Resonance®
Educating for better tomorrow

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

Resonance Eduventures Ltd.
Reg. Office & Corp. Office : CG Tower, A-46 & 52, IPIA, Near City Mall, Jhalawar Road, Kota (Raj.) - 324005
Ph. No.: +91-744-2777777, 2777700 | FAX No. : +91-022-39167222
To Know more : sms RESO at 56677 | Website : www.resonance.ac.in | E-mail : contact@resonance.ac.in | CIN : U80302RJ2007PLC024029
Toll Free : 1800 258 5555 7340010333 facebook.com/ResonanceEdu twitter.com/ResonanceEdu www.youtube.com/resowatch blog.resonance.ac.in

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) $CuFeS_2$ - 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 λ = 600 nm

Given h = 6.62×10^{-34} J-sec, c = $3 \times 10^9 ms^{-1}$

(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)

Sol. $E_T = \frac{N_A hC}{\lambda}$

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

$= 6.64 \times 10^4$ J/mol

6. H_2 is formed as by product during the formation of

(1) $Na_2Cr_2O_7$ (2) NaOH (3) Na metal (4) NaCl

Ans. (2)

Sol. In diaphragm cell: formation process of NaOH

Anode (oxidation) $2Cl^-(aq) \longrightarrow Cl_2(g) + 2e^-$

Cathode (reduction) $2H_2O + 2e^- \longrightarrow H_2 + 2OH^-$

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) $Ag + O_2 + H_2O + NaCN \longrightarrow Na[Ag(CN)_2] + NaOH$

(2) $SnO + C \xrightarrow{\Delta} Sn + CO$

(3) $Al_2O_3 + C \xrightarrow{\Delta} Al + CO$

(4) $Cu_2O + Cu_2S \xrightarrow{\Delta} Cu + SO_2$

Ans. (3)

Sol. Anode : $2O^{-2} \longrightarrow O_2 + 4e^-$

$2C + O_2 \longrightarrow 2CO$

Cathode : $Al^{+3} + 3e^- \longrightarrow Al$

9. Which of the following complex have maximum Δ_0 value [Δ_0 = octahedral splitting energy]

(1) $[Cr(H_2O)_6]^{3+}$ (2) $[Fe(H_2O)_6]^{3+}$ (3) $[Mo(H_2O)_6]^{3+}$ (4) $[Os(H_2O)_6]^{3+}$

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

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)

$$3MnO_4^{2-}(aq.) + 4H^+(aq.) \longrightarrow 2\overset{+7}{Mn}O_4^- + \overset{+4}{Mn}O_2 + 2H_2O$$

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

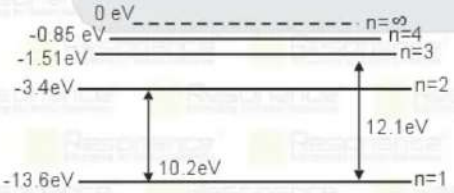
(3) P.E. and T.E. increases while K.E. decrease.

(4) P.E. and T.E. decrease while K.E. increase.

Ans. (3)

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

For hydrogen atom



Energy level diagram of H-atom

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 kJ/mole

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

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

Ans. (25)

Sol. Given

(i) $C_2H_6(g) + \frac{7}{2}O_2(g) \longrightarrow 2CO_2(g) + 3H_2O(l)$ $\Delta H^\circ_{comb} = -1560$ kJ/mole

(ii) $C(s) + O_2(g) \longrightarrow CO_2(g)$ $\Delta H^\circ_{comb} = -394$ kJ/mole

(iii) $H_2(g) + \frac{1}{2}O_2(g) \longrightarrow H_2O(g)$ $\Delta H^\circ_{comb} = -249$ kJ/mole

Target $2C(s) + 3H_2(g) \longrightarrow C_2H_6(g)$ $\Delta H^\circ_{rxn} = \Delta H^\circ_f$ (C_2H_6, g)

$\Delta H^\circ_f = \Delta H^\circ_c$ (reactant) – ΔH°_c (Product)

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

$= -788 - 747 + 1560$

= 25 KJ/mole

15. 3 gram of a gas at 300K have same pressure &volume equal to 0.2 gram hydrogen gas at 200 K, then molar mass of gas is:

Ans. (45)

Sol. $(PV)_{gas} = \left(\frac{W_{gas}}{M_{gas}}\right)RT_{gas}$

$(PV)_{H_2} = \left(\frac{W_{H_2}}{M_{H_2}}\right)RT_{H_2}$

According to question: $(PV)_{gas} = (PV)_{H_2}$

$\left(\frac{3}{M_{gas}}\right)300 = \left(\frac{0.2}{2}\right) = 200$

$M_{gas} = \left(\frac{3\times 3}{0.2}\right) = 45$

16. 120 gram of an organic compound on combustion analysis gives 330 gram of carbondioxide and 270 gram of water. % by mass of C and H in organic compound is:

(1) 50% C and 50% H (2) 60% C and 40% H

(3) 80% C and 20% H (4) 75% C and 25% H

Ans. (4)

Sol. Weight of CO_2 = 330 gram Weight of H_2O = 270 gram

Mole of $CO_2 = \frac{330}{44}$ gram Mole of $H_2O = \frac{270}{18}$ gram

Mole of C = $\frac{330}{44}$ gram Weight of H = $\frac{270}{18} \times 1$ gram

Weight of C = $\frac{330}{44} \times 12$ gram % of H = $\frac{270\times 100}{18\times 120} = 25\%$

% of C = $\frac{330\times 12\times 100}{44\times 120} = 75\%$

17. For the equilibrium $A(g) \rightleftharpoons B(g)$ $\Delta H = -42$ kJ/mole

If the ratio of activation energy of forward and backward reaction is $\frac{2}{3}$ then value of E_{af} and E_{ab} is respectively.

