# Competishun

52/6, Opposite Metro Mas Hospital, Shipra Path, Mansarovar

**Date:** 30/12/2024

**Time:** 3 hours **Max. Marks:** 300

## Assertion-Reason Test_(24-25)

## Physics

**Single Choice Question**

**Q1** **Assertion :** Average power consumption by a capacitor in one cycle for a sinusoidally varying ac current is zero.
**Reason :** The power consumed by a capacitor in a sinusoidally varying ac circuit is zero for every small time interval.
In the light of the above statements, choose the most appropriate answer from the options given below :

**a)** A is true but R is false

**b)** Both A and R are true but R is NOT the correct explanation of A.

**c)** Both A and R are true and R is the correct explanation of A

**d)** A is false but R is true

**Q2** **Assertion :** To put a dielectric plate in the interspace between two plates of a capacitor connected to a D.C. voltage external agency has to do negative work.
**Reason :** Putting the dielectric increases the capacitance.
In the light of the above statements, choose the most appropriate answer from the options given below :

**a)** A is true but R is false

**b)** Both A and R are true but R is NOT the correct explanation of A.

**c)** Both A and R are true and R is the correct explanation of A

**d)** A is false but R is true

**Q3** **Assertion :** When a particle is projected at some angle with horizontal, the radius of curvature of its path during the ascent decreases continuously.
**Reason :** The radius of curvature of trajectory of a particle in motion at a point is the ratio of square of magnitude of the velocity and the magnitude of acceleration at that point.
In the light of the above statements, choose the most appropriate answer from the options given below :

**a)** A is true but R is false

**b)** Both A and R are true but R is NOT the correct explanation of A.

**c)** Both A and R are true and R is the correct explanation of A

**d)** A is false but R is true

**Q4** **Assertion :** Two particles undergo rectilinear motion along different straight lines. Then the centre of mass of system of given two particles also always moves along a straight line.
**Reason :** If direction of net momentum of a system of particles (having nonzero net momentum) is fixed, the centre of mass of given system moves along a straight line.
In the light of the above statements, choose the most appropriate answer from the options given below :

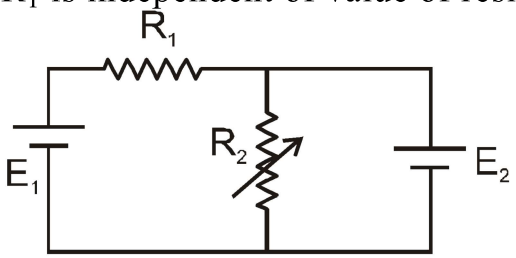
**a)** A is true but R is false

**b)** Both A and R are true but R is NOT the correct explanation of A.

**c)** Both A and R are true and R is the correct explanation of A

**d)** A is false but R is true

**Q5** **Assertion :** In the circuit shown both cells are ideal and of fixed emf, the resistor of resistance $R_1$ has fixed resistance and the resistance of resistor $R_2$ can be varied (but the value of $R_2$ is not zero). Then the electric power delivered to resistor of resistance $R_1$ is independent of value of resistance $R_2$.




**Reason :** If potential difference across a fixed resistance is unchanged, the power delivered to the resistor remains constant.
In the light of the above statements, choose the most appropriate answer from the options given below :

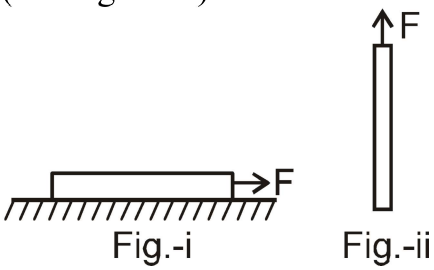
**a)** A is true but R is false

**b)** Both A and R are true but R is NOT the correct explanation of A.

**c)** Both A and R are true and R is the correct explanation of A

**d)** A is false but R is true

**Q6** **Assertion :** A uniform elastic rod lying on smooth horizontal surface is pulled by constant horizontal force of magnitude F as shown in figure (i). Another identical elastic rod is pulled vertically upwards by a constant vertical force of magnitude F (see figure ii). The extension in both rods will be same.




**Reason :** In a uniform elastic rod, the extension depends only on forces acting at the ends of rod.
In the light of the above statements, choose the most appropriate answer from the options given below :

**a)** A is true but R is false

**b)** Both A and R are true but R is NOT the correct explanation of A.

**c)** Both A and R are true and R is the correct explanation of A

**d)** A is false but R is true

**Q7** **Assertion :** If a proton and an electron are placed in the same uniform electric field one by one, they experience different accelerations (The only force acting on proton and electron is that exerted by uniform electric field).
**Reason :** Electric force on a test charge is independent of its mass.
In the light of the above statements, choose the most appropriate answer from the options given below :

**a)** A is true but R is false

**b)** Both A and R are true but R is NOT the correct explanation of A.

**c)** Both A and R are true and R is the correct explanation of A

**d)** A is false but R is true

**Q8** **Assertion :** Tension in a current carrying ring placed in uniform magnetic field is only due to torque acting on the ring
**Reason :** A current loop placed in uniform magnetic field will experience a zero net force but may experience a non-zero torque
In the light of the above statements, choose the most appropriate answer from the options given below :

**a)** A is true but R is false

**b)** Both A and R are true but R is NOT the correct explanation of A.

**c)** Both A and R are true and R is the correct explanation of A

**d)** A is false but R is true

**Q9** **Assertion :** Any pressure increase at one point of a static connected fluid passed to each point undiminished.
**Reason :** Fluid is assumed to be incompressible.
In the light of the above statements, choose the most appropriate answer from the options given below :

