## Additional Problems For Self Practice (APSP)

# PART - I : PRACTICE TEST PAPER

***This Section is not meant for classroom discussion. It is being given to promote self-study and self testing amongst the Resonance students.***

**Max. Marks : 120** **Max. Time : 1 Hr.**

### Important Instructions

**1.** The test is of **1 hour** duration.

**2.** The Test Booklet consists of **30** questions. The maximum marks are **120.**

**3.** Each question is allotted **4 (four)** marks for correct response.

**4.** Candidates will be awarded marks as stated above in Instructions No. 3 for correct response of each question.
**¼ (one fourth)** marks will be deducted for indicating incorrect response of each question. No deduction from the total score will be made if no response is indicated for an item in the answer sheet.

**5.** There is only one correct response for each question. Filling up more than one response in any question will be treated as wrong response and marks for wrong response will be deducted accordingly as per instructions 4 above.

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**1.** Which order of I effect is incorrect.

(I) $-\overset{\oplus}{N}(CH_3)_3 > -\overset{\oplus}{S}(CH_3)_2$ [–I]

(II) $-OCH_3 > -OH$ [–I]

(III) $-F > -Cl$ [–I]

(IV) $-CH_3 > -\overset{\ominus}{O}$ [+I]

(1) II, III & IV (2) III & IV (3) IV only (4) all

**2.** Select the correct statement ?

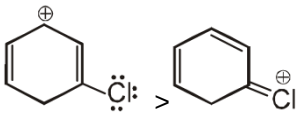
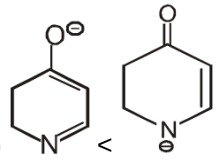
(1) All canonical forms always contribute equally to the resonance hybrid.

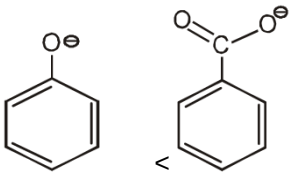
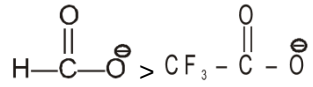
(2) In both ethanamine and ethenamine nitrogen is $sp_3$ hybridised.

(3) All 'C–O' bond length in carbonate dianion are equal.

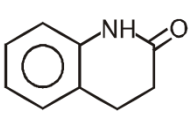
(4) $CH_2=C=O$ does not exhibit resonance because it is not a conjugated system.

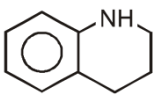
**3.** Select the correct option related to stability of following structures.

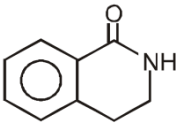
(1)  (2) 

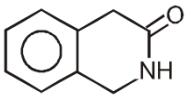
(3)  (4) 

**4.** Rank the following compounds in order of decreasing electron density in the benzene nucleus.

 (P)

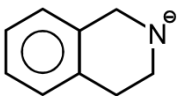
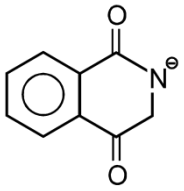
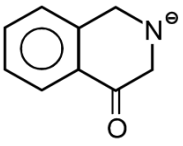
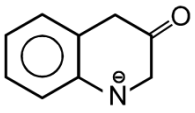
 (Q)

 (R)

 (S)

(1) Q > P > S > R (2) Q > P > R > S (3) P > Q > S > R (4) P > Q > R > S

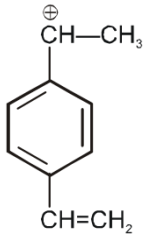
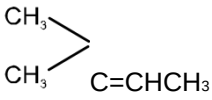
**5.** The decreasing order of electron density on the ring is :

(I)  (II)  (III)  (IV) 

(1) (II) > (III) > (IV) > (I) (2) (IV) > (I) > (II) > (III)

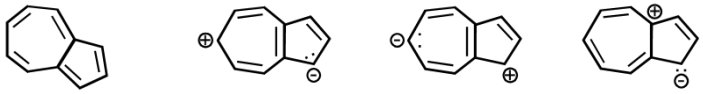
(3) (IV) > (I) > (III) > (II) (4) (I) > (III) > (IV) > (II)

