation greater would be the covalent character. Since Be^{2+} has maximum polarising power among given cation, therefore, BeX_2 would be most covalent among given alkaline with metal halides.

11. Polysubstitution is a major drawback in :

(1) Reimer Tiemann reaction (2) Acetylation of aniline

(3) Friedel Craft's acylation (4) Friedel Craft's alkylation

निम्न में से किसमें बहुप्रतिस्थापन एक मुख्य कमी है?

(1) राइमर टीमन अभिक्रिया (2) ऐनिलीन का ऐसिटिलेशन

(3) फ्रीडल–क्राफ्ट ऐसाइलेशन (एसिलीकरण) (4) फ्रीडल–क्राफ्ट ऐल्किलेशन

A. 4

sol. Polysubstitution is a major drawback in Friedel Craft's alkylation

12. The IUPAC symbol for the element with atomic number 119 would be :

119 परमाणु क्रमांक वाले तत्व के लिए IUPAC प्रतीक होगा :

(1) une (2) uun (3) uue (4) unh

A. 3

sol. Symbol for 1 is u

and for 9 is e

∴ IUPAC symbol for 119 is uue

13. 5 moles of an ideal gas at 100 K are allowed to undergo reversible compression till its temperature becomes 200 K. If $C_v = 28\ J\ K^{-1}\ mol^{-1}$, calculate ΔU and $\Delta(PV)$ for this process. ($R = 8.0\ J\ K^{-1}\ mol^{-1}$)

100 K पर, एक आदर्श गैस के 5 मोल का उत्क्रमणीय संपीडन तब तक किया जाता है जब तक की उसका ताप 200 K नहीं हो जाता। यदि $C_v = 28\ J\ K^{-1}\ mol^{-1}$, तो इस प्रक्रम के लिए ΔU तथा ΔpV की गणना कीजिए। ($R = 8.0\ J\ K^{-1}\ mol^{-1}$)

(1) $\Delta U = 14$ kJ; $\Delta(PV) = 18$ kJ (2) $\Delta U = 2.8$ kJ; $\Delta(PV) = 0.8$ kJ

(3) $\Delta U = 14$ kJ; $\Delta(PV) = 0.8$ kJ (4) $\Delta U = 14$ kJ; $\Delta(PV) = 4$ kJ

A. 4

sol. $\Delta U = nC_{v,m}\Delta T = 5 \times 28 \times 100 = 14$ kJ

$\Delta(PV) = nR(T_2 - T_1)$

$= 5 \times 8 \times 100$

$= 4$ kJ

14. The calculated spin-only magnetic moments (BM) of the anionic and cationic species of $[Fe(H_2O)_6]^{2+}$ and $[Fe(CN)_6]^{4-}$, respectively, are :

(1) 2.84 and 5.92 (2) 4.9 and 0 (3) 0 and 5.92 (4) 0 and 4.9

$[Fe(H_2O)_6]^{2+}$ तथा $[Fe(CN)_6]^{-4}$ के ऋणात्मक तथा धनात्मक स्पीशीज के लिए मापित केवल चक्रण चुम्बकीय आघूर्ण का मान क्रमशः है –

(1) 2.84 तथा 5.92 (2) 4.9 तथा 0 (3) 0 तथा 5.92 (4) 0 तथा 4.9

A. 4

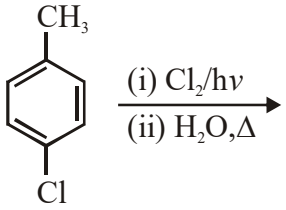
sol. $[Fe(H_2O)_6]^{2+}$ $[Fe(CN)_6]^{4-}$

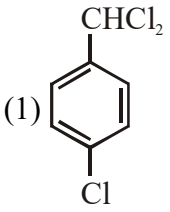
4 unpaired no unpaired electron

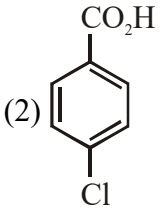
electrons $\mu = 0$

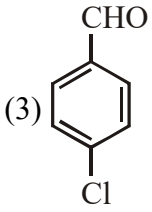
$\mu = 4.9$

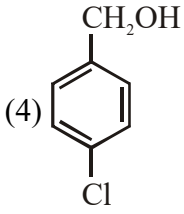
15. The major product of the following reaction is :
निम्न अभिक्रिया का मुख्य उत्पाद है :



