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JEE (Main)

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

2022

COMPUTER BASED TEST (CBT)
Memory Based Questions & Solutions

Date: 26 June, 2022 (SHIFT-2) | TIME : (3.00 a.m. to 6.00 p.m)

Duration: 3 Hours | Max. Marks: 300

SUBJECT: CHEMISTRY

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PART : CHEMISTRY

1. Atom A crystalizes in ccp structure in which all octahedral voids are occupied by atom B. If two A atoms from adjacent face center are removed then formula of compound is A_mB_n, find (m + n)

Ans. (7)

Sol. A = 8(corner) $\frac{1}{8}$ + 4[Face center] $\frac{1}{2}$ = 1 + 2 = 3

[Final UV]

Formula = $A_3B_4 = A_mB_n$

m + n = 7

2. Among the following compounds how many contain two lone pairs on central atom

XeF_4, H_2O, SF_4, CF_4

Ans. (2)

Sol. Compound

(i) XeF_4

(ii) H_2O

(iii) SF_4

(iv) CF_4

3. 10 gram of a protein (molar mass 60 gram) is dissolved in 200 ml of water then osmotic pressure of solution in atm is ... ...

Ans. (20.5)

Sol. $\pi = CRT$

$= \left[\frac{10\times1000}{60\times200}\right] \times 0.082 \times 300 = \frac{5}{6} \times 0.082 \times 300 = 20.5$ atm

4. Find ΔG of following reaction.

$Cu(s) + Sn^{2+}(0.01\ M) \longrightarrow Sn(s) + Cu^{2+}(0.001\ M)$

Given $E^{\circ}_{Sn^{2+}/Sn} = -0.14$ V, $E^{\circ}_{Cu^{2+}/Cu} = 0.34$ V

Report your answer [X] × 10^{-1} kJ, the value of X is :

Ans. (868.5)

Sol. $E^{\circ}_{cell} = E^{\circ}_{Sn^{2+}/Sn} - E^{\circ}_{Cu^{2+}/Cu}$

$= -0.14 - 0.34 = -0.48$

$E_{cell} = E^{\circ}_{cell} - \frac{0.059}{2} \log \frac{[Cu^{2+}]}{[Sn^{2+}]}$

$= -0.48 - \frac{0.06}{2} \log \frac{10^{-8}}{10^{-2}}$

$= -0.48 + 0.03 \log 10 = -0.45$ V

$\Delta G = -nFE_{cell} = +2 \times 96500 \times 0.45 = 86850$ J

$\Delta G = 86.850$ kJ $= 868.5 \times 10^{-1}$ kJ

5. Which of the following can show higher than +3 oxidation state

(1) Ln(Atomic number = 57) (2) Ce(Atomic number = 58)

(3) Lu(Atomic number = 71) (4) Ba(Atomic number = 56)

Ans. (2)

Among lanthanoids, La(III) and Ln(III) compounds the formation of CeY_4 is favoured by its noble gas

configuration.

6. In removing temporary hardness of $Ca(HCO_3)_2$ and $Mg(HCO_3)_2$ by boiling product obtained are

(1) $CaCO_3$, $MgCO_3$ (2) $Ca(OH)_2$, $MgCO_3$

(3) $CaCO_3$, $Mg(OH)_2$ (4) $Ca(OH)_2$, $Mg(OH)_2$

Ans. (3)

Sol. $Mg(HCO_3)_2 \xrightarrow{Boiling} Mg(OH)_2 + 2CO_2\uparrow$

$Ca(HCO_3)_2 \xrightarrow{Boiling} CaCO_3\downarrow + H_2O + CO_2\uparrow$

7. Which of the following is metalloid

(1) In (2) Te (3) Pb (4) Bi

Ans. (2)

Sol. 16^{Th} group : $\underbrace{O \quad S}_{\text{Non metal}} \quad \underbrace{Se \quad Te}_{\text{Metalloid}} \quad \underbrace{Po}_{\text{Metal}}$

8. Methane on combustion give 81 g of water then how many mole of methane are required for the combustion process

(1) 2.25 mole (2) 4.5 mole (3) 9 mole (4) 1.125 mole

Ans. (1)

Sol. $CH_4(g) + 2O_2(g) \longrightarrow CO_2(g) + 2H_2O$

$\frac{1}{2}\left[\frac{81}{18}\right]$ mole $\frac{81}{18}$ mole

= 2.25 mole

9. Which of the following is odd e^- species ?

(1) NO_2 (2) N_2O (3) N_2O_3 (4) N_2O_5

Ans. (1)

Sol.

Species	**Total e^-**
NO_2	23
N_2O	22
N_2O_3	38
N_2O_5	54

10. Activation energy of a reaction in presence of catalyst is 10 kJ less than activation energy of reaction in absence of catalyst at 300 K.