**a)** A is true but R is false

**b)** Both A and R are true but R is NOT the correct explanation of A.

**c)** Both A and R are true and R is the correct explanation of A

**d)** A is false but R is true

**Q10** **Assertion :** A body is lying at rest on a rough horizontal surface. A person accelerating with acceleration $a\hat{i}$ (where a is positive constant and $\hat{i}$ is a unit vector in horizontal direction) observes the body. With respect to him, the block experiences a kinetic friction.
**Reason :** Whenever there is relative motion between two rough contact surfaces then kinetic friction acts.
In the light of the above statements, choose the most appropriate answer from the options given below :

**a)** A is true but R is false

**b)** Both A and R are true but R is NOT the correct explanation of A.

**c)** Both A and R are true and R is the correct explanation of A

**d)** A is false but R is true

**Q11** **Assertion :** Keeping a point object fixed, if a plane mirror is moved, the image will also move.
**Reason :** In case of a plane mirror, distance of object and its image is equal from any point on the mirror.
In the light of the above statements, choose the most appropriate answer from the options given below :

**a)** A is true but R is false

**b)** Both A and R are true but R is NOT the correct explanation of A.

**c)** Both A and R are true and R is the correct explanation of A

**d)** A is false but R is true

**Q12** **Assertion :** Areal velocity of earth about centre of sun remains constant (areal velocity is defined as area swept per unit time by line joining the centre of earth and centre of sun).
**Reason :** Torque on earth due to gravitational force of sun about centre of sun remains constant.
In the light of the above statements, choose the most appropriate answer from the options given below :

**a)** A is true but R is false

**b)** Both A and R are true but R is NOT the correct explanation of A.

**c)** Both A and R are true and R is the correct explanation of A

**d)** A is false but R is true

**Q13** **Assertion :** Burns sustained from steam at 100°C are usually more serious than those sustained by boiling water (at 100°C)
**Reason :** To convert 1gm of water at 100°C to 1 gm of steam at 100°C, 540 calories of heat is to be supplied. Hence 1gm of steam at 100°C has more heat content than 1 gm of water at 100°C
In the light of the above statements, choose the most appropriate answer from the options given below :

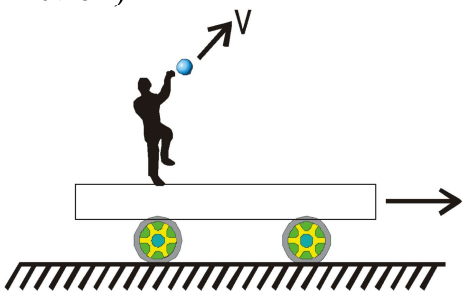
**a)** A is true but R is false

**b)** Both A and R are true but R is NOT the correct explanation of A.

**c)** Both A and R are true and R is the correct explanation of A

**d)** A is false but R is true

**Q14** **Assertion :** From a horizontally moving platform, a ball is projected at an angle θ with horizontal from a platform with constant velocity relative to platform. The time of flight of ball is independent of the horizontal velocity of platform. (Neglect the air friction)




**Reason :** The time of flight of projectile depends only on vertical component of initial velocity and acceleration in vertical direction.
In the light of the above statements, choose the most appropriate answer from the options given below :

**a)** A is true but R is false

**b)** Both A and R are true but R is NOT the correct explanation of A.

**c)** Both A and R are true and R is the correct explanation of A

**d)** A is false but R is true

**Q15** **Assertion :**In process of photoelectric emission, all emitted electrons donot have same kinetic energy.
**Reason :** If radiation falling on photosensitive surface of a metal consists of different wavelengths, then energy acquired by electrons absorbing photons of different wavelengths shall be different.
In the light of the above statements, choose the most appropriate answer from the options given below :

**a)** A is true but R is false

**b)** Both A and R are true but R is NOT the correct explanation of A.

**c)** Both A and R are true and R is the correct explanation of A

**d)** A is false but R is true

**Q16** **Assertion :** A man standing in a lift which is moving upward, will feel his weight to be greater than when the lift was at rest.
**Reason :** If the acceleration of the lift is 'a' upward, then the man of mass m shall feel his weight to be equal to normal reaction (N) exerted by the lift given by N = m(g + a) (where g is acceleration due to gravity)
In the light of the above statements, choose the most appropriate answer from the options given below :

**a)** A is true but R is false

**b)** Both A and R are true but R is NOT the correct explanation of A.

**c)** Both A and R are true and R is the correct explanation of A

**d)** A is false but R is true

**Q17** **Assertion :** A rigid disc rolls without slipping on a fixed rough horizontal surface with uniform angular velocity. Then the acceleration of lowest point on the disc is zero.
**Reason :** For a rigid disc rolling without slipping on a fixed rough horizontal surface, the velocity of the lowest point on the disc is always zero.
In the light of the above statements, choose the most appropriate answer from the options given below :

**a)** A is true but R is false

**b)** Both A and R are true but R is NOT the correct explanation of A.

**c)** Both A and R are true and R is the correct explanation of A

**d)** A is false but R is true

**Q18** **Assertion :** A particle is moving along x-axis. The resultant force F acting on it is given by F = – ax – b. Where a and b are both positive constants. The motion of this particle is not SHM.
**Reason :** In SHM resultant force must be proportional to the displacement from mean position.
In the light of the above statements, choose the most appropriate answer from the options given below :

