24th Feb. 2021 | Shift - 2
CHEMISTRY

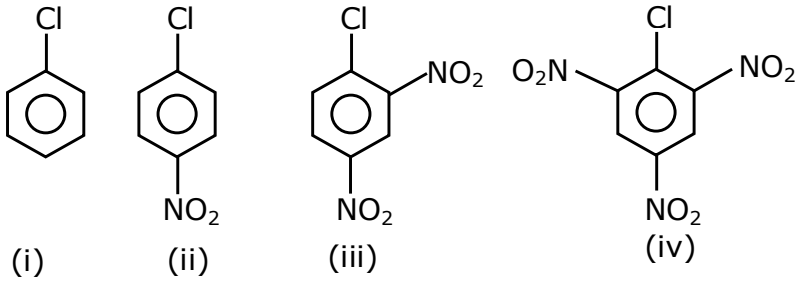
JEE I NEET I Foundation

MOTION™

25000+
SELECTIONS SINCE 2007

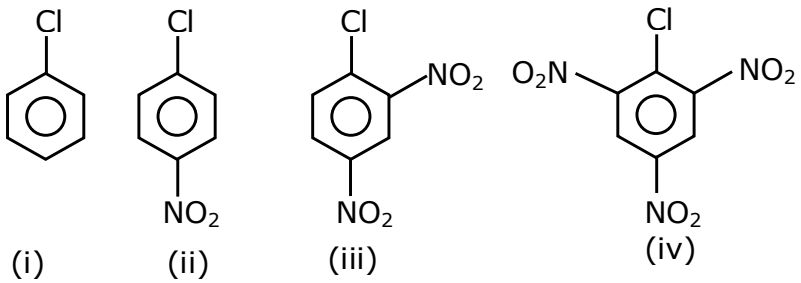
Topic- GOC (General Organic Chemistry)
Subtopic- Electron displacement effect
Level-M

1. The correct order of the following compounds showing increasing tendency towards nucleophilic substitution reaction is :



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

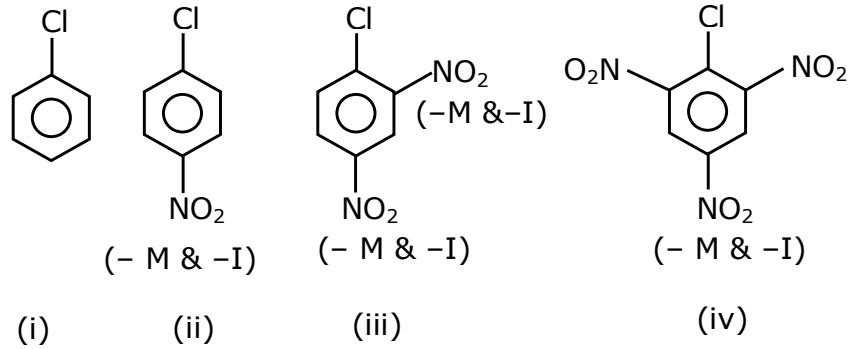
निम्नलिखित यौगिकों का, नाभिक स्नेही प्रतिस्थापन अभिक्रिया के लिए दर बढ़ने का सही क्रम है:



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

Ans. **(3)**

Sol.



Reactivity ∝ – M group present at o/p position.

Topic- Metallurgy
Subtopic- Introduction
Level-E

2. Match List-I with List-II

List- I (Metal)	List-II (Ores)
(a) Aluminium	(i) Siderite
(b) Iron	(ii) Calamine
(c) Copper	(iii) Kaolinite
(d) Zinc	(iv) Malachite

Choose the correct answer from the options given below :
(1) (a)-(iv), (b)-(iii), (c)-(ii), (d)-(i) (2) (a)-(i), (b)-(ii), (c)-(iii), (d)-(iv)
(3) (a)-(iii), (b)-(i), (c)-(iv), (d)-(ii) (4) (a)-(ii), (b)-(iv), (c)-(i), (d)-(iii)

सूची –I से सूची – II का सुमेल कीजिए:

सूची –I (धातु)	सूची – II (अयस्क)
(a) ऐलुमिनियम	(i) सिडेराइट
(b) आयरन	(ii) कैलामाइन
(c) कॉपर	(iii) केयोलिनाइट
(d) ऐलुमिनियम	(iv) मेलाकाइट

नीचे दिए गये विकल्पों में से सही उत्तर चुनिए:
(1) (a)-(iv), (b)-(iii), (c)-(ii), (d)-(i) (2) (a)-(i), (b)-(ii), (c)-(iii), (d)-(iv)
(3) (a)-(iii), (b)-(i), (c)-(iv), (d)-(ii) (4) (a)-(ii), (b)-(iv), (c)-(i), (d)-(iii)

Ans. (3)

Sol.

Siderite	$FeCO_3$
Calamine	$ZnCO_3$
Kaolinite	$Si_2Al_2O_5(OH)_4$ or $Al_2O_3.2SiO_2.2H_2O$
Malachite	$CuCO_3.Cu(OH)_2$

Topic- s-block
Subtopic- group IA, IIA
Level-M

3. Match List-I with List-II

List- I (Salt)	**List-II** (Flame colour wavelength)
(a) LiCl	(i) 455.5 nm
(b) NaCl	(ii) 970.8 nm
(c) RbCl	(iii) 780.0 nm
(d) CsCl	(iv) 589.2 nm

Choose the correct answer from the options given below :
(1) (a)-(ii), (b)-(i), (c)-(iv), (d)-(iii) (2) (a)-(ii), (b)-(iv), (c)-(iii), (d)-(i)
(3) (a)-(iv), (b)-(ii), (c)-(iii), (d)-(i) (4) (a)-(i), (b)-(iv), (c)-(ii), (d)-(iii)

