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JEE MAIN (APRIL) 2023 (12-04-2023-FN)

Memory Based Question Paper
CHEMISTRY



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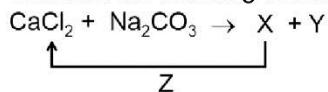
CHEMISTRY

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. Consider the following reaction sequence:



- | | X | Y | Z |
|-----|-------------------|---------------------------|------|
| (1) | CaCO ₃ | NaCl | HCl |
| (2) | CaO | NaCl
+ CO ₂ | KCl |
| (3) | CaO | NaCl
+ CO ₂ | NaCl |
| (4) | CaCO ₃ | NaCl | KCl |

Answer (1)

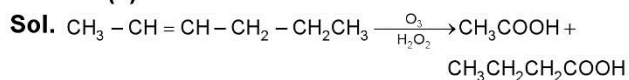


2. Hex-2-ene $\xrightarrow[\text{H}_2\text{O}_2]{\text{O}_3}$ A + B

Product A and B are

- (1) +
- (2) +
- (3) +
- (4) +

Answer (4)



3. Match the columns.

	Column-I (Type of hydride)		Column-II (Formula)
(A)	Electron deficient	(1)	MgH ₂
(B)	Electron precise	(2)	HF
(C)	Electron rich	(3)	CH ₄
(D)	Saline hydride	(4)	B ₂ H ₆

- (1) A → 4; B → 3; C → 1; D → 2
 (2) A → 4; B → 1; C → 3; D → 2
 (3) A → 4; B → 3; C → 2; D → 1
 (4) A → 1; B → 2; C → 3; D → 4

Answer (3)

- Sol.** Electron deficient → B₂H₆
 Electron precise → CH₄
 Electron rich → HF
 Saline hydride → MgH₂

4. Match the Columns

Column-I		Column-II	
A	Biodegradable	P	Polyacronitrile
B	Synthetic	Q	PHBV
C	Natural	R	Dacron
D	Polyester	S	Rubber

- (1) A – Q; B – P; C – S; D – R
 (2) A – Q; B – P; C – R; D – S
 (3) A – P; B – Q; C – S; D – R
 (4) A – Q; B – R; C – S; D – P

Answer (1)

Sol. PHBV is Biodegradable

Dacron is Polyester

5. **Assertion (A)** : 5f electrons can participate in bonding to a greater extent as compared to 4f electrons.

Reason (R) : Both resemble in their angular part of wave function, but 5f is not as buried as 4f orbitals.

- (1) (A) is correct, (R) is correct and (R) is the correct explanation of (A)
 (2) (A) is correct, (R) is correct and (R) is incorrect explanation of (A)
 (3) (A) is correct, (R) is incorrect
 (4) Both (A) and (R) are incorrect

Answer (1)

Sol. Both statements are correct and Reason is correct

[For explanation refer NCERT d & f block Elements]

6. Density of group-1 metal follows the order:

- (1) Li > Na > K > Rb (2) Li > K > Na > Rb
 (3) Rb > K > Na > Li (4) Rb > Na > K > Li

Answer (4)

Sol. $\left. \begin{array}{l} \text{Li} = 0.53 \\ \text{Na} = 0.97 \\ \text{K} = 0.86 \\ \text{Rb} = 1.53 \end{array} \right\}$ all in gm/cc

7. Critical temperature of A, B, C & D are 5.3, 20.3, 128.5, 166.5. Then order of adsorption is

- (1) $A > B > C > D$ (2) $D > C > B > A$
 (3) $C > D > A > B$ (4) $B > A > C > D$

Answer (2)

Sol. Higher is critical temperature more readily gas is liquified, means more are forces of attraction. Thus more readily gas will be adsorbed.

8. Molality of MgCl_2 is 1m ($\alpha = 80\%$)

Calculate vapour pressure of solution (in torr), if vapour pressure of pure solvent is 100 torr.

- (1) 95.53 (2) 78.23
 (3) 68.12 (4) 98.26

Answer (1)

Sol. $\frac{P^\circ - P_s}{P_s} = \frac{i \cdot n_A}{n_B}$

$$\frac{100 - P_s}{P_s} = (1 + 2\alpha) \times \frac{18}{1000}$$

$$= \frac{2.6 \times 18}{1000}$$

$$100 - P_s = 0.0468 P_s$$

$$\Rightarrow P_s = 95.53 \text{ torr}$$

9. **Assertion A** : Boron is hardest element in group-13.