**a)** A is true but R is false

**b)** Both A and R are true but R is NOT the correct explanation of A.

**c)** Both A and R are true and R is the correct explanation of A

**d)** A is false but R is true

**Q19** **Assertion :** When a wave enters from one medium to another, its frequency is not changed.
**Reason :** Speed of a wave in a medium is property of the source.
In the light of the above statements, choose the most appropriate answer from the options given below :

**a)** A is true but R is false

**b)** Both A and R are true but R is NOT the correct explanation of A.

**c)** Both A and R are true and R is the correct explanation of A

**d)** A is false but R is true

**Q20** **Assertion :** In a small segment of string carrying sinusoidal wave, total energy is conserved.
**Reason :** Every small part moves in SHM and total energy of SHM is conserved.
In the light of the above statements, choose the most appropriate answer from the options given below :

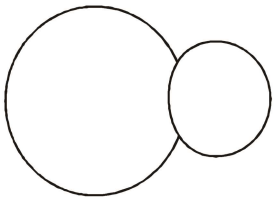
**a)** A is true but R is false

**b)** Both A and R are true but R is NOT the correct explanation of A.

**c)** Both A and R are true and R is the correct explanation of A

**d)** A is false but R is true

**Q21** **Assertion :** When two soap bubble's of different radii are brought into contact, the common interface of contact bulges into the bubble of larger radii as shown.



**Reason :** Pressure inside a soap bubble of lesser radius is more than pressure inside a soap bubble of larger radius.
In the light of the above statements, choose the most appropriate answer from the options given below :

**a)** A is true but R is false

**b)** Both A and R are true but R is NOT the correct explanation of A.

**c)** Both A and R are true and R is the correct explanation of A

**d)** A is false but R is true

**Q22** **Assertion :** Dimensional analysis can give you the numerical value of constants of proportionality that may appear in an algebraic expression.
**Reason :** Dimensional analysis makes use of the fact that dimensions can be treated as algebraic quantities.
In the light of the above statements, choose the most appropriate answer from the options given below :

**a)** A is true but R is false

**b)** Both A and R are true but R is NOT the correct explanation of A.

**c)** Both A and R are true and R is the correct explanation of A

**d)** A is false but R is true

**Q23** **Assertion :** In rectilinear motion when velocity is positive distance travelled increases and when velocity is negative distance travelled decreases.
**Reason :** Distance is length of the path covered by a particle.
In the light of the above statements, choose the most appropriate answer from the options given below :

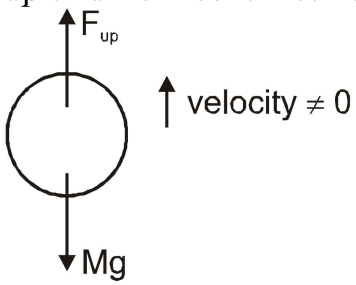
**a)** A is true but R is false

**b)** Both A and R are true but R is NOT the correct explanation of A.

**c)** Both A and R are true and R is the correct explanation of A

**d)** A is false but R is true

**Q24** **Assertion :** For the object shown in diagram, it is given that upwards force $F_{up}$ is equal to the magnitude of gravitational attraction force. Then it will continue to rise up and its mechanical energy keeps on increasing. (Neglect any viscous forces)




**Reason :** For body to move continuously in upward direction, $F_{up}$ must be greater than Mg at every instant.
In the light of the above statements, choose the most appropriate answer from the options given below :

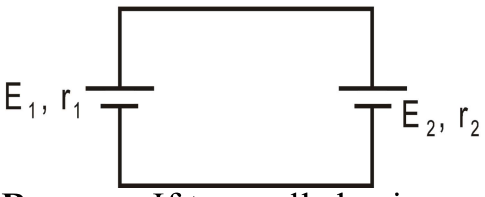
**a)** A is true but R is false

**b)** Both A and R are true but R is NOT the correct explanation of A.

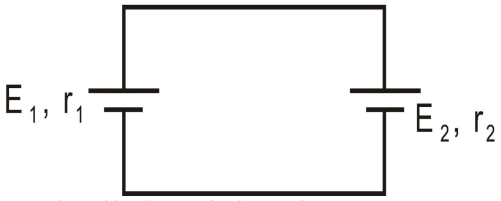
**c)** Both A and R are true and R is the correct explanation of A

**d)** A is false but R is true

**Q25** **Assertion :** Two cells of unequal emf $E_1$ and $E_2$ having internal resistances $r_1$ and $r_2$ are connected as shown in figure. Then the potential difference across any cell cannot be zero.




**Reason :** If two cells having nonzero internal resistance and unequal emf are connected across each other as shown, then the current in the circuit cannot be zero.




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

**a)** A is true but R is false

**b)** Both A and R are true but R is NOT the correct explanation of A.

**c)** Both A and R are true and R is the correct explanation of A

**d)** A is false but R is true

# Chemistry

**Single Choice Question**

**Q26** **Assertion :** The S–S–S bond angle in $S_8$ molecule is 105°.
**Reason :** $S_8$ has V-shape.

a) If both assertion and reason are true and reason is the correct explanation of assertion.

b) If both assertion and reason are true but reason is not the correct explanation of assertion.

c) If Assertion is true but reason is false.

d) If both assertion and reason are false.

