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JEE (Main)

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

2021

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COMPUTER BASED TEST (CBT) Memory Based Questions & Solutions

Date: 27 August, 2021 (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. How many electrons are there in f subshell of Np (Z = 93) in ground state configuration.

Ans. (18)

Sol. ${}_{93}\text{Np} = [{}_{86}\text{Rn}] 5f^4 6d^1 7s^2$

Total no. of electron in f subshell = 14 in 4f and 4 in 5f subshell = 18e⁻

2. Nature of V_2O_3 and CrO is :

(1) acidic, acidic (2) acidic, Basic (3) Basic, acidic (4) Basic, Basic

Ans. (4)

Sol. Oxide Nature

(i) V_2O_3 Basic

(ii) CrO Basic

3. In vanderwaal equation for a real gas

$$\left(P + \frac{an^2}{V^2}\right)(V - nb) = nRT$$

Unit of vander waal constant a is :

mole⁻² Lit² mole Lit

Ans. (1)

4. In BF_3 , BCl_3 , BBR_3 & BI_3 which one show strongest back bonding.

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(1) BF_3 (2) BCl_3 (3) BBr_3 (4) BI_3

Sol.

Due to small size atom show strongest back bonding in BF_3 .

In case of BF_3 (2P – 2P back bonding) while in BCl_3 (2P–3P), BBr_3 (2P – 4P) & BI_3 (2P – 5P) back bonding.

So extent of back bonding is maximum in (2P – 2P)

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5.

Column I Compound	Column II No. of lone pair on central atom
(i) XeO_2F_2	(a) 0
(ii) XeO_3F_2	(b) 1
(iii) XeF_2	(c) 2
(iv) XeF_4	(d) 3

Identify correct match :

(1) (i) – (b) ; (ii) – (a) ; (iii) – (d) ; (iv) – (c)

(2) (i) – (a) ; (ii) – (b) ; (iii) – (d) ; (iv) – (c)

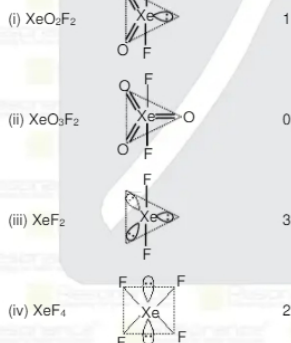
(3) (i) – (a) ; (ii) – (b) ; (iii) – (c) ; (iv) – (d)

(4) (i) – (b) ; (ii) – (a) ; (iii) – (c) ; (iv) – (d)

Ans.

(1)

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6. Solution of sucrose in 1 kg water of concentration of 0.75 mole freezes up to -4°C , then amount of ice (in gram) separated out is [given $K_f(\text{H}_2\text{O}) = 1.86 \text{ K.kg/mol}$]
[Report your answer to nearest integer]

Ans. 651

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Sol. On freezing mole of sucrose does not change.

$$\Delta T_f = i \times K_f \times m$$

$$4 = 1 \times 1.86 \left[\frac{0.75}{w_{H_2O}} \times 1000 \right] = 348.75 \text{ gram}$$

$$\text{Amount of ice separated} = 1000 - 348.75 = 651.25$$

7. For reaction $3A \longrightarrow 2B$

$$\text{Rate of formation of B} = 2.67 \frac{\text{mole}}{\text{Lit sec.}}$$

Then rate of disappearance of A is :

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Ans. (4)

Sol. $3A \longrightarrow 2B$

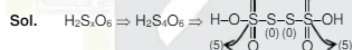
$$\begin{aligned} \text{rate} &= -\frac{1}{3} \frac{d}{dt} [A] = \frac{1}{2} \frac{d}{dt} [B] \\ &= -\frac{d}{dt} [A] = \frac{3}{2} \left[\frac{d}{dt} [B] \right] = \frac{3}{2} \times 2.67 = 4.005 \end{aligned}$$

8. For compound $H_2S_xO_6$ [where $x = 3$ to 5]

Oxidation state of sulphur in compound is :

- (1) 5, 0 (2) +5, 3 (3) only 6 (4) only 5

Ans. (1)



9. Which method of purification is used for purification of low melting point metal.

- (1) Zone refining (2) Liquification (3) Crystallization (4) Fractional distillation

Ans. (2)

Sol. **Liquification** : In this method a low melting metal like tin can be made to flow on a sloping surface. In this way it is separated from higher melting impurities.

This process is used for the purification of the metal in which melting point of the metal to be purified

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10. 200 ml, 0.2 M HCl is mixed with 400 ml, 0.1 M NaOH solution then find change in temperature.