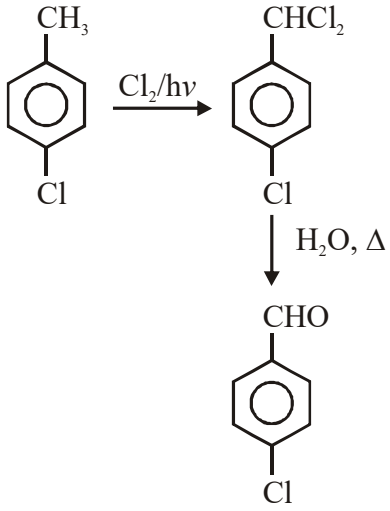
(1) 

(2) 

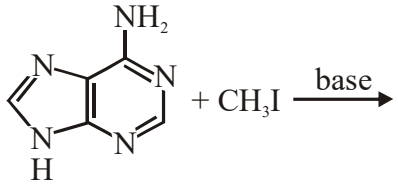
(3) 

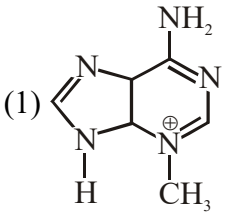
(4) 

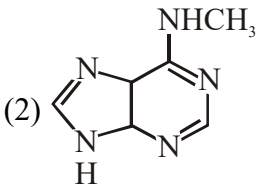
A. 3

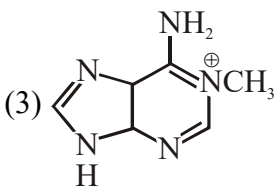
sol. 

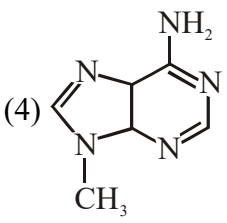
16. The major product in the following reaction is :
निम्न अभिक्रिया का मुख्य उत्पाद है :



(1) 

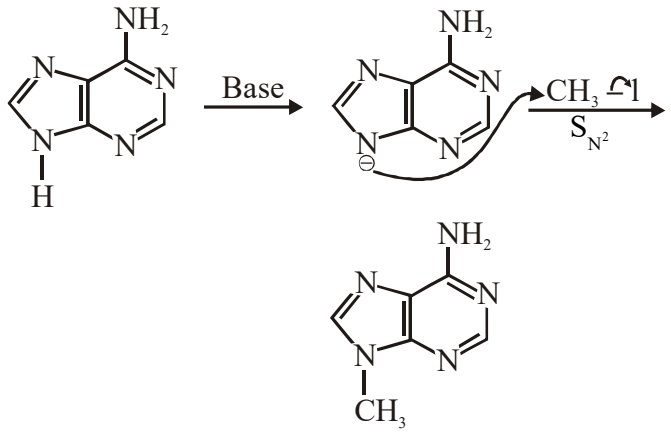
(2) 

(3) 

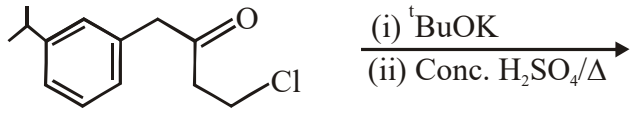
(4) 

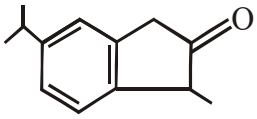
A. 4

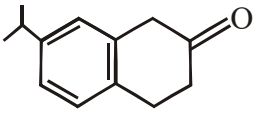
sol.

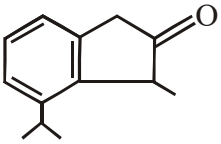


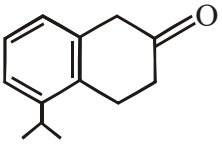
17. The major product of the following reaction is :
निम्न अभिक्रिया का मुख्य उत्पाद है :



(1) 

