JEE MAIN JAN'19

QUESTION WITH SOLUTION

DATE : 12-01-2019 _ EVENING

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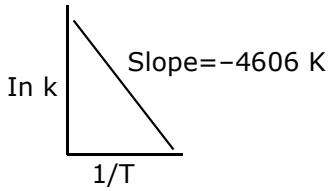
[CHEMISTRY]

1. For a reaction, consider the plot of ln k versus 1/T given in the figure. If the rate constant of this reaction at 400 K is 10^{-5} s^{-1}, then the rate constant at 500 K is :



(A) 10^{-6} s^{-1} (B) 10^{-4} s^{-1}
(C) 4×10^{-4} s^{-1} (D) 2×10^{-4} s^{-1}

Sol. **B**

$$\ell n\frac{K_2}{K_1} = \frac{E_a}{R}\left[\frac{1}{T_1} - \frac{1}{T_2}\right]$$

$$2.303\log\frac{K_2}{10^{-5}} = 4606\left[\frac{1}{400} - \frac{1}{500}\right]$$

$$\Rightarrow K_2 = 10^{-4}\ s^{-1}$$

2. The element that does NOT show catenation is :
(A) Si (B) Pb (C) Sn (D) Ge

Sol. **B**
Catenation is not shown by lead.

3. An open vessel at 27°C is heated until two fifth of the air (assumed as an ideal gas) in it has escaped from the vessel. Assuming that the volume of the vessel remains constant, the temperature at which the vessel has been heated is :
(A) 500 K (B) 500°C (C) 750°C (D) 750 K

Sol. **A**

$\frac{2}{5}$ air escaped from vessel, $\therefore \frac{3}{5}$ air remain is vessel. P, V constant

$n_1T_1 = n_2T_2$

$$n_1(300) = \left(\frac{3}{5}n_1\right)T_2 \Rightarrow T_2 = 500\ K$$

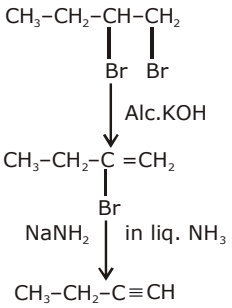
4. The major product of the following reaction is :

$$CH_3CH_2\underset{\underset{Br}{|}}{CH}—\underset{\underset{Br}{|}}{CH_2} \xrightarrow[\text{in liq } NH_3]{\text{(i) KOH alc.}\ \text{(ii) } NaNH_2}$$

(A) $CH_3CH=CHCH_2NH_2$ (B) $CH_3CH_2\underset{\underset{NH_2}{|}}{CH}—\underset{\underset{NH_2}{|}}{CH_2}$

(C) $CH_3CH_2C\equiv CH$ (D) $CH_3CH=C=CH_2$

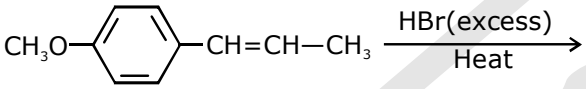
Sol. **C**

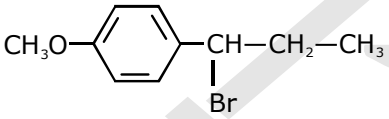


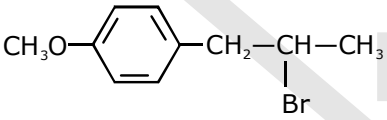
5. The correct statement(s) among I to III with respect to potassiumions that are abundant within the cell fluids is/are :
I. They activate many enzymes
II. They participate in the oxidation of glucose to produce ATP
III. Along iwth sodium ions, they are responsible for the transmission of nerve signals
(A) I, II and III (B) I and II only (C) I and III only (D) III only

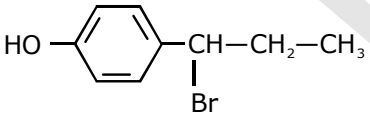
Sol. **A**
All the three statements are correct a/c to NCERT (s-block)

