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(for students moving from XI to XII)

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(for students moving from IX to X)

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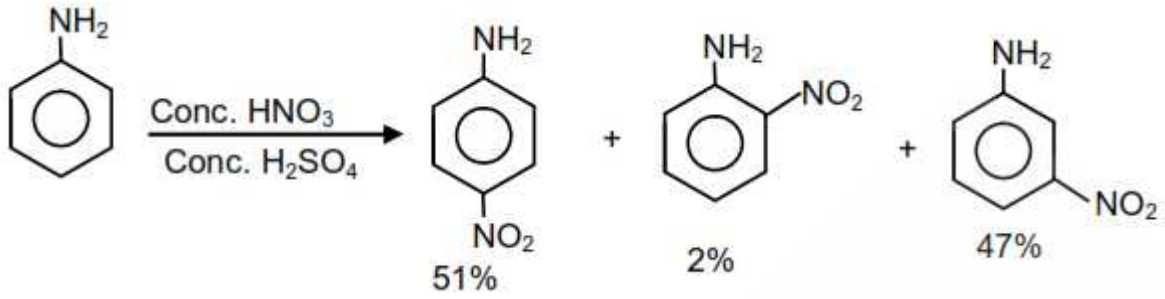
JEE-MAIN-2021

FEBRUARY ATTEMPT

24.02.21_SHIFT-1

CHEMISTRY

1. What is the reason for the formation of meta product in the following reaction?



1) Aniline is ortho/para directing

2) Aniline is meta directing

3) In acidic medium, aniline is converted into anilinium ion which is ortho/para directing

*4) In acidic medium, aniline is converted into anilinium ion which is meta directing

Sol: In acidic medium, aniline is converted into anilinium ion which is meta directing.

2. Arrange the following in the correct order of ionisation potential Mg, Al, Si, P, S

*1) Al < Mg < Si < S < P

2) Mg <Al < Si < S < P

3) Al < Mg < Si < P < S

4) Mg < Al < Si < P < S

Sol; Theory

3. S-1: Colourless cupric metaborate is converted into cuprous metaborate in luminous flame.

S-2: Cuprous metaborate is formed by reacting copper sulphate with boric anhydride heated in non luminous flame.

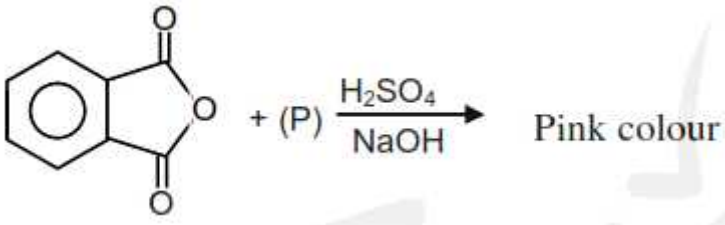
1) S_1 is true and S_2 is false

2) S_1 is false and S_2 is true

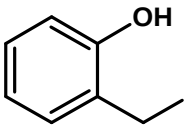
*3) Both are false

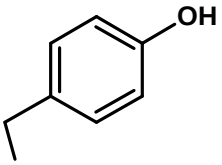
4) Both are true.

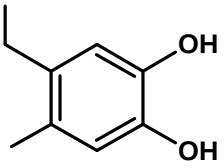
4.

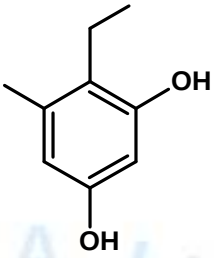


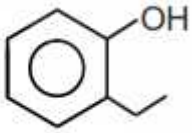
Missing reagent (P) is

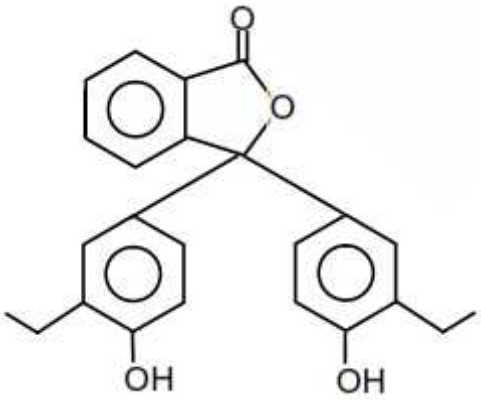
*1) 

