# JEE-ADVANCED-2012-P1-Model

**Time: 3:00 Hrs.** **IMPORTANT INSTRUCTIONS** **Max Marks: 210**

## PHYSICS:

| Section | Question Type | +Ve Marks | - Ve Marks | No.of Qs | Total marks |
|---|---|---|---|---|---|
| Sec – I(Q.N : 1 – 10) | Questions with Single Correct Choice | 3 | -1 | 10 | 30 |
| Sec – II(Q.N : 11 – 15) | Questions with Multiple Correct Choice | 4 | 0 | 5 | 20 |
| Sec – III(Q.N : 16 – 20) | Questions with Integer Answer Type | 4 | 0 | 5 | 20 |
| **Total** | | | | **20** | **70** |

## CHEMISTRY:

| Section | Question Type | +Ve Marks | - Ve Marks | No.of Qs | Total marks |
|---|---|---|---|---|---|
| Sec – I(Q.N : 21 – 30) | Questions with Single Correct Choice | 3 | -1 | 10 | 30 |
| Sec – II(Q.N : 31 – 35) | Questions with Multiple Correct Choice | 4 | 0 | 5 | 20 |
| Sec – III(Q.N : 36 – 40) | Questions with Integer Answer Type | 4 | 0 | 5 | 20 |
| **Total** | | | | **20** | **70** |

## MATHEMATICS:

| Section | Question Type | +Ve Marks | - Ve Marks | No.of Qs | Total marks |
|---|---|---|---|---|---|
| Sec – I(Q.N : 41 – 50) | Questions with Single Correct Choice | 3 | -1 | 10 | 30 |
| Sec – II(Q.N : 51 – 55) | Questions with Multiple Correct Choice | 4 | 0 | 5 | 20 |
| Sec – III(Q.N : 56 – 60) | Questions with Integer Answer Type | 4 | 0 | 5 | 20 |
| **Total** | | | | **20** | **70** |

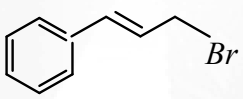
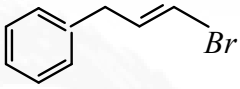
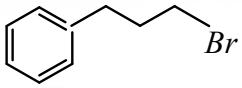
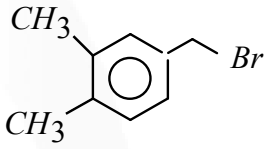
**CHEMISTRY** **Max.Marks:70**

**SECTION – I**

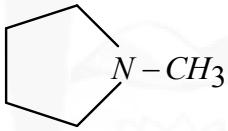
**( SINGLE CORRECT CHOICE TYPE )**

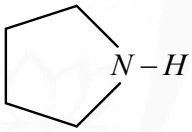
**This section contains 10 multiple choice questions. Each question has 4 choices (A), (B), (C) and (D) for its answer, out of which ONLY ONE is correct**

**21.** Which of the following does NOT undergo $SN^2$ displacement readily?

**A)**  **B)**  **C)**  **D)** 

**22.** What nucleophile could be used to react with 1, 4 – dibromobutane to prepare the following compound (You may assume that base is present to remove excess protons)



**A)** $CH_3 - NH_2$ **B)** $NH_3$ **C)** $(CH_3)_2 NH$ **D)** 

**23.** Reaction of (R)-2-chloro-4-methylpentane with excess NaI in acetone gives racemic 2-iodo-4-methylpentane. How can this be explained?

**A)** the reaction mechanism changes to $S_N1$

**B)** the reaction proceeds via a rapidly inverting radical intermediate

**C)** the substitution is $S_N2$, but repeated attack by iodide anion (with inversion) leads to racemisation

**D)** iodide anion preferentially attacks chlorine, giving a rapidly inverting carbanion intermediate

**24.** Consider the $S_N1$ solvolysis of the following 1°-alkyl chlorides in aqueous ethanol.

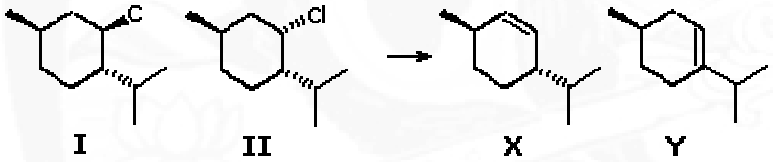
I. $CH_3CH_2CH_2Cl$ II $CH_2=CHCH_2Cl$ III. $CH_3OCH_2Cl$ IV. $CF_3CF_2CH_2Cl$

What is the order of decreasing reactivity?

