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JEE (MAIN) 2024

MEMORY BASED QUESTIONS & SOLUTIONS

SHIFT-2

DATE & DAY: 27th January 2024 & Saturday

PAPER-1

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

SUBJECT: CHEMISTRY

ADMISSIONS OPEN FOR CLASS 12+
ACADEMIC SESSION 2024-25

TARGET: JEE (ADV.) 2024
For Class XII Passed Student
VISHESH COURSE
MODE: OFFLINE/ONLINE
CLASS STARTS 08TH APRIL, 2024

TARGET: JEE (MAIN) 2024
For Class XII Passed Student
ABHYAAS COURSE
MODE: OFFLINE/ONLINE
CLASS STARTS 08TH APRIL, 2024

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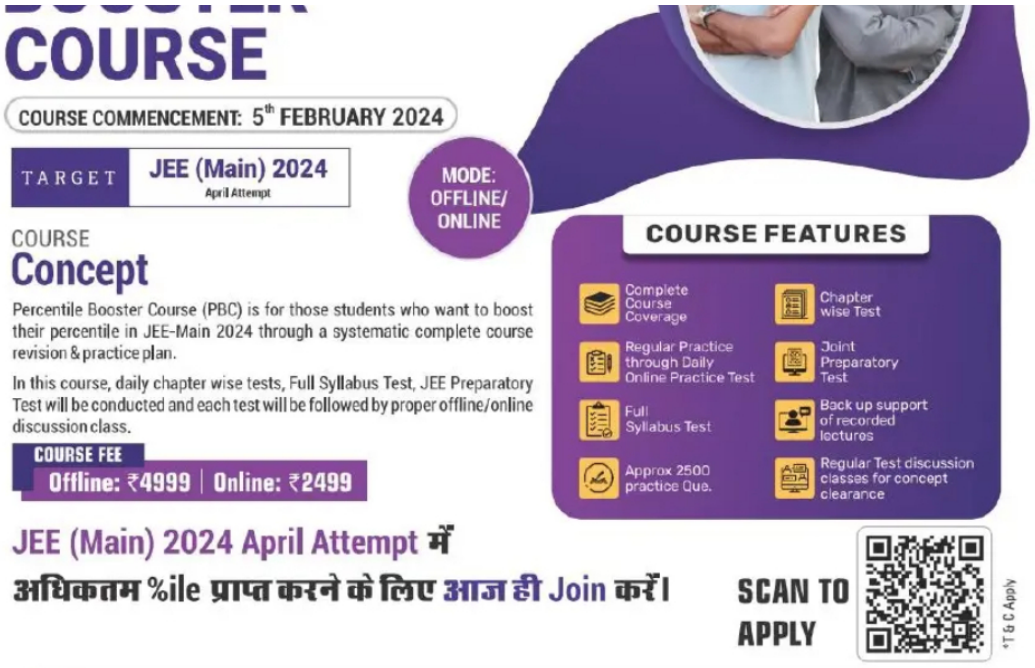


PART : CHEMISTRY

1. Among the following which is temperature dependent ?
(1) Molarity (2) Molality
(3) Mole fraction (4) Percentage weight by weight

Ans. **(1)**

Sol. Molarity is a mass-volume unit therefore temperature dependent where as other are mass-mass units therefore temperature independent.

2. Volume of solution of 3M NaOH, in which 84 gram NaOH is present, is _____ x 10^{-1} dm^3

Ans. **(7)**

Sol. $\text{Molarity} = \frac{\text{mole of solute}}{\text{volume(inLit.) of solution}}$

$\text{Molarity of [NaOH]} = \frac{84/40}{V_L} = 3$

$V_L = \frac{84}{40 \times 3} = 0.7$ Liter or $dm^3 = 7 \times 10^{-1}$

3. Which of the following cannot act as oxidising agent ?
(1) MnO_4^- (2) SO_4^{2-} (3) N^{3-} (4) BrO_3^-

Ans. **(3)**

Sol. Range of oxidation number of N is +5 to –3 therefore it's oxidation number cannot decrease from –3. oxidation number of oxidant decreases.

4. $PbS + O_3 \longrightarrow O_2$
(x mol) (y mol)
with 1 mol of PbS, determine in the given reaction (x + y) mol value.

Ans. **(8)**

Sol. $PbS + 4O_3 \longrightarrow PbSO_4 + 4O_2$
1 mol 4 mol 4 mol
4 + 4 = 8 mol

5. **Statement 1 :** The first member of 16th group, oxygen can exhibit –2 oxidation state only.
Statement 2 : The stability of +4 oxidation state decreases down the group and +6 oxidation state increases down the group.
(1) Both **Statement-1** & **Statement-2** are correct.
(2) Both **Statement-1** & **Statement-2** are incorrect.
(3) **Statement-1** is correct whereas **Statement-2** is incorrect.
(4) **Statement-1** is incorrect whereas **Statement-2** is correct.