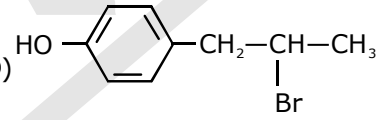
6. The major product in the following conversion is :



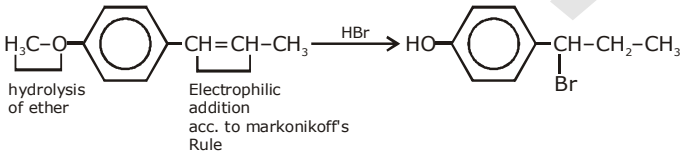
(A) 

(B) 

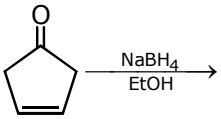
(C) 

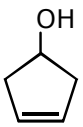
(D) 

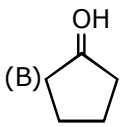
Sol. **C**

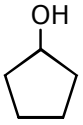


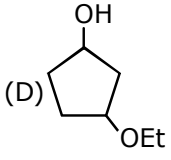
7. The major product of the following reaction is :



(A) 

(B) 

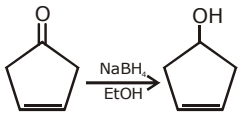
(C) 

(D) 

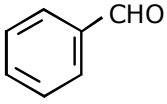
Sol. **A**

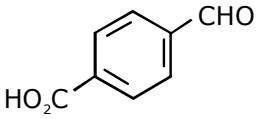
$NaBH_4$ can not reduce C=C

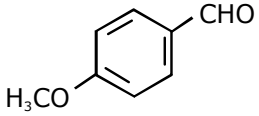
but can reduce $-\overset{\overset{O}{\|}}{C}-$ into OH.

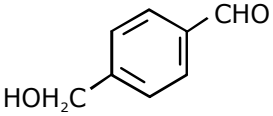


8. The aldehydes which will not form Grignard product with one equivalent Grignard reagents are :

(A) 

(B) 

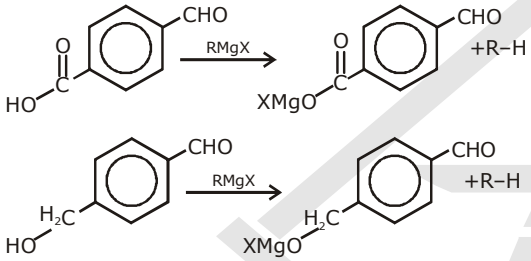
(C) 

(D) 

(A) C, D (B) B, C,D (C) B, C (D) B, D

Sol. **D**

Acid-base reaction of G.R are fast.



9. 8 g of NaOH is dissolved in 18 g of H_2O mole fraction of NaOH in solution and molality (in mol kg^{-1}) of the solution respectively are :

(A) 0.2, 22.20 (B) 0.167, 22.20

(C) 0.2, 11.11 (D) 0.167, 11.11

Sol. **D**

8g NaOH, mol of NaOH = $\frac{8}{40} = 0.2\,\text{mol}$

18g H_2O, mol of H_2O = $\frac{18}{18} = 1\,\text{mol}$

$\therefore X_{NaOH} = \frac{0.2}{1.2} = 0.167$

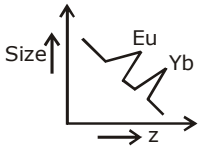
Molality = $\frac{0.2 \times 1000}{18} = 11.11$ m

10. The correct order of atomic radii is :

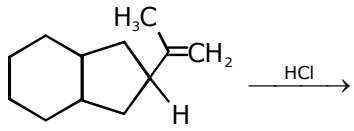
(A) Eu > Ce > Ho > N (B) Ho > N > Eu > Ce

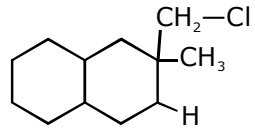
(C) N > Ce > Eu > Ho (D) Ce > Eu > Ho > N