(1) 84 kJ/mole, 126 kJ/mole (2) 24 kJ/mole, 36 kJ/mole

(3) 48 kJ/mole, 72 kJ/mole (4) 90 kJ/mole, 135 kJ/mole

Sol. $\frac{E_{af}}{E_{ab}} = \frac{2}{3} \Rightarrow E_{af} = \frac{2}{3}E_{ab}$

$\Delta H = E_{af} - E_{ab} = -42$

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

$E_{ab} = 42\times3 = 126$ kJ/mole

$E_{af} = 84$ 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 0.154×10^{-3} S cm^2 mol^{-1}

(1) $3.08\times10^{-7}cm^{-1}$ (2) $30.8\times10^{-7}cm^{-1}$ (3) $0.308\times10^{-6}cm^{-1}$ (4) $4.08\times10^{-6}cm^{-1}$

Ans. (1)

Sol. $\lambda_m = \frac{k\times1000}{M}$

$0.154\times10^{-3} = \frac{k\times1000}{0.1}$

$K = 0.154\times10^{-7}$ S cm^{-1}

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

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

$= 0.154\times10^{-7}\times20$

$= 3.08\times10^{-7}$ 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, Cholorofluoro 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.

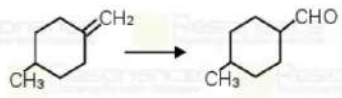
21. How many peptide linkage is present in given segment of proteins ?

Alanylglycinylleucinylalanylvaline

Ans. (4)

Sol. Ala-Gly-Leu-Ala-Val

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

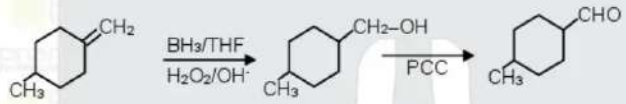
22. 

Suitable reagent for above reaction is

(1) BH_3/THF, H_2O_2/OH^- then PCC (2) H_3O^+, then PCC

(3) PCC Oxidation (4) BH_3/THF, HIO_4

Ans. (1)

Sol. 

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

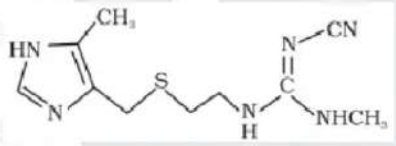
(3) Both statement-1 and statement 2 are correct

(4) Both statement-1 and statement 2 are wrong

Ans. (3)

Sol. π bond is weaker then σ bond

24. Identify the name of given compound



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

Ans. (1)

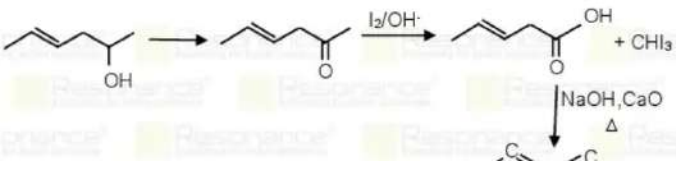
Sol. It is fact

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

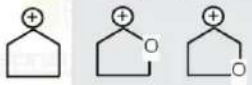
$$\text{Hex-4-en-2-ol} \xrightarrow{PCC} A \xrightarrow{I_2/OH^-} B \xrightarrow[\Delta]{NaOH,CaO} C$$

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

Ans. (1)

Sol. 

26. Order of stability of given carbocation is



(A) (B) (C)

(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 N_2 gas = 22.4 ml at STP

Mole of N_2 gas = $\frac{22.4}{22400} = \frac{1}{1000}$ mole

Weight of N_2 gas = $\frac{1}{1000} \times 28$

% 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 ?

$CH_3 - CH_2 - CH_2 - OH \xrightarrow{?} CH_3 - CH_2 - CH_2 - CH_2 - NH_2$

(1) $SOCl_2$,KCN,H_2/Pd (2) $SOCl_2$,AgCN,H_2/Pd

(3) PCl_5,AgCN,H_2/Pd (4) Red P/HI

Ans. (1)

Sol. $CH_3 - CH_2 - CH_2 - OH \xrightarrow{SOCl_2} CH_3 - CH_2 - CH_2 - Cl$

$CH_3 - CH_2 - CH_2 - Cl \xrightarrow{KCN} CH_3 - CH_2 - CH_2 - CN$

$CH_3 - CH_2 - CH_2 - CN \xrightarrow{H_2/Pd} CH_3 - CH_2 - CH_2 - CH_2 - NH_2$