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ASSERTION AND REASON

Chemistry for NEET UG

This edition includes

- Chapter-wise coverage
- NCERT based questions
- 500+ questions for practice
- Useful for NEET UG & other medical entrance exams

Table of Contents

Chemistry

1. Some Basic Concepts of Chemistry

1. **Assertion (A):** The percentage of nitrogen in urea is 46.6%.

Reason (R): Urea is Ionic compound.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

2. **Assertion (A):** One molal aqueous solution of glucose contains 180 g of glucose in 1 kg water.

Reason (R): Solution containing one mole of solute in 1000 g of solvent is called one molal solution.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

3. **Assertion (A):** The weight percentage of a compound A in a solution is given by

$$\% \text{ of A} = \frac{\text{Mass A}}{\text{Total mass of solution}} \times 100$$

Reason (R): The mole fraction of a component A is given by,

Mole fraction of A =

$$\frac{\text{No. of moles of A}}{\text{Total no. of moles of all components}}$$

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

4. **Assertion (A):** A one molal solution prepared at 20°C will retain the same molality at 100°C, provided there is no loss of solute or solvent on heating.

Reason (R): Molality is independent of temperature.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

5. **Assertion (A):** Laboratory reagents are usually made up to a specific molarity rather than a given molality.

Reason (R): The volume of a liquid is more easily measured than its mass.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

6. **Assertion (A):** Molality and mole fraction concentration units do not change with temperature.

Reason (R): These units are not defined in terms of any volume.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

7. **Assertion (A):** The molality and molarity of very dilute aqueous solutions differ very little.

Reason (R): The density of water is about 1.0 g cm^{-3} at room temperature.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

8. **Assertion (A):** For calculating the molality or the mole fraction of solute, if the molarity is known, it is necessary to know the density of the solution.

Reason (R): Molality, molarity and the mole fraction of solute can be calculated from the weight percentage and the density of the solution

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

9. **Assertion (A):** The ratio of the mass of 100 billion atoms of magnesium to the mass of 100 billion atoms of lead can be expressed as $\frac{24}{207}$.

Reason (R): Atomic weights are relative masses.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

10. **Assertion (A):** The average mass of one Mg atom is 24.305 amu, which is not the actual mass of one Mg atom.

Reason (R): Three isotopes, ^{24}Mg, ^{25}Mg and ^{26}Mg, of Mg are found in nature.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

11. **Assertion (A):** A molecule of butane, C_4H_{10} has a mass of 58.12 amu.

Reason (R): One mole of butane contains 6.022×10^{23} molecules and has a mass of 58.12 g.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

12. **Assertion (A):** Both 12 g of carbon and 27 g. of aluminium will have 6.02×10^{23} atoms.

Reason (R): Gram atomic mass of an element contains Avogadro's number of atoms.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

13. **Assertion (A):** The empirical mass of ethene is half of its molecular mass.

Reason (R): The empirical formula represents the simplest whole number ratio of various atoms present in a compound.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

14. **Assertion (A):** One atomic mass unit is defined as one twelfth of the mass of one carbon-12 atom.

Reason (R): Carbon-12 isotope is the most abundant isotope of carbon and has been chosen as standard.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

15. **Assertion (A):** Combustion of 16 g of methane gives 18 g of water.

Reason (R): In the combustion of methane, water is one of the products.

(1) Both A and R are true but R is not the correct explanation of A.

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

16. **Assertion (A):** Simple distillation can help in separating a mixture of propan-1-ol (boiling point 97°C) and propanone (boiling point 56°C).

Reason (R): Liquids with a difference of more than 20°C in their boiling points can be separated by simple distillation.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

17. **Assertion (A):** The percentage of nitrogen in urea is 46.6%.

Reason (R): Urea is a covalent compound.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

2. Structure of Atom

1. **Assertion (A):** 2p orbital do not have any spherical node.

Reason (R): The number of nodes in p-orbitals is given by (n–2) where n is the principal quantum number.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

2. **Assertion (A):** The radii of corresponding orbitals in all H-like particles are equal.

Reason (R): All H-like particles contain more than one electron.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

3. **Assertion (A):** The number of radial nodes in 3s and 4p orbitals is are equal.

Reason (R): The number of radial nodes in any orbital depends upon the values of 'n' and 'l' which are different for 3s and 4p orbitals.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

4. **Assertion (A):** Electrons are ejected from a certain metal when either blue or violet light strikes the metal surface. However, only violet light causes ejection from second metal.

Reason (R): The electrons in the first metal require less energy for ejection.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

5. **Assertion (A):** Hydrogen has one electron in its orbit but it produces several spectral lines.

Reason (R): There are many excited energy levels available.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

6. **Assertion (A):** The energy of an electron is largely determined by its principal quantum number.

Reason (R): The principal quantum number (n) is a measure of the most probable distance of finding the electron around the nucleus.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

7. **Assertion (A):** The 19th electron in potassium atom enters into 4s-orbital and not the 3d-orbital.

Reason (R): (n + 1) rule is followed for determining the orbital of the lowest energy state.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

8. **Assertion (A):** The free gaseous Cr atom has six unpaired electrons.

Reason (R): Half-filled s-orbital has greater stability.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

9. **Assertion (A):** The atoms of different elements having same mass number but different atomic number are known as isobars.

Reason (R): The sum of protons and neutrons in isobars is always different.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

10. **Assertion (A):** A beam of electrons deflects more than a beam of α – particles in an electric field.

Reason (R): Electrons possess negative charge while α – particles possess positive charge.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

11. **Assertion (A):** In Lyman of H–spectra, the maximum wavelength of lines is 121.65 nm.

Reason (R): Wavelength is maximum if there is transition from the very next level.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

12. **Assertion (A):** The number of radial nodes in 3s and 4p orbitals is not equal.

Reason (R): The number of radial nodes in any orbital depends upon the values of 'n' and 'l' which are different for 3s and 4p orbitals.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

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(4) Both (A) and (R) are false

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Reason (R): The principal quantum number (n) is a measure of the most probable distance of finding the electron around the nucleus.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

14. **Assertion (A):** Hydrogen has one electron in its orbit but it produces several emission spectrum lines.

Reason (R): There are many excited energy levels available.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

15. **Assertion (A):** The electronic configuration of Cr is $[Ar]3d^4 4s^2$

Reason (R): Cr is filed according to aufbau principle.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

16. **Assertion (A):** Fe^{3+} ion has more stable electronic configuration than Fe^{2+} ion in ground state.

Reason (R): Fe^{2+} ion has more no. of unpaired electrons than Fe^{3+}

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

17. **Assertion (A):** Radial probability distribution graph of an electron in 4d subshell consist of one radial node.

Reason (R): d-subshell of any shell contains radial nodes.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

18. **Assertion (A):** $\frac{1}{\lambda} = R_H Z^2 \left[\frac{1}{n_1^2} - \frac{1}{n_2^2}\right]$ can be used to determine the wavelength of an electron in an orbit.

Reason (R): Wavelength associated with a photon is given by $\lambda = \frac{h}{\sqrt{2mKE}}$

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

3. Classification of Element and Periodicity in Properties

1. **Assertion (A):** Be and Al show diagonal relationship.

Reason (R): Be and Al are diagonal to each other in the periodic table.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

2. **Assertion (A):** The first ionization energy of Al is lower than magnesium.

Reason (R): Atomic radius of Al is smaller then magnesium.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

3. **Assertion (A):** Electron affinity of oxygen is higher than sulphur.

Reason (R): Number of valence orbitals containing electrons are different

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

4. **Assertion (A):** F is most electro negative element of periodic table.

Reason (R): Cl is having highest electron affinity

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

5. **Assertion (A):** Cu, Ag, Au are known as coinage metal.

Reason (R): Coinage metals are d–block metals.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

6. **Assertion (A):** Boron has a smaller first ionization enthalpy than beryllium.

Reason (R): The penetration of a 2s electron to nucleus is more than the 2p electron hence 2p electron is more shielded by the inner core of electrons than the 2s electrons.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

7. **Assertion (A):** In a triad, the three elements present have different gaps of atomic masses.

Reason (R): Elements in a triad have different properties.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

8. **Assertion (A):** According to Mendeleev, periodic properties of elements is a function of their atomic mass.

Reason (R): Atomic number is equal to the number of protons.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

9. **Assertion (A):** Atomic number of the element ununbium is 112.

Reason (R): Name for digits 1 and 2 is un–and bi respectively in latin words.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

10. **Assertion (A):** Second period consists of 8 elements.

Reason (R): Number of elements in each period is four times the number of atomic orbitals available in the energy level that is being filled.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

11. **Assertion (A):** Helium is placed in group 18 along with p-block elements.

Reason (R): It shows properties similar to p-block elements.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

12. **Assertion (A):** Hydrogen can be placed in group 1.

Reason (R): Hydrogen can gain an electron to achieve a noble gas arrangement.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

13. **Assertion (A):** Atomic size decreases along a period.

Reason (R): Effective nuclear charge increases as the atomic number increases resulting in the increased attraction of electrons to the nucleus.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

14. **Assertion (A):** Second ionization enthalpy will be higher the first ionization enthalpy.

Reason (R): Ionization enthalpy is a quantitative measure of the tendency of an element to lose electron.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

15. **Assertion (A):** Alkali metals have least value of ionization energy within a period.

Reason (R): They precede alkaline earth metals in periodic table.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

16. **Assertion (A):** Electron gain enthalpy can be exothermic or endothermic.

Reason (R): Electron gain enthalpy provides a measure of the ease with which an atom adds an electron to form anion.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

17. **Assertion (A):** Smaller the size of an atom greater is the electronegativity.

Reason (R): Electronegativity refers to the tendency of atom so share electrons with other atom.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

18. **Assertion (A):** The decrease in the first ionization enthalpy from B to Al is much larger than that from Al to Ga.

Reason (R): The d orbitals in Ga are completely filled.

In the light of the above statements, choose the most appropriate answer from the options given below

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

4. Chemical Bonding and Molecular Structure

1. **Assertion (A):** CO_2 is resonance stabilized molecule.

Reason (R): Bond length of C—O in CO_2 is intermediate of single and double bond length

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

2. **Assertion (A):** Each molecule of H_2O forms four H–Bond in the form of ice.

Reason (R): Ice is solid state of H_2O.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

3. **Assertion (A):** Both methane and tetrachloromethane are nonpolar.

Reason (R): C–Cl bond is polar bond.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

4. **Assertion (A):** N_2 is more stable than N_2^+.

Reason (R): Bond order of N_2 is 3 while N_2^+ is 2.5.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

5. **Assertion (A):** Lattice energy of CaO is higher than LiCl.

Reason (R): Lattice energy of ionic compound is directly proportional to the product of charges of ion.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

6. **Assertion (A): All P–Cl bond lengths are** equal in PCl_3 but different in PCl_5

Reason (R): Hybrid state of central atom is different in Both molecules.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

7. **Assertion (A):** Equal number of sigma and pi bonds are present in ethyne.

Reason (R): π bond is stronger than σ bond

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

8. **Assertion (A):** Bond order of H_2^+ is 0.5.

Reason (R): Electrons are removed from the antibonding molecular orbital from H_2.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

9. **Assertion (A):** LiCl is more covalent than $BeCl_2$.

Reason (R): Li^+ ion is smaller than Be^{2+}.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

10. **Assertion (A):** O_2 is paramagnetic

Reason (R): N_2 is paramagnetic

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

11. **Assertion (A):** PCl_5 exist but NCl_5 does not.

Reason (R): Nitrogen is highly inert

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

12. **Assertion (A):** Sodium chloride formed by the action of chlorine gas on sodium metal is a stable compound.

Reason (R): This is because sodium and chloride ions acquire octet in sodium chloride formation.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

13. **Assertion (A):** O_2 is paramagnetic in nature.

Reason (R): According to molecular orbital theory, it contains unpaired electrons, so it is paramagnetic.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

14. **Assertion (A):** The order of thermal stability of

$Li_2CO_3 < Na_2CO_3 < K_2CO_3 < Rb_2CO_3 < Cs_2CO_3$

Reason (R): As we go

$Li_2CO_3 \rightarrow Na_2CO_3 \rightarrow K_2CO_3 \rightarrow Rb_2CO_3 \rightarrow Cs_2CO_3$

,ionic character of carbonates increases.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

15. **Assertion (A):** Among two cations of similar size, the polarising power of cation with pseudo noble gas configuration is larger than cation with noble gas configuration.

Reason (R): Polarising power of Ag^+ is more than K^+

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

16. **Assertion (A):** In PF_3Cl_2, fluorine occupy axial position and chlorine occupy equatorial position.