If $\frac{K_{catalyst}}{K_{absence\ of\ catalyst}} = e^x$, then value of 'X' is :

Ans. (4)

Sol. $K = Ae^{-\frac{Ea}{RT}}$

$K_{cat} = Ae^{-\frac{Ea'}{RT}}$

$K_{absence} = Ae^{-\frac{Ea}{RT}}$

$\frac{K_{catalyst}}{K_{absence}} = e^{-\frac{Ea-E_a'}{RT}} = e^{\frac{10\times1000}{8.314\times300}} = e^4$

11. 6.1 gram of CNG on combustion with 208 gram of $O_2(g)$ produce $CO_2(g)$ & H_2O with lot of Heat. Calculate amount of CO_2 produced in gram. [Consider CNG as methane and report your answer to nearest integer].

Ans. (17)

Sol. $CH_4 + 2O_2(g) \longrightarrow CO_2(g) + H_2O$

$\frac{1}{16}$mole $\frac{2.08}{32}$mole

0.38125 6.5

(LR) $\left(\frac{6.1}{16}\right)$mole

$W_{CO_2} = \frac{6.1}{16} \times 44 = 16.775$ gram ≈ 17

12. In 4d orbital to number of angular and radial nodes are respectively.

(1) 2, 1 (2) 1, 2 (3) 3, 1 (4) 1, 3

Ans. (1)

Sol. 4d orbital

Angular nodes = $\ell = 2$

Radial nodes = $(n - \ell - 1) = 4 - 2 - 1 = 1$

13. An aqueous complex $[Co(H_2O)_6]^{3+}$ when dissolved in excess of ammonia form a new complex which is diamagnetic in nature. Total number of electrons in new complex in t_{2g} orbital is :

Ans. (6)

Sol. $[Co(H_2O)_6]^{3+} + NH_3(excess) \longrightarrow [Co(NH_3)_6]^{3+}(aq) + 6H_2O$

$[Co(NH_3)_6]^{3+} \Rightarrow Co^{3+} = 3d^6 4s^0 \Rightarrow t_{2g}^{2,2,2}, e_g^{0,0}$

14. In froth flotation process main role of added depressant is :

(1) Selectively preventing one ore from forming froth

(2) Stabilize the ore complex

(3) Increase floatation property of ore

(4) increase stability of froth

Ans. (1)

Sol. In the froth floatation process, the role of the depressants is to separate two sulphide ores by selectively preventing one ore from forming froth.

For example, to separate two sulphide ores, PbS and ZnS, NaCN is utilised. NaCN forms a combination with zinc on the surface of zinc sulphide, $Na_2[Zn(CN)_4]$, preventing ZnS from foaming selectively.

$4NaCN + ZnS \Rightarrow Na_2[Zn(CN)_4] + Na_2S$

15. Which of the following s-Block element does not give flame colour test

(1) Be (2) Na (3) Li (4) Rb

Ans. (1)

Sol.

Metal	Li	Na	K	Rb	Cs
Colour	Crimson red	Yellow	Violet / Lilac	Red violet	Blue

Metal	Be	Mg	Ca	Sr	Ba
Colour	No colour	No colour	Brick red	Crimson red	Apple green

16. Which of the following can show disproportionation reaction

(1) MnO_4^- (2) ClO_4^- (3) MnO_4^{2-} (4) F_2

Ans. (3)

Sol. $\overset{+6}{3MnO_4^{2-}} + 4H^+ \longrightarrow \overset{+7}{2MnO_4^-} + \overset{+4}{MnO_2} + 2H_2O$

17. Which vitamin is water soluble, but not excreted ?

(1) B_{12} (2) B_6 (3) B_1 (4) B_2

Ans. (1)

Sol. Water soluble vitamins are almost not stored in the body except vitamin B_{12} (cyanocobalamine)

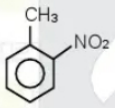
18. Toluene to benzaldehyde can be converted directly using.

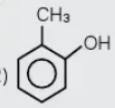
(1) CrO_3/H_3O^+ (2) $KMnO_4/H_3O^+$ (3) $K_2Cr_2O_7$ (4) MnO_2

Ans. (4)

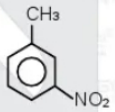
Sol. It is fact.

19. In halogenation reaction which of the following gives major meta product with respect to methyl group.

(1) 

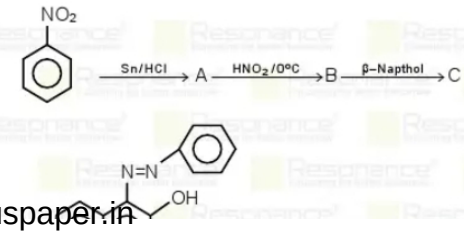
(2) 

(3) 

(4) 

Ans. (2)

Sol. OH^- is stronger o, p-directing and direct incoming group to meta position with respect to CH_3 group.