सूची –I से सूची – II का सुमेल कीजिए:

सूची –I (लवण)	सूची – II (ज्वाला की तरंगदैर्ध्य)
(a) LiCl	(i) 455.5 nm
(b) NaCl	(ii) 970.8 nm
(c) RbCl	(iii) 780.0 nm
(d) CsCl	(iv) 589.2 nm

नीचे दिए गये विकल्पों में से सही उत्तर चुनिए:
(1) (a)-(ii), (b)-(i), (c)-(iv), (d)-(iii) (2) (a)-(ii), (b)-(iv), (c)-(iii), (d)-(i)
(3) (a)-(iv), (b)-(ii), (c)-(iii), (d)-(i) (4) (a)-(i), (b)-(iv), (c)-(ii), (d)-(iii)

Ans. (2)

Sol. Range of visible region : - 390nm – 760nm
VIBGYOR
Violet Red

LiCl Crimson Red
NaCl Golden yellow
RbCl Violet
CsCl Blue

So LiCl which is crimson have wave length closed to red in the spectrum of visible region which is as per given data is.

Topic- s-block
Subtopic-Hydrogen, H2O2, H2O(hendnum removed)
Level- E

4. Given below are two statements : one is labelled as Assertion A and the other is labelled as Reason R.

Assertion A : Hydrogen is the most abundant element in the Universe, but it is not the most abundant gas in the troposphere.

Reason R : Hydrogen is the lightest element.

In the light of the above statements, choose the correct answer from the given below

(1) A is false but R is true

(2) Both A and R are true and R is the correct explanation of A

(3) A is true but R is false

(4) Both A and R are true but R is NOT the correct explanation of A

नीचे दो कथन दिए गए हैं। एक अभिकथन A और दूसरा कारण R है

अभिकथन A : हाइड्रोजन ब्रह्मांड का सर्वाधिक विद्यमान तत्व है परन्तु क्षोभमंडल में यह सर्वाधिक विद्यमान गैस नहीं है।

कारण R : हाइड्रोजन सबसे हल्का तत्व है।

उपरोक्त कथनों के संदर्भ में नीचे दिए गये विकल्पों में से सर्वाधिक सही उत्तर चुनिए:

(1) A असत्य है परन्तु R सत्य है।

(2) A तथा R दोनों सहीं हैं और R, A की सही व्याख्या है।

(3) A सत्य है परन्तु R असत्य है।

(4) A तथा R दोनों सहीं हैं परन्तु R, A की सही व्याख्या नहीं है।

Ans. (2)

Sol. Hydrogen is most abundant element in universe because all luminous body of universe i.e. stars & nebulae are made up of hydrogen which acts as nuclear fuel & fusion reaction is responsible for their light.

Topic- Chemistry in everyday life
Subtopic- Bio chemical
Level-M

5. Given below are two statements :
Statement I : The value of the parameter ''Biochemical Oxygen Demand (BOD)'' is important for survival of aquatic life.
Statement II : The optimum value of BOD is 6.5 ppm.
In the light of the above statements, choose the most appropriate answer from the options given below.
(1) Both Statement I and Statement II are false
(2) Statement I is false but Statement II is true
(3) Statement I is true but Statement II is false
(4) Both Statement I and Statement II are true
नीचे दो कथन दिए गए है:
कथन I : पैरामीटर ''जैवरासायनिक आक्सीजन मांग (BOD)'' का मान जल के जीवों के जीवन के लिए महत्वपूर्ण है।
कथन II : BOD का इष्टतम मान है 6.5 ppm।
उपरोक्त कथनों के लिए नीचे दिये गये विकल्पों में से सर्वाधिक सही उत्तर चुनिए:
(1) दोनों कथन I तथा कथन II असत्य हैं
(2) कथन I असत्य है परन्तु कथन II सत्य हैं
(3) कथन I सत्य है परन्तु कथन II असत्य है
(4) दोनों कथन I तथा कथन II सत्य हैं

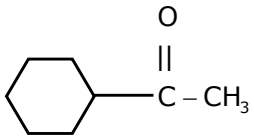
Ans. **(3)**

Sol. For survival of aquatic life dissolved oxygen is responsible its optimum limit 6.5 ppm and optimum limit of BOD ranges from 10-20 ppm & BOD stands for biochemical oxygen demand.

Topic- Carbonyl compound
Subtopic- Chemical reaction of carbonyl compound
Level-M

6. Which one of the following carbonyl compounds cannot be prepared by addition of water on an alkyne in the presence of $HgSO_4$ and H_2SO_4?

(1) $CH_3-CH_2-\overset{\overset{O}{\|}}{C}-H$

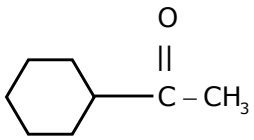
(2) 

(3) $CH_3-\overset{\overset{O}{\|}}{C}-H$

(4) $CH_3-\overset{\overset{O}{\|}}{C}-CH_2CH_3$

निम्नलिखित कार्बोनिल यौगिकों में से किस एक को $HgSO_4$ तथा H_2SO_4 की उपस्थित में ऐल्काइन पर जल का संयोजन करने से नहीं बना सकते हैं?

(1) $CH_3-CH_2-\overset{\overset{O}{\|}}{C}-H$

(2) 

(3) $CH_3-\overset{\overset{O}{\|}}{C}-H$

(4) $CH_3-\overset{\overset{O}{\|}}{C}-CH_2CH_3$

Ans. (1)

Sol. Reaction of Alkyne with $HgSO_4$ & H_2SO_4 follow as

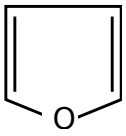
$$CH \equiv CH \xrightarrow[H_2O]{HgSO_4, H_2SO_4} CH_3CHO$$

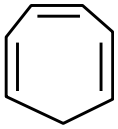
$$CH_3 - C \equiv CH \xrightarrow[H_2O]{HgSO_4, H_2SO_4} CH_3 - \overset{\overset{O}{\|}}{C} - CH_3$$

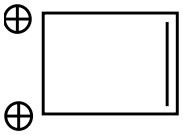
Hence, by this process preparation of CH_3CH_2CHO Can't possible.

