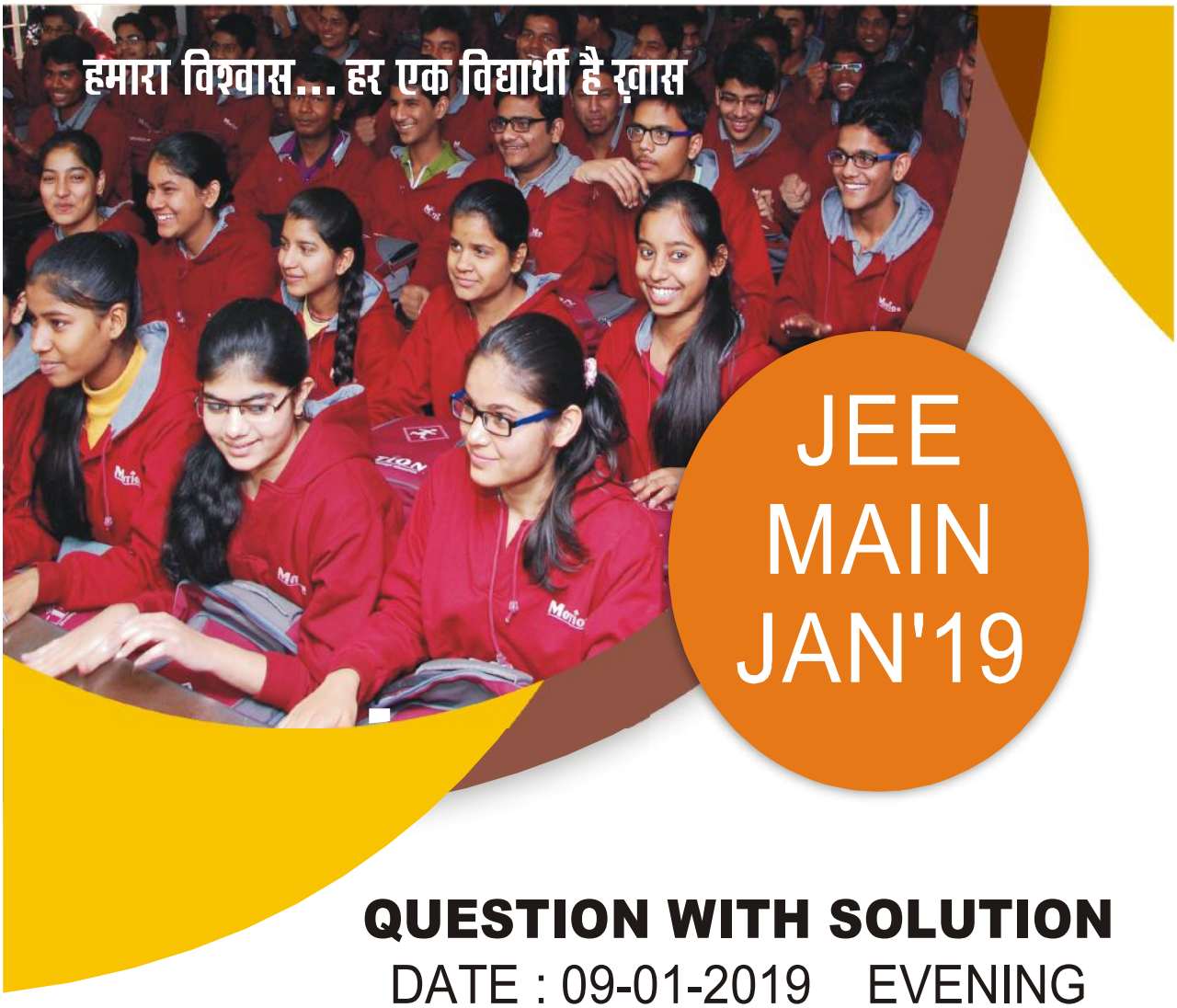

JEE MAIN JAN'19

QUESTION WITH SOLUTION

DATE : 09-01-2019 _ EVENING

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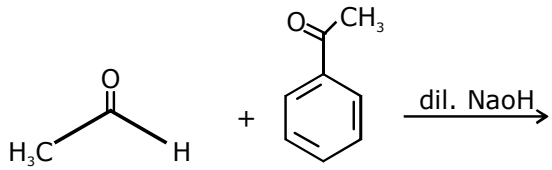
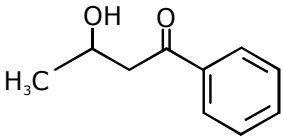
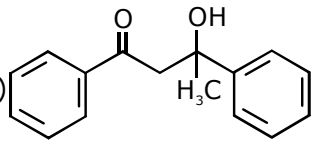
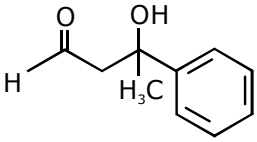
[CHEMISTRY]

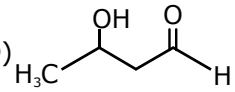
1. The major product formed in the following reaction is :



(A) 

(B) 

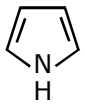
(C) 

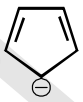
(D) 

Sol. **A**

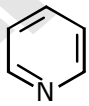
Aldehyde reacts at a faster rate than keton during aldol and stericall less hindered anion will be a better nucleophile so sefl aldol at $CH_3-\overset{\overset{O}{\|}}{C}-H$ will be the major product.

2. Which of the following compounds is not aromatic ?

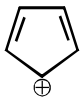
(A) 

(B) 

(C) 

(D) 

Sol. **C**



Do not have $(4n + 2)\ \pi$ electron It has $4n\ \pi$ electrons So it is Anti aromatic.

3. A solution containing 62 g ethylene glycol in 250 g water is cooled to –10°C. If K_f for water is 1.86 K kg mol^{-1}, the amount of water (in g) separated as ice is :