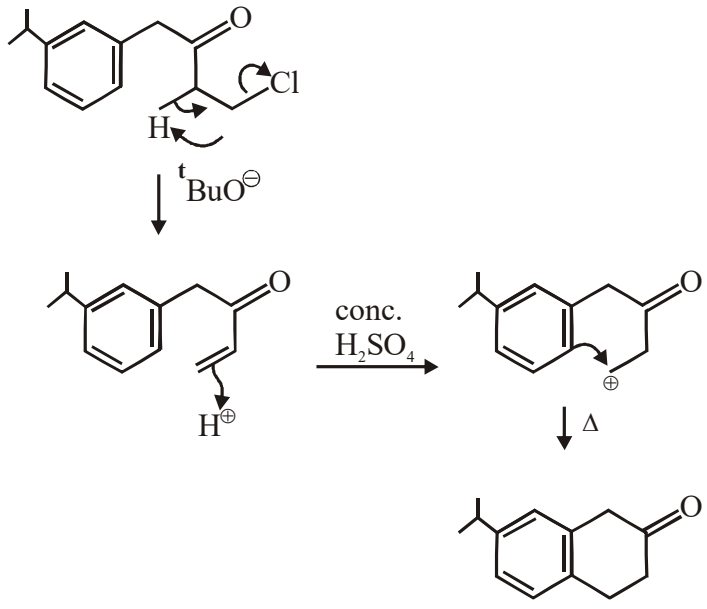
(2) 

(3) 

(4) 

A. 2

sol.



18. The ion that has sp^3d^2 hybridization for the central atom, is :
निम्न में से किस आयन में केन्द्रीय परमाणु का संकरण sp^3d^2 है?

(1) $[ICl_2]^-$ (2) $[IF_6]^-$ (3) $[BrF_2]^-$ (4) $[ICl_4]^-$

A. 4

sol.

Species	Hybridisation
ICl_2^-	sp^3d
ICl_4^-	sp^3d^2
BrF_2^-	sp^3d
IF_6^-	sp^3d^3

19. Calculate the standard cell potential (in V) of the cell in which following reaction takes place :
उस सेल के मानक सेल विभव (V में) की गणना कीजिए जिसमें निम्न अभिक्रिया होती है :

$Fe^{2+}(aq) + Ag^+(aq) \rightarrow Fe^{3+}(aq) + Ag(s)$

Given that
दिया गया है :

$E^\circ_{Ag^+/Ag} = xV$

$E^\circ_{Fe^{2+}/Fe} = yV$

$E^\circ_{Fe^{3+}/Fe} = zV$

(1) $x - y$ (2) $x + y - z$ (3) $x + 2y - 3z$ (4) $x - z$

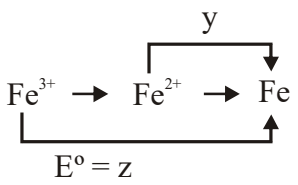
A. 3

sol. $Ag^+_{(aq)} + Fe^{+2}_{(aq)} \longrightarrow Fe^{3+}_{(aq)} + Ag_{(s)}$

$E^o_{cell} = E^o_{Ag+/Ag} - E^o_{Fe^{3+}/Fe^{2+}}$

To calculate

$E^o_{Fe^{3+}/Fe^{2+}}$



$E^o_{Fe^{3+}/Fe^{2+}} = 3z - 2y$

$3e^- + Fe^{+3} \rightarrow Fe\ 3z$

$2e^- + Fe^{+2} \rightarrow Fe\ 2y$

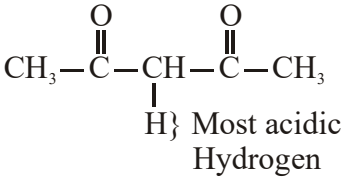
20. Which of the following compounds will show the maximum 'enol' content ?
निम्न यौगिकों में से कौन–सा 'ईनॉल' की अधिकतम मात्रा प्रदर्शित करेगा?

(1) $CH_3COCH_2COOC_2H_5$ (2) CH_3COCH_3

(3) $CH_3COCH_2COCH_3$ (4) $CH_3COCH_2CONH_2$

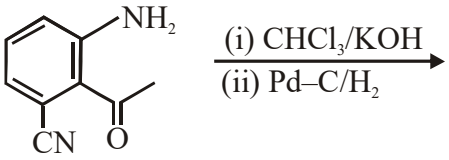
A. 3

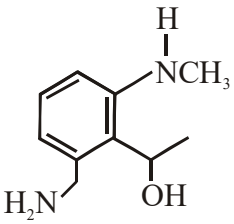
sol. enol content α acidity of active methelene hydrogens.

