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

2023

COMPUTER BASED TEST (CBT)
Memory Based Questions & Solutions

Date: 24 January, 2023 (SHIFT-2) | TIME : (3.00 p.m. to 6.00 p.m)
Duration: 3 Hours | Max. Marks: 300

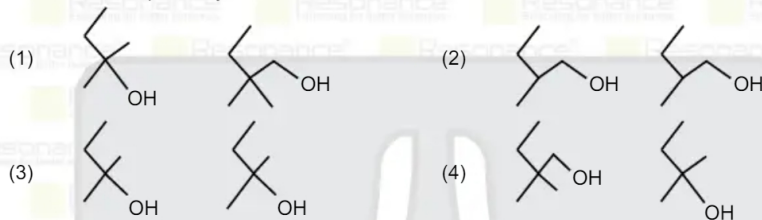
SUBJECT: CHEMISTRY

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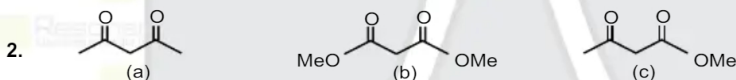


A and B are respectively :



Ans. (1)

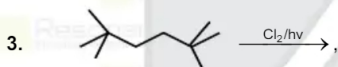
Sol. A is Markovnikov's addition while hydroboration oxidation is anti-Markovnikov's addition.



Which of the following compound has more deprotonation rate :

(1) (b) only (2) (c) only (3) (a) only (4) (a) and (c)

Ans. (a > c > b)



Total isomeric mono-chloro product(s) :

Ans. (3)



Total = 3

4. S₁ : Benzene is more stable than hypothetical cyclohexatriene.

S₂ : Localized π -electron cloud is more stable than delocalized π -electron.

(1) Both statement 1 and 2 are correct.
 (2) Statement 1 is correct but statement 2 is incorrect.
 (3) Statement 1 is incorrect but statement 2 is correct.
 (4) Both statement 1 & 2 are incorrect.

Ans. (3)

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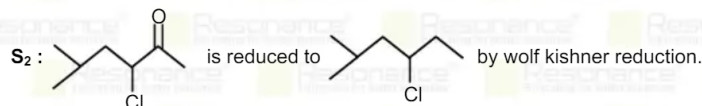
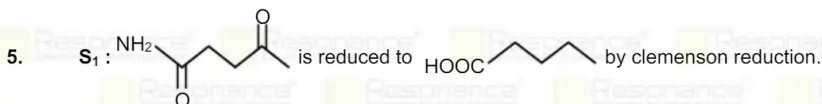
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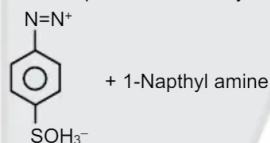
PAGE # 1



(1) Both statement 1 and 2 are correct.
 (2) Statement 1 is correct but statement 2 is incorrect.
 (3) Statement 1 is incorrect but statement 2 is correct.
 (4) Both statement 1 & 2 are incorrect.

Ans. (4)

6. Predict colour of product formed by the following reaction



- (1) Yellow (2) Orange (3) Blue (4) Green

Ans. (1)

7. Match column-I with column-II.

	Column-I		Column-II
(a)	Antihistamine	(p)	Seldane
(b)	Tranquillizer	(q)	Chlorpheniramine
(c)	Antifertility	(r)	Norethindrone
(d)	Antibiotic	(s)	Penicillin

- | | | | | | | | | | |
|-----|----------|----------|----------|----------|-----|----------|----------|----------|----------|
| | a | b | c | d | | a | b | c | d |
| (1) | q | p | s | r | (2) | p | q | s | r |
| (3) | q | p | r | s | (4) | p | q | r | s |

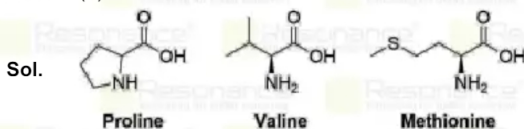
Ans. (3)

Sol. NCERT based Page No. 444.

8. Number of peptide bond present in tripeptide Val-Pro-Leu.

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

Ans. (2)



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9. Which of the following is correct statement.

- (1) A man consumes equal amount of air and food
 (2) A man consumes more food than air.
 (3) A man consumes 100 times more air than food
 (4) A man consumes 15 times more air than food.

