# JEE Main 2019 April Chemistry Paper with Solutions

**1. Which of the following amine will be prepared by Gabriel phthalimide reaction?**

a. n-Butylamine

b. Triethylamine

c. neo-Pentylamine

d. tert-Butylamine

**Solution: (a)**

Gabriel pthalimide synthesis is used to prepare $1^0$ amines only

**2.Reaction of dilute HCl with Maltose gives:**

a. D – glucose

b. D – fructose

c. D – glucose and D – fructose

d. D – galactose

**Solution:(a)**

Maltose is a dissacalaride, consisting of 2 glucose units. So on hydrolysis, it gives only D-glucose.

**3.The correct order of $K_b$ value of the following is**

$$(C_2H_5)_2\ddot{N}H > \ddot{N}(C_2H_5)_3 > NH_3$$

a. 1 > 2 > 3

b. 1 > 3 > 2

c. 3 > 2 > 1

d. 3 > 1 > 2

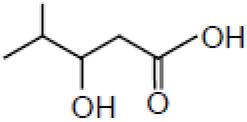
**Solution: (b)**

$k_b$ α Basic strength.

Basic strength α amount of hydration αAvailability of Lone Pairs on Nitrogen.

Combining both effects, the order of Basic strength is, $2^0 > 3^0 > NH_3$

**4. Write IUPAC name of the following compound**



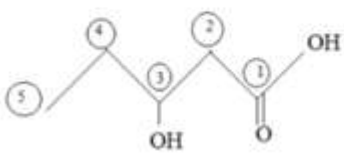

a. 3-Hydroxy-2-methylpentanoic acid

b. 4-Methyl-3-hydroxypentanoic acid

c. 3-Hydroxy-4-methylpentanoic acid

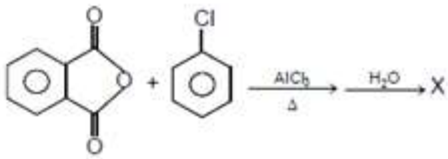
d. 2-Methyl-2-hydroxypentanoic acid

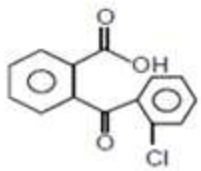
**Solution:(c)**

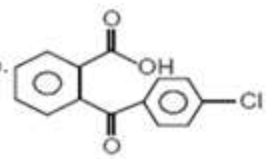


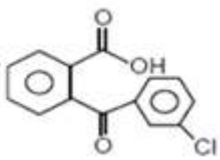

3-hydroxy 4-methyl Pentanoic acid

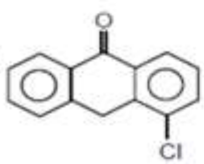
**5. Compound 'X' will be**



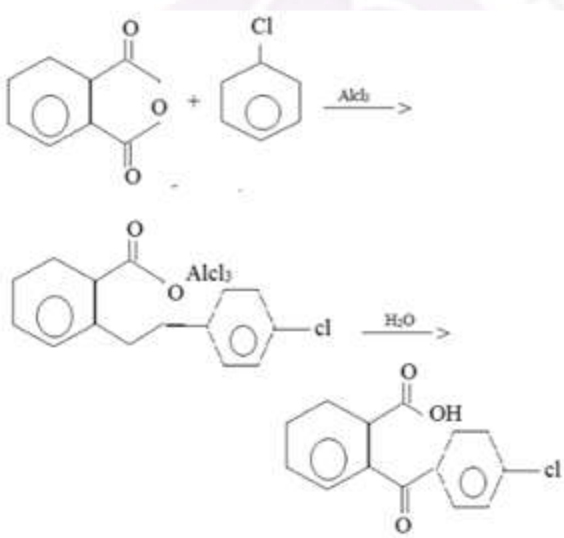
a. 

b. 

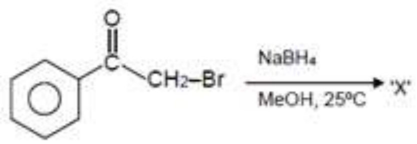
c. 

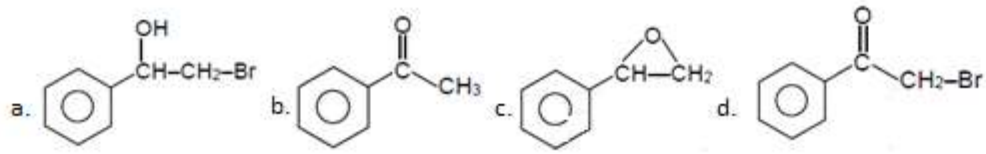
d. 