**Q27** **Assertion :** The $HF_2^-$ ions exists in the solid state and also in liquid state but not in aqueous solution.
**Reason :** The magnitude of hydrogen bonds in between HF – HF molecule is weaker than that in between HF and $H_2O$ molecules.

a) If both assertion and reason are true and reason is the correct explanation of assertion.

b) If both assertion and reason are true but reason is not the correct explanation of assertion.

c) If Assertion is true but reason is false.

d) If both assertion and reason are false.

**Q28** **Assertion :** $[SiF_6]^{2-}$ does exist.
**Reason :** The hybridisation of silicon in the complex is $sp^3d^2$.

a) Both A and R are true and R is the correct explanation of A.

b) Both A and R are true but R is not correct explanation of A

c) A is true but R is false

d) A and R are false

**Q29** **Assertion :** Carbon–oxygen bonds are of equal length in acetate ion.
**Reason :** Bond length decreases with the multiplicity of bond between two atoms.

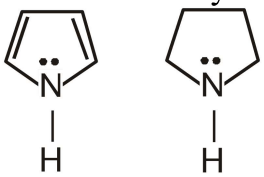
a) If both assertion and reason are true and reason is a correct explanation of assertion.

b) If both assertion and reason are true but reason is not a correct explanation of assertion.

c) If assertion is true but reason is false.

d) If assertion and reason both are false.

**Q30** **Assertion :** Pyrrolidine (II) is more basic than pyrrole (I)



(I) (II)

**Reason :** Protonated pyrrole has delocalisation of positive charge in aromatic ring.

**a)** If both assertion and reason are true and reason is a correct explanation of assertion.

**b)** If both assertion and reason are true but reason is not a correct explanation of assertion.

**c)** If assertion is true but reason is false.

**d)** If assertion and reason both are false.

**Q31** **Assertion :** The species $[CuCl_4]^{2-}$ exists but $[CuI_4]^{2-}$ does not.
**Reason :** $[NiCl_2(PPh_3)_2]$ have tetrahedral geometry.

**a)** If both assertion and reason are true and reason is the correct explanation of assertion.

**b)** If both assertion and reason are true but reason is not the correct explanation of assertion.

**c)** If Assertion is true but reason is false.

**d)** If both assertion and reason are false.

**Q32** **Assertion :** $Mn^{3+}$ and $Co^{3+}$ ions are the strongest oxidising agents in aqueous solutions amongst 3d series elements.
**Reason :** $E^0$ values for the redox couple $Mn^{3+} \mid Mn^{2+}$ and $Co^{3+} \mid Co^{2+}$ are +1.57V and + 1.97 V respectively.

**a)** If both assertion and reason are true and reason is the correct explanation of assertion.

**b)** If both assertion and reason are true but reason is not the correct explanation of assertion.

**c)** If Assertion is true but reason is false.

**d)** If both assertion and reason are false.

**Q33** **Assertion :** The green manganate is paramagnetic but the purple permanganate is diamagnetic in nature.
**Reason :** $MnO_4^{2-}$ contains one unpaired electron while in $MnO_4^-$ all electrons are paired.

a) If both assertion and reason are true and reason is the correct explanation of assertion.

b) If both assertion and reason are true but reason is not the correct explanation of assertion.

c) If Assertion is true but reason is false.

d) If both assertion and reason are false.

**Q34** **Assertion :** A solution containing $S^{2-}$ ions gives purple / violet colour with sodium nitroprusside solution in alkaline medium.
**Reason :** Sodium sulphide gives black precipitate with silver nitrate solution

a) Both A and R are true and R is the correct explanation of A.

b) Both A and R are true but R is not correct explanation of A

c) A is true but R is false

d) A and R are false

**Q35** **Assertion :** $CH_3 - C{\equiv}C{-}CH_3$ is more reactive for electrophilic addition reaction than $CH_3CH = CH{-}CH_3$
**Reason :** Carbocation intermediate formed in alkene is less stable than the alkyne

a) If both assertion and reason are true and reason is the correct explanation of assertion.

b) If both assertion and reason are true but reason is not the correct explanation of assertion.

c) If Assertion is true but reason is false.

d) If both assertion and reason are false.

**Q36** **Assertion :** Meso tartaric acid is optically inactive
**Reason :** Because it has plane of symmetry.

a) If both assertion and reason are true and reason is the correct explanation of assertion.

b) If both assertion and reason are true but reason is not the correct explanation of assertion.

c) If Assertion is true but reason is false.

d) If both assertion and reason are false.

**Q37** **Assertion:** Ammonolysis of alkyl halides is not a suitable method for the preparation of pure primary amines.
**Reason:** Ammonolysis of alkyl halides yield mainly secondary amines.

**a)** If both assertion and reason are true and reason is the correct explanation of assertion.

**b)** If both assertion and reason are true but reason is not the correct explanation of assertion.

**c)** If Assertion is true but reason is false.

**d)** If both assertion and reason are false.

**Q38** **Assertion:** Grignard reagent can't be prepared in all nonpolar solvent.
**Reason :** Diethyl ether do not solvates the Grignard reagent.

**a)** If both assertion and reason are true and reason is the correct explanation of assertion.

**b)** If both assertion and reason are true but reason is not the correct explanation of assertion.

**c)** If Assertion is true but reason is false.

**d)** If both assertion and reason are false.

**Q39** **Assertion :** All monosaccharides are sweet in taste.
**Reason :** All monosaccharides have the general formula, $C_6H_{12}O_6$.

