Self Practice Paper (SPP)

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) $-CH_3 >$ – [+I]

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

2. Select the correct statement ?

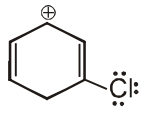
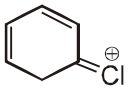
(1) All canonical forms always contribute equally to the resonance hybrid.

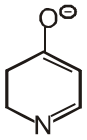
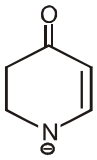
(2) In both ethanamine and ethenamine nitrogen is sp^3 hybridised.

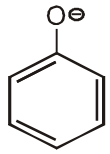
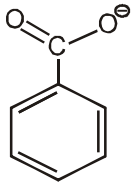
(3) All 'C–O' bond length in carbonate dianion are equal.

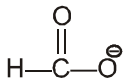
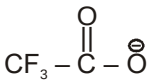
(4) $CH_2=C=O$ does not exhibit resonance because it is not a conjugated system.

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

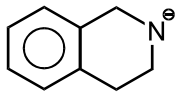
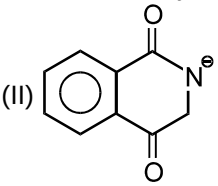
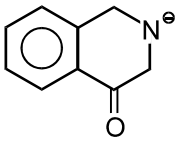
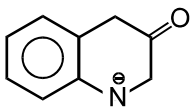
(1)  > 

(2)  < 

(3)  < 

(4)  > 

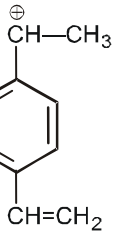
4. The decreasing order of electron density on the ring is :

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

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

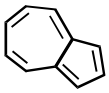
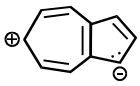
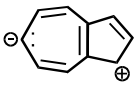
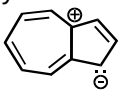
(3) (IV) > (I) > (III) > (II) (4) (I) > (III) > (IV) > (II)

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

(P)  (Q) $CH_3\overset{\oplus}{C}HCH_2CH_3$ (R) $(CH_3)_2C=CHCH_3$ (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

6. 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

7. 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

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

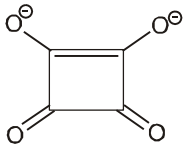
(P) $CH_3-\overset{\ominus}{C}H-C\equiv N \longleftrightarrow CH_3-CH=C=\ddot{N}:^{\ominus}$ (I) (II)

(Q) $CH_3-\overset{O}{\overset{\|}{C}}-\overset{\ominus}{C}H-\overset{O}{\overset{\|}{C}}-CH_3 \longleftrightarrow CH_3-\overset{O^{\ominus}}{\overset{|}{C}}=CH-\overset{O}{\overset{\|}{C}}-CH_3$ (I) (II)

(R) $CH_3-CH_2-\overset{\oplus}{\underset{NH_2}{\underset{|}{C}}}-NH_2 \longleftrightarrow CH_3-CH_2-\overset{\oplus}{C}=\underset{NH_2}{\underset{|}{NH_2}}$ (I) (II)

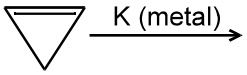
(S) $CH_3-\overset{\ominus}{C}H-CH=CH-NO_2 \longleftrightarrow CH_3-CH=CH-CH=\overset{\oplus}{N}-\overset{\ominus}{O}\ \underset{O^{\ominus}}{|}$ (I) (II)

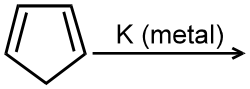
(1) II, II, I, II (2) II, II, II, I (3) II, II, II, II (4) I, I, II, I

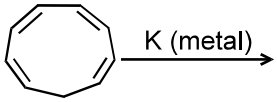
9. Which of the following statement is correct regarding dianion of squaric acid  ?

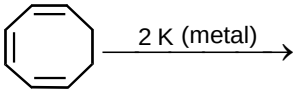
(1) In the dianion, all the C–C bonds are of same length but all C–O bonds are of different length.
(2) In the dianion, all C–C bonds are of same length and also all C–O bonds are of same lengths.
(3) In the dianion, all C–C bond lengths are not of same length.
(4) None of the above.

