

CHEMISTRY

SECTION - A

Multiple Choice Questions: This section contains 20 multiple choice questions. Each question has 4 choices (1), (2), (3) and (4), out of which **ONLY ONE** is correct.

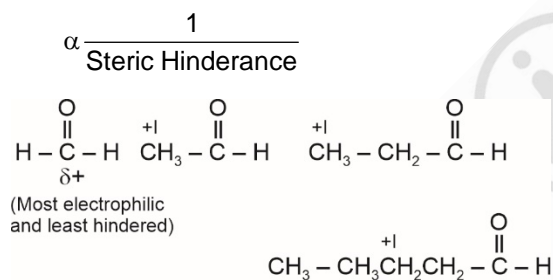
Choose the correct answer :

1. Among the given molecules, identify the one which undergoes nucleophilic addition reaction at fastest rate?

- (1) HCHO
- (2) CH₃CHO
- (3) CH₃CH₂CHO
- (4) CH₃CH₂CH₂CHO

Answer (1)

Sol. Rate of N.A.R. α electrophilicity of C-atom



2. Which compound will absorb light of highest frequency?

- (1) [Cr(H₂O)₆]³⁺
- (2) [CrCl₆]³⁻
- (3) [Cr(CN)₆]³⁻
- (4) [CrCl₃(H₂O)₃]

Answer (3)

Sol. More the crystal field splitting energy more will be the frequency of absorbed light.

Crystal field splitting energy depends on ligand strength here

Order of ligand strength

Cl⁻ < H₂O < CN⁻; So splitting energy will also follow same order

3. Find the ratio of shortest wavelengths in Lyman and Balmer series of H-atom.

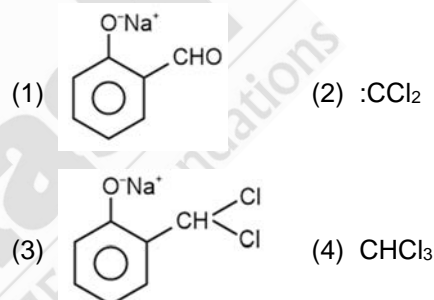
- (1) $\frac{1}{4}$
- (2) $\frac{4}{1}$
- (3) $\frac{1}{2}$
- (4) $\frac{2}{1}$

Answer (1)

Sol. $(\lambda_{\text{shortest}})_{\text{Lyman}} = \frac{1}{R}$; $(\lambda_{\text{shortest}})_{\text{Balmer}} = \frac{4}{R}$

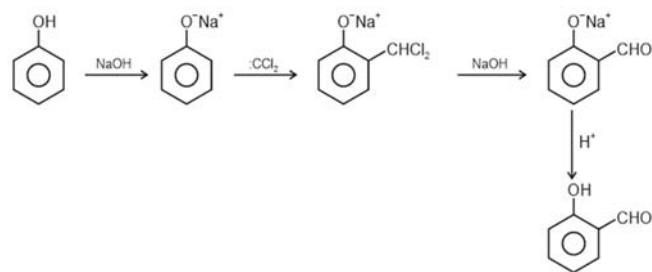
$$\frac{\lambda_{\text{Lyman}}}{\lambda_{\text{Balmer}}} = \frac{\frac{1}{R}}{\frac{4}{R}} = \frac{1}{4}$$

4. Which of the following is not the intermediate observed in Reimer Tiemann Reaction?



Answer (4)

Sol. CHCl₃ + NaOH \longrightarrow :CCl₂



CHCl₃ is the reagent.