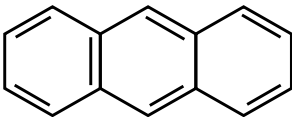
Topic- GOC (General Organic Chemistry)
Subtopic- Aromaticity
Level-E

7. Which one of the following compounds is non-aromatic ?

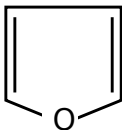
(1) 

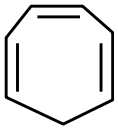
(2) 

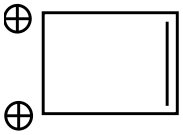
(3) 

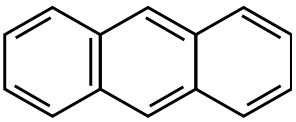
(4) 

निम्नलिखित में से कौन–सा यौगिक एरोमैटिक नहीं है?

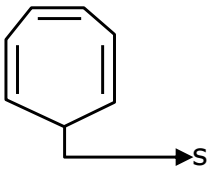
(1) 

(2) 

(3) 

(4) 

Ans. (2)

Sol. 

sp^3 carbon atom (Not planer)

Hence It is non-aromatic.

Topic- d-block
Subtopic- General propirlies
Level-E

8. The incorrect statement among the following is :

(1) $VOSO_4$ is a reducing agent
(2) Red colour of ruby is due to the presence of CO^{3+}
(3) Cr_2O_3 is an amphoteric oxide
(4) RuO_4 is an oxidizing agent

निम्नलिखित में से असत्य कथन है:

(1) $VOSO_4$ एक अपचायी कर्मक है
(2) माणिक्य का लाल रंग CO^{3+} की उपस्थिति के कारण होता है
(3) Cr_2O_3 एक उभयधर्मी ऑक्साइड है
(4) RuO_4 एक ऑक्सीकारक कर्मक है

Ans. (2)

Sol. Red colour of ruby is due to presence of CrO_3 or Cr^{+6} not CO^{3+}

Topic- Atomic
Subtopic- Bohr atomic Model
Level-M

9. According to Bohr's atomic theory :

(A) Kinetic energy of electron is $\propto \frac{Z^2}{n^2}$

(B) The product of velocity (v) of electron and principal quantum number (n). 'vn' $\propto Z^2$.

(C) Frequency of revolution of electron in an orbit is $\propto \frac{Z^3}{n^3}$.

(D) Coulombic force of attraction on the electron is $\propto \frac{Z^3}{n^4}$.

Choose the most appropriate answer from the options given below:

(1) (C) only
(2) (A) and (D) only
(3) (A) only
(4) (A), (C) and (D) only

बोर के परमाण्विक सिद्धान्त के अनुसार :

(A) इलेक्ट्रॉन की गतिज ऊर्जा $\propto \frac{Z^2}{n^2}$ ।

(B) इलेक्ट्रॉन की गति (v) तथा मुख्य क्वांटम संख्या (n) का गुणनफल 'vn' $\propto Z^2$ ।

(C) एक कक्षा में इलेक्ट्रान के परिक्रमण की आवृत्ति $\propto \frac{Z^3}{n^3}$ ।

(D) इलेक्ट्रॉन पर कूलॉम आकर्षण बल $\propto \frac{Z^3}{n^4}$ ।

(1) (C) केवल
(2) (A) तथा (D) केवल
(3) (A) केवल
(4) (A), (C) तथा (D) केवल

Ans. (2) Correction on NTA

Sol. (A) $KE = -TE = 13.6 \times \frac{Z^2}{n^2} eV$

$KE \propto \frac{Z^2}{n^2}$

(B) $V = 2.188 \times 10^6 \times \frac{Z}{n}$ m/sec.

So, $Vn \propto Z$

(C) Frequency = $\frac{V}{2\pi r}$

So, $F \propto \frac{Z^2}{n^3}$ $\left[\because r \propto \frac{n^2}{z} \text{ and } v \propto \frac{Z}{n}\right]$

(D) Force $\propto \frac{z}{r^2}$

So, $F \propto \frac{Z^3}{n^4}$

So, only statement (A) is correct

Topic- Environmental
Subtopic- Introduction
Level-M

10. Match List-I with List-II

List- I	**List-II**
(a) Valium	(i) Antifertility drug
(b) Morphine	(ii) Pernicious anaemia
(c) Norethindrone	(iii) Analgesic
(d) Vitamin B_{12}	(iv) Tranquilizer

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

सूची –I से सूची – II का सुमेल कीजिएः

	सूची –I		सूची – II
(a)	वैलियम	(i)	प्रजनन विरोधी (Anti fertility drug)
(b)	मॉर्फीन	(ii)	प्रणाशी रक्ताल्पता
(c)	नॉरएथिनड्रान	(iii)	ऐनेल्जेसिक (पीड़ाहारी)
(d)	विटामिन B_{12}	(iv)	प्रशांतक

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

Ans. (4)

Sol.