Reason R : High lattice enthalpy due to strong crystalline lattice.

- (1) Both A and R are correct and R is correct explanation of Assertion
 (2) Both A and R are correct but R is not correct explanation
 (3) A is correct but R is wrong statement
 (4) Both A and R are correct

Answer (1)

Sol. Due to very strong crystalline lattice Boron has unusually high M.P.

10. Bond order and magnetic property of acetylide is similar to

- (1) NO^+ (2) NO^-
 (3) O_2^+ (4) O_2^-

Answer (1)

Sol. $\text{HC} \equiv \text{C}^\ominus$ Bond order = 3

NO^+ also have bond order equal to 3.

11. Statement 1: In Ellingham diagram the change in slope for Mg to MgO reaction occurs at 1120°C .

Statement 2: Sudden change in entropy also occurs at 1120°C .

- (1) Both statements are correct
 (2) Both statements are incorrect
 (3) Statement 1 is correct but statement 2 is incorrect
 (4) Statement 1 is incorrect but statement 2 is correct

Answer (1)

Sol. Both statements are correct.

Reference: NCERT

12. A gas with MW = 42 AMU will have same RMS velocity (at 27°C) as that of V_{rms} of which gas at 27°C

- (1) CO_2 (2) CO
 (3) N_2O (4) NO_2

Answer (2)

Sol. $\sqrt{\frac{3}{42}} = \sqrt{\frac{2}{\text{MW}}}$

$$\Rightarrow \text{MW} = 28 \Rightarrow \text{CO gas}$$

13. A 12.5 eV electron beam is used to bombard gaseous hydrogen at room temperature. Calculate the total no. of spectral lines when electrons return to ground state

- (1) 3 (2) 2
 (3) 4 (4) 1

Answer (1)

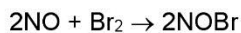
Sol. $E_3 = \frac{-13.6}{9} = -1.5 \text{ eV}$

$E_1 = -13.6 \text{ eV}$

$E_3 - E_1 = 12.09 \text{ eV}$

Hence, total spectral lines. $= \frac{2(3)}{2} = 3$

14. Following reaction is taking place :



(1) 01

(2) 02

(3) 03

(4) 04

Answer (3)

Sol. $r = k_3[\text{NOBr}_2][\text{NO}]$

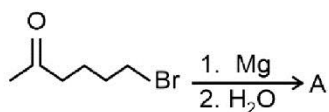
$[\text{NOBr}_2] = k_{eq} [\text{NO}][\text{Br}_2]$

$r = k_3[\text{NO}][\text{Br}_2] k_{eq} [\text{NO}]$

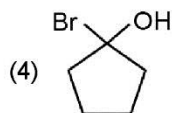
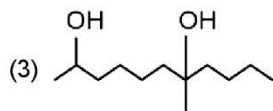
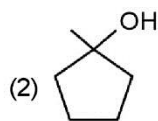
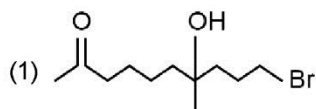
$r = k_3 \cdot k_{eq} [\text{NO}]^2 [\text{Br}_2]^1$

order = 3

15. Consider the following reaction

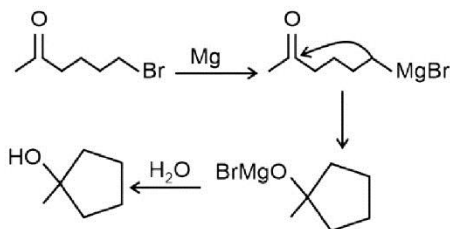


A is



Answer (2)

Sol.



