SUBJECT - CHEMISTRY

Time : 3 :00 Hrs. समय : 3 घंटे   **Max. Marks (अधिकतम अंक): 720**

READ THE INSTRUCTIONS CAREFULLY (कृपया इन निर्देशों को ध्यान से पढ़ें)

Important Instructions:	महत्वपूर्ण निर्देश :
1. The Answer Sheet is inside this Test Booklet. When you are directed to open the Test Booklet, take out the Answer Sheet and fill in the particulars on **Side-1** and **Side-2** carefully with **blue/black** ball point pen only.	1. उत्तर पत्र इस परीक्षा पुस्तिका के अन्दर रखा है। जब आपको परीक्षा पुस्तिका खोलने को कहा जाए, तो उत्तर पत्र निकाल कर **पृष्ठ-1** एवं **पृष्ठ-2** पर केवल **नीले/काले** बॉल पॉइंट पेन से विवरण भरें।
2. The test is of **3 hours** duration and Test Booklet contains **180 questions.** Each question carries 4 marks. For each correct response, the candidate will get **4 marks**. For each incorrect response, **one mark** will be deducted from the total scores. The maximum marks are **720**.	2. परीक्षा की अवधि **3 घंटे** है एवं परीक्षा पुस्तिका में **180** प्रश्न हैं। प्रत्येक प्रश्न **4 अंक** का है। प्रत्येक सही उत्तर के लिए परीक्षार्थी को **4 अंक** दिए जाएंगे। प्रत्येक गलत उत्तर के लिए कुल योग में से **एक अंक** घटाया जाएगा। अधिकतम अंक **720** हैं।
3. Use **Blue/Black Ball Point Pen** only for writing particulars on this page/marking response.	3. इस पृष्ठ पर विवरण अंकित करने एवं उत्तर पत्र पर निशान लगाने के लिए केवल **नीले/काले बॉल पॉइंट पेन** का प्रयोग करें।
4. Rough work is to be done on the space provided for this purpose in the Test Booklet only.	4. रफ कार्य इस परीक्षा पुस्तिका में निर्धारित स्थान पर ही करें।
5. **On completion of the test, the candidate must handover the Answer Sheet to the invigilator in the Room/Hall. The candidates are allowed to take away this Test Booklet with them.**	5. **परीक्षा सम्पन्न होने पर, परीक्षार्थी कक्ष/हॉल छोड़ने से पूर्व उत्तर पत्र कक्ष निरीक्षक को अवश्य सौंप दें। परीक्षार्थी अपने साथ प्रश्न पुस्तिका को ले जा सकते हैं।**
6. The CODE for this **Booklet is _____**. Make sure that the CODE printed on **Side-2** of the Answer Sheet is the same as that on this Booklet. In case of discrepancy, the candidate should immediately report the matter to the Invigilator for replacement of both the Test Booklets and the Answer Sheets.	6. इस पुस्तिका का संकेत है **_____.** यह सुनिश्चित कर लें कि इस पुस्तिका का संकेत, उत्तर पत्र के **पृष्ठ-2** पद छपे संकेत से मिलता है। अगर यह भिन्न हो, तो परीक्षार्थी दूसरी परीक्षा पुस्तिका और उत्तर पत्र लेने के लिए निरीक्षक को तुरन्त अवगत कराएं।
7. The Candidates should ensure that the Answer Sheet is not folded. Do not make any stray marks on the Answer Sheet. Do not write your roll no. anywhere else except in the specified space in the Test Booklet/Answer Sheet.	7. परीक्षार्थी सुनिश्चित करें कि इस उत्तर पत्र को मोड़ा न जाए एवं उस पर कोई अन्य निशान न लगाएं। परीक्षार्थी अपना अनुक्रमांक प्रश्न पुस्तिका/उत्तर पत्र में निर्धारित स्थान के अतिरिक्त अन्यत्र न लिखें।
8. Use of white fluid for correction is **NOT** permissible on the Answer Sheet.	8. उत्तर पत्र पर किसी प्रकार के संशोधन हेतु व्हाइट फ्लूइड के प्रयोग की अनुमति **नहीं** है।

In case of any ambiguity in translation of any question, English version shall be treated as final.

प्रश्नों के अनुवाद में किसी अस्पष्टता की स्थिति में, अंग्रेजी संस्करण को ही अन्तिम माना जायेगा।

Name of the Candidate (in Capital letters) : _____

Roll Number : in figures : ☐☐☐☐☐☐☐☐ in words : _____

Name of Examination Centre (in Capital letters) : _____

Candidate's Signature: _____ Invigilator's Signature: _____

136. The reason for greater range of oxidation states in actinoids is attributed to :
(1) The radioactive nature of actinoids
(2) Actinoid contraction
(3) 5f, 6d and 7s levels having comparable energies
(4) 4f and 5d levels being close in energies
Ans. (3)

137. An example of a sigma bonded organometallic compound is
(1) Ruthenocene   (2) Grignard's reagent   (3) Ferrocene   (4) Cobaltocene
Ans. (2)

138. Which one is the **wrong** statement ?

(1) de-Broglie's wavelength is given by $\lambda = \dfrac{h}{m\upsilon}$, where m = mass of the particle, υ = group velocity of the particle.