Reason (R): F is smaller in size than Cl

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

5. Thermodynamics

1. **Assertion (A):** The enthalpy of formation of $H_2O(\lambda)$ is greater than of H_2O (g) in magnitude.
Reason (R): Enthalpy change is negative for the condensation reaction,
H_2O (g) $\rightarrow$ $H_2O(\lambda)$.
(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)
(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)
(3) (A) is true but (R) is false
(4) Both (A) and (R) are false

2. **Assertion (A):** Heat of neutralisation of perchloric acid, $HClO_4$, with NaOH is same as that of HCl with NaOH.
Reason (R): Both HCl and $HClO_4$ are strong acids.
(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)
(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)
(3) (A) is true but (R) is false
(4) Both (A) and (R) are false

3. **Assertion (A):** In the following reaction : $C(s) + O_2(g) \rightarrow CO_2(g)$; $\Delta H = \Delta U - RT$
Reason (R): ΔH is related to ΔU by the equation, $\Delta H = \Delta U - \Delta n_g RT$.
(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)
(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)
(3) (A) is true but (R) is false
(4) Both (A) and (R) are false

4. **Assertion (A):** Entropy change in reversible adiabatic expansion of an ideal gas is zero.
Reason (R): The increase in entropy due to volume increase just compensate the decrease in entropy due to fall in temperature.
(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)
(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)
(3) (A) is true but (R) is false
(4) Both (A) and (R) are false

5. **Assertion (A):** Enthalpy and entropy of any elementary substance in the standard states are taken as zero.
Reason (R): At absolute zero, entropy of the perfectly crystalline substance is not equal to zero.
(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)
(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)
(3) (A) is true but (R) is false
(4) Both (A) and (R) are false

6. **Assertion (A):** Decrease of free energy during the process under constant temperature and pressure provides a measure of its spontaneity.
Reason (R): A spontaneous change must have +ve sign of ΔS_{system}.
(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)
(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)
(3) (A) is true but (R) is false
(4) Both (A) and (R) are false

7. **Assertion (A):** A reaction which is spontaneous and accompanied by decrease of randomness must be exothermic.
Reason (R): All exothermic reactions are accompanied by decrease of randomness.
(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)
(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)
(3) (A) is true but (R) is false
(4) Both (A) and (R) are false

8. **Assertion (A):** Work is a path function which is expressed in joule.

Reason (R): Work appears only at the boundary of the system.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

9. **Assertion (A):** The expansion of a gas into an evacuated space takes place spontaneously.

Reason (R): A process in which all steps cannot be retraced by themselves is called a spontaneous process.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

10. **Assertion (A):** $\Delta G = \Delta G^{\circ} + 2.303RT\log_{10} Q$, where Q is reaction quotient.

REASON (R): Q may be greater or lesser than K otherwise equal to K if $\Delta G = 0$.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

11. **ASSERTION (A):** A **process** is said to be adiabatic if the system does not exchange heat with surroundings.

REASON (R): It does not involve increase or decrease in temperature of the system.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

12. **ASSERTION (A):** For an isothermal expansion dT = 0.

REASON (R): Work done in reversible expansion at constant temperature

$$W = -2.303nRT\log\left(\frac{P_1}{P_2}\right)$$

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

13. **ASSERTION (A):** T, P and V are state variables or state functions.

REASON (R): Their values depends on the state of the system and how it is reached.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

14. **ASSERTION (A):** The heat absorbed during the isothermal expansion of an ideal gas against vacuum is zero.

REASON (R): The volume occupied by the molecules of an ideal gas is zero.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

6. Equilibrium

1. **Assertion (A):** For the reaction, $H_2(g) + I_2(g) \rightleftharpoons 2HI(g)$, $K_p = K_c$

Reason (R): K_p of all gases reactions is equal to K_c.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

2. **Assertion (A):** A net reaction can occur only if a system is not at equilibrium.

Reason (R): All reversible reactions occur to reach a state of equilibrium.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

3. **Assertion (A):** For the reaction, $N_2 + O_2 \rightleftharpoons 2NO$, increase in pressure at equilibrium has no effect on the reaction.

Reason (R): Σ moles of gaseous product – Σ moles of gaseous reactant = 0.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

4. **Assertion (A):** The reaction quotient, Q has the same form as the equilibrium constant K_{eq}, and is evaluated using any given concentrations of the species involved in the reaction, and not necessarily equilibrium concentrations.

Reason (R): If the numerical value of Q is not the same as the value of equilibrium constant, a reaction will occur.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

5. **Assertion (A):** If the equation for a reaction is reversed, the equilibrium constant is inverted and if the equation is multiplied by 2, the equilibrium constant is squared.

Reason (R): The numerical value of an equilibrium constant depends on the way the equation for the reaction is written.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

6. **Assertion (A):** $K_p = K_c$ for all reactions.

Reason (R): At constant temperature, the pressure of the gas is not proportional to the concentration.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

7. **Assertion (A):** A catalyst does not influences the values of equilibrium constant.

Reason (R): Catalysts influence the rate of both forward and backward reactions equally.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

8. **Assertion (A):** For

$PCl_5(g) \rightleftharpoons PCl_3(g) + Cl_2(g)$. If more Cl_2 is added the equilibrium will shift in backward direction hence equilibrium constant will decrease.

Reason (R): Addition of inert gas to the equilibrium mixture at constant volume, alter the equilibrium.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

9. **Assertion (A):** For a reaction at equilibrium, the Gibb's free energy of reaction is minimum at constant temp. and pressure.

Reason (R): The Gibb's free energy of both reactants and products increases and become equal at equilibrium.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

10. **Assertion (A):** If $Q_P < K_P$ reaction moves in direction of products.

Reason (R): Reaction quotient is defined in the same way as equilibrium constant at any stage of the reaction.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

11. **Assertion (A):** Among HCl, H_2SO_4 and $HClO_4$, $HClO_4$ is the strongest acid.

Reason (R): $HClO_4$ ionizes to maximum extent when dissolved in glacial acetic acid.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

12. **Assertion (A):** pH of x M HCl is less than pH of x M CH_3COOH.

Reason (R): The degree of ionization of HCl and CH_3COOH are equal at infinite dilution.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

13. **Assertion (A):** The degree of dissociation of a weak base increases on dilution.

Reason (R): The value of K_b increases on dilution

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

14. **Assertion (A):** The conjugate acid base pair differ by a proton.

Reason (R): NH_2^- and NH_4^+ are conjugate acid base pair.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

15. **Assertion (A):** Phenolphthalein is used as an indicator in the titration of weak acid with NaOH.

Reason (R): Near the end point, the pH of the solution is alkaline due to hydrolysis of anion.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

16. **Assertion (A):** The degree of dissociation of CH_3COOH is more in a solution which is basic than in water.

Reason (R): K_a of CH_3COOH increases in basic solution.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

17. **Assertion (A):** Addition of HCl (aq.) to HCOOH (aq.) decrease to ionization of HCOOH (aq.).

Reason (R): Due to common ion effect of H^+, ionization of HCOOH decrease.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

18. **Assertion (A):** pH of 10^{-7} M HCl is less than 7 at 25°C.

Reason (R): At very low concentration of HCl, contribution of H^+ from water is considerable.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

19. **Assertion (A):** Solubility of sparingly soluble salt decreases due to common ion effect.

Reason (R): Solubility product constant does not depend on common ion effect.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

20. **Assertion (A):** Solubility od AgCl in NH_3(aq.) is greater than in pure water.

Reason (R): When AgCl dissolve in NH_3(aq.), complex ion formation $Ag(NH_3)_2^+$ takes place and solubility equilibria of AgCl shifted in forward direction.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

21. **Assertion (A):** H_3PO_3 is a dibasic acid and it's salt Na_3PO_3 does not exist.

Reason (R): Being dibasic nature, only two H are replaceable.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

22. **Assertion (A):** The aqueous solution of $CF_3COO^-Na^+$ is more basic than the aqueous solution of $CH_3COO^-Na^+$ for same concentration of salt.

Reason (R): The salt derived from weak acid and strong base hydrolyses to generate acidic solution.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

23. **Assertion (A):** According to principle of common ion effect, the solubility of HgI_2 is expected to be less in an aqueous solution of KI than in water. But HgI_2 dissolves in an aqueous solution of KI to form a clear solution.

Reason (R): Iodide ion, I^- is highly polarizable.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

24. **Assertion (A):** pH of HCl solution is less than that of acetic acid solution of the same concentration.

Reason (R): In equimolar solutions, the number of titrable protons present in HCl acid is less than that present in acetic acid.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

25. **Assertion (A):** On increasing temperature pH of H_2O decreases.

Reason (R): At high temperature water become acidic.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

26. **ASSERTION (A):** The dissociation constant of polyprotic acid are in the order $K_1 > K_2 > K_3$.

REASON (R): The $\left[H^+\right]$ furnished in 1st step of dissociation exerts common ion effect to reduce 2nd dissociation and so on.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

27. **Assertion (A):** A catalyst (positive) decreases energy of activation of the reaction without changing the position of equilibrium.

Reason **(R):** By changing the concentration of any of the reactant or product species, the position of equilibrium may change but equilibrium constant will remain the same provided temperature remains constant.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

28. **Assertion (A):** The equilibrium (given below) attained in a closed vessel remains unaltered by the addition of $CaCO_{3(s)}$

$CaCO_{3(s)} \rightleftharpoons CaO_{(s)} + CO_2 \uparrow$

Reason (R): The active mass of a solid is a constant and independent of its mass and is always taken to be unity.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

29. **Assertion (A):** Addition of inert gas to an equilibrium mixture at constant pressure does not effect the equilibrium.

Reason (R): Addition of inert gas at constant pressure decreases the volume of equilibrium mixture.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

30. **Assertion (A):** At an equilibrium $A(g) + 2B(g) \rightleftharpoons C(g)$ if substantial amount of water is added to the mixture and stated that only A(g) gets dissolved to a certain extent in water then equilibrium shifts towards forward direction.

Reason (R): On decreasing the volume of reaction mixture and keeping rest of things same the equilibrium shifts to a direction having more number of gaseous molecules.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

7. Redox Reactions

1. **Assertion (A):** $3ClO^- \rightarrow ClO_3^- + 2Cl^-$ is an example of dissociation reaction.

Reason (R): ClO^- gets oxidised as well as reduced.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

2. **Assertion (A):** A substance which gets reduced can act as reducing agent.

Reason (R): An oxidising agent itself gets oxidised.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

3. **Assertion (A):** Copper sulphate solution is not stored in zinc vessel.

Reason (R): Zinc forms complex with copper sulphate.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

4. **Assertion (A):** The Daniell cell becomes dead after sometime.

Reason (R): Oxidation potential of zinc anode decreases and that of copper cathode increases.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

5. **Assertion (A):** In iodometric titration, starch is used as an indicator.

Reason (R): Starch is a polysaccharide.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

6. **Assertion (A):** Oxidation state of hydrogen in H_2O is + 1 and in CaH_2 it is -1.

Reason (R): CaH_2 is metal hydride and for hydrides, hydrogen is assigned the oxidation state of -1.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

7. **Assertion (A):** Oxidation number of C in HCHO is zero.

Reason (R): Formaldehyde is a covalent compound.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

8. **Assertion (A):** Oxygen has oxidation state of -2 in both O_2 and O_3.

Reason (R): Oxygen is assigned an oxidation state of -2 in almost all its compounds.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

9. **Assertion (A):** Oxidation number of phosphorus in P_4 is zero.

Reason (R): Phosphorus has oxidation state zero in all its compounds.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

10. **Assertion (A):** Redox reactions are also called neutralisation reactions.

Reason (R): The number of electrons gained or lost in the reaction are balanced.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

11. **Assertion (A):** In the titrations of Na_2CO_3 with HCl using methyl orange indicator, the volume required at the equivalence point is twice that of acid required using phenolphthalein indicator.

Reason (R): Two moles of HCl are required for complete neutralization of one mole of Na_2CO_3.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

12. **Assertion (A):** Addition of water to a solution containing solute and solvent cannot change it's normality or molarity

Reason (R): The milliequivalent and millimoles of the solute are changed on dilution.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

13. **Assertion (A):** The oxidation state of central sulphur in H_2SO_5 is +6

Reason (R): No peroxy linkage is present in H_2SO_5

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

14. **Assertion (A):** HNO_3 acts as oxidizing agent.

Reason (R): Oxidation no. of nitrogen is +5, no increase in oxidation no. beyond +5 can occur. The oxidation no. of HNO_3 can only decrease.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

15. **Assertion (A):** The oxidation state of oxygen in F_2O is +2.

Reason (R): Electronegativity of F is more than that of oxygen.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

1. **Assertion (A):** Borazine is more reactive than benzene.

Reason (R): Borazine is isostructural with benzene.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

2. **Assertion (A):** In Diborane containing eight B–H bonds only four B–H bonds are on the plane.

