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JEE (Main)

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

2022

COMPUTER BASED TEST (CBT)

Memory Based Questions & Solutions

Date: 29 July, 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. 20 gram N_2 and 5 gram of H_2 react according to following reaction.

$N_2(g) + 3H_2(g) \longrightarrow 2NH_3(g)$

then which reactant act as limiting reagent and also find number of mole of NH_3 formed.

(1) N_2, 1.43 mole (2) N_2, 0.714 mole

(3) H_2, 1.43 mole (4) H_2, 0.714 mole

Ans. (1)

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

$\left(\frac{20}{28}\right)$mole $\left(\frac{5}{2}\right)$mole

LR is N_2 (g)

0 $\frac{5}{2} - 3\left[\frac{20}{28}\right]$ $2\left[\frac{20}{28}\right]$

Mole of NH_3 formed $= \left(\frac{20}{14}\right) = \frac{10}{7} = 1.43$ mole

2. For inner orbital complex $[Fe(CN)_6]^{3-}$

Crystal field stabilization energy is $-x\Delta_0$, then value of x is :

[Neglect pairing energy]

Ans. (2)

Sol. $[Fe(CN)_6]^{3-}$

$\downarrow$

$Fe^{3+} = 3d^5 \Rightarrow t_{2g}^{2,2,1}, eg^{0,0}$ (inner orbital complex)

$CFSE = \left[-0.4n_{t_{2g}} + 0.6n_{eg}\right]\Delta_0 + n(P)$

$= [-0.4 \times 5 + 0]\Delta_0$

$= -2\Delta_0$

$x = 2$

3. On heating $LiNO_3$ and $NaNO_3$ product formed are respectively

(1) Li_2O, $NaNO_2$ (2) $LiNO_2$, Na_2O

(3) Li_2O, Na_2O (4) $LiNO_2$, $NaNO_2$

Ans. (1)

Sol. $4LiNO_3 \xrightarrow{\Delta} 2Li_2O + 4NO_2 + O_2$

$2NaNO_3 \xrightarrow{\Delta} 2NaNO_2 + O_2$

4. In 100 ml of 5% (w/v) NaCl solution in water, egg albumin is added. Then which of the following is correct.

(1) Lyophilic sol is obtained (2) Lyophobic sol is obtained

(3) Emulsion is formed (4) Precipitate in formed

Ans. (1)

Sol. Given in Lab manual

This is process of Lyophilic sol formation.

5. In alkaline or neutral medium $KMnO_4$ oxidise $S_2O_3^{2-}$ to SO_4^{2-} and itself get reduced. Find change in oxidation state of Mn in reactant and product

(1) 0 (2) 3 (3) 4 (4) 1

Ans. (2)

Sol. $\overset{+7}{8MnO_4^-} + 3S_2O_3^{2-} + H_2O \longrightarrow \overset{+4}{8MnO_2} + 6SO_4^{2-} + 2OH^-$

Change in oxidation state = [7 – 4] = 3

6. Ionisation energy of Na, Mg and Si are 496 KJ/mole, 738 KJ/mole and 789 KJ/mole respectively then possible value of Ionisation energy of Al is :

(1) 578 KJ/mole (2) 750 KJ/mole (3) 800 KJ/mole (4) 477 KJ/mole

Ans. (1)

Sol. Order of IE is $\Rightarrow$ Na < Al < Mg < Si

7. In the reaction of Zn with excess of alkali formed product is :

(1) ZnO (2) $Zn(OH)_2$ (3) ZnO_2 (4) ZnO_2^{2-}

Ans. (4)

Sol. $Zn + NaOH\ (excess) \longrightarrow [Zn(OH)_4]^{2-} + H_2(g)$

$\downarrow$

Na_2ZnO_2

8. A reaction is first order with respect to X and Zero order with respect to Y and following experimental data are collected.

Exp. No.	$[X]_0$	$[Y]_0$	Initial Rate
1	0.1	0.1	2×10^{-3}
2	N	0.2	4×10^{-3}
3	0.4	0.4	$M \times 10^{-3}$
4	0.1	0.2	2×10^{-3}

Then ratio of value of M and N is :

Ans. (40)

Sol. $Rate = K[X]^1[Y]^0$

$$\frac{R_1}{R_2} = \frac{K(0.1)}{K(N)} = \frac{2\times10^{-3}}{4\times10^{-3}} \qquad N = 0.2$$

$$\frac{R_1}{R_3} = \frac{K(0.1)}{K(0.4)} = \frac{2\times10^{-3}}{M\times10^{-3}} \qquad M = 8$$

$$\frac{M}{N} = \frac{8}{0.2} = 40$$

9. From following identify correct set of species in which one species is odd electron species and other is expanded octect species.