(A) 48 (B) 64 (C) 16 (D) 32

Sol. **B**

$\Delta T_f = K_f \cdot m$

$$10 = 1.86 \times \frac{62/62}{W_{kg}}$$

$W = 0.186$ kg

$\Delta W = (250 - 186) = 64$ gm

4. At 100°C, copper (Cu) has FCC unit cell structure with cell edge length of x A. What is the approximate density of Cu (in g cm^{-3}) at this temperature ?

[Atomic Mass of Cu = 63.55 u]

(A) $\frac{205}{x^3}$ (B) $\frac{211}{x^3}$ (C) $\frac{105}{x^3}$ (D) $\frac{422}{x^3}$

Sol. **D**

FCC unit cell Z = 4

$$d = \frac{63.5 \times 4}{6 \times 10^{23} \times x^3 \times 10^{-24}} g/cm^3$$

$$d = \frac{63.5 \times 4 \times 10}{6} g/cm^3$$

$$d = \frac{423.33}{x^3} \simeq \left(\frac{422}{x^3}\right)$$

5. For coagulation of arsenious sulphide sol, which one of the following salt solution will be most effective ?

(A) NaCl (B) Na_3PO_4 (C) $BaCl_2$ (D) $AlCl_3$

Sol. **D**

Sulphide is –ve charged colloid so cation with maximum charge will be most effective for coagulation.

$Al^{3+} > Ba^{2+} > Na^+$ coagulating power.

6. In which of the following processes, the bond order has increased and paramagnetic character has changed to diamagnetic ?