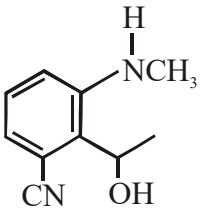


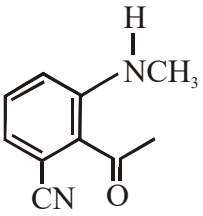
Maximum enol content

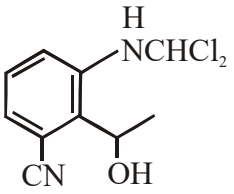
21. The major product obtained in the following reaction is :
निम्न अभिक्रिया में प्राप्त होने वाला मुख्य उत्पाद है :



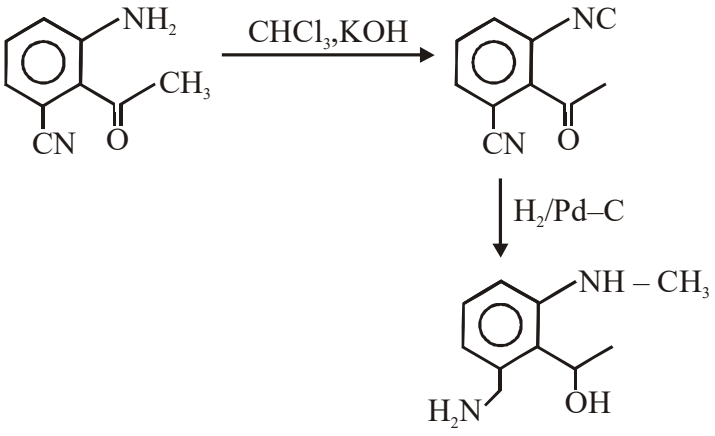
(1) 

(2) 

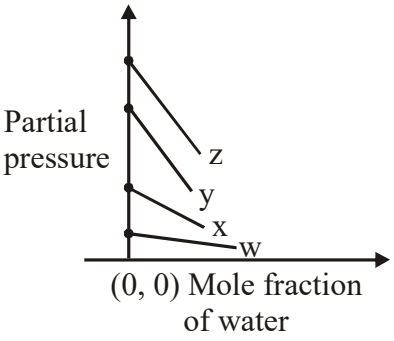
(3) 

(4) 

A. 1

sol. 

22. For the solution of the gases w, x, y and z in water at 298 K, the Henrys law constants (K_H) are 0.5, 2, 35 and 40 kbar, respectively. The correct plot for the given data is :
298 K पर जल में गैस w, x, y तथा z के विलयन के लिए हेनरी नियम स्थिरांक (K_H) क्रमशः 0.5, 2, 35 तथा 40 kbar हैं। दिये आँकड़ों के लिये सही प्लाट है :

(1)


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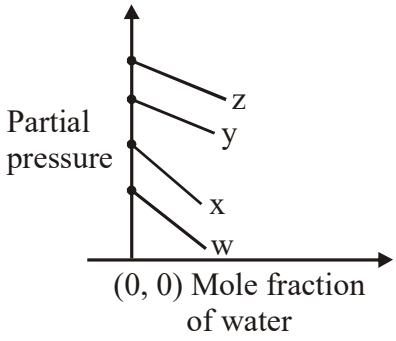

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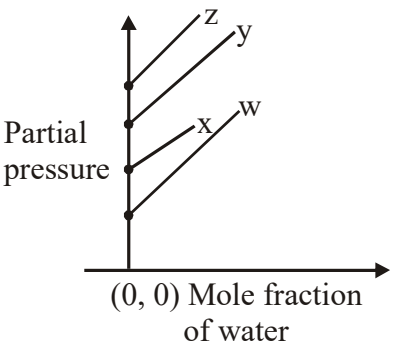

