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JEE (MAIN) 2025

MEMORY BASED QUESTIONS & TEXT SOLUTION

SHIFT-2

DATE & DAY: 04th April 2025 & Friday

PAPER-1

Duration: 3 Hrs.
Time: 03:00 PM – 06:00 PM

SUBJECT: CHEMISTRY

REGISTERED & CORPORATE OFFICE (CIN: U80302RJ2007PLC024029):
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PART : CHEMISTRY

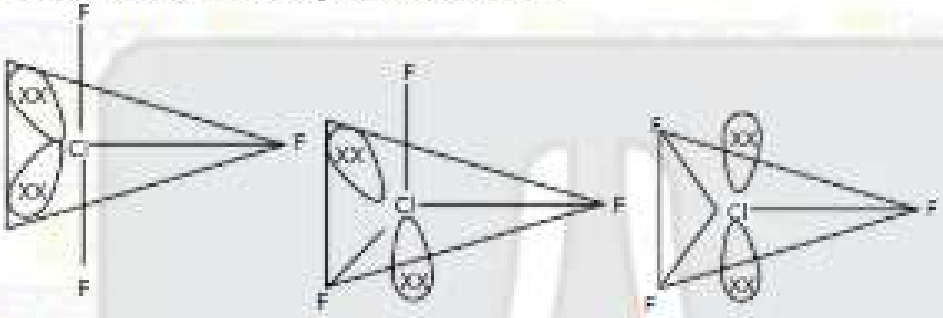
1. Maximum and minimum ionisation energy of group 13 element is for :

(1) B, In (2) B, Tl (3) Al, In (4) Al, Tl

Ans. (1)

Sol. Order of IE B > Tl > Ga > Al > In

2. **Statement I :** ClF_3 has 3 possible structures



(I) **(II)** **(III)**

Statement II : III is most stable structure due to least LP-BP repulsion

Select correct option

(1) Statement I is correct but Statement II is incorrect.

(2) Both Statement I & Statement II are correct.

(3) Statement I is incorrect but Statement II is correct.

(4) Both Statement I & Statement II are incorrect.

Ans. (1)

Sol. I is most stable structure according to bent's rule

3. Total number of electrons in Cr(z = 24) for which the value of azimuthal quantum number (l) is 1 & 2

(1) 18 (2) 15 (3) 17 (4) 20

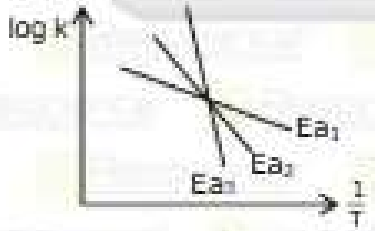
Ans. (3)

Sol.

${}_{24}Cr$	$1s^2$	$2s^2$	$2p^6$	$3s^2$	$3p^6$	$3d^5$	$4s^1$
l =	0	0	1	0	1	2	0

6 + 6 + 5 = 17

4. Consider the following graph between rate constant log (k) and $\frac{1}{T}$



Select correct order :

(1) $Ea_3 > Ea_2 > Ea_1$ (2) $Ea_2 > Ea_1 > Ea_3$ (3) $Ea_1 > Ea_3 > Ea_2$ (4) $Ea_1 > Ea_2 > Ea_3$

Ans. (3)

Sol. $k = Ae^{-E_a/RT}$

$\ln k = \ln A - \left(\frac{E_a}{R}\right)\frac{1}{T}$

$y = c + mx \qquad m = \frac{-E_a}{R}$

$|m| = \frac{E_a}{R}$

5. The amount of CaO produced when 150 kg of limestone (75% pure) is strongly heated:
(1) 625 mol (2) 1125 mol (3) 500 mol (4) 1000 mol

Ans. **(1125)**

Sol. $CaCO_3(s) \xrightarrow[75\%]{\Delta} CaO(S) + CO_2(g)$

$\frac{150\times10^3}{100}\text{Mol} \quad \frac{150\times10^3}{100}\times\frac{75}{100}$

$=1125$ mol

6. Consider the following
(a) $[Ni(CO)_4]$ (b) $[Ni(CN)_4]^{-2}$ (c) $[FeF_6]^{-3}$ (d) $[CoF_6]^{-3}$
The correct order of number of unpaired electrons is
(1) c > d > a = b (2) c > d > a > b (3) d > c > a = b (4) c > a > d = b

Ans. **(1)**

Sol: (a) diamagnetic
(b) diamagnetic
(c) Fe^{+3} (wf) n=5
(d) Co^{+3} (wf) n =4

7. Consider the following zero order reaction
A → Product
Half life of the reaction is 1 hr, if initial concentration of the reactant is 2M.
Find the half life of the reaction in min, if the initial conc. of the reaction is 0.5 M

Ans. **(15)**

Sol. $t_{1/2} \propto (a)^{1-n}$

$\frac{(t_{1/2})_1}{(t_{1/2})_2} = \left(\frac{a_1}{a_2}\right)^{1-n} \quad \frac{1}{(t_{1/2})_2} = \frac{2}{0.5}$

$(t_{1/2})_2 = \frac{1}{4}\text{hr} = 15\text{min}$

8. If x mg of $Mg(OH)_2$ is added in 1L of solution to make a solution with pH =12, then find the value of x.
Given molar mass of $Mg(OH)_2 = \frac{58g}{mol}$ & assume $Mg(OH)_2$ dissociates completely in water.