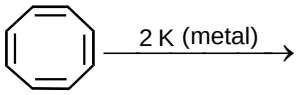
10. In which of the following reactions H_2 gas is not liberated

(I) 

(II) 

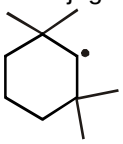
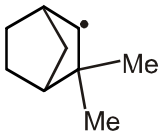
(III) 

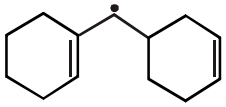
(IV) 

(V) 

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

11. Hyperconjugation observed in

(1)  (2) $\dot{C}Ph_3$ (3) 

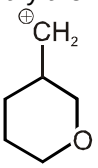
(4) 

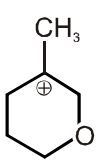
12. Correct stability order for :

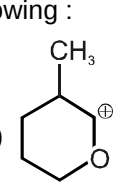
(I) $CH_3-\overset{\oplus}{\underset{CH_3}{\underset{|}{C}}}-CH_3$ (II) $CD_3-\overset{\oplus}{\underset{CD_3}{\underset{|}{C}}}-CD_3$

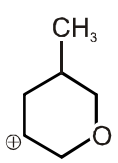
(1) I > II (2) II > I (3) II = I (4) Can't be predicted

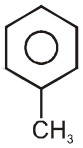
13. Identify the most stable carbocation among the following :

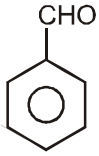
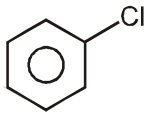
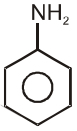
(1) 

(2) 

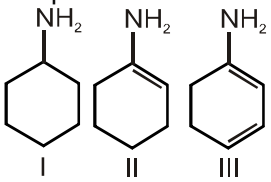
(3) 

(4) 

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

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

15. Compare C–N bond length in the following :

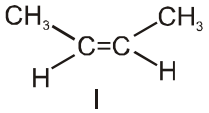


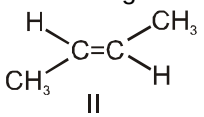
(1) I > II > III (2) I > III > II (3) III > II > I (4) III > I > II

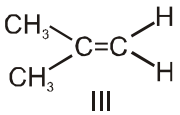
16. Which is not stable at room temperature ?

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

17. Correct order of stability of following alkenes is

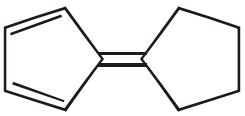

I

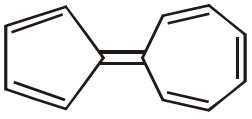

II

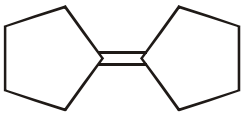

III

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

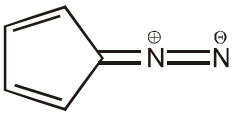
18. Compare dipole moment for the following :


α

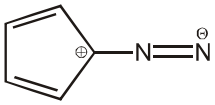
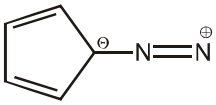
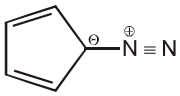

β


γ

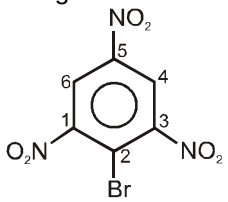
(1) α > β > γ (2) γ > β > α (3) γ > α > β (4) β > α > γ

19. 

The most stable canonical structure of this molecule is :

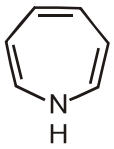
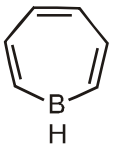
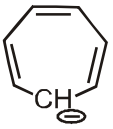
(1) 
(2) 
(3) 
(4) All are equally stable

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

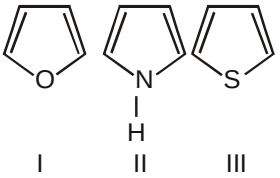


(1) All three C – N bonds are of same length.
(2) C1–N and C3–N bonds are of same length but shorter than C5–N
(3) C1–N and C3–N bonds are of same length but longer than C5–N bond
(4) C1–N and C3–N bonds are of different length but both are longer than C5–N bond

