

Questions & Solutions

PAPER – 1

SUBJECT: CHEMISTRY

MAX. MARKS: 186

TIME: 3 HRS.

PAPER-1 : INSTRUCTIONS TO CANDIDATES

- Question Paper-1 has three (03) parts: Physics, Chemistry and Mathematics.
- Each part has a total eighteen (18) questions divided into three (03) sections (Section-1, Section-2 and Section-3)
- Total number of questions in Question Paper-1 are Fifty Four (54) and Maximum Marks are One Hundred Eighty Six (186)

Type of Questions and Marking Schemes

SECTION-1 (Maximum Marks : 12)

- This section contains **FOUR (04)** questions.
- Each question has **FOUR** options **ONLY ONE** of these four options is the correct answer.
- For each question, choose the correct option corresponding to the correct answer.
- Answer to each question will be evaluated according to the following marking scheme :
Full Marks : +3 If **ONLY** the correct option is chosen.
Zero Marks : 0 If none of the options is chosen (i.e. the question is unanswered).
Negative Marks : -1 In all other cases.

SECTION-2 (Maximum Marks : 32)

- This section contains **EIGHT (08)** questions.
- Each question has **FOUR** options. **ONE OR MORE THAN ONE** of these four option(s) is (are) correct answer(s).
- For each question, choose the option(s) corresponding to (all) the correct answer(s).
- Answer to each question will be evaluated according to the following marking scheme.
Full Marks : +4 If only (all) the correct option(s) is (are) chosen.
Partial Marks : +3 If all the four options are correct but **ONLY** three options are chosen.
Partial Marks : +2 If three or more options are correct but **ONLY** two options are chosen and both of which are correct.
Partial Marks : +1 If two or more options are correct but **ONLY** one option is chosen and it is a correct option.
Zero Marks : 0 If none of the options is chosen (i.e. the question is unanswered).
Negative Marks : -1 In all other cases.

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SECTION-3 (Maximum Marks : 18)

- This section contains **SIX (06)** questions. The answer to each question is a **NUMERICAL VALUE**.
- For each question, enter the correct numerical value of the answer using the mouse and the on-screen virtual numeric keypad in the place designated to enter the answer. If the numerical value has more than two decimal places **truncate/round-off** the value to **TWO** decimal places.
- Answer to each question will be evaluated according to the following marking scheme :

Full Marks : **+3** If **ONLY** the correct numerical value is entered.

Zero Marks : **0** In all other cases.

Answering Questions :


- To select the option(s), use the mouse to click on the corresponding button(s) of the option(s).
- To deselect the chosen option for the questions of **SECTION-1**, click on the button of the chosen option again or click on the **Clear Response** button to clear the chosen option.
- To deselect the chosen option(s) for the questions of **SECTION-2**, click on the button(s) of the chosen option(s) again or click on the **Clear Response** button to clear all the chosen options.
- To change the option(s) of a previously answered question of **SECTION-1** and **SECTION-2** first deselect as given above and then select the new option(s).
- To answer questions of **SECTION-3**, use the mouse to click on numbers (and/or symbols) on the on-screen virtual numeric keypad to enter the numerical value in the space provided for answer.
- To change the answer of a question of **SECTION-3**, first click on the **Clear Response** button to clear the entered answer and then enter the new numerical value.
- To mark a question **ONLY** for review (i.e. without answering it), click on the **Mark for Review & Next** button.
- To mark a question for review (after answering it), click on **Mark for Review & Next** button – the answered question which is also marked for review will be evaluated.
- To save the answer, click on the **Save & Next** button – the answered question will be evaluated.

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GAMBHIR**
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Anshul Navphule

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CHEMISTRY

SECTION-1 (Maximum Marks : 12)

- This section contains **FOUR (04)** questions.
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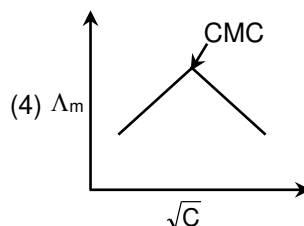
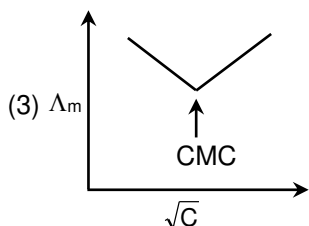
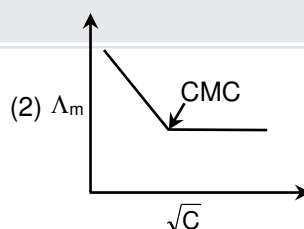
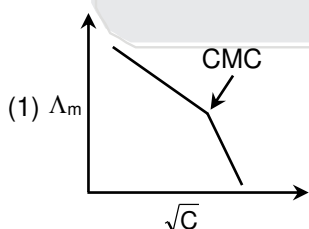
खंड 1 (अधिकतम अंक: 12)

- इस खंड में चार (04) प्रश्न हैं।
- प्रत्येक प्रश्न के लिए सही चार विकल्प दिए गए हैं। इन चार विकल्पों में से **केवल एक** ही विकल्प सही उत्तर है।
- प्रत्येक प्रश्न के लिए दिए हुए विकल्पों में से सही उत्तर से संबंधित विकल्प को चुनिए।
- प्रत्येक प्रश्न के उत्तर का मूल्यांकन निम्न योजना के अनुसार होगा :
 पूर्ण अंक : +3 यदि सिर्फ सही विकल्प ही चुना गया है।
 शून्य अंक : 0 यदि कोई भी विकल्प नहीं चुना गया है (अर्थात् प्रश्न अनुत्तरित है)।
 ऋण अंक : -1 अन्य सभी परिस्थितियों में।

1. Molar conductivity (Λ_m) of aqueous solution of sodium stearate, which behaves as a strong electrolyte, is recorded at varying concentrations (c) of sodium stearate. Which one of the following plots provides the correct representation of micelle formation in the solution ?

