# TEST PAPER OF JEE(MAIN) EXAMINATION – 2019

**(Held On Friday 11th JANUARY, 2019) TIME : 02 : 30 PM To 05 : 30 PM**

## CHEMISTRY

**1.** The correct option with respect to the Pauling electronegativity values of the elements is :-

(1) Ga < Ge (2) Si < Al

(3) P > S (4) Te > Se

**Ans. (1)**

**Sol.**

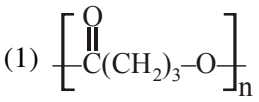
B C

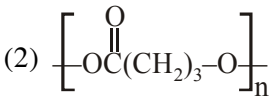
Al Si

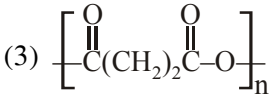
$\boxed{Ga < Ge}$

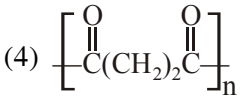
Along the period electronegativity increases

**2.** The homopolymer formed from 4-hydroxy-butanoic acid is :-

(1) 

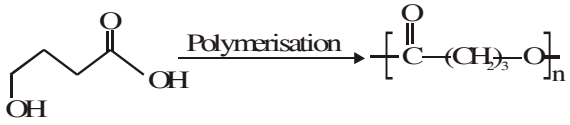
(2) 

(3) 

(4) 

**Ans. (1)**

**Sol.**




**3.** The correct match between Item I and Item II is :-

| Item I | | Item II | |
|---|---|---|---|
| (A) | Ester test | (P) | Tyr |
| (B) | Carbylamine test | (Q) | Asp |
| (C) | Phthalein dye test | (R) | Ser |
| | | (S) | Lys |

(1) (A)→(Q); (B)→(S); (C)→(P)

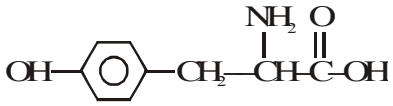
(2) (A)→(R); (B)→(Q); (C)→(P)

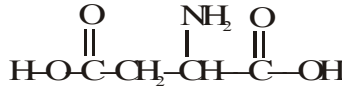
(3) (A)→(Q); (B)→(S); (C)→(R)

(4) (A)→(R); (B)→(S); (C)→(Q)

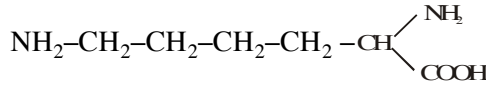
**Ans. (1)**

**Sol.**

(P) Tyrosine Tyr 

(Q) Aspartic ASP Acid 

(R) Serine Ser 

(S) Lysine 

(A) Ester test (Q) Aspartic acid (Acidic amino acid)

(B) Carbylamine (S) Lysine [$NH_2$ group present]

(C) Phthalein dye (P) Tyrosine {Phenolic group present)

**4.** Taj Mahal is being slowly disfigured and discoloured. This is primarily due to :-

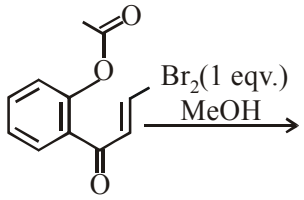
(1) Water pollution (2) Global warming

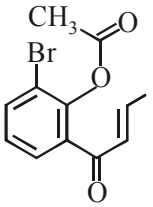
(3) Soil pollution (4) Acid rain

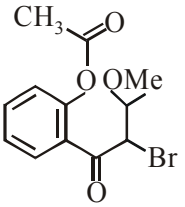
**Ans. (4)**

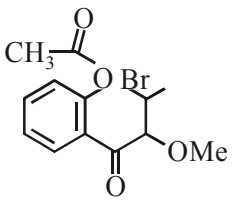
**Sol.** Taj mahal is slowely disfigured and discoloured due to acid rain.

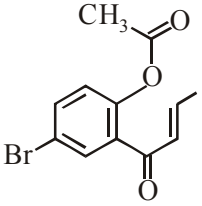
**5.** The major product obtained in the following conversion is :-




(1) 

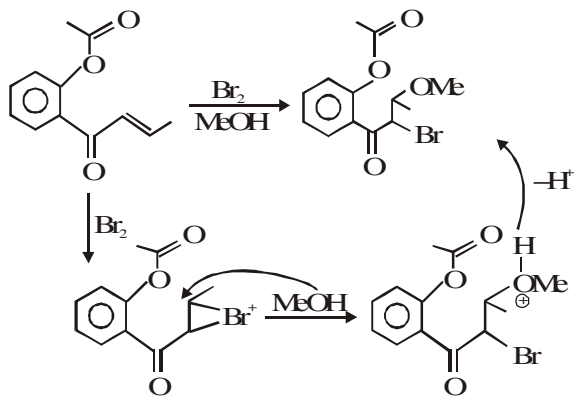
(2) 