(1) NO and H_2SO_4 (2) NO and BCl_3 (3) SF_6 and H_2SO_4 (4) BCl_3 and PCl_5

Ans. (1)

Sol. Odd electron species = NO[total = 15]

Expanded octect species $\Rightarrow$ H_2SO_4, SF_6, PCl_5

10. 1 gram Bromine on reaction with propyne give 1,1,2,2 tetra bromopropane with 27% yield then mass of product formed is $[X] \times 10^{-1}$ gram. The value of X is.....

[Given Atomic mass of Br = 18 gram/mole]

Ans. (3)

Sol. $CH_3{-}C{\equiv}CH + 2Br_2 \xrightarrow[\text{yield}]{27\%} CH_3{-}\underset{\displaystyle Br\ Br}{\overset{\displaystyle Br\ Br}{C{-}C}}{-}H$

$$\left(\frac{1}{160}\right) \qquad \frac{1}{2}\left[\frac{1}{60}\right]\times0.27$$

Molar mass of 1, 1, 2, 2 tetra bromopropane = 360

$$W_{product} = \frac{1}{2}\left[\frac{1}{60}\right]\times0.27\times360 = 0.30 \text{ gram.}$$

$W_{product} = 3 \times 10^{-1}$ gram

11. What is gangue ?

(1) Contamination of earthy material in ore.

(2) Contamination of metal other than metal to be extracted.

(3) Refind metal

(4) Calcinated or roasted ore.

Ans. (1)

Sol. Contamination of earthy or undesired material in ore is called gangue.

12. Solubility product of PbS is 8×10^{-28} then solubility of PbS in pure water is..... $\times 10^{-16}$ M

[Given $\sqrt{2} = 1.41$]

[Report your answer to nearest integer]

Ans. (282)

Sol. $PbS(s) \rightleftharpoons Pb^{2+}(aq) + S^{2-}(aq)$

s s

$K_{sp[} = (s)^2 = 8 \times 10^{-28}$

$s = 2\sqrt{2} \times 10^{-14}$

$= 2 \times 1.41 \times 10^{-14}$

$= 282 \times 10^{-16}$ M

13. Enthalpy of neutralization of strong acid with strong base is –13.7 KCal. Then find rise in temperature when 400 ml, 0.3 M NaOH solution is mixed with 600 ml, 1 M HCl, solution.
[Given specific heat of water = 4.2 J/gram]
[Report your answer to nearest integer]

Ans. (2)

Sol.

	HCl +	NaOH ⟶	NaCl	ΔH°_{neut} = –13.7 KCal
Milimole	600	120	120 milimole	
	480	0	= 0.12 mole	

$\Delta H_{neutralization} = [-13.7] \times 0.12 = 1.644$ KCal

$\Delta H = m.s.\Delta T$

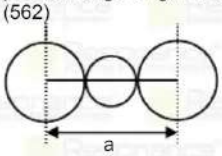
$1.644 \times 10^3 \times 4.2 = 1000 \times 4.2 \times \Delta T$

$\Delta T = 1.644$

14. Atom A form CCP lattice and atom B occupy all the octahedral void. If radius of A is 181 pm and B is 100 pm then edge length of unit cell is……..pm

Ans. (562)

Sol.



$a = 2[r_A + r_B] = 2[181 + 100]$

$= 281 \times 2$

$= 562$ pm

15. Aqueous solution of which set of ions is colourless

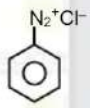
(1) Sc^{3+} , Zn^{2+} (2) Mn^{2+} , Ti^{2+} (3) Cu^{2+} , Ti^{3+} (4) Cr^{3+} , Zn^{2+}

Ans. (1)

Sol. d° & d^{10} electronic configuration ions are colourless in aqueous solution.

$_{21}Sc^{3+} = [Ar]3d^{\circ}$

$_{30}Zn^{2+} = [Ar]3d^{10}$

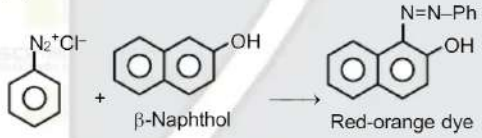
16.  + X $\xrightarrow{\text{slightly basic medium}}$ Red orange dye

What is x.

(1) α-Naphthol (2) β-Naphthol (3) Aniline (4) Toluene

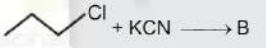
Ans. (2)

Sol.



β-Naphthol Red-orange dye

17.  + AgCN ⟶ A

 + KCN ⟶ B

A & B are :

A B

(1) 

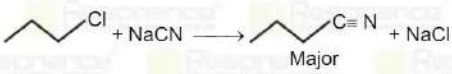
(2) 

(3) 

(4) 

Ans. (1)

Sol. 