Ans. **(290)**

Sol. $\underset{\frac{10^{-2}}{2}M}{Mg(OH)_2 aq} \longrightarrow \underset{}{Mg^{+2}_{(aq)}} + \underset{10^{-2}M}{2OH^-_{aq}}$

Moles of $Mg(OH)_2 = \frac{10^{-2}}{2}\text{mol} = 29\times10^{-2}\text{ g} = 290\text{mg}$

9. Match the column
(For an ideal gas)

Column-I	**Column-II**
(a) Adiabatic process	(i) $W = 0$
(b) Isochoric process	(ii) $\Delta E = W$
(c) Isothermal process	(iii) $\Delta P = 0$
(d) Isoboric process	(iv) $\Delta E = 0$

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

Ans. **(1)**

Sol. Theory based

10. The incorrect relationship in the following pair in relation to ionization enthalpy is :
(1) $Mn^{+} < Mn^{2+}$ (2) $Mn^{+} < Fe^{+2}$ (3) $Fe^{+2} < Fe^{+3}$ (4) $Mn^{+} < Cr^{+}$

Ans. **(2)**

Sol. $_{25}Mn^{+2}$: [Ar] $3d^5$
$_{26}Fe^{+2}$: [Ar] $3d^6$

11. Formula $Co(NH_3)_4Cl_2$ (1 mol) on reaction with excess $AgNO_3$ results in x mol of AgCl. Also x is number of LP on central atom of BrF_5 then determine total number of geometric isomers possible for given formula

Ans. **(2)**

Sol. $\overset{\infty}{B}rF_5$ i.e. x = 1
$[CoCl_2(NH_3)_4]Cl$, it's Cis and trans geometric isomers are possible.

12. At what pH does $[H^+] + [OH^-]$ attain minimum value at 25°C for an aqueous solution

Ans. **(7)**

Sol. pH = 7
$[H^+] + [OH^-]$
$= 10^{-7} + 10^{-7} = 2 \times 10^{-7}$ M

13. **Statement I:** Ionisation energy of Group 14 element is greater than corresponding Group 13 element.
Statement II : MP of Group 13 element is greater than corresponding Group 14 element.
Select correct option:
(1) Statement I is correct but Statement II is incorrect.
(2) Both Statement I & Statement II are correct.
(3) Statement I is incorrect but Statement II is correct.
(4) Both Statement I & Statement II are incorrect.

Ans. **(1)**

Sol. Theory based

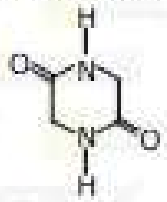
14. **Statement I:** $k_f = \dfrac{RT_f^2}{1000 \times \Delta S_{fusion}}$ is formula for molal depression constant.

Statement II: k_f of water is greater than C_6H_6.
(1) Statement I is correct but Statement II is incorrect.
(2) Both Statement I & Statement II are correct.
(3) Statement I is incorrect but Statement II is correct.
(4) Both Statement I & Statement II are incorrect.

Ans. **(4)**

Sol. $k_f = \dfrac{RT_f^2}{1000 \times \ldots_f}$

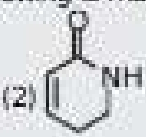
15. A dipeptide 'z' on complete hydrolysis gives 'y' and 'z'. y on treatment with aq. HNO_2 produces lactic acid on the other hand 'z' on heating gives the following the given dipeptide is:



(1) Alanine – Glycine (2) Valine – Glycine (3) Valine – Leucine (4) Alamine – Alamine

Ans. **(1)**

16. Arrange which of the following is maximum basic.

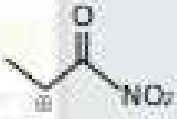
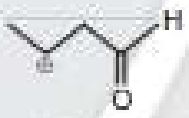
(1)  (2)  (3)  (4) 

Ans. **(3)**

17. In which of the following first cation is more stable than second.

(a)  and 

(b)  and 

(c)  and 

(d)  and 

(1) (a) & (d) (2) (a), (b) & (c) (3) (c) & (d) (4) (b), (c) & (d)

Ans. **(1)**

18. Which of the following gives yellow precipitate with I_2/NaOH.

(a)  (b)  (c)  (d) 

(1) a & b (2) b & c (3) a & c (4) b & d

Ans. **(1)**

19. The correct IUPAC name of the following compounds is

(1) 4-Hydroxyhept-6-en-1-yne (2) Hept-6-en-1-yne-4-ol
(3) 4-Hydroxyhept-1-en-6-yne (4) Hept-1-en-6-yne-4-ol

Ans. **(4)**

20. Given below are two statements:
Statement-I: Aqueous KOH gives elimination reaction as major product always.
Statement-II: Alcoholic KOH eliminates H^+ from β-carbon atom.
In the light of the above statements, choose the correct answer from the options given below:
(1) Statement-I is correct and statement-II is incorrect
(2) Statement-I is incorrect and statement-II is correct.
(3) Both statement-I and statement-II are correct
(4) Both statement-I and statement-II are incorrect

Ans. **(2)**