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JEE (Main)

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

2022

COMPUTER BASED TEST (CBT)

Memory Based Questions & Solutions

Date: 29 June, 2022 (SHIFT-1) | TIME : (9.00 a.m. to 12.00 p.m)

Duration: 3 Hours | Max. Marks: 300

SUBJECT: CHEMISTRY

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PART : CHEMISTRY

1. When white phosphorous react with conc. NaOH solution a sodium salt is formed. The anion of salt contain two P-H Bonds acid of that anion is

(1) Phosphonic acid (2) Phosphinic acid

(3) Pyro phosphoric acid (4) Meta phosphoric acid

Ans. (2)

Sol. P_4 (White) + Conc. NaOH $\rightarrow NaH_2PO_2 + PH_3$

$\downarrow$

H_3PO_2

Phosphinic acid

2. Activation energy of a first order reaction is 532611 J, then relation between rate constant of reaction at 300 K and 310 K is $K_{300} = [X] \times 10^{-3} K_{310}$, the value of X is ----- (Given $R = \frac{J}{mole \times K}$, ln 10 = 2.3).

Ans. (1)

Sol. $\ln\left(\frac{K_{310}}{K_{300}}\right) = \frac{Ea}{R}\left(\frac{1}{300} - \frac{1}{310}\right)$

$= \frac{532611}{8.3}\left(\frac{10}{300\times310}\right) = 6.9$

$\ln\left(\frac{K_{310}}{K_{300}}\right) = 6.9$

$\ln\left(\frac{K_{310}}{K_{300}}\right) = 2.3 \times 3$

$\ln\left(\frac{K_{310}}{K_{300}}\right) = 3 \ln (10)$

$\left(\frac{K_{310}}{K_{300}}\right) = 10^3$

$K_{300} = 1\times10^{-3} K_{310}$

So X = 1

3. Which of the following in true regarding colloidal solution

(1) Brownian movement destabilize the colloidal solution

(2) Opposite charge sol when mixed neutralize the charge stable the colloidal solution

(3) Similar charge on colloidal particle makes the sol stable

(4) None of these

Ans. (3)

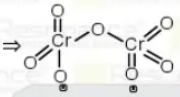
Sol. Similar charge on colloidal particle makes the sol stable

4. In the following reaction sequence $FeCr_2O_4 \xrightarrow{KOH} A \xrightarrow{H^+/H_2O} B$

Find no of terminal oxygen atom in product 'B'.

Ans. (6)

Sol. $FeCr_2O_4 \xrightarrow{KOH + O_2} K_2CrO_4 \xrightarrow{H^+/H_2O} K_2Cr_2O_7$

$Cr_2O_7^{2-} \Rightarrow$ 

No. of terminal oxygen = 6

5. Enthalpy of vaporization of 17 gram of ammonia is 23.4 kJ, then find enthalpy of vaporisation of 85 gram ammonia.

Ans. (117)

Sol. ΔH_{vap} of 17 gram of NH_3 = 23.4 gram

ΔH_{vap} of 85 gram of $NH_3 = \left[\frac{23.4}{17} \times 85\right]$

$= 23.4\times5 = 117$ kJ

6. 4.64kg Fe_3O_4 react with 2.52kg of CO according to following reaction

$Fe_3O_4 + 4CO \rightarrow 3Fe + 4CO_2$

Then Find mass of Iron is formed in gram is

(1) 3360 gram (2) 5040 gram (3) 2800 gram (4) 3920 gram

Ans. (1)

Sol.