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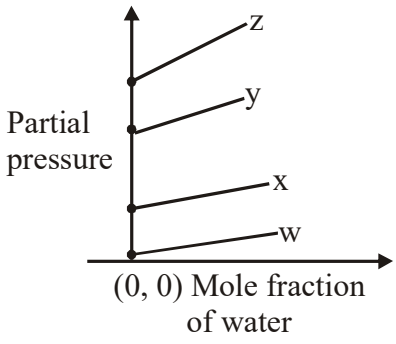
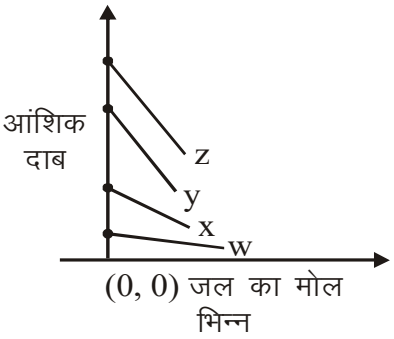
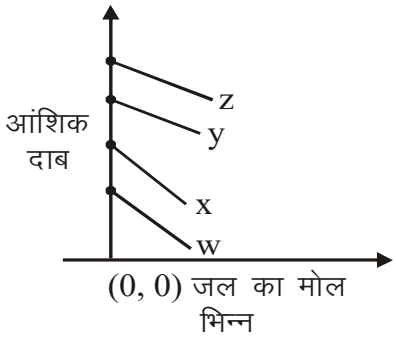
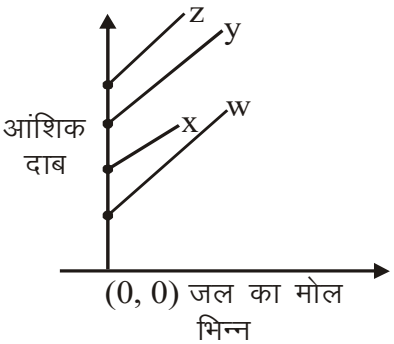
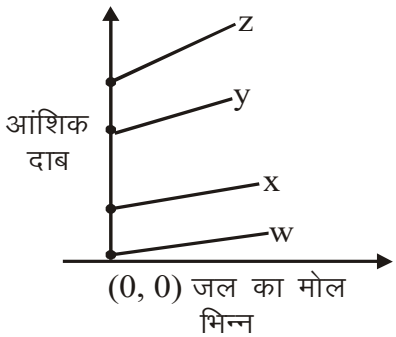


(1)


(2)


(3)


(4)


A. 1

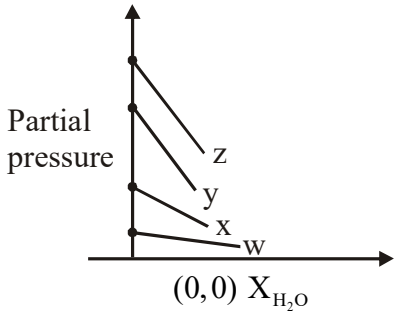
sol. According to Henry's law

$P = K_H \cdot X_{gas}$

$\because \quad x_{gas} = 1 - x_{H_2O}$

$\therefore \quad P = K_H - K_H . x_{H_2O}$

$y = C + mx$



gas	K_H
w	0.5
x	2
y	35
z	50

23. If p is the momentum of the fastest electron ejected from a metal surface after the irradiation of light having walvelength λ, then for 1.5 p momentum of the photoelectron, the wavelength of the light should be :
(Assume kinetic energy of ejected photoelectron to be very high in comparison to work function) :
यदि λ तरंगदैर्ध्य के प्रकाश से किरणित होने पर एक धातु की सतह से निकले हुए तीव्रतम इलेक्ट्रॉन का संवेग p है तो प्रकाशिक इलेक्ट्रॉन के 1.5 p संवेग के लिए प्रकाश का तरंगदैर्ध्य होगा :
(मान लीजिये कि निष्कासित प्रकाशिक इलेक्ट्रॉन की K.E. (गतिज ऊर्जा) उसके कार्यफलन की तुलना में बहुत उच्च है) :

(1) $\frac{3}{4}\lambda$ (2) $\frac{4}{9}\lambda$ (3) $\frac{2}{3}\lambda$ (4) $\frac{1}{2}\lambda$

A. 2

sol. In photoelectric effect,

$$\frac{hc}{\lambda} = w + KE \text{ of electron}$$

It is given that KE of ejected electron is very high in comparison to w.

$$\frac{hc}{\lambda} = KE \Rightarrow \frac{hc}{\lambda} = \frac{P^2}{2m}$$

New wavelength $\frac{hc}{\lambda'} = \frac{(1.5P)^2}{2m} \Rightarrow \lambda' = \frac{4}{9}\lambda$

24. Fructose and glucose can be distinguished by :
(1) Fehling's test (2) Seliwanoff's test (3) Barfoed's test (4) Benedict's test
फ्रक्टोज़ तथा ग्लुकोज़ निम्न किसके द्वारा पहचाने जा सकते हैं?
(1) फेहलिंग परीक्षण (2) सेलिवानॉफ परीक्षण (3) बार्फोड परीक्षण (4) बेनिडिक्ट परीक्षण

A. 2

sol. Seliwanoff's test is used to distinguish aldose and ketose

25. Among the following molecules/ions,

$C_2^{2-}, N_2^{2-}, O_2^{2-}, O_2$

Which one is diamagnetic and has the shortest bond length ?