**6.** The number of hyperconjugable hydrogen atoms of following species are respectively :

(P)  (Q) $CH_3\overset{\oplus}{C}H\,CH_2CH_3$ (R)  (S) $CH_3CH{=}CHC_2H_5$

(1) 3, 5, 9, 8 (2) 3, 5, 9, 5 (3) 5, 5, 3, 5 (4) 5, 2, 6, 5

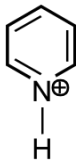
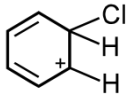
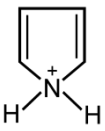
**7.** The most stable and the least stable resonating structures are respectively ?



I II III IV

(1) I and IV (2) I and III (3) II and III (4) III and II

**8.** Which of the following ion will be aromatic in nature ?

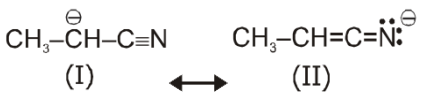
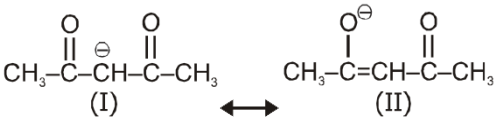
(1)  (2)  (3)  (4) 

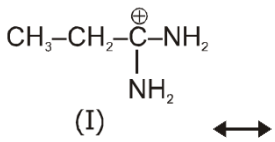
**9.** Stability order of the following carbocations is :

(I) $C_6H_5\overset{\oplus}{C}H_2$ (II) $C_6H_5CH_2\overset{\oplus}{C}H_2$ (III) $C_6H_5\overset{\oplus}{C}HCH_3$ (IV) $C_6H_5\overset{\oplus}{C}(CH_3)_2$

(1) II < I < III < IV (2) II < III < I< IV (3) III < I < II < IV (4) IV < III < I < II

**10.** In the following sets of resonating structure, label the major contributors towards resonance hybrid.

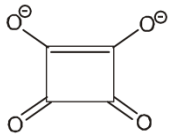
(P)  (Q) 

(R)  (S) 

(1) II, II, I, II (2) II, II, II, I (3) II, II, II, II (4) I, I, II, I

**11.** How many equally stable resonating structures are possible for  (tropylium cation) ?

(1) 2 (2) 4 (3) 5 (4) 7

**12.** Which of the following statement is correct regarding dianion of squaric acid  ?

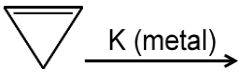
(1) In the dianion , all the C–C bonds are of same length but all C–O bonds are of different length.

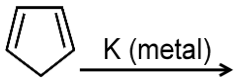
(2) In the dianion, all C–C bonds are of same length and also all C–O bonds are of same lengths.

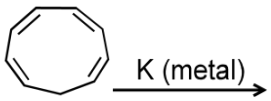
(3) In the dianion, all C–C bond lengths are not of same length.

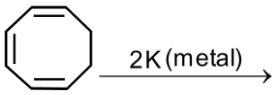
(4) None of the above.

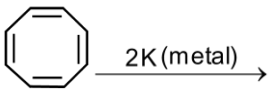
**13.** In which of the following reactions $H_2$ gas is not liberated

(I) 

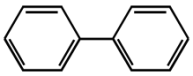

(II) 

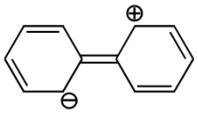
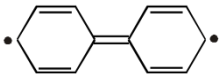
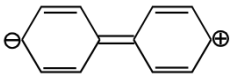
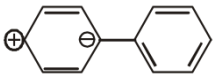

(III) 


(IV) 

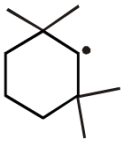

(V) 