18. Which of the following is Herbecide
(1) Sodium chlorate and sodium Arsenite
(2) Dieldrin and Aldrin
(3) Sodium Arsenite and Dieldrin
(4) Sodium chlorate and Aldrin

Ans. (1)

Sol. Fact.

19. In a tetrapeptide protein there are x number of amino acids and y number of peptide bonds. Find the value of z where z = x–y.

Ans. (1)

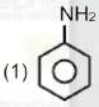
Sol. 4 – 3 = 1

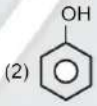
20. Which of the following is hypnotic drug.
(1) Aspartame (2) Amytal (3) Prontosil (4) Selden

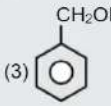
Ans. (2)

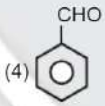
Sol. Fact.

21. Compound A which is acidic and gives violet colour with neutral $FeCl_3$.

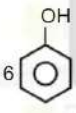
(1) 

(2) 

(3) 

(4) 

Ans. (2)

Sol. 

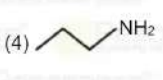
$+ FeCl_3 \longrightarrow [(Ph\text{-}O)_6Fe]^{-3}$ (Violet colour)

22. Which of the following is the strongest bronsted base ?

(1) 

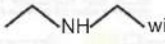
(2) 

(3) 

(4) 

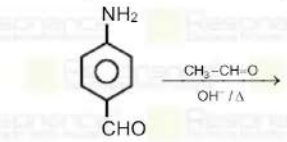
Ans. (1)

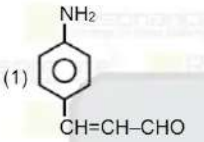
Sol. Order of basic strength is 2° > 3° > 1°

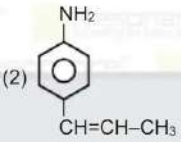
Hence 

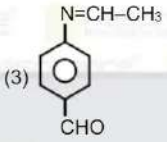
will be the strongest organic base.

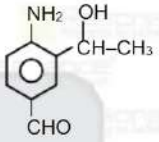
23. The final product of the following reaction will be :



(1) 

(2) 

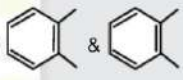
(3) 

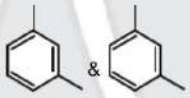
(4) 

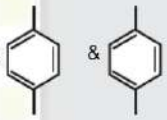
Ans. (1)

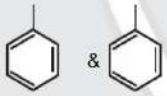
Sol. This is a cross aldol condensation which will produce α, β–unsaturated carbonyl compound.

24. Which of the following will give different products on ozonolysis assuming there is no delocalisation of π bonds :

(1) 

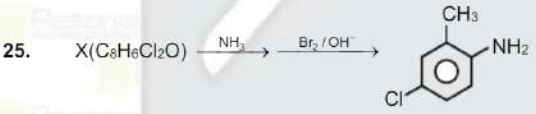
(2) 

(3) 

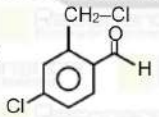
(4) 

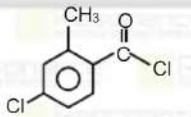
Ans. (1)

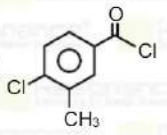
Sol. O–xylene has different resonating structures which will produce different ozonolysis products. m –xylene p–xylene and toluene have identical resonating structures which will give identical ozonolysis products.

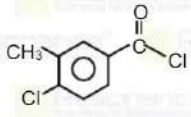
25. 

Which of the following is 'X' ?

(1) 

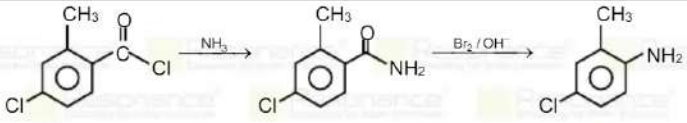
(2) 

(3) 

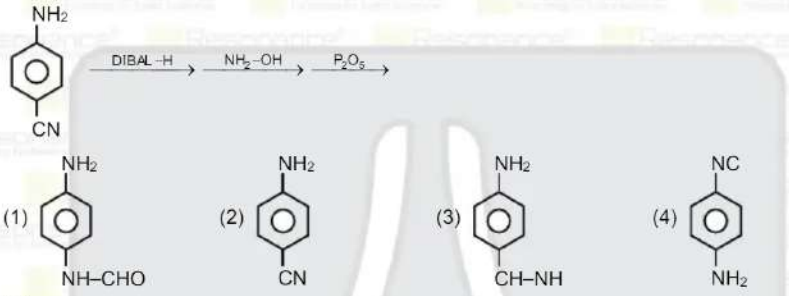
(4) 

Ans. (2)

Sol.



26. The final product of the following sequence of reactions will be :



Ans. (1)

Sol.