JEE (MAIN)-2025 (Online)

Chemistry Memory Based Answer & Solutions

EVENING SHIFT

DATE : 22-01-2025

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MEMORY BASED QUESTIONS JEE–MAIN EXAMINATION – JANUARY, 2025

(Held On Wednesday 22nd January, 2025) TIME : 3 : 00 AM to 6 : 00 PM

CHEMISTRY

TEST PAPER WITH SOLUTION

SECTION-A

1. Density of 3 M NaOH is 1.25 g/ml. Molality of solution is

(1) 2.65 (2) 2.5

(3) 2.8 (4) 4

Ans. **(1)**

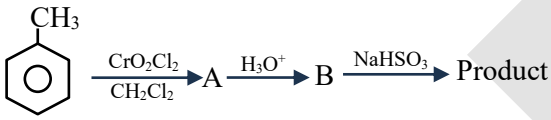
Sol. $m = \frac{3\times1000}{1.25}$

$$\frac{3\times1000}{1.25\times1000-3\times40} = \frac{M\times1000}{1000d - M\times M_{max}}$$

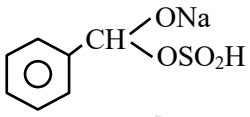
$$= \frac{3000}{1250-120}$$

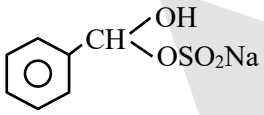
$= 2.65$ m

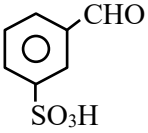
2.

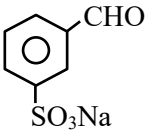


The product is

(1) 

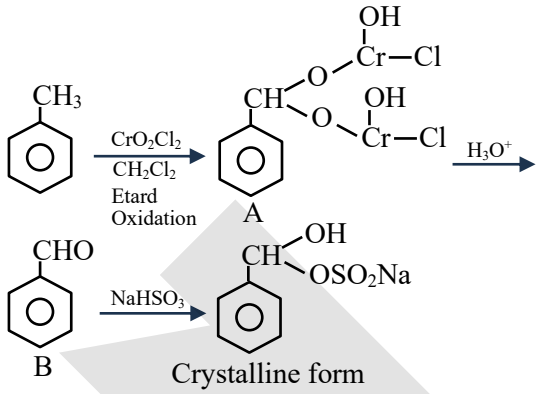
(2) 

(3) 

(4) 

Ans. **(2)**

Sol.



3. Which of the following doesn't show disproportionation reaction

(1) ClO^- (2) ClO_2^-

(3) ClO_3^- (4) ClO_4^-

Ans. **(4)**

Sol. Species with intermediate oxidation number can disproportionate.

$ClO^- \rightarrow +1$

$ClO_2^- \rightarrow +3$

$ClO_3^- \rightarrow +5$

$ClO_4^- \rightarrow +7$

4. Compare dipole moment of

(i) NF_3 (ii) $CHCl_3$

(iii) H_2S (iv) HBr

(1) (i) > (ii) > (iii) > (iv)

(2) (ii) > (iii) > (i) > (iv)

(3) (ii) > (iii) > (iv) > (i)

(4) (iii) > (i) > (iv) > (ii)

Ans. **(3)**

Sol.

Species	Dipole moment
$CHCl_3$	1.04 D
H_2S	0.95 D
HBr	0.79 D
NF_3	0.23 D

5. Which of the following has "two secondary hydrogens"

(1) 2,2,3,3-Tetramethyl Pentane

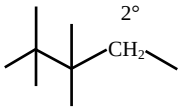
(2) 2,2,4,4-Tetramethyl Heptane

(3) 4-Ethyl-2, 2 Di methyl hexane

(4) None of these

Ans. **(1)**

Sol.



2,2,3,3-Tetramethyl Pentane

6. Arrange according to CFSE.

(i) $[Co(Cl)_4]^{2-}$

(ii) $[Co(NH_3)_6]^{3+}$

(iii) $[Co(NH_3)_6]^{2+}$

(iv) $[Co(en)_3]^{3+}$

(1) (iv) > (ii) > (iii) > (i)

(2) (iv) > (iii) > (ii) > (i)

(3) (i) > (iii) > (ii) > (iv)

(4) (i) > (ii) > (iii) > (iv)