Ans. (4)

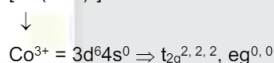
Sol. An average human being requires nearly 12-15 times more air than the food. (Ref. NCERT 398).

10. What are the hybridisation and magnetic moment (spin only)(in BM) of $[\text{Co}(\text{NH}_3)_6]^{3+}$ ion respectively?

- (1) d^2sp^3 , 0 (2) sp^3d^2 , 0 (3) d^2sp^3 , 1.732 (4) d^2sp^3 , 4.89

Ans. (1)

Sol. $[\text{Co}(\text{NH}_3)_6]^{3+}$



Hybridisation = d^2sp^3

Magnetic moment (μ) = 0

11. How many of the following statement are correct.

- (i) Physisorption are decrease with increase in temperature.
 (ii) In physisorption enthalpy of adsorption is very high.
 (iii) Physisorption is unimolecular layered.
 (iv) In Physisorption activation energy is not required.
 (v) Physisorption is not depend on nature of Adsorbate.

Ans. 3 [i, iv, v]

- (i) Physisorption are decrease with increase in temperature.
- (ii) In physisorption enthalpy of adsorption is low (20-40 KJ/mol).
- (iii) Physisorption is multimolecular layered.
- (iv) In Physisorption activation energy is not required.
- (v) Physisorption is not depend on nature of Adsorbate.

12. Which of the following gas turns acidified $K_2Cr_2O_7$ solution in green in colour solution.

- (1) SO_2 (2) CO_2 (3) SO_3 (4) O_3

Ans. (1)

Sol. $Cr_2O_7^{2-} + 2H^+ + 3SO_2 \longrightarrow 2Cr^{3+}$ (green) + $3SO_4^{2-} + H_2O$.

* CO_2 , SO_3 and O_3 do not react with $K_2Cr_2O_7$.

13. Which of these act as oxidising agent.

- (i) Sm^{2+} (ii) Ce^{4+} (iii) Tb^{4+} (iv) Tb^{2+}
(1) i & ii only (2) ii & iii only (3) i & iv only (4) iii & iv only

Ans. (2)






Sol. Both Ce^{4+} and Tb^{4+} act as oxidising agent.

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14. How many of the following describes the concentration of a solution.

- (a) mole (b) mole fraction (c) molarity (d) molality
(e) mass % (f) ppm

Ans. 05

Sol. Mole fraction, molarity, molality, mass % and ppm describes the concentration of solution.

15. A unipositive charge ion have 55 protons then how many s-electrons are present in ion.

- (1) 8 (2) 9 (3) 10 (4) 12

Ans. (3)

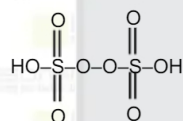
Sol. $Cs^{+1} = 1s^2 2s^2 2p^6 3s^2 3p^6 3d^{10} 4s^2 4p^6 4d^{10} 5s^2 5p^6$

Total number of s-electrons = 10

16. Calculate total number of π -bond in peroxodisulphuric acid and pyrosulphuric acid.

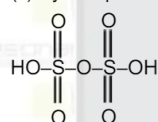
Ans. 8

Sol. (i) Peroxodisulphuric acid [$H_2S_2O_8$]



number of π bond = 4

(ii) Pyrosulphuric acid ($H_2S_2O_7$)



number of π bond = 4

17. The number of unpaired electron present in highest energy occupied molecular orbital in following species respectively are N_2 , N_2^+ , O_2 , O_2^+ .

- (1) 0, 0, 1, 2 (2) 0, 1, 2, 1 (3) 0, 1, 0, 1 (4) 2, 0, 0, 1

Ans. (2)

