

Questions and Answers – Mesomeric Effect

1. In mesomeric effect, the electrons are transferred from _____
- a) A multiple bonds to an atom
 - b) A multiple bonds to a single covalent bond
 - c) An atom with a lone pair to the adjacent single covalent bond
 - d) All of the mentioned

Answer: d

Explanation: In the mesomeric effect, the electrons are transferred from multiple bonds to an atom, a multiple bond to a single covalent bond and an atom with the lone pair to the adjacent single covalent bond.

2. Which of the following is a resonance effect?
- a) Inductive effect
 - b) Electromeric effect
 - c) Mesomeric effect
 - d) Inductomeric effect

Answer: c

Explanation: Mesomeric effect is also known as the resonance effect. The mesomeric effect is a permanent effect and operates in compounds containing at least one double bond.

3. The phenomenon in which 2 or more structures, involving identical position of atoms can be written for a particular molecule, is called _____
- a) Conjugation
 - b) Resonance
 - c) Hyper conjugation
 - d) Vibration

Answer: b

Explanation: The phenomenon in which 2 or more structures, involving the identical position of atoms can be written for a particular molecule, is called resonance. The mesomeric effect is a permanent effect and operates in compounds containing at least one double bond.

4. Select the incorrect option from the following option.
- a) Resonating structures have a real existence
 - b) The actual structure lies between various possible resonating structures
 - c) Resonating structures are useful as they allow us to describe molecules
 - d) None of the mentioned

Answer: a

Explanation: Resonating structures have no real existence. All the other options are correct. The actual structure lies between various possible resonating structures, resonating structures are useful as they allow us to describe molecules.

5. The resonance energy is defined as a difference in energy between _____
- a) Two consecutive resonating structures

- b) Resonance hybrid and most unstable resonating structure
- c) Resonance hybrid and most stable resonating structure
- d) First and last resonating structures

Answer: c

Explanation: The resonance energy is defined as a difference in energy between resonance hybrid and most stable resonating structure. The resonance energy of a compound is a measure of the extra stability of the conjugated system compared to the corresponding number of isolated double bonds.

6. Which of the following is an application of the mesomeric effect?

- a) Dipole moment
- b) Strength of acids and bases
- c) Bond length
- d) All of the mentioned

Answer: d

Explanation: Dipole moment, strength of acids and bases and bond length are some of the applications of the mesomeric effect.

7. Dipole moment of $\text{CH}_3\text{-CH}_2\text{-Cl} > \text{CH}_2\text{=CH-Cl}$.

- a) True
- b) False

Answer: a

Explanation: Dipole moment of $\text{CH}_3\text{-CH}_2\text{-Cl} > \text{CH}_2\text{=CH-Cl}$. This is due to resonance in vinyl chloride.

8. Select the correct statement from the following option.

- a) Benzene ring has two different types of bond length for single and double bonds
- b) All the bond length in benzene ring is equal due to hyperconjugation
- c) All the bond length in benzene ring is equal due to resonance
- d) All of the mentioned

Answer: c

Explanation: All the bond length in the benzene ring is equal due to resonance. All the bond lengths are equal in benzene ring i.e. double bond as well as single bond due to resonance.

9. Greater the number of resonating structures for a given intermediate _____

- a) Less will be its stability
- b) More will be its stability
- c) It will not affect its stability
- d) None of the mentioned

Answer: b

Explanation: Greater the number of resonating structures for a given intermediate, more will be its stability. More resonating structure increases stability.

10. Phenyl group show _____

- a) (+M) effect
- b) (+E) effect
- c) (+I) effect
- d) (-M) effect

View Answer

Explanation: Phenyl group show (-M) effect. The phenyl group or phenyl ring is a cyclic group of atoms with the formula C_6H_5 .

Questions and Answers – Hyperconjugation

1. Which of the following is known as Baker-Nathan effect?

- a) Mesomeric effect
- b) Inductive effect
- c) Hyperconjugation
- d) Electromeric effect

Answer: c

Explanation: Hyperconjugation is also known as Baker-Nathan effect. Hyperconjugation is the stabilising interaction that results from the interaction of the electrons in a σ -bond (usually C-H or C-C) with an adjacent empty or partially filled p-orbital or a π -orbital to give an extended molecular orbital that increases the stability of the system.

2. Hyperconjugation involves the delocalisation of _____

- a) σ bond orbital
- b) π bond orbital
- c) Both σ and π bond orbital
- d) None of the mentioned

Answer: a

Explanation: Hyperconjugation involves the delocalisation of σ bond orbital. It is the stabilising interaction that results from the interaction of the electrons in a σ -bond (usually C-H or C-C) with an adjacent empty or partially filled p-orbital or a π -orbital to give an extended molecular orbital that increases the stability of the system.