**Solution: (b)**

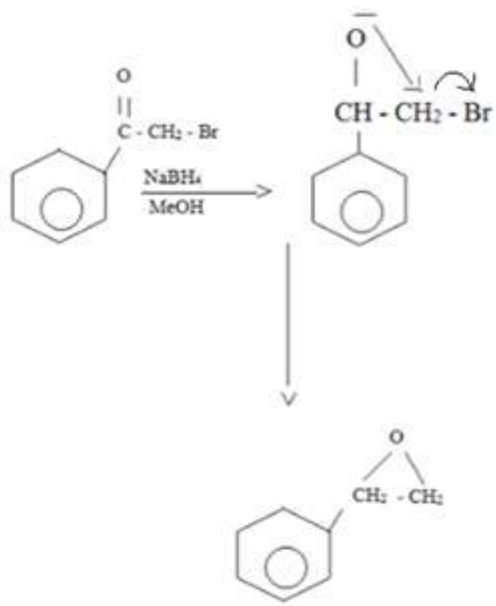


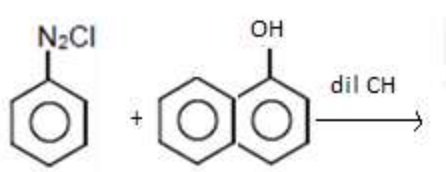
**6. X will be:**

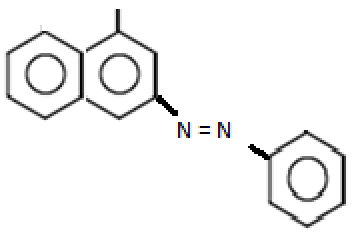



**Solution: (c)**




7. 

a.
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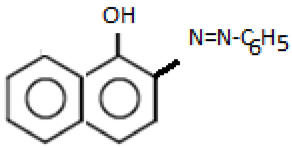


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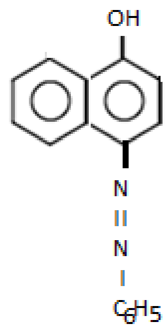


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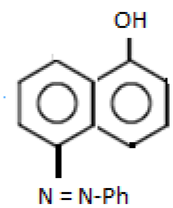
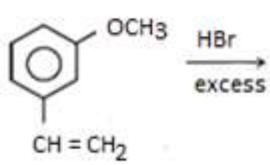
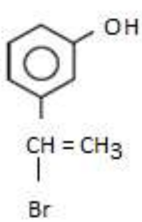



**Solution: (c)**

In a$_2$o coupling reaction, the Hydrogen is taken from the less hindered para position.

8.



a.
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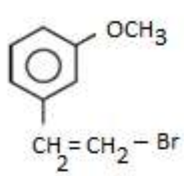


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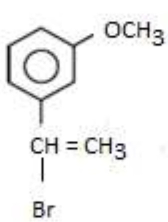


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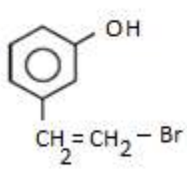
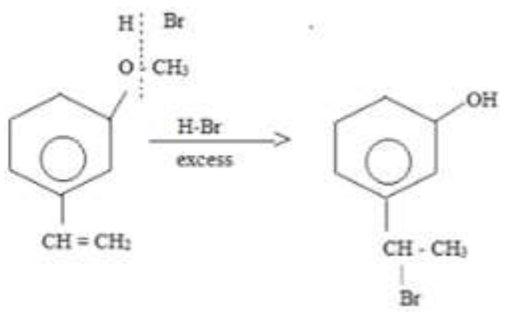


**Solution: (a)**




Two reaction occur simultaneously

a) Ether hydrolysis using HBr

b) Electrophilic addition of H-Br

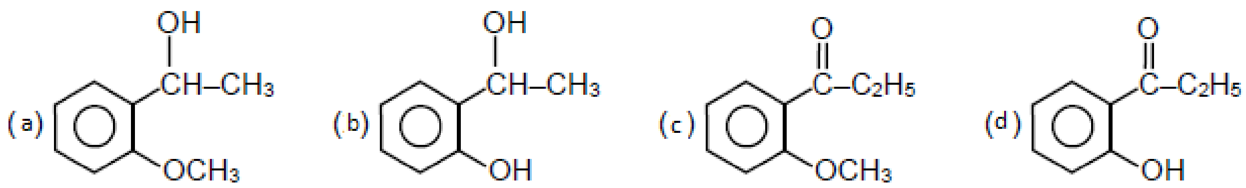
**9. Find the compound 'X' which give following test.**

