44 YEARS OF EXCELLENCE

NARAYANA EDUCATIONAL INSTITUTIONS

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JEE MAIN (APRIL) 2023 (10-04-2023-AN)

Memory Based Question Paper

CHEMISTRY

CHEMISTRY

SECTION - A

Multiple Choice Questions: This section contains 20 multiple choice questions. Each question has 4 choices (1), (2), (3) and (4), out of which **ONLY ONE** is correct.

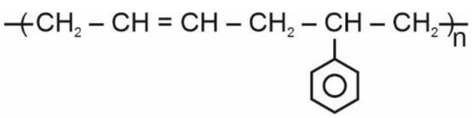
Choose the correct answer:

1. Delicate balance of CO_2 and O_2 is not disturbed by
   (1) Deforestation (2) Photosynthesis
   (3) Burning of coal (4) Burning of petroleum

Answer (2)

Sol. Deforestation & burning of fossil fuels increase CO_2 level and disturb the balance in the atmosphere.

2. Which of the following options correctly represent the structure of Buna -S ?

   (1) 

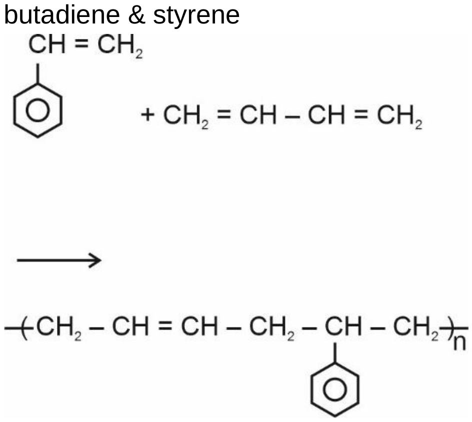
   (2) $\text{-}\!\!(CH_2 - CH = CH - CH_2)\!\!\text{-}_n$

   (3) $\text{-}\!\!(H_2C - CH = CH - CH_2 - CH{=}CH)\!\!\text{-}_n$ with CH attached below

   (4) $\text{-}\!\!(CH_2 - CH = CH - CH_2 - CH{=}CH)\!\!\text{-}_n$

Answer (1)

Sol. Buna-S is formed by polymerisation of 1, 3 – butadiene & styrene



3. Relation between radius of a lattice (r) and edge length (a) of an FCC unit cell is ________.

   (1) $r = \frac{a}{2}$ (2) $r = \frac{\sqrt{2}a}{2}$

   (3) $r = \frac{\sqrt{2}a}{4}$ (4) $r = \frac{\sqrt{3}a}{4}$

Answer (3)

Sol. In an F.C.C. unit cell, the lattice points along the diagonal of a square face are in contact with each other.

$\therefore \quad \sqrt{2}a = 4r$

$\Rightarrow \quad r = \frac{\sqrt{2}a}{4}$

4. The increasing order of metallic character
   (1) Be > Ca > K (2) K > Ca > Be
   (3) Ca > K > Be (4) K > Be > Ca

Answer (2)

Sol. Metallic character increases down the group and decreases from left to right along a period.

$\therefore$ K > Ca > Be (Metallic character)

5. During bleeding from cut $FeCl_3$ is used to stop bleeding as
   (1) Cl^- cause coagulation
   (2) Ferric ion cause coagulation
   (3) $FeCl_3$ dilutes blood
   (4) Bleeding does not stop

Answer (2)

Sol. Fe^{+3} ion coagulate blood which is colloid.

6. Correct order of magnetic moment of
   $[Ni(CO)_4]$, $[CoF_6]^{-3}$, $[FeF_6]^{-3}$, $[Cr(H_2O_6)]^{+3}$
   (1) $[FeF_6]^{-3} > (CoF_6)^{-3} > [Cr(H_2O_6)]^{+3} > [Ni(CO)_4]$
   (2) $[FeF_6]^{-3} > [Ni(CO)_4] > [Cr(H_2O_6)]^{+3} > [CoF_6]^{-3}$
   (3) $[CoF_6]^{-3} > [FeF_6]^{-3} > [Ni(CO)_4] > [Cr(H_2O_6)]^{+3}$
   (4) $[CoF_6]^{-3} > [Ni(CO)_4] > [Cr(H_2O_6)]^{+3} > [FeF_6]^{-3}$