(critical micelle concentration (CMC) is marked with an arrow in the figures)

सोडियम स्टीरेट (sodium stearate) के जलीय विलयन, जो एक प्रबल वैद्युत अपघट्य (electrolyte) जैसा व्यवहार दर्शाता है, की मोलर चालकता (Λ_m) को विभिन्न सान्द्रताओं (c) में मापा गया। निम्न चित्रों में से मिसेल विरचन (micelle formation) दर्शाने वाला सही चित्र कौनसा है? (क्रांतिक मिसेल सान्द्रता (critical micelle concentration, CMC)) को चित्रों में तीर द्वारा दर्शाया गया है।



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Ans. (1)

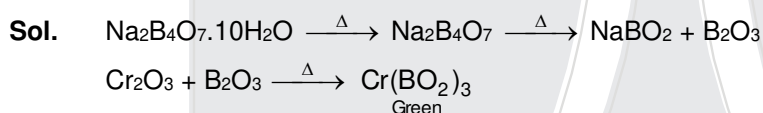
Sol. As the concentration of sodium stearate increases beyond CMC, stearate ions get clubbed together and form micelles. This abruptly causes the concentration of the current carrier anions to decrease. This is reflected by the sharp change in Δm at CMC, followed by greater rate of decrease of Δm with \sqrt{C} .

CMC के आगे सोडियम स्टीरिएट की सांद्रता बढ़ने के साथ, मुक्त आयन परस्पर संगुणित हो जाते हैं तथा मिसेल का निर्माण करते हैं। इसके परिणामस्वरूप विद्युतधारा वाहक ऋणायनों की सांद्रता में कमी होती है। यह CMC पर Δm में तीव्र परिवर्तन द्वारा प्रदर्शित होता है। इसके पश्चात् \sqrt{C} के साथ Δm में तीव्र दर से कमी होती है।

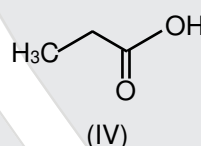
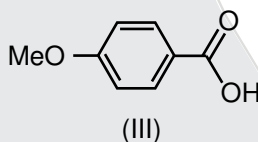
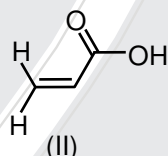
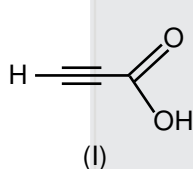
2. The green colour produced in the borax bead test of a chromium (III) salt is due to
क्रोमियम (III) लवण के सुहागा-मनका परीक्षण (borax bead test) में हरे रंग का कारण है।

- (1) CrB (2) Cr₂O₃ (3) Cr(BO₂)₃ (4) Cr₂(B₄O₇)₃

Ans. (3)



3. The correct order of acid strength of the following carboxylic acids is :
निम्न कार्बोक्सिलिक अम्लों की अम्ल प्रबलता का सही क्रम है :



- (1) I > II > III > IV (2) II > I > IV > III (3) I > III > II > IV (4) III > II > I > IV

Ans. (1)

Sol.

	pKa
(i) HC≡C-COOH	1.89
(ii) H ₂ C=CH-COOH	4.3
(iii) COOH	4.5
(iv) CH ₃ -CH ₂ -COOH	4.87

4. Calamine, malachite, magnetite and cryolite, respectively, are

कैलामीन (Calamine), मैलाकाइट (malachite), मेग्नेटाइट (magnetite) और क्रायोलाइट (cryolite), क्रमशः है।

- (1) ZnSO₄, Cu(OH)₂, Fe₃O₄, Na₃AlF₆ (2) ZnCO₃, CuCO₃, Fe₂O₃, Na₃AlF₆
 (3) ZnSO₄, CuCO₃, Fe₂O₃, AlF₃ (4) ZnCO₃, CuCO₃.Cu(OH)₂, Fe₃O₄, Na₃AlF₆

Ans. (4)

Sol. (i) Calamine, ZnCO₃ (ii) Malachite, CuCO₃.Cu(OH)₂
 (iii) Magnetite, Fe₃O₄ (iv) Cryolite, Na₃AlF₆

Sol. (i) कैलामाइन, ZnCO₃ (ii) मेलेकाइट, CuCO₃.Cu(OH)₂
 (iii) मैग्नेटाइट, Fe₃O₄ (iv) क्रायोलाइट, Na₃AlF₆

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SECTION-2 (Maximum Marks : 32)

- This section contains **EIGHT (08)** questions.
- Each question has **FOUR** options. **ONE OR MORE THAN ONE** of these four option(s) is (are) correct answer(s).
- For each question, choose the option(s) corresponding to (all) the correct answer(s).
- Answer to each question will be evaluated according to the following marking scheme.

Full Marks	:	+4 If only (all) the correct option(s) is (are) chosen.
Partial Marks	:	+3 If all the four options are correct but ONLY three options are chosen.
Partial Marks	:	+2 If three or more options are correct but ONLY two options are chosen and both of which are correct.
Partial Marks	:	+1 If two or more options are correct but ONLY one option is chosen and it is a correct option.
Zero Marks	:	0 If none of the options is chosen (i.e. the question is unanswered).
Negative Marks	:	-1 In all other cases.