2) 

3) 

4) 

Sol: P is 



5. The gas evolved due to anaerobic degradation of vegetation causes?

*1) Global warming and caner 2) Acid rain

3) Ozone hole 4) Metal corrosion

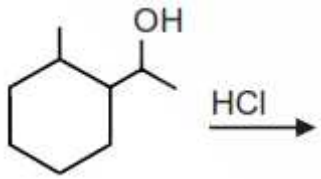
Sol: The gas CH_4 evolved due to anaerobic degradation of vegetation which causes global warming and caner.

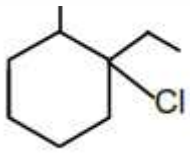
6. Match the column

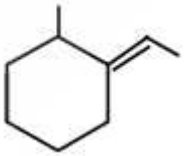
(i) Caprolactum	a) Neoprene
(ii) Acrylo nitrile	b) Buna N
(iii) 2-chlorobuta-1, 3-diene	c) Nyolon-6
(iv) 2-Methylbuta-1, 3-diene	d) Natural rubber

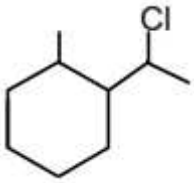
1) i-b; ii-c; iii-a; iv-d
2) i-a; ii-c; iii-b; iv-d
*3) i-c; ii-b; iii-a; iv-d
4) i-c; ii-a; iii-b; iv-d

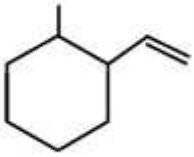
7. What is the major product of the following reaction?



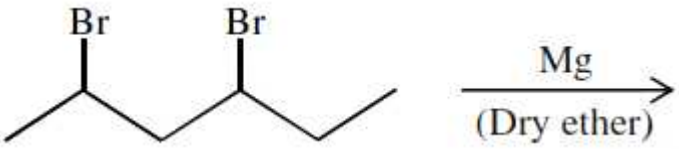
*1) 

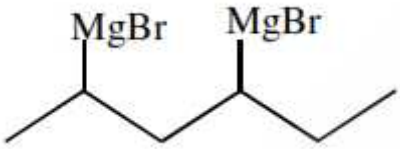
2) 

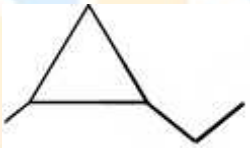
3) 

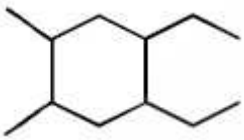
4) 

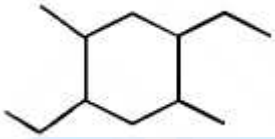
8. Identify the major product?

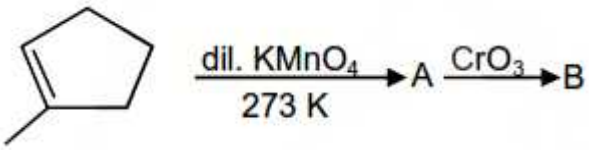


1) 

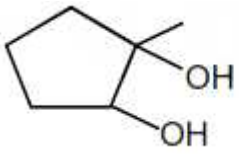
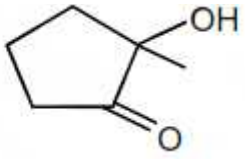
*2) 

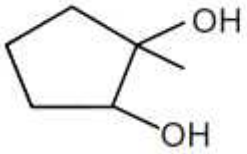
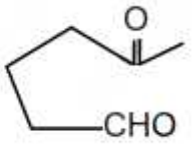
3) 

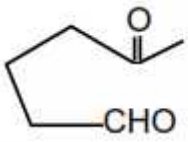
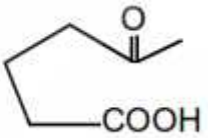
4) 

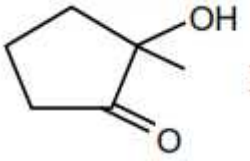
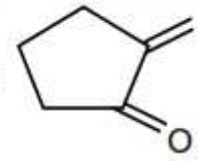
9. 