Answer (1)

Sol. $\underset{\sqrt{35}\text{ B.M.}}{[FeF_6]^{-3}} > \underset{\sqrt{24}\text{ B.M}}{[CoF_6]^{-3}} > \underset{\sqrt{15}\text{B.M}}{[Cr(H_2O_6)]^{+3}} > \underset{0\text{ B.M}}{[Ni(CO)_4]}$

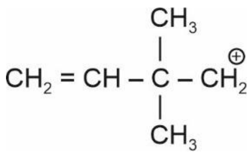
7. Consider, a mixture of 2 moles of oxygen, 4 moles of Neon gas.
   Neglect any vibrational degree of freedom.
   Calculate the total internal energy of system (Assuming E = 0 at T = 0 K)
   (1) 5RT (2) 11RT
   (3) 6RT (4) 7RT

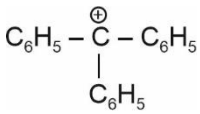
Answer (2)

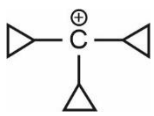
Sol. $E = (2)\left(\frac{5R}{2}\right)(T) + (4)\left(\frac{3R}{2}\right)(T)$

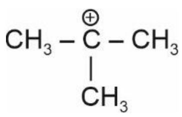
$= 11\ RT$

8. Which of the following is the correct hydride affinity order of carbocations

(a) 

(b) 

(c) 

(d) 

(1) (c) < (b) < (d) < (a) (2) (b) < (d) < (c) < (a)

(3) (a) < (d) < (b) < (c) (4) (c) < (a) < (d) < (b)

Answer (1)

Sol. The correct hydride affinity order of carbocations will be decided by the stability of carbocation. Higher the stability of carbocation, lower will be hydride affinity.

∴ Correct hydride affinity order of carbocations is

(c) < (b) < (d) < (a)

9. Water of crystallization in Soda ash and washing soda is respectively.

(1) 0,10 (2) 10,0

(3) 0,0 (4) 0,1

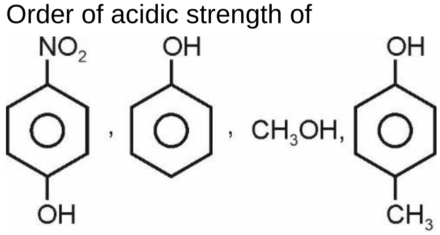
Answer (1)

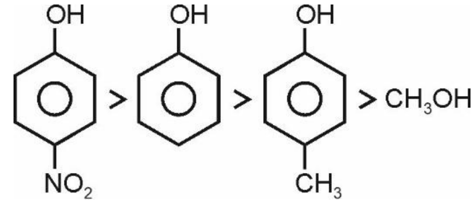
Sol. Soda ash is Na_2CO_3

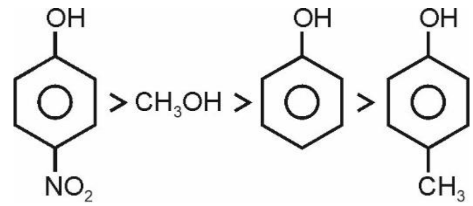
Washing soda is $Na_2CO_3.10H_2O$.

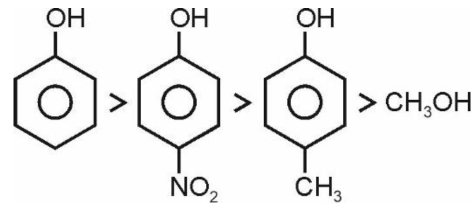
Therefore correct answer is 0,10.