खंड 2 (अधिकतम अंक: 32)

- इस खंड में **आठ (08)** प्रश्न हैं।
- प्रत्येक प्रश्न के लिए चार विकल्प दिए गए हैं। इन चार विकल्पों में से **एक या एक से अधिक** विकल्प सही हैं(हैं)।
- प्रत्येक प्रश्न के लिए, दिए हुए विकल्पों में से सही उत्तर (उत्तरों) से संबंधित विकल्प (विकल्पों) को चुनिए।
- प्रत्येक प्रश्न के उत्तर का मूल्यांकन निम्न योजना के अनुसार होगा :

पूर्ण अंक	:	+4 यदि केवल (सारे) सही विकल्प (विकल्पों) को चुना गया है।
आंशिक अंक	:	+3 यदि चारों विकल्प सही हैं परन्तु केवल तीन विकल्पों को चुना गया है।
आंशिक अंक	:	+2 यदि तीन या तीन से अधिक विकल्प सही हैं परन्तु केवल दो विकल्पों को चुना गया है और दोनों चुने हुए विकल्प सही विकल्प हैं।
आंशिक अंक	:	+1 यदि दो या दो से अधिक विकल्प सही हैं परन्तु केवल एक विकल्प को चुना गया है और चुना हुआ विकल्प सही विकल्प है।
शून्य अंक	:	0 यदि किसी भी विकल्प को नहीं चुना गया है (अर्थात् प्रश्न अनुत्तरित है)।
ऋण अंक	:	-1 अन्य सभी परिस्थितियों में।

1. Each of the following options contains a set of four molecules, Identify the option(s) where all four molecules passes permanent dipole moment at room temperature.

निम्न विकल्पों में चार अणुओं के समुच्चय हर विकल्प में दिये गए हैं। सामान्य ताप पर, जिस (जिन) विकल्प (विकल्पों) के सभी चार अणुओं की स्थायी द्विध्रुव-आघूर्ण (permanent dipole moment) है, उसे (उन्हें) चुनिये।

- | | |
|--|---|
| (1) NO ₂ , NH ₃ , POCl ₃ , CH ₃ Cl | (2) BF ₃ , O ₃ , SF ₆ , XeF ₆ |
| (3) BeCl ₂ , CO ₂ , BCl ₃ , CHCl ₃ | (4) SO ₂ , C ₆ H ₅ Cl, H ₂ Se, BrF ₅ |




Ans. (1 & 4)

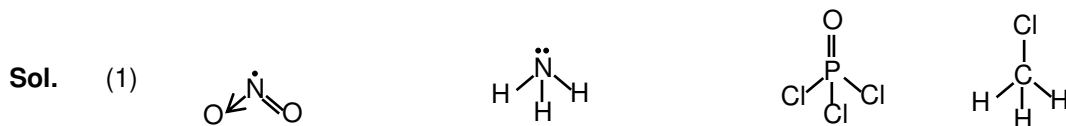
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2. Which of the following statement(s) is(are) correct regarding the root mean square speed (U_{rms}) and average translational kinetic energy (ϵ_{av}) of a molecule in a gas at equilibrium ?

- (1) U_{rms} is inversely proportional to the square root of its molecular mass
- (2) ϵ_{av} is doubled when its temperature is increased four times.
- (3) U_{rms} is doubled when its temperature is increased four times.
- (4) ϵ_{av} at a given temperature does not depend on its molecular mass.

साम्यावस्था में, एक गैस अणु की वर्ग माल्य मूल गति (root mean square speed, U_{rms}) और औसत स्थानांतरण ऊर्जा (average translational kinetic energy, ϵ_{av}) के संदर्भ में, निम्न कथनों में से सही कथन कौन सा (से) है (हैं)?

- (1) आण्विक द्रव्यमान के वर्गमूल पर U_{rms} व्युत्क्रमानुपाती (inversely proportional) है।
- (2) जब ताप चौगुना किया जाता है, तब ϵ_{av} दुगुनी हो जाती है।
- (3) जब ताप चौगुना किया जाता है, तब U_{rms} दुगुनी हो जाती है।
- (4) किसी दिये गये ताप पर, ϵ_{av} आण्विक द्रव्यमान पर निर्भर नहीं है।

Ans. (1, 3 & 4)

Sol. $\epsilon_{\text{av}} = \frac{3}{2}RT$ $U_{\text{rms}} = \sqrt{\frac{3RT}{M}}$ & $U_{\text{rms}} \propto \frac{1}{\sqrt{M}}$

$\therefore \epsilon_{\text{av}}$ doesn't depend on its molecular mass $\therefore \epsilon_{\text{av}}$ इसके आण्विक द्रव्यमान पर निर्भर नहीं करती है।

3. Which of the following statements(s) is(are) true ?

- (1) The two six-membered cyclic hemiacetal forms of D-(+)-glucose are called anomers.
- (2) Hydrolysis of sucrose gives dextrorotatory glucose and laevorotatory fructose.
- (3) Monosaccharides cannot be hydrolysed to give polyhydroxy aldehydes and ketones.
- (4) Oxidation of glucose with bromine water gives glutamic acid.

निम्न में सही कथन कौन सा है (से हैं) ?

- (1) D-(+)-ग्लूकोस के दो छः सदस्यीय चक्रीय हैमिऐसीटैल (hemiacetal) रूपों को ऐनोमर (anomers) कहते हैं।
- (2) सुक्रोस (sucrose) के जलअपघटन पर दक्षिण ध्रुवण-घूर्णक (dextrorotatory) और वाम ध्रुवण-घूर्णक (laevorotatory) फ्रक्टोज (fructose) प्राप्त होते हैं।
- (3) मोनोसैकैराइडों (Monosaccharides) के जलअपघटन कराने पर पालीहाइड्रोक्सी ऐल्डीहाइड (polyhydroxy aldehydes) और कीटोन (ketones) प्राप्त नहीं होते हैं।
- (4) ब्रोमीन (bromine) जल द्वारा ग्लूकोस (glucose) अम्ल प्राप्त होता है।

Ans. (1, 2 & 3)