(3) 

(4) 

**Ans. (2)**

**Sol.**



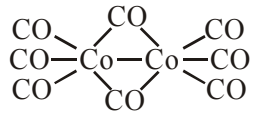
**6.** The number of bridging CO ligand (s) and Co-Co bond (s) in $CO_2(CO)g$, respectively are :-

(1) 0 and 2 (2) 2 and 0

(3) 4 and 0 (4) 2 and 1

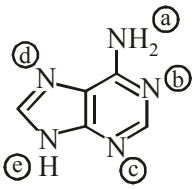
**Ans. (4)**

**Sol.**



Bridging CO are 2 and Co – Co bond is 1.

**7.** In the following compound,



the favourable site/s for protonation is/are :-

(1) (b), (c) and (d) (2) (a)

(3) (a) and (e) (4) (a) and (d)

**Ans. (1)**

**Sol.** Localised lone pair $e^-$.

**8.** The higher concentration of which gas in air can cause stiffness of flower buds ?

(1) $SO_2$ (2) $NO_2$

(3) $CO_2$ (4) CO

**Ans. (1)**

**Sol.** Due to acid rain in plants high concentration of $SO_2$ makes the flower buds stiff and makes them fall.

**9.** The correct match between item I and item II is :-

| Item I | | Item II | |
|---|---|---|---|
| (A) | Allosteric effect | (P) | Molecule binding to the active site of enzyme |
| (B) | Competitive inhibitor | (Q) | Molecule crucial for communication in the body |
| (C) | Receptor | (R) | Molecule binding to a site other than the active site of enzyme |
| (D) | Poison | (S) | Molecule binding to the enzyme covalently |

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

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

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

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

**Ans. (4)**

**10.** The radius of the largest sphere which fits properly at the centre of the edge of body centred cubic unit cell is : (Edge length is represented by 'a') :-

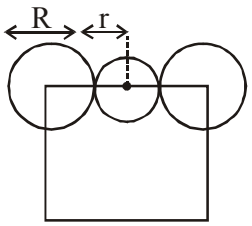
(1) 0.134 a (2) 0.027 a

(3) 0.067 a (4) 0.047 a

**Ans. (3)**

**Sol.**

$a = 2(R + r)$



$\frac{a}{2} = (R + r)$ ...(1)

$a\sqrt{3} = 4R$ ...(2)

Using (1) & (2)

$\frac{a}{2} = \frac{a\sqrt{3}}{4} = r$

$a\left(\frac{2-\sqrt{3}}{4}\right) = r$

$r = 0.067\ a$

**11.** Among the colloids cheese (C), milk (M) and smoke (S), the correct combination of the dispersed phase and dispersion medium, respectively is :-

(1) C : solid in liquid; M : solid in liquid; S : solid in gas

(2) C : solid in liquid; M : liquid in liquid; S : gas in solid

(3) C : liquid in solid; M : liquid in solid; S : solid in gas

(4) C : liquid in solid; M : liquid in liquid; S : solid in gas

**Ans. (4)**

**Sol.**

| | **Dispersed Phase** | **Dispersion Medium** |
|---|---|---|
| Cheese | Liquid | Solid |
| Milk | Liquid | Liquid |
| Smoke | Solid | Gas |

**12.** The reaction that does NOT define calcination is:-

(1) $ZnCO_3 \xrightarrow{\Delta} ZnO + CO_2$

(2) $Fe_2O_3 \cdot XH_2O \xrightarrow{\Delta} Fe_2O_3 + XH_2O$

(3) $CaCO_3 \cdot MgCO_3 \xrightarrow{\Delta} CaO + MgO + 2\ CO_2$

(4) $2\ Cu_2S + 3\ O_2 \xrightarrow{\Delta} 2\ Cu_2O + 2\ SO_2$

**Ans. (4)**

**Sol.** Calcination in carried out for carbonates and oxide ores in absence of oxygen. Roasting is carried out mainly for sulphide ores in presence of excess of oxygen.

