

QUESTIONS & SOLUTIONS

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 27 JANUARY, 2024

 03:00 PM to 06:00 PM

SHIFT - 2

Duration : 3 Hours

Maximum Marks : 300

SUBJECT - CHEMISTRY

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CHEMISTRY

1. For 1st order reaction, time required for 99.9% completion is :

- (1) $2t_{1/2}$ (2) $4t_{1/2}$ (3) $5t_{1/2}$ (4) $10t_{1/2}$

Ans. (4)

Sol.
$$\frac{t_{99.9\%}}{t_{1/2}} = \frac{\frac{1}{k} \ln\left(\frac{100}{100-99.9}\right)}{\frac{1}{k} \ln 2} = \frac{\ln(10^3)}{\ln 2} = \frac{3}{0.3} = 10$$

$t_{99.9\%} = 10t_{1/2}$

2. Number of non polar molecules among following are :

HF, H₂O, CO₂, NH₃, SO₂, H₂, CH₄, BF₃

Ans. (4)

Sol. CO₂, H₂, CH₄, BF₃

3. 3M NaOH solution is to be prepared using 84 g NaOH, then the volume of solution in litre is _____ × 10⁻¹

Ans. (7)

Sol. $3 = \frac{84 / 40}{V_{\text{sol(L)}}}$

∴ V_{solution} = 0.7 L

4. Select **incorrect** match :

- (1) Haber process : Fe
 (2) Polythene : Ziegler-Natta catalyst [Al₂(CH₃)₆ + TiCl₄]
 (3) Wacker's process : PtCl₂
 (4) Photography : AgBr

Ans. (3)

Sol. Wacker's process : PdCl₂

5. 1 mole PbS is oxidised by x mole O₃ liberating y mole O₂.

Determine (x + y).

Ans. (8)

Sol. $\text{PbS} + 4\text{O}_3 \longrightarrow \text{PbSO}_4 + 4\text{O}_2$

x = 4 ; y = 4

6. Spin only magnetic moment of [Pt(NH₃)₂Cl(CH₃NH₂)]Cl is :

Ans. (0)

Sol. $\text{Pt}^{+2} : 5d^8 \Rightarrow dsp^2$ & unpaired $e^- = 0 \Rightarrow$ Magnetic moment = 0

7. **S-1:** Formation of Ce⁴⁺ is favoured by inert gas configuration.

S-2: Ce⁴⁺ acts as strong oxidising agent & converts to Ce³⁺.

Ans. Both S-1 & S-2 are correct.

8. Which of the following can't act as oxidising agent ?

(1) MnO₄⁻ (2) N³⁻ (3) BrO₃⁻ (4) SO₄²⁻

Ans. (2)

Sol. In N³⁻, nitrogen is present in minimum O.N. & hence it cannot act as oxidising agent.

9. The quantity which changes with temperature is:

(1) Molarity (2) Molality (3) Mole fraction (4) Mass %

Ans. (1)

Sol. Quantities involving volume are temperature dependent.

10. Reduction potential of hydrogen electrode at pH = 3 is.....

$$\left(\frac{2.303RT}{F} = 0.059 \right)$$

Ans. (-0.177 volt)

Sol. $\text{H}^+ (\text{aq}) + e^- \longrightarrow \frac{1}{2} \text{H}_2(\text{g})$

$$\text{R.P.} = -\frac{0.059}{1} \log \left(\frac{1}{\text{H}^+} \right) = -0.059 \log(10^{-3})$$

$$= -0.059 \times 3 = -0.177 \text{ volt}$$

11. Identify the species in which central atom is in d^2sp^3 hybridisation :

- (1) SF_6 (2) BrF_5 (3) $[PtCl_4]^{2-}$ (4) $[Co(NH_3)_6]^{3+}$

Ans. (4)

Sol. SF_6 : sp^3d^2
 BrF_5 : sp^3d^2
 $[PtCl_4]^{2-}$: dsp^2
 $[Co(NH_3)_6]^{3+}$: d^2sp^3

12. $\Delta H^\circ = +77.2$ kJ, $\Delta S^\circ = 122$ J/mol-K, $T = 300$ K, $\log K = ?$

Ans. (-7.07)

Sol. $\Delta G^\circ = -2.303RT \log k$

$$77.2 - \frac{300 \times 122}{1000} = \frac{-2.303 \times 8.314 \times 300 \log K}{1000}$$

$$\therefore \log K = -7.07$$

13. In group 16

Statement-I : Oxygen shows only -2 oxidation state.