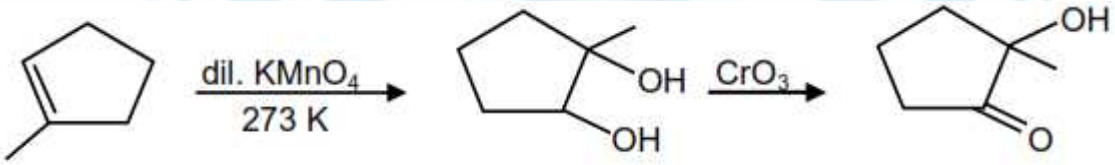
Product A and B are?

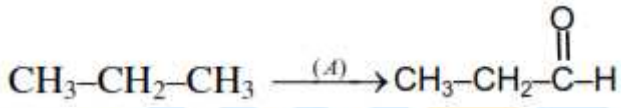
*1) A =  B = 

2) A =  B = 

3) A =  B = 

4) A =  B = 

Sol: 

10. 

Which reagent (A) is used for following given conversion?

1) $Cu / \Delta /$ high pressure *2) molybdenum oxide

3) Manganese acetate 4) Potassium permanganate

11. Which force is responsible for the stacking of α – helix structure of protein?

*1) H-bonding 2) Ionic bonding 3) Covalent bond 4) Vanderwal forces

Sol: Hydrogen bond is responsible for the stacking of α – helix structure of protein.

12. Which of the following ores are concentrated by cyanide of group Ist element?

*a) Sphalerite 2) Malachite 3) Calamine 4) Siderite

13. (1) $I_2 + H_2O_2 + 2OH^- \longrightarrow 2I^- + 2H_2O + O_2$

(2) $H_2O_2 + HOCl \longrightarrow Cl^- + H_3O^+ + O_2$

1) H_2O_2 is acting as oxidising agent in both the reaction

*2) H_2O_2 is acting as reducing agent in both the reaction

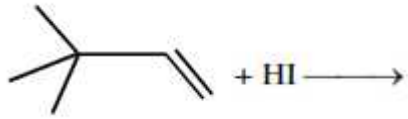
3) H_2O_2 is acting as oxidising agent in reaction (1) and as reducing agent in reaction (2)

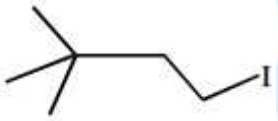
4) H_2O_2 is acting as reducing agent in reaction (1) and as oxidising agent in reaction (2)

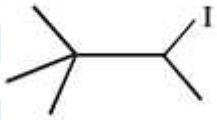
14. $E^{o}_{M^{2+}/M}$ has positive value for which of the element of 3d transition series.

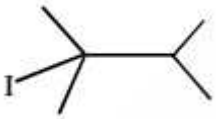
1) Zn *2) Cu 3) Ni 4) Co

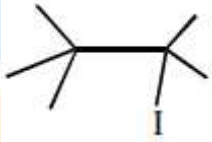
15. What is the major product of following reaction?



1) 

2) 

*3) 

4) 

16. $Al + NaOH \longrightarrow X \xrightarrow{Y_{(g)}} Z$

Identify X, Y, Z in the above reaction sequence

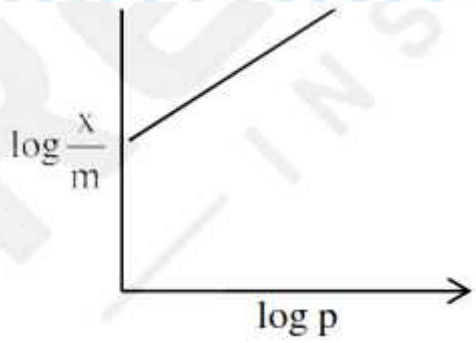
*1) $X = Na[Al(OH)_4]$ $Y = CO_2$ $Z = Al_2O_3.xH_2O$