(2) The uncertainty principle is $\Delta E \times \Delta t \geq \dfrac{h}{4\pi}$

(3) Half filled and fully filled orbitals have greater stability due to greater exchange energy, greater symmetry and more balanced arrangement.
(4) The energy of 2s orbital is less than the energy of 2p orbital in case of Hydrogen like atoms.
Ans. (4)

139. Mixture of chloroxylenol and terpineol acts as :
(1) Analgesic   (2) Antiseptic   (3) Antipyretic   (4) Antibiotic
Ans. (2)

140. The element Z = 114 has beeen discovered recently. It will belong to which of the following family/ group and electronic configuration ?
(1) Halogen family, $[Rn]\ 5f^{14}6d^{10}7s^{2}7p^{5}$ (2) Carbon family, $[Rn]\ 5f^{14}6d^{10}7s^{2}7p^{2}$
(3) Oxygen family, $[Rn]\ 5f^{14}6d^{10}7s^{2}7p^{4}$ (4) Nitrogen family, $[Rn]\ 5f^{14}6d^{10}7s^{2}7p^{6}$
Ans. (2)

141. A 20 litre container at 400 K contains $CO_2(g)$ at pressure 0.4 atm and an excess of SrO neglect the volume of solid SrO). The volume of the container is now decreased by moving the movable piston fitted in the container. The maximum volume of the container, when pressure of CO_2 attains its maximum value, will be :
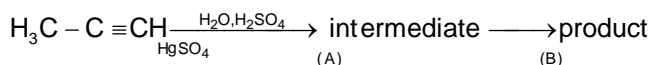(Given that : $SrCO_3(s) \rightleftharpoons SrO(s) + CO_2(g)$, Kp = 1.6 atm)
(1) 5 litre   (2) 10 litre   (3) 4 litre   (4) 2 litre
Ans. (1)

142. Predict the correct intermediate and product in the following reaction :

$$H_3C - C \equiv CH \xrightarrow[\text{HgSO}_4]{\text{H}_2\text{O,H}_2\text{SO}_4} \underset{(A)}{\text{intermediate}} \longrightarrow \underset{(B)}{\text{product}}$$

(1) A : H₃C–C=CH₂ B : H₃C–C–CH₃
          | ‖
          SO₄   O

(2) A : H₃C–C=CH₂ B : CH₃–C–CH₂
          | |
          OH   SO₄

(3) A : CH₃–C–CH₃ B : H₃C–C≡CH
          ‖
          O

(4) A : H₃C–C=CH₂ B : H₃C–C–CH₃
          | ‖
          OH   O

Ans. (4)

143. Which of the following is a sink for CO ?
(1) Haemoglobin
(2) Micro organisms present in the soil.
(3) Oceans
(4) Plants

Ans. (1)

144. Which of the following reactions is appropriate for converting acetamide to methanamine ?
(1) Carbylamine reaction
(2) Hoffmann hypobromamide reaction
(3) Stephens reaction
(4) Gabriels phthalimide synthesis

Ans. (2)

145. The species, having bond angles of 120⁰ is :
(1) PH_3 (2) ClF_3 (3) NCl_3 (4) BCl_3

Ans. (4)

146. The correct of order the stoichiometries of AgCl formed when $AgNO_3$ in excess is treated with the complexes $CoCl_3.6NH_3$, $CoCl_3. 5NH_3$, $CoCl_3. 4NH_3$ respectively is :
(1) 1 AgCl, 3AgCl, 2AgCl
(2) 3AgCl, 1 AgCl, 2AgCl
(3) 3AgCl, 2AgCl, 1 AgCl
(4) 2 AgCl, 3 AgCl, 1 AgCl

Ans. (3)

147. For a given reaction ΔH = 35.5 kJ mol^{-1} and ΔS = 83.6 JK^{-1} mol^{-1}. The reaction is spontaneous at :
(Assume that ΔH and ΔS do not vary with temperature)
(1) T < 425 K   (2) T > 425 K   (3) All temperatures   (4) T > 298 K

Ans. (2)

