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

2023


COMPUTER BASED TEST (CBT)
Memory Based Questions & Solutions

Date: 31 January, 2023 (SHIFT-2) | TIME : (3.00 p.m. to 6.00 p.m)
Duration: 3 Hours | Max. Marks: 300

SUBJECT: CHEMISTRY

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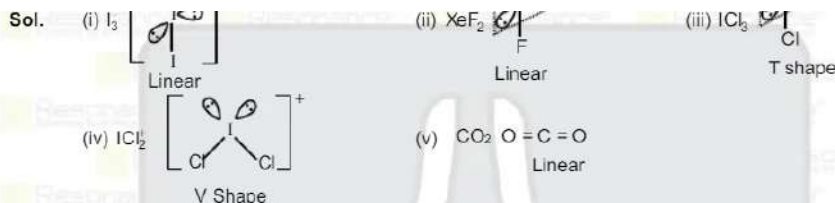
PART : CHEMISTRY

1. How many of the following species are linear in shape.

I_3 , XeF_2 , ICl_3 , ICl_2^+ , CO_2 , C_3O_2 , $BeCl_2$

Ans. (5)





2. For the following reaction
 $CCl_4 + 2H_2O \rightarrow CO_2 + 4HCl$
 Value of ΔH° reaction is _____ KJ
 [Given $\Delta H_f^\circ(CCl_4) = 405 \text{ kJ/mol}$, $\Delta H_f^\circ(H_2O) = -242 \text{ kJ/mol}$]
 $\Delta H_f^\circ(CO_2) = -394 \text{ kJ/Mole}$
 $\Delta H_f^\circ(HCl) = -92 \text{ kJ/Mole}$

Ans. (683)

Sol. $\Delta H_f^\circ = \Delta H_f^\circ(CO_2, g) + 4\Delta H_f^\circ(HCl) - \Delta H_f^\circ(CCl_4) - 2\Delta H_f^\circ(H_2O, l)$
 $= [-394] + 4[-92] - 405 - 2 \times [242]$
 $= -394 - 368 - 405 + 484$
 $= -683 \text{ kJ/mole}$

3. **S₁**: Upon heating borax dipped in $CuSO_4$ in luminous flame, the bead becomes green
S₂: The green colour observed is due to formation of copper (I) metaborate
 (1) Both statements are true
 (2) Both statements are false
 (3) **S₁** is true and **S₂** is false
 (4) **S₁** is false and **S₂** is true

Ans. (3)

Sol. **Statements I** is true but **Statements II** is false as blue colour is obtained due to copper (II) metaborate while copper (I) metaborate is colourless

4. Ionisation energy of H atom is 13.6 eV, then ionisation energy of Li^{2+} ion is
 (1) 54.4 eV
 (2) 13.6 eV
 (3) 122.4 eV
 (4) 1.4 eV

Ans. (3)

Sol. $(E_n)^{+} = -13.6 \text{ eV}$
 $(E_n)^{2+} = -13.6 \times (3)^2$
 $= -122.4 \text{ eV}$
 So IE of Li^{2+} ion = 122.4 eV

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5. Which of the following element have half-filled f orbital configuration.
 (a) Sm (b) Eu (c) Gd (d) Lu
 (1) b, c only (2) a, b, c only
 (3) a, d only (4) a, b, c, d

Ans. (1)

Sol. $Sm(Z = 62) = 4f^6s^2$
 $Eu(Z = 63) = 4f^7s^2$
 $Gd(Z = 64) = 4f^75d^1s^2$
 $Tb(Z = 65) = 4f^9s^2$
 Here Eu & Gd have half-filled configuration

6.

	List-I		List-II
(i)	Physisorption	(a)	Single layer
(ii)	Chemisorption	(b)	$\Delta H = 20 - 40 \text{ KJ / mole}$
(iii)	$N_2 + 3H_2 \xrightarrow{Fe} 2NH_3$	(c)	Heterogeneous catalyst
(iv)	analytical adsorption	(d)	chromatography

Identify the correct match

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

Ans. (1)

Sol. Chemisorption is single layer physisorption have $\Delta H = 20 - 40 \text{ KJ/Mole}$

$N_2 + 3H_2 \xrightarrow{Fe} 2NH_3$ is example of Heterogeneous analytical adsorption is used is chromatography.