$Fe_3O_4 + 4CO \longrightarrow 3Fe + 4CO_2$

Mole $\left(\frac{4.64\times10^3}{232}\right)$ $\frac{2.52\times10^3}{28}$

20 90 Mole LR is Fe_3O_4

0 (90–80) 3×20

$= 60$ Mole

Mass of Fe = $60 \times 56 = 3360$ Gram

7. In extraction of which metal cyanide is not used

(1) Zn (2) Au (3) Ag (4) Cu

Ans. (1)

Sol. (i) $Ag + NaCN \xrightarrow{O_2} [Ag(CN)_2]^{\ominus}$

(ii) $Au + NaCN \xrightarrow{O_2} [Au(CN)_2]^{\ominus}$

(iii) During froth floatation process of copper pyrites it contain PbS and ZnS as impurities, NaCN is used as depressant during this process

8. In which solution AgCl has maximum solubility

(1) 0.01MKCl (2) 0.01MHCl

(3) 0.01M$AgNO_3$ (4) Deionised water

Ans. (4)

Sol. In kcl, HCl and $AgNO_3$ solubility decrease due to common ion effect so solubility maximum in deionised water

9.

Column-I **Metal**	**Column-II** **Wave length of Colour (λ(nm))**
(i) Li	(a) 780
(ii) Na	(b) 670.8
(iii) Rb	(c) 589.2
(iv) Cs	(d) 455.5

	(i)	(ii)	(iii)	(iv)
(1)	b	c	a	d
(2)	a	b	c	d
(3)	d	c	b	a
(4)	b	a	c	d

Ans. (1)

Sol.

Metal	Li	Na	K	Rb	Cs
Colour	Crimson red	Yellow	Violet / Lilac	Red violet	Blue
Wave length (λ(nm))	670.8	589.2	766.5	766.5	766.5

10. Identify correct decreasing order of covalent character.

(a) LiCl (b) NaCl (c) RbCl (d) CsCl

(1) a > b > c > d (2) d > c > b > a (3) a > c > b > d (4) a > b > d > c

Ans. (1)

Sol. On moving down the group covalent character is decreasing.

11. 0.55 gram of an organic compound containing nitrogen in kjeldahl method it give NH_3 gas which neutralize

completely by 12.5 ml, 1 M H_2SO_4, then find % of nitrogen in organic compound. [Report your answer to nearest integer]

Ans. (64)

Sol. Organic compound $\rightarrow NH_3(g)$

0.55 g

$NH_3 + H_2SO_4 \rightarrow (NH4)_2\ SO_4$

VF =1 VF = 2

Eq. of NH_3 = eq. of H_2SO_4

$1(n_{NH3}) = 2\ [1\times12.5]\times10^{-3}$

$n_{Nitrogen} = 2 \times 12.5 \times 10^{-3}$

$W_{Nitrogen} = [14 \times 2 \times 12.5] \times 10^{-3}$ gram

$= 35 \times 10^{-2}$ gram

% of Nitrogen $= \frac{35\times10^{-12}}{55\times10^{-12}} \times 100$

$= 63.636\% \approx 64\%$

12. In which of the following reaction H_2O_2 act as reducing agent (in alkaline medium)

(1) $PbS + H_2O_2 \rightarrow PbSO_4 + H_2S$

(2) $Mn O_4^- + H_2O_2 \rightarrow MnO_2 + O_2 + OH^-$

(3) $HOCl + H_2O_2 \rightarrow Cl_2 + O_2 + H^+$

(4) $Sn^{2+} + H_2O_2 \rightarrow Sn^{4+} + H_2O$

Ans. (2)

Sol. $\underset{\text{Oxidising Agent}}{MnO_4^-} + \underset{\text{Reducing agent}}{H_2O_2} \longrightarrow \underset{\text{(alkaline Medium)}}{MnO_2 + O_2 + OH^-}$

13. 1.2 ml of acetic acid with density 1.02 gram/ml When dissolved in 2 Lit of water depression in freezing point observed is 0.0198°C then find % dissociation of acetic acid in this solution [given $K_f(H_2O)$= 1.85K.kg/ mole]

(Report your answer to nearest integer)

Ans. (5)

Sol. Mass of $CN_3\ COOH$ = dV = 1.02 × 1.2

= 1.224 gram

Molality of CH_3COOH solution = $\left(\frac{1.224}{60\times2}\right)$

$\Delta T_b = ik_f \times m$

$0.0198 = i \times 1.85\left(\frac{1.224}{60\times2}\right)$

$i = 1.0493$

$i = 1 + (n - 1)\alpha$

$1.0493 = 1 + (2 - 1)\alpha$

$\alpha = 0.0493$

$\%\alpha = 4.93 \approx 5$

14. 0.1 amp current is passed for 2 hours through dil. H_2SO_4 solution, then find total volume of gases (in ml) produced as electrode during electrolysis at NTP. [Given volume of 1 mole of ideal gas at NTP = 22.7 lit.]