21. The aromatic compound would be

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

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



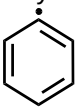
I II III

(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

23. 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

24. Rank the following radicals in order of decreasing stability.

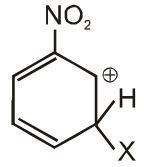
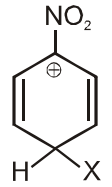
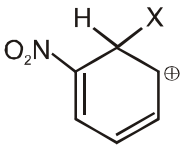
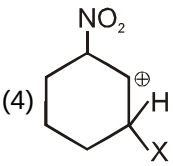
(I)  (II)  (III)  (IV) 

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

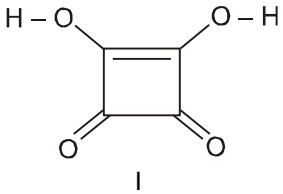
25. Among the following the strongest acid is :

(1) HC ≡ CH (2) C_6H_6 (3) C_2H_6 (4) CH_3OH

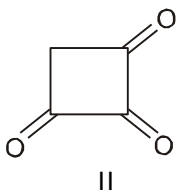
26. Which of the following carbocation is most stable?

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

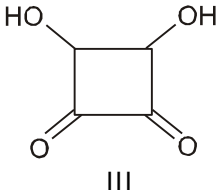
27. The correct pK_a order of the following acids is



I



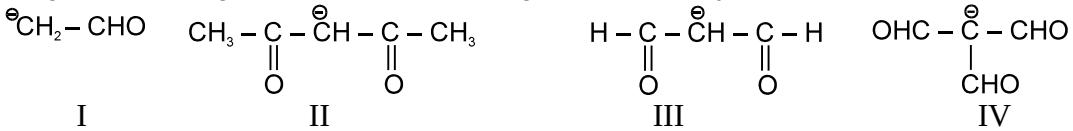
II



III

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

28. Arrange the following carbanions in decreasing order of stability :



I II III IV

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

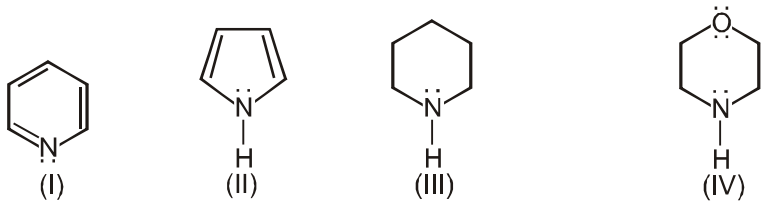
29. Which of the following compounds will show tautomerism :

(1) 2, 2-Dimethyl propanal (2) Benzaldehyde (3) Acetyl acetone (4) Benzophenone

30. In which pairs first compound is stronger acid than the second ?

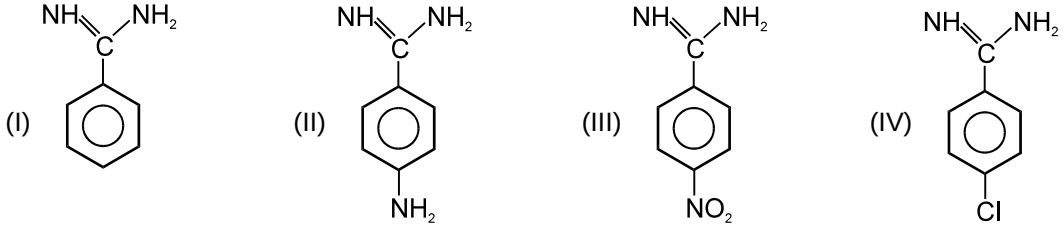
(1) Adipic acid, succinic acid (2) Fumaric acid, maleic acid
(3) Phthalic acid, terepthalic acid (4) o–toluic acid, Salicylic acid

