

Questions & Solutions

PAPER – 2

SUBJECT: CHEMISTRY

MAX. MARKS: 186

TIME: 3 HRS.

PAPER-2 : INSTRUCTIONS TO CANDIDATES

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

Type of Questions and Marking Schemes

SECTION 1 (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.

SECTION 2 (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.

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SECTION 3 (Maximum Marks : 12)

- This section contains **TWO (02)** List-Match sets.
- Each List-Match set has **TWO (02)** Multiple Choice Questions.
- Each List-Match set has two lists : **List-I** and **List-II**.
- **List-I** has **Four** entries (I),(II), (III) and (IV) **List-II** has **Six** entries (P),(Q), (R), (S), (T) and (U).
- **FOUR** options are given in each Multiple Choice Question based on **List-I** and **List-II** and **ONLY ONE** of these four options satisfies the condition asked in the Multiple Choice Question.
- Answer to each question will be evaluated according to the following marking scheme :
Full Marks : **+3** If **ONLY** the option corresponding to the correct combination 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.

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(s) for the questions of **SECTION-1** 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 deselect the chosen option for the questions of **SECTION-3**, click on the button of the chosen option again or click on the **Clear Response** button to clear the chosen option.
- To change the option(s) of a previously answered question of **SECTION-1** and **SECTION-3** first deselect as given above and then select the new option(s)
- To answer questions of **SECTION-2** 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-2** first click on the **Clear Response** button to clear the correct 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 is 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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CHEMISTRY

SECTION 1 (Maximum Marks : 32)

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- Each question has **FOUR** options **ONE OR MORE THAN ONE** of these four option(s) is(are) correct answer(s).
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Negative Marks : -1 In all other cases.

खंड 1 (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।

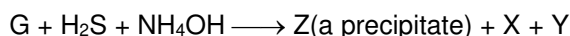
आंशिक अंक : +2 यदि तीन या तीन से अधिक विकल्प सही हैं परन्तु केवल दो विकल्पों को चुना गया है और दोनों चुने हुए विकल्प सही विकल्प हैं।

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. Consider the following reaction (unbalanced)



Choose the correct option(s)

- (1) Bond order of Q is 1 in its ground state (2) The oxidation state of Zn in T is +1.
 (3) R is a V-shaped molecule (4) Z is dirty white in colour

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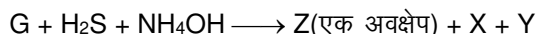
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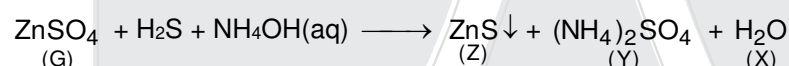
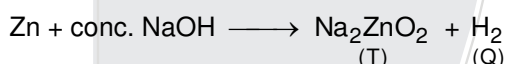
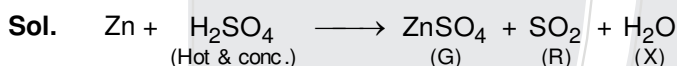
निम्न अभिक्रियाओं (असंतुलित) पर विचार करे –



सही विकल्प(विकल्पों) को चुनिये –

- (1) अपनी निम्नतम अवस्था (ground state) में Q का आबन्ध (Bond order) क्रम एक है।
- (2) Z का रंग अस्वच्छ श्वेत (dirty white) है।
- (3) R एक V-आकार का अणु है।
- (4) T में Zn की ऑक्सीकरण अवस्था (oxidation state) +1 है।

Ans. (1, 3 & 4)



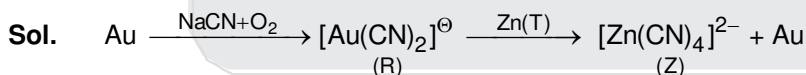
2. The cyanide process of gold extraction involves leaching out gold from its ore with CN^- in the presence of Q in water to form R. Subsequently, R is treated with T to obtain Au and Z. Choose the correct option(s)

- (1) R is $[\text{Au}(\text{CN})_4]^-$ (2) T is Zn (3) Q is O_2 (4) Z is $[\text{Zn}(\text{CN})_4]^{2-}$

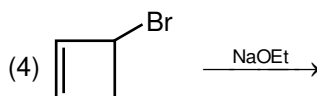
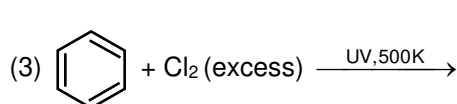
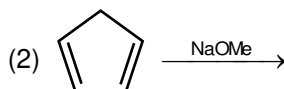
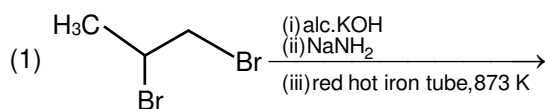
सायनाइड प्रक्रम (cyanide process) से सोने के निष्कर्षण (extraction) में उसके अयस्क से CN^- द्वारा पानी में Q की उपस्थिति में निक्षालन (leaching) पर R बनता है। इसके पश्चात् R का T से विवेचन पर Au और Z प्राप्त होते हैं। निम्न में से सही विकल्प (विकल्पों) को चुनिये।

- (1) R है $[\text{Au}(\text{CN})_4]^-$ (2) T है Zn (3) Q है O_2 (4) Z है $[\text{Zn}(\text{CN})_4]^{2-}$

Ans. (2, 3 & 4)