Reason (R): Boron in B_2H_6 is sp^2 hybridised.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

3. **Assertion (A):** All the oxides of born family with the general formula M_2O_3 are basic.

Reason (R): From B_2O_3 to Tl_2O_3 basic character decreases.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

4. **Assertion (A):** When borax is strongly heated it forms transparent glassy bead.

Reason (R): Borax is the other name for sodium tetraborate decahydrate.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

5. **Assertion (A):** CBr_4 is thermally more stable than Cl_4.

Reason (R): C–Br bond energy is more than C–I.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

6. **Assertion (A):** Boric acid is weak monobasic acid.

Reason (R): Boric acid give one H^+ ion.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

7. **Assertion (A):** Al forms $[AlF_6]^{3-}$.

Reason (R): It is octahedral complex.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

8. **Assertion (A):** Anhydride of carbonic acid is CO_2.

Reason (R): Carbonic acid is dibasic.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

9. **Assertion (A):** CaC_2 is interstitial carbide.

Reason (R): Calcium ions are present in the Interstices.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

10. **Assertion (A):** Fullerene is the purest allotrope of carbon.

Reason (R): They have smooth structure without dangling bonds.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

11. **Assertion (A):** $GeCl_4$ is easily hydrolysed by water.

Reason (R): Central atom can accommodate lone pair of e^- from oxygen atom of water molecules in $GeCl_4$.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

12. **Assertion (A):** Carbon has maximum tendency of catenation among group 14.

Reason (R): C–C bond strength is very strong.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

13. **Assertion (A):** Oxides of carbon in higher oxidation state is more acidic than in lower oxidation state.

Reason (R): Both CO_2 and CO can exist.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

14. **Assertion (A):** Heavier elements of 14^{th} group do not form $p\pi - p\pi$ bonds.

Reason (R): Atomic orbital of heavier elements are too large and do not have effective overlapping.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

15. **Assertion (A):** Carbon shows anomalous behavior in group-14.

Reason (R): Carbon has maximum covalency of 4.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

16. **Assertion (A):** H_2O is the hydride of chalcogen family which is liquid.

Reason (R): Acidic nature of hydrides of chalcogen family increases down the group.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

17. **Assertion (A):** PF_5 and IF_5 have similar shapes.

Reason (R): All the bond lengths are equal in PF_5.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

18. **Assertion (A):** Atomic size of F is smaller than that of Cl.

Reason (R): F–F bond is stronger than Cl–Cl bond.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

19. **Assertion (A):** P_4 is more reactive than N_2.

Reason (R): P–P bonds are relatively weaker than N≡N bond.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

20. **Assertion (A):** Noble gases have highest ionization energies in their respective periods.

Reason (R): The outermost sub-shell of noble gases in which electron enters in completely filled.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

21. **Assertion (A):** The bond angle of NH_3 is greater than BiH_3.

Reason (R): 'Bi' is metal while 'N' is non-metal.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

22. **Assertion (A):** 'XeF_6' on the reaction with 'RbF' gives $Rb^+[XeF_7]^-$.

Reason (R): XeF_6 is non-reactive.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

23. **Assertion (A):** Tailing of Hg caused by ozone is due to formation of HgO.

Reason (R): In the presence of O_3, Hg does not loses its meniscus.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

24. **Assertion (A):** The valency and oxidation number of Sulphur in S_8 respectively are 2 and 0.

Reason (R): S_8 Rhombic is the most stable allotropic form of Sulphur.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

25. **Assertion (A):** Dissolution of concentrated H_2SO_4 in water is highly exothermic process.

Reason (R): Sulphuric acid is always diluted by adding acid to water slowly.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

26. **Assertion (A):** N_2 is more stable than O_2.

Reason (R): Bond order of N_2 is 3.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

27. **Assertion (A):** PH_5 is not possible.

Reason (R): –5 oxidation state of phosphorus is not possible.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

28. **Assertion (A):** NH_3 is more polar than NF_3.

Reason (R): NF_3 cannot be hydrolysed.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

29. **Assertion (A):** O_3 is better oxidizing agent than H_2O_2.

Reason (R): O_3 converts Ag to Ag_2O.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

30. **Assertion (A):** $Na_2S_2O_3$ on reaction with I_2 gives $Na_2S_4O_6$.

Reason (R): This reaction involves colour and electronic change Both.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

31. **Assertion (A):** Cl_2 on reaction with NaOH (Cold and dilute) gives $NaClO_3$.

Reason (R): Cl_2 get oxidized only in this reaction.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

32. **Assertion (A):** $2F^- + Cl_2 \longrightarrow 2Cl^- + F_2$ is a reaction having ΔG = –ve.

Reason (R): Cl_2 is better oxidizing agent than F_2.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

33. **Assertion (A):** H_3PO_4 is less acidic than H_3PO_3.

Reason (R): Oxidation state of phosphorus in H_3PO_4 < H_3PO_3.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

34. **Assertion (A):** CN^- is pseudohalide.

Reason (R): $(CN)_2$ is pseudohalogen.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

35. **Assertion (A):** Xe is the only element of group 18 which from compounds.

Reason (R): Xe does not form clatherates.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

36. **Assertion (A):** Boron is Metalloid.

Reason (R): Boron shows metallic nature.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

37. **Assertion (A):** The use of aluminum and its compounds for domestic purposes is now reduced considerably.

Reason (R): The highly toxic nature of aluminum is the responsible factor.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

38. **Assertion (A):** Pb^{4+} compounds are stronger oxidizing agents than Sn^{4+} compound.

Reason (R): The higher oxidation states for the group 14 elements are more stable for the heavier members of the group due to 'inert pair effect'.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

39. **Assertion (A):** PbI_4 of lead does not exist.

Reason (R): Pb–I bond initially formed during the reaction does not release enough energy to unpair $6s^2$ electrons.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

40. **Assertion (A):** Graphite is thermodynamically most stable allotrope of carbon.

Reason (R): $\Delta_f H^{\ominus}$ of graphite is taken as zero.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

41. **Assertion (A):** Dinitrogen is inert at room temperature.

Reason (R): Dinitrogen directly combines with lithium to form ionic nitrides.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

42. **Assertion (A):** N_2 is less reactive than P_4.

Reason (R): Nitrogen has more electron gain enthalpy than phosphorus.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

43. **Assertion (A):** When a metal is treated with conc. HNO_3 it generally yields a nitrate, NO_2 and H_2O.

Reason (R): Conc. HNO_3 reacts with metal and first produces a metal nitrate and nascent hydrogen. The nascent hydrogen then further reduces HNO_3 to NO_2.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

44. **Assertion (A):** White phosphorus is more reactive than red phosphorus.

Reason (R): Red phosphorus consists of P_4 tetrahedral units linked to one another to form linear chains.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

45. **Assertion (A):** Bond angle of H_2S is smaller than H_2O.

Reason (R): Electronegativity of the central atom increases, bond angle decreases.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

46. **Assertion (A):** Both rhombic and monoclinic Sulphur exist as S_8 but oxygen exists as O_2.

Reason (R): Oxygen forms $p\pi-p\pi$ multiple bond due to small size and small bond length but $p\pi-p\pi$ bonding is not possible in Sulphur.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

47. **Assertion (A):** SF_6 cannot be Hydrolyzed but SF_4 can be.

Reason (R): Six F atoms in SF_6 prevent the attack of H_2O on Sulphur atom of SF_6.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

48. **Assertion (A):** $AlCl_3$ forms a dimer in aqueous medium

Reason (R): In aqueous medium Al^{3+} is octa hedrally hydrated

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

49. **Assertion (A):** H_3BO_3 is a weak monobasic acid

Reason (R): H_3BO_3 dissociates as

$$H_3BO_3 \rightleftharpoons \overset{+}{H} + H_2BO_3^-$$

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

50. **Assertion (A):** Aq. Solution of borax has pH < 7

Reason (R): H_3BO_3 is a weak acid with Ka = 10^{-9}

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

51. **Assertion (A):** Diamond is covalent yet it has high mp

Reason (R): Diamond has 3-d network involving strong C–C bonds

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

52. **Assertion (A):** In silicates like SiO_2, Si, is sp^3 hybridised

Reason (R): SiO_2 is a linear molecule

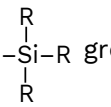
(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

53. **Assertion (A):** R_3SiCl in used to control chain length in silicone polymers

Reason (R): Introduction of  group in silicone polymers prevent it from increasing chain length

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

54. **Assertion (A):** fullerenes are quite pure allotrope of C

Reason (R): fullerenes do not have any dangling bonds.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

55. **Assertion (A):** $(SiF_6)^{2-}$ exist but $(SiCl_2)^{2-}$ do not

Reason (R): Si can't show covalency greater from 4

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

56. **Assertion (A):** Conc. HNO_3 Can be transported in Al-container

Reason (R): Al dissolves in presence of HNO_3

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

57. **Assertion (A):** BF_4^- has longer B–F bond length than BF_3

Reason (R): BF_3 Show shortening in bond length due to back bonding effect

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

58. **Assertion (A):** N_2 is less reactive than P_4

Reason (R): N has more e^- gain enthalpy than P

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

59. **Assertion (A):** HNO_3 makes iron passive

Reason (R): HNO_3 makes a protective layer of ferric nitrate

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

60. **Assertion (A):** HI can't be prepared by reaction of KI with Conc. H_2SO_4

Reason (R): HI has lowest HX bond strength among halogen acids

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

61. **Assertion (A):** Both rhombic and Monoclinic sulphur exist as S_8 but oxygen exist as O_2

Reason (R): Oxygen forms $p\pi$ $p\pi$ multiple bond due to small size but $p\pi$ $p\pi$ bonding is not possible in sulphur

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

62. **Assertion (A):** NaCl react with Conc. H_2SO_4 to give colourless fumes with pungent smell. But on adding MnO_2 the fumes become greenish yellow.

Reason (R): MnO_2 oxdises HCl to Cl_2 gas which is greenish yellow.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

63. **Assertion (A):** SF_6 can be hydrolysed but not SF_4

Reason (R): In SF_6 attack of H_2O isn't possible due to steric factors

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

64. **Assertion (A):** Pb_3O_4 is a basic oxide

Reason (R): Pb_3O_4 IS mixed oxide of 2PbO & PbO_2

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

65. **Assertion (A):** Oxidising power of halogen is in order $F_2 > Cl_2 > Br_2 > I_2$

Reason (R): Bond strength of halogens is $F_2 < Cl_2 < Br_2 < I_2$

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

66. **Assertion (A):** Xe, like O_2, forms $Xe^+[PtF_6]^-$

Reason (R): IP of Xe is nearly equal to atomic O

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

67. **Assertion (A):** Barium azide, when heated, gives very pure N_2

Reason (R): No redox reaction occurs during above change

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

68. **Assertion (A):** N_2O_5 is not possible due to

Reason (R): incapability of N to show pentavalency Max. covalency of N can be 4

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

69. **Assertion (A):** H_3PO_3 can form three series of salt

Reason (R): H_3PO_3 is a dibasic acid

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

70. **Assertion (A):** H_3PO_2 is better reducing agent than H_3PO_3

Reason (R): H_3PO_2 has greater no of P-H bonds compared to H_3PO_3

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

71. **Assertion (A):** ClF_3 exist but FCl_3 does not

Reason (R): F is II period elements & it has no vacant d orbital to allow expansion of octet

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

72. **Assertion (A):** SF_6 is known but not SCl_6

Reason (R): F has higher e^- gain enthalpy than Cl

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

73. **Assertion (A):** NH_4NO_3, on heating gives NH_3

Reason (R): NO_3^- is an oxidising anion

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

74. **Assertion (A):** $(NH_4)_2\ Cr_2O_7$, on heating doesn't form any residue

Reason (R): In $Cr_2O_7^{2-}$ there are six equivalent Cr-O bonds

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

75. **Assertion (A):** SO_2 can turn lime water milky & on passing in excess, milkiness disappears

Reason (R): SO_2 is an example of reducing gas

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

76. **Assertion (A):** P_4 on reaction with NaOH in inert atmosphere oxidise into P_4O_{10}

Reason (R): P_4 has angle strain due to 60° bond angle in P_4

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

77. **Assertion (A):** O_3 is thermodynamically less stable than O_2

Reason (R): ΔS = –ve when O_3 changes to O_2

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

78. **Assertion (A):** Inert gases can be separated using activated charcoal

Reason (R): Lighter inert gases have greater adsorption on charcoal surface compared with heavier gases

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

79. **Assertion (A):** $PCl_5(s)$ is an example of molecular solid

Reason (R): $PCl_5(s)$ exist as $(PCl_4)^+ (PCl_6)^-$

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

80. **Assertion (A):** Conc. Sulphuric acid can be used to prepare HCl on reaction with NaCl

Reason (R): Conc. H_2SO_4 is a moderately strong reducing agent

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

81. **Assertion (A):** NH_3 has lesser volatility then PH_3 despite of higher molecular mass of PH_3

Reason (R): N in NH_3 is sp^3 hybridised & NH_3 has pyramidal structure

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

82. **Assertion (A):** Bond length B-F in BF_3 increases in presence of Lewis base.