(a) Valium	(iv) Tranquilizer
(b) Morphine	(iii) Analgesic
(c) Norethindrone	(i) Antifertility drug
(d) Vitamin B_{12}	(ii) Pernicious anaemia

Topic- Chemical bonding
Subtopic-Fazan Rule
Level-M

11. The Correct set from the following in which both pairs are in correct order of melting point is :

(1) LiF > LiCl ; NaCl > MgO (2) LiF > LiCl ; MgO > NaCl
(3) LiCl > LiF ; NaCl > MgO (4) LiCl > LiF ; MgO > NaCl

निम्नलिखित में से सही समुह जिसमें दोनों युग्म गलनांक के सही क्रम में हैं, वह है:

(1) LiF > LiCl ; NaCl > MgO (2) LiF > LiCl ; MgO > NaCl
(3) LiCl > LiF ; NaCl > MgO (4) LiCl > LiF ; MgO > NaCl

Ans. **(2)**

Sol. Generally

M.P. $\propto$ Lattice energy $= \frac{KQ_1Q_2}{r^+ + r^-}$

$\propto$ (packing efficiency)

Topic- Coordination chemistry
Subtopic- Hybridisation (a) VBT
Level-M

12. The calculated magnetic moments (spin only value) for species $\left[FeCl_4\right]^{2-}$, $\left[Co\left(C_2O_4\right)_3\right]^{3-}$ and MnO_4^{2-} respectively are :

(1) 5.92, 4.90 and 0 BM (2) 5.82, 0 and 0 BM
(3) 4.90, 0 and 1.73 BM (4) 4.90, 0 and 2.83 BM

$\left[FeCl_4\right]^{2-}$, $\left[Co\left(C_2O_4\right)_3\right]^{3-}$ तथा MnO_4^{2-} के परिकलित चुम्बकीय आघूर्ण (केवल स्पिन) मान क्रमशः हैः–

(1) 5.92, 4.90 तथा 0 BM (2) 5.82, 0 तथा 0 BM
(3) 4.90, 0 तथा 1.73 BM (4) 4.90, 0 तथा 2.83 BM

Ans. **(3)**

Sol. $\left[FeCl_4\right]^{2-}$ Fe^{2+} $3d^6 \rightarrow$ 4 unpaired electron. as Cl^- in a weak field liquid.

$\mu_{spin} = \sqrt{24}\,BM$

= 4.9 BM

$\left[Co\left(C_2O_4\right)_3\right]^{3-}$ Co^{3+} $3d^6 \rightarrow$ for Co^{3+} with coodination no. 6 $C_2O_4^{2-}$ is strong field ligend & causes pairing & hence no. unpaired electron

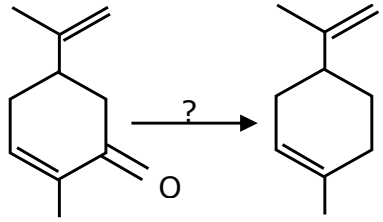
μ_{spin} = 0

$\left[MnO_4\right]^{2-}$ Mn^{+6} it has one unpaired electron.

$\mu_{spin} = \sqrt{3}\,BM$

Topic- Carbonyl compound
Subtopic- Chemical reaction of carbonyl compound
Level-M

13.



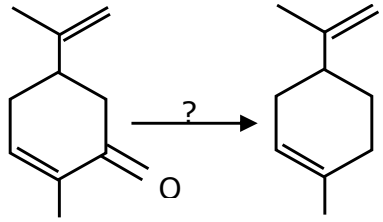
Which of the following reagent is suitable for the preparation of the product in the above reaction.

(1) Red P + Cl_2

(2) $NH_2-NH_2/C_2H_5\overset{\ominus\oplus}{O}Na$

(3) Ni/H_2

(4) $NaBH_4$



निम्नलिखित में कौन–सा अभिकर्मक उपरोक्त अभिक्रिया में उत्पाद के विरचन के लिए उपयुक्त हैं?

(1) लाल P + Cl_2

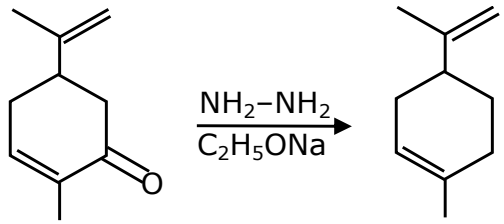
(2) $NH_2-NH_2/C_2H_5\overset{\ominus\oplus}{O}Na$

(3) Ni/H_2

(4) $NaBH_4$

Ans. (2)

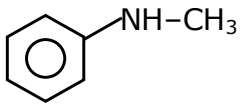
Sol.

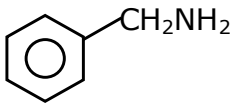


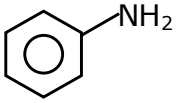
It is wolf-kishner reduction of carbonyl compounds.

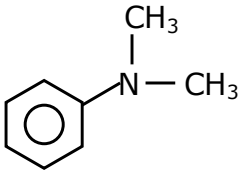
Topic- Amine
Subtopic- Chemical reaction of amine
Level-E

14. The diazonium salt of which of the following compounds will form a coloured dye on reaction with β-Naphthol in NaOH ?

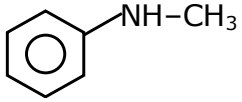
(1) 

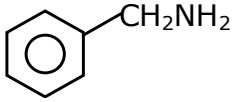
(2) 

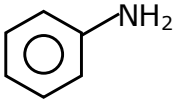
(3) 

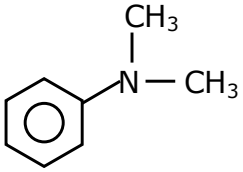
(4) 

निम्नलिखित में से किसका डाइऐजोनियम लवण, NaOH में β-नैफथॉल से अभिक्रिया करके रंगीन डाइ विरचित करेगा?