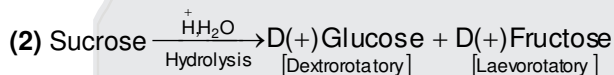
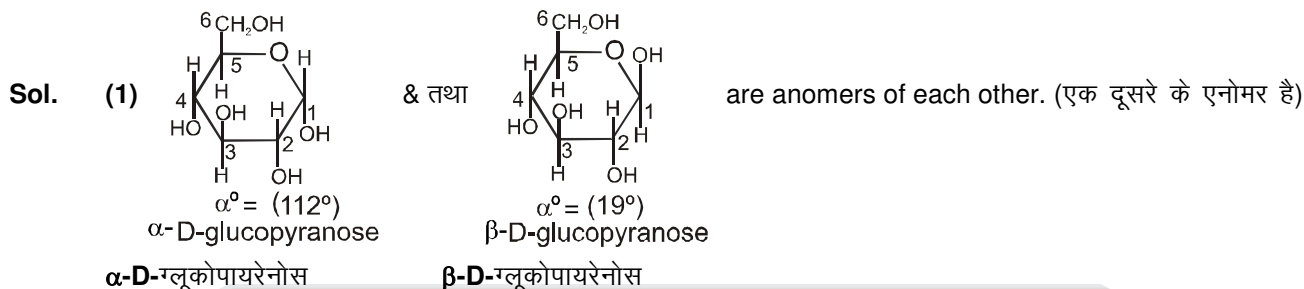
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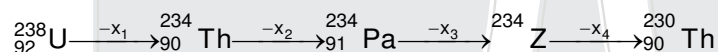
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(4) Oxidation of glucose with bromine water gives gluconic acid.

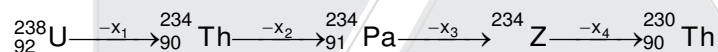
4. In the decay sequence,



x_1 , x_2 , x_3 and x_4 , are particles/radiation emitted by the respective isotopes. The correct option(s) is(are):

- (1) x_1 will deflect towards negatively charged plate.
- (2) x_2 is β^-
- (3) x_3 is γ -ray
- (4) z is an isotope of uranium

दिये गये क्षय क्रम में,



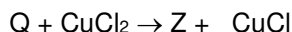
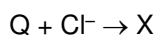
x_1 , x_2 , x_3 और x_4 , क्रमानुसार प्रत्येक समस्थानिक (isotope) से उत्सर्जित कण/विकिरण है। सही विकल्प है(हैं):

- (1) x_1 ऋणावेशित प्लेट (negatively charged plate) की तरफ विक्षेपित होगा।
- (2) x_2 है, β^-
- (3) x_3 है, γ - किरण
- (4) z यूरेनियम (uranium) का एक समस्थानिक है।

Ans. (1, 2 & 4)

Sol. $x_1 = \alpha$
 $x_2 = \beta$
 $x_3 = \beta$
 $x_4 = \alpha$

5. A tin chloride Q undergoes the following reaction (not balanced)



X is monoanion having pyramidal geometry. Both Y and Z are neutral compounds. Choose the correct option(s)

- (1) The central atom in X is sp^3 hybridized.
- (2) There is a coordinate bond in Y
- (3) The oxidation state of the central atom in Z is +2
- (4) The central atom in Z has one lone pair of electrons.

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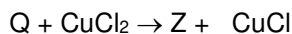
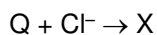
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एक टिन क्लोराइड Q, निम्न अभिक्रियाएँ (असंतुलित) दर्शाता है।



X एक पिरामिडिय ज्यामिति (pyramidal geometry) दर्शाने वाला ऋणायन (monoanion) है। Y और Z दोनों उदासीन यौगिक हैं। सही विकल्प (विकल्पों) को चुनिये।

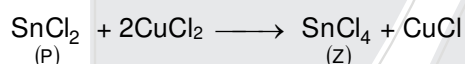
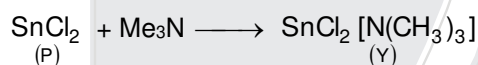
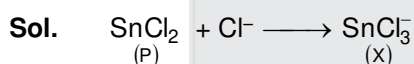
(1) X में केन्द्रिय परमाणु का संकरण (hybridization) sp^3 है।

(2) Y में समन्वयी आबन्ध (coordinate bond) है।

(3) Z में ऑक्सीकरण अवस्था (oxidation state) +2 है।

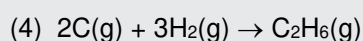
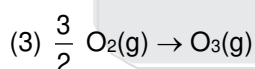
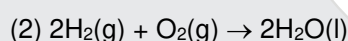
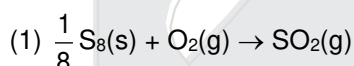
(4) Z में केन्द्रिय परमाणु पर एक एकाकी इलेक्ट्रॉन युग्म (lone pair of electrons) है।

Ans. (1 & 2)



6. Choose the reaction(s) from the following options, for which the standard enthalpy of reaction is equal to the standard enthalpy of formation

निम्न विकल्पों में से वो अभिक्रिया (अभिक्रियाएँ) जिसकी (जिनकी) मानक अभिक्रिया एन्थैल्पी (standard enthalpy of reaction) अपने मानक विरचन एन्थैल्पी (standard enthalpy of formation) के समान हो, उसे (उन्हें) चुनिये।



Ans. (1 & 3)

Sol. **Standard enthalpy of formation** : "The standard enthalpy of formation of a compound is the change in the standard enthalpy when one mole of the compound is formed starting from the requisite amounts of elements in their stable state of aggregation".