**13.** The reaction,

$MgO(s) + C(s) \rightarrow Mg(S) + CO(g)$, for which $\Delta_r H^\circ = +491.1$ kJ $mol^{-1}$ and $\Delta_r S^\circ = 198.0$ $JK^{-1}$ $mol^{-1}$, is not feasible at 298 K. Temperature above which reaction will be feasible is :-

(1) 1890.0 K (2) 2480.3 K

(3) 2040.5 K (4) 2380.5 K

**Ans. (2)**

**Sol.** $T_{eq} = \frac{\Delta H}{\Delta S}$

$= \frac{491.1 \times 1000}{198}$

$= 2480.3$ K

**14.** Given the equilibrium constant :

KC of the reaction :

$Cu(s) + 2Ag^+(aq) \rightarrow Cu^{2+}(aq) + 2Ag(s)$ is $10 \times 10^{15}$, calculate the $E^0_{cell}$ of this reaction at 298 K

$\left[2.303\frac{RT}{F} \text{at} 298\,K = 0.059V\right]$

(1) 0.04736 V (2) 0.4736 V

(3) 0.4736 mV (4) 0.04736 mV

**Ans. (2)**

**Sol.** $E_{cell} = E^\circ_{cell} - \frac{0.059}{n}\log Q$

At equilibrium

$E^\circ_{Cell} = \frac{0.059}{2}\log 10^{16}$

$= 0.059 \times 8$

$= 0.472$ V

**15.** The hydride that is NOT electron deficient is:-

(1) $B_2H_6$ (2) $AlH_3$

(3) $SiH_4$ (4) $GaH_3$

**Ans. (3)**

**Sol.** (1) $B_2H_6$ : Electron deficient

(2) $AlH_3$ : Electron deficient

(3) $SiH_4$ : Electron precise

(4) $GaH_3$ : Electron deficient

**16.** The standard reaction Gibbs energy for a chemical reaction at an absolute temperature T is given by

$$\Delta_r G^o = A - Bt$$

Where A and B are non-zero constants. Which of the following is TRUE about this reaction ?

(1) Exothermic if $B < 0$

(2) Exothermic if $A > 0$ and $B < 0$

(3) Endothermic if $A < 0$ and $B > 0$

(4) Endothermic if $A > 0$

**Ans. (4)**

**Sol.** Theory

**17.** $K_2HgI_4$ is 40% ionised in aqueous solution. The value of its van't Hoff factor (i) is :-

(1) 1.8 (2) 2.2 (3) 2.0 (4) 1.6

**Ans. (1)**

**Sol.** For $K_2[HgI_4]$

$i = 1 + 0.4\ (3-1)$

$= 1.8$

**18.** The de Broglie wavelength ($\lambda$) associated with a photoelectron varies with the frequency ($\nu$) of the incident radiation as, [$\nu_0$ is thrshold frequency] :

(1) $\lambda \propto \dfrac{1}{(\nu-\nu_0)^{\frac{3}{2}}}$ (2) $\lambda \propto \dfrac{1}{(\nu-\nu_0)^{\frac{1}{2}}}$

(3) $\lambda \propto \dfrac{1}{(\nu-\nu_0)^{\frac{1}{4}}}$ (4) $\lambda \propto \dfrac{1}{(\nu-\nu_0)}$

**Ans. (2)**

**Sol.** For electron

$$\lambda_{DB} = \frac{\lambda}{\sqrt{2mK.E.}} \quad \text{(de broglie wavelength)}$$

By photoelectric effect

$h\nu = h\nu_0 + KE$

$KE = h\nu - h\nu_0$

$$\lambda_{DB} = \frac{h}{\sqrt{2m \times (h\nu - h\nu_0)}}$$

$$\lambda_{DB} \propto \frac{1}{(\nu-\nu_0)^{1/2}}$$

**19.** The reaction $2X \rightarrow B$ is a zeroth order reaction. If the initial concentration of X is 0.2 M, the half-life is 6 h. When the initial concentration of X is 0.5 M, the time required to reach its final concentration of 0.2 M will be :-

(1) 18.0 h (2) 7.2 h (3) 9.0 h (4) 12.0 h

**Ans. (1)**

**Sol.** For zero order

$[A_0]-[A_t] = kt$

$0.2 - 0.1 = k \times 6$

$$k = \frac{1}{60} \text{ M/hr}$$

$$\text{and } 0.5-0.2 = \frac{1}{60} \times t$$

$t = 18$ hrs.