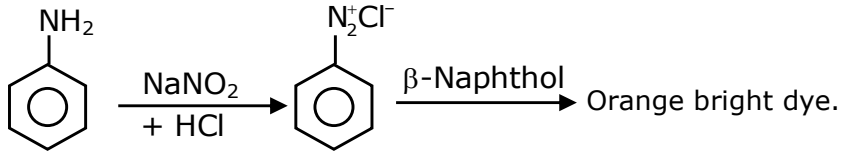
(1) 

(2) 

(3) 

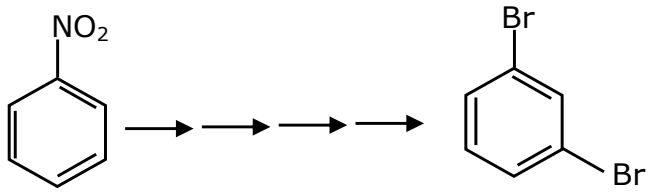
(4) 

Ans. (3)

Sol. 

Topic- Aromatic compounds
Subtopic- Electrophilic substitution reaction
Level- E

15. What is the correct sequence of reagents used for converting nitrobenzene into m-dibromobenzene ?



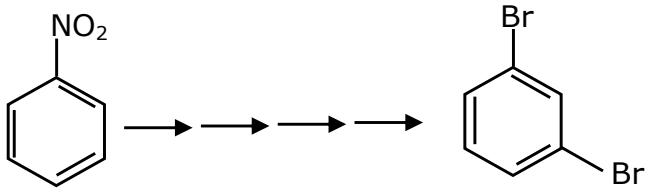
(1) $\xrightarrow{Sn/HCl} / \xrightarrow{Br_2} / \xrightarrow{NaNO_2} / \xrightarrow{NaBr}$

(2) $\xrightarrow{Sn/HCl} / \xrightarrow{KBr} / \xrightarrow{Br_2} / \xrightarrow{H^+}$

(3) $\xrightarrow{NaNO_2} / \xrightarrow{HCl} / \xrightarrow{KBr} / \xrightarrow{H^+}$

(4) $\xrightarrow{Br_2/Fe} / \xrightarrow{Sn/HCl} / \xrightarrow{NaNO_2/HCl} / \xrightarrow{CuBr/HBr}$

नाइट्रोबेन्जीन को m-डाइब्रोमोबेन्जीन में परिवर्तित करने के लिए उपयोग किये जाने वाले अभिकर्मक का सही क्रम क्या हैं?



(1) $\xrightarrow{Sn/HCl}$ / $\xrightarrow{Br_2}$ / $\xrightarrow{NaNO_2}$ / $\xrightarrow{NaBr}$

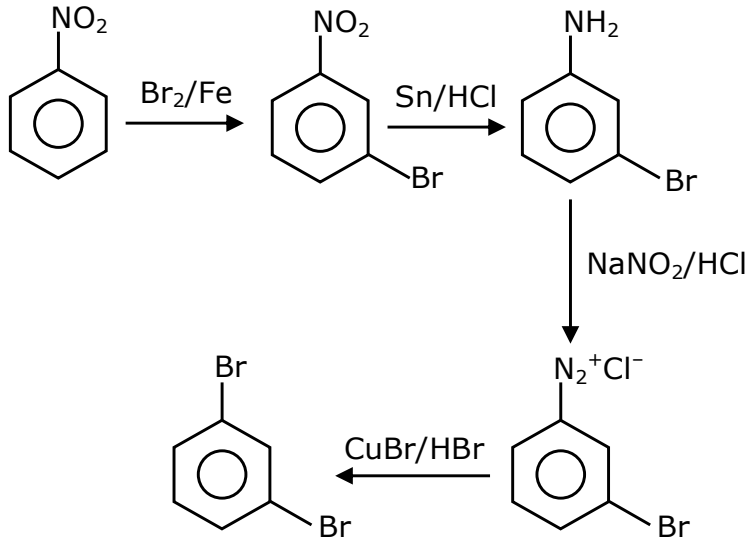
(2) $\xrightarrow{Sn/HCl}$ / $\xrightarrow{KBr}$ / $\xrightarrow{Br_2}$ / $\xrightarrow{H^+}$

(3) $\xrightarrow{NaNO_2}$ / $\xrightarrow{HCl}$ / $\xrightarrow{KBr}$ / $\xrightarrow{H^+}$

(4) $\xrightarrow{Br_2/Fe}$ / $\xrightarrow{Sn/HCl}$ / $\xrightarrow{NaNO_2/HCl}$ / $\xrightarrow{CuBr/HBr}$

Ans. (4)

Sol.



Topic- Chemical bonding
Subtopic- Hybridization
Level-E

16. The correct shape and I-I-I bond angles respectively in I_3^- ion are :

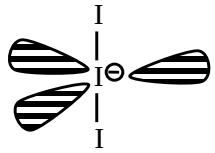
(1) Trigonal planar; 120º
(2) Distorted trigonal planar; 135º and 90º
(3) Linear; 180º
(4) T-shaped; 180º and 90º

I_3^- आयन की सही आकृति तथा I-I-I कोण क्रमशः हैं–

(1) त्रिकोणीय समतली; 120º
(2) विकृत त्रिकोणीय समतली; 135º तथा 90º
(3) रैखिक; 180º
(4) T-जैसी आकृति; 180º तथा 90º

Ans. (3)

Sol. I_3^- sp^3d hybridisation (2BP + 3L.P.) Linear geometry



Topic- d-block
Subtopic- General propirlies
Level-E

17. What is the correct order of the following elements with respect to their density ?
निम्नलिखित तत्वों के घनत्वों के अनुसार सही क्रम क्या हैं?

(1) Cr < Fe < Co < Cu < Zn
(2) Cr < Zn < Co < Cu < Fe
(3) Zn < Cu < Co < Fe < Cr
(4) Zn < Cr < Fe < Co < Cu

Ans. (4)

Sol. Fact Based
Density depend on many factor like atomic mass. atomic radius and packing efficiency.