Statement-II : On moving top to bottom, stability of $+4$ oxidation state decreases, whereas that of $+6$ oxidation state increases.

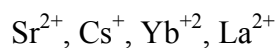
- (1) Both Statement I and Statement II are correct.
 (2) Both Statement I and Statement II are incorrect.
 (3) Statement I is correct but Statement II is incorrect.
 (4) Statement I is incorrect but Statement II is correct.

Ans. (2)

Sol. **Statement-I** : Since electronegativity of oxygen is very high, it shows only negative oxidation state as -2 except in the case of OF_2 where its oxidation state is $+2$.

Statement-II : The stability of $+6$ oxidation state decreases down the group and stability of $+4$ oxidation state increases (inert pair effect).

14. How many of following has/have noble gas configuration ?



Ans. (2)

Sol. (Sr^{2+} , Cs^+)

15. Which of the following has d^{10} configuration ?

(1) Cr, Cd, Cu, Ag

(2) Cd, Cr, Ag, Zn

(3) Ag, Cr, Cu, Zn

(4) Cu, Cd, Zn, Ag

Ans. (4)

Sol. Cr : $[\text{Ar}] 3d^5 4s^1$

Cu : $[\text{Ar}] 3d^{10} 4s^1$

Ag : $[\text{Kr}] 4d^{10} 5s^1$

Zn : $[\text{Ar}] 3d^{10} 4s^2$

Cd : $[\text{Kr}] 4d^{10} 5s^2$

16. Which of the following is used to identify the phenolic group test?

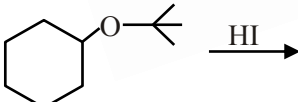
(1) Carbylamine test

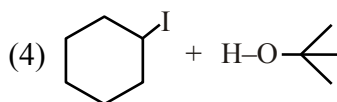
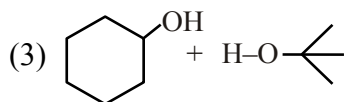
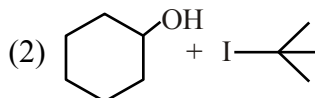
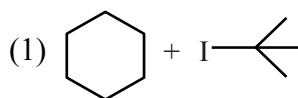
(2) Lucas test

(3) Tollen's test

(4) Phthalein dye test

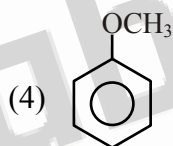
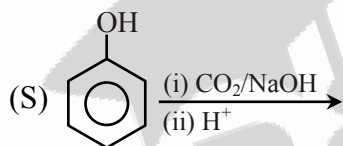
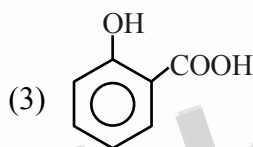
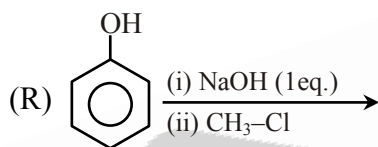
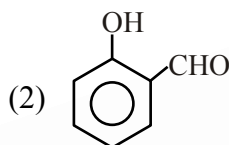
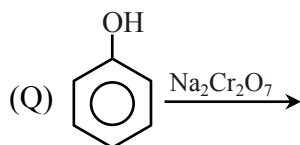
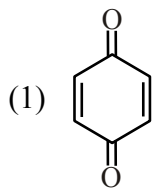
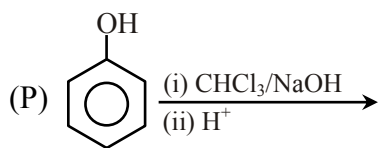
Ans. (4)

17.  $\xrightarrow{\text{HI}}$ Product is :



Ans. (2)

18. Match the column



Ans. (P) – (2) ; (Q) – (1) ; (R) – (4) ; (S) – (3)

19. When egg is boiled then which of the following structure of protein remains intact?

- (1) Quaternary structure (2) Primary structure
(3) Secondary structure (4) Tertiary structure

Ans. (2)

