

FINAL JEE(Advanced) EXAMINATION - 2019

(Held On Monday 27th MAY, 2019)

PAPER-2

TEST PAPER WITH ANSWER

PART-2 : CHEMISTRY

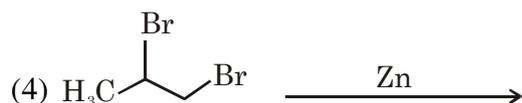
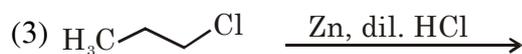
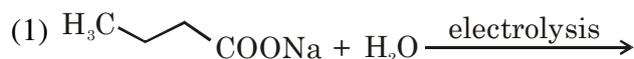
SECTION-1 : (Maximum Marks: 32)

- 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.
- For example, in a question, if (A), (B) and (D) are the **ONLY** three options corresponding to correct answers, then
choosing **ONLY** (A), (B) and (D) will get +4 marks;
choosing **ONLY** (A) and (B) will get +2 marks;
choosing **ONLY** (A) and (D) will get +2 marks;
choosing **ONLY** (B) and (D) will get +2 marks;
choosing **ONLY** (A) will get +1 marks;
choosing **ONLY** (B) will get +1 marks;
choosing **ONLY** (D) will get +1 marks;
choosing no option (i.e. the question is unanswered) will get 0 marks, and
choosing any other combination of options will get -1 mark.

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

Ans. (1,3,4)

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



Ans. (2,3)

3. 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 has 2 angular nodes

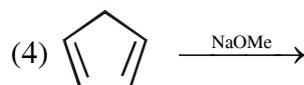
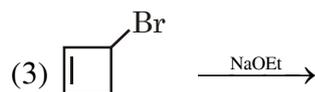
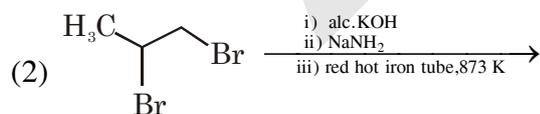
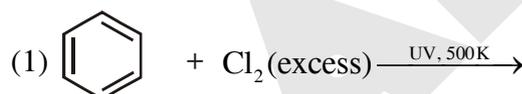
(2) It has 3 radial nodes

(3) It is a 4d state

(4) The nuclear charge experienced by the electron in this state is less than $2e$, where e is the magnitude of the electronic charge.

Ans. (1,3)

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



Ans. (2,4)

5. Consider the following reactions (unbalanced)



Choose the correct option(s).

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

Ans. (2,3,4)

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

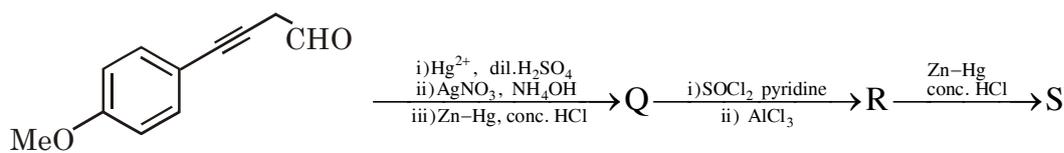
Ans. (2,3,4)

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

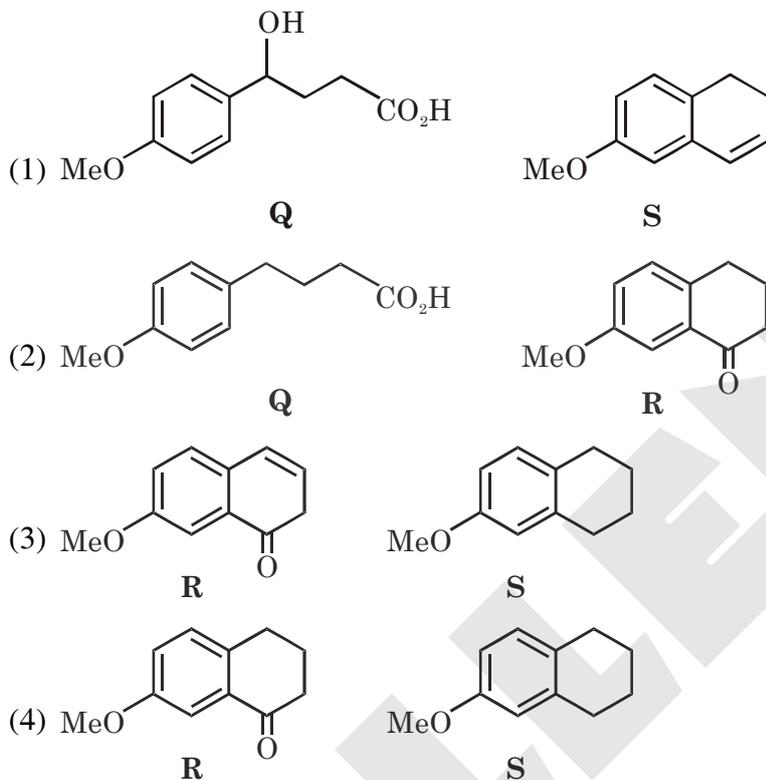
- (1) Natural rubber is polyisoprene containing *trans* alkene units
- (2) Nylon-6 has amide linkages
- (3) Cellulose has only α -D-glucose units that are joined by glycosidic linkages
- (4) Teflon prepared by heating tetrafluoroethene in presence of a persulphate catalyst at high pressure

Ans. (2,4)

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



Consider Q, R and S as major products



Ans. (2,4)

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.