3. Choose the correct option(s) that give(s) an aromatic compound as the major product



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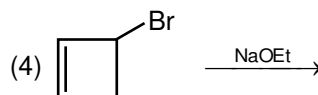
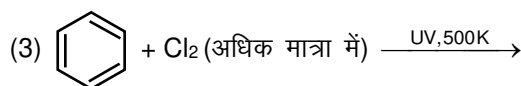
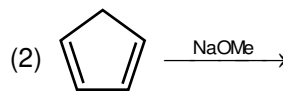
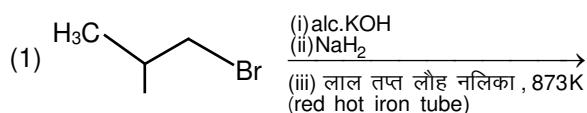
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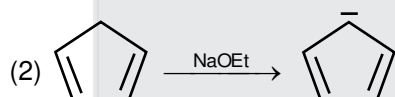
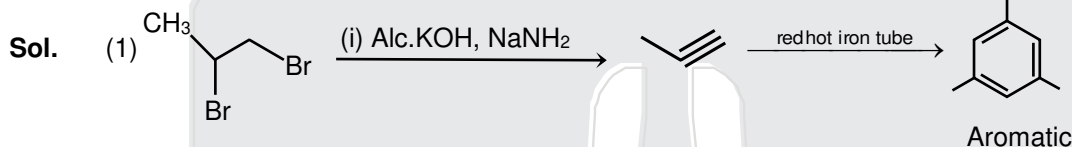
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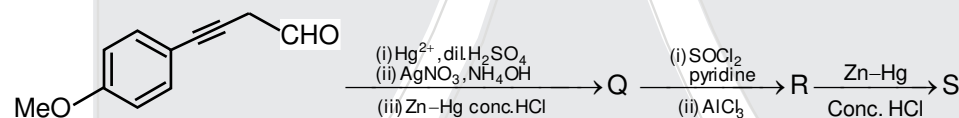
सही विकल्प(विकल्पों) को चुनिये जिसमें(जिनमें) ऐरोमेटिक (aromatic) उत्पाद मुख्य है(हैं)



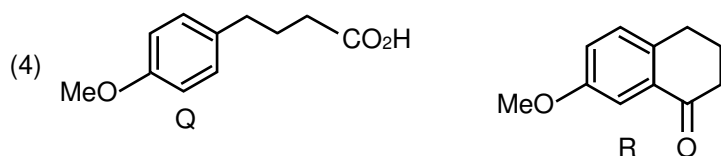
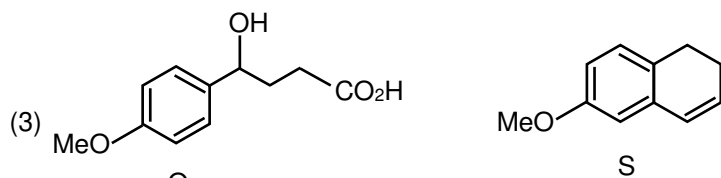
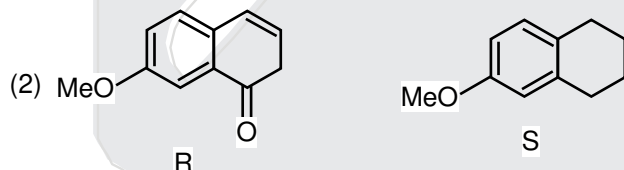
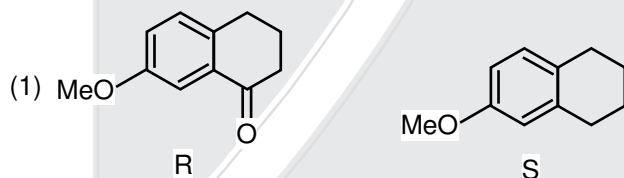
Ans. (1 & 2)



4. Choose the correct option(s) for the following reaction sequence



Consider Q, R and S as major products



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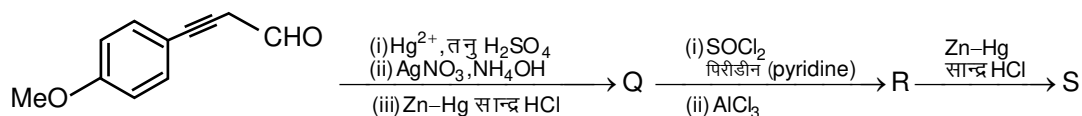
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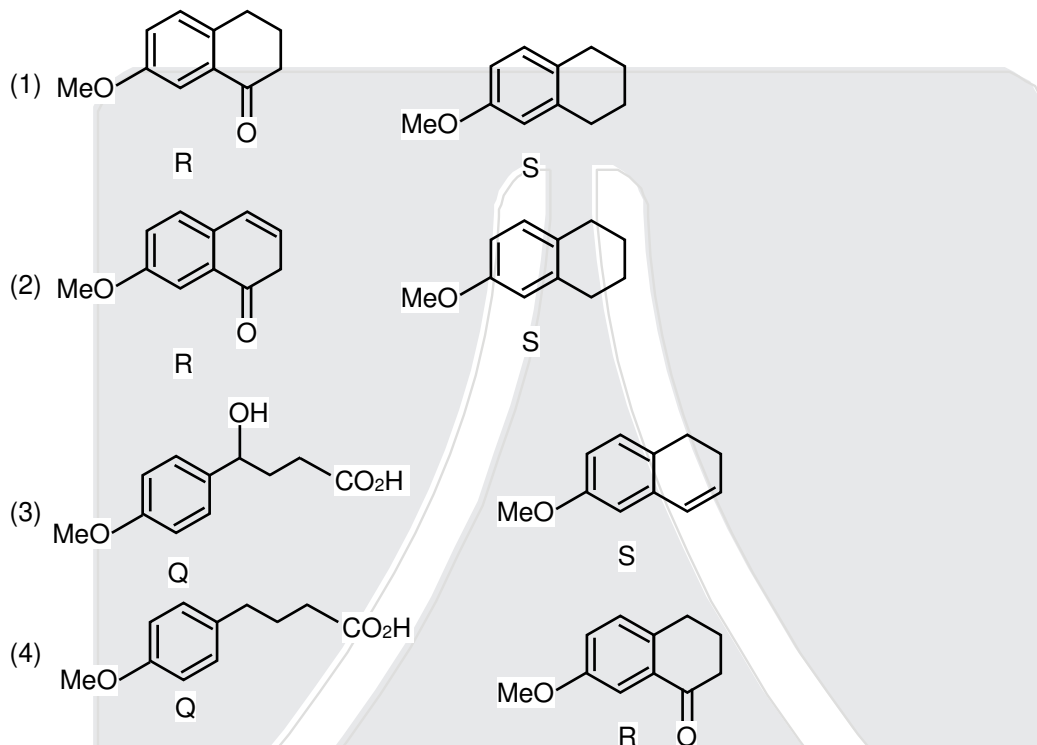
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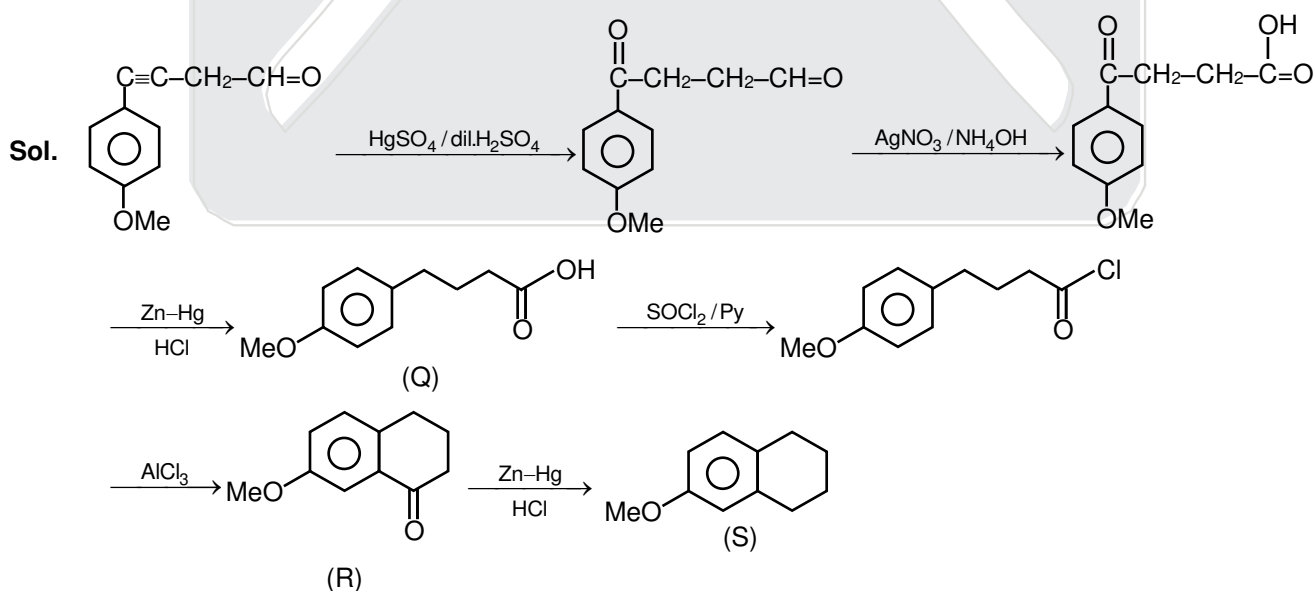
निम्न अभिक्रिया क्रम के लिए सही विकल्प (विकल्पों) को चुनिए—