Ans. **(2)**

Sol. Oxygen, can show other oxidation state also in it's compound like –1, +1, +2
Due to inert pair effect stability of +4 oxidation state increases in oxygen family.

6. If R is Rhydberg constant and longest wavelength of Paschen series is $\frac{\alpha}{7R}$ then α is _____?

Ans. **(144)**

Sol. Ist line of Paschen series is : $n_2 = 4 \rightarrow n_1 = 3$

$$\frac{1}{\lambda} = R.Z^2\left(\frac{1}{n_1^2} - \frac{1}{n_2^2}\right)$$

$$= \frac{1}{\lambda} = R.(1)^2\left(\frac{1}{3^2} - \frac{1}{4^2}\right)$$

$$= \frac{7R}{144}; \qquad \lambda = \frac{144}{7R} \qquad \therefore \alpha = 144$$

7. Time taken for completion of 99.9% of reaction in first order reaction is_____ times of time taken in 50% completion of reaction.

Ans **(10)**

Sol. For Ist order reaction :

$$t_{99.9} = \frac{2.303}{K}\log\frac{100}{100-99.9} \quad \text{_____ (1)}$$

$$t_{50\%} = \frac{2.303}{K}\log\frac{100}{100-50} \quad \text{_____ (2)}$$

Then from (1)/(2)

$$\frac{t_{99.9}}{t_{50}} = \frac{3}{0.301} = 10$$

$t_{99.9} = 10\ t_{50\%} = 10t_{½}$

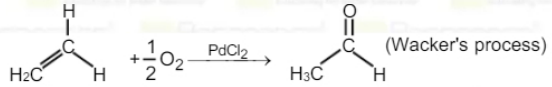
8. Which of the following is incorrectly matched.

Column-I	**Column-II**
Process	**Catalyst/Reagents used**
(1) Wacker's process	$PtCl_2$
(2) Polythene formation	$Al(C_2H_5)_3/TiCl_4$

(3) Haber's process Fe

(4) Photography AgBr

Ans. **(1)**

Sol. 

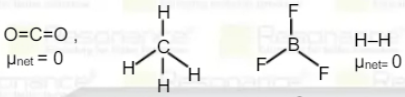
(Wacker's process)

9. Total number of non-polar molecule in

H_2O, CO_2, SO_2, CH_4, NH_3, BF_3, $CHCl_3$ HCl and H_2

Ans. **(4)**

Sol. Total number of non-polar molecule = 4



$\mu_{net} = 0$ $\mu_{net} = 0$

10. For hydrogen electrode at pH = 3, the reduction potential is – ___ × 10^{-2} V (Nearest integer)

Ans. **(18)**

Sol. $2H^+ + 2e^- \rightarrow H_2(g)$

$$E_{RP} = E^{\circ}_{RP} - \frac{0.0591}{2}\log\frac{1}{[H^+]^2}$$

$$= -\frac{0.0591}{2}\log\frac{1}{(10^{-3})^2}$$

$$= -\frac{0.0591}{2} \times 6$$

$$= -0.0591 \times 3 = -0.1773 \approx -18 \times 10^{-2} \text{ V}$$

11. Which of the following species has d^2sp^3 hybridisation ?

(1) SF_6 (2) BrF_5 (3) $[PtCl_4]^{-2}$ (4) $[Co(NH_3)_6]^{+3}$

Ans. **(4)**

Sol. (1) $SF_6 \longrightarrow sp^3d^2$

(2) $BrF_5 \longrightarrow sp^3d^2$

(3) $[PtCl_4^-]^{-2} \longrightarrow dsp^2$

(4) $[Co(NH_3)_6]^{+3} \longrightarrow d^2sp^3$

12. The value of magnetic moment of $[Pt(NH_3)_2(CH_3NH_2)Cl]Cl$ is _____ BM.

Ans. **(0)**

Sol. $Pt^{+2} = [_{54}Xe]\ 4f^{14}\ 5d^8\ 6s^0$

$[Pt(NH_3)_2(CH_3NH_2)Cl]Cl$ is a square planar complex.

In $4d^8$ and $5d^8$ due to high z_{eff} value of the central metal ion pairing occurs irrespective of nature of ligand.

So there is no unpaired electrons. Hence magnetic moment is zero.