Aakashians Conquer JEE (Main) 2024 SESSION-1

Perfect Score!
300/300
100
Percentile
RISHI S SHUKLA
TWO YEAR CLASSROOM PROGRAM

****143**
100 PERCENTILERS
(PHY. OR CHEM. OR MATHS)

****936** 99+ PERCENTILERS
****4155** 95+ PERCENTILERS
*Counting & Digitals Courses

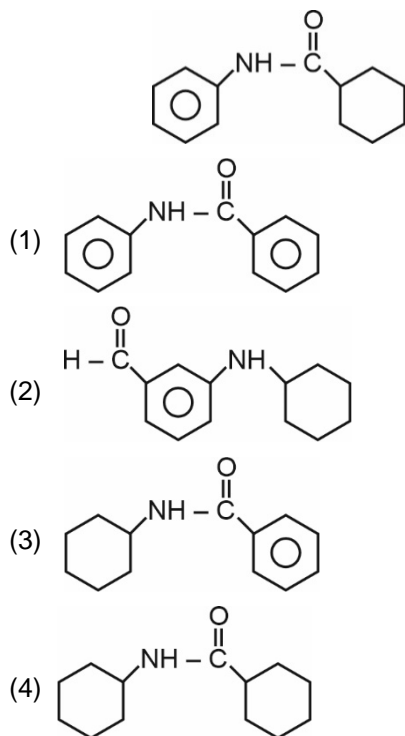
*As per student response sheet and NTA answer key.

Our Stars

Chirag Falor
4 Year Classroom
1 AIR
JEE (Adv.)
2020

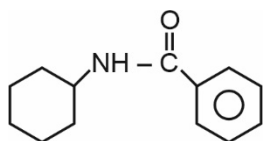
Tanishka Kabra
4 Year Classroom
1 AIR-16 CR.
JEE (Adv.)
2022
ALL INDIA RANK

5. Correct metamer of the following compound is



Answer (3)

Sol. Metamers have the same functional group but differ in the alkyl/aryl groups attached to it keeping the molecular formula unchanged. Therefore, metamer of the given compound is



6. How many of the following do not belong to Lanthanoids?

Eu, Er, Lu, Cm, Yb, Tb

- (1) 5
(2) 4
(3) 3
(4) 1

Answer (4)

Sol. ${}^{63}\text{Eu}$, ${}^{65}\text{Tb}$, ${}^{68}\text{Er}$, ${}^{70}\text{Yb}$ and ${}^{71}\text{Lu}$ belong to Lanthanoids.

${}^{96}\text{Cm}$ belongs to actinoids.

7. Density of x M solution of NaOH is 1.12 g/mL and molality is 3 m, then the value of x is

- (1) 3
(2) 2.8
(3) 3.8
(4) 3.5

Answer (1)

Sol. Given molality of NaOH = 3 m

It means 3 moles of NaOH present in 1000 g of solvent.

Mass of solute (NaOH) = $3 \times 40 = 120$ g

Mass of solution = $1000 + 120 = 1120$ g

Density of solution = $1.12 = \frac{1120}{\text{volume}}$

Volume of solution = $\frac{1120}{1.12} = 1000$ mL

Molarity of solution = $\frac{3}{1000} \times 1000 = 3$ M

8. Which of the following is not a semiconductor?

- (1) Si
(2) Graphite
(3) CuO
(4) Ge

Answer (2)

Sol. Graphite is not a semiconductor, it is an allotrope of carbon and good conductor of electricity.

CuO is a p-type semiconductor.

Si and Ge are also semiconductors.

Aakashians Conquer JEE (Main) 2024 SESSION-1



143
100 PERCENTILERS
(PHY. OR CHEM. OR MATHS)

936 99+ PERCENTILERS
4155 95+ PERCENTILERS
*Includes Students from Classroom, Distance & Digital Courses

Our Stars



9. Match List-I with List-II and choose the correct option.

	List-I (Reagent)		List-II (Radical)
(i)	dil. HCl	(A)	Pb ²⁺
(ii)	NH ₄ Cl + NH ₄ OH + (NH ₄) ₂ CO ₃	(B)	Al ³⁺
(iii)	NH ₄ Cl + NH ₄ OH + H ₂ S	(C)	Mn ²⁺
(iv)	NH ₄ Cl + NH ₄ OH	(D)	Sr ²⁺

- (1) (i)-(A), (ii)-(D), (iii)-(C), (iv)-(B)
 (2) (i)-(D), (ii)-(A), (iii)-(C), (iv)-(B)
 (3) (i)-(A), (ii)-(D), (iii)-(B), (iv)-(C)
 (4) (i)-(B), (ii)-(C), (iii)-(D), (iv)-(A)