31. Arrange the following compounds in the increasing order of basicity.



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

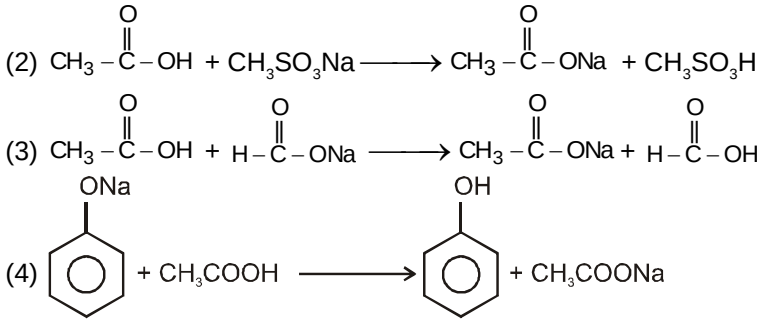
32. Select the decreasing order of relative basic strength of following species :



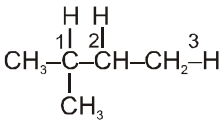
(1) (II) > (IV) > (I) > (III) (2) (III) > (I) > (IV) > (II) (3) (III) > (IV) > (I) > (II) (4) (II) > (I) > (IV) > (III)

33. Which of the following reaction is possible ?

(1) $EtOH + CH_3COONa \rightarrow EtONa + CH_3COOH$



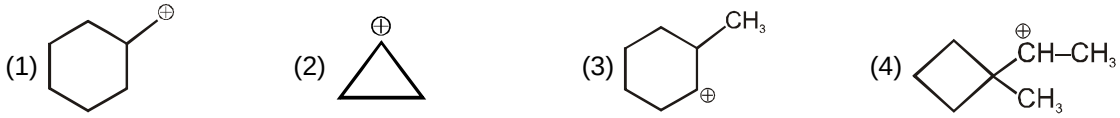
34.



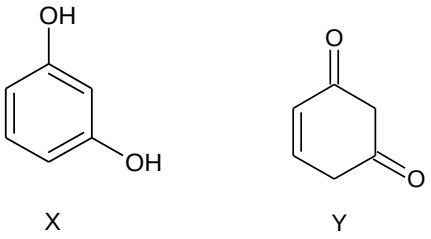
in C_1–H, C_2–H and C_3–H the homolytic bond dissociation energy order is :

(1) C_2–H > C_3–H > C_1–H (2) C_2–H > C_3–H > C_1–H (3) C_2–H > C_3–H > C_1–H (4) C_3–H > C_2–H > C_1–H

35. In which of the following carbocation rearrangement will not take place?



36. At normal temperature, X and Y are

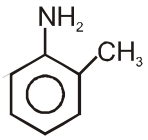
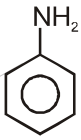


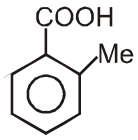
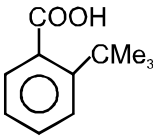
X Y

(1) resonance structures (2) tautomers

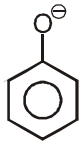
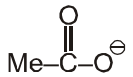
(3) functional isomers (4) positional isomers

37. Select correct statement from the following :

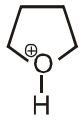
(1)  is more basic than 

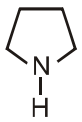
(2)  is more acidic than 

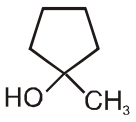
(3) HC≡CH is more acidic than NH_3

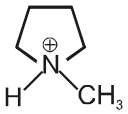
(4)  is more stable than 

38. Which is correct decreasing order of acidic strength of following compounds ?


(i)


(ii)


(iii)


(iv)

(1) (i) > (iii) > (iv) > (ii) (2) (i) > (iv) > (iii) > (ii) (3) (iii) > (i) > (iv) > (ii) (4) (iv) > (iii) > (i) > (ii)

39. Which is most basic in aqueous solution ?

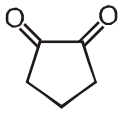
(1) CH_3NH_2 (2) $(CH_3)_2NH$ (3) $(CH_3)_3N$ (4) $Ph–NH_2$

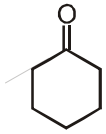
40. Give the correct order of decreasing acidity :

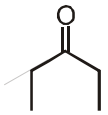
(i) $C_2H_5–SH$ (ii) $C_2H_5–OH$ (iii) $C_2H_5NH_2$ (iv) $CH_3–CH_2–CH_3$