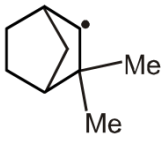

(1) I, III (2) II, III, IV (3) I, V (4) V only

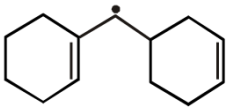
**14.** Which of the following does not represent the resonating structure of 

(1)  (2)  (3)  (4) 

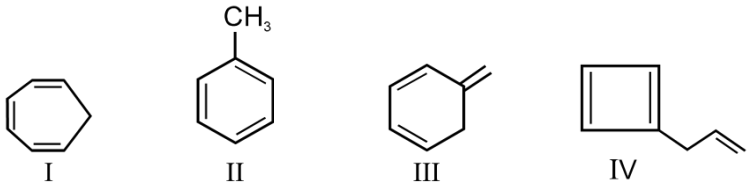
**15.** Hyperconjugation observed in

(1)  (2) 


(3) 


(4) 

**16.** The correct order of resonance energy of the following compounds would be




(1) I > II > III > IV (2) IV > III > II > I (3) II > I > III > IV (4) II > III > I > IV

**17.** The oxygen atom in phenol.

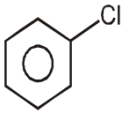
(1) exhibits only inductive effect

(2) exhibits only mesomeric effect

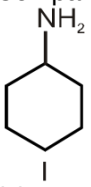
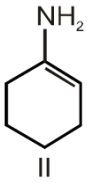
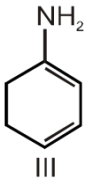
(3) has more dominating mesomeric effect than inductive effect

(4) has more dominating inductive effect than the mesomeric effect

**18.** Which of the following benzene ring has greater electron density than

(1)  (2)  (3)  (4) 

**19.** Compare C–N bond length in the following :

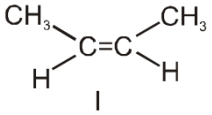
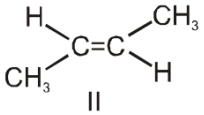
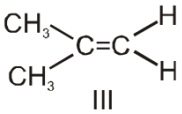
 I  II  III

(1) I > II > III (2) I > III > II (3) III > II > I (4) III > I > II

**20.** Which is not stable at room temperature ?

(1)  (2)  (3)  (4) 

**21.** Correct order of stability of following alkenes is

 I  II  III

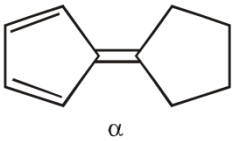
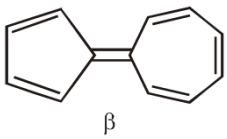
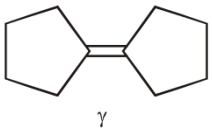
(1) I > II > III (2) I > III > II (3) III > II > I (4) III > I > II

**22.** The kind of delocalization involving sigma bond orbitals is called :

(1) Inductive effect (2) Hyperconjugation effect

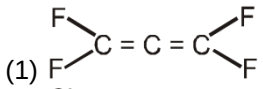
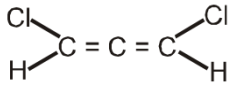
(3) Electromeric effect (4) Mesomeric effect

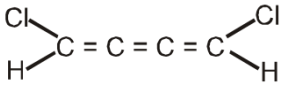
**23.** Compare dipole moment for the following :

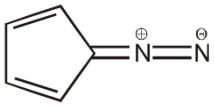
 α  β  γ

(1) α > β > γ (2) γ > β > α (3) γ > α > β (4) β > α > γ

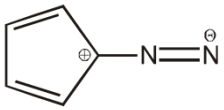
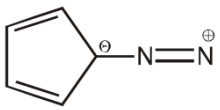
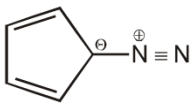
**24.** Which of the following molecule is polar as well as planar?