Reason (R): BF_3 can not exhibit back bonding.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

83. **Assertion (A):** BF_3 is a weaker Lewis acid than BCl_3

Reason (R): In BF_3 molecule, back bonding $\left(P_\pi - P_\pi\right)$ is stronger than BCl_3

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

84. **Assertion (A):** Ti^{3+} acts as an oxidizing agent.

Reason (R): Due to inert pair effect, Ti^+ is more stable than Ti^{3+}.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

1. **Assertion (A):** Carboxylic acid is more acidic than carbolic acid

Reason (R): Conjugate base of carboxylic acid is more stable than conjugate base of carbolic acid.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

2. **Assertion (A):** Carboxylic acid is more acidic than carbolic acid

Reason (R): Carboxylic acid have equivalent resonating structure.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

3. **Assertion (A):** A species having a carbon atom possessing sextext of electrons and a positive charge is called a carbocation

Reason (R): A species having a carbon carrying a negative charge on carbon atom is called carbanion.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

4. **Assertion (A):** $(CH_3)_3\overset{\oplus}{C}$ is more stable than $CH_3\overset{+}{C}H_2$ and $\overset{+}{C}H_3$ is the least stable cation.

Reason (R): Hyperconjugation interaction in $(CH_3)_3\overset{\oplus}{C}$ is greater than in $CH_3\overset{+}{C}H_{2+}$ as the $(CH_3)_3\overset{+}{C}$ has nine C–H bonds. In CH_3, vacant p orbital is perpendicular to the plane in which C–H bonds lie; hence cannot overlap with it.

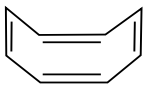
(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

5. **Assertion (A):** The compound cyclooctatetraene has the following structural formulas



It is cyclic and non-aromatic compound.

Reason (R): $(4n+2)\pi-$ electron rule does not hold good and ring is non-planar

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

6. **Assertion (A):** Energy of resonance hybrid is equal to the average of energies of all canonical forms.

Reason (R): Resonance hybrid cannot be presented by a single structure.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

7. **Assertion (A):** Tertiary carbonium ions are generally formed more easily than primary carbonium ions.

Reason (R): Hyper conjugative as well as inductive effect due to additional alkyl groups stablise tertiary carbonium ion.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

8. **Assertion (A):** Cyclohexanone exhibits keto-enol tautomerism

Reason (R): Keto form of cyclohexanone is more stable than its enol form.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

9. **Assertion (A):** Pyrrole is strong base than aniline

Reason (R): Pyrrole have delocalised lone pair.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

10. **Assertion (A):** The ratio of σ — bonds and π — bonds in tetracyanomethane is 1.

Reason (R): Tetracyanomethane has 8σ and 8π bonds.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

11. **Assertion (A):** $CHCl_3$ is more acidic than CHF_3.

Reason (R): The conjugate base of $CHCl_3$ is more stable than CHF_3.

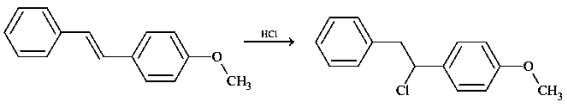
(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

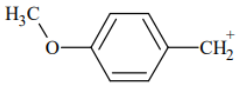
(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

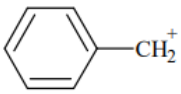
12. **Assertion (A):** The major product of addition of HCl upon the alkene (I) is II given below.



Reason (R): The reaction occurs by carbocationic inter mediate formation and the carbocation

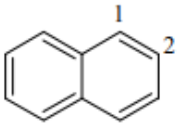


is more stable than



(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)
(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)
(3) (A) is true but (R) is false
(4) Both (A) and (R) are false

13. **Assertion (A):** In naphthalene



the electrophilic attack on indicated position 1 is more hindered so less stable intermediate is formed hence it takes place at position 2.

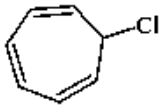
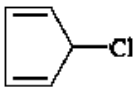
Reason (R): The electrophile attacks on the position which gives less stable intermediate.

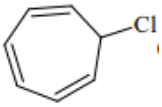
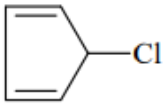
(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)
(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)
(3) (A) is true but (R) is false
(4) Both (A) and (R) are false

14. **Assertion (A):** Pyrrole, is aromatic and undergoes electrophilic aromatic substitution extremely readily and predominant by at position adjacent to nitrogen.

Reason (R): Nitrogen in the ring bearing a lone pair in conjugation with $\pi-$ electrons brings aromaticity to the pyrrole.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)
(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)
(3) (A) is true but (R) is false
(4) Both (A) and (R) are false

15. **Assertion (A):**  dissociates easily whereas  does not dissociate

Reason (R):  dissociates produces a highly stable aromatic cycloheptatrienyl carbocation but  produces very unstable anti aromatic cyclopentadienyl cation on dissociation.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)
(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)
(3) (A) is true but (R) is false
(4) Both (A) and (R) are false

1. **Assertion (A):** Kjeldahl method is not applicable to compounds containing nitrogen in nitro and azo groups and nitrogen present in the ring

   Reason (R): Nitrogen of these compounds does not change to ammonium sulphate under these conditions.

   (1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)
   (2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)
   (3) (A) is true but (R) is false
   (4) Both (A) and (R) are false

2. **Assertion (A):** Nitrogen, Sulphur, halogens and phosphorus present in an organic compound are detected by "Lassaigne's test"

   Reason (R): The elements present in the compound are converted from covalent form into the ionic form by fusing the compound with sodium metal.

   (1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)
   (2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)
   (3) (A) is true but (R) is false
   (4) Both (A) and (R) are false

3. **Assertion (A):** Rate of reaction of alkanes with halogens is $F_2 > Cl_2 > Br_2 > I_2$.

   Reason (R): Rate of Fluorination is too violent to be controlled & iodination is very slow and a reversible reaction

   (1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)
   (2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)
   (3) (A) is true but (R) is false
   (4) Both (A) and (R) are false

4. **Assertion (A):** Arrangements of atoms which can be converted into one another by rotation around a C-C single bond are called conformation or conformers or rotamers

   Reason (R): Rotation around a C-C single bond is hindered by a small energy barrier of 1-20 kJ mol^{-1}

   (1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)
   (2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)
   (3) (A) is true but (R) is false
   (4) Both (A) and (R) are false

5. **Assertion (A):** Nitration of benzene with nitric acid requires the use of concentrated sulphuric acid.

   Reason (R): The mixture of concentrated sulphuric acid and concentrated nitric acid produces the electrophile, NO_2^+.

   (1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)
   (2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)
   (3) (A) is true but (R) is false
   (4) Both (A) and (R) are false

6. **Assertion (A):** Heterolytic fission involves the breaking of covalent bond in such a way that both the electrons of the shared pair are carried away by one the atoms

   Reason (R): Heterolytic fission occurs readily in polar covalent bonds.

   (1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)
   (2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)
   (3) (A) is true but (R) is false
   (4) Both (A) and (R) are false

7. **Assertion (A):** Boiling point of alkanes increases with increase in molecular weight.

Reason (R): Van der Waal's forces increase with increase in molecular weight

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)
(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)
(3) (A) is true but (R) is false
(4) Both (A) and (R) are false

8. **Assertion (A):** Sodium acetate on kolbe's electrolysis gives methane

Reason (R): Methyl free radical is formed at anode

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)
(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)
(3) (A) is true but (R) is false
(4) Both (A) and (R) are false

9. **Assertion (A):** Wurtz reaction is not a good method to prepare propane.

Reason (R): Wurtz reaction leads to the formation of symmetrical alkane having an even number of carbon atom.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)
(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)
(3) (A) is true but (R) is false
(4) Both (A) and (R) are false

10. **Assertion (A):** Chlorination of methane can takes place in sunlight

Reason (R): Methyl chloride formed as major product if Cl_2 present in excess.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)
(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)
(3) (A) is true but (R) is false
(4) Both (A) and (R) are false

11. **Assertion (A):** Iodination of alkane is reversible

Reason (R): Iodination of alkane is carried out in presence of iodic acid.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)
(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)
(3) (A) is true but (R) is false
(4) Both (A) and (R) are false

12. **Assertion (A):** Ethene is more reactive than ethyne towards electrophilic addition reaction.

Reason (R): Intermediate formed by ethene is more stable than ethyne in Electrophilic addition reaction

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)
(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)
(3) (A) is true but (R) is false
(4) Both (A) and (R) are false

13. **Assertion (A):** Hydroxylation of cis-alkene of the type RCH = CHR by alkaline $KMnO_4$ solution (cold and dilute) yields meso product RCH(OH) – CH(OH)R.

Reason (R): Hydroxylation by cold and dilute and alkaline solution of $KMnO_4$ is an anti-addition.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)
(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)
(3) (A) is true but (R) is false
(4) Both (A) and (R) are false

14. **Assertion (A):** Rate of electrophilic aromatic nitration of C_6H_6, C_6D_6 and C_6T_6 follows the order $C_6H_6 > C_6D_6 > C_6T_6$

Reason (R): The cleavage of C–H, C–D and C–T is involved in rate limiting step.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

15. **Assertion (A):** Hydration of alkene using $Hg(OAc)_2 / H_2O$ followed by $NaBH_4$ is regioselective.

REASON (R): It involves carbocation formation.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

16. **Assertion (A):**

$$CH_3 - CH = CH - O - CH_3 + HCl \longrightarrow CH_3-CH_2-\underset{\displaystyle Cl}{\underset{|}{CH}}-O-CH_3$$

Reason (R): $CH_3 - CH_2 - \overset{+}{C}H - O - CH_3$ is more stable than

$CH_3 - \overset{+}{C}H - CH_2 - O - CH_3$.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

17. **Assertion (A):** Chlorination in alkane is less reactive more selective.

Reason (R): Bromination in alkane is more reactive less selective.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

18. **Assertion (A):** Bromination of cis-2-butene gives racemic mixture.

Reason (R): Bromination to alkene is anti-addition.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

19. **Assertion (A):** Alkenes are more reactive than alkynes towards bromination.

Reason (R): Cyclic bromonium ion formed by alkene is more stable than that formed by alkyne.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

11. Solution

1. **Assertion (A):** If on mixing the two liquids, the solution becomes hot, it implies that it shows negative deviation from Raoult's law.

Reason (R): Solution which show negative deviation are accompanied by decrease in volume.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

2. **Assertion (A):** If a liquid more volatile than the solvent is added to the solvent, the vapour pressure of the solution may increase, i.e. $p_s > p°$

Reason (R): In the presence of more volatle liquid solute, Raoult's law does not hold good.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

3. **Assertion (A):** Water boils at 373 K as the vapour pressure at this temperature becomes equal to atmosphere pressure.

Reason (R): Vapour pressure of water is less than 1.013 bar at 373 K.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

4. **Assertion (A):** The depression in freezing point depends on the amount of the solute and nature of solvent.

Reason (R): For aqueous solutions of different electrolytes, molal depression constant will have different value.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

5. **Assertion (A):** 0.1 M solution of glucose has higher increment in the freezing point than 0.1 M solution of urea.

Reason (R): K_f for both has different values.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

6. **Assertion (A):** Increasing pressure on pure water decrease its freezing point.

Reason (R): density of water is maximum at 273 K.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

7. **Assertion (A):** The molecular weight of acetic acid determined by depression in freezing point method in benzene and water was found to be different.

Reason (R): Water is polar and benzene is non-polar.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

8. **Assertion (A):** When dried fruits and vegetables are placed in water, they slowly get swelled.

Reason (R): It happens due to the phenomenon of reverse osmosis.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

9. **Assertion (A):** Reverse osmosis is used to purify sea water.

Reason (R): Solvent molecules pass from concentrate solution to pure solvent through semipermeable membrane if high pressure is applied on solution side.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

10. **Assertion (A):** If red blood cells were removed from the body and placed in pure water, pressure inside the cell increases.

Reason (R): The concentration of the salt content in the cells increases.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

11. **Assertion (A):** The molecular weight of acetic acid determined by depression in freezing point method in benzene and water was found to be different.

Reason (R): Water is polar and benzene is non-polar solvent.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

12. **Assertion (A):** Reverse osmosis is used to purify saline water.