13. Which of the following set of species have d^{10} configuration ?

(1) Cu^{+1}, Zn^{+2}, Pd, Ag^+ (2) Cu, Cr, Cs, Fe

(3) Mn, Zn^{+2}, Pd, Ag^+ (4) Fe, Ba, Cu^{+2}, Zn^{+2}

Ans. **(1)**

Sol. $_{29}Cu^{+} = [Ar]3d^{10}$

$_{30}Zn^{+2} = [Ar]3d^{10}$

$_{46}Pd = [Kr]4d^{10}$

$_{47}Ag^{+} = [Kr]4d^{10}$

14. **Statement-1** : Ce^{+4} has inert gas configuration

Statement-2 : Ce^{+4} convert to Ce^{+3} because it is strong oxidising agent.

(1) Both **Statement-1** & **Statement-2** are correct.

(2) Both **Statement-1** & **Statement-2** are incorrect.

(3) **Statement-1** is correct whereas **Statement-2** is incorrect.

(4) **Statement-1** is incorrect whereas **Statement-2** is correct.

Ans. **(1)**

Sol. $_{58}Ce = [Xe]\ 4f^{1}, 5d^{1}, 6s^{2}$

$Ce^{+4}/Ce^{+3}(E°_{RP}) = 1.74V$

15. Identify the incorrect statement regarding rusting of iron ?

(1) Rusting of iron can be prevented by coating of tin even if the layer of tin is pealed off.

(2) Rusting of iron can be considered as electrochemical cell on the surface of iron.

(3) At pH = 8 or 9 rusting can take place.

(4) Acidic oxides like SO_2 and NO_2 catalyse rusting of iron.

Ans. **(1)**

Sol. Theory based

16. How many of the following have noble gas configuration ?

$Sr^{+2}, Cs^{+}, La^{+2}, Pb^{+2}, Yb^{+2}, Fe^{+2}$

Ans. **(2)**

Sol. Sr^{+2}, Cs^{+}

$_{38}Sr^{+2} = [Kr]$

$_{55}Cs^{+} = [Xe]$

$_{82}Pb^{+2} = [Xe]\ 4f^{14}, 5d^{10}, 6s^{2}$

$_{57}La^{+2} = [Xe]\ 5d^{1}$

$_{70}Yb^{+2} = [Xe]\ 4f^{14}$

$_{26}Fe^{+2} = [Ar]\ 3d^{6}$

17. For an equilibrium reaction

$\Delta H° = 77.2$ kJ ; $\Delta S° = 122.5$ J/K-mol

T = 300 K. then $\log K_{eq} = -$_____ (Nearest integer)

Ans. **(7)**

Sol. For equilibrium reaction $\Delta G = 0$

$\Delta G° = -2.303\ RT \log K_{eq}$

$\Delta H° - T\Delta S° = -2.303\ RT \log K_{eq}$

$$\log K_{eq} = \frac{\Delta H - T\Delta S°}{-2.303RT} = \frac{\frac{77.2 - 300 \times 122 \times 10^{-3}}{-2.303 \times 8.314 \times 300}}{1000} = -\frac{40.6}{5.76} = -7.07$$

18. Which structure of a protein remain intact even after coagulation of egg white.

(1) Primary structure (2) Secondary structure

(3) Tertiary structure (4) Quaternary structure

Ans. **(1)**

Sol. Primary structure means sequence of amino acid and remain unchanged even after coagulation.

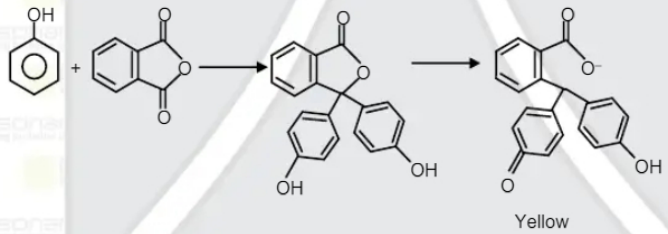
19. Phenolic group can be identified by

(1) Lucas reagent (2) Carbylamine test

(3) Tollen's reagent test (4) Phthalein test

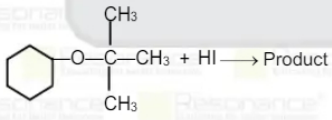
Ans. **(4)**

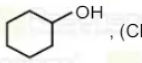
Sol.



Yellow

20. The product of given reaction is

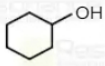


(1)  , $(CH_3)_3C–I$ (2)  , $(CH_3)_3C–I$

(3)  , $(CH_3)_3COH$ (4)  , $(CH_3)_3CH$

Ans. **(1)**

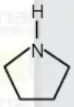
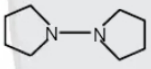
Sol. The reaction proceed with S_N1, through-t-butyl carbocation intermediate. Hence the best answer is

 , $(CH_3)_3C–I$.