(A) $O_2 \rightarrow O_2^{2-}$ (B) $NO \rightarrow NO^+$ (C) $N_2 \rightarrow N_2^+$ (D) $O_2 \rightarrow O_2^+$

Sol. **B**

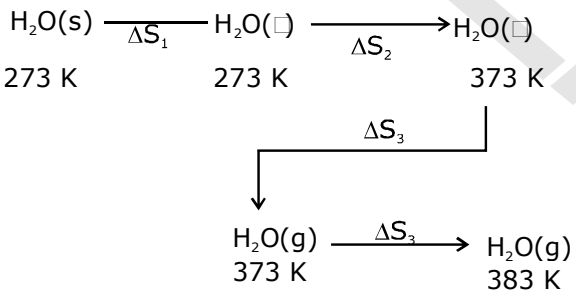
Process	**Change in magnetic nature**	**Bonad order change**
$N_2 \rightarrow N_2^+$	Dia $\rightarrow$ Para	$3 \rightarrow 2.5$
$NO \rightarrow NO^+$	Para $\rightarrow$ Dia	$2.5 \rightarrow 3$
$O_2 \rightarrow O_2^{-2}$	Para $\rightarrow$ Dia	$2 \rightarrow 1$
$O_2 \rightarrow O_2^+$	Para $\rightarrow$ Para	$2 \rightarrow 2.5$

7. The entropy change associated with the conversion of 1 kg of ice at 273 K to water vapours at 383 K is :

(Specific heat of water liquid and water vapour are 4.2 kJ K^{-1} kg^{-1} and 2.0 kJ K^{-1} kg^{-1}; heat of liquid fusion and vapourisation of water are 334 kJ kg^{-1} and 2491 kJ kg^{-1}, respectively). (log 273 = 2.436, log 373 = 2.572, log 383 = 2.583)

(A) 2.64 kJ kg^{-1} K^{-1} (B) 8.49 kJ kg^{-1} K^{-1} (C) 9.26 kJ kg^{-1} K^{-1} (D) 7.90 kJ kg^{-1} K^{-1}

Sol. **C**



$$\Delta S_1 = \frac{\Delta H_{fusion}}{273} = \frac{334}{273} = 1.22$$

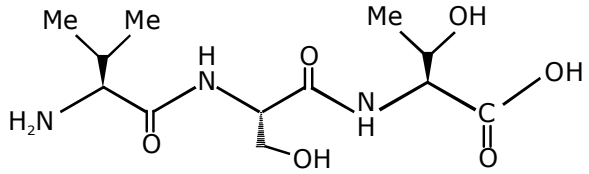
$$\Delta S_2 = 4.2\ \ell n\left(\frac{373}{273}\right) = 1.31$$

$$\Delta S_3 = \frac{\Delta H_{vap}}{373} = \frac{2491}{373} = 6.67$$

$$\Delta S_4 = 2.0\ \ell n\left(\frac{383}{373}\right) = 0.05$$

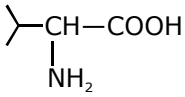
ΔS_{total} = 9.26 kJ kg^{-1} K^{-1}

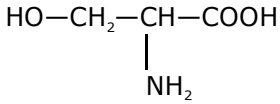
8. The correct sequence of amino acids present in the tripeptide given below is :

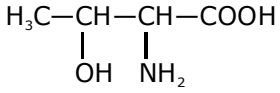


(A) Thr-Ser-Val (B) Thr-Ser-Leu (C) Val-Ser-Thr (D) Leu-Ser-Thr

Sol. **C**

Leusine 

Serine 

Throcnine 

9. The metal that forms nitride by reacting directly with N_2 of air is :

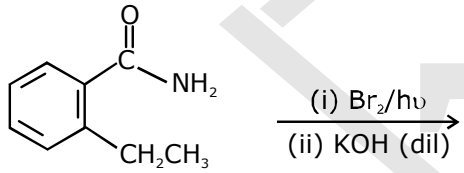
(A) Cs (B) K (C) Li (D) Rb

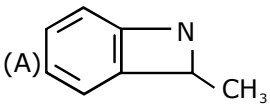
Sol. **C**

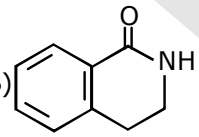
Only Li react directly with N2 out of alkali metals

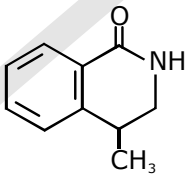
$6Li + N_2 \rightarrow 2Li_3N$

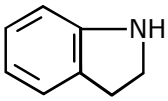
10. The major product fo the following reaction is :