2) $X = Na[Al(OH)_4]$ $Y = SO_2$ $Z = Al_2O_3.xH_2O$

3) $X = Al(OH)_3$ $Y = CO_2$ $Z = Al_2O_3$

4) $Al(OH)_3$ $Y = SO_2$ $Z = Al_2O_3$

17. The slope of the straight line given in the following diagram for adsorption is



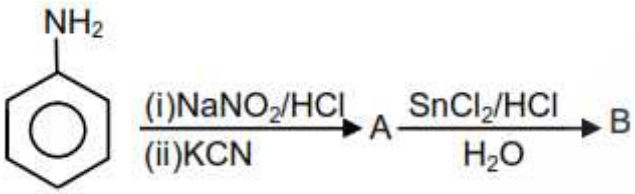
*1) $\frac{1}{n}$(0 to 1) 2) $\frac{1}{n}$(0.1 to 0.5) 3) log n 4) $\log\frac{1}{n}$

Sol; Slope $= \frac{1}{n} (0 \text{ to } 1)$

18. Composition of gun metal is

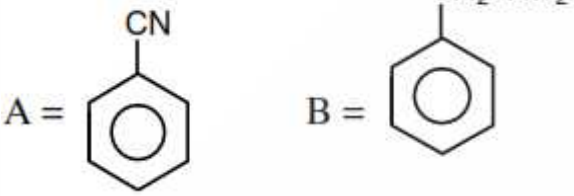
*1) Cu, Zn, Sn 2) Al, Mg, Mn, Cu 3) Cu, Ni, Fe 4) Cu, Sn, Fe

19.



Find A and B

1)



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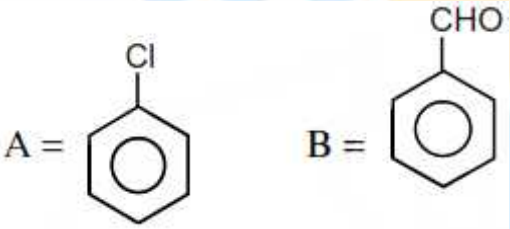
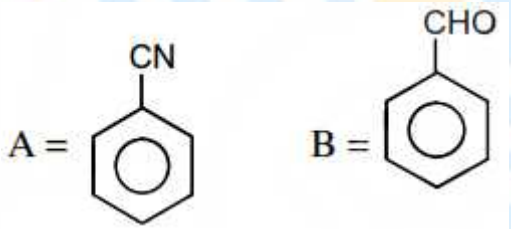
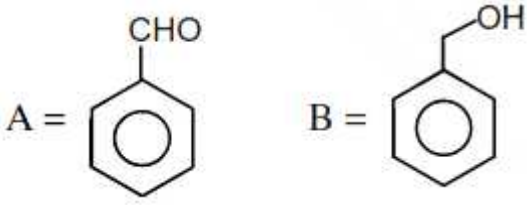


*3)



4)



20. Which of the following have both the compound isostructural?

(A) $TiCl_4, SiCl_4$ (B) SO_4^{2-}, CrO_4^{2-} (C) NH_3, NO_3^- (D) ClF_3, BCl_3

1) A, B 2) A, C 3) B, C 4) A, D

21. $Cl_{2(g)} \rightleftharpoons 2Cl_{(g)}$

For the given reaction at equilibrium moles of $Cl_{2(g)}$ is equal to the moles of $Cl_{(g)}$ and equilibrium pressure is 1 atm. If K_p of this reaction is $x \times 10^{-1}$. Find x

Ans: 5

Sol: $Cl_2 \rightleftharpoons 2Cl$

Moles x x

At eqn

P.P. $\frac{1}{2}$ $\frac{1}{2}$

$$K_P = \frac{P_{Cl}^2}{P_{Cl_2}}$$

$$= \frac{\left(\frac{1}{2}\right)^2}{\frac{1}{2}} = \frac{1}{2} = 0.5$$

$$= 5 \times 10^{-1}$$

$$x = 5$$

22. $S_8 + bOH^- \longrightarrow cS^{2-} + dS_2O_3^{2-} + 6H_2O$

Find the value of c.