16. Select correct statements about lead storage battery:

(1) PbSO_4 converts into PbO_2 at anode during discharging

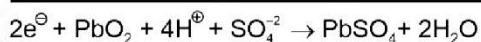
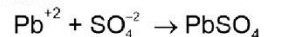
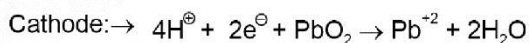
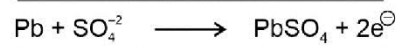
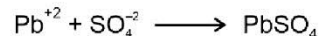
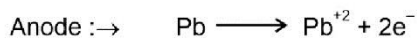
(2) PbSO_4 converts into PbO_2 at cathode during discharge

(3) 38% H_2SO_4 solution is taken as the electrolyte

(4) H_2SO_4 is produced during discharging

Answer (3)

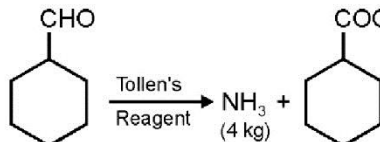
Sol.



net reaction during discharging:-



17.



Calculate mass of Tollen's Reagent Required?

(1) 18.70 kg

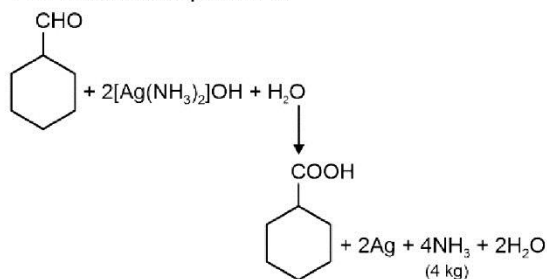
(2) 37.40 kg

(3) 9.35 kg

(4) 55.10 kg

Answer (1)

Sol. The balanced equation is



$$\text{No. of moles of NH}_3 \text{ formed} = \frac{4 \times 10^3}{17}$$

$$\therefore \text{No. of moles of tollens's reagent consumed} = \frac{2 \times 10^3}{17}$$

$$\text{So mass of tollens's reagent} = \frac{2 \times 10^3}{17} \times 159$$

$$= 18.70 \text{ kg}$$

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. pH of 1 litre HCl solution is 1.0. How much water is added to make pH 2.

Answer (09.00)

$$\text{Sol. } (10^{-1})(1) = (10^{-2})(V_2)$$

$$V_2 = 10 \text{ lit}$$

$$\text{Water added} = (10 - 1)$$

$$= 9 \text{ lit}$$

22. Given $P_1 = 3 \text{ atm}$

$$V_{\text{initial}} = 2 \text{ L}$$

$$V_{\text{final}} = 3 \text{ L}$$

$$T = 350 \text{ K}$$

If isothermal reversible process is carried out, calculate ΔS for system (in Joules)

Answer (0.72)

$$\text{Sol. } \Delta S = 1 \times R \ln \left(\frac{V_2}{V_1} \right)$$

$$= R \ln \frac{3}{2}$$

$$= \frac{P_1 V_1}{T} \ln \frac{3}{2}$$

$$= \frac{6}{350} \ln \frac{3}{2}$$

$$= 4 \times (0.48 - 0.30)$$

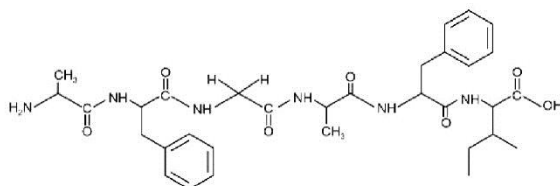
$$= 0.72 \text{ J}$$

23. The number of sp^2 hybridized carbon atoms in the following peptide is

Ala – Phe – Gly – Ala – Phe – Ley

Answer (18)

Sol.



24. How many of the given metals will show photoelectric effect when light of 400 nm falls on below metal?

Metal	Li	Na	K	Mg	Cu	Ag
W(eV)	2.42	2.3	2.25	3.7	4.8	4.3

Answer (03.00)

$$\text{Sol. } E_{\text{photon}} = \frac{12400}{4000} = 3.1 \text{ eV}$$

Metals Li; Na; K will show photoelectric effect.

25. A metal chloride contains 55% by mass of chlorine. 100 mL of vapours gives 0.57 gm of chlorine at STP. Calculate the molecular mass of metal chloride. (Nearest integer)

Answer (232.00)

$$\text{Sol. } \frac{(1) \times MW}{(R) \times (273)} = \frac{.57}{(.1)} \times \frac{100}{55}$$

$$MW = 232.28 (\approx 232)$$

26.

27.

28.

29.

30.