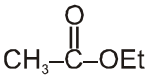
(1) (ii) > (i) > (iii) > (iv) (2) (iii) > (ii) > (i) > (iv) (3) (i) > (ii) > (iii) > (iv) (4) (iii) > (iv) > (ii) > (i)

41. Decreasing order of enol content of the following compound in liquid phase :


(i)


(ii)


(iii)


(iv)

(1) (ii) > (i) > (iii) > (iv) (2) (i) > (ii) > (iii) > (iv) (3) (iv) > (iii) > (ii) > (i) (4) (iii) > (i) > (ii) > (iv)

42. The correct order of acidity for the following compound is

(1) Benzoic acid > phenol > p-nitrobenzoic acid > m-nitrobenzoic acid.
(2) phenol > p-nitrobenzoic acid > m-nitrobenzoic acid > benzoic acid.
(3) p-nitrobenzoic acid > m-nitrobenzoic acid > benzoic acid > phenol.
(4) m-nitrobenzoic acid > p-nitrobenzoic acid > benzoic acid > phenol.

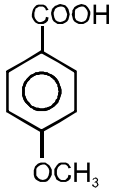
43. The correct order of acidity of the C-H proton is –

(1) acetylene > ethylene > ethane (2) ethylene > acetylene > ethane
(3) ethane > ethylene > acetylene (4) acetylene > ethane >.ethylene

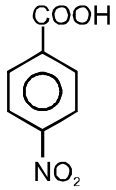
44. Which one of the following compounds can be deprotonated by OH^- fastest ?

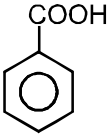
(1) HCOOH, $pK_a = 3.8$ (2) H_2S, $pK_a = 7.0$ (3) Toluene, $pK_a = 41$ (4) CH_3NH_2, $pK_a = 40$

45. The pKa values of the acids A to D are found to be 4.19, 3.41, 4.46 and 4.76. The acid having pKa of 3.41 is

(1) 

(2) CH_3COOH

(3) 

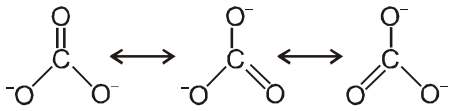
(4) 

SPP Answers

1.	(3)	**2.**	(3)	**3.**	(3)	**4.**	(3)	**5.**	(2)	**6.**	(3)	**7.**	(1)
8.	(3)	**9.**	(2)	**10.**	(3)	**11.**	(4)	**12.**	(1)	**13.**	(3)	**14.**	(3)
15.	(1)	**16.**	(3)	**17.**	(3)	**18.**	(4)	**19.**	(3)	**20.**	(3)	**21.**	(3)
22.	(3)	**23.**	(3)	**24.**	(1)	**25.**	(4)	**26.**	(1)	**27.**	(3)	**28.**	(3)
29.	(3)	**30.**	(3)	**31.**	(2)	**32.**	(4)	**33.**	(4)	**34.**	(4)	**35.**	(2)
36.	(2)	**37.**	(3)	**38.**	(2)	**39.**	(2)	**40.**	(3)	**41.**	(2)	**42.**	(3)
43.	(1)	**44.**	(1)	**45.**	(3)								

SPP Solutions

2.



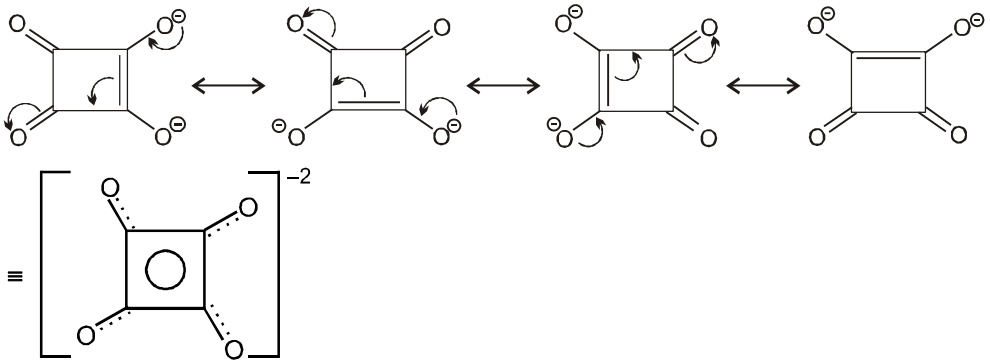
Equivalent resonating structures thus all bonds have equal bond lengths.

