Resonance Effect Chemistry Questions with Solutions

Q1. Resonance effect involves-

a.) Delocalisation of σ electrons.
b.) Delocalisation of π-electrons.
c.) Partial displacement of electrons.
d.) Delocalisation of π and σ electrons.

Correct Answer– (b.) Delocalisation of π-electrons.

Q2. Which of the following exhibit +R effect?

a.) $–NO_2$
b.) –CHO
c.) –OH
d.) –COOH

Correct Answer– (c.) –OH

Q3. Which of the following is the correct statement about resonance–

a.) It decreases the energy of the system.
b.) The hybridisation of atoms do not change due to resonance.
c.) Resonance hybrid is more stable than any resonating structure.
d.) Resonating structures cannot be isolated at any temperature.

Correct Answer– (c.) Resonance hybrid is more stable than any resonating structure.

Q4. Choose the incorrect statement about the resonance contributing structures of a resonance hybrid?

a.) Equivalent contributing structure make the resonance very important.
b.) Contributing structures contribute to the resonance hybrid in proportion of their energies.
c.) Contributing structures represent hypothetical molecules having no real existences.
d.) Contributing structures are less stable than the resonance hybrid.

Correct Answer– (b.) Contributing structures contribute to the resonance hybrid in proportion of their energies.

Q5. Which of the following compound does not have a resonant effect?

a.) C_6H_5Cl
b.) C_6H_5OH
c.) $C_6H_5NH_3$
d.) $C_6H_5NH_2$

Correct Answer– (c.) $C_6H_5NH_3$

Q6. State the Positive Resonance Effect.

Answer. A positive resonance effect occurs when the groups release electrons to the other molecules by the process of delocalization. The groups are usually denoted by +R or +M. In this process, the molecular electron density increases. For example- -OH, -SH, -OR,-SR.

Q7. State the Negative Resonance Effect.

Answer. A negative resonance effect occurs when the groups withdraw the electrons from other molecules by the process of delocalization. The groups are usually denoted by -R or -M. In this process, the molecular electron density is said to decrease. For example- -NO2, C=O, -COOH, -C≡N.

Q8. State True or False.
Aromatic rings do not have resonance structures.

Answer. False.
Due to cycling double bonds, aromatic rings have resonance structure, and all aromatic rings must have resonance, but the converse is not required.

Q9. What causes the effect of resonance?

Answer. Resonance can occur through the interaction of two π-bonds or between a π-bond and a lone pair of electrons on an adjacent atom. This effect is caused by the delocalisation of π-electrons.

Q10. What are the conditions of resonance?

Answer. The conditions of resonance are as follows-

- All atoms participating in resonance must be sp or sp^2 hybridised.
- The parallel p-orbitals overlap to each other.
- Molecule should have conjugated system (parallel p-orbitals system is called conjugate system).

Q11. State the difference between resonance effect and mesomeric effect.

Answer. The main difference between resonance and the mesomeric effect is that the resonance effect describes how a molecule's lone electron pair and bond electron pair determine its chemical structure,

whereas the mesomeric effect describes how a molecule's chemical structure is stabilized by using a functional group.

Q12. Discuss how does the stability of resonance increases?

Answer. The stability of resonance increases with:

- The number of covalent bonds.
- The number of atoms that have an octet of electrons (except hydrogen).
- Separation of the opposite charges.
- Charge dispersal.
- A negative charge on a more electronegative atom, or a positive charge on a more electropositive atom, increases the atom's stability.

Q13. Why is the effect of resonance more dominating than hyperconjugation?

Answer. Like resonance, hyperconjugation has a stabilising effect, but resonance has a stronger effect than hyperconjugation because only p-orbitals overlap in resonance, whereas σ molecular orbitals overlap with p-orbitals in hyperconjugation.

Q14. On the basis of resonance energy, compare between aromatic, anti aromatic and non-aromatic compounds.

Answer. On the basis of resonance energy, comparison between aromatic, anti aromatic and non-aromatic compounds can be done as–

- Aromatic compounds have a very high energy.
- Anti aromatic compounds have zero resonance energy.
- Non Aromatic compounds have approximately 4 – 8 kcal/mol resonance energy like alkenes.

Q15. Give the difference between Resonance effect and Inductive effect.

Answer. The difference between inductive effect and resonance effect is that inductive effect is used for describing the transmission of electrical charges between the atoms whereas resonance effect is used for describing the transmission of electron pairs between the atoms.

Practise Questions on Resonance Effect

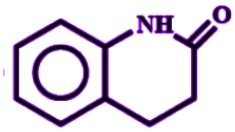
Q1. In which of the following molecule resonance effect is possible?

a.) Vinyl carbocation
b.) Allyl carbocation
c.) 3-Butenal
d.) Vinyl chloride

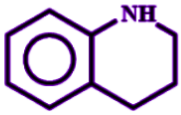
Correct Answer– (b.) Allyl carbocation, (c.) 3-Butenal.
The lone pair is not conjugated with the bond in allyl chloride, and conjugation is also absent in 3-butenal. Thus, the mesomeric effect is not present in allyl chloride and 3-butenal.

Q2. Which of the following molecules, does not have the mesomeric effect with the benzene nucleus?

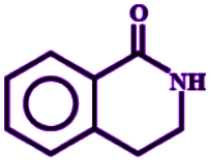
a.)



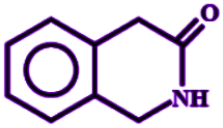
b.)



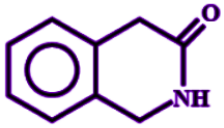
c.)



d.)



Correct Answer– (d.)



Q3. Fill in the blank.
___ electrons are displaced in mesomeric effect.

Answer. π electrons are displaced in mesomeric effect.

Q4. State True or False.
Resonance forms are in equilibrium with each other.

Answer. False.
Resonance forms are hybrid in nature.

Q5. Is resonance effect temporary or permanent?

Answer. It is a permanent effect that occurs in unsaturated molecules, particularly unsaturated molecules that involve conjugation. The resonance effect refers to the permanent and complete shifting of a multiple bond's pi-electron pair to one of the bonded atoms or to the adjacent single bond.