Sol.	Species	Number of unpaired electron
	$(N_2) : (\sigma 1s)^2 (\sigma^* 1s)^2 (\sigma 2s)^2 (\sigma^* 2s)^2 (\pi 2p_x = \pi 2p_y)^2 (\sigma 2p_z)^2$	0
	$(N_2^+) : (\sigma 1s)^2 (\sigma^* 1s)^2 (\sigma 2s)^2 (\sigma^* 2s)^2 (\pi 2p_x = \pi 2p_y)^2 (\sigma 2p_z)^1$	1
	$(O_2) : (\sigma 1s)^2 (\sigma^* 1s)^2 (\sigma 2s)^2 (\sigma^* 2s)^2 (\sigma 2p_z)^2 (\pi 2p_x = \pi 2p_y)^2 (\pi^* 2p_x = \pi^* 2p_y)$	2
	$(O_2^+) : (\sigma 1s)^2 (\sigma^* 1s)^2 (\sigma 2s)^2 (\sigma^* 2s)^2 (\sigma 2p_z)^2 (\pi 2p_x = \pi 2p_y)^2 (\pi^* 2p_x = \pi^* 2p_y)$	1

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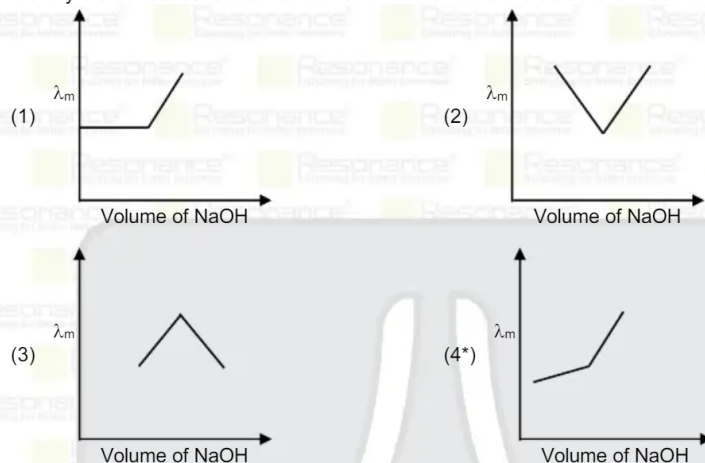
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18. Identify the correct conductometric titration curve for Benzoic acid and NaOH titration



Ans. (4)

Sol. $C_6H_5COOH + NaOH \rightarrow C_6H_5COONa + H_2O$

- The conductance first drops rapidly due to loss of more conducting H^+ already in the solution.
- However soon, due to common ion effect of $C_6H_5COO^-$, the free H^+ concentration in solution is almost negligible, and then the added NaOH only increase the number of ions by forming more of C_6H_5COONa .
- At the end point, the conductance rises much more rapidly due to addition of OH^- which has higher conductivity.

19. In metallurgical extraction of metal. First oxidation then reduction process is followed. Metal is ____.

- (1) Ag (2) Cu (3) Zn (4) Pb

Ans. (1)

Sol. $4Au/Ag(s) + 8CN^-(aq) + 2H_2O(aq) + O_2(g) \rightarrow 4[Au/Ag(CN)_2]^-(aq) + 4OH^-(aq)$
 $2[Au/Ag(CN)_2]^-(aq) + Zn(s) \rightarrow 2Au/Ag(s) + [Zn(CN)_4]^{2-}(aq)$

20. The pH of 0.005 M Calcium Lactate is $x \times 10^{-1}$ then value of x is ____ [Nearest integer]
 [Given pKa of Lactic acid = 5]

Ans. 105

Sol. $Ca(Lac)_2 \rightarrow Ca^{2+} + 2 Lac^-$
 $5 \times 10^{-3} \quad 5 \times 10^{-3} \quad 2 \times 5 \times 10^{-3}$
 $= 10^{-2} M$

Calcium lactate is a weak acid and strong base salt so

$$pH = 7 + \frac{1}{2} pKa + \frac{1}{2} \log C$$

$$= 7 + \frac{1}{2} \times 5 + \frac{1}{2} \log 10^{-2}$$

$$= 7 + 2.5 - 1$$

$$= 6 + 2.5 = 8.5$$

$$= 85 \times 10^{-1}$$

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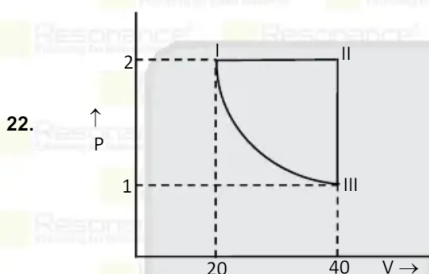
21. In which of the following reaction H_2O_2 act as reducing agent.