**Neutral $FeCl_3 \rightarrow$ -ve**

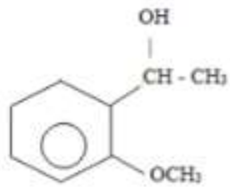
**Fehling solution → -ve**

**Iodoform reaction → +ve**

**Grignard reagent → +ve**




**Solution: (a)**



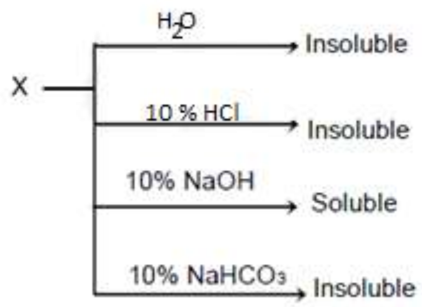

Neutre $Fecl_3 \rightarrow$ - ve (phenol is absent)

Fehling test → - ve (no CHO)

Iodoform → + ve (α – Methyl group is present)

Grignard → acidic H-atom is present

**10. Identify the compound 'X'**




a. Toluidine

b. Benzamide

c. Para-Cresol

d. Oleic acid

**Solution:(c)**

Para-cresol is acidic enough to be soluble in 10% NaOH. But Oleic acid forms salt, but is insoluble due topresence & long chain of Hydrocarbon

**11. Which of the following is not correct for an ideal gas as per first law of thermodynamics?**

a. Adiabatic $\Delta U = -w$

b. Isothermal $q = -w$

c. cyclic $q = -w$

d. Isochoric $\Delta U = q$

**Solution: (a)**

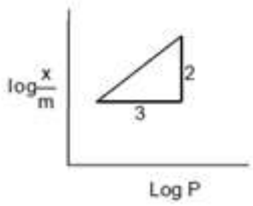
From 1st Law,

$\Delta U = q + \omega$

In adiabatic, q = 0

Therefore, $\Delta U = \omega$

**12. In Freundlich isotherm, $\frac{x}{m} \propto P^a$ .Find the value of a from the following graph**




a. 2/3

b. 1/3

c. 3/2

d. 1

**Solution: (a)**

**Freundlich Isotherm equations:**

$$\log \frac{x}{m} = \log k + \frac{1}{n} \log P$$

$$y = c + mx$$

$$m = \frac{1}{n} = \frac{2}{3}.$$

**13. In a mixture of A and B having vapour pressure of pure A and pure B are 400 mm Hg and 600 mm Hg respectively, mole fraction of B in liquid phase is 0.5. Calculate total vapour pressure and mole fraction of A and B in vapour phase**

a. 500, 0.4, 0.6

b. 500, 0.5, 0.5

c. 450, 0.4, 0.6

d. 450, 0.5, 0.5

**Solution : (a)**

$$P_T = P^o_{A \times A} + P^o_{B \times B}$$

= 0. 5 × 400 + 0.5 × 600

= 500 mm of Hg

$$\frac{1}{P_T} = \frac{Y_A}{400} + \frac{1 - Y_B}{600}$$

Therefore, $Y_A = 0.6$

$Y_B = 1 - 0.6 = 0.4$

**14. Arrange the following set of quantum numbers having highest energy of an electron.**

| | | | |
|---|---|---|---|
| (p) n = 4 | l = 1 | m = +1 | s=1/2 |
| (q) n = 4 | l = 2 | m = -1 | s=-1/2 |
| (r) n = 3 | l = 2 | m = 0 | s=1/2 |
| (s) n = 3 | l = 1 | m + 1 | s=-1/2 |

a. q > r > p > s

b. q > p > r > s

c. s > p > r > q

d. s > r > p > q

**Solution: (c)**

We know that n is principle quantum number and l is an azimuthal quantum number.

Also, l= n - 1

The set of quantum number which have highest value of n+l will have the highest energy and vice versa.

E directly proportion to (n+l)

**15. A forms ccp lattice, B occupy half of the octahedral voids and 'O' occupy all the tetrahedral voids. Calculate formula –**

a. $A_2BO_4$

b. $ABO_4$

c. $A_2B_2O$

d. $A_2B_2O$

**Solution: (a)**

CCP lattice of A → no of atom of A per unit cell → 4.