(1)  (2) 

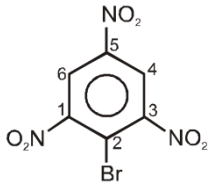
(3)  (4) None of these

**25.** 

The most stable canonical structure of this molecule is :

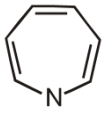
(1)  (2)  (3)  (4) All are equally stable

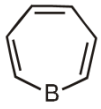
**26.** Which of the following statements would be true about this compound :

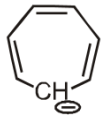



(1) All three C–N bonds are of same length.
(2) $C_1$–N and $C_3$–N bonds are of same length but shorter than $C_5$–N.
(3) $C_1$–N and $C_3$–N bonds are of same length but longer than $C_5$–N bond.
(4) $C_1$–N and $C_3$–N bonds are of different length but both are longer than $C_5$–N bond.

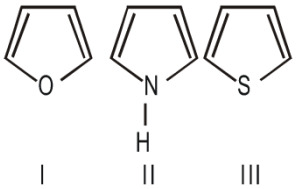
**27.** The aromatic compound would be

(1) 

(2) 
(3) 

(4) 


**28.** Match the resonance energies 67, 88 and 121 kJ $mol^{-1}$ for the following compounds.



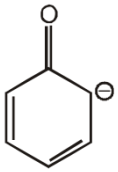

I II III

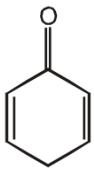
(1) I - 67, II - 121, III-88
(2) I - 121, II - 67, III - 88
(3) I - 67, II - 88, III-121
(4) I - 121, II - 88, III - 67

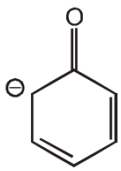
**29.** The most Carbocations, carbanions, free radicals and radical cation are reactive carbon intermediates. Their hybrid orbitals respectively are

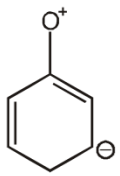
(1) $sp^2$, $sp^2$, $sp^3$, sp (2) $sp^2$,$sp^2$, sp, $sp^3$ (3) $sp^2$, $sp^3$, $sp^2$, sp (4) $sp^3$, $sp^2$, sp, $sp^2$

**30.** Which of the following is not a resonating structure for the phenoxide ion ?

(1) 

(2) 

(3) 

(4) 

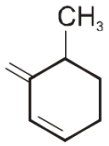
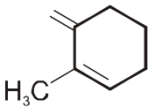
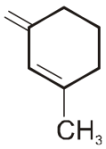
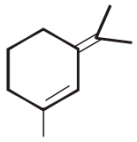
## Practice Test (JEE-Main Pattern)

**OBJECTIVE RESPONSE SHEET (ORS)**

| Que. | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| Ans. | | | | | | | | | | |
| Que. | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
| Ans. | | | | | | | | | | |
| Que. | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 |
| Ans. | | | | | | | | | | |

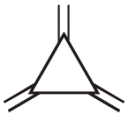
# PART - II : PRACTICE QUESTIONS

**1.** The correct stability order of following is :

(I)  (II)  (III)  (IV) 

(1) I > II > III > IV (2) III > IV > II > I (3) II > IV > III > I (4) IV > III > II > I

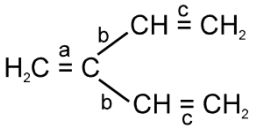
**2.** Which of the following species will show hyperconjugation :

(1)  (2)  (3)  (4) 

**3.** The correct order of dipolemoment of ortho, meta, and para-nitrotoluene is

(1) o > m > p (2) p > o > m (3) p > m > o (4) m > o > p

**4.** The correct bond order is



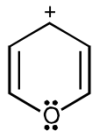
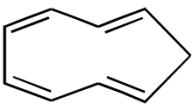
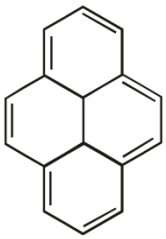
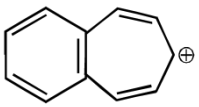
(1) a > b > c (2) b > a > c (3) c > a > b (4) c > b > a

**5.** The correct order of increasing bond length of C–H, C–O, C–C and C=C is :

(1) C–H < C=C < C–O < C–C (2) C–C < C=C < C–O < C–H

(3) C–O < C–H < C–C < C=C (4) C–H < C–O < C–C < C=C

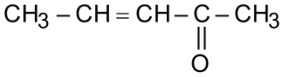
**6.** Which of the following compound(s) is/are an aromatic compounds?