Q, R तथा S को मुख्य उत्पाद मानें।



Ans. (1 & 4)



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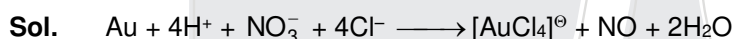
5. With reference to *aqua regia*, choose the correct option(s)

- (1) Reaction of gold with *aqua regia* produces NO_2 in the absence of air
- (2) The yellow colour of *aqua regia* is due to the presence of NOCl and Cl_2 .
- (3) *Aqua regia* is prepared by mixing conc. HCl and conc. HNO_3 in 3 : 1 (v/v) ratio.
- (4) Reaction of gold with *aqua regia* produces an anion having Au in +3 oxidation state.

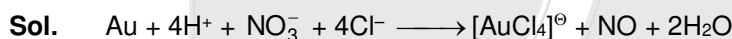
एक्वा रेजिया (*aqua regia*) के संदर्भ में सही विकल्प/विकल्पों का चयन कीजिए :

- (1) सोने की एक्वा रेजिया के साथ वायु की अनुपस्थिति में अभिक्रिया कराने पर NO_2 उत्पादित होता है।
- (2) एक्वा रेजिया का पीला रंग NOCl तथा Cl_2 की उपस्थिति के कारण है।
- (3) एक्वा रेजिया को सांद्रित HCl तथा सांद्रित HNO_3 के 3 : 1 आयतनिक मात्रा (v/v) के मिश्रण से बनाया जाता है।
- (4) एक्वा रेजिया की सोने के साथ अभिक्रिया पर एक ऋणायन (anion) उत्पादित होता है जिसमें Au की ऑक्सीकरण अवस्था (oxidation state) +3 है।

Ans. (2, 3 & 4)



- (2) NOCl/NO is formed.
- (4) $[\text{AuCl}_4]^-$ gets formed; Au(+3).



- (2) NOCl/NO बनता है।
- (4) $[\text{AuCl}_4]^-$ बनता है Au(+3).

6. The ground state energy of hydrogen atom is -13.6 eV. Consider an electronic state Ψ of He^+ whose energy, azimuthal quantum number and magnetic quantum number are -3.4 eV, 2 and 0, respectively. Which of the following statement(s) is(are) true for the state Ψ ?

- (1) It is a 4d state
- (2) The nuclear charge experienced by the electron in this state is less than $2e$, where e is the magnitude of the electronic charge
- (3) It has 3 radial nodes
- (4) It has 2 angular nodes

हाइड्रोजन परमाणु की निम्नतम अवस्था (ground state) की ऊर्जा -13.6 eV है। मान लीजिये कि He^+ की एलेक्ट्रॉनिक अवस्था Ψ की ऊर्जा, दिगंशी क्वांटम संख्या (azimuthal quantum number) तथा चुम्बकीय क्वांटम संख्या (magnetic quantum number) क्रमशः -3.4 eV, 2 तथा 0 हैं। दिये गए कथनों में से अवस्था Ψ के संदर्भ में सही कथन कौनसा/कौनसे है/हैं ?