N oct. voids = 2 N tetra. Voids. But B occupies only half of oct. voids

Therefore, Number of atoms of B = 4 *1/2 = 2

No. of atoms of C → 4 x 2 = 8

So, the formula → $A_4$ $B_2$ $C_8$

**16.** $B_2H_6$ reacts with $O_2$ and $H_2O$ respectively to form

a. $B_2O_3$, $H_3BO_3$

b. $B_2O_3$, $BH_4^-$

c. $HBO_2$, $H_3BO_3$

d. $H_3BO_3$, $HBO_2$

**Solution: (a)**

$B_2H_6$ reacts with $O_2$ and $H_2O$ to form Diborane extensively burns in oxygen to form basic oxide and $B_2H_6$ hydrolysis to give Boric acid

$$B_2H_6 + 3O_2 \rightarrow B_2O_3 + 3H_2O$$
$$B_2H_6 + 6H_2O \rightarrow 2H_3BO_3 + 3H_2$$

**17. Solution of 100 ml water contains 0.73 g of $Mg(HCO_3)_2$ and 0.81 g of $Ca(HCO_3)_2$. Calculate the hardness in terms of ppm of $CaCO_3$.**

a. $10^2$ ppm

b. $10^4$ ppm

c. $5 \times 10^3$ ppm

d. $10^3$ ppm

**Solution: (c)**

Number of moles of

$$Mg(HCO_3)_2 = \frac{0.73}{146} = 0.005$$

Number of moles of

$$Ca(HCO_3)_2 = \frac{0.81}{162} = 0.005$$

PPM= [Totalno.ofmole x 100 x $10^6$]/100

= [.005+0.005 x 100 x $10^6$]/100

PPM = $10^4$

**18. For $Zr_3(PO_4)_4$ the solubility product is $K_{sp}$ and solubility is S. Find the correct relation.**

a. $S = \left(\frac{K_{sp}}{6912}\right)^{1/7}$

b. $S = \left(\frac{K_{sp}}{216}\right)^{1/7}$

c. $S = \left(\frac{K_{sp}}{216}\right)^{1/8}$

d. $S = \left(\frac{K_{sp}}{912}\right)^{1/3}$

**Solution: (a)**

It is $A_3B_4$ type of salt

Hence $Ks_p = (3s)^3 \times (4s)^4$

$= 27s^3 \times 256s^4 \; Ks_p$

$= 6912s^7 \; S = \sqrt[7]{\frac{Ks_P}{6912}}$

**19. Given complexes are low spin complexes,**

$[V(CN)_6]^{4-} \; [Cr(NH_3)_6]^{2+} \; [Ru(NH_3)_6]^{3+} \; [Fe(CN)_6]^{4-}$

Then order of magnetic moment (μ) for $V^{2+}, Fe^{2+}, Cr^{+3}, Ru^{3+}$ is

a. $V^{2+} > Cr^{2+} > Fe^{2+} > Ru^{3+}$

b. $Fe^{2+} > V^{2+} > Cr^{+2} > Ru^{3+}$

c. $V^{2+} > Cr^{2+} > Ru^{3+} > Fe^{2+}$

d. $Fe^{2+} > Cr^{3+} > V^{2+} > Ru^{3+}$

**Solution: (c)**

For $[V(CN)_6]^{-4}$

Magnetic moment = √(3(3+2) = √15 BM = 3.9 BM

$[Cl(NH_3)_6]^{2+}$

Magnetic moment = √(2(2+2) = √8 = 2.9 BM

$[Ru(NH_3)_6]^{+3}$

Magnetic moment = √(1(1+2) = √3 = 1.732

$[Fe(CN_3)_6]^{-4}$

Magnetic moment =√[nounpaired] =0

Hence, order$V^{+2}$>$Cl^{+2}$$Ru^{+3}$ >$Fe^{+2}$

**20. Given**

$$E^{\circ}_{S_2O_8^{2-}/SO_4^{2-}} = 2.05V$$

$$E^{o}_{Br_2/Br^-} = 1.40V$$

$$E^{o}_{Au^{3+}/Au} = 1.10V$$

$$E^{o}_{O_2/H_2O} = 1.20V$$

Which of the following is the strongest oxidizing agent?

a. $S_2O_8^{2-}$

b. $Br_2$

c. $Au^{+3}$

d. $O_2$

**Solution:** (a)

More is Positive standard reduction Potential more is oxidizing nature.

Hence, $S_2O_8^{2-}$ is answer.

**21. Assertion: Ozone is getting depleted due to CFCs**

**Reason: With the deplection of ozone layer more UV radiation filters into troposphere**

a. Both Assertion and Reason are true and Reason is the correct explanation of Assertion.

b. Both Assertion and Reason are true but Reason is not correct explanation of Assertion.

c. Assertion is true but Reason is false.

d. Assertion is false but Reason is true.