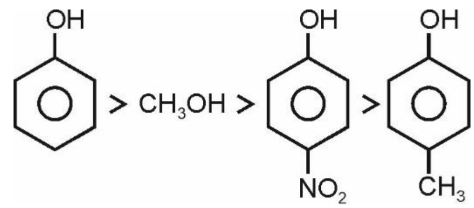
10. Order of acidic strength of



(1) 

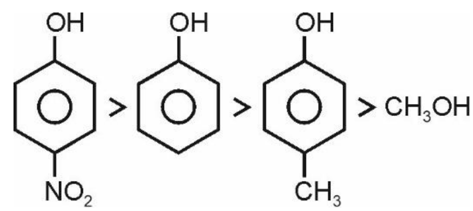
(2) 

(3) 

(4) 

Answer (1)

Sol. Correct order is



11. What process is used to make soap from fat?

(1) Saponification

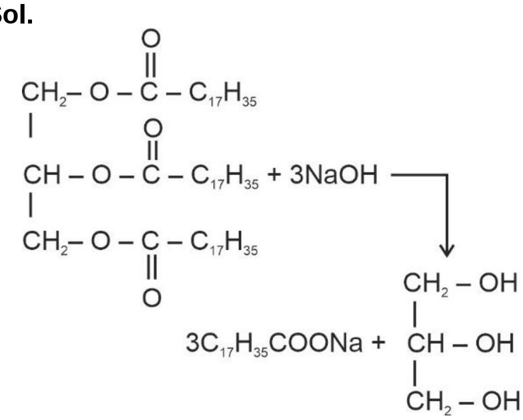
(2) Electrolysis

(3) Solvay process

(4) Haber process

Answer (1)

Sol.



12. **Assertion:** Higher energy is required for the conversion of Mg to Mg^{2-} than that for Mg to Mg^{-}.
Reason: Mg^{2-} has very small size and more charge.
(1) Both Assertion and Reason are correct and Reason is the correct explanation of Assertion
(2) Both Assertion and Reason are correct but Reason is not the correct explanation of Assertion
(3) Assertion is correct but Reason is incorrect
(4) Assertion is incorrect but Reason is correct

Answer (3)

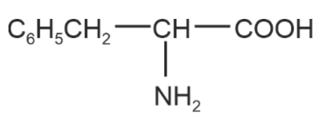
Sol. Since Mg^{2-} has higher charge density than Mg^{-}, then interelectronic repulsion will be higher in case of Mg^{2-} as compared to Mg^{-}.

Hence, higher energy is required for the conversion of Mg to Mg^{2-} than that of Mg to Mg^{-}.

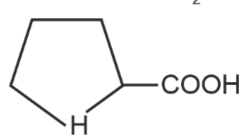
13. An unknown organic compound is heated with fuming HNO_3. The reaction mixture is treated with aq $BaCl_2$ solution which gives white precipitate. Identify the unknown organic compound.
(1) Phenylalanine (2) Proline
(3) Cysteine (4) Valine

Answer (3)

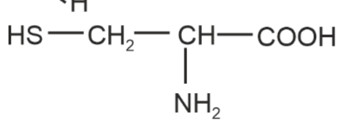
Sol. The unknown organic compound contains S-atom which gets oxidised by fuming HNO_3 to SO_4^{2-} ions. Addition of aq $BaCl_2$ gives white precipitate of $BaSO_4$. Among the given compounds only cysteine has S-atom.



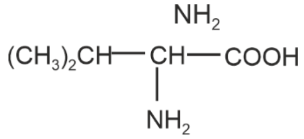
Phenylalanine



Proline



Cysteine



Valine

14. Following two columns are provided

	Column-I (Complex)		Column-II (CFSE)
a.	$[Ti(H_2O)_6]^{2+}$	(i)	$-1.2\ \Delta_0$
b.	$[V(H_2O)_6]^{2+}$	(ii)	$-0.6\ \Delta_0$
c.	$[Mn(H_2O)_6]^{3+}$	(iii)	0
d.	$[Fe(H_2O)_6]^{3+}$	(iv)	$-0.8\ \Delta_0$

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

Answer (1)

Sol. CFSE = $-\frac{2}{5}\Delta_0(t_{2g}\text{ electrons}) + \frac{3}{5}\Delta_0\ (e_g\text{ electrons})$

15.
16.
17.
18.
19.
20.

SECTION - B

Numerical Value Type Questions: This section contains 10 questions. In Section B, attempt any five questions out of 10. The answer to each question is a **NUMERICAL VALUE.** For each question, enter the correct numerical value (in decimal notation, truncated/rounded-off to the second decimal place; e.g., 06.25, 07.00, –00.33, –00.30, 30.27, –27.30) using the mouse and the on-screen virtual numeric keypad in the place designated to enter the answer.

