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JEE

(Main)

PAPER-1 (B.E./B. TECH.)

2022

COMPUTER BASED TEST (CBT)

Memory Based Questions & Solutions

Date: 25 July, 2022 (SHIFT-2) | TIME : (3.00 p.m. to 6.00 p.m)

Duration: 3 Hours | Max. Marks: 300

SUBJECT: CHEMISTRY

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PART : CHEMISTRY

1. 56 litre of N_2 react with excess of H_2 gives 20 litre of NH_3 then find amount of N_2 unreacted.

Ans. (46)

Sol. $N_2(g) + 3H_2(g) \rightarrow 2NH_3(g)$

$t = 0$ 56 litre excess — 20 litre

56 — 10 20 litre

= 46 litre

volume of $N_2(g)$ remain unreacted = 46 litre

Ans. = 46 litre

2. 1 gram of solute x and y each are added in 1 kg solvent separately, ratio of depression in freezing point is 1:4, find ratio of molecular mass of x and y respectively.

(1) 1 : 2

(2) 1 : 4

(3) 4 : 1

(4) 1 : 3

Ans. (3)

Sol. $\Delta T_f = iK_f m$

$$(\Delta T_f)_x = iK_f m_x$$

$$(\Delta T_f)_y = iK_f m_y$$

$$\frac{(\Delta T_f)_x}{(\Delta T_f)_y} = \frac{m_x}{m_y}$$

$$\frac{1}{4} = \frac{1}{M_x} \times \frac{M_y}{1}$$

$$\frac{M_x}{M_y} = \frac{4}{1}$$

3. For an acid base titration, methyl orange is used as indicator, then which form of the methyl orange is exist at end point

(1) Quinonoid

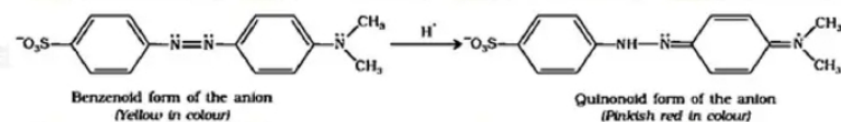
(2) Heterocyclic

(3) Phenolic

(4) Benzonoid

Ans. (1)

Sol. For an acid base titration, methyl orange exist at end point as Quinonoid form



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4. In the following complexes (a) : $[Co(NH_3)_6]^{3+}$, (b) : $[Co(en)_3]^{3+}$, (c) : $[Co(H_2O)_6]^{3+}$

Identify the correct order of absorption of energy.

(1) $c < a < b$

(2) $a < b < c$

(3) $c < b < a$

(4) $a < c < b$

Ans. (1)

Sol. All are Co^{3+} complex so stronger the ligand, greater is splitting of d orbital and greater is amount of energy absorbed.

Order of strength of ligands: $en > NH_3 > H_2O$

$$E = \frac{hc}{\lambda}$$

5. **Statement – I** : Pig iron is formed by cast iron and iron scrap.

Statement – II : Pig iron contain less carbon, than cast iron.

(1) Both statement - I & II are true

(2) Statement - I is true while statement - II is false

(3) Statement - I is false while statement - II is true

(4) Both statement - I & Statement - II are false.

Ans. (4)

Sol. Cast iron are formed by pig iron & scarp iron

Pig iron \Rightarrow Carbon 4%

Cast Iron \Rightarrow Carbon 3%

6. Find magnetic movement (spin only) of M^{3+} ion which have negative electrode potential for $M^{3+}|M^{2+}$.
 $Cr^{3+}|Cr^{2+}$, $Mn^{3+}|Mn^{2+}$, $Co^{3+}|Co^{2+}$, $Fe^{3+}|Fe^{2+}$
 report you answer to nearest integer.

Ans. (4)

Sol.

$M^{3+} M^{2+}$	$Cr^{3+} Cr^{2+}$	$Mn^{3+} Mn^{2+}$	$Fe^{3+} Fe^{2+}$	$Co^{3+} Co^{2+}$
$E^{\circ}_{M^{3+} M^{2+}}$	-0.41V	1.57 V	0.77 V	1.97 V

So, negative value of electrode potential for $M^{3+}|M^{2+}$ is for $Cr^{3+}|Cr^{2+}$

So, $Cr^{3+} = [Ar]_{18}, 3d^3$

$$\mu = \sqrt{n(n+2)} = \sqrt{3(3+2)} = \sqrt{15} BM$$

$$= 3.97 \approx 4$$

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7. List – I

(Compound)