**a)** If both assertion and reason are true and reason is a correct explanation of assertion.

**b)** If both assertion and reason are true but reason is not a correct explanation of assertion.

**c)** If assertion is true but reason is false.

**d)** If assertion and reason both are false.

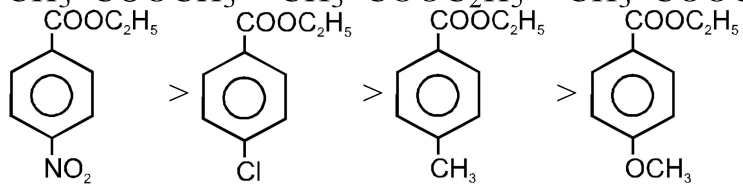
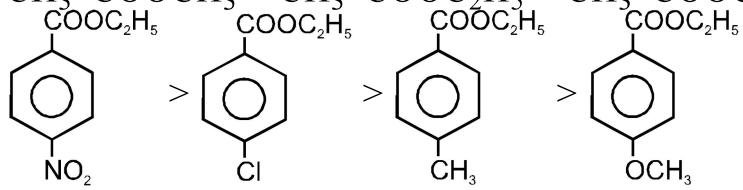
**Q40** **Assertion :** Aniline reacts with concentrated $H_2SO_4$ to form anilinium sulphate which on heating to about 473 K forms mainly p-aminobenzene sulphonic acid (sulphanilic acid).
**Reason :** Sulphanilic acid exists as a dipolar ion.

**a)** If both assertion and reason are true and reason is the correct explanation of assertion.

**b)** If both assertion and reason are true but reason is not the correct explanation of assertion.

**c)** If Assertion is true but reason is false.

**d)** If both assertion and reason are false.

**Q41** **Assertion :** The order of base catalysed hydrolysis of ester is
(1) $CH_3–COOCH_3 > CH_3–COOC_2H_5 > CH_3–COOCH(CH_3)_2$ .
(2)  >  >  > 
**Reason** : $S_N2$ Th reaction is sterically as well as electronically controlled reaction.
(1) $CH_3–COOCH_3 > CH_3–COOC_2H_5 > CH_3–COOCH(CH_3)_2$ .
(2)  >  >  > 

**a)** If both assertion and reason are true and reason is the correct explanation of assertion.

**b)** If both assertion and reason are true but reason is not the correct explanation of assertion.

**c)** If Assertion is true but reason is false.

**d)** If both assertion and reason are false.

**Q42** Given below are two statements: one is labelled as Assertion A and the other is labelled as Reason R:
**Assertion A:** In the photoelectric effect, the electrons are ejected from the metal surface as soon as the beam of light of frequency greater than threshold frequency strikes the surface.
**Reason R:** When the photon of any energy strikes an electron in the atom, transfer of energy from the photon to the electron takes place.
In the light of the above statements, choose the most appropriate answer from the options given below:

**a)** Both A and R are correct but R is NOT the correct explanation of A

**b)** A is correct but R is not correct

**c)** Both A and R are correct and R is the correct explanation of A

**d)** A is not correct but R is correct

**Q43** Given below are two statements. One is labeled as **Assertion A** and the other is labeled as **Reason R**.
**Assertion A :** Energy of 2s orbital of hydrogen atom is greater than that of 2s orbital of lithium.
**Reason R :** Energies of the orbitals in the same subshell decrease with increase in the atomic number.
In the light of the above statements, choose the correct answer from the options given below.

a) Both **A** and **R** are true and **R** is the correct explanation of **A**.

b) Both **A** and **R** are true but **R** is NOT the correct explanation of **A**.

c) **A** is true but **R** is false.

d) **A** is false but **R** is true.

**Q44** Given below are two statement: one is labelled as Assertion A and the other is labelled as Reason R
**Assertion A:** 5f electrons can participate in bonding to a far greater extent than 4f electrons
**Reason R:** 5f orbitals are not as buried as 4f orbitals
In the light of the above statements, choose the correct answer from the options given below

a) Both A and R are true but R is NOT the correct explanation of A

b) Both A and R are true and R is the correct explanation of A

c) A is false but R is true

d) A is true but R is false

**Q45** Given below are two statements: one is labelled as Assertion (A) and the other is labelled as Reason(R)
**Assertion (A):** The ionic radii of $O^{2-}$ and $Mg^{2+}$ are same.
**Reason (R):** Both $O^{2-}$ and $Mg^{2+}$ are isoelectronic species
In the light of the above statements, choose the correct answer from the options given below

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

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

c) (1) is true but (R) is false

d) (1) is false but (R) is true

**Q46** Given below are two statements : one is labelled as Assertion A and the other is labelled as Reason R:
**Assertion A:** The first ionisation enthalpy decreases across a period.
**Reason R:** The increasing nuclear charge outweighs the shielding across the period.
In the light of the above statements, choose the most appropriate from the options given below:

a) Both A and R are true and R is the correct explanation of A

b) A is true but R is false

c) A is false but R is true

d) Both A and R are true but R is NOT the correct explanation of A

**Q47** Given below are two statements : One is labeled as **Assertion A** and the other is labeled as **Reason R**
**Assertion A :** Zero orbital overlap is an out of phase overlap.
**Reason R :** It results due to different orientation/ direction of approach of orbitals. In the light of the above statements. Choose the correct answer from the options given below

a) Both **A** and **R** are true and **R** is the correct explanation of **A**

b) Both **A** and **R** are true but **R** is NOT the correct explanation of **A**

c) **A** is true but **R** is false

d) **A** is false but **R** is true

**Q48** Given below are two statements : one is labelled as **Assertion A** and the other is labelled as **Reason R.**
**Assertion A :** Dipole-dipole interactions are the only non-covalent interactions, resulting in hydrogen bond formation.
**Reason R :** Fluorine is the most electronegative element and hydrogen bonds in HF are symmetrical.
In the light of the above statements, choose the most appropriate answer from the options given below.

