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

2022

COMPUTER BASED TEST (CBT)
Memory Based Questions & Solutions

Date: 24 June, 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. Which of the following has highest melting point?

- (1) Ag (2) Ga (3) Cs (4) Hg
- Ans.** (1)
- Sol.** Metal Melting Point
- | | |
|----|---------|
| Ag | 961.8°C |
| Ga | 29.76°C |
| Cs | 28.5°C |
| Hg | -38.3°C |
2. Which of the following is present in fire extinguisher?
 (1) Backing Soda (2) Washing Soda (3) Caustic Soda (4) Soda ash
- Ans.** (1)
- Sol.** Fire extinguisher contain sodium bicarbonate (Backing soda)
3. Correct increasing order of stability of $C_2^{2-}, O_2^{2-}, N_2^{2-}$ is
 (1) $C_2^{2-}, O_2^{2-}, N_2^{2-}$ (2) $O_2^{2-}, C_2^{2-}, N_2^{2-}$ (3) $N_2^{2-}, C_2^{2-}, O_2^{2-}$ (4) $O_2^{2-}, N_2^{2-}, C_2^{2-}$
- Ans.** (4)
- Sol.**
- | Ion | Bond order |
|------------------|------------|
| (i) C_2^{2-} | 3 |
| (ii) N_2^{2-} | 2 |
| (iii) O_2^{2-} | 1 |
4. Among the following how many are sulphide ores?
 (a) Galena (b) Copper pyrite (c) Zinc blende (d) Bauxite
- Ans.** (03.00)
- Sol.** (a) PbS - Galena (b) CuFeS₂ - Copper pyrite
 (c) ZnS - Zinc blende (d) AlO_x(OH)_{3-2x} (0 < x < 1) - Bauxite
5. Determine total energy of 1 mol of photons in J/mol having $\lambda = 600$ nm
 Given $h = 6.62 \times 10^{-34}$ J-sec, $c = 3 \times 10^8$ ms⁻¹
 (1) 6.64×10^4 J/mol (2) 6.64×10^8 J/mol (3) 1.24×10^4 J/mol (4) 1.24×10^8 J/mol
- Ans.** (1)

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Sol. $E_T = \frac{N_A h c}{\lambda}$

$$\text{or } E_T = \frac{6.02 \times 10^{23} \times 6.62 \times 10^{-34} \times 3 \times 10^8}{600 \times 10^{-9}}$$

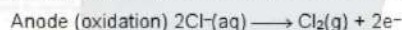
$$= 6.64 \times 10^4 \text{ J/mol}$$

6. H₂ is formed as by product during the formation of

- (1) Na₂Cr₂O₇ (2) NaOH (3) Na metal (4) NaCl

Ans. (2)

Sol. In diaphragm cell: formation process of NaOH



7. PCl_5 is formed NCl_5 is not formed why?
 (1) Phosphorous has vacant d-orbitals while nitrogen do not have vacant d-orbitals
 (2) PCl_5 is stable while NCl_5 is unstable
 (3) Phosphorous is more reactive while nitrogen is inert
 (4) Phosphorous has large size while nitrogen has small size.

Ans. (1)

Sol. Nitrogen do not have vacant d-orbitals so it do not expands it's octet, while phosphorous have vacant 3d orbitals so it can expands it is octet.

8. Reaction involved in the Hall-Herault process.
 (1) $\text{Ag} + \text{O}_2 + \text{H}_2\text{O} + \text{NaCN} \longrightarrow \text{Na}[\text{Ag}(\text{CN})_2] + \text{NaOH}$
 (2) $\text{SnO} + \text{C} \xrightarrow{\Delta} \text{Sn} + \text{CO}$
 (3) $\text{Al}_2\text{O}_3 + \text{C} \xrightarrow{\Delta} \text{Al} + \text{CO}$
 (4) $\text{Cu}_2\text{O} + \text{Cu}_2\text{S} \xrightarrow{\Delta} \text{Cu} + \text{SO}_2$

Ans. (3)

Sol. Anode : $2\text{O}^{2-} \longrightarrow \text{O}_2 + 4\text{e}^-$
 $2\text{C} + \text{O}_2 \longrightarrow 2\text{CO}$
 Cathode : $\text{Al}^{3+} + 3\text{e}^- \longrightarrow \text{Al}$

9. Which of the following complex have maximum Δ_0 value [Δ_0 = octahedral splitting energy]
 (1) $[\text{Cr}(\text{H}_2\text{O})_6]^{3+}$ (2) $[\text{Fe}(\text{H}_2\text{O})_6]^{3+}$ (3) $[\text{Mn}(\text{H}_2\text{O})_6]^{3+}$ (4) $[\text{Os}(\text{H}_2\text{O})_6]^{3+}$

Sol. 5d series member have more value of Δ_0 in comparison to 3d & 4d complexes.