- (i) XeF_2
 (ii) XeF_6
 (iii) $XeOF_4$
 (iv) XeO_3

List – II

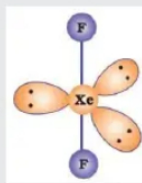
Hybridisation & Structure

- (a) sp^3d^3 , distorted octahedral.
 (b) sp^3d , Linear
 (c) sp^3 , pyramidal
 (d) sp^3d^2 , square pyramidal

	I	II	III	IV
(1)	b	a	d	c
(2)	a	b	c	d
(3)	b	a	c	d
(4)	a	b	d	c

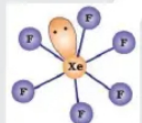
Ans. (1)

Sol. (i) $XeF_2 \Rightarrow$



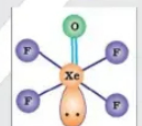
sp^3d , Linear

(ii) $XeF_6 \Rightarrow$



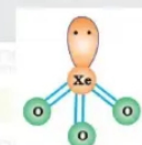
sp^3d^3 , distorted octahedral

(iii) $XeOF_4 \Rightarrow$



sp^3d^2 , square pyramidal

(iv) $XeO_3 \Rightarrow$



sp^3 , pyramidal

8. Identify correct order of density of alkaline earth metal is -
 (1) $\text{Ca} < \text{Mg} < \text{Be} < \text{Sr}$ (2) $\text{Be} < \text{Mg} < \text{Ca} < \text{Sr}$
 (3) $\text{Sr} < \text{Ca} < \text{Mg} < \text{Be}$ (4) $\text{Be} < \text{Ca} < \text{Mg} < \text{Sr}$

Ans. (1)

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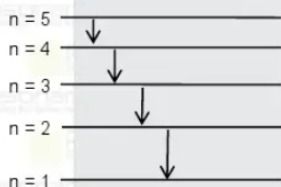
Sol.

Element	Be	Mg	Ca	Sr
Density gram/cm ³	1.84	1.74	1.55	2.63

9. If an excited electron in H atom jumps from $n = 5$ to ground state, then maximum number of spectral line observed are.

Ans. (4)

Sol. In single H atom if electron jumps from $n = 5$ to ground state



So, maximum no. of spectral line = 4

10. Solution - I : 10 mole, 20 ml

Solution - II 20 mole, 80 ml

Conductivity of both solution are same if both solution are present in such type of cell which have same cell constant, then relation between λ_{m1} and λ_{m2} is

- (1) $\lambda_{m2} = 2 \lambda_{m1}$ (2) $\lambda_{m2} = \frac{1}{2} \lambda_{m1}$ (3) $\lambda_{m2} = \lambda_{m1}$ (4) $\lambda_{m2} = 4 \lambda_{m1}$

Ans. (1)

Sol. $\lambda_m = \frac{K \times 1000}{M}$

$$\frac{\lambda_{m1}}{\lambda_{m2}} = \frac{M_2}{M_1}$$

$$\frac{\lambda_{m1}}{\lambda_{m2}} = \left(\frac{20 \times 1000}{80} \cdot \frac{20}{10 \times 1000} \right) = \frac{1}{2}$$

$$\lambda_{m2} = 2 \lambda_{m1}$$

11. The sum of number of lone pair present on central atom in following specie are
 XeF_6 , XeOF_4 , XeO_3

Ans. (3)

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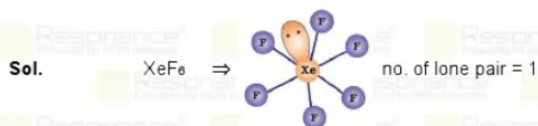
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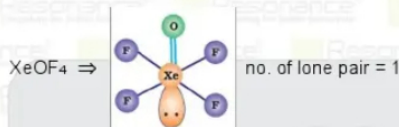
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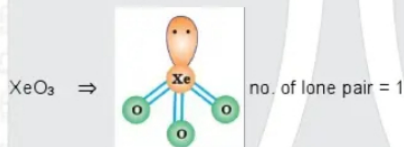
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sp^3d^3 , distorted octahedral



sp^3d^2 , square pyramidal



sp^3 , pyramidal

12. Find total number of acidic oxides in the following species

NO , N_2O , CO , B_2O_3 , P_4O_{10} , SO_3 , CO_2

(1) 3

(2) 4

(3) 5

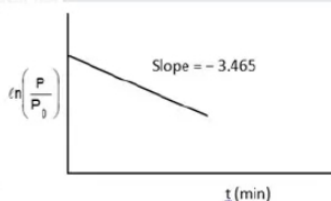
(4) 6

Ans. (2)

Sol. acidic oxide $\Rightarrow \text{B}_2\text{O}_3$, P_4O_{10} , SO_3 , CO_2

Neutral oxide $\Rightarrow \text{NO}$, N_2O , CO

13. For a 1st order reaction graph between $\ln\left(\frac{P}{P_0}\right)$ with t as follows.



Then $t_{1/2}$ of reaction (in sec) is -

Ans. (12)