- (1) $2\text{Fe}^{2+} + 2\text{H}_2\text{O}_2 \rightarrow 2\text{Fe}^{3+} + 2\text{OH}^-$ (2) $\text{Mn}^{2+} + \text{H}_2\text{O}_2 \rightarrow \text{Mn}^{4+} + 2\text{OH}^-$
(3) $\text{HOCl} + \text{H}_2\text{O}_2 \rightarrow \text{Cl}^- + 2\text{H}_2\text{O} + \text{O}_2$ (4) $2\text{Fe}^{2+}(\text{aq}) + 2\text{H}^+(\text{aq}) + \text{H}_2\text{O}_2(\text{aq}) \rightarrow 2\text{Fe}^{3+}(\text{aq}) + 2\text{H}_2\text{O}(\text{l})$

Ans. (3)

Sol. $\text{HOCl} + \text{H}_2\text{O}_2 \rightarrow \text{Cl}^- + 2\text{H}_2\text{O} + \text{O}_2$

In this reaction H_2O_2 reduce HOCl to Cl^- and it self get oxidised to O_2 .



Given

I \rightarrow II isobaric

II \rightarrow III isochoric

III \rightarrow I isothermal

Calculate | work done | in cyclic process (in atm \times lit) [Nearest Integer]

Ans. 12

Sol. $W_{I \rightarrow II} = -2[40 - 20] = -40 \text{ atm} \times \text{lit}$

$W_{II \rightarrow III} = 0$

$$W_{III \rightarrow I} = -nRT \ln \left(\frac{V_2}{V_1} \right)$$

$$= -2.303 \times 1 \times 40 \log \left(\frac{20}{40} \right)$$

$$= +2.303 \times 40 \log 2$$

$$= 2.303 \times 40 \times 0.3$$

$$= 27.636$$

$$= -12.364 \text{ atm} \times \text{lit.}$$

23. Statement I: Be has least negative SRP value (E°) in alkaline earth metal group.

Statement II: Be has high hydration enthalpy and high enthalpy of atomization.

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

Ans. (1)

Sol. Be has least negative SRP value in alkaline earth metal group as it has high hydration enthalpy and high enthalpy of atomisation.

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PAGE # 6

24. Find the order of reaction $x \rightarrow y$. Using following data.

P(mm of Hg)	50	100	200	400
Half life	4	2	1	0.5

Ans. 2

Sol. $T_{\frac{1}{2}} \propto (C_0)^{1-n}$

$$\left(\frac{T_{\frac{1}{2}}}{T_{\frac{1}{2}}}\right)_{1^{st}} = \left(\frac{P_1}{P_2}\right)^{1-n}$$

$$\left(\frac{T_{\frac{1}{2}}}{T_{\frac{1}{2}}}\right)_{2^{nd}}$$

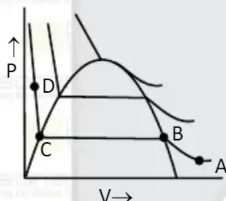
$$= \frac{4}{2} = \left(\frac{50}{100}\right)^{1-n} = 2 = \left(\frac{1}{2}\right)^{1-n}$$

$$2 = (2)^{n-1}$$

$$n - 1 = 1 \Rightarrow n = 2$$

$$\text{Order} = 2$$

25. Which of the following statement are correct for given Andrew isotherm of CO_2



(i) Formation of liquid start at point C

(ii) From point B to C amount of liquid increase.

(iii) Formation of liquid start from point B

(iv) At point B & C both liquid and vapour coexist

(1) Only i, ii

(2) Only ii, iii

(3) Only iii, iv

(4) Only ii, iii, iv

Ans. (4)

26. An ideal solution has mole fraction $X_A = 0.7$ and vapour pressure equal to 350 torr. Another ideal solution has mole fraction of solute $X_A = 0.2$ and vapour pressure equal to 410 torr.

Calculate vapour pressure P_A^0

Ans. 314

Sol. $X_A P_A^0 + X_B P_B^0 = P_s$

$$0.7 P_A^0 + 0.3 P_B^0 = 350$$

$$\& 0.2 P_A^0 + 0.8 P_B^0 = 410$$

$$\therefore P_A^0 = 314 \text{ torr.}$$

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