Ans. (127)

Sol. Charge = q = it = 0.1 × 2 × 60 × 60

= 720 C

Anode : $2H_2O(l) \longrightarrow O_2(g) + 4H^+ + 4e^-$

Cathode : $[2H_2O(l) + 2e^- \longrightarrow H_2(g) + 2OH^-] \times 2$

$2H_2O(l) + 4e^- \longrightarrow 2H_2(g) + O_2$

4F charge produced = 3 mole gas

$\left(\frac{720}{96500}\right)$F charge produced = $\left(\frac{3}{4} \times \frac{720}{96500}\right)$ mole = $\frac{3\times18}{9650}$ mole

Volume of gas (at NTP) = $\frac{54}{9650} \times 22.7 = 0.127$ lit. = 127 ml

15. Correct electronic configuration of Pt (atomic no. 78) :

(1) [Xe] $4f^{14}\ 5d^{10}\ 6s^0$ (2) [Xe] $4f^{14}\ 5d^9\ 6s^1$ (3) [Xe] $4f^{14}\ 5d^8\ 6s^2$ (4) [Xe] $4f^{14}\ 5d^{10}\ 6s^0$

Ans. (2)

Sol. Pt (Z = 78) = [Xe] $4f^{14}\ 5d^9\ 6s^1$

16. MnO_4^{2-} disproportionate in acidic medium then find magnetic moment (spin only) in higher oxidation state product.

Ans. (0)

Sol. $3MnO_4^{2-} + 4H^+ \rightarrow 2MnO_4^- + MnO_2 + 2H_2O$

$_{25}Mn^{7+} = 3d^0$ unpaired electron = 0

$\mu_{(spin\ only)} = 0$

17. Which of the following set of statement is correct.

(a) magnetic quantum number can have negative value.

(b) In ground state electron are always filled according to increasing order of energy of orbital.

(c) Total number of nodes are (n – 2).

(d) electronic configuration of Cr is [Ar] $3d^5\ 4s^1$.

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

Ans. (1)

Sol. Total number of nodes are (n – 1).

18. An ideal gas (density = 0.121 gram/ml) at 257°C temperature have pressure 100 mm of Hg then find molar mass of gas. [Given R = 0.082 Latam / mole.k.]

[Report your answer to nearest integer]

Ans. = 40

Sol. For ideal gas

PM = d R T

$\left(\frac{100}{760}\right)$M = 0.121 × 0.082 × 530

$M = d \times 330.296$

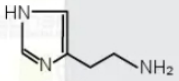
$M = 39.97 \approx 40$

19. Which of the following compound does not contain Sulphur atom.

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

Ans. (3)

Sol. It is fact.



Histamine

20. The acid that is believed to be mainly responsible for the damage of Taj Mahal is

(1) Phosphoric acid (2) Hydrochloric acid

(3) Hydrofluoric acid (4) Sulphuric acid

Ans. (4)

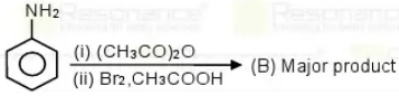
Sol. The acid rain reacts with marble, $CaCO_3$ of Taj Mahal

($CaCO_3 + H_2SO_4 \rightarrow CaSO_4 + H_2O + CO_2$)

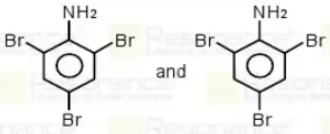
causing damage to this wonderful monument that has attracted people from around the world. As a result, the monument is being slowly disfigured and the marble is getting discoloured and lustreless.

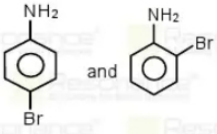
21. In the given reaction, the product (A) and (B) are respectively.