Reason (R): Solvent molecules pass from concentrated to dilute solution through semipermeable membrane if high pressure is applied on solution.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

13. **Assertion (A):** Vant Hoff's factor for dissociating electrolytes is always greater than unity.
Reason (R): The no. of particles increases in solution due to electrolytic dissociation.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

14. **Assertion (A):** The vapour pressure of 0.45 molar urea solution is more than that of 0.45 molar solution of sugar.
Reason (R): Elevation of vapour pressure is directly proportional to the number of species present in the solution.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

15. **Assertion (A):** Mixture of ethanol and cyclohexane shows positive deviation.
Reason (R): Cyclohexane breaks the intermolecular H-bonding between ethanol molecules to some extent.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

12. Electrochemistry

1. **Assertion (A):** Cu is less reactive than hydrogen.

Reason (R): $E^0_{Cu^{2+}/Cu}$ is negative.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

2. **Assertion (A):** E_{Cell} should have a positive value for the cell to function.

Reason (R): $E_{cathode} < E_{anode}$

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

3. **Assertion (A):** Conductivity of all electrolytes decreases on dilution.

Reason (R): On dilution number of ions per unit volume decreases.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

4. **Assertion (A):** $\wedge_m$ for weak electrolytes shows a sharp increase when the electrolytic solution is diluted.

Reason (R): For weak electrolytes degree of dissociation increases with dilution of solution.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

5. **Assertion (A):** Electrolysis of NaCl solution gives chlorine at anode instead of O_2.

Reason (R): Formation of oxygen at anode requires overvoltage.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

6. **Assertion (A):** Current stops flowing when $E_{Cell} = 0$.

Reason (R): Equilibrium of the cell reaction is attained.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

7. **Assertion (A):** Molar conductivity increases with decrease in concentration for week electrolytes.

Reason (R): No. of ions increases and no. of ions per unit volume decreases due to dilution.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

8. **Assertion (A):** Conductivity decreases with the decreases in concentration both the weak and strong electrolytes.

Reason (R): No. of ions per unit volume linearly decreases in both electrolytes.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

9. **Assertion (A):** For a spontaneous process $E_{cell} = -ve.$

Reason (R): $\Delta G = nFE_{cell}$

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

10. **Assertion (A):** Although standard oxidation potential of Cl^- ion (–1.36V) is lower than of water (–1.23V) still it is Cl^- which is oxidized to Cl_2 at the anode during electrolysis of an aq. Solution of NaCl.

Reason (R): H_2O needs greater voltage for oxidation to O_2 than that needed for oxidation to Cl_2.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

11. **Assertion (A):** Metal-metal ion electrode are different from metal-metal insoluble salt ion electrode.

Reason (R): In standard metal-metal ion electrode metal ion conc. = 1 M whereas in standard insoluble salt electrode anion conc. = 1 M.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

12. **Assertion (A):** The equivalent conductance of an electrolyte (whether weak or strong) increases with dilution until a limiting value i.e. $\wedge_0$ or $\wedge_\infty$ is attained.

Reason (R): The increase in equivalent

conductance of a solution of a weak electrolyte is due to increase in number of ions while for a strong electrolyte it is due to increase in the velocity of ions upon dilution.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

13. **Assertion (A):** 1 Faraday of electricity deposits 1 gm of Ag or Cu or Al.

Reason (R): 1 mol of electrons are required to reduce 1 mol Al^{3+}.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

14. **Assertion (A):** In the Daniel cell, if the conc. of Cu^{2+} and Zn^{2+} ions are doubled, the emf of the cell does not change.

Reason (R): If the conc. of ions in contact with metal is doubled, the electrode potential will doubled.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

1. **Assertion (A):** The rate of reaction whether exothermic or endothermic, increase with temperature.

Reason (R): The rate reaction = K [reactant]^n and K increases with temperature.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

2. **Assertion (A):** A catalyst always lower the energy of activation.

Reason (R): The catalyst-reactant interaction forms activated adsorbed complex and adsorption is always exothermic.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

3. **Assertion (A):** The catalyst does not affect the heat of reaction.

Reason (R): It increases the rate of reaction.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

4. **Assertion (A):** The elementary reaction is single step reaction and does not possess mechanism.

Reason (R): An elementary reaction has order of reaction and molecularity same.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

5. **Assertion (A):** For the reaction $2O_3 \longrightarrow 3O_2$, the rate = $K[O_3]^2\,[O_2]^{-1}$

Reason (R): The reaction has –ve order for O_2.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

6. **Assertion (A):** Order of reaction can never be fractional for an elementary reaction.

Reason (R): An elementary reaction takes place by one step mechanism.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

7. **Assertion (A):** Every collision between molecules does not lead to a chemical reaction.

Reason (R): Only those molecules reacts during collisions which acquire threshold energy level.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

8. **Assertion (A):** Order of the reaction can be zero or fractional.

Reason (R): We cannot determine order from balanced chemical equation.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

9. **Assertion (A):** Order and molecularity are same.

Reason (R): Order is determined experimentally and molecularity is the sum of the stoichiometric coefficient of rate determining elementary step.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

10. **Assertion (A):** The enthalpy of reaction remains constant in the presence of a catalyst.

Reason (R): A catalyst participating in the reaction, forms different activated complex and lowers down the activation energy but the difference in energy of reactant and product remains the same.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

11. **Assertion (A):** All collision of reactant molecules lead to product formation.

Reason (R): Only those collisions in which molecules have correct orientation and sufficient kinetic energy lead to compound formation.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

12. **Assertion (A):** Order of reaction is an experimental property and irrespective of the fact whether the reaction is elementary or complicated, it is the sum of the powers of the concentration terms appearing in the rate law i.e. experimentally observed rate law.

Reason (R): Order of reaction may change with change in experimental conditions.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

13. **Assertion (A):** If order with respect to species involved in any reaction is equal to the stoichiometric coefficient of that species in the reaction then reaction must be an complex reaction.

Reason (R): In a complex reaction the order with respect to species involved is equal to the stoichiometric coefficients.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

14. **Assertion (A):** If in a zero order reaction, the concentration of the reactant is doubled, the half-life period is also doubled.

Reason (R): For a zero order reaction, the rate of reaction is independent of initial concentration.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

15. **Assertion (A):** The rate of reaction normally increases by a factor of 2 or 3 for every 10° rise in temperature.

Reason (R): By increasing the temperature, activation energy decreases.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

16. **Assertion (A):** For a chemical reaction to occur, there must be collision in between reactant species.

Reason (R): All such collisions necessarily convert themselves into product formation

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

14. The d & f Block Elements

1. **Assertion (A):** 1^{st} ionisation potential of mercury is greater than cadmium

Reason (R): Hg has stable electronic configuration ($5d^{10}$ $6s^2$)

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

2. **Assertion (A):** Zr and Hf have about the same atomic radius.

Reason (R): Zr and Hf lies in the same group

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

3. **Assertion (A):** Zn, Cd, Hg are non-transition elements while Cu, Ag, Au are transition element

Reason (R): In Zn, Cd, Hg (n–1) d orbitals are completely filled in their atomic state where as in Cu, Au they are incomplete.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

4. **Assertion (A):** Cu^+ is more stable than Cu^{+2}

Reason (R): ΔIP is greater than 16 eV

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

5. **Assertion (A):** $KMnO_4$ is dark pink coloured compound

Reason (R): In the $KMnO_4$ charge transfer spectrum occurs.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

6. **Assertion (A):** Hg is the only metal which is liquid at 0°C.

Reason (R): It has very high IP and weak metallic bond

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

7. **Assertion (A):** Valency of transition elements is variable

Reason (R): Energy of ns and (n–1)d orbital is almost same

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

8. **Assertion (A):** Melting point of Mn less than that of Fe

Reason (R): Mn has less number of unpaired e^- than Fe in atomic state

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

9. **Assertion (A):** Solution of Na_2CrO_4 in water is intensely colored.

Reason (R): Ox. State of Cr in Na_2CrO_4 is +6.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

10. **Assertion (A):** Ce^{+4} acts as oxidizing agent in aqueous medium

Reason (R): +4 is common oxidation state of lanthanides

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

11. **Assertion (A):** Neptunium is transuranic element

Reason (R): It is heavier than uranium

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

12. **Assertion (A):** $La(OH)_3$ is more basic than $Lu(OH)_3$

Reason (R): Lanthanum is d-block element

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

13. **Assertion (A):** Actinides show much higher range of oxidation states

Reason (R): Energy difference between 5f and 6d orbitals is large

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

14. **Assertion (A):** All the lanthanide elements exhibits a common oxidation state of +3 in their compounds

Reason (R): The atoms of the lanthanide elements contains three electron in their outermost

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

15. **Assertion (A):** $K_2Cr_2O_7$ is used as a primary standard in volumetric analysis.

Reason (R): It has a good solubility in water.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

16. **Assertion (A):** Change in colour of acidic solution of potassium dichromate by breath is used to test drunk drivers.

Reason (R): Change in colour is due to the complexation of alcohol with potassium dichromate.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

17. **Assertion (A):** Eu^{2+} & Yb^{2+} are reducing agents for their ions.

Reason (R): Both ions have stable half filled configuration.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

18. **Assertion (A):** MnO_2 is anti ferromagnetic in nature.

Reason (R): In MnO_2, equal number of domain are aligned with parallel and antiparallel spin.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

19. **Assertion (A):** La_2O_3 is basic nature.

Reason (R): La in aqueous solution gives $La(OH)_3$.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

20. **Assertion (A):** $FeCl_3$ does not affect iodemetric titration of $CuSO_4$ solution.

Reason (R): FeI_3 is formed.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

21. **Assertion (A):** Actinoids can posses +4 O.S. more easily then lanthanoid.

Reason (R): 4f, 5d, 6s have almost same energy levels.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

22. **Assertion (A):** UF_6 is more covalent than UF_4.

Reason (R): Fluorine is smaller in size.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

23. **Assertion (A):** When $AgCl_{(s)}$ is dissolved in NH_3 solution, then its solubility is greater in comparison to that in water.

Reason (R): Ag^+ forms complex with NH_3

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

1. **Assertion (A):** The aqueous solution of $K_2SO_4.Al(SO_4)_3.24H_2O$ is acidic in nature.

Reason (R): It ionizes to give a complex ion.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

2. **Assertion (A):** In the complex $K_2[PtCl_6]$ coordination number of Pt is 6.

Reason (R): In the complex six coordination bonds are formed between Pt and chloro ligands.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

3. **Assertion (A):** Tetrahedral complex do not exhibit geometrical isomerism.

Reason (R): In tetrahedral complex all the four positions are identical.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

4. **Assertion (A):** $[Fe(CO)_5]$ is inner orbital complex.

Reason (R): In the given complex oxidation state of Iron is zero.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

5. **Assertion (A):** $[Fe(CN)_6]^{-3}$ is paramagnetic in nature.

Reason (R): $[Fe(CN)_6]^{-3}$ is low spin complex.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

6. **Assertion (A):** Hexachloroplatinate is a complex anion.

Reason (R): Complex has negatively charged ligands.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

7. **Assertion (A):** $[Ni(CN)_4]^{-2}$ has zero unpaired electron while that of $[NiCl_4]^{-2}$ has two unpaired e^-.

Reason (R): $[NiCl_4]^{-2}$ has strong crystal field while $[NiCl_4]^{-2}$ has weak crystal field.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

8. **Assertion (A):** Cis – $[Fe(en)_2Cl_2]^+$ can form racemic mixture.

Reason (R): Cis – $[Fe(en)_2Cl_2]^+$ is square planar complex.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

9. **Assertion (A):** Square planar complex Ma_2b_2 has two optical isomers.

Reason (R): Mirror image of Ma_2b_2 is non-super impossible.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

10. **Assertion (A):** AgI is coloured while AgF is colourless.

Reason (R): Unpaired e^- Present In AgI.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

11. **Assertion (A):** $[CoF_6]^{3-}$ is high spin complex.

Reason (R): F^- is strong field ligand.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

12. **Assertion (A):** Ferrocene is π– bonded organometallic compound.

Reason (R): Ferrocene is a sandwich compound.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

13. **Assertion (A):** Solution of Na_2CrO_4 in water is intensely coloured.

Reason (R): Ox, state of Cr in Na_2CrO_4 is +6.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

14. **Assertion (A):** Potassium ferrocyanide is diamagnetic whereas potassium ferricyanide is paramagnetic.

Reason (R): Crystal field splitting in ferrocyanide ion is greater than that of ferricyanide ion.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

15. **Assertion (A):** In a mixture of Cd (II) and Cu(II), (Cd^{+2}) gets precipitated in presence of KCN by H_2S.

Reason (R): The stability constant of $[Cu(CN)_4]^{-3}$ is greater than $[Cd(CN)_4]^{2-}$.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

16. **Assertion (A):** aq. Solution of $CoCl_2$ is pink in colour. It turns blue in presence of conc, HCl.