[given (i) Heat of neutralization of 1 mole of HCl and 1 mole of NaOH = 57.1 KJ/mol]

$$(ii) \text{ Specific heat of water} = 4.18 \frac{\text{J}}{\text{gram} \times ^\circ\text{C}}$$

$$(iii) \text{ density of water} = 1 \text{ gram/cm}^3$$

Ans. (1)

Sol. $HCl + NaOH \longrightarrow NaCl + H_2O$ $\Delta H = -57.1 \text{ KJ}$

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$$\Delta H = [-57.1 \times 40 \times 10^{-3} \times 10^3] \text{J} = 2284 \text{ J}$$

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

$$2284 = 600 \times 4.18 \times \Delta T$$

$$\Delta T = 0.91 \approx 1$$

11. Column-I

- (i) Paramagnetic
(ii) Diamagnetic
(iii) Ferromagnetic
(iv) Antiferromagnetic

Identify correct matching:

(1) i - c, ii - d, iii - b, iv - a

(3) i - a, ii - b, iii - c, iv - d

Ans. (1)

Sol. NCERT Based.

Column-II

- (a) MnO
(b) Fe_3O_4
(c) O_2
(d) $NaCl$

(2) i - c, ii - a, iii - b, iv - d

(4) i - c, ii - d, iii - a, iv - b

12. Number of water of crystallization in gypsum, plaster of paris (POP) and dead burnt plaster are respectively:

- (1) 2, 0.5, 0 (2) 0, 0.5, 2 (3) 2, 0, 0.5 (4) 0.2, 2, 0

Ans. (1)



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13. When FeCl_3 react with $\text{K}_4[\text{Fe}(\text{CN})_6]$ a blue coloured colloidal solution is obtained. The product can be :
(1) $\text{KFe}[\text{Fe}(\text{CN})_6]$ (2) $\text{Fe}_4[\text{Fe}(\text{CN})_6]_3$ (3) $\text{Fe}_3[\text{Fe}(\text{CN})_6]_2$ (4) $\text{Fe}[\text{Fe}(\text{CN})_6]$

Ans. (2)

Blue colour

14. Deuterium is different from hydrogen in which property
(1) It react more than hydrogen (2) It react less than hydrogen
(3) It emits β^- particles (4) Its reactivity is almost equal to hydrogen

Ans. (2)

Sol. Reactivity of Deuterium is less than hydrogen due to high bond dissociation energy of D_2

	H_2	D_2
Bond dissociation :	435.88	443.35
Energy (kJ/mole)		

15. Which one of the following solution show higher Tyndall effect ?
(1) Lyophilic colloidal solution (2) Lyophobic colloidal solution
(3) True solution (4) Suspension

Ans. (2)

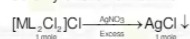
Sol.

Property	Lyophilic colloids	Lyophobic colloids
Tyndall effect	They do not show tyndall effect	They show tyndall effect.

16. 1 mole of an octahedral complex of formula $\text{MCl}_6.2\text{L}$ on reaction with excess AgNO_3 gives precipitate of 1 mole AgCl , then denticity of ligand (L) in complex is _____.

Sol. As 1 mole complex give 1 mole mole AgCl precipitate.

So only one Cl ion is in ionisation sphere.



As complex is octahedral so denticity of Ligand (L) is = 2.

17. 10 ml of KMnO_4 solution react completely with 10 ml, 0.1 M FeSO_4 solution, then strength of KMnO_4 solution in gram/Lit is.....
[Report your answer in nearest integer]

Ans. (3)

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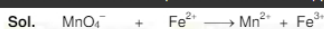
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$$v_f = 5 \quad v_f = 1$$

$$\text{Milli equ. of } \text{MnO}_4^- = \text{milli equ. of } \text{Fe}^{2+}$$

$$5[M \times 10] = 1[0.1 \times 10]$$

$$M = \left[\frac{0.1}{5} \right] = 0.02 \frac{\text{mole}}{\text{Lit}}$$

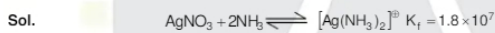
$$\text{Strength of } \text{KMnO}_4 = 0.02 \times 158 \frac{\text{gram}}{\text{Lit}} = 3.16 \text{ g/L}$$

18. In 100ml, 0.1M AgNO_3 solution ammonia is passed. At equilibrium, 5×10^{-6} M Ag^+ ion are remaining then the number of millimoles of NH_3 added initially are :

[Given $K_f[\text{Ag}(\text{NH}_3)_2]^+ = 1.8 \times 10^7$]

[Report your answer to nearest integer]

Ans. 53



millimole 10 a 0

At equilibrium 5×10^{-6} (a - 20) 10

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$$K_f = \frac{1}{5 \times 10^{-6} \times [\text{NH}_3]^2} = 1.8 \times 10^7$$

$$[\text{NH}_3] = \frac{1}{3} \frac{\text{mole}}{\text{lit}}$$

$$\Rightarrow \text{millimole of } \text{NH}_3 = \frac{1}{3} \times 100 = 33.3$$

$$\text{So } [a - 20] = 33.3$$

$$a = 53.3 \text{ millimole}$$

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19. S₁ : Ethyl phenyl ether can be synthesised by Williamson's ether synthesis.