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 ____

Ans. (2.30)

2. Total number of isomers, considering both structural and stereoisomers, of cyclic ethers with the molecular formula C_4H_8O is ____

Ans. (10.00)

3. 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 ____

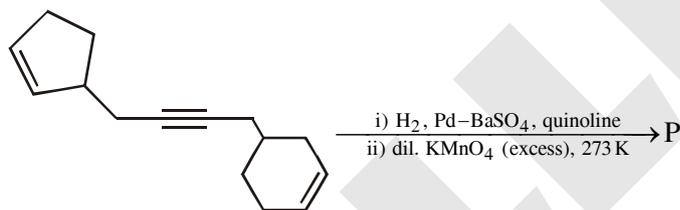
(Given data : Molar mass of water = 18 g mol^{-1})

Ans. (288.00)

4. Total number of *cis* N–Mn–Cl bond angles (that is, Mn–N and Mn–Cl bonds in *cis* positions) present in a molecule of *cis*- $[Mn(en)_2Cl_2]$ complex is ____ (*en* = $NH_2CH_2CH_2NH_2$)

Ans. (6.00)

5. Total number of hydroxyl groups present in a molecule of the major product P is ____



Ans. (6.00)

6. 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 cm^{-3} , 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)

Ans. (2.98)

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) and **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

1. 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) $\propto n^{1/2}$

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

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

Ans. (3)

2. 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
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(IV) Potential energy of the electron in the n^{th} orbit	(S) $\propto n^1$
	(T) $\propto n^2$
	(U) $\propto n^{1/2}$

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

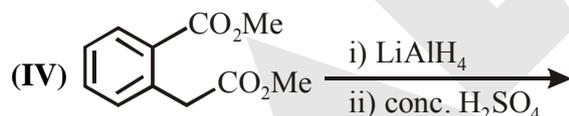
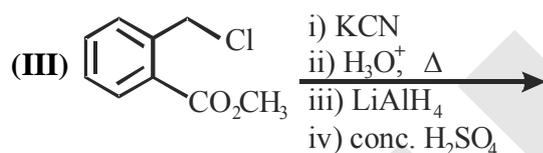
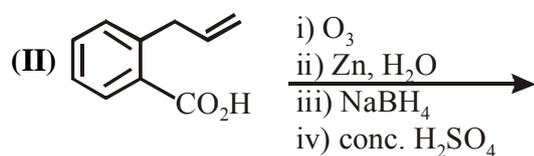
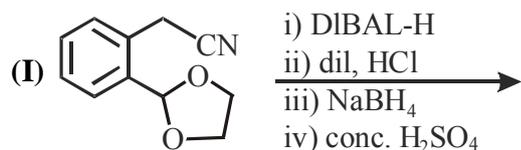
- (1) (III), (S) (2) (IV), (Q) (3) (IV), (U) (4) (III), (P)

Ans. (4)

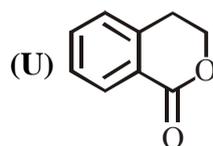
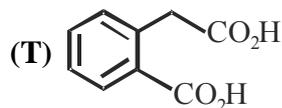
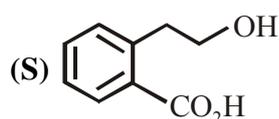
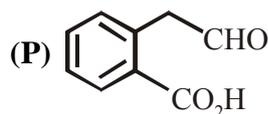
3. Answer the following by appropriately matching the lists based on the information given in the paragraph

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

List-I



List-II



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

(1) (III), (S), (R)

(2) (IV), (Q), (R)

(3) (III), (T), (U)

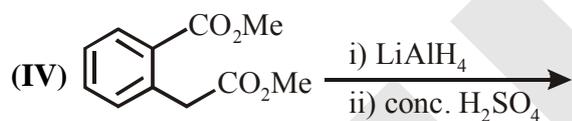
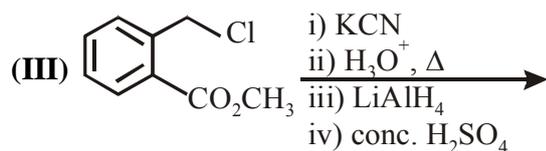
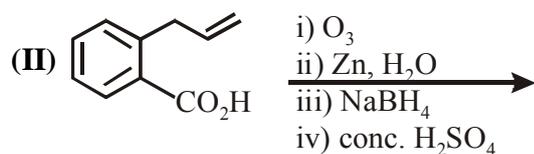
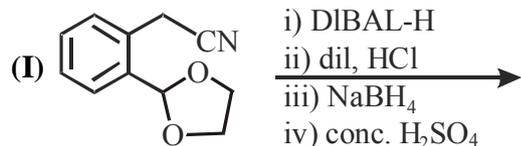
(4) (IV), (Q), (U)

Ans. (2)

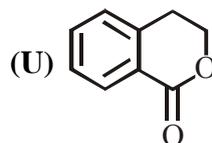
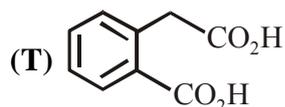
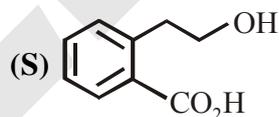
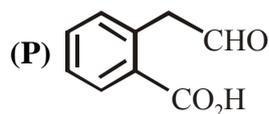
4. Answer the following by appropriately matching the lists based on the information given in the paragraph

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

List-I



List-II



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

(1) (I), (Q), (T), (U)

(2) (II), (P), (S), (U)

(3) (II), (P), (S), (T)

(4) (I), (S), (Q), (R)

Ans. (2)