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10. In acidic solution Mn(VI) become unstable and convert into it's two product ions. The difference in oxidation state of it's product ions is 'X', then value of 'X' is.

Ans. (3)

Sol. In acidic solution Mn(VI) become unstable relative to Mn(VII) and Mn(IV)



So difference in oxidation state of product ions of Mn is = 3

11. Which of the following metal ion gives flame as Green with Blue centre
 (1) Cu (2) Ba (3) K (4) Li

Ans. (1)

Sol.	Colour of flame	Metal
(i)	Green with Blue center	Cu
(ii)	Apple green	Ba
(iii)	Pink violet	K
(iv)	Crimson Red	Li

12. An electron shows transition from lower Bohr's atomic orbit to higher orbit, then comment on potential energy (P.E.), kinetic energy (K.E.) and total energy (T.E.) of electron.

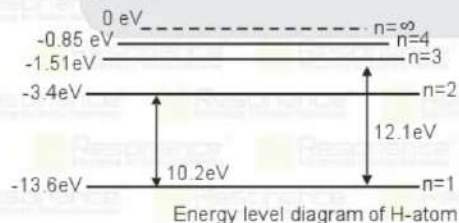
(1) All three are increase

- (2) All three are decrease
 (3) P.E. and T.E. increases while K.E. decrease.
 (4) P.E. and T.E. decrease while K.E. increase.

Ans. (3)

Sol. $TE = \frac{PE}{2} = -KE$

For hydrogen atom



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13. In a 1st order reaction time taken in 90% completion reaction is X times of half life, then value of X is _____.

[Report your answer to nearest integer]

Ans. 3

Sol. $T_{90\%} = \frac{2.303}{K} \log \left(\frac{100}{10} \right) = \frac{2.303}{K} \log 10$

$T_{50\%} = \frac{2.303}{K} \log \left(\frac{100}{50} \right) = \frac{2.303}{K} \log 2$

$\frac{T_{90\%}}{T_{50\%}} = \frac{\log 10}{\log 2} = \frac{1}{0.3010} = 3.32$

14. Find value of ΔH_f of C_2H_6 (in kJ/mole)
 Using following enthalpy of combustion

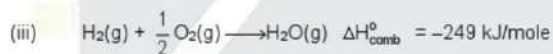
$\Delta H_{comb.} (C_2H_6, g) = -1560 \text{ kJ/mole}$

$\Delta H_{comb.} (C, S) = -394 \text{ kJ/mole}$

$\Delta H_{comb.} (H_2, g) = -249 \text{ kJ/mole}$

Ans. (25)

Sol. Given



$\Delta H_f^\circ = \Delta H_c^\circ (\text{reactant}) - \Delta H_c^\circ (\text{Product})$

$= 2 \times (-394) + 3 \times (-249) - (-1560)$

$= -788 - 747 + 1560$

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$$\frac{2}{3} E_{ab} - E_{ab} = -42$$

$$E_{ab} = 42 \times 3 = 126 \text{ kJ/mole}$$

$$E_{af} = 84 \text{ kJ/mole}$$

18. Find the value of cell constant for a given cell in which 0.1 molar solution have resistance 20Ω and molar conductivity $0.154 \times 10^{-3} \text{ S cm}^2 \text{ mol}^{-1}$

(1) $3.08 \times 10^{-7} \text{ cm}^{-1}$ (2) $30.8 \times 10^{-7} \text{ cm}^{-1}$ (3) $0.308 \times 10^{-9} \text{ cm}^{-1}$ (4) $4.08 \times 10^{-6} \text{ cm}^{-1}$

Ans. (1)

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

$$0.154 \times 10^{-3} = \frac{k \times 1000}{0.1}$$

$$K = 0.154 \times 10^{-7} \text{ S cm}^{-1}$$

$$K = \left(\frac{l}{a}\right) \frac{1}{R}$$

$$\text{Cell constant } \left(\frac{l}{a}\right) = K \times R$$

$$= 0.154 \times 10^{-7} \times 20$$

$$= 3.08 \times 10^{-7} \text{ cm}^{-1}$$

19. Which of the following gas is not involved in heating of atmosphere (Green House Effect).

(1) N_2 (2) O_3 (3) H_2O (4) CO_2

Ans. (1)

Sol. Green house gases are CO_2 , CH_4 , Chlorofluoro carbon, O_3 , N_2O , H_2O

Note: Gas, which is not a green house gas is nitrogen.