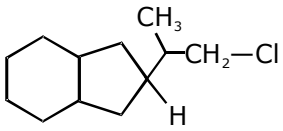
Sol. **A**

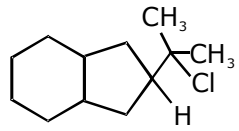


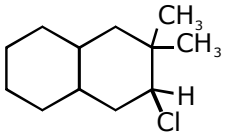
11. The major product of the following reaction :



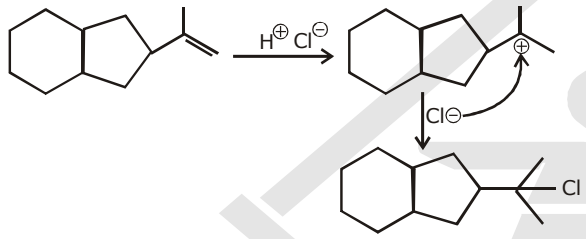
(A) 

(B) 

(C) 

(D) 

Sol. **C**



12. Chlorine on reaction with hot and concentrated sodium hydroxide gives :

(A) ClO_3^- and ClO_2^- (B) Cl^- and ClO_3^-

(C) Cl^- and ClO_2^- (D) Cl^- and ClO^-

Sol. **B**

$3Cl_2 + 6OH^- \rightarrow 5Cl^- + ClO_3^- + 3H_2O$

13. The volume strength of 1M H_2O_2 is :

(Molar mass of H_2O_2 = 34 g mol^{-1})

(A) 5.6 (B) 16. 8

(C) 11.35 (D) 22.4

Sol. **C**

1L –1M H_2O solution will produce 11.35 L O_2 gas at STP.

14. The upper stratosphere consisting of the ozone layer protects us from the sun's radiation that falls in the wavelength region of :

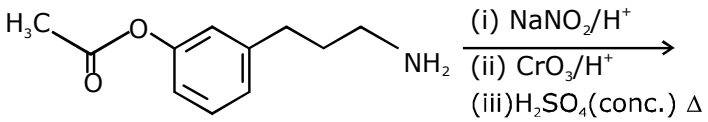
(A) 200 – 315 nm (B) 600 – 750 nm

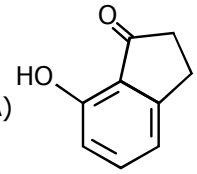
(C) 400 – 550 nm (D) 0.8 – 1.5 nm

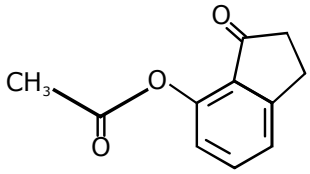
Sol. **A**

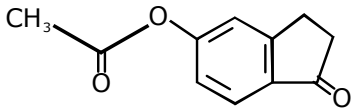
Ozone protects most of the medium freequnecies ultravoilet light from 200-315 nm wave length.

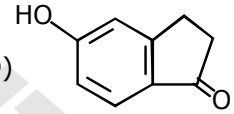
15. The major product of the following reaction is :



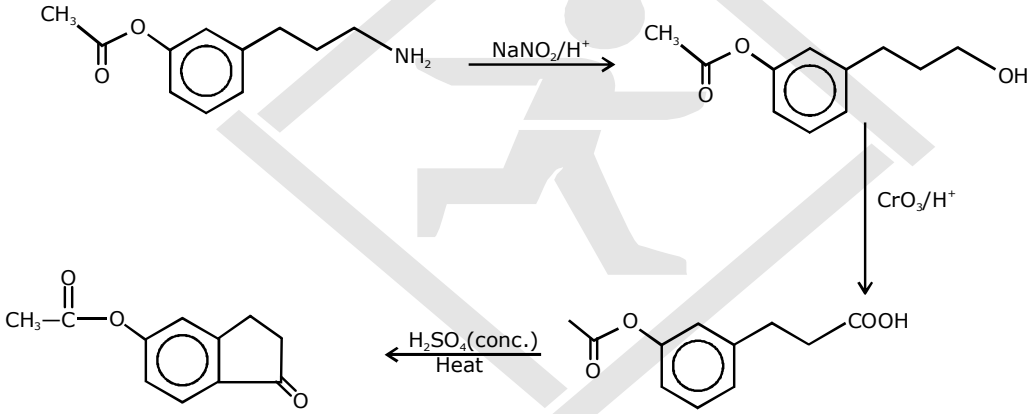
(A) 