**Solution**: (b)

Ozone gets decomposed by CFCS hence Assertion is correct

Ozone depletion cause, harmful UV rays to enter troposphere hence reason is correct but reason is not correct explanation of assertion.

**22. In which of the following order of hydration energy correct.**

a. $Li^+ > Na^+ > K^+ > Rb^+ > Cs^+$

b. $Li^+ < Na^+ < K^+ < Rb^+ < Cs^+$

c. $Li^+ > Na^+ > K^+ > Cs^+ > Rb^+$

d. $Li^+ < Na^+ < K^+ < Cs^+ < Rb^+$

**Solution: (a)**

Hydration energy α charge, $\alpha_{size}{}^{1}$

$Li^+ > Na^+ > K^+ > Rb^+ > Cs^+$

**23. Ellingham diagram is used for**

a. Reduction

b. Electrolysis

c. Zone refining

d. Van-Arkel

**Solution: (a)**

It is used for estimating, the temperature at which a particular metal oxide is reduced by another metal.

**24. In isoelectronic species $Cl^-$, Ar, $Ca^{2+}$ size differ due to**

a. Nuclear charge

b. Electronic – electronic repulsion in valence shell

c. Magnetic quantum number

d. Principal quantum number

**Solution: (a)**

In isoelectronic species, number of electrons are same but size decrease with increase in atomicnumber or nuclear charge.

**25. Three mole of Ag is heated from 300 K to 1000 K. Calculate ΔH when P = 1 atm and $C_P$ = 23 + 0.01 T.**

a. 62 kJ/mol

b. 45 kJ/mol

c. 38 kJ/mol

d. 54 kJ/mol

**Solution:** (a)

$$\Delta H = \int_{T_1}^{T_2} n\,Cp dT$$

$$n \int_{30}^{400} (23 - 0.1T)\,dT$$

$$= 3\left[23T + \frac{0.1T^2}{2}\right]_{300}^{400}$$

$$= 61960 J/mol$$

$$\Rightarrow 62k^{\circ} mol$$

**26. $FeC_2O_4$, $Fe_2(C_2O_4)_3$, $FeSO_4$, $Fe_2(SO)_4$ one mole each, will react with how many moles of $KMnO_4$**

a. 1

b. 2

c. 3

d. 5

**Solution: (b)**

$$FeC_2O_4 + KMnO_4 \longrightarrow Fe^{3+} + Co_2 + Mn^{2+} \quad Fe_2(C_2O_4)_3 + MnO_4^- \longrightarrow Fe^{3+}$$

$$Fe_3O_4 \longrightarrow Fe^{3+}$$

$$\therefore \text{Total: } \frac{3}{3} + \frac{6}{5} + \frac{1}{5} = 2$$

**27. For 2A + B → C. Find the rate low.**

| [A] | [B] | Initial Rate |
|---|---|---|
| 0.05 | 0.05 | 0.045 |
| 0.10 | 0.05 | 0.09 |
| 0.20 | 0.10 | 0.72 |

a. R = K[A] [B]

b. R = k[A] $[B]^2$)

c. R = $k[A^2][B]$

d. R = $k[A]^2 [B]^2$

**Solution: (b)**

$$v_1 = K[A_1]^x[B]^4$$

$$\frac{v_2}{r_1} = \frac{0.09}{0.045} = \left(\frac{0.1}{0.05}\right)^x$$

$$2 = 2^x$$

$$x = 1$$

Again,

$$\frac{0.79}{0.09} = \left(\frac{0.2}{0.1}\right)^1 \left[\frac{0.1}{0.05}\right]^4$$

$$8 = 2^1 2^y$$
$$y = 2$$

**28. Which of the following lanthanoid ions are coloured?**

1. $Lu^{+3}$

2. $Pm^{+3}$

3. $Sm^{+3}$

4. $Eu^{+3}$

a. $Lu^{+3}$,$Pm^{+3}$,$Sm^{+3}$

b. $Pm^{+3}$,$Sm^{+3}$,$Eu^{+3}$

c. $Lu^{+3}$,$Pm^{+3}$,$Sn^{+3}$

d. $Lu^{+3}$,$Sm^{+3}$,$Eu^{+3}$

**Solution: (b)**

$Pm^{+3}$,$Sm^{+3}$,$Eu^{+3}$ contain unpaired f- electrons. Hence coloured.