Reason (R): It is due to formation of $[CoCl_4]^{2-}$.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

17. **Assertion (A):** Triethylenediamine is a bidentate monoanion

Reason (R): Complex containing propylenediamine ligand shows ligand isomerism.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

18. **Assertion (A):** $[Co^{III}(gly)_3]$ is called inner-metallic complex because.

Reason (R): Both the coordination number and charge of the cation are satisfied simultaneously by ligands.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

19. **Assertion (A):** All tetrahedral complexes are mainly high spin and low spin configurations are rarely observed.

Reason (R): Δ_t is always much smaller even with stronger field ligands and it is never energetically favourable to pair up the electrons.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

20. **Assertion (A):** NH_2NH_2 although possesses two electron pairs for donation but not acts as a chelating agent.

Reason (R): The coordination by NH_2NH_2 leads to a three member highly unstable strained ring

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

21. **Assertion (A):** The correct order for the wave length of absorption in the visible region is ; $[Ni(NO_2)_6]^{4-} < [Ni(NH_3)_6]^{2+} < [Ni(H_2O)_6]^{2+}$

Reason (R): The stability of different complexes depends on the strength of the ligand field of the various ligands.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

22. **Assertion (A):** The 'spin only' magnetic moment of a green complex, potassium amminetetracyani donitrosonium chromate(I) is 1.73 BM.

Reason (R): To have two d-orbitals empty for d^2sp^3 hybridisation, the pairing of electrons take place leaving behind one unpaired electron as CN^- is a stronger ligand.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

23. **Assertion (A):** Pentaamminethiocyanato-N-chromium (III) tetrachloridozincate (II) is a coloured compound and is an example of ionisation isomerism.

Reason (R): The compound is paramagnetic and therefore, d-d transition is possible

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

24. **Assertion (A):** $Cu[Hg(SCN)_4]$ and $Hg[Co(NCS)_4]$ are isomers.

Reason (R): SCN^- is an ambidentate ligand.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

25. **Assertion (A):** Coordination number of Pt in Zeise's salt is 5.

Reason (R): C_2H_4 act as bidentate ligand.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

26. **Assertion (A):** Fe^{+3} not used brown ring test of NO_3^{-1}

Reason (R): NO_3^- is first converted into NO_2.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

27. **Assertion (A):** $[Co(H_2O)_6]^{+3} \rightarrow [Co(H_2O)_6]^{+2}$ changes its colour on reduction.

Reason (R): Crystal field stabilization energy increases on reduction

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

28. **Assertion (A):** If in $[Co(NH_3)_6]^{+3}$, NH_3 is replaced by H_2O , same wavelength will be absorbed by the complex :

Reason (R): It is a high spin species.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

29. **Assertion (A):** $\left[Co\left(NH_3\right)_5 Cl\right]Cl_2$ reacts with excess of $AgNO_3$ solution to give 2 moles of AgCl.

Reason (R): Primary valencies are ionisable.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

16. Haloalkanes and Haloarenes

1. **Assertion (A):** In the electrophilic substitution of aryl halides, the incoming electrophile gets attached to the meta position.

Reason (R): Aryl halides are moderately deactivating.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

2. **Assertion (A):** Phosphorus chlorides (tri and penta) are preferred over thionyl chloride for the preparation of alkyl chlorides from alcohols.

Reason (R): Phosphorus chlorides give pure alkyl halides.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

3. **Assertion (A):** The boiling points of alkyl halides decrease in the order:

RI > RBr > RCl > RF

Reason (R): The boiling points of alkyl chlorides. Bromides and iodides are considerably higher than that of the hydrocarbon of comparable molecular mass.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

4. **Assertion (A):–** KCN reacts with methyl chloride to give methyl isocyanide

Reason (R):– CN^- is an ambident nucleophile.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

5. **Assertion (A):** Presence of a nitro group at ortho or para position increases the reactivity of haloarenes towards nucleophilic substitution.

Reason (R): Nitro group, being an electron withdrawing group decreases the electron density over the benzene ring.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

6. **Assertion (A):** In monohaloarenes, further electrophilic substitution occurs at ortho and para positions.

Reason (R): Halogen atom is a ring deactivator.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

7. **Assertion (A):** Aryl iodides can be prepared by reaction of arenes with iodine in the presence of an oxidizing agent.

Reason (R): Oxidising agent oxidises I_2 into HI.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

8. **Assertion (A):** It is difficult to replace chlorine by –OH in chlorobenzene in comparison to that in chloroethane.

Reason (R): Chlorine-carbon (C–Cl) bond in chlorobenzene has a partial double bond character due to resonance.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

9. **Assertion (A):** Hydrolysis of (–)-2-bromooctane proceeds with inversion of configuration.

Reason (R): This reaction proceeds through the formation of a carbocation.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

10. **Assertion (A):** Nitration of chlorobenzene leads to the formation of m-nitrochlorobenzene

Reason (R): $-NO_2$ group is a m-directing group.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

11. **Assertion (A):** Rate of hydrolysis of methyl chloride to methanol is higher in DMF than in water

Reason (R): Hydrolysis of methyl chloride follows second order kinetics.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

12. **Assertion (A):** The presence of nitro group facilitates nucleophilic substitution reactions in aryl halides.

Reason (R): The intermediate carbanion is stabilised due to the presence of nitro group.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

13. **Assertion (A):** Alkyl iodide can be prepared by treating alkyl chloride/bromide with Nal in acetone.

Reason (R): NaCl/NaBr are soluble in acetone while Nal is not

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

14. **Assertion (A):** Rate of reaction of alkyl halide in Williamson's synthesis reaction is 1°RX > 2°RX > 3°RX

Reason (R): It is a type of bimolecular substitution reaction (S_N2).

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

15. **Assertion (A):** Peroxide effect is shown by H – X (where X = F, Cl, Br, I).

Reason (R): HCl bond dissociation energy is low and that of H – I is high.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

16. **Assertion (A):** Aryl halides and vinyl halides are less reactive than alkyl halides and are not easily hydrolysed.

Reason (R): Cleavage bond in aryl halides acquire double bond character due to resonance which makes its cleavage difficult.

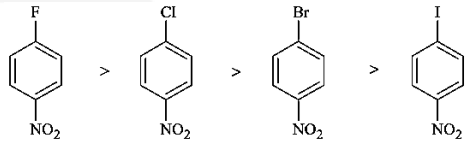
(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

17. **Assertion (A):** The order of reactivity of the following compounds, towards nucleophilie substitution reaction



Reason (R): Higher the electro negativity of the atom greater will be the stability of the intermediate formed by the attack of the nucleophile at the rate determining step.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

18. **Assertion (A):** Reaction of 3° R—X with an alkoxide ion at elevated temperature results in elimination exclusively.

Reason (R): S_N2 attack of alkoxide ion on 1° R – X results in formation of ether.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

17. Alcohol Phenol and Ethers

1. **Assertion (A):** Benzyl alcohol is an isomer of p-cresol.

Reason (R): Benzyl alcohol is also known as Benzenol.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

2. **Assertion (A):** Phenol is stronger acid than alcohols.

Reason (R): Phenol is stabilized by resonance whereas alcohol are not.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

3. **Assertion (A):** Phenols give picric acid on nitration with conc. HNO_3.

Reason (R): –OH group in phenol shows –M effect.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

4. **Assertion (A):** m-Nitrophenol is less acidic than p-nitrophenol.

Reason (R): p-Nitrophenol has intra molecular H-bonding.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

5. **Assertion (A):** Benzene sulphonic acid on heating with NaOH gives sodium phenate.

Reason (R): Sulphonic group is a poor leaving group.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

6. **Assertion (A):** $Ph–O–CH_3$ can be prepared from PhONa and methyl iodide.

Reason (R): Aryl halides are less reactive substrates for nucleophilic substitution reaction.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

7. **Assertion (A):** Cumene (isopropyl benzene) reacts with O_2 and after hydrolysis gives phenol and acetone.

Reason (R): Initially cumene converts into 2-phenylpropan-2-ol.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

8. **Assertion (A):** Methoxy ethane has more boiling point than propanal.

Reason (R): Attraction is more in methoxy ethane than propanal.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

9. **Assertion (A):** Anisole on reaction with HI gives phenol and CH_3I.

Reason (R): Phenol-oxygen bond is stronger than methyl-oxygen bond in anisole and hence is not claved by HI.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

10. **Assertion (A):** In Lucas test, 3° alcohols react immediately.

Reason (R): A mixture of anhydrous $ZnCl_2$ and conc. HCl is called Lucas reagent.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

11. **Assertion (A):** Addition reaction of water to but-1-ene in acidic medium yields butan-1-ol.

Reason (R): Addition of water in acidic medium proceeds through the formation of primary carbocation.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

12. **Assertion (A):** p-nitrophenol is more acidic than phenol.

Reason (R): Nitro group helps in the stabilization of the phenoxide ion by dispersal of negative change due to resonance.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

13. **Assertion (A):** Boiling points of alcohols and ethers are high.

Reason (R): They can form intermolecular hydrogen-bonding.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

14. **Assertion (A):** Like bromination of benzene, bromination of phenol is also carried out in the presence of Lewis acid.

Reason (R): Lewis acid polarizes the bromine molecule.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

15. **Assertion (A):** Phenol forms 2, 4, 6,– tribromophenol on treatment with Br_2 in carbon disulphide at 273 K.

Reason (R): Bromine polarizes in carbon disulphide.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

16. **Assertion (A):** p-Nitrophenol gives more electrophilic substituted compound than m-methoxyphenol

Reason (R): methoxy group shows only negative *I*-effect.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

17. **Assertion (A):** Phenol is more acidic than ethanol.

Reason (R): Phenoxide ion is resonance stabilised

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

18. **Assertion (A):** Phenol forms 2, 4, 6-tribromo-phenol on treatment with Br_2-water at 273 K.

Reason (R): In Phenol –OH is o, p-directing group.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

19. **Assertion (A):** Phenol undergoes Kolbe reaction whereas ethanol does not.

Reason (R): Phenoxide ion is more basic than ethoxide ion.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

20. **Assertion (A):** o-nitrophenol is more volatile than p-nitrophenol

Reason (R): Intramolecular hydrogen bonding is present in o-nitrophenol while intermolecular H-bonding is in p-nitrophenol.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

21. **Assertion (A):** CH_3OCH_3 and C_2H_5OH has comparable molecular weight but boiling point of C_2H_5OH is more than dimethyl ether.

Reason (R): C_2H_5OH forms intermolecular H-bonding while CH_3OCH_3 forms intramolecular H-bonding.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

22. **Assertion (A):** Ethers behave as bases in the presence of mineral acids

Reason (R): It is due to the presence of lone pair of electrons on the oxygen.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

23. **Assertion (A):** The major products formed by heating $C_6H_5CH_2OCH_3$ with Hl are $C_6H_5CH_2I$ and CH_3OH

Reason (R): Benzyl cation is more stable than methyl cation.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

24. **Assertion (A):** The pK_a of acetic acid is lower than that of phenol.

Reason (R): Phenoxide ion is more resonance stabilised.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

25. **Assertion (A):** 2-Butanol on heating with H_2SO_4 gives 2-butene as major product.

Reason (R): Dehydration of 2-butanol follows Saytzeff's rule.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

26. **Assertion (A):** Tertiary alcohol does not form ester with carboxylic acid in the presence of conc. H_2SO_4

Reason (R): Tertiary alcohol undergoes dehydration in the presence of conc. H_2SO_4.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

27. **Assertion (A): Bromination** of phenol in aqueous medium or in CS_2 leads to different products.

Reason (R): Phenol in aqueous medium is more activating towards EAS than it is in CS_2.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

28. **Assertion (A):** The major products formed by heating $C_6H_5CH_2OCH_3$ and HI are $C_6H_5CH_2I$ and CH_3OH.

Reason (R): Benzyl cation is more stable than methyl cation.

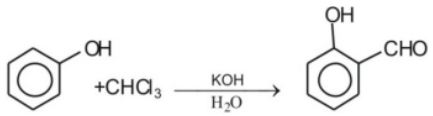
(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

29. **Assertion (A):**



Reason (R): Reaction proceeds by carbanion mechanism.

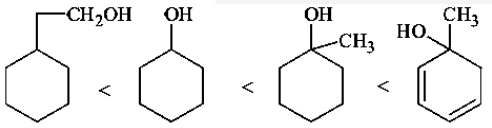
(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

30. **Assertion (A):** Ease of dehydration with H_2SO_4 follows the order:



Reason (R): More stable the carbocation, **easier** the dehydration in acidic medium.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

31. **Assertion (A):** 3^0 alcohols show turbidity within 5 minutes, when treated with lucas reagent.