(B) 

(C) 

(D) 

Sol. **C**



16. Molecules of benzoic acid (C_6H_5COOH) dimerise in benzene . 'w' g of the acid dissolved in 30 g of benzene shows a depression in freezing point equal to 2k. If the percentage association of the acid to form dimer in the solutoin is 80, then w is :

(Given that K_f = 5 K kg mol^{-1}, Molra mass of benzoic acid = 122 g mol^{-1})

(A) 1.0 g (B) 2.4 g (C) 1.5 g (D) 1.8g

Sol. **B**

$$2(C_6H_5COOH) \xrightarrow[(30g)]{C_6H_6} \underset{Wg}{(C_6H_5COOH)_2}\ (dimer)$$

$\Delta_f T = i\, k_f\, m$

$$2 = 0.6 \times 5 \times \frac{w \times 1000}{122 \times 30}$$

(i = 1 –0.8 +0.4 = 0.6)

w = 2.44 g

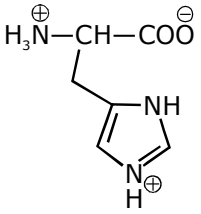
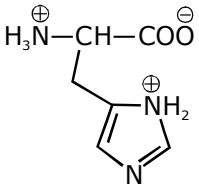
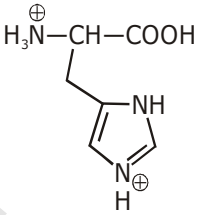
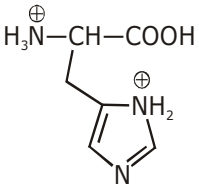
17. The element that shows greater ability to form $p\pi$-$p\pi$ multiple bonds is :
(A) Ge (B) C (C) Si (D)Sn

Sol. **B**
carbon atom have 2p orbitals able to form strongest $p\pi$ bonds

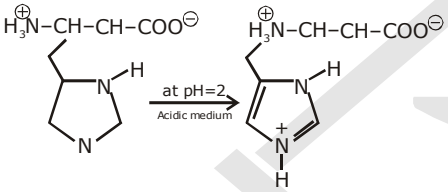
18. The pair that does NOT require calcination is :
(A) $ZnCO_3$ and CaO (B) Fe_2O_3 and $CaCO_3.MgCO_3$
(C) ZnO and Fe_2O_3. xH_2O (D) ZnO and MgO

Sol. **D**
ZnO & MgO both are in oxide form therefore no change on calcination.

19. The correct structure of histidine in a strongly acidic solution (pH =2) is

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

Sol. **C**
Histidine is



Zwitter ionic form
pIn = 7.59

20. Given :
(i)$C(graphite) + O_2(g) \rightarrow CO_2(g)$;
$\Delta rH^{(-)} = x\ kJ\ mol^{-1}$

(ii) $C(graphite) + \frac{1}{2} O_2(g) \rightarrow CO_2(g)$;

$\Delta rH^{(-)} = y\ kJ\ mol^{-1}$

(iii) $CO(g) + \frac{1}{2} O_2(g) \rightarrow CO_2(g)$;

$\Delta rH^{(-)} = z\ kJ\ mol^{-1}$
Based on the above thermochemical equations, find out which one of the following algebraic relationships is correct ?
(A) x = y + z (B) x = y – z
(C) z = x + y (D) y = 2z – x