निम्न अणुओं/आयनों में

$C_2^{2-}, N_2^{2-}, O_2^{2-}, O_2$

कौन प्रतिचुम्बकीय है और उसकी आबन्ध लम्बाई सबसे कम है?

(1) O_2 (2) O_2^{2-} (3) N_2^{2-} (4) C_2^{2-}

A. 4

sol. Bond length $\propto \frac{1}{\text{bond order}}$

and diamgnetic species has no unpaired electron in their molecular orbitals.

	Bond order	Magnetic character
C_2^{2-}	3	diamagnetic
N_2^{2-}	2	paramagnetic
O_2^{2-}	1	diamagnetic
O_2	2	paramagnetic

$\therefore$ C_2^{2-} has least bond length and is diamagnetic

26. For a reaction scheme $A \xrightarrow{k_1} B \xrightarrow{k_2} C$, if the rate of formation of B is set to be zero then the concentration of B is given by :

अभिक्रिया योजना $A \xrightarrow{k_1} B \xrightarrow{k_2} C$ के लिए, यदि B के बनने की दर शून्य कर दी जाये तो B की सान्द्रता निम्न के द्वारा दी जायेगी :

(1) $k_1k_2[A]$ (2) $(k_1 - k_2)[A]$ (3) $\left(\frac{k_1}{k_2}\right)[A]$ (4) $(k_1 + k_2)[A]$

A. 3

sol. $A \xrightarrow{k_1} B \xrightarrow{k_2} C$

$$\frac{d[B]}{dt} = k_1[A] - k_2[B] = 0$$

$$[B] = \frac{k_1[A]}{k_2}$$

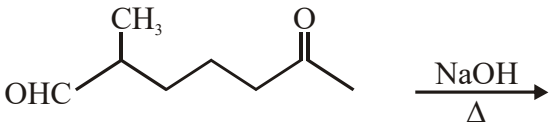
27. The maximum prescribed concentration of copper in drinking water is :
पीने के जल में कॉपर (तांबें) की निर्धारित अधिकतम सान्द्रता है :

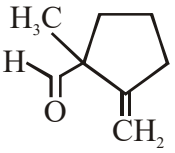
(1) 3 ppm (2) 0.05 ppm (3) 0.5 ppm (4) 5 ppm

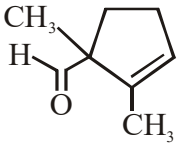
A. 1

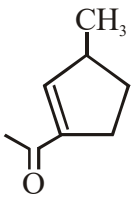
sol. Maximum prescribed concentration of Cu in drinking water is 3 ppm.

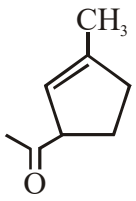
28. The major product obtained in the following reaction is :
निम्न अभिक्रिया में प्राप्त होने वाला मुख्य उत्पाद है :



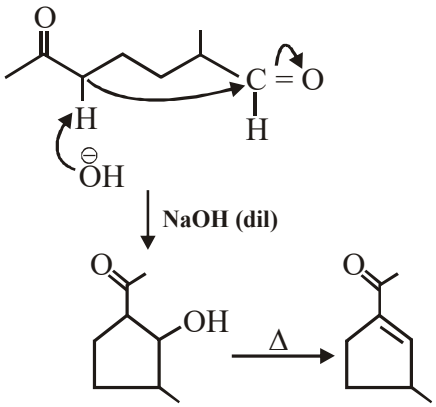
(1) 

(2) 

(3) 

(4) 

A. 3

sol. 

29. The percentage composition of carbon by mole in methane is :
मोल के आधार पर मिथेन में कार्बन की प्रतिशतता संघटन है :

(1) 80% (2) 75% (3) 20% (4) 25%

A. 3

sol. In CH_4
one atom of carbon among 5 atoms (1C + 4H atoms)

$$\therefore \quad \text{Mole \% of C} = \frac{1}{5}\times 100$$
$$= 20\%$$

30. The statement that is INCORRECT about the interstitial compounds is :

(1) They are chemically reactive (2) They are very hard

(3) They have high melting points (4) They have metallic conductivity

अन्तरकाशी यौगिको के लिए निम्न में से कौनसा कथन असत्य है –

(1) वे रासायनिक रूप से क्रियाशील होते है। (2) वे बहुत कठोर होते है।

(3) उनके गलनांक बिन्दु उच्च होते है। (4) वे धात्विक चालकता दर्शाते है।

A. 1

sol. Interstitial compounds are inert.