- (1) यह एक 4d अवस्था है।
- (2) इस अवस्था में इलेक्ट्रॉन $2e$ से कम नाभिकीय आवेश (nuclear charge) अनुभव करता है, जहाँ e इलेक्ट्रॉनिक आवेश (electronic charge) का परिमाण है।
- (3) इसमें 3 त्रिज्य नोड (radial nodes) हैं।
- (4) इसमें 2 कोणीय नोड (angular nodes) हैं।

Ans. (1 & 4)

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Sol. $E_{\text{He}^+} = -13.6 \times \frac{(2)^2}{n^2} = -3.4 = \frac{-13.6}{4}$

$n^2 = 16$ so $n = 4$

quantum number are

$n = 4, l = 2, m = 0$

so subshell is = d.

angular node = $l = 2$

Radial node = $[n-l-1] = 4 - 2 - 1 = 1$

Sol. $E_{\text{He}^+} = -13.6 \times \frac{(2)^2}{n^2} = -3.4 = \frac{-13.6}{4}$

$n^2 = 16$ so $n = 4$

क्वान्टम संख्याएं हैं:

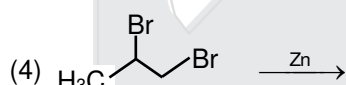
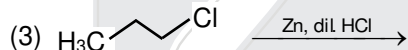
$n = 4, l = 2, m = 0$

इसलिए उपकोश = d है।

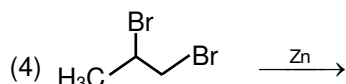
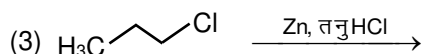
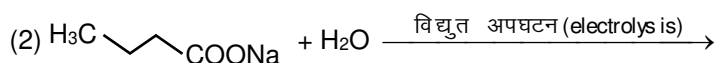
कोणीय नोड = $l = 2$

त्रिज्य नोड = $[n-l-1] = 4 - 2 - 1 = 1$

7. Which of the following reactions produce(s) propane as a major product ?



दिये गये निम्न अभिक्रियाओं में किस (किन) अभिक्रिया (अभिक्रियाओं) में प्रोपेन (propane) एक मुख्य उत्पाद है?



Ans. (1 & 3)

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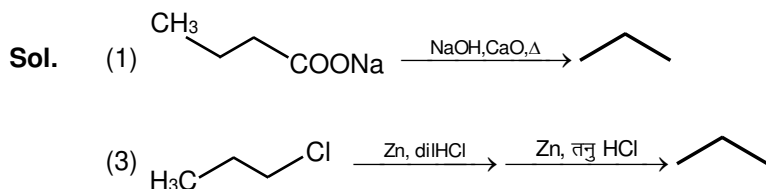
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8. Choose the correct option(s) from the following

- (1) Teflon is prepared by heating tetrafluoroethene in presence of a persulphate catalyst at high pressure
 - (2) Natural rubber is polyisoprene containing *trans* alkene units
 - (3) Nylon-6 has amide linkages
 - (4) Cellulose has only α -D-glucose units that are joined by glycosidic linkages
- निम्न में से सही विकल्प (विकल्पों) को चुनिये

- (1) टेफ्लॉन (Teflon) को, टेट्राफ्लुओरोएथीन (tetrafluoroethene) को गर्म करके परसल्फेट (persulphate) उत्प्रेरक की उपस्थिति में उच्च दाब पर बनाया जाता है।
- (2) प्राकृतिक रबर पॉलीआइसोप्रीन (polyisoprene) है जिसमें विपक्ष (trans) एल्कीन एकांक होते हैं।
- (3) नाइलॉन-6 (Nylon-6) में ऐमाइड बन्ध है।
- (4) सेलुलोस (Cellulose) में केवल α -D-ग्लूकोस एकांक है, जो ग्लाइकोसाइडी बन्धनों (glycosidic linkages) द्वारा जुड़े हैं।

Ans. (1 & 3)

- Sol. (1) Teflon is prepared by heating tetrafluoroethene in presence of a persulphate catalyst at high pressure via radical addition mechanism.
- (2) Natural rubber is polyisoprene containing *cis* alkene units.
- (3) Nylon-6 has amide linkages. It is fact.
- (4) Cellulose has only β -D-glucose units that are joined by glycosidic linkages

- Sol. (1) टेफ्लॉन (Teflon) को, टेट्राफ्लुओरोएथीन (tetrafluoroethene) को गर्म करके परसल्फेट (persulphate) उत्प्रेरक की उपस्थिति में उच्च दाब पर मूलक योगात्मक अभिक्रिया द्वारा बनाया जाता है।
- (2) प्राकृतिक रबर पॉलीआइसोप्रीन (polyisoprene) है जिसमें समपक्ष (cis) एल्कीन एकांक होते हैं।
- (3) नाइलॉन-6 (Nylon-6) में ऐमाइड बन्ध है।
- (4) सेलुलोस (Cellulose) में केवल β -D-ग्लूकोस एकांक है, जो ग्लाइकोसाइडी बन्धनों (glycosidic linkages) द्वारा जुड़े हैं।

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SECTION 2 (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 2 (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 माउज़ (mouse) और ऑन-स्क्रीन (on-screen) वर्चुअल न्यूमेरिक 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. The decomposition reaction $2\text{N}_2\text{O}_5(\text{g}) \xrightarrow{\Delta} 2\text{N}_2\text{O}_4(\text{g}) + \text{O}_2(\text{g})$ is started in a closed cylinder under isothermal isochoric condition at an initial pressure of 1 atm. After $Y \times 10^3$ s, the pressure inside the cylinder is found to be 1.45 atm. If the rate constant of the reaction is $5 \times 10^{-4} \text{ s}^{-1}$, assuming ideal gas behavior, the value of Y is _____
- 1 atm शुरुआती दबाव पर अपघटन अभिक्रिया $2\text{N}_2\text{O}_5(\text{g}) \xrightarrow{\Delta} 2\text{N}_2\text{O}_4(\text{g}) + \text{O}_2(\text{g})$ को एक बन्द सिलेण्डर में समतापी (isothermal) समआयतनिक (isochoric) अवस्था में शुरु किया गया $Y \times 10^3$ s के पश्चात् सिलेण्डर के अन्दर का दबाव 1.45 atm पाया गया। आदर्श गैस व्यवहार मान कर, अगर इस अभिक्रिया का वेग स्थिरांक (rate constant) $5 \times 10^{-4} \text{ s}^{-1}$ है, तब Y का मान है _____

Ans. (2.30)

Sol. From unit of k reaction is first order

k की इकाई से अभिक्रिया प्रथम कोटि की है

$$2\text{N}_2\text{O}_5 \xrightarrow{\Delta} 2\text{N}_2\text{O}_4 + \text{O}_2$$

t = 0	1 atm	0	0
t = t	(1-P)	P	$\frac{P}{2}$
t = ∞	0	1 atm	0.5 atm

$P_0 = 1 \text{ atm}, P_t = 1.45 \text{ atm}, P_\infty = 1.5 \text{ atm}$

$$t = \frac{1}{2K} \ln \left(\frac{P_\infty - P_0}{P_\infty - P_t} \right)$$

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$$t = \frac{2.303}{2 \times 5 \times 10^{-4}} \log \left(\frac{1.5-1}{1.5-1.45} \right)$$

$$t = 2.303 \times 10^3 = y \times 10^3$$

$$\text{so } y = 2.303$$

Answer after rounding off & truncation = 2.30.