21. For a metal ion, μ = 4.9 B.M. Find out number of unpaired electrons

Answer (04.00)

Sol. $\sqrt{(n)(n+2)} = 4.92$

$(n)(n + 2) = 24$

$n = 4$

22. Find out difference in oxidation state of Xe in completely Hydrolysed form of XeF_4 and XeF_6

Answer (00.00)

Sol. $XeF_6 + 3H_2O \xrightarrow[\text{Hydrolysis}]{\text{Complete}} \underset{(+6)}{XeO_3} + 6HF$

$XeF_4 + H_2O \xrightarrow[\text{Hydrolysis}]{\text{Complete}} \underset{(+6)}{XeO_3} + Xe + O_2 + HF$

23. NH_3, NO, N_2, F_2, CO, CO_2, H_2O, and XeF_4

Fill the number of above molecules having only two lone pair of electrons.

Answer (3)

Sol. These are N_2, CO and H_2O.

24. How many electrons are gained by $MnO_4^{\ominus}$ in strongly alkaline medium?

Answer (1)

Sol. $MnO_4^{\ominus}$ gains one electron to form MnO_4^{-2} in strongly alkaline medium.

25. Consider a reaction at equilibrium

$$\underset{(g)}{A} \rightleftharpoons \underset{(g)}{2B} + \underset{(g)}{C}$$

If final pressure at equilibrium is 1 atm & $k_p = \frac{1}{27}$, then % dissociation of A will be (consider $1 - \alpha \approx 1$) (nearest integer)

Answer (21)

Sol. A(g) $\rightleftharpoons$ 2B(g) + C(g)

P	---	---
$P(1-\alpha)$	$2P\alpha$	$P\alpha$

$\therefore P_{total} = P(1 + 2\alpha)$

$$k_p = \frac{(4P^2\alpha^2)P\alpha}{P(1-\alpha)} = \frac{4P^2\alpha^3}{1-\alpha}$$

$$k_P = \frac{4P_T^2\alpha^3}{(1-\alpha)(1+2\alpha)^2}$$

$$\frac{1}{27} = \frac{4P_T^2\alpha^3}{1}$$

$$P_T^2\alpha^3 = \frac{1}{108}$$

$$\alpha^3 = \frac{1}{108}$$

$$\alpha = \left(\frac{1}{108}\right)^{1/3} \times 100$$

$$= \frac{100}{4.762}$$

$\alpha \simeq 21$

26. 0.02 M CH_3COOH has specific conductance, K = 5 × 10^{-5} S cm^{-1}. Also given limiting molar conductance of CH_3COOH is 400 S cm^2 mol^{-1}.

Therefore, K_a for CH_3COOH is_____× 10^{-7} M

Answer (8)

Sol. $CH_3COOH \rightleftharpoons CH_3COO^{\ominus} + H^{\oplus}$

$$\Lambda_m = \frac{K \times 1000}{M} = \frac{5 \times 10^{-5} \times 10^3}{2 \times 10^{-2}}$$

$= 2.5$

$$\alpha = \frac{\Lambda_m}{\Lambda_{m^\circ}} = \frac{2.5}{400}$$

$$\therefore K = \frac{C\alpha^2}{1-\alpha}$$

$$= \frac{0.02 \times \left(\frac{2.5}{400}\right)^2}{1 - \frac{2.5}{400}}$$

$$= \frac{7.8125 \times 10^{-7}}{0.99375}$$

$\simeq 7.861 \times 10^{-7}$

$K_a \simeq 8 \times 10^{-7}$ M

27. For a first-order reaction, if the value of $t_{1/2}$ is T, then the value of $t_{7/8}$ will be_____ T.

Answer (3)

Sol. $t_{7/8}$ means 3 half lives.

$\therefore \quad t_{7/8} = 3T$

28. Number of endothermic reactions among following

(a) $2HCl(g) \longrightarrow H_2(g) + Cl_2(g)$

(b) $H_2O(l) \longrightarrow H_2O(g)$

(c) $C(s) + O_2(g) \longrightarrow CO_2(g)$

(d) Dissolution of NH_4Cl

(e) $I_2(g) \longrightarrow 2I(g)$

Answer (04)

Sol. Burning of carbon is exothermic, all other are endothermic.

29.

30.