

CUET 2026 May 26 Shift 2 Chemistry

Question Paper (Memory-Based) with Solutions

Conducted by National Testing Agency (NTA)



1. According to Collision Theory, the rate constant of a chemical reaction depends on activation energy. If the activation energy of a reaction increases, then the value of the rate constant k will:

- (A) Increase exponentially
- (B) Remain unchanged
- (C) Decrease exponentially
- (D) Become zero

Correct Answer: (C) Decrease exponentially

Solution:

Concept:

According to Arrhenius equation:

$$k = Ae^{-E_a/RT}$$

where:

- k = Rate constant
- A = Frequency factor
- E_a = Activation energy
- R = Universal gas constant
- T = Absolute temperature

The equation clearly shows that the rate constant depends exponentially on activation energy.

Step 1: Analyze the exponential term.

The exponential factor is:

$$e^{-E_a/RT}$$

When activation energy E_a increases:

$$-\frac{E_a}{RT}$$

becomes more negative.

As a result:

$$e^{-E_a/RT}$$

decreases rapidly.

Hence:

$$k$$

also decreases exponentially.

Step 2: Physical interpretation.

Higher activation energy means reactant molecules require more energy to cross the energy barrier.

Therefore:

- Fewer molecules can form activated complex
- Number of effective collisions decreases
- Reaction becomes slower

Hence, rate constant decreases.

Therefore, the correct answer is:

(C) Decrease exponentially

Quick Tip: Remember:

$$k = Ae^{-E_a/RT}$$

- Larger activation energy \Rightarrow smaller rate constant
- Higher temperature \Rightarrow larger rate constant

2. For a first order reaction, the time required for completion of 75% of the reaction is 40

minutes. The half-life of the reaction is:

- (A) 10 min
- (B) 20 min
- (C) 40 min
- (D) 80 min

Correct Answer: (B) 20 min

Solution:

Concept:

For first order reactions:

$$t = \frac{2.303}{k} \log \frac{a}{a-x}$$

and:

$$t_{1/2} = \frac{0.693}{k}$$

Step 1: Interpret 75% completion.

If 75% reaction is completed, then:

25%

reactant remains.

Hence:

$$\frac{a}{a-x} = 4$$

Step 2: Apply integrated rate equation.

$$40 = \frac{2.303}{k} \log 4$$

Since:

$$\log 4 = 0.6021$$

$$40 = \frac{2.303 \times 0.6021}{k}$$

$$40 = \frac{1.386}{k}$$

$$k = \frac{1.386}{40}$$

Step 3: Calculate half-life.

$$t_{1/2} = \frac{0.693}{k}$$

Substituting:

$$t_{1/2} = \frac{0.693}{1.386/40}$$

$$t_{1/2} = 20 \text{ min}$$

Hence:

20 min

Quick Tip: For first order reactions:

$$75\% \text{ completion} = 2t_{1/2}$$

because after two half-lives only 25% reactant remains.

3. The standard electrode potential of zinc electrode is -0.76 V and that of copper electrode is $+0.34 \text{ V}$. The standard EMF of the Daniell cell is:

- (A) 0.42 V
- (B) 1.10 V
- (C) 0.76 V
- (D) 1.52 V

Correct Answer: (B) 1.10 V

Solution:

Concept:

The standard EMF of a galvanic cell is:

$$E_{\text{cell}}^{\circ} = E_{\text{cathode}}^{\circ} - E_{\text{anode}}^{\circ}$$

The electrode with higher reduction potential acts as cathode.

Step 1: Identify cathode and anode.

Given:

$$E_{\text{Zn}^{2+}/\text{Zn}}^{\circ} = -0.76 \text{ V}$$

$$E_{\text{Cu}^{2+}/\text{Cu}}^{\circ} = +0.34 \text{ V}$$

Since copper has higher reduction potential:

$$\text{Cathode} = \text{Cu}$$

and:

$$\text{Anode} = \text{Zn}$$

Step 2: Apply EMF formula.

$$E_{\text{cell}}^{\circ} = 0.34 - (-0.76)$$

$$E_{\text{cell}}^{\circ} = 0.34 + 0.76$$

$$E_{\text{cell}}^{\circ} = 1.10 \text{ V}$$

Hence:

$$\boxed{1.10 \text{ V}}$$

Quick Tip: In galvanic cells:

$$E_{\text{cell}}^{\circ} = E_{\text{cathode}}^{\circ} - E_{\text{anode}}^{\circ}$$

Always subtract oxidation electrode potential from reduction electrode potential.