Answer (1)

Sol. (i) dil. HCl

Group-I: Pb²⁺

(ii) NH₄Cl + NH₄OH + (NH₄)₂CO₃

Group-V: Ba²⁺, Sr²⁺, Ca²⁺

(iii) NH₄Cl + NH₄OH + H₂S

Group-IV: Co²⁺, Ni²⁺, Mn²⁺, Zn²⁺

(iv) NH₄Cl + NH₄OH

Group-III: Al³⁺, Fe³⁺

10. Choose the correct option based on matching.

	Hybridization		Shape
A	sp ³	I	Octahedral
B	sp ³ d	II	Tetrahedral
C	sp ²	III	Trigonal bipyramidal
D	sp ³ d ²	IV	Trigonal planar

- (1) A(I); B(II); C(III); D(IV)
 (2) A(II); B(III); C(IV); D(I)
 (3) A(II); B(III); C(I); D(IV)
 (4) A(III); B(II); C(IV); D(I)

Answer (2)

Sol.

Hybridization	Shape
sp ³	Tetrahedral
sp ³ d	Trigonal bipyramidal
sp ²	Trigonal planar
sp ³ d ²	Octahedral

11. Which of the following will have positive electron gain enthalpy?

- (A) Na + e[⊖] → Na[⊖]
 (B) O + 2e[⊖] → O^{2⊖}
 (C) Be + e[⊖] → Be[⊖]
 (D) F + e[⊖] → F[⊖]
 (E) N + e[⊖] → N[⊖]

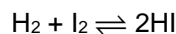
- (1) (B, C, E) (2) (A, B, E)
 (3) (A, C, D) (4) (A, B, C)

Answer (1)

Sol. Be & N have stable fully filled & half-filled electronic configuration respectively



12. Consider the given reaction :



If equal number of molecules of H₂, I₂ and HI are present at equilibrium. Then K_p = t × 10⁻¹

Find out t

- (1) 10 (2) 0.01
 (3) 0.1 (4) 1

Answer (1)

Aakashians Conquer JEE (Main) 2024 SESSION-1

Perfect Score!
300/300
100 Percentile
RISHI S SHUKLA
TWO YEAR CLASSROOM PROGRAM

143
100 PERCENTILERS
(PHY. OR CHEM. OR MATHS)

936 99+ PERCENTILERS
4155 95+ PERCENTILERS
*Includes Students from Classroom, Distance & Digital Courses

Our Stars

Chirag Falor
4 Year Classroom
1 AIR
JEE (Adv.)
2020

Tanishka Kabra
4 Year Classroom
1 AIR-16 CR.
JEE (Adv.)
2022

Sol. $H_2 + I_2 \rightleftharpoons 2HI$

$$K_p = \frac{(P_{HI})^2}{(P_{H_2})(P_{I_2})} = 1$$

$$K_p = t \times 10^{-1}$$

$$t = 10$$

13. **Statement-I:** Gallium has low melting point, so it is used in thermometers.

Statement-II: A substance having 253 K can be measured by Ga thermometer.

- (1) Statement-I and Statement-II both correct
- (2) Statement-I and Statement-II both incorrect
- (3) Statement-I correct and Statement-II incorrect
- (4) Statement-II correct and Statement-I incorrect

Answer (3)

Sol. Melting point of Gallium is nearly 302 K so, it can't measure temperature of 253 K.

14. Choose the correct option regarding the following statements:

Statement-I: 2, 4, 6-Trinitrotoluene is picric acid.

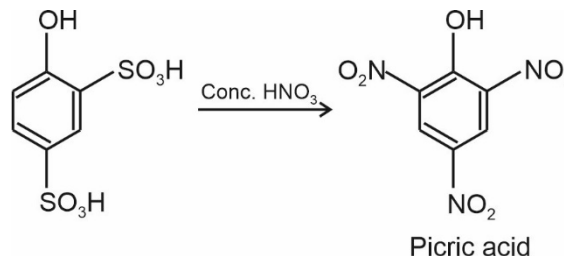
Statement-II: Reaction of 4-hydroxybenzene-1, 3-disulphonic acid with conc. HNO_3 gives picric acid.