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Sol. $k = \frac{1}{t} \ln\left(\frac{P_0}{P}\right)$

$-K_t = \ln\left(\frac{P}{P_0}\right)$

$\ln\left(\frac{P}{P_0}\right) = (-k)t$

$$\text{slope} = -k = -3.465$$

$$k = 3.465 \text{ min}^{-1}$$

$$t_{\frac{1}{2}} = \frac{0.693}{k} = \frac{0.693}{3.465} = \frac{1}{5} \text{ min} = 12 \text{ sec.}$$

14. Which of the following are correct for micelle formation.

- (a) Enthalpy of system decreases (b) Enthalpy of system increases
(c) Entropy of system increases (d) Entropy of system decreases

Correct set of statement are

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

Ans. (3)

Sol. Micelle formation is spontaneous therefore $\Delta S > 0$.

Micelle formation decrease stability of colloidal solution so enthalpy should be positive $\Delta H > 0$

15. Correct order of 1st ionisation energy of Be, B, N, O

- (1) B < Be < O < N (2) Be < B < N < O (3) Be < B < O < N (4) B < Be < N < O

Ans. (1)

Sol. Be = 1s², 2s²

B = 1s², 2s², 2p¹

N = 1s², 2s², 2p³

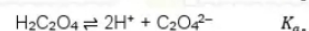
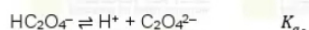
O = 1s², 2s², 2p⁴

As IE of N > O [due to Half-filled configuration]

IE of Be > B [due to penetration effect]

So, correct order $\Rightarrow B < Be < O < N$.

16. H₂C₂O₄ is ionised as



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Relation between K_{a_1} , K_{a_2} and K_{a_3} is

- (1) $K_{a_3} = K_{a_1} \times K_{a_2}$ (2) $K_{a_3} = K_{a_1} + K_{a_2}$ (3) $K_{a_3} = \frac{K_{a_1}}{K_{a_2}}$ (4) $K_{a_3} = K_{a_1} - K_{a_2}$

Ans. (1)

Sol. $K_{a_3} = K_{a_1} \times K_{a_2}$

17. High purity H₂ can be obtained

- (1) By electrolysis of warm aqueous barium hydroxide solution using Ni electrodes
(2) Electrolysis of acidified water using Pt electrode
(3) by reaction of steam with coke at high temperature
(4) as by product in the manufacture of NaOH and Cl₂ by electrolysis of brine solution

Ans. (1)

Sol. High purity (>99.95%) dihydrogen is obtained by electrolysis of warm aqueous barium hydroxide solution between nickel electrodes.

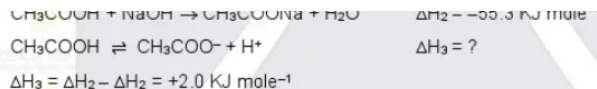
18. The enthalpy of neutralisation of HCl with NaOH is 57.3 KJ mole⁻¹ and that of CH₃COOH with NaOH is 55.3 KJ mole⁻¹ calculate the enthalpy of ionisation of CH₃COOH (in KJ mole⁻¹)

Ans. (2)

Sol. $\text{HCl} + \text{NaOH} \rightarrow \text{NaCl} + \text{H}_2\text{O}$

$$\Delta H_1 = -57.3 \text{ KJ mole}^{-1}$$



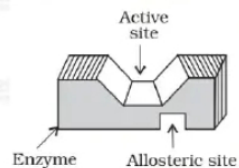


19. Some drugs do not bind to the enzyme's active site. These bind to a different site of enzyme which is called.

(1) Therapeutic Site (2) Non Active Site (3) Allosteric Site (4) Binding Site

Ans. (3)

Sol. Some drugs do not bind to the enzyme's active site. These bind to a different site of enzyme which is called **allosteric site**.



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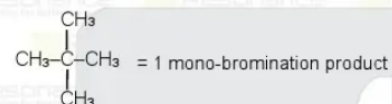
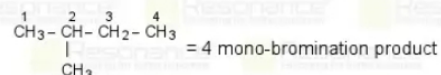
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20. The total number of products formed on mono-bromination of C_5H_{12} is (excluding stereoisomers)

Ans. (8)

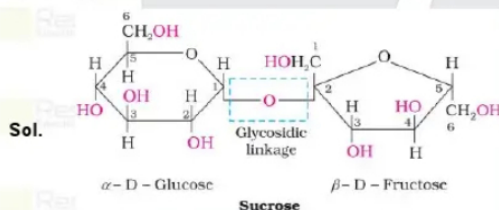
Sol. $\text{CH}_3-\text{CH}_2-\text{CH}_2-\text{CH}_2-\text{CH}_3 = 3$ mono-bromination product