सम्भवन की मानक एन्थैल्पी : पदार्थ या यौगिक की मानक संभवन उष्मा, मानक उष्मा में परिवर्तन जब एक मोल यौगिक, अपने प्रारम्भिक तत्वों की आवश्यक मात्रा से इसकी स्थायी संगुणीत अवस्था में बनता है।

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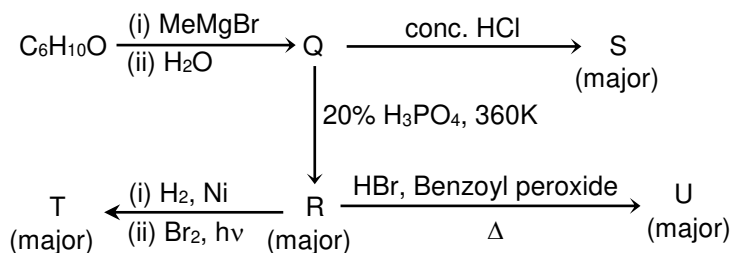
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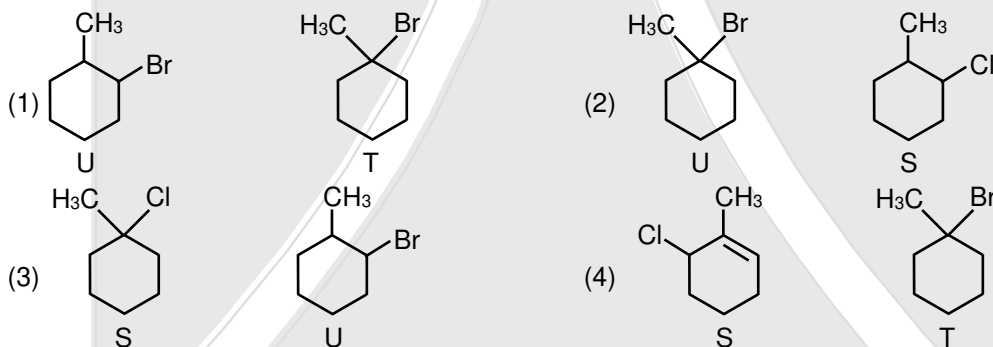
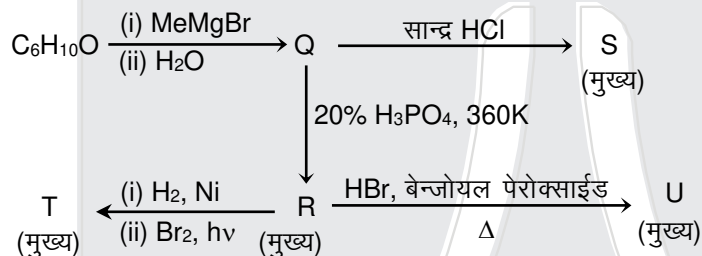
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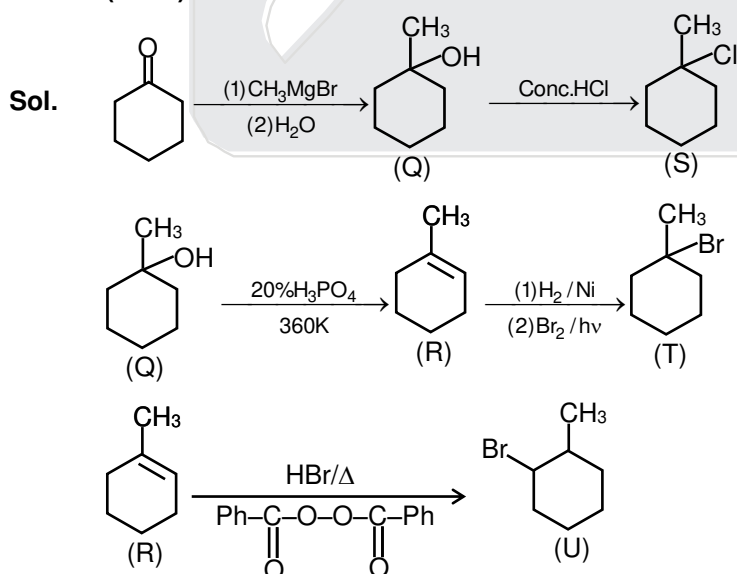
7. Choose the correct option(s) for the following set of reactions



दिये गये अभिक्रिया क्रमों के लिए सही विकल्प (विकल्पों) को चुनिये।



Ans. (1 & 3)



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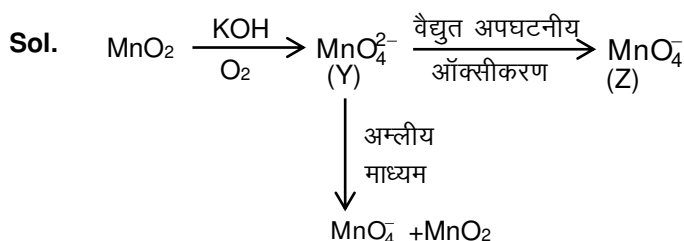
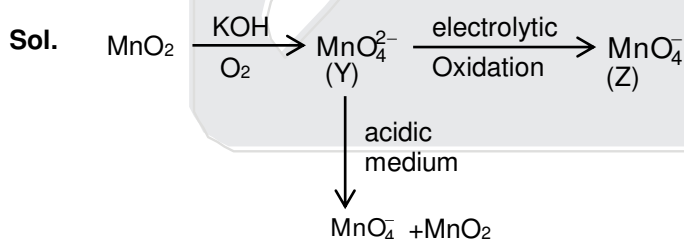
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8. Fusion of MnO_2 , with KOH in presence of O_2 produces a salt W. Alkaline solution of W upon electrolytic oxidation yields another salt X. The manganese containing ions present in W and X, respectively are Y and Z. Correct statement(s) is (are)

O_2 की उपस्थिति में MnO_2 का KOH के साथ संगलन पर एक लवण W उत्पादित होता है W के क्षारीय विलयन का विद्युत अपघटनीय ऑक्सीकरण (electrolytic oxidation) पर एक अन्य लवण X उत्पादित होता है W और X में उपस्थित मैंगनीज रहने वाला आयन क्रमशः Y और Z है। सही कथन है (हैं)

- (1) In both Y and Z, π -bonding occurs between p-orbitals of oxygen and d-orbitals of manganese
 - (2) Both Y and Z are coloured and have tetrahedral shape
 - (3) In aqueous acidic solution, Y undergoes disproportionation reaction to give Z and MnO_2
 - (4) Y is diamagnetic in nature while Z is paramagnetic
- (1) Y और Z दोनों में, π -आबन्ध ऑक्सीजन के p-कक्षकों एवं मैंगनीज के d-कक्षकों के बीच है।
- (2) Y और Z दोनों रंगीन और चतुष्फलकीय (tetrahedral) आकार के हैं।
- (3) जलीय अम्लीय घोल में Y असमानुपातन अभिक्रिया (disproportionation reaction) के पश्चात् Z और MnO_2 देता है।
- (4) Y प्रतिचुम्बकीय (diamagnetic) स्वभाव और Z अनुचुम्बकीय (paramagnetic) स्वभाव के हैं।