Sol. **A**

$C_{(graphite)} + O_2(g) \rightarrow CO_2(g)\ \Delta_f H^\circ = xkJ/mol...(1)$

$C_{(graphite)} + \frac{1}{2} O_2(g) \rightarrow CO(g)\ \Delta_f H^\circ = ykJ/mol\ ...(2)$

$CO(g) + \frac{1}{2} O_2(g) \rightarrow CO_2(g)\ \Delta_r H^\circ = zkJ/mol....(3)$

(1) = (2) + (3)
x = y + z

21. Λ_m° for NaCl, HCl and NaA are 126.4, 425.9 and 100.5 S cm^{2}mol^{-1},respectively. If the conductivity of 0.001 M HA is 5 × 10^{-5} S cm^{-1}, degree of dissociation of HA is :
(A) 0.25 (B) 0.125
(C) 0.75 (D) 0.50

Sol. **B**

$\Lambda_m^0(HA) = \Lambda_m^0(HCl) + \Lambda_m^0(NaA) - \Lambda_m^0(NaCl)$
= 425.9 + 100.5 –126.4
= 400 S cm^2 mol^{-1}

$\Lambda_m^0 = \frac{1000K}{M} = \frac{1000 \times 5 \times 10^{-5}}{10^{-3}}$ = 50 S cm^2 mol^{-1}

$\alpha = \frac{\Lambda_m}{\Lambda_m} = \frac{50}{400} = 0.125$

22. Among the following the false statement is :
(A) It is possible to cause artificial rain by throwing electrified sand carrying charge opposite to the one on clouds from an aeroplane.
(B) Latex is a colloidal solution of rubber particles which are positively charged
(C) Lyophilic sol can be coagulated by adding an electrolyte.
(D) Tyndall effect can be used to distinguish between a colloidal solution and a true solution.

Sol. **B**
Colloidal solution for rubber are negatively chaged.

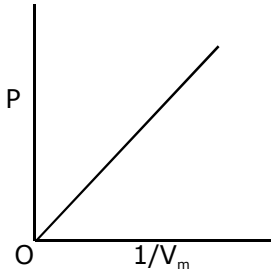
23. If the de Broglie wavelength of the electron in nth Bohr orbit in a hydrogenic atom is equal to 1.5 πa_0(a_0 is Bohr radius), then the value of n/z is :
(A) 1.0 (B) 0.40
(C) 0.75 (D) 1.50

Sol. **C**
According to de-broglie's hypothesis

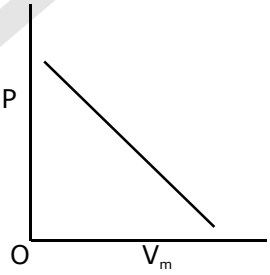
$2\pi r_n = n\lambda \Rightarrow 2\pi.a_0 = \frac{n^2}{z} = n \times 1.5\pi a_0$

$\frac{n}{z} = 0.75$

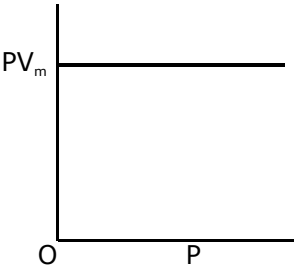
24. The combination of plots which does not represent isothermal expansion of an ideal gas is :

(A)


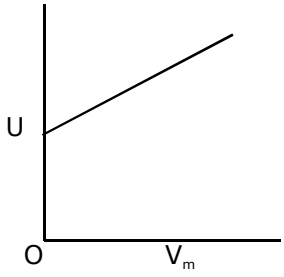
(A)

(B)


(B)

(C)


(C)

(D)


(D)

(A) B & D (B) B & C
(C) A & C (D) A & D

Sol. **A**

Isothermal expansion $PV_m = K(Graph-C)$

$$P = \frac{K}{V_m}(Graph - A)$$

25. The magnetic moment of an octahedral homoleptic Mn(II) complex is 5.9 BM. The suitable ligand for this complex is :
(A) ethylenediamine (B) NCS^{-1}
(C) CN^- (D) CO

Sol. **B**

$\mu = 5.9$ BM $\therefore n$ (no of unpaired.e^-) = 5

Cation Mn^{11} –$3d^5$ confirm only possible for relatively weak ligand.