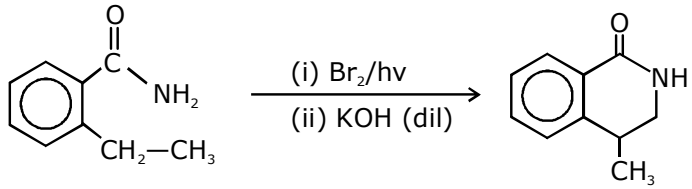
(A) 

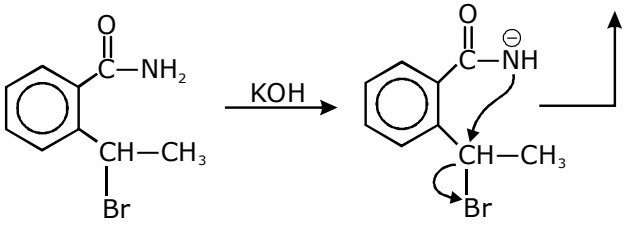
(B) 

(C) 

(D) 

Sol. **C**





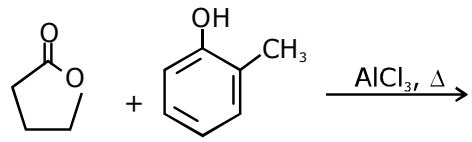
11. The correct matcvh between Item I and Item II is :

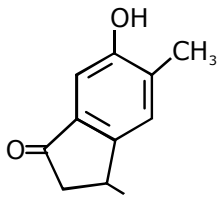
	Item I		**Item II**
(A)	Benzaldehyde	(P)	Mobile phase
(B)	Alumina	(Q)	Adsorbent
(C)	Acetonitrile	(R)	Adsorbate

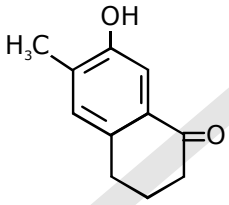
(A) (A) → (P) ; (B) → (R) ; (C) → (Q)
(B) (A) → (R) ; (B) → (Q) ; (C) → (P)
(C) (A) → (Q) ; (B) → (R) ; (C) → (P)
(D) (A) → (Q) ; (B) → (P) ; (C) → (R)

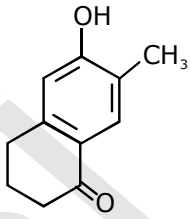
Sol. **B**

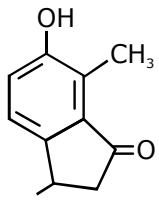
12. The major product of the following reaction is :



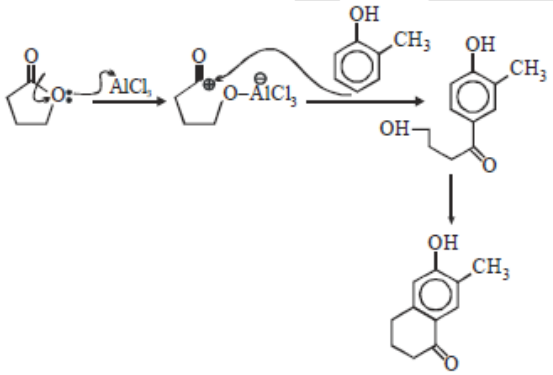
(A) 

(B) 

(C) 

(D) 

Sol. **C**



13. Consider the following reversible chemical reactions :

$A_2(g) + B_2(g) \underset{}{\overset{k_1}{\rightleftharpoons}} 2AB(g)$ ....(i)

$6AB(g) + \underset{}{\overset{k_2}{\rightleftharpoons}} 3A_2(g) + 3B_2(g)$ ....(ii)

The relation between K_1 and K_2 is :

(A) $K_1K_2 = \frac{1}{3}$ (B) $K_1K_2 = 3$ (C) $K_2 = K_1^{-3}$ (D) $K_2 = K_1^{3}$