Reason (R): Conc. HCl and anhydrous $ZnCl_2$ in $1:1$ mixture is called Lucas reagent.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

32. **Assertion (A):** CH_3OH is a nucleophile.

Reason (R): CH_3OH forms sodium methoxide on treatment with $NaOH$

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

33. **Assertion (A):** Primary and secondary alcohol can be distinguished by Victor-Meyer test.

Reason (R): Primary alcohols form nitrolic acids which dissolve in $NaOH$ to form blood red colour but secondary alcohols from pseudonitroles which gives blue colour with $NaOH$

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

34. **Assertion (A):** The acidity of alcohols follows the order $1^0 > 2^0 > 3^0$.

Reason (R): The $+I$ effect of the additional alkyl groups favours the cleavage of $O-H$ bond.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

35. **Assertion (A):** Ether behaves as bases in the presence of mineral acids.

Reason (R): Due to the presence of lone pair of electrons on oxygen.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

36. **Assertion (A):** The boiling point of ethanol is much higher than that of dimethyl ether.

Reason (R): In ethanol, the molecules are associated by the formation of intermolecular hydrogen bonding whereas in diethyl diether it is absent.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

37. **Assertion (A):** Tert. butyl methyl ether is not prepared by the reaction of tert. butyl bromide with sodium methoxide.

Reason (R): Sodium methoxide is a strong nucleophile.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

38. **Assertion (A):** With HI, anisole forms iodobenzene and methyl alcohol.

Reason (R): I^- ion will combine with smaller group to avoid steric hindrance.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

39. **Assertion (A):** t-butyl methyl ether on reaction with HI at 273 K gives tert. butyl iodide and methanol.

Reason (R): The reaction occurs by SN^2 mechanism.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

40. **Assertion (A):** Phenol is more reactive than benzene towards electrophilic substitution.

Reason (R): In case of phenol, the intermediate carbocation is more resonance stabilized.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

41. **Assertion (A):** p-nitrophenol is stronger acid than 0 nitrophenol.

Reason (R): Intramolecular hydrogen bonding makes ortho-isomer weaker acid than para isomer.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

42. **Assertion (A):** Phenol is stronger acid than alcohols.

Reason (R): Phenoxide is stabilized by resonance whereas alkoxide is not.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

43. **Assertion (A):** Phenols undergo electrophilic substitution at the ring much more readily than aryl halides.

Reason (R): In aryl halides electron density at the ring decreases due to resonance whereas in phenols it increases.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

44. **Assertion (A):** –OH group in phenols cannot be substituted easily.

Reason (R): $C-O$ bond in phenols has partial double bond character due to resonance.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

45. **Assertion (A):** Sodium salts of phenols can exist in water whereas sodium salts of alcohols do not exist in water.

Reason (R): Phenol is stronger acid than water whereas alcohol is weaker acid than water

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

46. **Assertion (A):** Benzyl alcohol turns blue litmus red.

Reason (R): Benzyl alcohol is an isomer of p-cresol.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

47. **Assertion (A):** Phenol is more reactive than benzene towards electrophilic substitution reactions.

Reason (R): In the case of phenol, the intermediate carbocation is more resonance stabilized.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3)(A) is true but (R) is false

(4) Both (A) and (R) are false

48. **Assertion (A):** p-Nitrophenol is a stronger acid than o-nitrophenol.

Reason (R): Intramolecular H-bonding makes 0 -isomer weaker than p-isomer.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

49. **Assertion (A):** Solubility on n-alcohols in water decreases with increase in molecular weight.

Reason (R): The relative proportion of the hydrocarbon part in alcohols increases with increasing molecular weight which permits enhanced hydrogen bond with water.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3)(A) is true but (R) is false

(4) Both (A) and (R) are false

50. **Assertion (A):** $t-Bu$ toxide is a stronger base than OH^- or $C_2H_5O^-$ ion but is a much poorer nucleophile.

Reason (R): A negatively charged ions is always more powerful nucleophile than its conjugate acid.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

18. Aldehyde, Ketone and Carboxylic Acid

1. **Assertion (A):** Benzaldehyde is less reactive than ethanal towards nucleophilic attack.

Reason (R): All the carbon atoms of benzaldehyde are sp^2 hybridized.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

2. **Assertion (A):** Crossed-Cannizzaro reaction between formaldehyde and benzaldehyde gives benzyl alcohol and formate ion.

Reason (R): Formaldehyde is a better hydride donor than benzaldehyde.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

3. **Assertion (A):** Ketones cannot be prepared by the reaction of RCOCl with Grignard reagent R'MgCl.

Reason (R): The Grignard reagent reacts with ketone to form alcohol

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

4. **Assertion (A):** Carbonyl compounds are more soluble in water than the isomeric alkanes.

Reason (R): The carbonyl oxygen forms extensive hydrogen bonding with water.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

5. **Assertion (A):** Pentan-2-one can be distinguished from pentan-3-one by iodoform test.

Reason (R): Former is a methyl ketone while the latter is not.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

6. **Assertion (A):** Aromatic aldehydes as well as formaldehyde undergo Cannizzaro's reaction with strong alkali.

Reason (R): Aldehydes which have α-hydrogen atoms undergo Cannizzaro's reaction.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

7. **Assertion (A):** Protonation of a carbonyl group increases its electrophilic nature.

Reason (R): The protonation of nucleophilic oxygen is an electrophilic addition reaction.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

8. **Assertion (A):** Formic acid reduces Tollen's reagent

Reason (R): Compounds containing CHO group reduce Tollen's reagent.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

9. **Assertion (A):** Aldehydes and have much higher boiling points than corresponding alkanes

Reason (R): Aldehyde and ketone are much more polar than alkanes

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

10. **Assertion (A):** The correct acidity order among formic acid (I), acetic acid (II) and benzoic acid (III) is I > III > II.

Reason (R): Formic acid is the only acid which gives positive tollen's test.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

11. **Assertion (A):** A ketone may also reduce Fehling's solution and Tollen's reagent if there is an –OH group at $\alpha -$ position w.r.t. each.

Reason (R): Fructose reduces Fehling's solution and Tollen's reagent.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

12. **Assertion (A):** Acetic acid does not undergo haloform reaction.

Reason (R): Acetic acid has no alpha hydrogen.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

13. **Assertion (A):** Acetophenone and benzophenone can be distinguished by iodoform test.

Reason (R): Acetophenone and benzophenone both are carbonyl compounds.

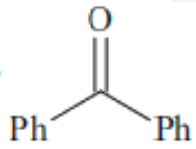
(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

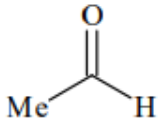
(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

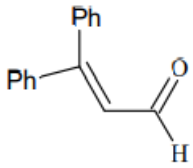
14. **Assertion (A):** A mixture of



and



on treatment with dil. NaOH gives



Reason (R): The ketone is very hindered and very conjugated and so less reactive than aldehyde.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

15. **Assertion (A):** The addition of amines in aldehyde and ketone is carried out in weakly acidic medium.

Reason (R): In strong acidic medium amines will be protonated hence the nucleophilic character of amine decrease.

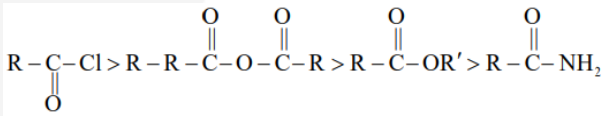
(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

16. **Assertion (A):** The order of reactivity towards nucleophilic substitution of carboxylic acid derivatives is



Reason (R): The order of reactivity is related to the leaving aptitude of the leaving group.

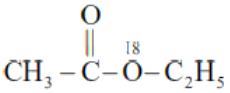
(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

17. **Assertion (A):** Hydrolysis



in acid catalysed medium gives $CH_3COOOH + C_2H_5\overset{18}{O}H$

Reason (R): Esters on hydrolysis gives alcohol and carboxylic acid.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

18. **Assertion (A):** Grignard reagent reacts with aldehydes and ketones to form alcohol.

Reason (R): Alcohols have acidic hydrogen.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

19. **Assertion (A):** Carbonyl compound take part is nucleophilic addition reactions.

Reason (R): These reactions are initiated By nucleophilic attack at the electron deficient carbon atom.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

20. **Assertion (A):** The addition of ammonia derivatives on carbonyl compounds is carried in weakly acidic medium.

Reason (R): In weakly acidic medium attacking nucleophile is also protonated.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

21. **Assertion (A):** Formic acid reduces mercuric chloride solution.

Reason (R): Formic acid has reducing aldehydic group.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

22. **Assertion (A):** Acetaldehyde undergoes aldol condensation with dilute NaOH.

Reason (R): Aldehyde which do not contain α-hydrogen undergoes aldol condensation.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

23. **Assertion (A):** Crossed Cannizzaro reaction between formaldehyde and benzaldehyde give benzyl alcohol and formate ion.

Reason (R): Formaldehyde is a better hydride donar than benzaldehyde.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

24. **Assertion (A):** Acetic acid does not give haloform reaction.

Reason (R): Acetic acid has no α-hydrogen.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

25. **Assertion (A):** Carboxylic acid $R-\overset{\overset{O}{\|}}{C}-OH$ have a carbonyl group but it does not give the test of carbonyl group.

Reason (R): Due to resonance the double bond character of group is greatly reduced.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

26. **Assertion (A):** Acetic acid does not give haloform reaction.

Reason (R): Acetic acid has no α-hydrogen

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

27. **Assertion (A):** Ethanamide undergoes dehydration by heating with P_2O_5.

Reason (R): Ethanamide undergoes dehydration to give nitro compound.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

28. **Assertion (A):** 1^0 amide react with Br_2 in presence of NaOH to form 1^0 amine having one carbon atom less than amide.

Reason (R): It is degradative reduction involving acylnitrene intermediate.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

29. **Assertion (A):** Ester which contain α-hydrogen undergoes Claisen condensation.

Reason (R): $LiAlH_4$ reduction of ester gives acid.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

30. **Assertion (A):** Aceto acetic ester will $CH_3 - C - CH_2 - \overset{O}{\overset{\|}{C}} - OC_2H_5$ give iodoform test.

Reason (R): It contains methyl keto group.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

31. **Assertion (A):** p-nitrobenzaldehyde is more reactive than benzaldehyde.

Reason (R): Benzaldehyde is less reactive than acetone.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

32. **Assertion (A):** Both acetone and benzaldehyde are less reactive to nucleophilic attack as compared to acetaldehyde.

Reason (R): Both acetone and benzaldehyde are resonance stabilized.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

33. **Assertion (A):** Aldehydes can be easily prepared by the reduction of carboxylic acids with $LiAlH_4$.

Reason (R): In going from $-COOH$ to $-CHO$ group oxidation number of C decreases.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

34. **Assertion (A):** Picric acid does not contain $-COOH$ group.

Reason (R): Picric acid is 2, 4, 6-trinitrophenol.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

35. **Assertion (A):** Distillation of calcium carboxylate and sulphuryl chloride can produce acid anhydrides.

Reason (R): Distillation of calcium carboxylate produces ketones.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

36. **Assertion (A):** Benzamide and methyl benzoate are derivatives of benzoic acid.

Reason (R): Benzamide is less easily hydrolysed as compared to methyl benzoate.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

37. **Assertion (A):** Benzoic acid does not undergo Friedel-Craft's reaction.

Reason (R):-COOH group deactivates the benzene ring by its electron withdrawing nature.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

38. **Assertion (A):** p-Fluorobenzoic acid is weaker acid as compared to p-chlorobenzoic acid.

Reason (R): Fluoroacetic acid is strongest acid as compared to chloroacetic acid.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

39. **Assertion (A):** m-Nitrobenzoic acid is less acidic as compared to p-nitrobenzoic acid.

Reason (R): It is due to $+M$ effect of $-NO_2$ group.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

40. **Assertion (A):** With $Br_2 - H_2O$, phenol gives 2, 4, 6tribromophenol but with $Br_2 - CS_2$ it gives 4-bromophenol is the major product.

Reason (R): In water ionization of phenol is enhanced but in CS_2, it is greatly suppressed.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

41. **Assertion (A):** m-Chlorobenzoic acid is a stronger acid than p-chlorobenzoic acid.

Reason (R): In p-chlorobenzoic acid both -I-effect and +R-effect of Cl operate but in m-chlorobenzoic acid only -I-effect of Cl operates.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

42. **Assertion (A):** Although fluorine is more electronegative than chlorine, yet p-fluorobenzoic acid is a weaker acid than p-chlorobenzoic acid.

Reason (R): Due to matching size of 2p-orbitals of F and C, F has a stronger +R -effect than Cl.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

44. **Assertion (A):** Nitration of benzoic acid gives m nitrobenzoic acid.