**20.** A compound 'X' on treatment with $Br_2$/NaOH, provided $C_3H_9N$, which gives positive carbylamine test. Compound 'X' is :-

(1) $CH_3COCH_2NHCH_3$

(2) $CH_3CH_2COCH_2NH_2$

(3) $CH_3CH_2CH_2CONH_2$

(4) $CH_3CON(CH_3)_2$

**Ans. (3)**

**Sol.**

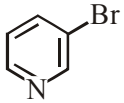
$$[X] \xrightarrow[NaOH]{Br_2} C_3H_9N \xrightarrow[KOH]{CHCl_3} CH_3CH_2CH_2\text{–}NC$$

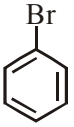
Hoff mann's Bromaide degradation — Carbylamine Reaction

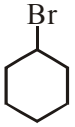
Thus [X] must be aride with oen carbon more than is amine.

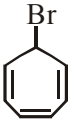
Thus [X] is $CH_3CH_2CH_2CONH_2$

**21.** Which of the following compounds will produce a precipitate with $AgNO_3$ ?

(1) 

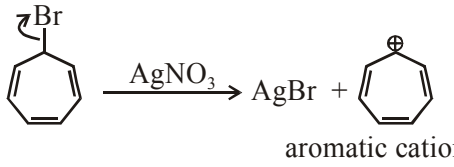
(2) 

(3) 

(4) 

**Ans. (4)**

**Sol.**




aromatic cation

as it can produce aromatic cation so will produce precipitate with $AgNO_3$.

**22.** The relative stability of +1 oxidation state of group 13 elements follows the order :-

(1) Al < Ga < Tl < In (2) Tl < In < Ga < Al

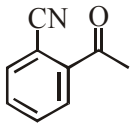
(3) Al < Ga < In < Tl (4) Ga < Al < In < Tl

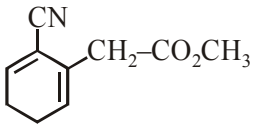
**Ans. (3)**

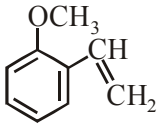
**Sol.** Due to inert pair effect as we move down the group in 13th group lower oxidation state becomes more stable.

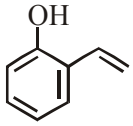
Al < Ga < In < T$\ell$

**23.** Which of the following compounds reacts with ethylmagnesium bromide and also decolourizes bromine water solution :-

(1) 

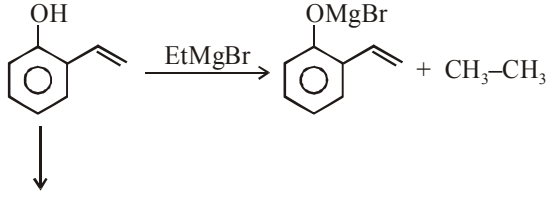

(2) 


(3) 


(4) 


**Ans. (4)**

**Sol.**




declolourizes Bromin water

**24.** Match the following items in column I with the corresponding items in column II.

| Column I | | Column II | |
|---|---|---|---|
| (i) | $Na_2CO_3 \cdot 10\ H_2O$ | (P) | Portland cement ingredient |
| (ii) | $Mg(HCO_3)_2$ | (Q) | Castner-Keller process |
| (iii) | NaOH | (R) | Solvay process |
| (iv) | $Ca_3Al_2O_6$ | (S) | Temporary hardness |

(1) (i)→(C); (ii)→(B); (iii)→(D); (iv)→(A)

(2) (i)→(C); (ii)→(D); (iii)→(B); (iv)→(A)

(3) (i)→(D); (ii)→(A); (iii)→(B); (iv)→(C)

(4) (i)→(B); (ii)→(C); (iii)→(A); (iv)→(D)

**Ans. (2)**

**Sol.** $Na_2CO_3.10H_2O \rightarrow$ Solvay process

$Mg(HCO_3)_2 \rightarrow$ Temporary hardness

NaOH → Castner-kellner cell

$Ca_3Al_2O_6 \rightarrow$ Portland cement

**25.** 25 ml of the given HCl solution requires 30 mL of 0.1 M sodium carbonate solution. What is the volume of this HCl solution required to titrate 30 mL of 0.2 M aqueous NaOH solution?

(1) 25 mL (2) 50 mL (3) 12.5 mL(4) 75 mL

**Ans. (1)**

**Sol.** HCl with $Na_2CO_3$

Eq. of HCl = Eq. of $Na_2CO_3$

$$\frac{25}{1000} \times M \times 1 = \frac{30}{1000} \times 0.1 \times 2$$

$$M = \frac{6}{25} M$$

Eq of HCl = Eq. of NaOH

$$\frac{6}{25} \times 1 \times \frac{V}{1000} = \frac{30}{1000} \times 0.2 \times 1$$