ट्रंकेट और राउन्ड ऑफ के पश्चात् उत्तर = 2.30.

2. The Mole fraction of urea in an aqueous urea solution containing 900 g of water is 0.05. If the density of the solution is 1.2 g/cm³, the molarity of urea solution is _____.

(Given data : Molar masses of urea and water are 60 g mol⁻¹ and 18 g mol⁻¹, respectively)

यूरिया के एक जलीय विलयन में, जिसमें 900 g पानी है, यूरिया का मोल-अंश (Mole fraction) 0.05 है। अगर इस विलयन का घनत्व 1.2 g/cm³ है, तब इस यूरिया विलयन की मोलरता _____ है।

(दिया गया: यूरिया और पानी के मोलर द्रव्यमान क्रमशः 60 g mol⁻¹ और 18 g mol⁻¹ है।)

Ans. (2.98)

Sol. Mole fraction of urea in aqueous solution = 0.05

Let number of moles of solution is = 1 mole

	Mole	Mass	Volume
Solute	0.05	3 g	
Solvent	0.95	17.1g	
Solution	1	20.1g	20.1/1.2 cm ³

$$\begin{aligned} \text{Molarity} &= \frac{n_{\text{solute}}}{V_{\text{solution (in mL)}}} \times 1000 \\ &= \frac{0.05 \times 1.2}{20.1} \times 1000 = \frac{60}{20.1} = 2.985 \end{aligned}$$

Answer after rounding off = 2.98

Answer after truncation = 2.98

Sol. जलीय विलयन में यूरिया का मोल अंश = 0.05

माना विलयन के मोलो की संख्या = 1 mole

	मोल	द्रव्यमान	आयतन
विलेय	0.05	3 g	
विलायक	0.95	17.1g	
विलयन	1	20.1g	20.1/1.2 cm ³

$$\begin{aligned} \text{मोलरता} &= \frac{n_{\text{विलेय}}}{V_{\text{विलयन (mL में)}}} \times 1000 \\ &= \frac{0.05 \times 1.2}{20.1} \times 1000 = \frac{60}{20.1} = 2.985 \end{aligned}$$

राउन्ड ऑफ के पश्चात् उत्तर = 2.98





ट्रंकेट के पश्चात् उत्तर = 2.98

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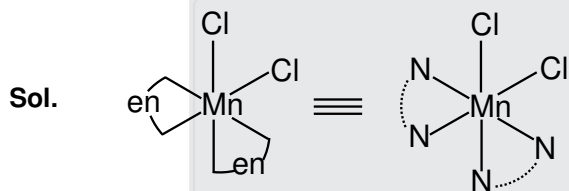
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3. Total number of cis N–Mn–Cl bond angles (that is, Mn–N and Mn–Cl bonds in cis position) present in a molecule of cis $[\text{Mn}(\text{en})_2\text{Cl}_2]$ complex is _____ (en = $\text{NH}_2\text{CH}_2\text{CH}_2\text{NH}_2$)

समपक्ष (cis) – $[\text{Mn}(\text{en})_2\text{Cl}_2]$ कॉम्प्लेक्स (complex) के एक अणु में समपक्षी N–Mn–Cl आबंध कोणों [अर्थात् Mn–N तथा Mn–Cl आबंध समपक्षीय (cis) हों] की कुल संख्या है _____ (en = $\text{NH}_2\text{CH}_2\text{CH}_2\text{NH}_2$)

Ans. (6)



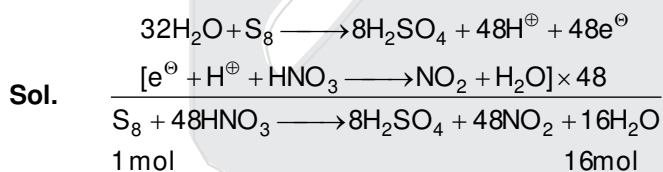
4. The amount of water produced (in g) in the oxidation of 1 mole of rhombic sulphur by conc. HNO_3 to a compound with the highest oxidation state of sulphur is _____

(Given data : Molar mass of water = 18 g mol^{-1})

1 मोल विषमलंबाक्ष सल्फर (rhombic sulphur) की सान्द्र HNO_3 द्वारा ऑक्सीकरण पर पानी और एक यौगिक, जिसमें सल्फर की ऑक्सीकरण अवस्था उच्चतम है, उत्पादित होता है। उत्पादित पानी की मात्रा (g में) _____ है।

(दिया गया: पानी का मोलर द्रव्यमान = 18 g mol^{-1})

Ans. (288)



\Rightarrow mass of H_2O formed = (16) (18)g = 288 g

\Rightarrow निर्मित H_2O का द्रव्यमान = (16) (18)g = 288 g

5. Total number of isomers considering both structural and stereoisomers, of cyclic ethers with the molecular formula $\text{C}_4\text{H}_8\text{O}$ is _____

$\text{C}_4\text{H}_8\text{O}$ अणुसूत्र के कुल चक्रीय ईथर (त्रिविम सहित) की गणना कीजिए।

Ans. (10)