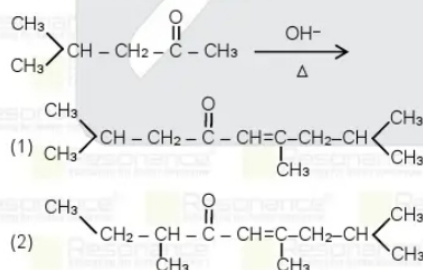
21. Glycosidic linkage between C_1 of glucose and C_2 of fructose is found in

(1) Amylose (2) Sucrose (3) Maltose (4) Lactose

Ans. (2)



22. Product of the given reaction is



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25. Match the following

- | | |
|--------------------|--------------------|
| a. Sodium arsenite | p. Bending bones |
| b. Nicotine | q. Pesticides |
| c. Fluoride | r. Herbicides |
| d. Sulphate | s. Laxative effect |

(1) (a) - (r), (b) - (q), (c) - (p), (d) - (s)

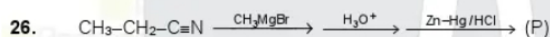
(2) (a) - (q), (b) - (r), (c) - (p), (d) - (s)

(3) (a) - (r), (b) - (q), (c) - (s), (d) - (p)

(4) (a) - (r), (b) - (p), (c) - (q), (d) - (s)

Ans. (1)

Sol. fact



Major Product (P) is :

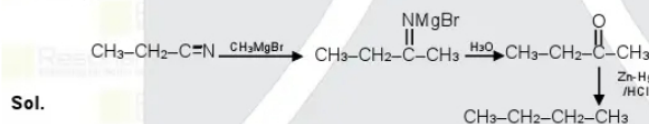
(1) $\text{CH}_3\text{--CH}_2\text{--CH}_2\text{--CH}_2\text{--OH}$

(2) $\text{CH}_3\text{--CH}_2\text{--C}(=\text{O})\text{--CH}_3$

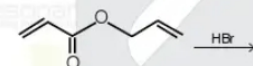
(3) $\text{CH}_3\text{--CH}_2\text{--CH}(\text{OH})\text{--CH}_3$

(4) $\text{CH}_2\text{--CH}_2\text{--CH}_2\text{--CH}_3$

Ans. (4)



27.



Major Product of the reaction is :

(1) $\text{CH}_3\text{--CH}(\text{Br})\text{--CH}_2\text{--CH}_2\text{CH}_2\text{CH}_3$

(2) $\text{CH}_3\text{--CH}(\text{OCH}_2\text{CH}_2\text{CH}_2\text{CH}_3)\text{--CH}_2\text{--CH}_2\text{Br}$

(3) $\text{CH}_3\text{--CH}(\text{Br})\text{--CH}_2\text{--CH}_2\text{CH}_2\text{CH}_3$

(4) $\text{CH}_3\text{--CH}(\text{OCH}_2\text{CH}_2\text{CH}_2\text{CH}_3)\text{--CH}_2\text{--CH}_2\text{Br}$

Ans. (1)

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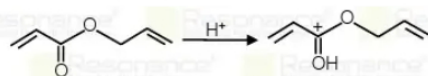
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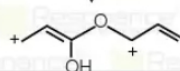
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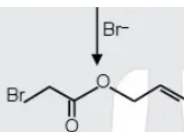
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Sol.





28. If the distance travelled by solvent is 3.25 and distance travelled by A and B respectively is 2.08 and 1.05. Then ratio of R_f factor of A and B is

Ans. (2)

Sol. $R_f = \frac{\text{distance travel by the solute}}{\text{distance travel by the solvent}}$

$$R_{fA} = \frac{2.08}{3.25} = 0.64$$

$$R_{fB} = \frac{1.05}{3.25} = 0.32$$

$$\text{Ratio} = \frac{R_{fA}}{R_{fB}} = \frac{0.64}{0.32} = 2$$

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JEE (Main) 2022

JUNE (SESSION-1) RESULT

लगातार दूसरे वर्ष, कोटा का श्रेष्ठ परिणाम, रेजोनेंस के नाम

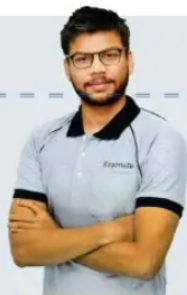
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JUNE (Session-1)

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NTA SCORE (%ile)
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in CHEMISTRY



VARDAN VERMA
Classroom Student



CHAITANYA AGGARWAL
Classroom Student

JEE (Adv.) 2021

AIR
8

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