Topic- Carbonyl compound
Subtopic- Chemical reaction of carbonyl compound
Level-M

18. Match List-I and List-II.

List – I	**List-II**
(a) $R-\overset{\overset{O}{\|\|}}{C}-Cl \rightarrow R-CHO$	(i) $Br_2/NaOH$
(b) $R-CH_2-COOH \rightarrow R-\underset{\underset{Cl}{\|}}{CH}-COOH$	(ii) $H_2/Pd\text{-}BaSO_4$
(c) $R-\overset{\overset{O}{\|\|}}{C}-NH_2 \rightarrow R-NH_2$	(iii) Zn(Hg)/Conc. HCl
(d) $R-\overset{\overset{O}{\|\|}}{C}-CH_3 \rightarrow R-CH_2-CH_3$	(iv) Cl_2/Red P, H_2O

Choose the correct answer from the options given below :

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

सूची – I से सूची – II का सुमेल कीजिए:

सूची – I	**सूची -II**
(a) $R-\overset{\overset{O}{\|\|}}{C}-Cl \rightarrow R-CHO$	(i) $Br_2/NaOH$
(b) $R-CH_2-COOH \rightarrow R-\underset{\underset{Cl}{\|}}{CH}-COOH$	(ii) $H_2/Pd\text{-}BaSO_4$
(c) $R-\overset{\overset{O}{\|\|}}{C}-NH_2 \rightarrow R-NH_2$	(iii) Zn(Hg)/सान्द्र. HCl
(d) $R-\overset{\overset{O}{\|\|}}{C}-CH_3 \rightarrow R-CH_2-CH_3$	(iv) Cl_2/लाल P, H_2O

नीचे दिए गये विकल्पों में से सही उत्तर चुनिए:

(1) (a)-(ii), (b)-(i), (c)-(iv), (d)-(iii) (2) (a)-(iii), (b)-(iv), (c)-(i), (d)-(ii)

(3) (a)-(iii), (b)-(i), (c)-(iv), (d)-(ii) (4) (a)-(ii), (b)-(iv), (c)-(i), (d)-(iii)

Ans. (4)

Sol. (a) $R-\overset{\overset{O}{\|\|}}{C}-Cl \xrightarrow{H_2/Pd\text{-}BaSO_4} R-CHO$ (Rosenmund reaction)

(b) $R-CH_2-COOH \xrightarrow{Cl_2/Red\ P,\ H_2O} R-\underset{\underset{Cl}{\|}}{CH}-COOH$ (HVZ reaction)

(c) $R-\overset{\overset{O}{\|\|}}{C}-NH_2 \xrightarrow{Br_2/NaOH} R-NH_2$ (Hoffmann Bromamide reaction)

(d) $R-\overset{\overset{O}{\|\|}}{C}-CH_3 \xrightarrow{Zn(Hg)/conc.HCl} R-CH_2-CH_3$ (Clemmensen reaction)

Topic- Polymers
Subtopic- Types of Polymers
Level-E

19. In polymer Buna-S ; 'S' stands for :

(1) Styrene (2) Sulphur (3) Strength (4) Sulphonation

बहुलक ब्यूना–S में 'S' जिसके लिए हैं, वह है:

(1) स्टाइरीन (2) सल्फर (3) शक्ति (4) सल्फोनीकरण

Ans. (1)

Sol. Buna-S is the co-polymer of buta- 1, 3 diene & styrene.

Topic-Chemistry in everyday life
Subtopic-Reagent
Level-M

20. Most suitable salt which can be used for efficient clotting of blood will be :
रक्त का थक्का प्रभावी रूप से बनाने में जो लवण सबसे अधिक उपयुक्त है, है वह है:
(1) $Mg(HCO_3)_2$ (2) $FeSO_4$ (3) $NaHCO_3$ (4) $FeCl_3$

Ans. **(4)**

Sol. Blood is a negative sol, according to Hardy-Schulz's rule, the cation with high charge has high coagulation power. Hence, $FeCl_3$ can be used for clotting blood.

Section –B

Topic-Electrochemistry
Subtopic- Electrochemical cell
Level- T

1. The magnitude of the change in oxidising power of the MnO_4^- / Mn^{2+} couple is x × 10^{-4} V, if the H^+ concentration is decreased from 1M to 10^{-4} M at 25ºC. (Assume concentration of MnO_4^- and Mn^{2+} to be same on change in H^+ concentration). The value of x is _____.
(Rounded off to the nearest integer)

$\left[\text{Given : } \frac{2303RT}{F} = 0.059\right]$

MnO_4^- / Mn^{2+} युग्म की ऑक्सीकरण सामर्थ्य में परिवर्तन होने का परिमाण x × 10^{-4} V है, यदि H^+ आयन की सांद्रता 25ºC पर, 1M से 10^{-4} M तक घटा दी जाए तो x का मान है । (निकटतम पूर्णांक)(H^+ आयन की सांद्रता परिवर्तित होने पर MnO_4^- तथा Mn^{2+} की सांद्रता समान मान लीजिए)।

$\left[\text{दिया है : } \frac{2303RT}{F} = 0.059\right]$

Ans. **3776**

Sol. $5e^- + MnO_4^- + 8H^+ \longrightarrow Mn^{+2} + 4H_2O$

$$Q = \frac{\left[Mn^{+2}\right]}{\left[H^+\right]^8\left[MnO_4^-\right]} \quad \Rightarrow \quad E_1 = E^\circ - \frac{0.059}{5}\log(Q_1)$$

$$E_2 = E^\circ - \frac{0.059}{5}\log(Q_2) \quad \Rightarrow \quad E_2 - E_1 = \frac{0.059}{5}\log\left(\frac{Q_1}{Q_2}\right)$$

$$= \frac{0.059}{5}\log\left\{\frac{\left[H^+\right]_{II}}{\left[H^+\right]_I}\right\}^8 \quad \Rightarrow \quad = \frac{0.059}{5}\log\left(\frac{10^{-4}}{1}\right)^8$$

$$(E_2 - E_1) = \frac{0.059}{5} \times (-32) \quad \Rightarrow \quad \left|(E_2 - E_1)\right| = 32 \times \frac{0.059}{5} = x \times 10^{-4}$$

$$= \frac{32 \times 590}{5} \times 10^{-4} = x \times 10^{-4} \quad \Rightarrow \quad = 3776 \times 10^{-4} \qquad x = 3776$$