3. Number of hyperconjugation structures in isopropyl radical is _____

- a) 3
- b) 6
- c) 9
- d) 12

Answer: b

Explanation: Number of hyperconjugation structures in isopropyl radical is 6. Isopropyl is C_3H_7 .

4. The resonance energy (kCal/mol) of tertiary butyl is _____

- a) 9
- b) 10

- c) 11
- d) 12

Answer: d

Explanation: The resonance energy of tertiary butyl is 12 kCal/mol. It is also called tert-butanol, is the simplest tertiary alcohol, with a formula of $(\text{CH}_3)_3\text{COH}$. It is one of the four isomers of butanol.

5. Larger the number of hyperconjugation structures, the stability of free radicals will

-
- a) Increase
 - b) Decrease
 - c) Remains same
 - d) None of the mentioned

Answer: a

Explanation: Larger the number of hyperconjugation structures, greater will be the stability of free radicals.

6. Which of the following is a consequence of Baker-Nathan effect?

- a) It is helpful in explaining the directive influence of alkyl groups in aromatic alkyl benzene
- b) It is helpful in explaining the relative stability of alkenes
- c) It is helpful in explaining the relative stabilities of alkyl carbocations
- d) All of the mentioned

Answer: d

Explanation: Baker-Nathan effect is helpful in explaining the directive influence of alkyl groups in aromatic alkyl benzene. It is helpful in explaining the relative stability of alkenes and relative stabilities of alkyl carbocations.

7. On increasing the number of α -hydrogens, the number of hyperconjugation structures will

-
- a) Decrease
 - b) Increase
 - c) Remains same
 - d) None of the mentioned

Answer: b

Explanation: On increasing the number of α -hydrogens, the number of hyperconjugation structures will increase. Hyperconjugation is directly proportional to the number of α -hydrogens. α -hydrogen is the hydrogen atom attached to the carbon which is attached to a functional group.

8. When the contributing structure contains the same number of two-electron bonds as the normal lewis formula, it will be _____

- a) Heterovalent hyperconjugation
- b) Sacrificial hyperconjugation
- c) Isovalent hyperconjugation

d) All of the mentioned

Answer: c

Explanation: When the contributing structure contains the same number of two-electron bonds as the normal lewis formula, it will be isovalent hyperconjugation.

9. The compound that can be most readily sulphonated is _____

- a) Benzene
- b) Toluene
- c) Nitrobenzene
- d) Chlorobenzene

Answer: b

Explanation: The compound that can be most readily sulphonated is toluene. Toluene contains a methyl group with benzene ring and is a colorless, water-insoluble liquid with the smell associated with paint thinners.

10. Ethene is devoid of any alpha hydrogen so hyperconjugation is not possible.

- a) True
- b) False

Answer: a

Explanation: Ethene is devoid of any alpha hydrogen so hyperconjugation is not possible because the presence of alpha hydrogen is the necessary condition for hyperconjugation.

Questions and Answers – Resonance and Aromaticity

1. Resonance forms are in equilibrium with each other. State true or false

- a) True
- b) False

Answer: b

Explanation: Resonance forms are hybrid in nature and hence it is not correct to say that they are in equilibrium with each other.

2. Identify the false statement regarding resonance

- a) As the number of charges increases, the resonance forms gets more significant
- b) Zero charge of resonance is the most significant one
- c) Atoms with full octet resonance form are more stable when compared with the one with unfilled octet
- d) Resonance is unstable in case of unfilled octet of nitrogen atom

Answer: a

Explanation: Greater the number of charges, less stable and less significant gets the resonance form.

3. Identify the correct sequence according to electronegativity

- a) $F > NH_2 > CH_3 > OH$
- b) $NH_2 > F > CH_3 > OH$
- c) $NH_2 > OH > CH_3 > F$
- d) $F > OH > NH_2 > CH_3$

Answer: d

Explanation: In the sequence " $F > OH > NH_2 > CH_3$ ", F is the most stable one and CH_3 is the least stable one, as the stability of the anions increases on moving towards the right of the periodic table.

4. Identify the correct sequence with respect to Inductive effects

- a) $CF_3 > CH_2F > CHF_2 > CF_3$
- b) $CF_3 > CHF_2 > CH_2F > CH_3$
- c) $CH_3 > CH_2F > CHF_2 > CF_3$
- d) $CH_3 > CHF_2 > CH_2F > CF_3$

Answer: b

Explanation: As electron withdrawing substituent is greater in CF_3 , it is more stable and CH_3 is the least stable one and hence the sequence.

5. Stability sequence: primary carbocation > secondary carbocation > tertiary carbocation.

Is this sequence correct?