S₂ : When bromobenzene reacts with sodium ethoxide, ethyl phenyl ether is formed.

(1) Both S₁ and S₂ are correct.

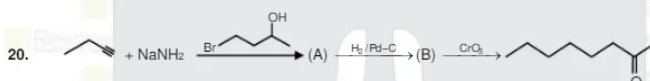
(2) S₁ is correct and S₂ is incorrect.

(3) S₁ is incorrect and S₂ is correct.

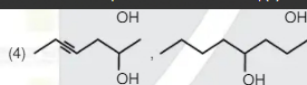
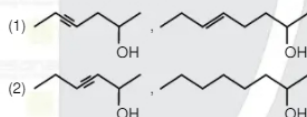
(4) Both S₁ and S₂ are incorrect.

Ans. (2)

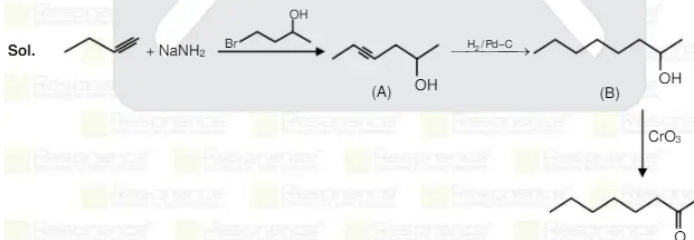
Sol. Due to double bond character in C-Br bond in bromobenzene reaction with sodium ethoxide is not possible.



A and B respectively are :



Ans. (3)



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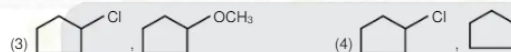
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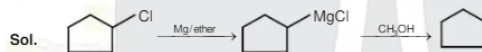
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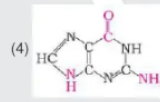
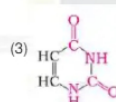
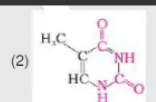
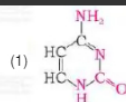
A and B respectively are :



Ans. (1)

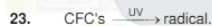


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Ans. (3)

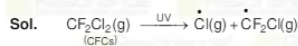
Sol. Fact



Radical formed in reaction will be :



Ans. (3)



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24. 0.2 gm of an organic compound when analysed using Carius method gives 0.188 gm of AgBr. Find the percentage of bromine in the compound ?

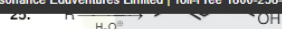
(1) 10% (2) 20% (3) 40% (4) 80%

Ans. (3)

Sol.
$$= \frac{\text{Atomic mass of X}}{\text{Molecular mass of Ag}} \times \frac{\text{wt. of AgX}}{\text{wt of organic halides}}$$

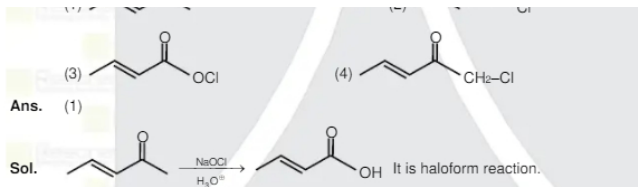
$$= \frac{80}{887} \times \frac{0.188}{0.2} \times 100 = 40\%$$

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Reactant is :





26. Which of the following statements is incorrect for primary amines.
- (1) Primary amines are less basic than secondary amines.
 - (2) Primary amines can be prepared by Gabriel phthalimide synthesis.
 - (3) Intermolecular association is more in primary amines than in secondary amines.
 - (4) Primary amines on reaction with nitrous acid give yellow oily liquid.

Ans. (4)

Sol. Primary amines on reaction with nitrous acid give alcohol.

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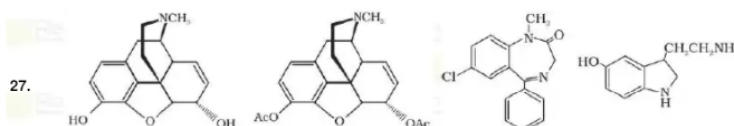
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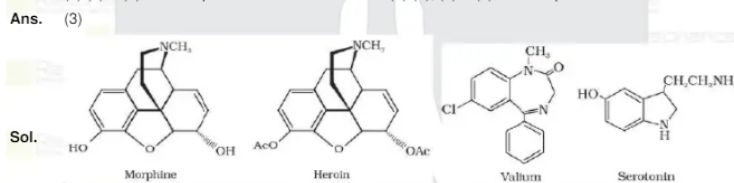
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- (1) (a), (b) & (d) are Narcotic analgesic
- (2) (b) & (c) are Narcotic analgesic
- (3) (c) & (d) are tranquilizers
- (4) (a), (b) & (c) are tranquilizers



Morphine & Heroin are Narcotic analgesic while Valium and Serotonin are tranquilizers.

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