(i)  (ii)  (iii)  (iv) 

(1) I, II and III (2) III and IV (3) IV only (4) I, III and IV

**7.** Which of the following compounds has inductive, mesomeric and hyperconjugative effect ?

(1) $CH_3Cl$ (2) $CH_3–CH=CH_2$

(3)  (4) $CH_2=CH–CH=CH_2$

**8.** Aromatic compounds burn with sooty flame because :

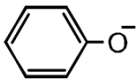
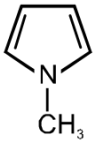
(1) They contain a ring structure of carbon atoms.

(2) They contain a relatively high percentage of hydrogen.

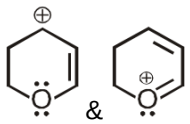
(3) They resist reaction with oxygen of air.

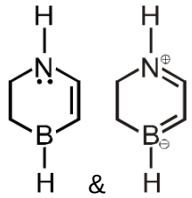
(4) They contain a relatively high percentage of carbon.

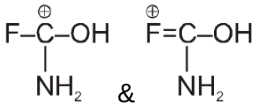
**9.** The compound which does not stabilised by resonance :

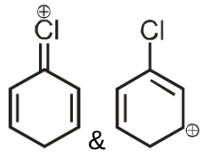
(1) $CH_2=CH-Cl$ (2)  (3) $CH_2=CH-CH_2-Cl$ (4) 

**10.** In which of the following pairs of compounds, first structure have more contribution to resonance hybrid than second?

(1) 

(2) 

(3) 

(4) 

# APSP Answers

## PART - I

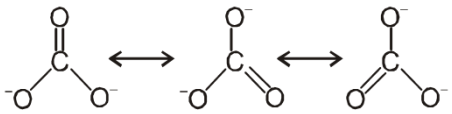
| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **1.** | (3) | **2.** | (3) | **3.** | (3) | **4.** | (1) | **5.** | (3) |
| **6.** | (2) | **7.** | (3) | **8.** | (1) | **9.** | (1) | **10.** | (3) |
| **11.** | (4) | **12.** | (2) | **13.** | (3) | **14.** | (2) | **15.** | (4) |
| **16.** | (3) | **17.** | (3) | **18.** | (3) | **19.** | (1) | **20.** | (3) |
| **21.** | (3) | **22.** | (2) | **23.** | (4) | **24.** | (3) | **25.** | (3) |
| **26.** | (3) | **27.** | (3) | **28.** | (3) | **29.** | (3) | **30.** | (4) |

## PART - II

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **1.** | (4) | **2.** | (2) | **3.** | (3) | **4.** | (3) | **5.** | (1) |
| **6.** | (4) | **7.** | (3) | **8.** | (4) | **9.** | (3) | **10.** | (4) |

# APSP Solutions

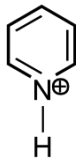
## PART - I

**2.** 

Equivalent resonating structures thus all bonds have equal bond lengths.

**6.** Number of α - hydrogens

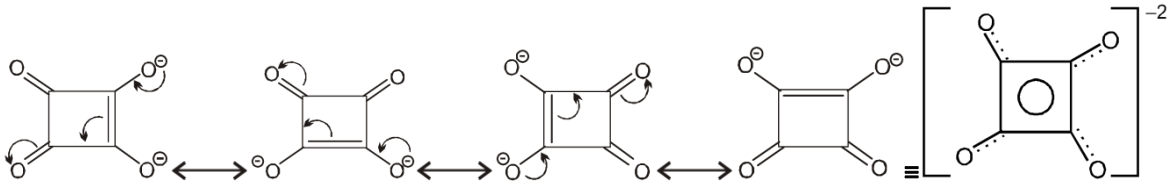
**7.** In structure II, both the rings are aromatic hence II is most stable structure but in structure III, both rings are antiaromatic, hence structure III is least stable structure.