20. Which of the following compound will not give S_N1 reaction?

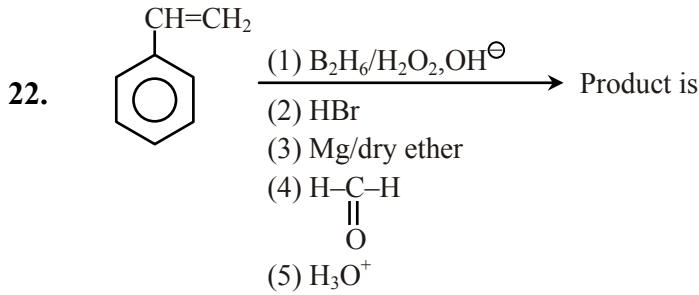
- (1) CH2=CH-CH2Cl (2) Ph-CH2-Cl
(3) C(C)C(Cl) (4) CH3-CH=CH-Cl

Ans. (4)

21. The second homologue of monocarboxylic acid is

- (1) HCOOH (2) CH3COOH (3) CH3CH2COOH (4) CH3CH2CH2-COOH

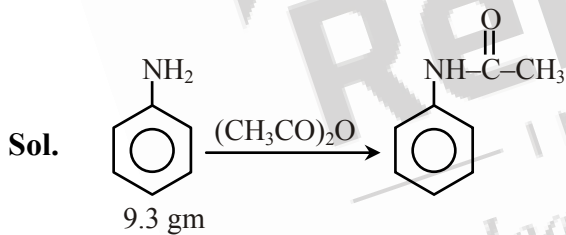
Ans. (2)



- (1)  (2) $\text{Ph}-\text{CH}_2-\text{CH}_2-\text{CH}_2-\text{OH}$
 (3) $\text{Ph}-\text{CH}_2-\text{CH}_2-\text{O}-\text{CH}_3$ (4) 

Ans. (1)

23. When 9.3 gm of aniline is reacted with acetic anhydride then mass of acetanilide formed is [X] gm. Report your answer as 10X.



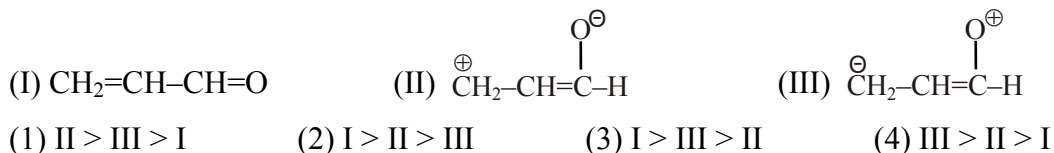
$$\text{Mole of Aniline} = \frac{9.3}{93} = 0.1$$

$$\text{Mole of acetanilide} = 0.1$$

$$\text{Mass of acetanilide} = 0.1 \times 135 = 13.5 \text{ gm}$$

$$10x = 13.5 \times 10 = 135 \text{ gm}$$

24. The correct stability order of following resonating structures is

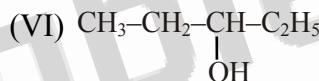
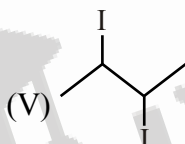
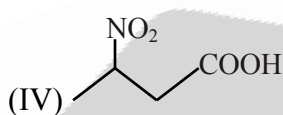
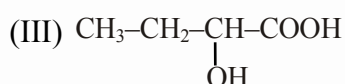
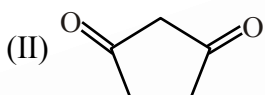
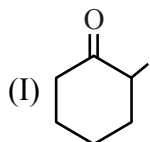


Ans. (2)

25. Steam volatile and water immiscible substances are separated by
- (1) Steam distillation (2) Fractional distillation under reduced pressure
(3) Fractional distillation (4) Distillation.

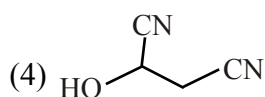
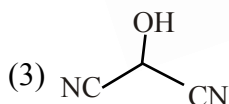
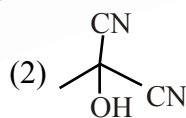
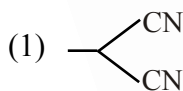
Ans. (1)

26. How many of the following compounds contain chiral centre ?



Ans. 4 (I, III, IV, V)

27. The bond line representation of following compound is CH(OH)(CN)_2



Ans. (3)

SATYAM CHAKRAVORTY

(Classroom) →→

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