4. The Nernst equation for a half-cell reaction at 298 K is:

- (A) $E = E^{\circ} - \frac{0.0591}{n} \log Q$
(B) $E = E^{\circ} + \frac{0.0591}{n} \log Q$
(C) $E = E^{\circ} - \frac{n}{0.0591} \log Q$
(D) $E = E^{\circ} + \frac{n}{0.0591} \log Q$

Correct Answer: (A)

Solution:

Concept:

The Nernst equation relates electrode potential with ionic concentration and reaction quotient.

General form:

$$E = E^{\circ} - \frac{RT}{nF} \ln Q$$

At 298 K:

$$\frac{2.303RT}{F} = 0.0591$$

Thus:

$$E = E^{\circ} - \frac{0.0591}{n} \log Q$$

Step 1: Understand the terms in equation.

Where:

- E° = Standard electrode potential
- n = Number of electrons transferred
- Q = Reaction quotient

The equation predicts how electrode potential changes with concentration.

Step 2: Check all options.

Option (A):

$$E = E^\circ - \frac{0.0591}{n} \log Q$$

Correct standard form at 298 K.

Other options contain incorrect signs or incorrect placement of n .

Hence:

(A)

Quick Tip: At 298 K:

$$E = E^\circ - \frac{0.0591}{n} \log Q$$

This formula is extremely important for electrochemistry numericals.

5. The violet colour of $KMnO_4$ solution is due to:

- (A) $d - d$ transition
- (B) Charge transfer transition
- (C) Presence of unpaired electrons
- (D) Hybridization

Correct Answer: (B) Charge transfer transition

Solution:

Concept:

Colour in transition metal compounds may arise due to:

- $d - d$ transitions
- Charge transfer transitions

In permanganate ion:



manganese exists in:

+7

oxidation state.

Step 1: Find electronic configuration of manganese.

Atomic number of manganese:

25

Electronic configuration:

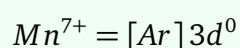


For:



all seven valence electrons are removed.

Thus:



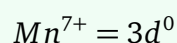
There are no electrons in d -orbitals.

Step 2: Check possibility of $d - d$ transition.

For $d - d$ transition:

- Electrons must be present in d -orbitals.

But:



Therefore:



transition is impossible.

Step 3: Identify actual reason for violet colour.

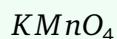
In permanganate ion:

- Electrons transfer from oxygen ligand orbitals to empty metal orbitals.

This process is known as:

Charge transfer transition

Charge transfer transitions are usually very intense, which explains the deep violet colour of:

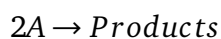


Hence, the correct answer is:

Charge transfer transition

Quick Tip: Compounds having d^0 or d^{10} configuration generally do not show $d-d$ transitions. Their colour usually arises from charge transfer transitions.

6. For the reaction:



the rate law is:

$$\text{Rate} = k[A]^2$$

If the concentration of A is doubled, the rate of reaction will become:

- (A) Doubled
- (B) Four times
- (C) Half
- (D) Unchanged

Correct Answer: (B) Four times

Solution:

Concept:

The rate law of a reaction expresses how the rate depends upon concentration of reactants.

For a reaction:

$$\text{Rate} = k[A]^n$$

where:

- k = rate constant

- $n =$ order of reaction with respect to A

If concentration changes, the rate changes according to the power of concentration.

Step 1: Write the given rate law.

Given:

$$\text{Rate} = k[A]^2$$

This means reaction is second order with respect to A .

Step 2: Determine new concentration.

Suppose initial concentration is:

$$[A]$$

New concentration after doubling:

$$[A]' = 2[A]$$

Step 3: Substitute into rate equation.

New rate:

$$\text{Rate}' = k(2[A])^2$$

$$\text{Rate}' = k(4[A]^2)$$

$$\text{Rate}' = 4k[A]^2$$

But:

$$k[A]^2 = \text{original rate}$$

Therefore:

$$\text{New rate} = 4 \times \text{original rate}$$

Hence, the rate becomes four times.

Therefore, the correct answer is:

(B) Four times

Quick Tip: For reactions:

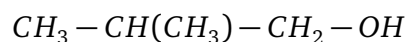
$$\text{Rate} \propto [A]^n$$

If concentration becomes m times:

$$\text{New rate} = m^n$$

times the original rate.

7. The IUPAC name of the compound



is:

- (A) Propan-1-ol
- (B) 2-Methylpropan-1-ol
- (C) Butan-2-ol
- (D) 2-Methylpropan-2-ol

Correct Answer: (B) 2-Methylpropan-1-ol

Solution:

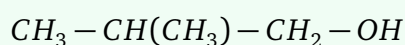
Concept:

In IUPAC nomenclature:

- Longest carbon chain containing functional group is selected.
- Alcohol group gets lowest possible number.
- Alkyl substituents are named with their positions.