Ans. (1, 2 & 3)



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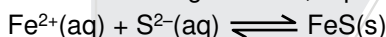
SECTION-3 (Maximum Marks : 18)

- This section contains **SIX (06)** questions. The answer to each question is a **NUMERICAL VALUE**.
- For each question, enter the correct numerical value of the answer using the mouse and the on-screen virtual numeric keypad in the place designated to enter the answer. If the numerical value has more than two decimal places **truncate/round-off** the value to **TWO** decimal places.
- Answer to each question will be evaluated according to the following marking scheme :
Full Marks : +3 If ONLY the correct numerical value is entered.
Zero Marks : 0 In all other cases.

खंड 3 (अधिकतम अंक: 18)

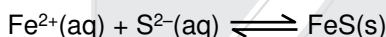
- इस खंड में छः (06) प्रश्न हैं। प्रत्येक प्रश्न का उत्तर एक संख्यात्मक मान (**NUMERICAL VALUE**) है।
- प्रत्येक प्रश्न के उत्तर के सही संख्यात्मक मान को माउज (mouse) और ऑन-स्क्रीन (on-screen) वर्चुअल नुमेरिक कीपैड (virtual numeric keypad) के प्रयोग से उत्तर के लिए चिन्हित स्थान पर दर्ज करें। यदि संख्यात्मक मान में दो से अधिक दशमलव स्थान हैं, तो संख्यात्मक मान को दशमलव के दो स्थानों तक **ट्रंकेट/राउंड ऑफ (truncate/round-off)** करें।
- प्रत्येक प्रश्न के उत्तर का मूल्यांकन निम्न योजना के अनुसार होगा :-
 पूर्ण अंक : +3 यदि दर्ज किया गया संख्यात्मक मान (**Numerical value**) ही सही उत्तर है।
 शून्य अंक : 0 अन्य सभी परिस्थितियों में।

1. For the following reaction, equilibrium constant K_c at 298 K is 1.6×10^{17}



When equal volume of 0.06 M $\text{Fe}^{2+}(\text{aq})$ and 0.2 M $\text{S}^{2-}(\text{aq})$ solution are mixed, then equilibrium concentration of $\text{Fe}^{2+}(\text{aq})$ is found to be $Y \times 10^{-17}$ M. The value of Y is _____

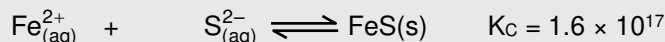
298 K पर, निम्न अभिक्रिया का साम्यावस्था स्थिरांक K_c (equilibrium constant) 1.6×10^{17} है।



जब 0.06 M $\text{Fe}^{2+}(\text{aq})$ और 0.2 M $\text{S}^{2-}(\text{aq})$ के समान आयतनों का मिश्रण किया गया, तब $\text{Fe}^{2+}(\text{aq})$ की साम्य सांद्रता (equilibrium concentration) $Y \times 10^{-17}$ M पायी गयी। Y का मान है _____

Ans. (8.92)

Sol.



$$0.06 \text{ M} \quad 0.2 \text{ M}$$

$$\text{After mixing} \quad 0.03 \text{ M} \quad 0.1 \text{ M}$$

(मिलाने के पश्चात्)

$$? \quad 0.07 \text{ M}$$

$$1.6 \times 10^{17} = \frac{1}{[\text{Fe}^{2+}] \times 0.07}$$

$$\text{or } [\text{Fe}^{2+}] = \frac{10^{-17}}{1.6 \times 0.07} = \frac{10^{-15}}{11.2} = \frac{100}{11.2} \times 10^{-17} = 8.928 \times 10^{-17} = Y \times 10^{-17}$$

Answer after rounding is = 8.93

Answer after truncation is = 8.92

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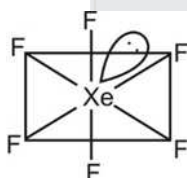
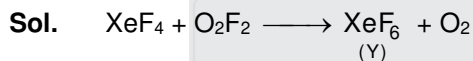
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2. At 143 K, the reaction of XeF_4 with O_2F_2 produces a xenon compound Y. The total number of lone pair(s) electrons present on the whole molecule of Y is _____

143 K पर, XeF_4 और O_2F_2 की अभिक्रिया से एक जिन्नॉन (xenon) यौगिक Y उत्पादित होता है। सम्पूर्ण अणु Y में एकाकी इलेक्ट्रॉन युग्म (युग्मों) (lone pair(s) of electrons) की कुल संख्या है _____

Ans. (19)

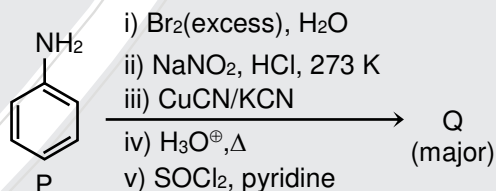


(3 lp on each F and 1 lp on Xe)

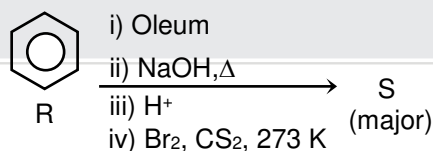
(प्रत्येक F पर 3 lp तथा Xe पर 1 lp)

3. Schemes 1 and 2 describe the conversion of P to Q and R to S, respectively. Scheme 3 describes the synthesis of T from Q and S. the total number of Br atoms in a molecule of T is _____

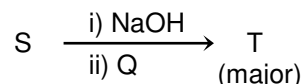
Scheme 1:



Scheme 2:



Scheme 3:



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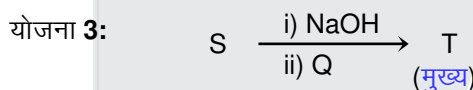
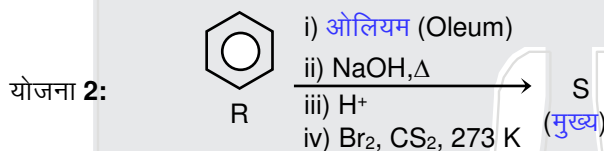
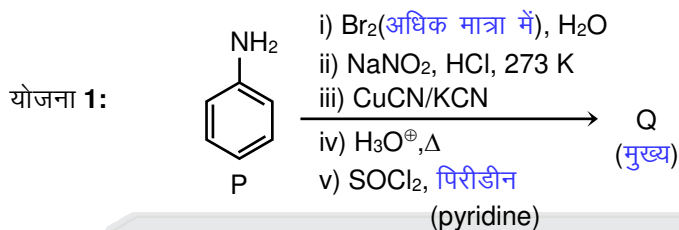
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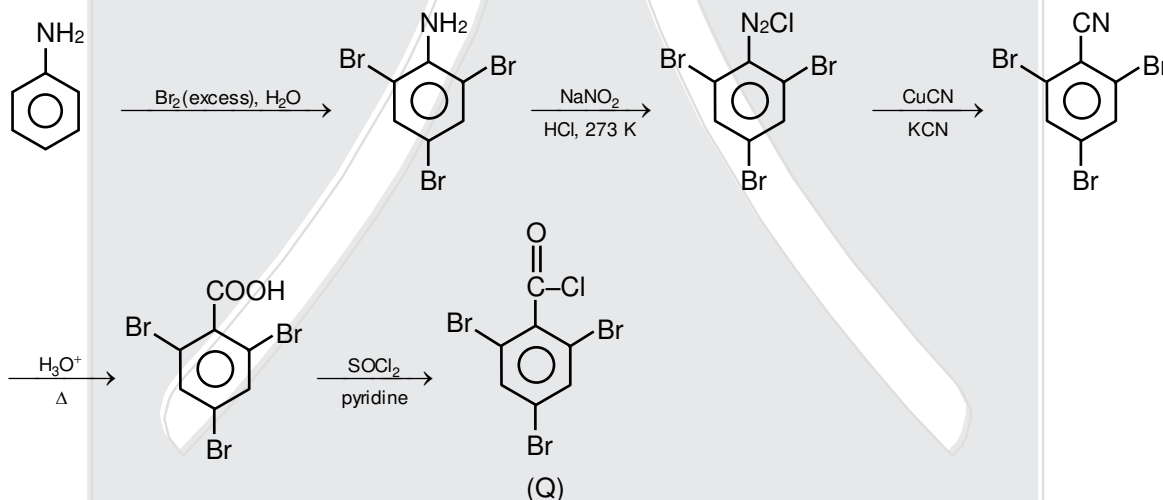
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योजनायें 1 और 2 (Schemes 1 and 2) क्रमशः P से Q तक, तथा R से S तक का रूपान्तरण दर्शाते हैं। योजना 3 में T का संश्लेषण Q और S से दर्शाया गया है। T के एक अणु में Br परमाणुओं की कुल संख्या है _____

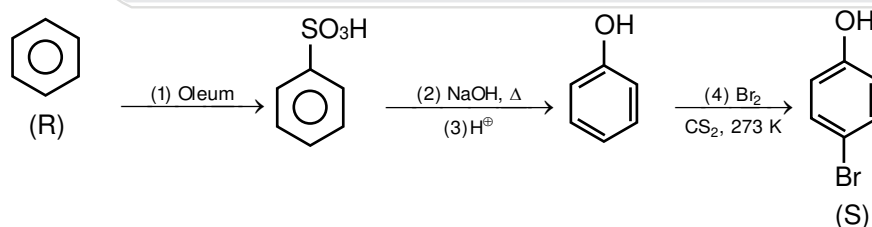


Ans. (4.00)

Sol. Scheme 1:



Scheme 2:



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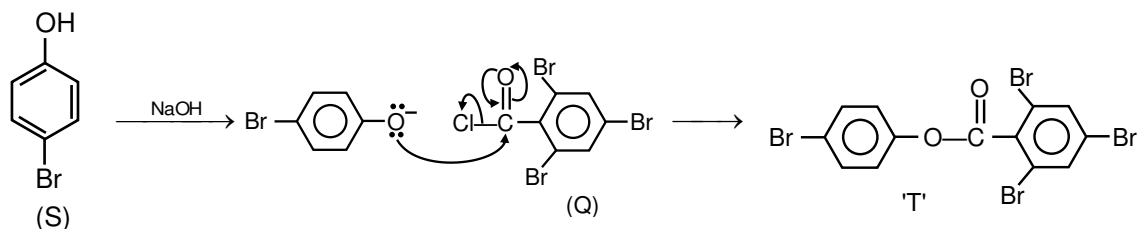
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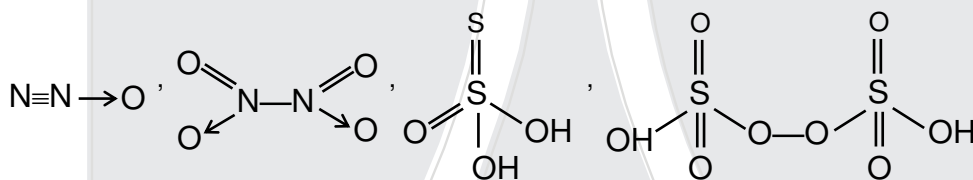
Scheme 3:



4. Among B_2H_6 , $B_3N_3H_6$, N_2O , N_2O_4 , $H_2S_2O_3$ and $H_2S_2O_8$, the total number of molecules containing covalent bond between two atoms of the same kind is _____
 B_2H_6 , $B_3N_3H_6$, N_2O , N_2O_4 , $H_2S_2O_3$ और $H_2S_2O_8$, में से जिन अणुओं में दो समान परमाणुओं के बीच सहसंयोजक (covalent) आबंध है, उनकी कुल संख्या है _____

Ans. (4)

Sol. N_2O_4 , $H_2S_2O_3$, N_2O , $H_2S_2O_8$



5. Consider the kinetic data given in the following table for the reaction $A + B + C \rightarrow \text{product}$.

Experiment No.	[A] (mol dm ⁻³)	[B] (mol dm ⁻³)	[C] (mol dm ⁻³)	Rate of reaction (mol dm ⁻³ s ⁻¹)
1	0.2	0.1	0.1	6.0×10^{-5}
2	0.2	0.2	0.1	6.0×10^{-5}
3	0.2	0.1	0.2	1.2×10^{-4}
4	0.3	0.1	0.1	9.0×10^{-5}

The rate of the reaction for $[A] = 0.15 \text{ mol dm}^{-3}$, $[B] = 0.25 \text{ mol dm}^{-3}$ and $[C] = 0.15 \text{ mol dm}^{-3}$ is found to be $Y \times 10^{-5} \text{ mol dm}^{-3}\text{s}^{-1}$. The value of Y is _____

निम्न सारणी में, $A + B + C \rightarrow \text{उत्पाद}$ की अभिक्रिया के बलगतिकी आँकड़ों पर गौर कीजिए।

प्रयोग संख्या	[A] (mol dm ⁻³)	[B] (mol dm ⁻³)	[C] (mol dm ⁻³)	अभिक्रिया गति (mol dm ⁻³ s ⁻¹)
1	0.2	0.1	0.1	6.0×10^{-5}
2	0.2	0.2	0.1	6.0×10^{-5}
3	0.2	0.1	0.2	1.2×10^{-4}
4	0.3	0.1	0.1	9.0×10^{-5}

जब $[A] = 0.15 \text{ mol dm}^{-3}$, $[B] = 0.25 \text{ mol dm}^{-3}$ और $[C] = 0.15 \text{ mol dm}^{-3}$ है, तब अभिक्रिया गति $Y \times 10^{-5} \text{ mol dm}^{-3}\text{s}^{-1}$ पायी गयी। Y का मान है _____

Ans. (6.75)

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Sol. $r = k [A]^a [B]^b [C]^c$
 by experiment no. 1 & 2 $b = 0$
 by experiment no. 1 & 3 $c = 1$
 by experiment no. 1 & 4 $a = 1$
 $r = K [A]^1 [B]^0 [C]^1$
 From Ex. no.1 $6 \times 10^{-5} = k (0.2) (0.1)$
 $k = 3 \times 10^{-3}$

Given $[A] = 0.15$ $[B] = 0.25$ $[C] = 0.15$

$r = k [A]^1 [B]^0 [C]^1$
 $= 3 \times 10^{-3} \times 0.15 \times 1 \times 0.15$
 $= 3 \times 0.025 \times 10^{-3}$
 $= 6.75 \times 10^{-5} \text{ mol L}^{-1} \text{ sec}^{-1}$
 $Y = 6.75$

Sol. $r = k [A]^a [B]^b [C]^c$
 प्रयोग संख्या 1 तथा 2 से $b = 0$
 प्रयोग संख्या 1 तथा 3 से $c = 1$
 प्रयोग संख्या 1 तथा 4 से $a = 1$
 $r = K [A]^1 [B]^0 [C]^1$
 प्रयोग संख्या 1 से $6 \times 10^{-5} = k (0.2) (0.1)$
 $k = 3 \times 10^{-3}$

दिया है $[A] = 0.15$ $[B] = 0.25$ $[C] = 0.15$

$r = k [A]^1 [B]^0 [C]^1$
 $= 3 \times 10^{-3} \times 0.15 \times 1 \times 0.15$
 $= 3 \times 0.025 \times 10^{-3}$
 $= 6.75 \times 10^{-5} \text{ mol L}^{-1} \text{ sec}^{-1}$
 $Y = 6.75$

6. On dissolving 0.5 g of a non-volatile non-ionic solute to 39 g of benzene, its vapor pressure decreases from 650 mm Hg to 640 mm Hg. The depression of freezing point of benzene (in K) upon addition of the solute is _____

(Given data : Molar mass and the molal freezing point depression constant of benzene are 78 g mol^{-1} and $5.12 \text{ K kg mol}^{-1}$, respectively)

0.5 g अवाष्पशील अनायनिक विलेय (non-volatile non-ionic solute) को 39 g बेन्जीन (benzene) में घोलने पर, उसका वाष्प दाब 650 mm Hg से 640 mm Hg हो गया। इस विलेय को बेन्जीन में मिलाने के उपरांत, बेन्जीन के हिमांक का अवनमन (depression of freezing point) (K में) है _____

(दिया गया : बेन्जीन का मोलर द्रव्यमान 78 g mol^{-1} और बेन्जीन का मोलल अवनमन स्थिरांक (molal freezing point depression constant) $5.12 \text{ K kg mol}^{-1}$ है।)

Ans. (1.02)

Sol. $\frac{P^0 - P_s}{P_s} = i \left[\frac{n_{\text{solute}}}{n_{\text{solvent}}} \right]$ $\frac{P^0 - P_s}{P_s} = i \frac{n_{\text{विलेय}}}{n_{\text{विलायक}}}$
 $\frac{650 - 640}{640} = 1 \times \frac{0.5 \times 78}{M \times 39} \Rightarrow M_{\text{solute}} = 64 \text{ gm}$
 $\Delta T_f = K_f \times m = 5.12 \times \frac{0.5 \times 1000}{64 \times 39} \Rightarrow \Delta T_f = 1.02$

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