$\therefore NCS^-$

26. The two monomers for the synthesis of Nylon 6, 6 are :
(A) $HOOC(CH_2)_6COOH$, $H_2N(CH_2)_4NH_2$ (B) $HOOC(CH_2)_6COOH$, $H_2N(CH_2)_6NH_2$
(C) $HOOC(CH_2)_4COOH$, $H_2N(CH_2)_6NH_2$ (D) $HOOC(CH_2)_4COOH$,$H_2N(CH_2)_4NH_2$

Sol. **C**

Nylon-6,6 is polymer of
Hexamethylene diamine & Adipic acid

$$H_2N-(CH_2)_6-NH_2 \quad HOOC-(CH_2)_4-COOH$$

27. If K_{sp} of Ag_2CO_3 is 8×10^{-12}, the molar solubility of Ag_2CO_3 in 0.1 M $AgNO_3$ is :
(A) 8×10^{-10} M (B) 8×10^{-11} M (C) 8×10^{-12} M (D) 8×10^{-13} M

Sol. **A**

$$Ag_2CO_3(s) \rightleftharpoons \underset{(0.1+2S)\ M}{2Ag^+(aq.)} + \underset{S\ M}{CO_3^{-2}}\ (aq)$$

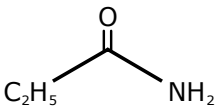
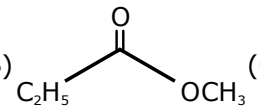
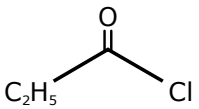
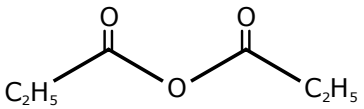
$K_{sp} = [Ag^+]^2[CO_3^{-2}]$
$8\times10^{-12} = (0.1 + 2S)^2\ (S)$
$S = 8 \times10^{-10}$ M

28. The compound that is NOT a common component of photochemical smog is :
(A) CH_2=CHCHO (B) CF_2Cl_2
(C) $H_3C-\underset{\underset{O}{\|}}{C}-OONO_2$ (D) O_3

Sol. **B**

Freons (CFC's) are not common components of photo chemical smog.

29. The increasing order of the reactivity of the following with $LiAlH_4$ is :

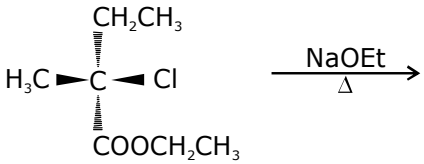
(A)  (B)  (C)  (D) 

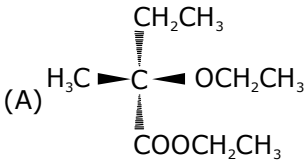
(A) (A) < (B) < (C) < (D)
(B) (A) < (B) < (D) < (C)
(C) (B) < (A) < (C) < (D)
(D) (B) < (A) < (D) < (C)

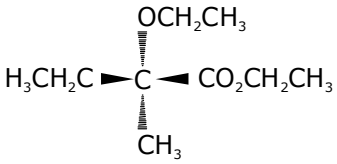
Sol. **B**

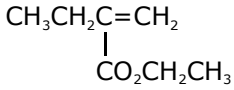
Rate of nucleophilic attack on carbonyl $\propto$ Electrophilicity of carbonyl group

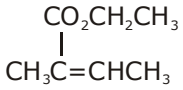
30. The major product of the following reaction is :



(A) 

(B) 

(C) 

(D) 

Sol. **D**