- (1) Both statement-I and statement-II are true
- (2) Both statement-I and statement-II are false
- (3) Statement-I is true but statement-II is false
- (4) Statement-I is false but statement-II is true

Answer (4)

Sol. 2, 4, 6-Trinitrotoluene is an explosive and not picric acid. Therefore statement-I is false

2, 4, 6-Trinitrophenol is called picric acid. It is synthesised by the reaction of 4-hydroxybenzene-1,3-disulphonic acid with conc. HNO_3 .



∴ Statement-II is true.

15. Among the following which is not a base of DNA?
- (1) Adenine
 - (2) Uracil
 - (3) Guanine
 - (4) Cytosine

Answer (2)

Sol. Uracil is present in RNA. Instead of uracil, thymine is present in DNA.

16. Identify the correct match among the given species and respective shape of molecule

Species	Shape
(A) NH_4^+	See-Saw
(B) SF_4	Tetrahedral
(C) ClF_3	T-shaped
(D) XeF_6	Square planar
(1) A	(2) B
(3) C	(4) D

Answer (3)

Sol. NH_4^+ : Tetrahedral ClF_3 : T-shaped
 SF_4 : See-Saw XeF_6 : Distorted Octahedral

Aakashians Conquer JEE (Main) 2024 SESSION-1



143
100 PERCENTILERS
(PHY. OR CHEM. OR MATHS)

936 99+ PERCENTILERS
4155 95+ PERCENTILERS
**Includes Students from Classroom, Distance & Digital Courses

Our Stars



17. Which of the following statement is incorrect?

- (1) Glycerol is purified by vacuum distillation
- (2) Aniline is purified by steam distillation
- (3) Chloroform and aniline can be separated by distillation
- (4) Ethanol and water are azeotropic mixture can be separated by distillation

Answer (4)

Sol. Ethanol and water are azeotropic mixture and can't be separated by distillation

18.

19.

20.

SECTION - B

Numerical Value Type Questions: This section contains 10 Numerical based questions. The answer to each question should be rounded-off to the nearest integer.


21. Find out ratio of t_{99} and t_{90} for first order

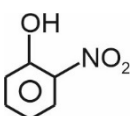
Answer (2)

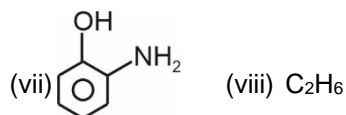
$$\text{Sol. } t_{99} = \frac{2.303}{k} \log \frac{100}{1}$$

$$t_{90} = \frac{2.303}{k} \log \frac{100}{10}$$



22. How many of the following show(s) H-bonding.

- (i)  (ii) H₂O (iii) CH₃OH

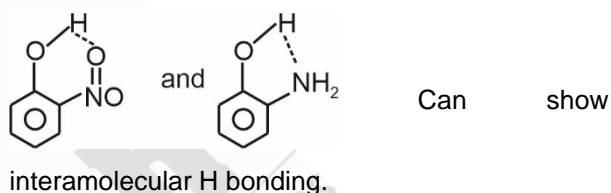
- (iv) HF (v) NH₃ (vi) 



Answer (6)

Sol. The system having suitable electropositive pole H and suitable electronegative pole can show H-bonding. Suitable positive pole H: F—H, , , suitable negative pole: Electronegative element F, O, N with sufficient negative charge.

Hence H₂O, CH₃OH, HF and NH₃ can show intermolecular H bonding and



23. $\text{KMnO}_4 \xrightarrow{\text{H}^+} \text{X}(\text{product having Mn})$

What is the difference in spin only magnetic moment (in B.M.) between the given reactant and product. (Nearest integer)

Answer (6)

Sol. In acidic medium KMnO₄ goes to Mn²⁺ e.g. MnSO₄.