21. $Cl–(CH_2)_4Cl \xrightarrow[NaOH]{Excess–NH_3} A + H_2O + NaCl$

Product A is

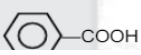
(1) $\overset{\oplus}{N}H_3–(CH_3)_4–\overset{\oplus}{N}H_3 \quad Cl^-$ (2) $NH_2–(CH_2)_4–NH_2$

(3)  (4) 

Ans. **(3)**

Sol. $Cl–(CH_2)_4–Cl \xrightarrow{NH_3} Cl–(CH_2)_4–\overset{\oplus}{N}H_4\ Cl^- \xrightarrow[-NH_4Cl]{NH_3}$ 

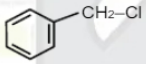
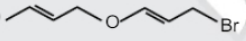
22. The second homologous member of monocarboxylic acid is

(1) HCOOH (2) CH_3COOH (3) $CH_3–CH_2–COOH$ (4) 

Ans. **(2)**

23. Which of the following does not give S_N1 reaction

(1) $CH_3–CH=CH–CH_2–Cl$ (2) $CH_3–CH=CH–Cl$

(3)  (4) 

Ans. **(2)**

Sol. In case of vinylic halide carbocation is not formed, hence it will not proceed via S_N1 reaction.

24. If a substance is steam volatile and immiscible in water then which separation technique can be applied.

(1) Distillation (2) Steam distillation

(3) Fractional distillation (4) Distillation under reduced pressure.

Ans. **(2)**

25. The correct match is :

	Reaction		Reagent
(A)	Ph–OH → Salicyldehyde	(P)	$CHCl_3$, aq. NaOH
(B)	Ph–OH → Salicylic acid	(Q)	NaOH, CO_2, H^+
(C)	Ph–OH → Benzoquinone	(R)	$Na_2Cr_2O_7/H_2SO_4$
(D)	Ph–OH → Anisole	(S)	NaOH, CH_3Br

(1) A – P, B – Q, C – R, D – S (2) A – Q, B – R, C – S, D – P

(3) A – R, B – S, C – P, D – Q (4) A – S, B – P, C – Q, D – R

Ans. **(1)**

26. $Ph–CH=CH_2 \xrightarrow[2.\ H_2O_2/OH^-\ 3.\ HBr\ 4.\ Mg/Et_2O/HCHO/H_2O]{1.\ BH_3/THF}$ Product is :

(1) $Ph–CH_2–CH_2–CH_2–OH$ (2) $Ph–CH_2–CH_2–OH$

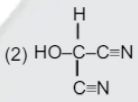
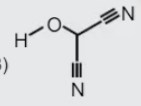
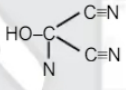
(3) $Ph–\underset{\displaystyle CH_2OH}{\underset{|}{CH}}–CH_3$ (4) $Ph–CH=CH–CH_2–OH$

Ans. **(1)**

Sol. $Ph–CH=CH_2 \xrightarrow[2.\ H_2O_2/OH^-]{1.\ BH_3/THF} Ph–CH_2–CH_2–OH \xrightarrow{HBr} Ph–CH_2–CH_2–Br \xrightarrow[HCHO/H_2O]{Mg/Et_2O}$

$Ph–CH_2–CH_2–CH_2–OH$

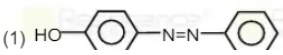
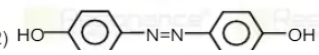
27. Correct bond line notation is :

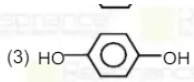
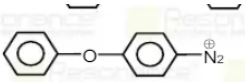
(1) $HO–CH(CN)_2$ (2)  (3)  (4) 

Ans. **(3)**

28. Product of the reaction is

$Ph–OH + Ph–\overset{\oplus}{N_2} \xrightarrow{PH = 8–10}$

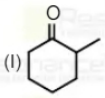
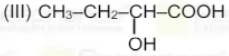
(1)  (2) 

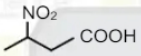
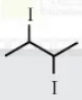
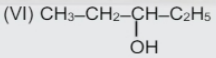
(3)  (4) 

Ans. **(1)**

Sol. In basic medium phenol form para hydroxy-azobenzene with benzene diazonium chloride.

29. How many of the following contain chiral center ?

(I)  (II)  (III) 

(IV)  (V)  (VI) 

Ans. (4)

Sol. (I), (III), (IV) and (V) contains chiral centre.

30. For conformation of C_2H_6, which is not correct information.

(1) Infinite conformers (2) Interconvertible

(3) Dihedral angle in staggered 60° (4) Eclipsed is more stable

Ans. (4)

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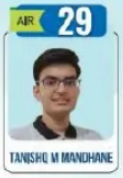

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