20. Which of the following is not a condensation polymer.

(1) Nylon-66 (2) Buna-N (3) Dacron (4) Silicones

Ans. (2)

Sol. Buna-N is a addition polymer of Buta-di-en and styrene.

21. How many peptide linkage is present in given segment of proteins ?

Alanylglycinylleucinylalanylvaline

Ans. (4)

Sol. Ala-Gly-Leu-Ala-Val

The amino acids are connected to each other by peptide linkage.

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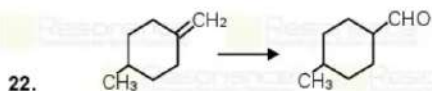
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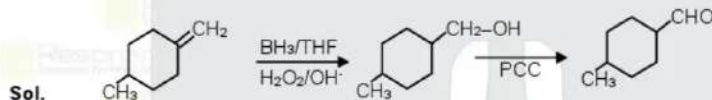
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Suitable reagent for above reaction is

- (1) BH_3/THF , $\text{H}_2\text{O}_2/\text{OH}^-$ then PCC (2) H_3O^+ , then PCC
 (3) PCC Oxidation (4) BH_3/THF , HIO_4

Ans. (1)



23. **Statement-1:** Alkene has weak π bond, therefore less stable than alkane.

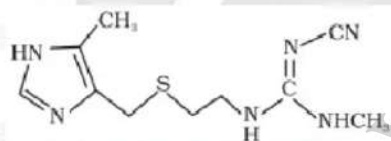
Statement-2: Weak π bond is less stronger than carbon-carbon sigma bond.

- (1) statement-1 is only correct
 (2) statement-2 is only correct
 (3) Both statement-1 and statement 2 are correct
 (4) Both statement-1 and statement 2 are wrong

Ans. (3)

Sol. π bond is weaker than σ bond

24. Identify the name of given compound

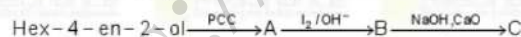


- (1) Cimetidine (2) Ranitidine (3) Histamine (4) novestrol

Ans. (1)

Sol. It is fact

25. Identify the major product 'C' in given reaction sequence.



- (1) But-2-ene (2) But-1-ene (3) Pent-2-ene (4) Isobutene

Ans. (1)

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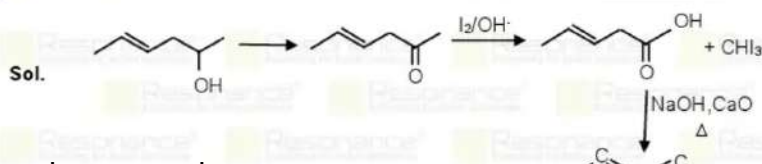
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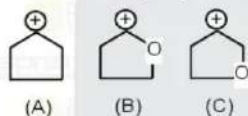
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26. Order of stability of given carbocation is



- (1) A > B > C (2) C > B > A (3) B > A > C (4) B > C > A

Ans. (3)

Sol. B is most stable due to resonance.

27. In Duma's method of estimation of nitrogen, 0.2 gram of an organic compound gives 22.4 ml of nitrogen gas at STP. % of nitrogen in the organic compound is :

Ans. (14)

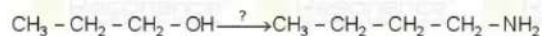
Sol. Vol of N₂ gas = 22.4 ml at STP

$$\text{Mole of N}_2 \text{ gas} = \frac{22.4}{22400} = \frac{1}{1000} \text{ mole}$$

$$\text{Weight of N}_2 \text{ gas} = \frac{1}{1000} \times 28$$

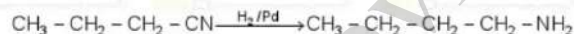
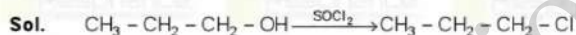
$$\% \text{ of N in organic compound is } \frac{28}{1000} \times \frac{100}{0.2} = 14\%$$

28. Which of the following sequence of reagents can perform the following conversion ?



- (1) SOCl₂, KCN, H₂/Pd (2) SOCl₂, AgCN, H₂/Pd
(3) PCl₅, AgCN, H₂/Pd (4) Red P/HI

Ans. (1)



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