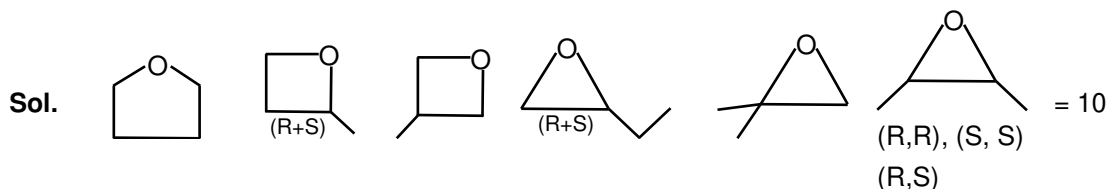
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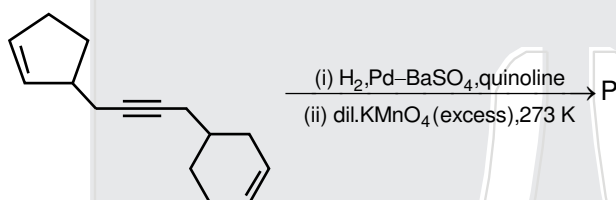
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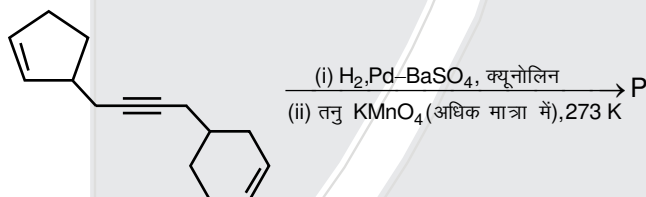
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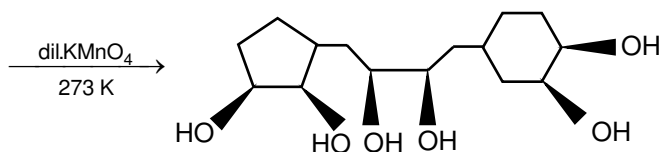
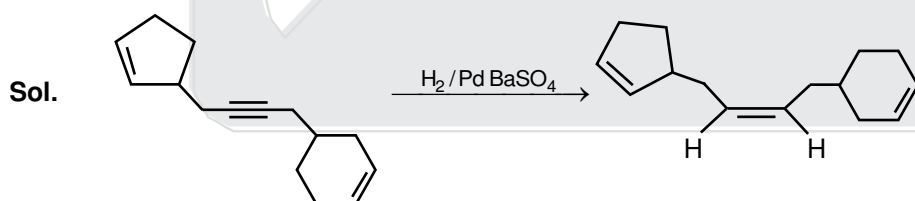
6. Total number of hydroxyl groups present in a molecule of the major product P is _____



मुख्य उत्पाद 'P' के एक अणु में हाइड्रोक्सिल समूहों की कुल संख्या _____ है।



Ans. (06)



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SECTION 3 (Maximum Marks : 12)

- This section contains **TWO (02)** List-Match sets.
- Each List-Match set has **TWO (02)** Multiple Choice Questions.
- Each List-Match set has two lists : **List-I** and **List-II**.
- **List-I** has **Four** entries (I),(II), (III) and (IV) **List-II** has **Six** entries (P),(Q), (R), (S), (T) and (U).
- **FOUR** options are given in each Multiple Choice Question based on **List-I** and **List-II** and **ONLY ONE** of these four options satisfies the condition asked in the Multiple Choice Question.
- Answer to each question will be evaluated according to the following marking scheme :
 Full Marks : **+3** If **ONLY** the option corresponding to the correct combination 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.

खंड 3 (अधिकतम अंक: 12)

- इस खंड में **दो (02)** सूची-सुमेलन (List-Match) सेट्स (sets) हैं।
- प्रत्येक सूची-सुमेलन सेट (set) में **दो (02)** एकाधिक विकल्प प्रश्न (Multiple Choice Question) हैं।
- प्रत्येक सूची-सुमेलन सेट में दो सूचियाँ हैं : **सूची-I** और **सूची-II**
- **सूची-I** में चार प्रविष्टियाँ (I),(II),(III) और (IV) हैं एवं **सूची-II** में छः प्रविष्टियाँ (P),(Q),(R),(S),(T) और (U) हैं।
- प्रत्येक एकाधिक विकल्प प्रश्न में सूची-I और सूची-II पर आधारित चार विकल्पों में से केवल एक विकल्प ही एकाधिक विकल्प प्रश्न की शर्त को पूरा करता है।
- प्रत्येक प्रश्न के उत्तर का मूल्यांकन निम्नयोजना 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

Answer the following by appropriately matching the lists based on the information given in the paragraph.

Consider the Bohr's model of a one-electron atom where the electron moves around the nucleus. In the following List-I contains some quantities for the n^{th} orbit of the atom and List-II contains options showing how they depend on n .

	List-I		List-II
(I)	Radius of the n^{th} orbit	(P)	$\propto n^{-2}$
(II)	Angular momentum of the electron in the n^{th} orbit	(Q)	$\propto n^{-1}$
(III)	Kinetic energy of the electron in the n^{th} orbit	(R)	$\propto n^0$
(IV)	Potential energy of the electron in the n^{th} orbit	(S)	$\propto n^1$
		(T)	$\propto n^2$
		(U)	$\propto n^{1/2}$

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एक इलेक्ट्रॉन परमाणु के बोर के मॉडल (Bohr's model) का विचार कीजिये, जहां इलेक्ट्रॉन एक नाभिक के चारों ओर घूम रहा है। निम्न में सूची-I में n^{th} कक्षक के कुछ परिमाण दिये गए हैं तथा सूची-II में उनकी n पर निर्भरता दी गयी है।

	सूची-I		सूची-II
(I)	n^{th} कक्षक की त्रिज्या	(P)	$\propto n^{-2}$
(II)	n^{th} कक्षक में इलेक्ट्रॉन का कोणीय संवेग (angular momentum)	(Q)	$\propto n^{-1}$
(III)	n^{th} कक्षक में इलेक्ट्रॉन की गतिक ऊर्जा (Kinetic energy)	(R)	$\propto n^0$
(IV)	n^{th} कक्षक में इलेक्ट्रॉन की स्थितिज ऊर्जा (Potential energy)	(S)	$\propto n^1$
		(T)	$\propto n^2$
		(U)	$\propto n^{1/2}$

1. Which of the following has the correct combination considering List-I and List-II ?

सूची-I तथा सूची-II का विचार करते हुए निम्न में से किस विकल्प में सही मेल दिया गया है?