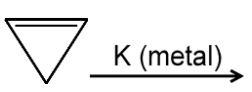
**8.** 

Pyridinium ion is aromatic in nature because in pyridine the lone pair is not involved in conjugation.

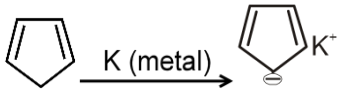
**10.** More stable resonating structure contribute more towords resonance hybrid.

**11.** 7 including the given structure in which every C will recieve a positive charge.

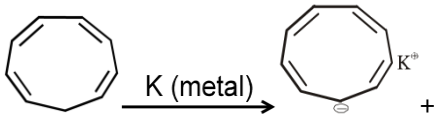
**12.** 

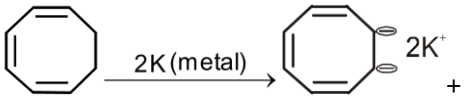
**13.** (I) 

no reaction

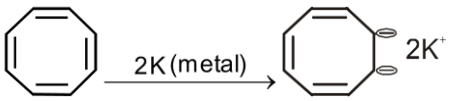
(II) 

+ ½H₂

(III) 

+ ½ $H_2$ (IV) 

+ $H_2$

(V) 

(No $H_2$ gas)

**14.** There are unpaired electrons, others have no unpaired electrons.

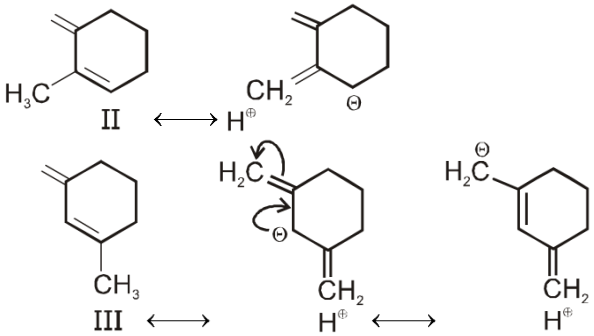
**16.** Resonance energy α stabicity.

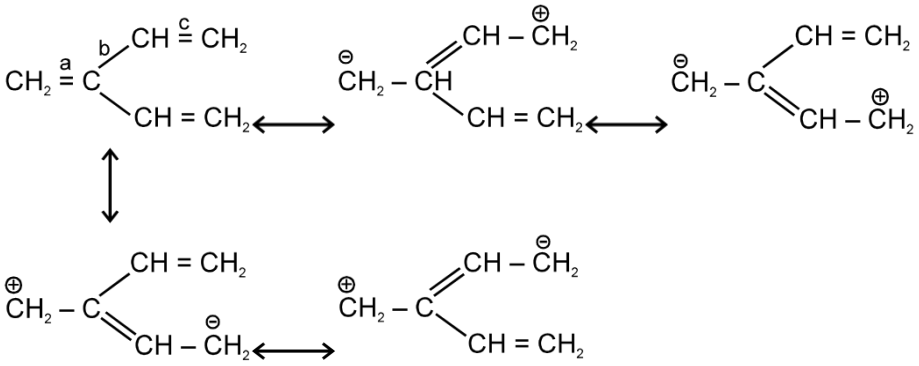
**29.** Carbocations, carbonions, free radicals and radical cations are $sp_2$, $sp_3$, $sp_2$ and sp hybrid respectively.

**30.** Charge is never delocalized on the meta positon at the benzene nucleus with respect to group.

## PART - II

**1.** Stability ∝ resonance
∝ Hyperconjugation
length of conjugation is equal in all I, II, III & IV.
But Hyperconjugation is IV > III = II > I and Hyperconjugative structure of III is more stable than II since it is more delocalised.




**4.** 


**7.** (i) Only inductive (ii) hyperconjugation (iii) Inductive, mesomeric and hyperconjugative.
(iv) resonance and hyperconjugation

**9.** There is conjugation in A,B,D but not in C.