a) A is false but R is true

b) Both A and R are true and R is the correct explanation of A

c) A is true R is false

d) Both A and R are true but R is NOT the correct explanation of A

**Q49** Given below are two statements : One is labeled as **Assertion A** and the other is labeled as **Reason R**
**Assertion A :** Permanganate titrations are not performed in presence of hydrochloric acid.
**Reason R :** Chlorine is formed as a consequence of oxidation of hydrochloric acid.
In the light of the above statements, choose the correct answer from the options given below

a) Both **A** and **R** are true and **R** is the correct explanation of **A**

b) Both **A** and **R** are true but **R** is NOT the correct explanation of **A**

c) **A** is true but **R** is false

d) **A** is false but **R** is true

**Q50** Given below are two statements : One is labeled as **Assertion A** and the other is labeled as **Reason R**
**Assertion A :** Permanganate titrations are not performed in presence of hydrochloric acid.
**Reason R :** Chlorine is formed as a consequence of oxidation of hydrochloric acid.
In the light of the above statements, choose the correct answer from the options given below

a) Both **A** and **R** are true and **R** is the correct explanation of **A**

b) Both **A** and **R** are true but **R** is NOT the correct explanation of **A**

c) **A** is true but **R** is false

d) **A** is false but **R** is true

# Mathematics

**Single Choice Question**

**Q51** **Assertion (A) :** The number N = $\underbrace{1111111111.....111111}_{2009-times}$ is composite.

**Reasons (R) :** Any natural number is composite if it has more than 2 divisors.

a) Both A and R are true and R is the correct explanation of A .

b) Both A and R are true but R is not the correct explanation of A

c) A is true, R is false.

d) A is false, R is true.

**Q52** **Assertion (A) :** The number of ways of distributing $n$ identical objects in $r$ distinct boxes is ${}^{n+r-1}C_{r-1}$.

**Reasons (R):** The number of arrangement of $n$ objects of one kind and $r-1$ objects of another kind in a line must be $\frac{(n+r-1)!}{n!(r-1)!}$.

a) Both A and R are true and R is the correct explanation of A .

b) Both A and R are true but R is not the correct explanation of A

c) A is true, R is false.

d) A is false, R is true.

**Q53** **Assertion (A) :** All the real roots of the equation $x^4 - 3x^3 - 2x^2 - 3x + 1 = 0$ lie in the interval [0, 3].

**Reasons (R) :** The equation reduces to a quadratic equation in the variable $t = x + \frac{1}{x}$.

a) Both A and R are true and R is the correct explanation of A .

b) Both A and R are true but R is not the correct explanation of A

c) A is true, R is false.

d) A is false, R is true.

**Q54** **Assertion (A) :** In Δ ABC, sin 2A + sin 2B + sin 2C is always positive.
**Reasons (R) :** In Δ ABC, sin 2A + sin 2B + sin2C = 8 sinA sinB sinC.

a) Both A and R are true and R is the correct explanation of A .

b) Both A and R are true but R is not the correct explanation of A

c) A is true, R is false.

d) A is false, R is true.

**Q55** **Consider the functions**

$f(x) = \text{sgn}(x-1)$ and $g(x) = \cot^{-1}[x-1]$

where [ . ] denotes the greatest integer function.

**Assertion (A) :** The function $F(x) = f(x) \cdot g(x)$ is discontinuous at $x = 1$.

**Reason (R):** If $f(x)$ is discontinuous at $x = a$ and $g(x)$ is also discontinuous at $x = a$ then the product function $f(x)$. g(x) is discontinuous at $x = a$.

a) Both A and R are true and R is the correct explanation of A .

b) Both A and R are true but R is not the correct explanation of A

c) A is true, R is false.

d) A is false, R is true.

**Q56** **Assertion (A) :** Each point on the line x – y = 4 is equidistant from the lines 8x + 6y – 5 = 0 and 6x + 8y + 3 = 0.

**Reasons (R) :** The locus of a point which is equidistant from two lines $L_1 \equiv a_1x + b_1y + c_1 = 0$ and $L_2 \equiv a_2x + b_2y + c_2 = 0$ is always the angle bisector of the two given lines.

a) Both A and R are true and R is the correct explanation of A .

b) Both A and R are true but R is not the correct explanation of A

c) A is true, R is false.

d) A is false, R is true.

**Q57** **Assertion (A):** The expression n!(100 – n)! is maximum when n = 50.

**Reasons (R):** $^{2n}C_r$ is maximum when r = n.

a) Both A and R are true and R is the correct explanation of A .

b) Both A and R are true but R is not the correct explanation of A

c) A is true, R is false.

d) A is false, R is true.

**Q58** **Assertion (A) :** There are 3 non-zero values of x for which [x], sgn x, {x} are in A.P. where [x] denotes greatest integer function of x , {x} denotes fractional part function of x and sgn x denotes signum function of x .

**Reasons (R) :** If a, b, c are in A.P., then b – a = c – b.

a) Both A and R are true and R is the correct explanation of A .

b) Both A and R are true but R is not the correct explanation of A

c) A is true, R is false.

d) A is false, R is true.