20. 

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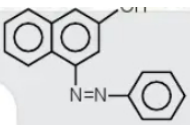
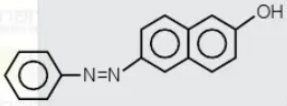
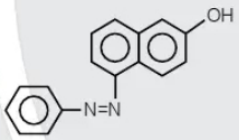
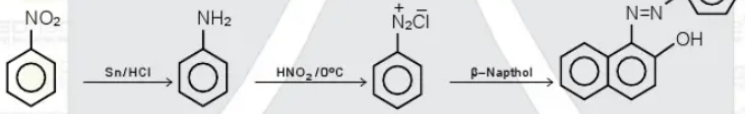
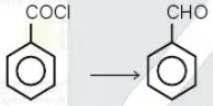
(2) 
(3) 
(4) 

Ans. (1)

Sol. 

21. 

In single step, which of the following reagent gives benzaldehyde.

(1) MnO_2 (2) $KMnO_4$ (3) $LiAlH_4$ (4) $NaBH_4$

Ans. (4)

Sol. It is fact.

22. Which of the following is incorrect about p-nitrobenzene sulphonyl chloride.

(1) It is known Hinsberg reagent

(2) It can differential primary and secondary amine

(3) It gives product soluble in KOH with secondary amine

(4) It gives no reaction with tertiary amine

Ans. (3)

Sol. Secondary amine gives product which is insoluble in KOH.

23. Match the column :

(A) Diastage	(i) Starch → maltose
(B) Zymase	(ii) Cane sugar → glucose + fructose
(C) Maltase	(iii) Maltose → glucose
(D) Invertase	(iv) Glucose → ethanol

(1) (A)-(i), (B)-(iii), (C)-(iv), (D)-(ii) (2) (A)-(ii), (B)-(iii), (C)-(iv, (D)-(i)

(3) (A)-(i), (B)-(iv), (C)-(iii), (D)-(ii) (4) (A)-(iv), (B)-(iii), (C)-(i), (D)-(ii)

Ans. (3)

Sol. It is fact.

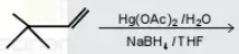
24. Which of the following order of nucleophilicity is correct ?

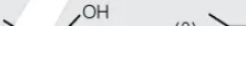
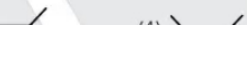
(1) $NH_2^- > NH_3$ (2) $H_2O > OH^-$ (3) $F^- > I^-$ (4) $Ph\text{–}O^- > OH^-$

Ans. (1)

Sol. Stronger the base, greater the nucleophilicity.

25. Find major product.



(1) 
(2) 
(3) 
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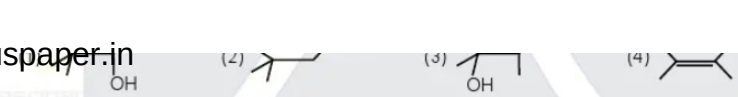
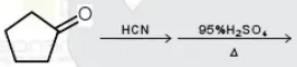
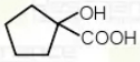


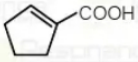
Ans. (1)

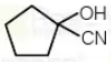
Sol. It is example of oximercuration-demercuration reaction which proceeds with markownikov addition of water without rearrangement.

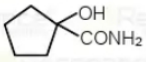
26.



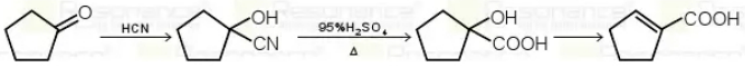
(1) 

(2) 

(3) 

(4) 

Ans. (2)

Sol. 

27. Four waste water sample has given BOD level.

A → 3 PPM, B → 18 PPM, C → 22 PPM, D → 4 PPM

most polluted organic waste is :

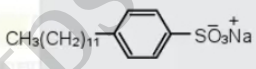
(1) A & B (2) B & C (3) B & D (4) A & D

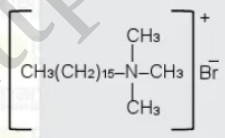
Ans. (2)

Sol. The sample with BOD value < 14 is considered polluted.

28. Which is not a synthetic detergent ?

(1) $CH_3(CH_2)_{10}CH_2O\overset{-}{S}O_3\overset{+}{N}a$

(2) 

(3) 

(4) $CH_3(CH_2)_{16}CH_3$

Ans. (4)

Sol. Sulphonates and quaternary ammonium salt of long chain fatty acids are used as synthetic detergent option (4) is just a hydrocarbon chain which is insoluble in water.