- a) Yes
- b) No

Answer: b

Explanation: The tertiary carbocation has the highest stability and the primary carbocation has the least stability, as it lies close to electron withdrawing group and hence the sequence is not correct.

6. Identify the incorrect statement regarding aromaticity

- a) It is the extra stability possessed by a molecule
- b) p-orbitals must be planar and overlap
- c) Cyclic delocalization takes place
- d) It does not follow Huckel's rule

Answer: d

Explanation: It follows Huckel's rule, according to which a molecule must possess specific number of pi electrons within a closed ring of p-orbitals.

7. Aromatic rings do not have resonance structures. State true or false

- a) False
- b) True

Answer: a

Explanation: Aromatic rings have resonance structure due to cycling double bonds and all aromatic rings must have resonance but the converse need not be satisfied.

8. Select the correct statement regarding the aromatic nitrogen molecule

- a) It is not hybridized
- b) It is sp hybridized
- c) It is sp² hybridized
- d) It is sp³ hybridized

Answer: c

Explanation: As a result of its overall structure and electron delocalization, it becomes a sp² hybridized, aromatic molecule.

9. Can a linear molecule have aromaticity?

- a) Yes
- b) No

Answer: b

Explanation: A molecule can have aromaticity if it is closed loop or ring-shaped or has p-orbitals and hence linear molecule cannot have aromaticity.

10. Select the incorrect statement:

- a) A resonance may sometimes cause sp³ atoms to become sp² hybridized
- b) Delocalizing one lone pair causes aromaticity
- c) One lone pair will be counted as two pi electrons according to Huckel's equation
- d) Two sigma bonds make up a double bond

Answer: d

Explanation: A double bond is one which has a sigma bond and a pi bond. Each pi bond has two pi electrons.

Questions and Answers – Acids and Bases

1. Which one is correctly matched?

- a) Acids – pH range above 7
- b) Acids – pH range below 7
- c) Acids – pH range 7 (neutral)
- d) Acids – pH range 8-9

Answers: b

Explanation: Acids have a pH range less than 7, Water is the only solvent that has a pH of 7 (neutral).

2. A Strong acid is same as concentrated acid. State true or false

- a) False
- b) True

Answer: a

Explanation: Concentration of an acid depends upon the water content whereas the strength of an acid depends on dissociation power.

3. When an acid reacts with a metal, which one of the following gas is usually liberated?

- a) ammonia gas
- b) chlorine
- c) oxygen
- d) Hydrogen gas

Answer: d

Explanation: When metal reacts with acid, a soap bubble is formed and the bubble contains Hydrogen gas (example: HCl , H_2SO_4).

4. Select the one which is wrongly mapped

- a) Sodium carbonate – Washing soda
- b) Sodium chloride – common salt
- c) Calcium carbonate – slaked lime
- d) Sodium hydroxide – caustic soda

5. $\text{MgO} + 2\text{HCl} \longrightarrow \text{X} + \text{H}_2\text{O}$

- a) Mg_2Cl
- b) 2MgCl
- c) MgCl
- d) MgCl_2

Answer: d

Explanation: MgCl_2 is the product formed when magnesium oxide reacts with hydrochloric acid and water is formed as a by-product.

6. Select the one which is neither an acid nor base

- a) CH_3COOH
- b) HCl
- c) KCl
- d) CH_3OH

Answer: c

Explanation: CH_3COOH and CH_3OH are organic acids, HCl is strong acid and KCl is a salt.

7. Which one will change from red litmus to blue?

- a) NaCl
- b) HCl
- c) KOH
- d) LiOH

Answer: b

Explanation: since HCl is a base it turns red litmus to blue.

8. What is the pH of 0.0001 molar HCl solution?

- a) 1
- b) 2
- c) 3

d) 4

Answer: d

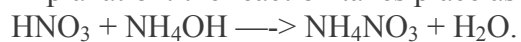
Explanation: It has a H^+ concentration of 10^{-4} . The value of negative exponent($^{-4}$) gives pH value to be 4.

9. What will be the product when HNO_3 reacts with NH_4OH ?

- a) $NH_4 NO_3$
- b) $2NH_4 NO_3$
- c) $NH_4 (NO_3)^2$
- d) NH_2NO_3

Answer: a

Explanation: the reaction takes place as follows:



10. Find the odd one out:

- a) Neutral salt : $NaCl$
- b) Acid salt : $CuSO_4.5H_2O$
- c) Basic salt: $CuCO_3.Cu(OH)^2$
- d) Nonhydrated salt: KNO_3

View Answer

Explanation: $CuSO_4.5H_2O$ is a hydrated salt. An example of acid salt is $NaHCO_3$.