5. Number of α - hydrogens

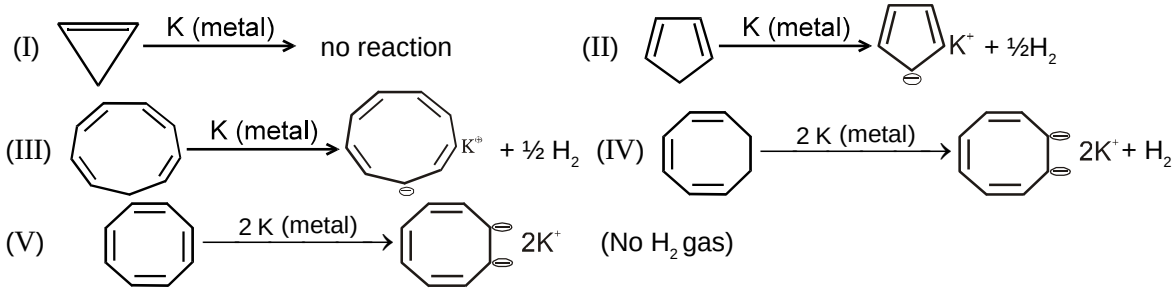
6. In structure II, both the rings are aromatic hence II is most stable structure but in structure III, both rings are antiaromatic, hence structure III is least stable structure.

8. More stable resonating structure contribute more towords resonance hybrid.

9.



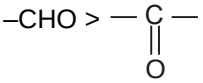
10.

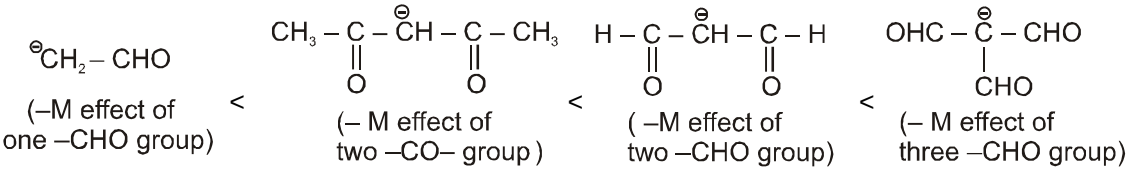


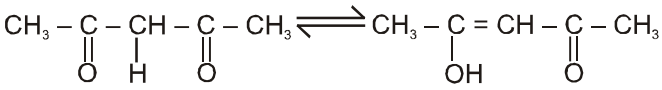
23. Carbocations, carbonions, free radicals and radical cations are sp^2, sp^3, sp^2 and sp hybrid respectively.

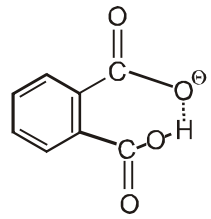
24. Order of radical stability : Resonance > Hyperconjugation > +Inductive effect

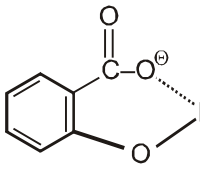
27. On the basis of stability of conjugate base due to electronic effects.

28. –CHO > 



29. 
Acetylacetone

30. (3)  Phthalic acid is stronger acid due to intramolicular hydrogen bonding.

(4)  Salicylic acid is stronger acid due to intramolicular H-bonding.

31. Compound (I) : N is sp^2 hybrid and lone pair of N is localised.

Compound (II) : N is sp^2 hybrid and lone pair of N is delocalised.
Compound (III) : N is sp^3 hybrid

Compound (IV) : N is sp^3 hybrid and –I effect of oxygen atom.

Hence, K_b : III > IV > I > II.

32. II $\rightarrow$ + m effect III $\rightarrow$ – NO_2 (–m effect) IV $\rightarrow$ – I effect

33. Stronger acid give H^+ ion to weaker acid.

34. Dissociation energy $\propto \dfrac{1}{\text{stability of free radical}}$

36. X and Y are tautomers.