Topic- P-block
Subtopic- Oxygen family & compounds of oxygen & sulfuric
Level- E

2. Among the following allotropic forms of sulphur, the number of allotropic forms, which will show paramagnetism is _____.
(1) α-sulphur (2) β-sulphur (3) S_2-form
निम्नलिखित सल्फर के अपररूप में से अनुचुम्बकत्व दर्शाने वाले अपररूपों की संख्या है–
(1) α-सल्फर (2) β- सल्फर (3) S_2-रूप

Ans. **(1)**

Sol. S_2 is like O_2 i;e paramagnetic as per molecular orbital theory.

Topic- Liquid – Liquid solution
Subtopic- Ideal Vs non ideal solution & their distillation and immiscible liquid solution
Level- M

3. C_6H_6 freezes at 5.5ºC. The temperature at which a solution of 10 g of C_4H_{10} in 200 g of C_6H_6 freeze is _____ºC. (The molal freezing point depression constant of C_6H_6 is) 5.12ºC/m)
C_6H_6, 5.5ºC पर जमती है। वह ताप जिस पर 200 g C_6H_6 में 10 g C_4H_{10} का एक विलयन जम जाता है वह है..... ºC (C_6H_6 का मोलल हिमांक अवनमन स्थिरांक 5.12ºC/m है।)

Ans. **1**

Sol. $\Delta T_f = i \times K_f \times m$

$= (1) \times 5.12 \times \frac{10/58}{200} \times 1000 \quad \Rightarrow \quad \Delta T_f = \frac{5.12 \times 50}{58} = 4.414$

$T_{f(solution)} = T_{K(solvent)} - \Delta T_f$

$= 5.5 - 4.414$

$= 1.086°C$

$\approx 1.09°C = 1$ (nearest integer)

Topic- Gaseous
Subtopic- Real gas Introduction
Level-M

4. The volume occupied by 4.75 g of acetylene gas at 50ºC and 740 mmHg pressure is _____L. (Rounded off to the nearest integer)
(Given R = 0.0826 L atm K^{-1} mol^{-1})
50ºC तथा 740 mmHg दाब पर 4.75 g ऐसीटिलीन गैस द्वारा घेरा गया आयतन, L में, है .....। (निकटतम पूर्णांक)
(दिया है : R = 0.0826 L atm K^{-1} mol^{-1})

Ans. **5**

Sol. T = 50ºC = 323.15 K

P = 740 mm of Hg = $\frac{740}{760}$ atm

V = ?

moles (n) = $\frac{4.75}{26}$

$V = \frac{4.75}{26} \times \frac{0.0821 \times 323.15}{740} \times 760$

V = 4.97 ; 5 Lit

Topic- Ionic Equilibriums
Subtopic- Solubility & Solubility product
Level-M

5. The solubility product of PbI_2 is 8.0×10^{-9}. The solubility of lead iodide in 0.1 molar solution of lead nitrate is $x \times 10^{-6}$ mol/L. The value of x is _____(Rounded off to the nearest integer)
[Given $\sqrt{2} = 1.41$]
PbI_2 का विलेयता गुणनफल 8.0×10^{-9} है। लेड आयोडाइड की विलेयता 0.41 मोलर लेड नाइट्रेट विलयन में $x \times 10^{-6}$ mol/L है। x का मान है ..... (पूर्णांक उत्तर) [दिया है: $\sqrt{2} = 1.41$]

Ans. **141**

Sol. $K_{SP}(PbI_2) = 8 \times 10^{-9}$

$PbI_2\ s \rightleftharpoons Pb^{+2}\ aq + 2I^-\ aq$

$S + 0.1 \quad 2S$

$K_{SP} = [Pb^{+2}][I^-]^2$

$8 \times 10^{-9} = (S + 0.1)\ (2S)^2 \Rightarrow 8 \times 10^{-9} \approx 0.1 \times 4S^2$

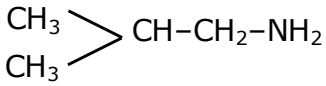
$\Rightarrow S^2 = 2 \times 10^{-8}$

$S = 1.414 \times 10^{-4}$ mol/Lit

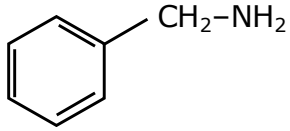
$= x \times 10^{-6}$ mol/Lit $\quad \therefore \quad x = 141.4 \approx 141$

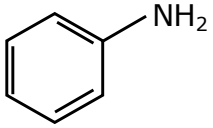
Topic- Amine
Subtopic- Chemical reaction of amine
Level-E

6. The total number of amines among the following which can be synthesized by Gabriel synthesis is _____.

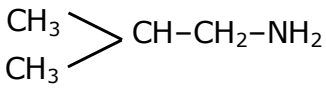
(1) 

(2) $CH_3CH_2NH_2$

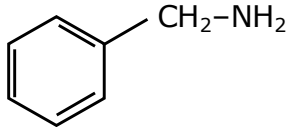
(3) 

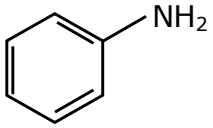
(4) 

निम्नलिखित में से उन ऐमीनों की संख्या, जिनमा संश्लेषण गैब्रएल संश्लेषण से कर सकते हैं, है .....।

(1) 

(2) $CH_3CH_2NH_2$

(3) 

(4) 

Ans. **(3)**

Sol. Only 1º amines can be prepared by Gabriel synthesis.