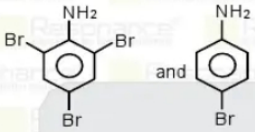
(A) Major product

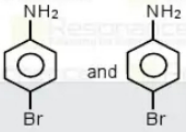


(B) Major product

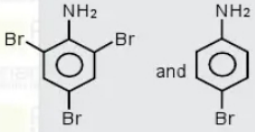
(1) 

(2) 

(3) 

(4) 

Ans. (3)

Sol. (3) 

22. **Statement-I :** During esterification of acid with alcohol, the reaction proceeds via Nucleophilic acyl substitution.

Statement-II : Present of Electron withdrawing group on acid increases the rate of esterification.

(1) Statement-I is correct only. (2) Statement-II is correct only.

(3) Both statement-I & II are correct. (4) None of the statement is correct.

Ans. (3)

Sol. Both statement-I & II are correct.

23. C_4H_8 with acidified $KMnO_4$ gives effervescence of a gas and a ketone. The compound is

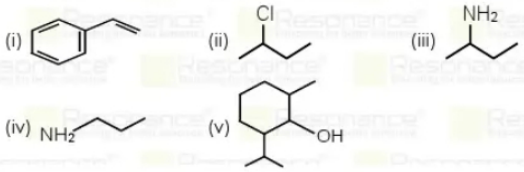
(1) But-1-ene (2) Cis-But-2-ene

(3) Trans-But-2-ene (4) 2-Methylpropene

Ans. (4)

Sol. 

24. How many of the following compounds has asymmetric carbon atom.



Ans. (3)

Sol. (ii), (iii) and (v) has asymmetric carbon atom.

25. **Statement-I :** Phenol shows acidic character so it is soluble in NaOH.

Statement-II : Phenol is weaker acid than alcohol and water.

(1) Statement-I is correct only. (2) Statement-II is correct only.

(3) Both statement-I & II are correct. (4) None of the statement is correct.

Ans. (1)

Sol. Phenol is stronger acid than alcohol and water but weakest acid then organic and mineral acids.

26. The polymer made of which of the following monomer can be stretches and still retain its physical form.

(1) Buna-N (2) Bakelite

(3) Terylene (4) Nylon-6,6

Ans. (1)

Sol. In elastomeric polymers, the polymer chains are held together by the weakest intermolecular forces. These weak binding forces permit the polymer to be stretched. A few 'crosslinks' are introduced in between the chains, which help the polymer to retract to its original position after the force is released as in vulcanised rubber. The examples are buna-S, buna-N, neoprene, etc.

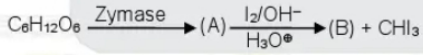
27. In DNA and RNA, which of sugar molecule is present respectively.

(1) Ribose, 2-DeoxyRibose (2) 2-DeoxyRibose, Ribose

(3) Ribose, Ribose (4) 2-DeoxyRibose, Deoxy-2-Ribose

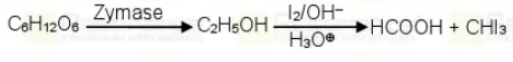
Ans. (1)

Sol. The sugar found in polynucleotides is either ribose (a monosaccharide pentose) or 2' deoxyribose. A nucleic acid containing deoxyribose is called deoxyribonucleic acid (DNA) while that which contains ribose is called ribonucleic acid (RNA).

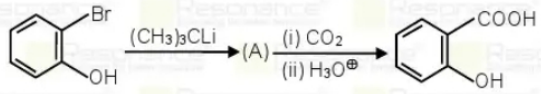
28. 

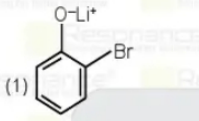
No. of carbon in compound is

Ans. (1)

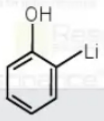
Sol. 

29. Product (A) in the given reaction is





(1)



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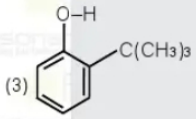

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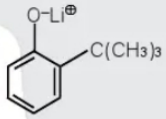

(4)

Ans. (1)

Sol.