Ans: 4

Sol: $S_8 + 12OH^- \longrightarrow 4S^{2-} + 2S_2O_3^{2-} + 6H_2O + 6H_2O$

23. Calculate time taken in seconds for 40% completion of first order reaction if rate constant is $3.3 \times 10^{-4}\ sec^{-1}$.

Ans: 1535.3

Sol: $t = \frac{2.303}{K} \log \frac{100}{100 - x}$

$$= \frac{2.303}{3.3 \times 10^{-4}} \log \frac{100}{100 - 40}$$

$$= \frac{2.303}{3.3 \times 10^{-4}} \times 0.22$$

$= 1535.3 \text{sec}$.

24. For a chemical reaction K_{eq} is 100 at 300 K, the value of $\Delta_r G°$ is –xR Joule at 1 tm pressure. Find the value of x. (Use ln 10 = 2.3)

Ans: 1380

Sol: $\Delta_r G° = -RT \ln K_{eq}$

$= -R \times 300 \times 2 \times 2.3$

$= -1380 \text{ R}$

25. $Cu^{2+} + NH_3 \rightleftharpoons [Cu(NH_3)]^{2+}$ $\quad K_1 = 10^4$

$[Cu(NH_3)]^{2+} + NH_3 \rightleftharpoons [Cu(NH_3)_2]^{2+}$ $\quad K_2 = 1.58 \times 10^3$

$[Cu(NH_3)_2]^{2+} + NH_3 \rightleftharpoons [Cu(NH_3)_3]^{2+}$ $\quad K_3 = 5 \times 10^2$

$[Cu(NH_3)_3]^{2+} + NH_3 \rightleftharpoons [Cu(NH_3)_4]^{2+}$ $\quad K_4 = 10^2$

Dissociation constant of $[Cu(NH_3)_4]^{2+}$ is $x \times 10^{-12}$. Determine x

Ans: 1.26 9Nearest integer = 1)

Sol: $[Cu(NH_3)_4]^{2+} \rightleftharpoons Cu^{2+} + 4NH_3$

$$K = \frac{1}{K_1 K_2 K_3 K_4} = \frac{1}{10^4 \times 1.58 \times 10^3 \times 5 \times 10^2 \times 10^2}$$

$= 1.26 \times 10^{-12} = 1.26$

26. 9.45 g of $CH_2ClCOOH$ is dissolved in 500 ml of H_2O and depression in freezing point of solution is $0.5°C$.

Find percentage dissociation.

$(K_f)_{H_2O} = 1.86 \text{ k kg mole}^{-1}$

Ans: 7.5

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

$$0.5 = (1+\alpha) \times 1.86 \times \frac{9.45 \times 1000}{94.5 \times 500}$$

$\Rightarrow (1+\alpha) = 1.075$

$\Rightarrow \alpha = 0.075$

$\Rightarrow \alpha = 7.5\%$

27. What is the coordination number of Body centered cubic (BCC) arrangement of identical particles

Ans: 8

Sol: Theory

28. Among the following compounds how many are amphoteric in nature

$Be(OH)_2, BeO, Ba(OH)_2, Sr(OH)_2$

Ans: 2

Sol: $Be(OH)_2, BeO$

29. 4.5 gm of solute having molar mass of 90 gm/mol is dissolved in water to make 250 ml solution. Calculate molarity of the solution

Ans: 0.2

Sol: $M = \frac{n}{V} = \frac{4.5/90}{250/1000} = 0.2$

30. Mass of Li^{3+} is 8.33 times mass of proton Li^{3+} and proton are accelerated through same potential difference. Then ratio of de Broglie's wavelength of Li^{3+} to proton is $x \times 10^{-1}$. Find x

Ans: 2

Sol: $\lambda_{DB} \alpha \frac{1}{\sqrt{m.K.E.}}$

$$\frac{\lambda_{Li^{3+}}}{\lambda_P} = \sqrt{\frac{m_p \times e_p V}{8.33 m_P \times 3 e_P V}}$$

$$\sqrt{\frac{1}{25}} = \frac{1}{5} = 0.2 = 2 \times 10^{-1}$$