V = 25 ml

**26.** $\underline{A} \xrightarrow{4\,KOH,\,O_2} 2\underline{B} + 2\,H_2O$ (Green)

$3\,\underline{B} \xrightarrow{4\,HCl} 2\,\underline{C} + MnO_2 + 2\,H_2O$ (Purple)

$2\,\underline{B} \xrightarrow{H_2O,\,KI} 2\,\underline{A} + 2KOH + \underline{D}$

In the above sequence of reactions,

$\underline{A}$ and $\underline{D}$ respectively, are :-

(1) $KIO_3$ and $MnO_2$ (2) KI and $K_2MnO_4$

(3) $MnO_2$ and $KIO_3$ (4) KI and $KMnO_4$

**Ans. (3)**

**Sol.** $MnO_2(A) \xrightarrow{4KOH,O_2} 2K_2MnO_4(B) + 2H_2O$ (Green)

$3K_2MnO_4(B) \xrightarrow{4HCl} 2KMnO_4(C) + 2H_2O$ (Purple)

$2KMnO_4(C) \xrightarrow{H_2O,\,KI} 2MnO_2(A) + 2KOH + KIO_3(D)$

$A \rightarrow MnO_2$

$D \rightarrow KIO_3$

**27.** The coordination number of Th in $K_4[Th(C_2O_4]_4(OH_2)_2]$ is :-

$\left(C_2O_4^{2-} = \text{Oxalato}\right)$

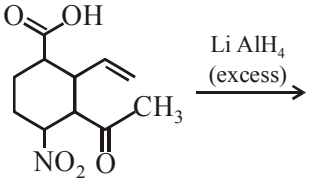
(1) 6 (2) 10 (3) 14 (4) 8

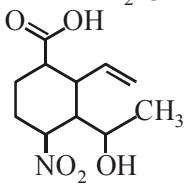
**Ans. (2)**

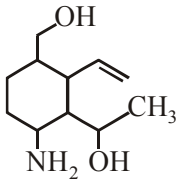
**Sol.** $C_2O_4^{2-}$ (oxalato) : bidentate

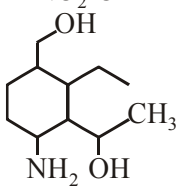
$H_2O$ (aqua) : Monodentate

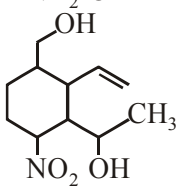
**28.** The major product obtained in the following reaction is :-




(1) 

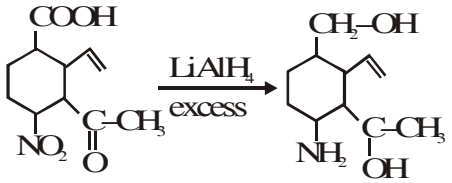

(2) 


(3) 


(4) 

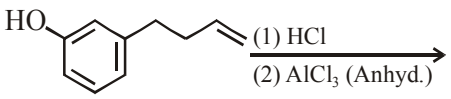

**Ans. (2)**

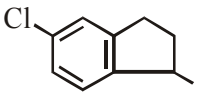
**Sol.**

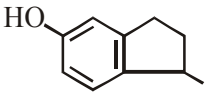


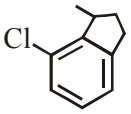

$LiAlH_4$ will not affect C=C in this compound.

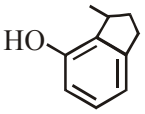
**29.** The major product of the following reaction is :-




(1) 

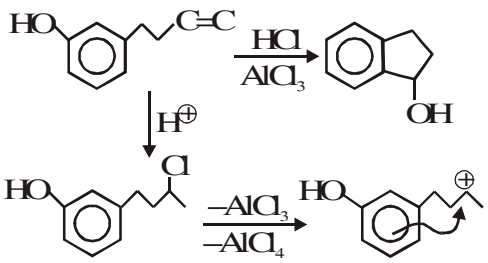

(2) 


(3) 


(4) 


**Ans. (2)**

**Sol.**




**30.** For the equilibrium,

$2H_2O \rightleftharpoons H_3O^+ + OH^-$, the value of $\Delta G^\circ$ at 298 K is approximately :-

(1) –80 kJ $mol^{-1}$ (2) –100 kJ $mol^{-1}$

(3) 100 kJ $mol^{-1}$ (4) 80 kJ $mol^{-1}$

**Ans. (4)**

**Sol.**

$2H_2O = H_3O^+ + OH^-$ $K = 10^{-14}$

$\Delta G^\circ = -RT\,\ell n\,K$

$$= \frac{-8.314}{1000} \times 298 \times \ell n 10^{-14}$$

= 80 KJ/Mole