Topic- Mole
Subtopic- Purity
Level- M

7. 1.86 g of aniline completely reacts to form acetanilide. 10% of the product is lost during purificatiion. Amount of acetanilide obtained after purification (in g) is _____$\times 10^{-2}$.
1.86 g ऐनिलीन पूर्णरूप से अभिक्रिया करके ऐसिटेनिलाइड बनाती है। उत्पाद का 10% शुद्धिकरण में खत्म हो जाता है। प्राप्त, ऐसिटेनिलाइड की मात्रा (g में) है ..... $\times 10^{-2}$।

Ans. **243**

Sol. $Ph-NH_2 \longrightarrow Ph-NH-\overset{\overset{O}{||}}{C}-CH_3$

(C_6H_7N) $(Acetanilide)(C_8H_9NO)$

Molar mass = 93 Molar mass = 135

93 g Aniline produce 135 g acetanilide

1.86 g produce $\frac{135\times1.86}{93} = 2.70\,g$

At 10% loss, 90% product will be formed after purification.

$\therefore$ Amount of product obtained = $\frac{2.70\times90}{100} = 2.43\,g = 243 \times 10^{-2}$ g

Topic- Mole
Subtopic- POAC
Level- easy

8. The formula of a gaseous hydrocarbon which requires 6 times of its own volume of O_2 for complete oxidation and produces 4 times its own volume of CO_2 is C_xH_y. The value of y is .....
गैसीय हाइड्रोकार्बन जिसके संपूर्ण ऑक्सीकरण के लिए उसके अपने आयतन से 6 गुनी O_2 की आवश्यकता होती है और अपने आयतन से 4 गुनी CO_2 उत्पन्न होती है, वह C_xH_y है जहाँ y का मान है .....।

Ans. **8**

Sol. $C_xH_y + 6O_2 \longrightarrow 4CO_2 + \frac{y}{2} H_2O$

Applying POAC on 'O' atoms
$6 \times 2 = 4 \times 2 + y/2 \times 1$
$y/2 = 4 \Rightarrow y = 8$

Topic- Chemical Kinetic
Subtopic-First law
Level-M

9. Sucrose hydrolyses in acid solution into glucose and fructose following first order rate law with a half-life of 3.33 h at 25ºC. After 9h, the fraction of sucrose remaining is f. The value of $\log_{10}\left(\frac{1}{f}\right)$ is _____$\times 10^{-2}$ (Rounded off to the nearest integer)
[Assume: ln10 = 2.303, ln2 = 0.693]

अम्लीय विलयन में सुक्रोस का ग्लूकोस तथा फ्रुक्टोज में 25°C पर अपघटन प्रथम कोटि के दर नियम का अनुसरण 3.33 h की अर्ध आयु के साथ करता है। 9h के पश्चात बचे हुए सुक्रोस का अंश f है। $\log_{10}\left(\frac{1}{f}\right)$ का मान है _____ × 10^{-2}। (निकटतम पूर्णांक) [मान लीजिए: ln10 = 2.303, ln2 = 0.693]

Ans. **81**

Sol. Sucose $\xrightarrow{\text{Hydrolysis}}$ Glucose + Fructose

$t_{1/2}$ = 3.33h = $\frac{10}{3}$h $\Rightarrow$ $C_t = \frac{C_o}{2^{t/t_{1/2}}}$

Fraction of sucrose remaining = f = $\frac{C_t}{C_o} = \frac{1}{2^{t/t_{1/2}}}$

$\frac{1}{f} = 2^{t/t_{1/2}}$

$\log(1/f) = \log\left(2^{t/t_{1/2}}\right) = \frac{t}{t_{1/2}}\log(2)$

= $\frac{9}{10/3} \times 0.3 = \frac{8.1}{10} = 0.81$ = x × 10^{-2} x = 81

Topic- Thermodynamics
Subtopic- Third law
Level-M

10. Assuming ideal behaviour, the magnitude of log K for the following reaction at 25°C is x × 10^{-1}. The value of x is _____.(Integer answer)

$$3HC \equiv CH_{(g)} \rightleftharpoons C_6H_{6(\ell)}$$

[Given : $\Delta_f G°(HC \equiv CH)$ = – 2.04 × 10^5] mol^{-1}; $\Delta_f G°(C_6H_6)$ = – 1.24 × 10^5 J mol^{-1} ; R = 8.314 J K^{-1} mol^{-1}]

आदर्श व्यवहार मानकर, निम्नलिखित अभिक्रिया के लिए 25°C पर log K का मान x × 10^{-1} है। x का मान है । (पूर्णांक उत्तर)

$$3HC \equiv CH_{(g)} \rightleftharpoons C_6H_{6(\ell)}$$

[दिया है : $\Delta_f G°(HC \equiv CH)$ = – 2.04 × 10^5] mol^{-1}; $\Delta_f G°(C_6H_6)$ = – 1.24 × 10^5 J mol^{-1} ; R = 8.314 J K^{-1} mol^{-1}]

Ans. **855**

Sol. $3HC \equiv CH(g) \rightleftharpoons C_6H_6(\ell)$

$\Delta G_r^\circ = \Delta G_f^\circ\left[C_6H_8(\ell)\right] - 3 \times \Delta G_f^\circ\left[HC \equiv CH\right]$

= [– 1.24 × 10^5 – 3x(– 2.04 × 10^5)]

= 4.88 × 10^5 J/mol

ΔG_r° = – RT ln(K_{eq})

$\log(K_{eq}) = \frac{-\Delta G^\circ}{2.303RT} = \frac{-4.88 \times 10^5}{2.303 \times 8.314 \times 298}$ = – 8.55 × 10^1 = 855 × 10^{-1}

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