The KMnO₄ has zero unpaired electrons (hence it is diamagnetic) because it has Mn at +7 oxidation state (electronic configuration (n - 1)d⁰ ns⁰).

Mn²⁺ has 5 unpaired electrons as it has (n - 1)d⁵ ns⁰ electronic configuration so it has 5.92 B.M. magnetic moment so difference will be 5.92 B.M. Nearest integer = 6.

Aakashians Conquer JEE (Main) 2024 SESSION-1

Perfect Score!
300/300
100
Percentile
RISHI S SHUKLA
TWO YEAR CLASSROOM PROGRAM

****143**
100 PERCENTILERS
(PHY. OR CHEM. OR MATHS)

****936** 99+ PERCENTILERS
****4155** 95+ PERCENTILERS
*Counting

** (Includes Students from Classroom, Distance & Digital Courses)

Our Stars

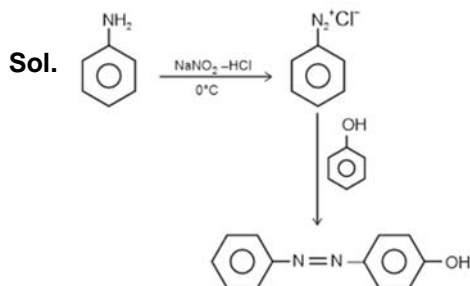

Chirag Falor
4 Year Classroom
1 AIR
JEE (Adv.)
2020


Tanishka Kabra
4 Year Classroom
1 AIR-16 CRL
JEE (Adv.)
2022
ALL INDIA RANK

*As per student response sheet and NTA answer key.

24. 9.3 g of aniline was treated with NaNO_2 and HCl at 0°C to get product A which reacts with phenol to form a product B. Assuming 100% yield in each step, what is the weight of product B obtained?

Answer (20)



9.3 g

$$\frac{9.3}{93} = 0.1 \text{ mole.}$$

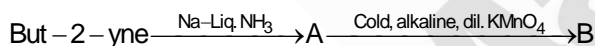
Final product formed = 0.1 mol.

$$= 0.1 \times 198$$

$$= 19.8 \text{ gm}$$

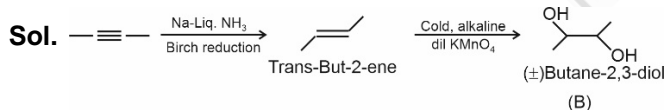
$$= 20$$

25. Consider the following sequence of reactions



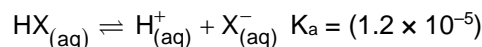
Find the number of oxygen in B (1 molecule)

Answer (2)



Hence the number of O atom in one molecule of B is 2.

26. According to the reaction,



Find out osmotic pressure of 0.03 M HX solution at 300 K (in atm).

Answer (1)

Sol. $K_a = \frac{C\alpha^2}{1-\alpha}$

$$1.2 \times 10^{-5} = (3 \times 10^{-2}) (\alpha^2)$$

$$\alpha^2 = 0.4 \times 10^{-3}$$

$$\alpha^2 = 4 \times 10^{-4}$$

$$\alpha = 0.02$$

$$\pi = iCRT$$

$$i = 1 + \alpha = 1.02$$

$$\pi = (1.02) (0.03) (0.0821) (300)$$

$$= 0.7536 \text{ atm}$$

$$\approx 1$$

27.

28.

29.

30.

Aakashians Conquer JEE (Main) 2024 SESSION-1



Perfect Score!
300/300
100 Percentile
RISHI S SHUKLA
TWO YEAR CLASSROOM PROGRAM

****143**
100 PERCENTILERS
(PHY. OR CHEM. OR MATHS)

****936** 99+ PERCENTILERS

****4155** 95+ PERCENTILERS
& Counting

** (Includes Students from Classroom, Distance & Digital Courses)

Our Stars



Chirag Falor
4 Year Classroom
1 AIR
JEE (Adv.)
2020



Tanishka Kabra
4 Year Classroom
1 AIR-16 CR.
JEE (Adv.)
2022
ALL INDIA RANK