**A)** III > II > I > IV **B)** II > I > III > IV

**C)** IV > III > II > I **D)** I > II > III > IV

**25.** Stereoisomers **I** and **II** undergo E2 elimination on treatment with sodium ethoxide in ethanol One isomer reacts 500 times faster than the other. Also, one isomer gives **X** as the only product, whereas the other gives **Y** together with some **X .** Which of the following statements provides the best assignment of **I** and **II**?




**I** **II** **X** **Y**

**A) II** reacts faster and gives both **Y** & **X** **B) II** reacts faster and gives only **X**

**C) I** reacts faster and gives both **Y** & **X** **D) I** reacts faster and gives only **X**

**26.** If the rate of reaction of [0.1 M] sodium cyanide with [0.1M] 1-bromoethane is $1.4\times10^{-4}$. What effect will an increase in $NaCN$ concentration to [0.3] and alkyl bromide concentration to [0.2] have on the overall reaction rate?

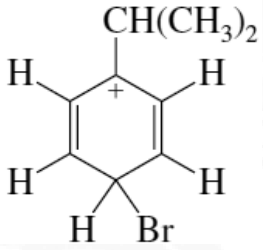
**A)** increase by 2 times **B)** increase by 3 times

**C)** increase by 6 times **D)** increase by 1.5 times

**27.** Which of the following organic chlorides will not give a Friedel-Craft alkylation product when heated with benzene and $AlCl_3$ (Consider Alkenylation and Alkynylation as alkylation if any in the given reaction)

**A)** $(CH_3)_3CCl$ **B)** $CH_2=CHCH_2Cl$ **C)** $CH_3CH_2Cl$ **D)** $CH_2=CHCl$

**28.** Which reactants combine to give the species shown below as a reactive intermediate?



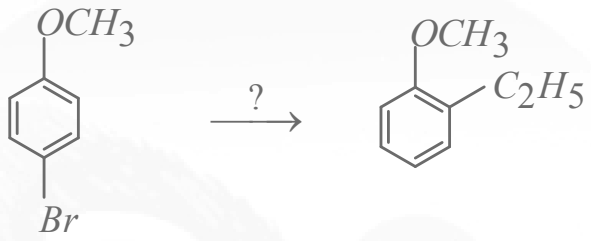

**A)** Benzene, isopropyl bromide, and $HBr$

**B)** Bromobenzene, isopropyl chloride, and $AlCl_3$

**C)** Isopropylbenzene, $Br_2$ and $FeBr_3$

**D)** Isopropylbenzene, $Br_2$, light, and heat

**29.** Which of the following reaction sequences would be best for converting *para*-bromoanisole to *ortho*-ethylanisole?



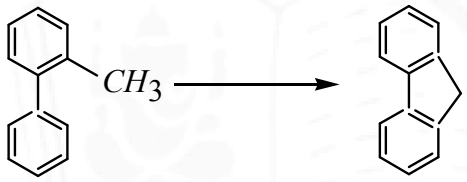

**A)** (i) $H_2$ & $Pt$ catalyst (ii) $C_2H_5Cl$ & $AlCl_3$

**B)** (i) $Mg$ in ether (ii) aqueous alcohol (iii) $C_2H_5Cl$ & $AlCl_3$

**C)** (i) $Mg$ in ether (ii) $C_2H_5Cl$ & $AlCl_3$

**D)** (i) $C_2H_5Cl$ & $AlCl_3$ (ii) $Mg$ in ether (iii) aqueous alcohol

**30.** Which reagents are needed to complete the transformation given below?

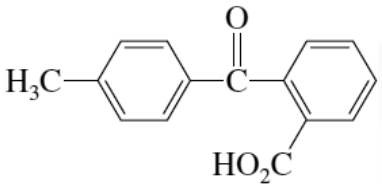


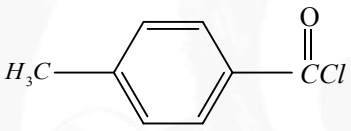

**A)** $SOCl_2, AlCl_3$ **B)** $NBS, Aq\ NaOH$ **C)** $Cl_2 / h\upsilon, AlCl_3$ **D)** $Cl_2 / AlCl_3$

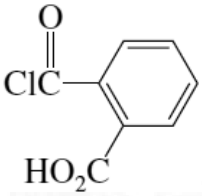
## SECTION – II
### ( MULTIPLE CORRECT CHOICE TYPE )