7. The correct increasing order of acidic strength of BX_3 is (where X = F, Cl, Br, I)

No. of Half life = 5
Time required = $20 \times 5 = 100$ min

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12. Bohr radius of hydrogen atom is R, then radius of 2nd orbit of Li²⁺ ion is.

(1) $\frac{4R}{3}$

(2) $\frac{3}{4}R$

(3) 2R

(4) $\frac{2}{43}R$

Ans. (1)

Sol. $(r_H)_{n=1} = 0.529 A^{\circ} = R$

$$(r_L^{+2})_{n=2} = 0.529 \times \frac{n^2}{Z}$$

$$= 0.529 \times \frac{(2)^2}{3}$$

$$= R \times \frac{4}{3}$$

$$= \frac{4R}{3}$$

13. Which one of following have important role in neuromuscular function ?

(1) Ca

(2) Mg

(3) Be

(4) Li

Ans. (1)

Sol. Calcium plays important role in neuromuscular function, interneuronal transmission, Cell membrane integrity and blood coagulation.

From NCERT.

14. Statement-I : H₂O₂ used in manufacture of cephalosporin.

Statement-II : H₂O₂ used in oxidations of cyanides, restoration of aerobic conditions to sewage wastes, etc.

(1) Both statement I and II are correct.

(2) Statement I is correct while statement II is incorrect.

(3) Statement I is incorrect while statement II is correct.

(4) Both statement I and statement II are incorrect.

Ans. (1)

Sol. H₂O₂ used in manufacture of cephalosporin & in oxidations of cyanides, restoration of aerobic conditions to sewage wastes, etc.

From NCERT. Page no. 294 (XI)

15. Solubility of AgCl in aqueous solution is 1.434×10^{-3} g/L the value of $[-\log K_{sp}]$ is

[Given atomic mass of Ag = 107.9 & Cl = 35.5].

Ans. (10)

Sol. Solubility(s) = $\frac{1.434}{143.4} \times 10^{-3} = 10^{-6} M$

$$K_{sp}(AgCl) = (s)^2$$

$$K_{sp}(AgCl) = 10^{-10}$$

$$-\log(K_{sp}) = 10$$

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16. The CFSE of $[Ti(H_2O)_6]^{3+}$ is -96.0 KJ/ mole, then this complex absorb maximum wave length for excitation of electron is _____ nm.

Ans. 1240

Sol. For given complex CFSE = -96.0 KJ/ mol

$$\Rightarrow E = 96.0 \text{ KJ/mol} = \left(\frac{96.0}{96.0}\right) \text{ eV } (\because 1 \text{ eV} \approx 96.0 \text{ KJ/mol})$$

$$E = 1 \text{ eV}$$

$$\lambda(\text{nm}) = \frac{1240}{E} = \frac{1240}{1} = 1240 \text{ nm}$$

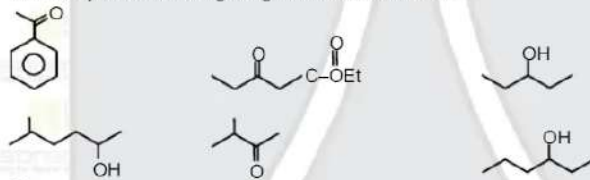
17. Which of the following Statement is incorrect

- (1) Phenolphthalein may be used as indicator for strong acid and strong base
- (2) Phenolphthalein may be used as indicator for weak acid strong base.
- (3) Methyl orange may be used as indicator for weak acid and weak base.
- (4) Methyl orange may be used as indicator for strong acid and weak base.

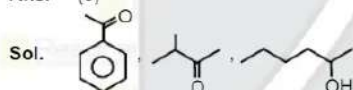
Ans. (3)

Sol. Methyl orange is not suitable indicator for weak acid and weak base titration.

18. How many of the following will give haloform reaction :



Ans. (3)



Aldehyde or ketones with acyl group $-\text{C}(=\text{O})-\text{CH}_3$ or $-\text{C}(\text{OH})(\text{CH}_3)-$ group gives haloform test.