Sol. **C**

$A_2(g) + B_2(g) \underset{}{\overset{k_1}{\rightleftharpoons}} 2AB$ ...(1)

$\Rightarrow$ eq. (1) × 3

$6\,AB(g) \rightleftharpoons 3A_2(g) + 3B_2(g)$

$\Rightarrow \left(\frac{1}{k_1}\right)^3 = k_2 \Rightarrow k_2 = (k_1)^{-3}$

14. For the following reaction, the mass of water produced from 445 g of $C_{57}H_{110}O_6$ is :
$2C_{57}H_{110}O_6(s) + 163\ O_2(g) \rightarrow 114\ CO_2(g) + 110\ H_2O\ (I)$
(A) 495 K (B) 490 g (C) 890 g (D) 445 g

Sol. **A**

$$\text{moles of } C_{57}H_{110}O_6(s) = \frac{445}{890} = 0.5 \text{ moles}$$

$$n_{H_2O} = \frac{110}{4} = \frac{55}{2}$$

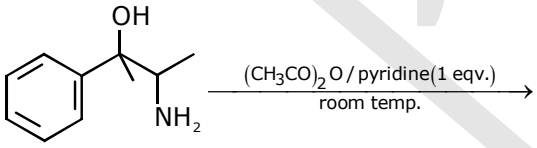
$$m_{H_2O} = \frac{55}{2} \times 18$$

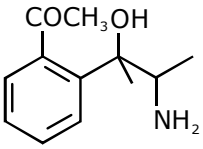
$$= 495 \text{ gm}$$

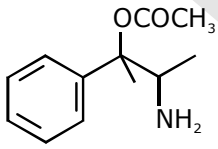
15. For the reaction, 2A + B $\rightarrow$ products, when the concentrations of A and B both were doubled, the rate of the reaction increased from 0.3 mol $L^{-1}s^{-1}$ to 2.4 mol L^{-1} s^{-1}. When the concentration of A alone is doubled, the rate increased from 0.3 mol L^{-1} s^{-1} to mol L^{-1} s^{-1}.
Which one of the folloiwng statemetns is correct ?
(A) Order of the reaction with respect to B is 1
(B) Order of the raction with respect to A is 2
(C) Total order of the reaction is 4
(D) Order of the reaction with respect to B is 2

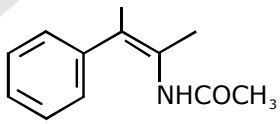
Sol. **D**
$r = K[A]^x [B]^y$
$\Rightarrow 8 = 2^3 = 2^{x+y}$
$\Rightarrow x + y = 3$ ...(1)
$\Rightarrow 2 = 2^x$
$\Rightarrow x = 1, y = 2$
Order w.r.t. A = 1
Order w.r.t. B = 2

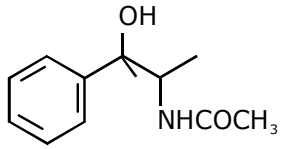
16. The major prodeuct obtained in the following reaction is :



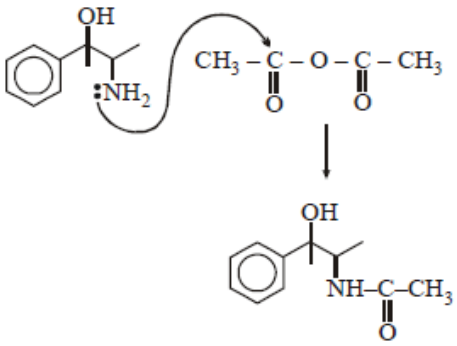
(A) 

(B) 

(C) 

(D) 

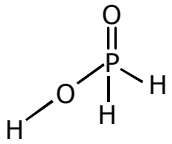
Sol. **D**



17. Good reducing nature of H_3PO_2 is attributed to the presence of :
(A) One P – OH bond (B) Two P – Oh bonds
(C) Two P – H bonds (D) One P–H bond

Sol. **C**

H_3PO_2 is good reducing agent due to presence of two P.H bonds.