**Q59** Let g : R→R defined by g(x) = $\{e^x\}$, where {x} denotes fractional part function.
**Assertion (A) :** g(x) is periodic function.
**Reason (R) :** {x} is periodic function.

**a)** Both A and R are true and R is the correct explanation of A .

**b)** Both A and R are true but R is not the correct explanation of A

**c)** A is true, R is false.

**d)** A is false, R is true.

**Q60** Let $F(x)$ be an indefinite integral of $\sin^2 x$.
**Assertion (A):** The function $F(x)$ satisfies $F(x+\pi)=F(x)$ for all real x .
**Reasons (R):** $\sin^2(x+\pi)=\sin^2 x$ for all real $x$.

**a)** Both A and R are true and R is the correct explanation of A .

**b)** Both A and R are true but R is not the correct explanation of A

**c)** A is true, R is false.

**d)** A is false, R is true.

**Q61** **Assertion (A) :** Let $f(x)=x^3+2x^2+2x+1$ and $g(x)$ be its inverse. The area bounded by $g(x)$, $x$-axis, $x=-3$ and $x=6$ is given by

$$\int_0^1\left(5-x^3-2x^2-2x\right)dx+\int_{-2}^0\left(x^3+2x^2+2x+4\right)dx$$

**Reason (R) :** $\int_a^b f(x)dx+\int_{f(a)}^{f(b)} f^{-1}(x)dx=bf(b)-af(a)$

**a)** Both A and R are true and R is the correct explanation of A .

**b)** Both A and R are true but R is not the correct explanation of A

**c)** A is true, R is false.

**d)** A is false, R is true.

**Q62** **Assertion (A):** If a circle S = 0 of radius unity touches the co-ordinate axes in the first quadrant, then sum and product of all radii of the circles touching S = 0 and the co-ordinates axes is 6 and 2 respectively.
**Reason (R):** If two circles touches each other externally then the distance between their centres is equal to the sum of their radii.

**a)** Both A and R are true and R is the correct explanation of A .

**b)** Both A and R are true but R is not the correct explanation of A

**c)** A is true, R is false.

**d)** A is false, R is true.

**Q63** Four children A, B, C and D have 1, 3, 5 and 7 identical unbiased dice respectively and roll them with the condition that one who obtains an even score, wins. They keep playing till some one or the other wins.
**Assertion (A):** All the four children are equally likely to win provided they roll their dice simultaneously.
**Reason (R):** The child A is most probable to win the game if they roll their dice in order of A, B, C and D respectively.

**a)** Both A and R are true and R is the correct explanation of A .

**b)** Both A and R are true but R is not the correct explanation of A

**c)** A is true, R is false.

**d)** A is false, R is true.

**Q64** **Assertion (A) :** Let f be a differentiable function such that $f(x)+f'(x)\le 1$ for all x , and $f(0)=0$. The largest possible value of $f(1)$ is $1-\frac{1}{e}$.

**Reason (R):** Consider $g(x)=e^x f(x)$. Then $g'(x)\le e^x$. Integrating we get $g(1)-g(0)\le e-1$.

**a)** Both A and R are true and R is the correct explanation of A .

**b)** Both A and R are true but R is not the correct explanation of A

**c)** A is true, R is false.

**d)** A is false, R is true.

**Q65** **Assertion (A):** Let f (x) = $x^3 - ax^2 + bx + 6$ where a, b ∈ {1, 2, 3, 4, 5, 6}. The probability that f (x) is strictly increasing function is 4/9.
**Reason (R):** If y = g(x) is differentiable function in (– ∞, ∞) then g(x) is strictly increasing provided g′(x) ≥ 0 and g′(x) = 0 does not form an interval.

**a)** Both A and R are true and R is the correct explanation of A .

**b)** Both A and R are true but R is not the correct explanation of A

**c)** A is true, R is false.

**d)** A is false, R is true.

**Q66** Consider a differentiable function y = f (x) which satisfies f (x) = $\int_0^x \left(f(t)\sin t-\sin(t-x)\right)dt$

**Assertion (A):** The differential equation corresponding to y = f (x) is a first order linear differential equation.
**Reason (R):** The differential equation corresponding to y = f (x) is of degree one.

**a)** Both A and R are true and R is the correct explanation of A .

**b)** Both A and R are true but R is not the correct explanation of A

**c)** A is true, R is false.

**d)** A is false, R is true.

**Q67** **Assertion (A) :** If A is skew symmetric matrix of order 3 × 3 then det (A) = 0
**Reason (R) :** If A is square matrix, then $\det(A) = \det(-A)^T$ whose $A^T$ represents transpose of A.

**a)** Both A and R are true and R is the correct explanation of A .

**b)** Both A and R are true but R is not the correct explanation of A

**c)** A is true, R is false.

**d)** A is false, R is true.

**Q68** **Assertion (A) :** Let A = {1, 2, 3, 4, 5, 6}. If a, b, c ∈ A, then the probability that

$$\lim_{x\to 0}\left(\frac{a^x+b^x+c^x}{3}\right)^{\frac{3}{x}}=6 \text{ is } \frac{1}{36}.$$

**Reason (R) :** $\lim_{x\to 0}\left(\frac{a_1^{\,x}+a_2^{\,x}+a_3^{\,x}}{3}\right)^{\frac{3}{x}} = a_1a_2a_3$, where $a_1 > 0$, $a_2 > 0$, $a_3 > 0$.