Reason (R): carboxylic group is meta-directing group.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

19. Amines

1. **Assertion (A):** Aniline does not give Friedel crafts reaction

Reason (R): strong deactivating group can not show Friedel craft reaction

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)
(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)
(3) (A) is true but (R) is false
(4) Both (A) and (R) are false

2. **Assertion (A):** Carbylamine reaction involves the reaction between primary amine and chloroform in the presence of alkali.

Reason (R): In carbylamines reaction, NH_2 group changes to NC group.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)
(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)
(3) (A) is true but (R) is false
(4) Both (A) and (R) are false

3. **Assertion (A):** Aniline does not undergo Friedel-Crafts reaction.

Reason (R): Friedel-Crafts reaction is an electrophilic substitution reaction.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)
(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)
(3) (A) is true but (R) is false
(4) Both (A) and (R) are false

4. **Assertion (A):** Aniline reacts with bromine water to form 2,4,6-tribromoaniline.

Reason (R): Aniline is resonance stabilized.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)
(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)
(3) (A) is true but (R) is false
(4) Both (A) and (R) are false

5. **Assertion (A):** The order of basicity among the following is

$CH_3CH_2NH_2 > NH_3 > C_6H_5NH_2$.

Reason (R): Electron releasing groups increase the basicity of amines while electron withdrawing groups decrease the basicity.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)
(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)
(3) (A) is true but (R) is false
(4) Both (A) and (R) are false

6. **Assertion (A):** n-Propylamine has a higher boiling point than trimethylamine

Reason (R): Among n-propylamine molecules there is hydrogen bonding but there is no hydrogen bonding among trimethylamine molecules.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)
(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)
(3) (A) is true but (R) is false
(4) Both (A) and (R) are false

7. **Assertion (A):** All the amines except tertiary amines are capable of forming intermolecular hydrogen bonds.
Reason (R): Tertiary amines have larger molecules and surface area.
(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)
(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)
(3) (A) is true but (R) is false
(4) Both (A) and (R) are false

8. **Assertion (A):** Aromatic amines are less basic than alkyl amines
Reason (R): The π electrons on the aromatic ring decrease the basic character.
(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)
(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)
(3) (A) is true but (R) is false
(4) Both (A) and (R) are false

9. **Assertion (A):** $(CH_3)_3N$ boils at 276 K, while $CH_3CH_2CH_2NH_2$ boil at 322 K though both have same molecular mass
Reason (R): Molecules of $CH_3CH_2CH_2NH_2$ form hydrogen bonds while $(CH_3)_3N$ molecules are incapable of forming hydrogen bonds.
(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)
(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)
(3) (A) is true but (R) is false
(4) Both (A) and (R) are false

10. **Assertion (A):** In strongly acidic solutions, aniline becomes less reactive towards electrophilic reagents
Reasons (R): The amino group being completely protonated in strongly acidic solution, the lone pair of electrons on nitrogen is no longer available for resonance.
(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)
(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)
(3) (A) is true but (R) is false
(4) Both (A) and (R) are false

11. **Assertion (A):** $C_6H_5NH_2$ is a 1° amine and can be prepared by Phthalimide synthesis.
Reason (R): $C_6H_5NH_2$ is strongly basic in nature.
(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)
(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)
(3) (A) is true but (R) is false
(4) Both (A) and (R) are false

12. **Assertion (A):** Amines have a higher boiling point than the corresponding alcohols.
Reason (R): Alcohols possess intramolecular H-bonding
(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)
(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)
(3) (A) is true but (R) is false
(4) Both (A) and (R) are false

13. **Assertion (A):** Aniline does not undergo the Friedel-Crafts reaction.

Reason (R): Diazonium salts of aromatic amines are more stable than those of aliphatic amines.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

14. **Assertion (A):** Secondary amines have higher boiling point than their respective tertiary isomers

Reason (R): H-bonding is absent in tertiary amines.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

15. **Assertion (A):** pK_b of aniline is higher than ethylamine.

Reason (R): The lone pair of $-NH_2$ group in aniline is involved in conjugation with a benzene ring.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

16. Match the reaction given in Column I with the statements given in Column II.

Column I		**Column II**	
A.	Ammonolysis	I.	Amine with a lesser number of carbon atoms
B.	Gabrielphthalimide synthesis	II.	Detection test for primary amines
C.	Hofmann bromamide reaction	III.	Reaction of phthalimide with KOH and R–X
D.	Carbylamine reaction	IV	Reaction of alkyl halides with NH_3

	A	**B**	**D**	**C**
(1)	II	III	IV	I
(2)	III	I	IV	II
(3)	I	IV	III	II
(4)	IV	III	I	II

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

17. **Assertion (A):** Nitration of aniline at a low temperature gives 47% m-nitroaniline.
Reason (R): In acidic medium NH_2 group is converted into $-\overset{+}{N}H_3$ group which is m-directing.
(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)
(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)
(3) (A) is true but (R) is false
(4) Both (A) and (R) are false

18. **Assertion (A):** CH_3NH_2 on reaction with chloroform and KOH gives isocyanide.
Reason (R): The reaction involve carbocation formation
(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)
(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)
(3) (A) is true but (R) is false
(4) Both (A) and (R) are false

19. **Assertion (A):** Ethyl acetate is more reactive than acetamide towards nucleophilic substitution.
Reason (R): $-OC_2H_5$ is more electron attraction than $-NH_2$ group.
(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)
(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)
(3) (A) is true but (R) is false
(4) Both (A) and (R) are false

1. **Assertion (A):** D(+)– Glucose is dextrorotatory in nature.

Reason (R): 'D' represents its dextrorotatory nature.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

2. **Assertion (A):** Vitamin D can be stored in our body.

Reason (R): Vitamin D is fat soluble vitamin.

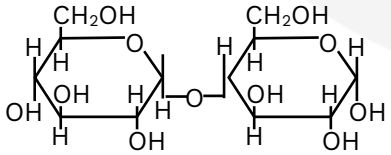
(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

3. **Assertion (A):** α-glycosidic linkage is present in maltose,



Reason (R): Maltose is composed of two glucose units in which C–1 of one glucose unit is linked to C–4 of another glucose unit.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

4. **Assertion (A):** All naturally occurring α–aminoacids except glycine are optically active.

Reason (R): Most naturally occurring amino acids have L-configuration

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

5. **Assertion (A):** Deoxyribose, $C_5H_{10}O_4$ is not a carbohydrate.

Reason (R): Carbohydrates are hydrates of carbon so compound which follow $C_x(H_2O)_y$ formula are carbohydrates.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

6. **Assertion (A):** Glycine must be taken through diet.

Reason (R): It is an essential amino acid.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

7. **Assertion (A):** In presence of enzyme, substrate molecule can be attacked by the reagent effectively.

Reason (R): Active sites of enzymes hold the substrate molecule in a suitable position.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

8. **Assertion (A):** D–(+)-Glucose and L–(–)–glucose are enantiomer.

Reason (R): Enantiomer are stereoisomer which are not mirror image.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

9. **Assertion (A):** Lactose is a reducing sugar.

Reason (R): Upon hydrolysis lactose gives 2 molecules of glucose.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

10. **Assertion (A):** All enzymes are made up of proteins which have three dimensional structure.

Reason (R): Secondary structure of protein are sequence of amino acid.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

11. **Assertion (A):** Sucrose is dextro rotatory but its aqueous solution is laevorotatony.

Reason (R): Laevorotation of fructose is more than dextro rotatory of glucose.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

12. **Assertion (A):** Oxidation of glucose by Br_2–water gives saccharic acid.

Reason (R): Br_2–water oxidises –CHO and –OH group.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

13. **Assertion (A):** Fructose is a reducing sugar.

Reason (R): It has a ketonic group.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

14. **Assertion (A):** Starch is a polymer of α-D-Glucose.

Reason (R): It is consist of two components amylose and amylopectin.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

15. **Assertion (A):** A solution of sucrose in water is dextro-rotatory. But on hydrolysis in the presence of a little hydrochloric acid it becomes laevo-rotatory.

Reason (R): Sucrose on hydrolysis gives unequal amounts of glucose and fructose. As a result of this, change in sign of rotation is observed.

(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)

(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)

(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

1. Some Basic Concepts of Chemistry

ANSWER KEY																
Que.	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**
Ans.	3	1	2	1	1	1	1	2	1	1	1	1	1	2	3	1	2

2. Structure of Atom

ANSWER KEY																	
Que.	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**
Ans.	1	4	1	1	1	1	1	3	3	2	1	4	1	1	1	3	3	4

3. Classification of Element and Periodicity in Properties

ANSWER KEY																		
Que.	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**
Ans.	2	2	4	2	2	1	3	2	1	3	3	2	2	2	2	2	3	2

4. Chemical Bonding and Molecular Structure

ANSWER KEY																
Que.	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**
Ans.	3	2	2	1	1	2	4	3	4	3	2	1	1	1	2	1

5. Thermodynamics

ANSWER KEY														
Que.	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**
Ans.	1	1	4	1	4	3	3	2	1	2	3	2	3	2

6. Equilibrium

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

7. Redox reactions

ANSWER KEY															
Que.	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
Ans.	4	4	3	1	2	1	2	4	3	4	2	4	3	1	1

8. The p-Block Elements

ANSWER KEY																			
Que.	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**
Ans.	2	3	4	2	1	3	2	2	4	1	1	1	2	1	2	2	4	3	1	1
Que.	**21**	**22**	**23**	**24**	**25**	**26**	**27**	**28**	**29**	**30**	**31**	**32**	**33**	**34**	**35**	**36**	**37**	**38**	**39**	**40**
Ans.	2	3	4	2	2	1	1	2	2	2	4	4	3	2	4	3	1	3	1	1
Que.	**41**	**42**	**43**	**44**	**45**	**46**	**47**	**48**	**49**	**50**	**51**	**52**	**53**	**54**	**55**	**56**	**57**	**58**	**59**	**60**
Ans.	3	3	1	2	3	1	1	4	3	4	1	3	1	1	3	3	1	3	3	3
Que.	**61**	**62**	**63**	**64**	**65**	**66**	**67**	**68**	**69**	**70**	**71**	**72**	**73**	**74**	**75**	**76**	**77**	**78**	**79**	**80**
Ans.	1	1	4	4	3	3	3	4	4	1	1	3	4	4	2	4	3	3	4	3
Que.	**81**	**82**	**83**	**84**																
Ans.	2	3	1	1																

9. Organic Chemistry-Some Basic Principles and Techniques

ANSWER KEY															
Que.	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
Ans.	1	3	1	1	1	3	1	1	4	1	1	1	4	2	1

10. Hydrocarbons

ANSWER KEY																			
Que.	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**
Ans.	1	1	1	1	1	1	1	4	1	3	2	1	3	4	3	1	4	1	1

11. Solution

ANSWER KEY															
Que.	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
Ans.	2	3	3	3	4	3	1	3	2	3	2	1	1	4	1

12. Electrochemistry

ANSWER KEY														
Que.	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**
Ans.	3	3	1	1	1	1	1	3	4	1	1	1	4	3

13. Chemical Kinetics

ANSWER KEY																
Que.	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**
Ans.	1	1	2	1	2	1	1	2	4	1	4	2	4	2	3	3

14. The d & f Block Elements

ANSWER KEY																				
Que.	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**
Ans.	2	2	3	4	1	1	1	3	2	3	1	2	3	3	3	3	3	1	1	4
Que.	**21**	**22**	**23**																	
Ans.	2	2	1																	

15. Co-ordination Compound

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

16. Haloalkanes and Haloarenes

ANSWER KEY																		
Que.	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**
Ans.	4	4	2	4	1	2	3	1	3	4	1	1	3	1	4	1	1	2

17. Alcohol Phenol and Ethers

ANSWER KEY																				
Que.	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**
Ans.	3	2	3	3	3	1	3	4	1	2	4	1	4	4	4	4	1	2	3	1
Que.	**21**	**22**	**23**	**24**	**25**	**26**	**27**	**28**	**29**	**30**	**31**	**32**	**33**	**34**	**35**	**36**	**37**	**38**	**39**	**40**
Ans.	3	1	1	3	1	1	1	1	3	1	3	1	1	1	1	1	1	2	4	3
Que.	**41**	**42**	**43**	**44**	**45**	**46**	**47**	**48**	**49**	**50**										
Ans.	1	1	1	1	2	1	4	1	3	2										

18. Aldehyde Ketone and Carboxylic Acid

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

19. Amines

ANSWER KEY																		
Que.	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**
Ans.	2	1	2	2	2	1	3	3	1	1	4	4	2	1	1	4	1	3	1

20. Biomolecules

ANSWER KEY															
Que.	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
Ans.	3	1	2	2	4	4	1	3	3	3	1	4	2	2	3