18. The temporary hardness of water is due to :
(A) $CaCl_2$ (B) $Ca(HCO_3)_2$ (C) Na_2SO_4 (D) NaCl

Sol. **B**
$Ca(HCO_3)_2$ is reponsible for temporary hardness of water

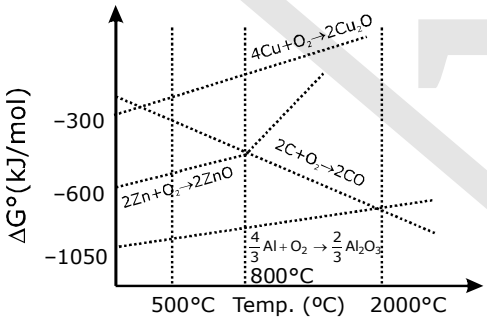
19. Which of the following conditions in drinking water causes methemoglobinemia ?
(A) > 50 ppm of chloride (B) > 50 ppm of nitrate
(C) > 50 ppm of lead (D) > 100 ppm of sulphate

Sol. **B**
Concentration of nitrate >50 ppm in drinking water causes methemoglobinemia

20. The pH of rain water, is approximately :
(A) 5.6 (B) 6.5 (C) 7.5 (D) 7.0

Sol. **A**
pH of rain water is approximate 5.6

21. The correct statement regarding the given Elingham diagram is :



(A) At 500ºC, coke can be used for the extraction of Zn from ZnO
(B) At 1400°C, Al can be used for the extraction of Zn from ZnO
(C) At 800°C, Cu can be used for the extraction of Zn from ZnO
(D) Coke cannot be used for the extraction of Cu from Cu_2O

Sol. **B**
According to the given diagram Al can reduce ZnO.
$3ZnO+2Al \rightarrow 3Zn+Al_2O_3$

22. When the first electron gain enthalpy ($\Delta_{eg}H$) of oxygen is –141 kJ/mol, its second electron gain enthalpy is :
(A) a positive value
(B) almost the same as that of the first
(C) a more negative value than the first
(D) negative, but less negative than the first

Sol. **A**
Second electron gain enthalpy is always positive for every element.
$O^-_{(g)} + e^- \rightarrow O^{-2}_{(g)}$; ΔH = positive

23. If the standard electrode potential for a cell is 2 V at 300 K, the equilibrium constnat (K) for the reaction

$Zn(s) + Cu^{2+}(aq) \rightleftharpoons Zn^{2+}(aq) + Cu(s)$ at 300 K approximately

($R = 8\ JK^{-1}\ mol^{-1}$, $F = 96000\ C\ mol^{-1}$)

(A) e^{160} (B) e^{-80} (C) e^{320} (D) e^{-160}

Sol. **A**

$\Delta G° = -RT \ln k = .\ nFE°_{cell}$

$$\ln k = \frac{n \times F \times E^o}{T \times T} = \frac{2 \times 96000 \times 2}{8 \times 300}$$

$\ln k = 160$

$k = e^{160}$

24. Homoleptic octahedral complexes of a metal ion 'M^{3+}' with three monodentate ligands L_1, L_2 and L_3 absorb wavelengths in the region of green, blue and red respectively. The increasing order of the ligand strength is :

(A) $L_2 < L_1 < L_3$ (B) $L_1 < L_2 < L_3$ (C) $L_3 < L_2 < L_1$ (D) $L_3 < L_1 < L_2$

Sol. **D**

Order of λ_{abs} – $L_3 > L_1 > L_2$

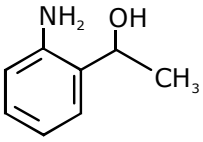
So Δ_0 order will be $L_2 > L_1 > L_3$ (as $\Delta_0 \propto \frac{1}{\lambda_{abs}}$)

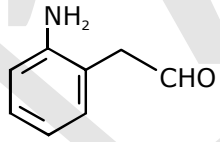
So order of ligand strenght will be $L_2 > L_1 > L_3$