**a)** Both A and R are true and R is the correct explanation of A .

**b)** Both A and R are true but R is not the correct explanation of A

**c)** A is true, R is false.

**d)** A is false, R is true.

**Q69** **Assertion (A) :** The sum of focal distances of a point on the ellipse $4x^2 + 5y^2 - 16x - 30y + 41 = 0$ is $2\sqrt{5}$.
**Reason (R) :** The equation $4x^2 + 5y^2 - 16x - 30y + 41 = 0$ can be expressed as $4(x-2)^2 + 5(y-3)^2 = 20$.

**a)** Both A and R are true and R is the correct explanation of A .

**b)** Both A and R are true but R is not the correct explanation of A

**c)** A is true, R is false.

**d)** A is false, R is true.

**Q70** Let $L_1$, $L_2$, $L_3$ be three distinct lines in a plane P and another line L, is equally inclined with these three lines.
**Assertion (A):** The line L is normal to the plane P.
**Reason (R):** If non zero vector $\vec{V}$ is equally inclined to three non zero coplanar vector $\vec{V}_1, \vec{V}_2, \vec{V}_3$ then the vector $\vec{V}$ is normal to the plane of $\vec{V}_1, \vec{V}_2$ and $\vec{V}_3$.

**a)** Both A and R are true and R is the correct explanation of A .

**b)** Both A and R are true but R is not the correct explanation of A

**c)** A is true, R is false.

**d)** A is false, R is true.

**Q71** **Assertion (A) :** The set of real values of y for which real x satisfy $x^2y + 2xy^2 + 64 = 0$ is $(-\infty, 0] \cup [4, \infty)$
**Reason (R) :** If x is real then the discriminant of the quadratic equation $ax^2+bx+c=0$ is non-negative, where a, b, c $\in$ R and a $\neq$ 0.

**a)** Both A and R are true and R is the correct explanation of A .

**b)** Both A and R are true but R is not the correct explanation of A

**c)** A is true, R is false.

**d)** A is false, R is true.

**Q72** **Assertion (A):** $\text{cosec}^{-1}\left(\frac{1}{2}+\frac{1}{\sqrt{2}}\right) > \sec^{-1}\left(\frac{1}{2}+\frac{1}{\sqrt{2}}\right)$
**Reason (R):** $\text{cosec}^{-1}x > \sec^{-1} x$ if $1 \leq x < \sqrt{2}$

**a)** Both A and R are true and R is the correct explanation of A .

**b)** Both A and R are true but R is not the correct explanation of A

**c)** A is true, R is false.

**d)** A is false, R is true.

**Q73** Consider two functions f (x) = $1+e^{\cot^2 x}$ and g (x) = $\sqrt{2|\sin x|-1}+\frac{1-\cos 2x}{1+\sin^4 x}$
**Assertion (A):** The solutions of the equation f(x) = g(x) is given by x = $(2n+1)\frac{\pi}{2}$ $\forall n \in I$ .
**Reason (R):** If f (x) $\geq$ k and g (x) $\leq$ k (where k $\in$ R) then solutions of the equation f (x) = g (x) is the solution corresponding to the equation f (x) = k.

**a)** Both A and R are true and R is the correct explanation of A .

**b)** Both A and R are true but R is not the correct explanation of A

**c)** A is true, R is false.

**d)** A is false, R is true.

**Q74** **Assertion (A):** The number 'c' in the domain of function f such that either f '(c) = 0 or f '(c) fails to exist imply that f(x) has local extremum at x = c.
**Reason (R) :** If f(x) has local extremum at x = c then either f '(c) = 0 or f '(c) does not exist.

**a)** Both A and R are true and R is the correct explanation of A .

**b)** Both A and R are true but R is not the correct explanation of A

**c)** A is true, R is false.

**d)** A is false, R is true.

**Q75** **Assertion (A):** For $0 < x < \frac{\pi}{2}$, $\cos x \sin(\tan x) < \sin(\sin x)$

**Reason (R):** $\frac{\tan x}{x}$ is increasing function in $\left(0, \frac{\pi}{2}\right)$.

**a)** Both A and R are true and R is the correct explanation of A .

**b)** Both A and R are true but R is not the correct explanation of A

**c)** A is true, R is false.

**d)** A is false, R is true.

# Answer Key

| Que. | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| **Ans.** | **A** | **B** | **A** | **D** | **C** | **A** | **B** | **D** | **C** | **D** |
| Que. | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
| **Ans.** | **D** | **B** | **C** | **C** | **B** | **D** | **D** | **D** | **A** | **D** |
| Que. | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 |
| **Ans.** | **C** | **D** | **D** | **A** | **B** | **A** | **A** | | **B** | **C** |
| Que. | 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 40 |
| **Ans.** | **B** | **A** | **A** | **B** | **D** | **A** | **C** | **C** | **C** | **B** |
| Que. | 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | 49 | 50 |
| **Ans.** | **A** | **B** | **A** | **B** | **D** | **C** | **A** | **A** | **A** | **Bonus** |
| Que. | 51 | 52 | 53 | 54 | 55 | 56 | 57 | 58 | 59 | 60 |
| **Ans.** | **A** | **A** | **D** | **C** | **C** | **C** | **D** | **D** | **D** | **D** |
| Que. | 61 | 62 | 63 | 64 | 65 | 66 | 67 | 68 | 69 | 70 |
| **Ans.** | **B** | **D** | **B** | **A** | **A** | **B** | **C** | **D** | **A** | **A** |
| Que. | 71 | 72 | 73 | 74 | 75 | | | | | |
| **Ans.** | **B** | **A** | **C** | **D** | **B** | | | | | |