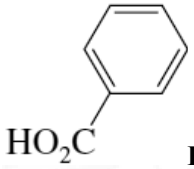
**This section contains 5 multiple choice questions. Each question has 4 choices (A), (B), (C) and (D) for its answer, out of which ONE OR MORE is/ are correct**

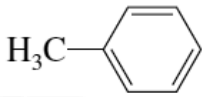
**31.** Select better combination of reactants which gives following compound as major product in EAS reaction in presence of suitable catalyst



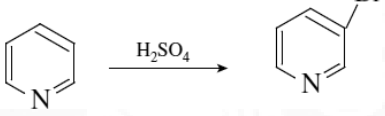

**A)** 

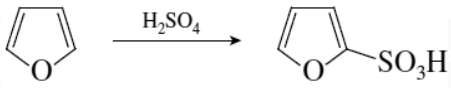

**B)** 

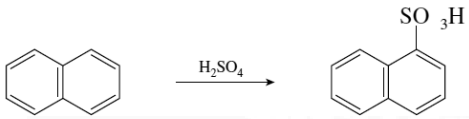

**C)** 

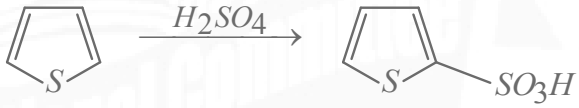

**D)** 


**32.** Orientation in EAS reactions is predicted based on relative stability of intermediate arenium ion..Apply this concept and identify which of following reactions are correct w.r.t to orientation?

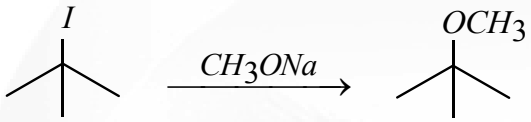
**A)** 

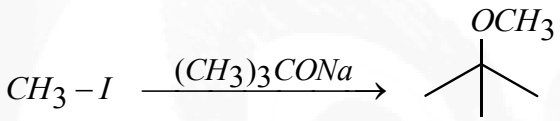

**B)** 


**C)** 


**D)** 

**33.** Below are two potential methods for preparing the same ether but only one of them is successful. Identify the successful approach and choose correct choice(s) to explain your method.

**(I)** 


**(II)** 


**A)** (I) **:** $S_N1$ is favoured in (I) **B)** (II) : $E_1$ & $E_2$ are not favoured in (II)

**C) (**I) : $E_2$ is not favoured in (I) **D)** (II) : $S_N2$ is most favoured

**34.** Choose the correct order(s):

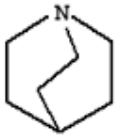
**A)** $CH_3-\overset{\overset{O}{\|}}{C}-CH_2Br > CH_2=CH-CH_2Br \quad (S_N1)$

**B)** $CH_3OCH_2Cl > CH_3CH_2Cl \ (S_N1)$

**C)** $CF_3SO_3^- > CH_3SO_3^-$ (Leaving ability)

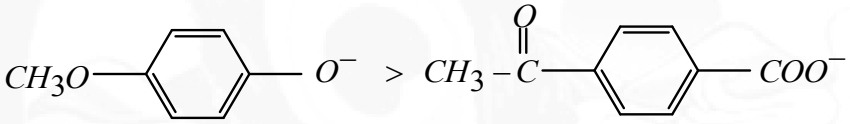
**D)** $Et-S-CH_2CH_2Cl > Et-O-CH_2-CH_2-Cl$ (Rate of hydrolysis)

**35.** Which of the following are correct order of nucleophilicity?

**A)** $(CH_3CH_2)_3N$ > 

**B)** $H-O-O^- > H-O^-$

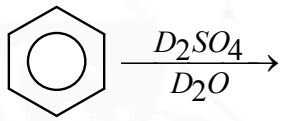
**C)** $I^- > F^-$ (*polar protic solvent*)

**D)** 

**SECTION –III**
**( INTEGER ANSWER TYPE)**

**This section contains 5 questions . The answer to each of the questions is a single digit integer, ranging from 0 to 9. The appropriate bubbles below the respective question numbers in the ORS have to be darkened.**