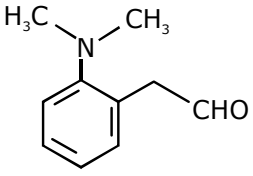
25. The test performed on compound X and their inferences are :

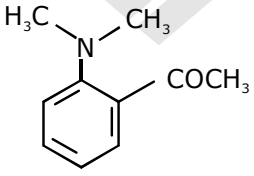
	Test	**Inference**
(A)	2, 4 –DNP test	Coloured precipitate
(B)	Iodoform test	Yellow precipitate
(C)	Azo-dye test	No dye formation

Compound 'X' is

(A) 

(B) 

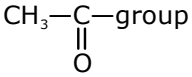
(C) 

(D) 

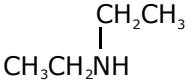
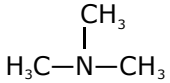
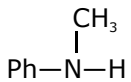
Sol. **D**

→ 2,4 – DNP test is given by aldehyde on ketone

→ Iodoform test is given by compound having

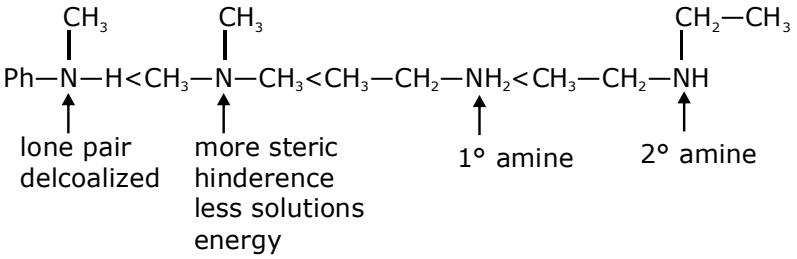


26. The increasing basicity order of the following compounds is :

(A) $CH_3CH_2NH_2$ (B)  (C)  (D) 

(A) A < B < D < C (B) D < C < A < B (C) D <C < B< A (D) A <B <C < D

Sol. **B**



27. The complex that has highest crystal field splitting energy (Δ), is
(A) $K_3[Co(CN)_6]$ (B) $K_2[CoCl_4]$
(C) $[Co(NH_3)_5(H_2O)]Cl_3$ (D) $[Co(NH_3)_5Cl]Cl_2$

Sol. **A**
As complex $K_3[Co(CN)_6]$ have CN^- ligand which is strongfield ligand amongst the given ligands in other complexes.

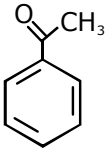
28. Which of the following combination of statements is true regarding the interpretation of the atomic orbitals ?
(A) An electron in an orbital of high angular momentum stays away from the nucleous than an electron in the orbital of lower angular momentum.
(B) For a given value of the principal quantum number, the size of the orbit is inversely proportional to the azimuthal quantum number.
(C) According to wave mechanics, the ground state angular momentum is equal to $\frac{h}{2\pi}$.
(D) The plot of Ψ Vs r for various azimuthal quantum numbers, shows peak shifting towards higher r value.
(A) A, B (B) A, D (C) B, C (D) A, C

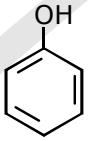
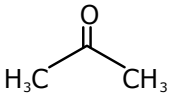
Sol. **D**
Refer Theory

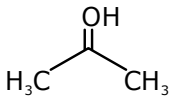
29. The transition element that has lowest enthalpy of atomisation, is :
(A) V (B) Zn (C) Fe (D) Cu

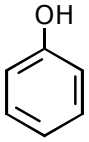
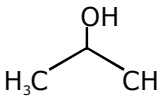
Sol. **B, D**
Since Zn is not a transition element so transition element having lowest atomisation energy out of Cu, V, Fe is Cu.

30. The products formed in the reaction of cumene with O_2 followed by treatment with dil. HCl are :

(A)  and CH_3–OH

(B)  and 

(C)  and 

(D)  and 

Sol. **B**
Cummene hydroperoxide reaction