- (1) (III), (S) (2) (IV), (Q) (3) (III), (P) (4) (IV), (U)

Ans. (3)

2. Which of the following options has the correct combination considering List-I and List-II ?

सूची-I तथा सूची-II का विचार करते हुए निम्न में से किस विकल्प में सही मेल दिया गया है?

- (1) (II), (R) (2) (II), (Q) (3) (I), (P) (4) (I), (T)

Ans. (4)

Sol. $r_n = 0.529 \left(\frac{n^2}{Z} \right) \text{Å} \Rightarrow r_n \propto n^2$

Angular momentum कोणीय संवेग (ℓ) = $\left(\frac{nh}{2\pi} \right) \Rightarrow \ell \propto n^1$

K.E. = $\frac{1}{2}mv^2 = \frac{1}{2}m \left[2.18 \times 10^6 \frac{Z}{n} \right]^2$

$\Rightarrow \text{K.E.} \propto \frac{Z^2}{n^2} \Rightarrow \text{K.E.} \propto n^{-2}$

P.E. = $-2\text{K.E.} \Rightarrow \text{P.E.} \propto \frac{Z^2}{n^2}$

$\Rightarrow \text{P.E.} \propto n^{-2}$

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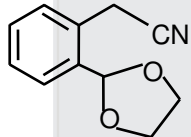
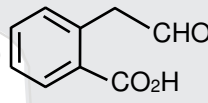
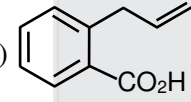
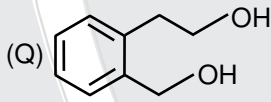
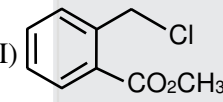
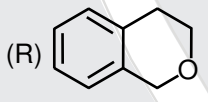
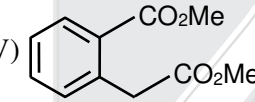
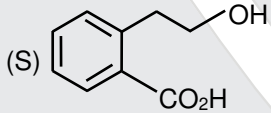
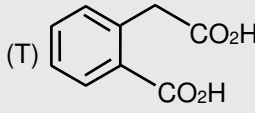
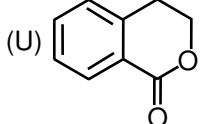
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Answer the following by appropriately matching the lists based on the information given in the paragraph.

List-I includes starting materials and reagents of selected chemical reactions. List-II gives structures of compounds that may be formed as intermediate products and/or final products from the reactions of List-I.

Column-I		Column-II
<p>(I)  $\xrightarrow[\text{(iv) Conc. H}_2\text{SO}_4]{\text{(i) DIBAL-H, (ii) dil. HCl, (iii) NaBH}_4}$</p>		<p>(P) </p>
<p>(II)  $\xrightarrow[\text{(iv) Conc. H}_2\text{SO}_4]{\text{(i) O}_3, \text{(ii) Zn, H}_2\text{O, (iii) NaBH}_4}$</p>		<p>(Q) </p>
<p>(III)  $\xrightarrow[\text{(iv) Conc. H}_2\text{SO}_4]{\text{(i) KCN, (ii) H}_3\text{O}^+, \Delta, \text{(iii) LiAlH}_4}$</p>		<p>(R) </p>
<p>(IV)  $\xrightarrow[\text{(ii) Conc. H}_2\text{SO}_4]{\text{(i) LiAlH}_4}$</p>		<p>(S) </p> <p>(T) </p> <p>(U) </p>

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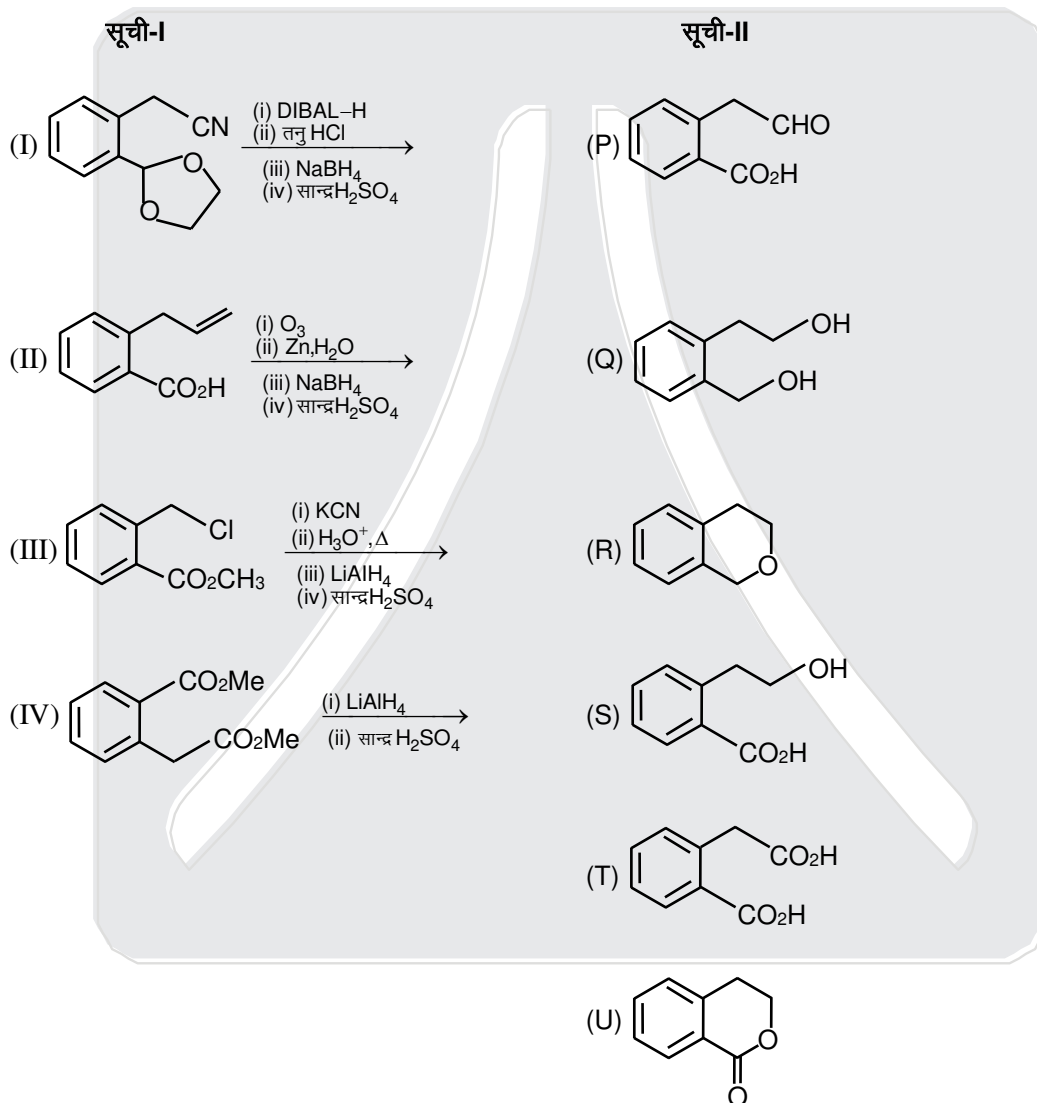
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सूची-I में कुछ चुनिंदा रासायनिक अभिक्रियाओं के प्रारम्भिक पदार्थ तथा अभिकर्मक दिये गये हैं। सूची-II में कुछ यौगिकों की संरचना दी गयी है। जो सूची-I की अभिक्रियाओं से मध्यवर्ती उत्पाद एवं/या अंतिम उत्पाद के रूप में निर्मित हो सकते हैं।