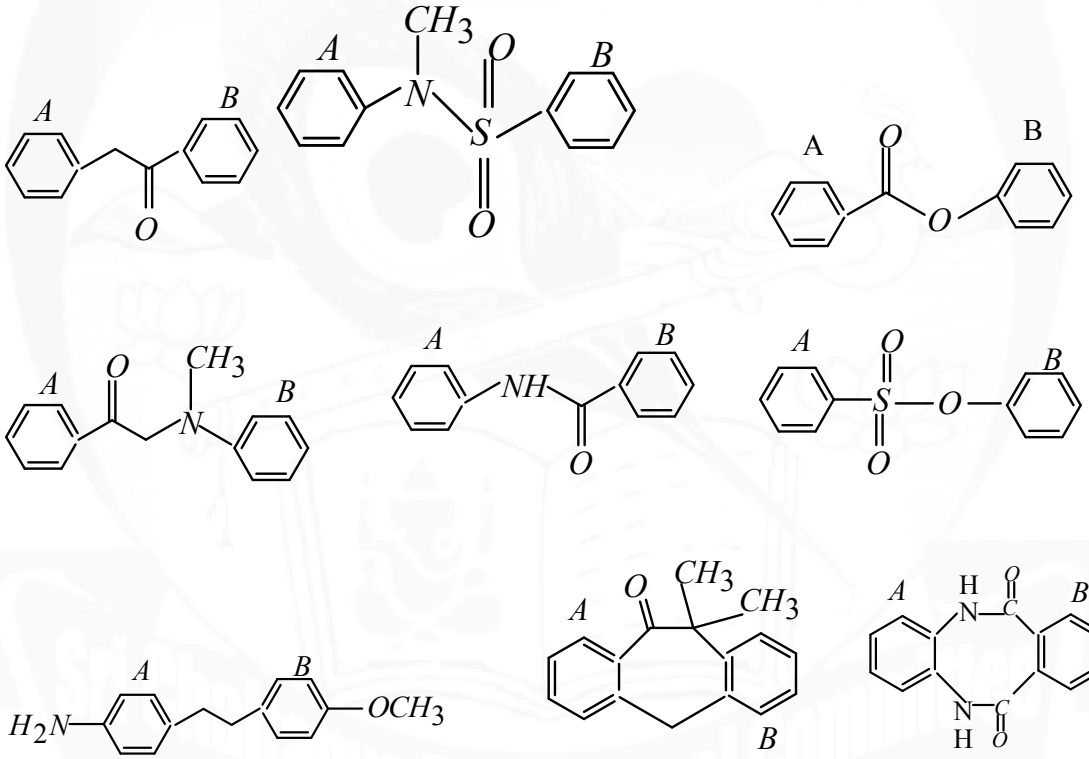
**36.**



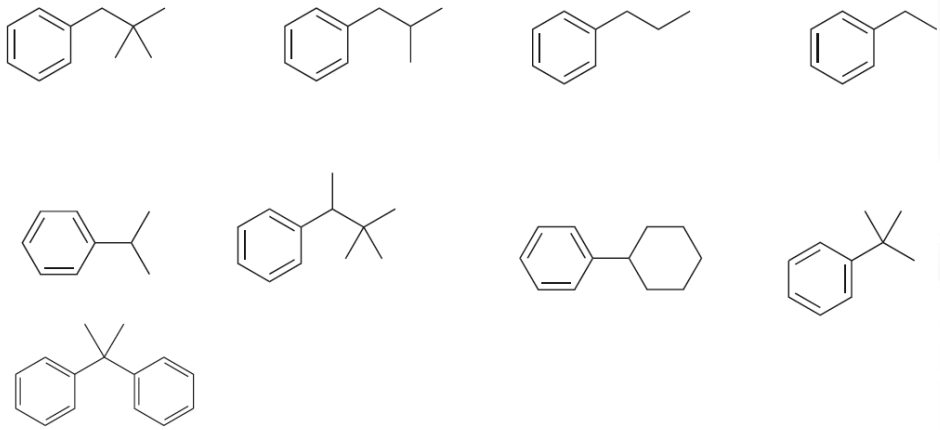
Molecular mass of product is higher than that of benzene by _____units

(Consider excess reagent)