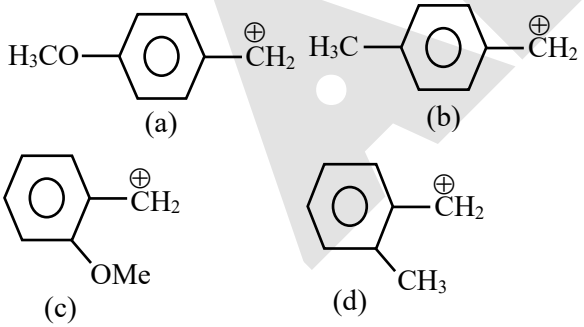
Ans. **(1)**

Sol. Crystal field splitting of any octahedral complex > tetrahedral and as charge on CMA ↑ ⇒ Δ ↑

$[Co(en)_3^{3+}] > [Ca(NH_3)_6^{3+}] > [Co(NH_3)_6^{2+}] > [Co(Cl)_4^{2-}]$

(iv) > (ii) > (iii) > (i)

7. What is correct order of stability of carbocation.



(1) a > b > c > d

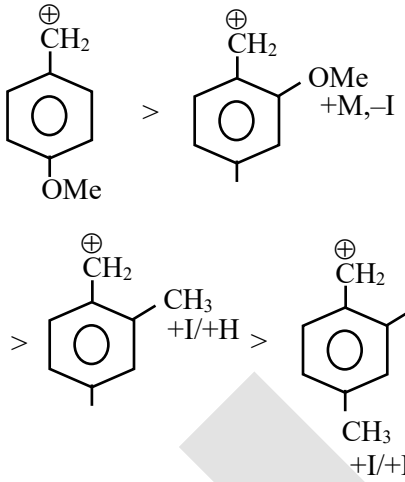
(2) c > a > d > b

(3) a > c > d > b

(4) c > b > a > d

Ans. **(3)**

Sol.



8. 200 ml of 0.2 M solutions of NaOH is mixed with 400 mL of 0.5 M NaOH solution molarity of mixture is

(1) 0.4 M (2) 0.6 M

(3) 4 M (4) 0.8 M

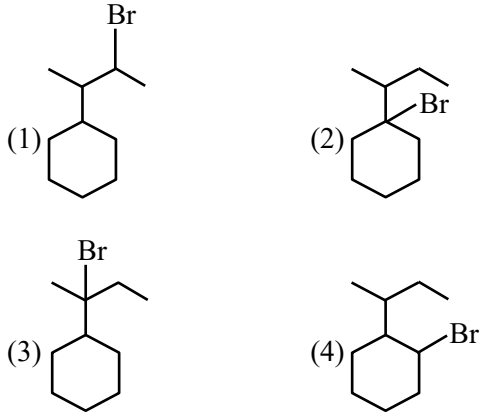
Ans. **(1)**

Sol. $M_{mix} = \frac{M_1V_1 + M_2V_2}{V_1 + V_2}$

$$M = \frac{200 \times 0.2 + 400 \times 0.5}{200 + 400}$$

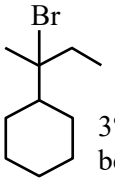
$$= \frac{0.4 + 2}{6} = \frac{2.4}{6} = 0.4 \text{ M}$$

9. Sec-butyl cyclohexane $\xrightarrow{Br_2/h\nu}$ Major product is



Ans. **(3)**

Sol.



3° mono bromo product is major because
Bromination is less reactive and more selective

10. Given below are two statements

S-1 : Lassaigne test is used for detection of Nitrogen, phosphorous, sulphur and Halogens.

S-2 : The element present in compound are converted from covalent to ionic by fusing with sodium metal.

(1) Both S-1 and S-2 are correct.

(2) Both S-1 and S-2 are incorrect.

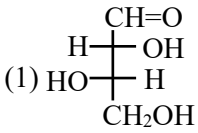
(3) S-1 is correct and S-2 is correct.

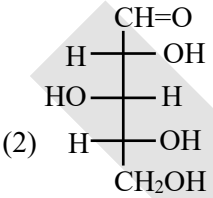
(4) S-1 is incorrect and S-2 is correct.

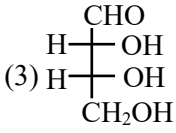
Ans. (3)

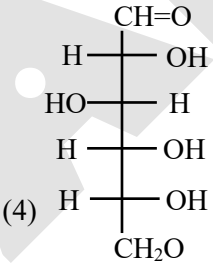
Sol. Lassaigne extract is made with sodium metal.