Step 1: Identify longest carbon chain.

Given structure:



The longest continuous chain contains:

3 carbon atoms

Hence parent chain is:

propane

Step 2: Locate alcohol group.

The:

$-OH$

group is attached to carbon number 1.

Thus:

propan-1-ol

Step 3: Identify substituent.

There is one methyl group attached to carbon number 2.

Hence the complete name becomes:

2-Methylpropan-1-ol

Therefore, the correct answer is:

(B) 2-Methylpropan-1-ol

Quick Tip: While naming alcohols:

- Give lowest number to $-OH$ group.
- Select longest chain containing the functional group.

8. The number of sigma (σ) and pi (π) bonds respectively in ethene molecule are:

- (A) 4σ , 1π
- (B) 5σ , 1π
- (C) 6σ , 1π
- (D) 5σ , 2π

Correct Answer: (B) 5σ , 1π

Solution:

Concept:

A single bond contains:

$$1\sigma$$

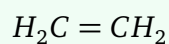
bond.

A double bond contains:

$$1\sigma + 1\pi$$

bond.

Ethene structure is:



Step 1: Count C-H sigma bonds.

Each carbon atom forms two C-H single bonds.

Total C-H bonds:

$$4$$

Each single bond contributes:

$$1\sigma$$

Therefore:

$$4\sigma$$

bonds are present from C-H bonds.

Step 2: Count bonds in carbon-carbon double bond.

The:



double bond contains:

$$1\sigma + 1\pi$$

bond.

Thus:

$$1\sigma$$

and:

$$1\pi$$

bond are contributed.

Step 3: Calculate total bonds.

Total sigma bonds:

$$4 + 1 = 5$$

Total pi bonds:

$$1$$

Hence:

$$5\sigma, 1\pi$$

Quick Tip: Remember:

$$\text{Single bond} = 1\sigma$$

$$\text{Double bond} = 1\sigma + 1\pi$$

$$\text{Triple bond} = 1\sigma + 2\pi$$

9. The hybridization of carbon atom in CH_4 molecule is:

- (A) sp
- (B) sp^2
- (C) sp^3
- (D) dsp^2

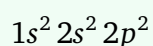
Correct Answer: (C) sp^3

Solution:

Concept:

Hybridization is the mixing of atomic orbitals having comparable energies to form equivalent hybrid orbitals.

Carbon electronic configuration:



In methane:



carbon forms four equivalent sigma bonds.

Step 1: Determine number of sigma bonds around carbon.

In methane:



carbon forms:

4

single covalent bonds with hydrogen atoms.

Thus total sigma bonds around carbon:

4

Step 2: Relate sigma bonds with hybridization.

Hybridization pattern:

2 sigma bonds $\rightarrow sp$

3 sigma bonds $\rightarrow sp^2$

4 sigma bonds $\rightarrow sp^3$

Since carbon forms four sigma bonds:

Hybridization = sp^3

Step 3: Determine geometry.

sp^3 hybridization leads to:

Tetrahedral geometry

with bond angle:

109.5°

Hence, the correct answer is:

sp^3

Quick Tip: Shortcut:

Steric number = 4 $\Rightarrow sp^3$

Methane is the most common example of sp^3 hybridization.

10. Which of the following solutions will conduct electricity most effectively?

- (A) Glucose solution
- (B) Urea solution
- (C) Sodium chloride solution
- (D) Sugar solution

Correct Answer: (C) Sodium chloride solution

Solution:

Concept:

Electrical conductivity in aqueous solutions depends upon:

- Presence of ions
- Number of free moving charged particles

Substances are classified as:

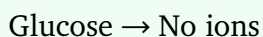
- Electrolytes
- Non-electrolytes

Electrolytes dissociate into ions in aqueous solution and conduct electricity.

Step 1: Analyze glucose solution.

Glucose is a covalent compound.

In water:



Hence glucose solution conducts electricity very poorly.

Step 2: Analyze urea solution.

Urea is also a covalent molecular compound.

It dissolves in water but does not ionize.

Therefore:

Poor conductor

Step 3: Analyze sodium chloride solution.

Sodium chloride is an ionic compound.

In water:



Large number of ions are produced.

These ions carry electric current efficiently.

Hence:

Strong conductor

Step 4: Analyze sugar solution.

Sugar solution also does not produce ions.

Hence conductivity is negligible.

Therefore, sodium chloride solution conducts electricity most effectively.

Thus, the correct answer is:

(C) Sodium chloride solution

Quick Tip: Strong electrolytes completely ionize in water and conduct electricity efficiently.

Examples:



Non-electrolytes like sugar and glucose do not produce ions.