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3. Which of the following options has correct combination considering List-I and List-II

सूची-I और सूची-II का विचार करते हुए निम्न में से किस विकल्प में सही मेल दिया गया है?

- (1) (II), (P), (S), (U) (2) (I), (S), (Q), (R) (3) (II), (P), (S), (T) (4) (I), (Q), (T), (U)

Ans. (1)

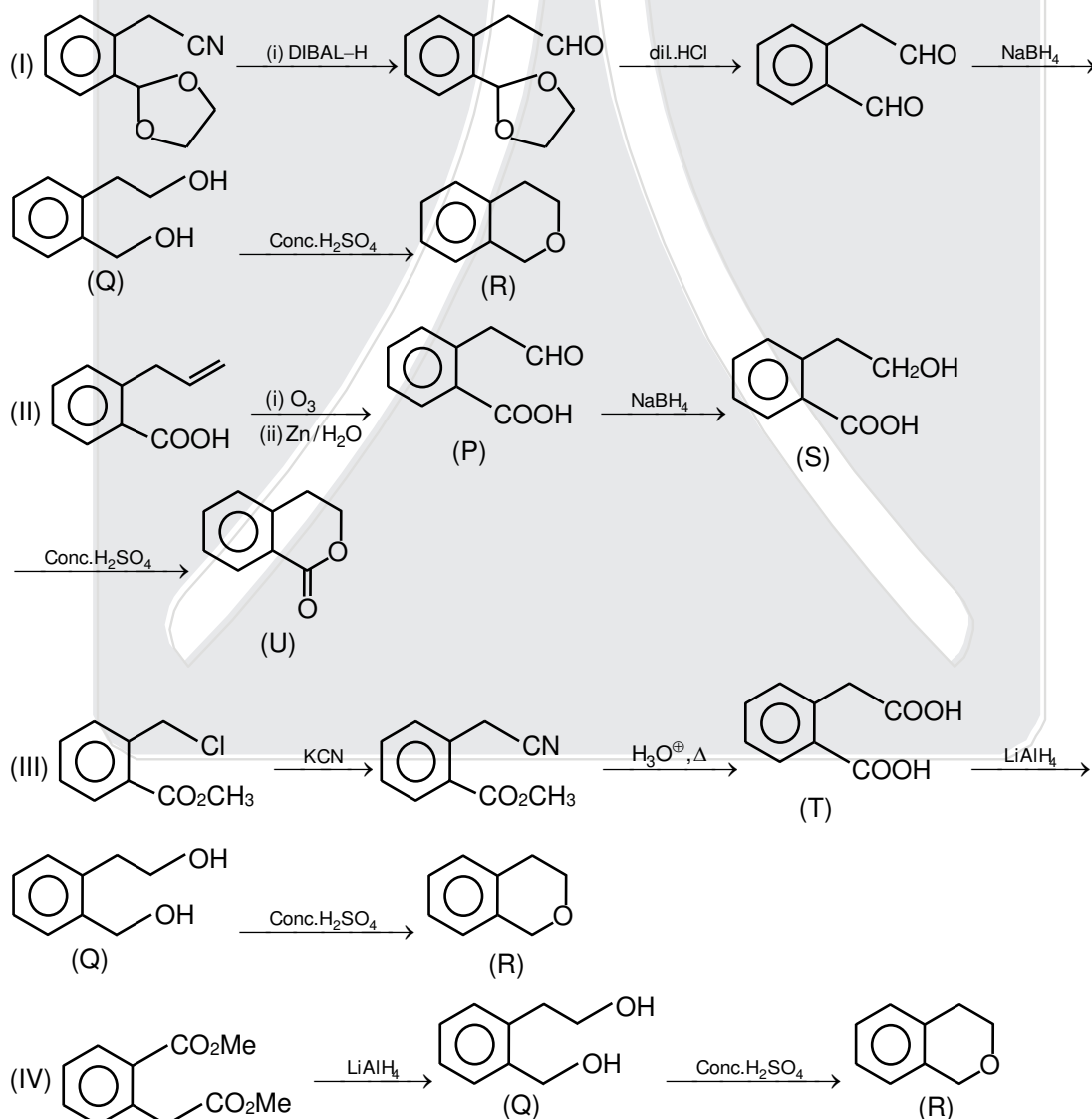
4. Which of the following options has correct combination considering List-I and List-II

सूची-I और सूची-II का विचार करते हुए निम्न में से किस विकल्प में सही मेल दिया गया है?

- (1) (III), (S), (R) (2) (IV), (Q), (U) (3) (IV), (Q), (R) (4) (III), (T), (U)

Ans. (3)

Sol. (3 & 4)



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