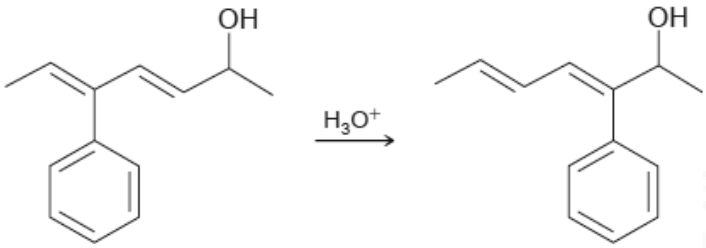
**37.** Each of following compounds contain two aromatic (benzene) rings. In every case two rings are different and labeled as A and B. Identify the number of compounds in which EAS reaction is more favoured in ring A compared to ring B



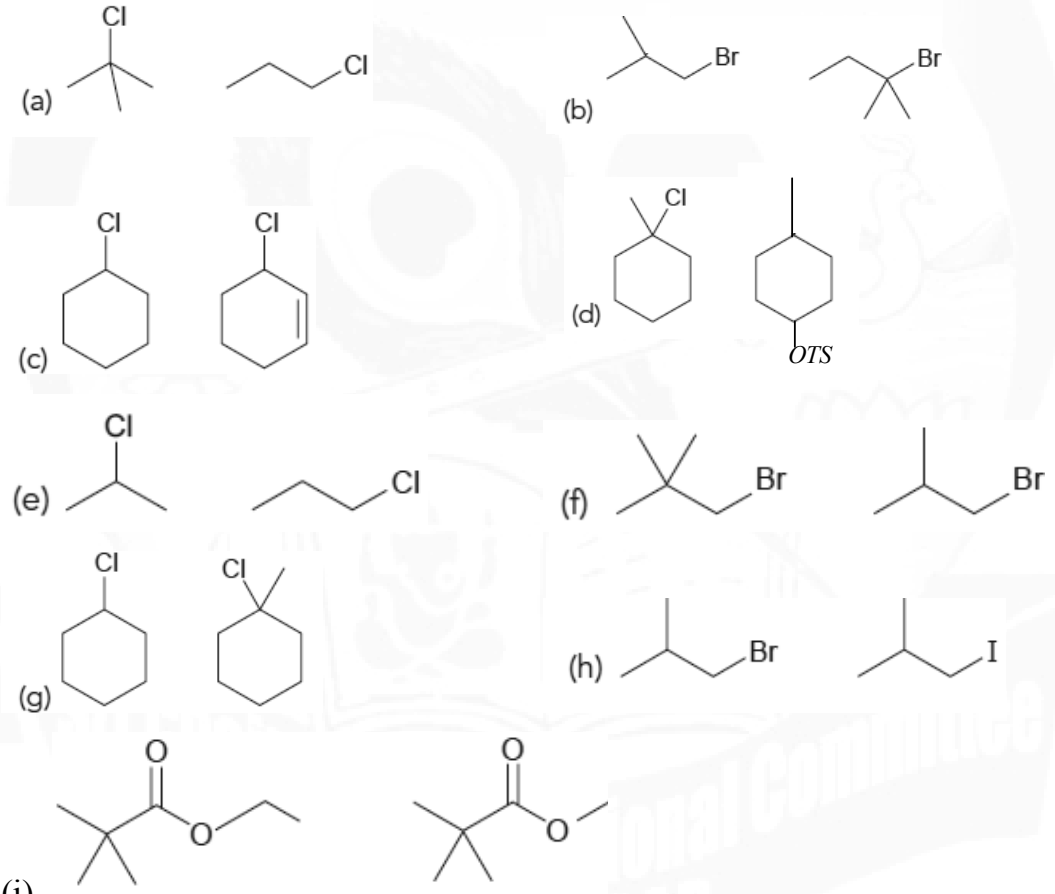
**38.** Identify the number of compounds which can' t be made using a direct Friedel-Crafts alkylation as major product. (it is necessary to perform an acylation followed by a Clemmensen reduction to avoid carbocation rearrangements and some may not obtained even by this process)



**39.** Following isomerisation occurs by how many steps?



**40.** There are certain factors which favours 'SN' reactions to follow either $S_N1$ or $S_N2$ path, structure of substrate is one of them. In how many of following pairs of substrates, structure of first member is more favoured for $S_N2$ compared to next one?




(i)