11. How many of the following structure(s) shows co-relation with D-Glyceraldehyde

(1) 

(2) 

(3) 

(4) 

(1) 1 (2) 2

(3) 3 (4) 4

Ans. (3)

Sol. Compound 2, 3 and 4 are derivatives of D-Glyceraldehyde due to presence of –OH group of last Chiral centre is toward RHS on the other hand in compound 1 is derivatives of L-Glyceraldehyde.

12. How many of the following homoleptic complexes are low spin $[CoF_6]^{3-}$, $[Fe(CN)_5(\overset{+}{N}O)]^{2-}$, $[Co(NH_3)_6]^{3+}$, $[Co(H_2O)_6]^{3+}$

(1) 1 (2) 2

(3) 3 (4) 4

Ans. (2)

Sol. $[Fe(CN)_5(\overset{+}{N}O)]^{2-} \rightarrow$ Heteroleptic

$[CoF_6]^{3-} \rightarrow sp^3d^2$ (High spin)

$[Co(NH_3)_6]^{3+} \rightarrow d^2sp^3$ (Low spin)

$[Co(H_2O)_6]^{3+} \rightarrow d^2sp^3$ (Low spin)

13. Identify the extensive and intensive property?

(1) Mass, volume, conductivity-Intensive property

(2) Mass, temperature, heat, volume-Extensive property

(3) Mass, volume, internal energy-Extensive property

(4) Density, temperature, moles, internal energy-Intensive property

Ans. (3)

Sol. Extensive : Mass, Volume, Moles, Internal energy and Heat

Intensive : Density, Temperature

14. Among Group-15 elements, what is the maximum covalency of an element having strongest E-E bond (E = element)

(1) 4 (2) 3

(3) 5 (4) 2

Ans. (3)

Sol. Among Group-15 elements, Strongest E-E bond is of "P–P"

Maximum covalency of P in neutral species is "5".

15. For a Diatomic gas if $\gamma_1 = C_p/C_v$ for rigid molecules and $\gamma_2 = C_p/C_v$ for another diatomic molecule having vibrational modes then

(1) $\gamma_2 < \gamma_1$ (2) $\gamma_2 > \gamma_1$

(3) $\gamma_2 = \gamma_1$ (4) $\gamma_2 = 2\gamma_1$

Ans. (1)

Sol. $\gamma_1 = C_p/C_v = \frac{7}{5}$

$\gamma_2 = C_p/C_v = \frac{9}{7}$

$\gamma_1 > \gamma_2$

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16. Molar solubility of $Zr_3(PO_4)_4$ is

(1) $\left(\frac{K_{sp}}{108}\right)^{1/5}$ (2) $\left(\frac{K_{sp}}{6912}\right)^{1/7}$

(3) $\left(\frac{K_{sp}}{1692}\right)^{1/7}$ (4) $\left(\frac{K_{sp}}{2916}\right)^{1/7}$

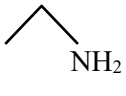
Ans. **(2)**

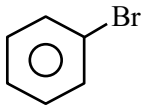
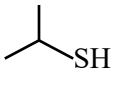
Sol. $Zr_3(PO_4)_4(s) \rightleftharpoons \underset{3S}{3Zr^{4+}} + \underset{4S}{4PO_4^{3-}}$

$K_{sp} = (3s)^3 (4s)^4$

$s = \left(\frac{K_{sp}}{27 \times 256}\right)^{1/7} = \left(\frac{K_{sp}}{6192}\right)^{1/7}$

17. Which one gives prussian blue colour with Lassaigne's test :

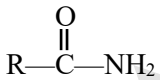
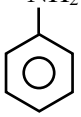
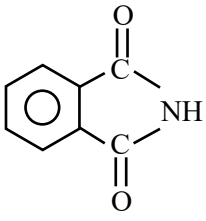
(1) $NH_2—NH_2$ (2) 

(3)  (4) 

Ans. **(2)**

Sol. Prussian blue colour shows the presence of Nitrogen in Organic compound, and hydrazine do not form NaCN with sodium on heating.