19. Cyclohexylamine $\xrightarrow[\text{acid}]{\text{Nitrous}}$ A $\xrightarrow{\text{PCC}}$ B $\xrightarrow[\Delta]{\text{Conc. NaOH}}$ Product

Product is :



Ans. (4)

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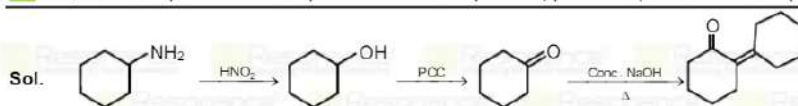
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20. Normally rain water has a pH of 5.6 due to which of the following reaction.

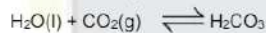
- (1) $\text{H}_2\text{O}(\text{l}) + \text{CO}_2(\text{g}) \rightleftharpoons \text{H}_2\text{CO}_3$
- (2) $2\text{SO}_2(\text{g}) + \text{O}_2(\text{g}) + 2\text{H}_2\text{O}(\text{l}) \rightarrow 4\text{HNO}_3$
- (3) $4\text{NO}(\text{g}) + \text{O}_2(\text{g}) + 2\text{H}_2\text{O}(\text{l}) \rightarrow 4\text{HNO}_2$



(4) None of these

Ans. (1)

Sol. rain water has pH 5 – 6 due to presence of H^+ ion formed by the reaction of rain water with carbon dioxide present in the atmosphere.



21. Which of the following contains maximum number of chlorine atoms ?

(1) Chloral (2) Gammaxene (3) Freon-12 (4) DDT

Ans. (2)

Sol. Chloral = CCl_3CHO

Gammaxene = $\text{C}_8\text{H}_6\text{Cl}_6$

Freon-12 = CF_2Cl_2

DDT = $\text{C}_{14}\text{H}_9\text{Cl}_5$

22. Which of the following compound is not a disinfectant ?

(a) Chloroxylenol (b) Biotionol (c) Terpeneol (d) Veronal

(e) Protosil

(1) a & d (2) c & d (3) b & e (4) d & e

Ans. (4)

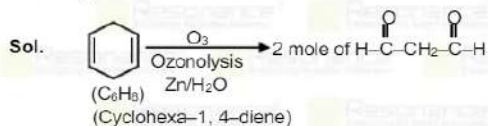
Sol. Protosil is an antibiotic, whereas veronal is a tranquilizer.

23. A on ozonolysis give 2 mole of methanedicarbaldehyde, compound (A) is :

(1) Cyclohexan-1, 3-diene (2) Cyclohexan-1, 4-diene

(3) Methylene cyclopentane (4) hexan-1,3,5-triene

Ans. (2)



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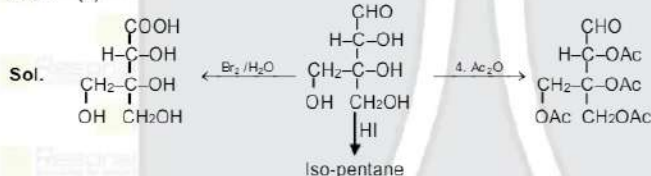
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24. Compound (A) utilises four moles of Ac_2O , and react with bromine water to give $\text{C}_5\text{H}_{10}\text{O}_6$. On reduction with HI, (A) gives isopentane, then compound (A) is :

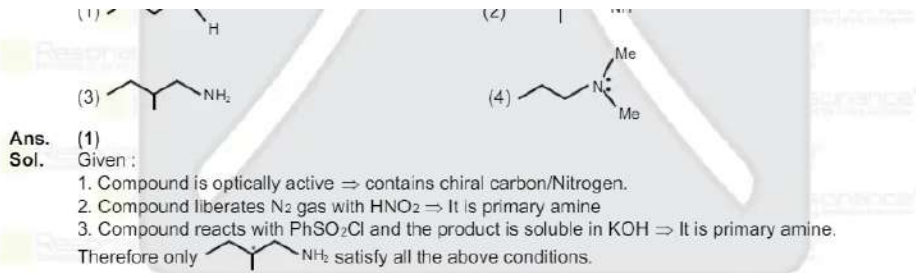


Ans. (1)



25. An optically active compound 'A' reacts with nitrous acid and liberates N_2 gas, compound A also reacts with PhSO_2Cl and give another compound that is soluble in aqueous KOH compound A is





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