18. Which of the following converts into amine after reduction.

(P)		(1)	$LiAlH_4$
(Q)	$R—C \equiv N$	(2)	Sn / HCl
(R)		(3)	H_2 / Pd
(S)		(4)	aq. NaOH, Br_2, Δ

Which of the following is CORRECTLY Matched

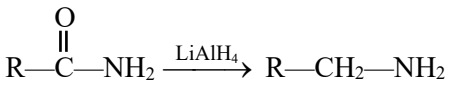
(1) P→1, Q →3, R →2, S →4

(2) P→3, Q →1, R →4, S →2

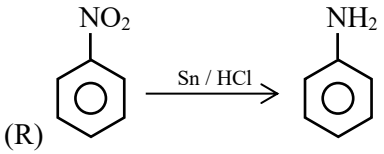
(3) P→1, Q →2, R →3, S →4

(4) P→4, Q →3, R →2, S →1

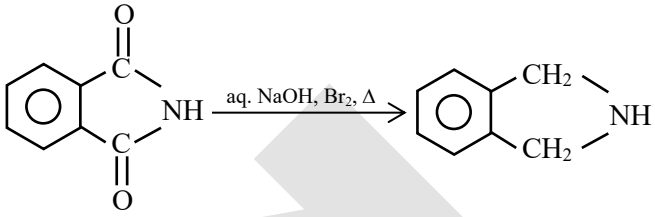
Ans. **(4)**

Sol. **(P)** 

(Q) $R—C \equiv N \xrightarrow{H_2,Pd} R—CH_2—NH_2$

(R) 

(S)



19. S-1 : Extreme left of periodic table element form acidic oxide.

S-2 : Extreme right reactive elemental oxide on hydrolysis gives acid.

(1) Statement-1 is correct and statement-2 is correct

(2) Statement-1 is correct and statement-2 is incorrect

(3) Statement-1 is incorrect and statement-2 is correct

(4) Statement-1 is incorrect and statement-2 is incorrect

Ans. **(3)**

Sol. S-1 : Incorrect

Extreme left of periodic table element form basic oxide.

S-2 : Correct

Extreme right reactive elemental oxides are acidic which on hydrolysis gives acid.

20. Consider the following statements S-1 and S-2 and choose the correct option.

S-1 : During corrosion pure metal acts as anode and impure metal acts as cathode.

S-2 : Rate of corrosion is more in alkaline medium than in acidic medium.

(1) Both S-1 and S-2 are correct.

(2) Both S-1 and S-2 are incorrect.

(3) S-1 is correct and S-2 is incorrect.

(4) S-1 is incorrect and S-2 is correct.

Ans. **(3)**

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Sol. It is true that during corrosion pure metals act as anode and impure metal acts as cathode. However, rate of corrosion depends upon the nature of metals. For most of the metals the rate increases in acidic medium while for some other metals the rate increases in alkaline medium(for those metals which reacts with alkalies).

SECTION-B

21. Calculate the radius of first excited state of He^+ ion (in Å). Mark your answer as nearest integer.

Ans. **(1)**

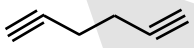
Sol. $r = 0.529\frac{n^2}{Z} = 0.529\frac{(2)^2}{2}$

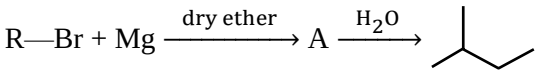
$r = 0.529 \times 2 = 1.058$ Å

$r \cong 1$ (nearest integer)

22. The compound X with molecular formula C_6H_6 gives one bromo derivative in presence of light and requires four moles of hydrogen for hydrogenation. The number π electrons in the compound X is_____?

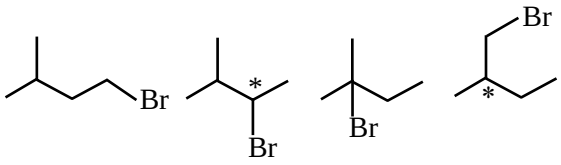
Ans. **(8)**

Sol. $C_6H_6 \Rightarrow$ 

23. 

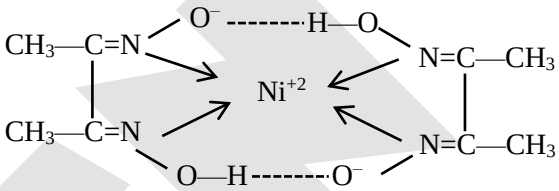
How many R—Br can form isopentane?

Ans. **(6)**

Sol. 

24. Total number of Hydrogen atoms are present in $[Ni(dmg)_2]$

Ans. **(14)**

Sol. 

25. The number of 4d electrons in Nb and Ru are x and y respectively. Calculate x + y ?

Ans. **(11)**

Sol.

	4d electron
Nb →	4
Ru →	7

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