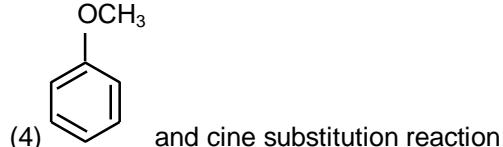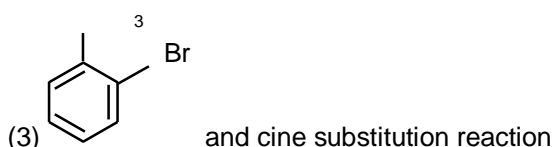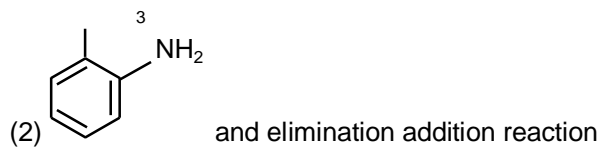**148.** Match the interhalogen compounds of Column I with the geometry in column II and Assign the correct code.
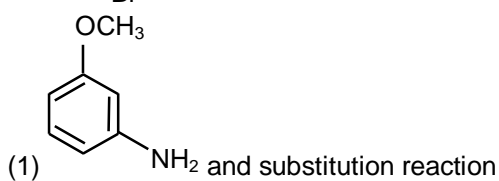
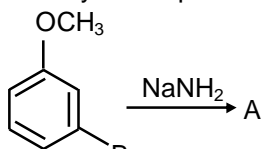|	Column I		Column II
(a)	XX'	(i)	T-shape
(b)	XX₃'	(ii)	Pentagonal bipyramidal
(c)	XX₅'	(iii)	Linear
(d)	XX₇'	(iv)	Square-pyramidal
		(v)	Tetrahedral

Code :

	(a)	(b)	(c)	(d)		(a)	(b)	(c)	(d)
(1)	(iii)	(iv)	(i)	(ii)	(2)	(iii)	(i)	(iv)	(ii)
(3)	(v)	(iv)	(iii)	(ii)	(4)	(iv)	(iii)	(ii)	(i)

Ans. (2)

149. Identify A and predict the type of reaction :

(1) and substitution reaction

(2) and elimination addition reaction

(3) and cine substitution reaction

(4) and cine substitution reaction

Ans. (2)

150. Which one of the following statements is not correct?
(1) Catalyst does not initiate any reaction.
(2) The value of equilibrium constant is changed in the presence of a catalyst in the reaction at equilibrium.
(3) Enzymes catalyse mainly bio-chemical reactions
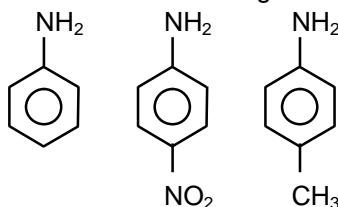(4) Coenzymes increase the catalytic activity of enzyme.

Ans. (2)

151. Name the gas that can readily decolourise acidified $KMnO_4$ solution:
(1) CO_2 (2) SO_2 (3) NO_2 (4) P_2O_5

Ans. (2)

152. The correct increasing order of basic strength for the following compounds is :
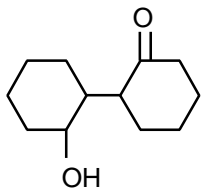

(I)   (II)   (III)

(1) II < III < I   (2) III < I < II   (3) III < II < I   (4) II < I < III
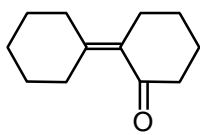
Ans. (4)

153. If molality of the dilute solution is doubled, the value of molal depression constant (K_f) will be :

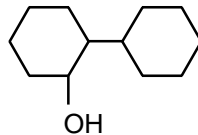(1) doubled   (2) halved   (3) tripled   (4) unchanged

Ans. **(4)**

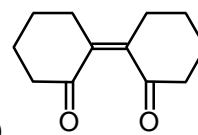**154.** Of the following, which is the product formed when cyclohexanone undergoes aldol condensation followed by heating?
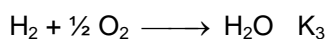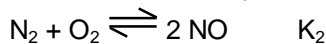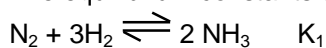

(1)   OH   (2)   (3)   OH   (4)

Ans. **(2)**

155. The equilibrium constants of the following are :

$N_2 + 3H_2 \rightleftharpoons 2\,NH_3$ K_1

$N_2 + O_2 \rightleftharpoons 2\,NO$ K_2

$H_2 + \frac{1}{2}\,O_2 \longrightarrow H_2O$ K_3

The equilibrium constant (K) of the reaction :

$2NH_3 + \dfrac{5}{2}O_2 \xrightleftharpoons{K} 2NO + 3\,H_2O$, will be :
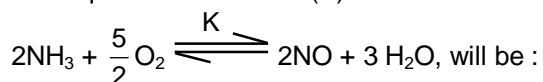
(1) $K_1 K_3^3 / K_2$

(2) $K_2 K_3^3 / K_1$

(3) $K_2 K_3 / K_1$

(4) $K_2^3 K_3 / K_1$

Ans. (2)

156. The correct statement regarding electrohile is :

(1) Electrophile is a negatively charged species and can form a bond by acepting a pair of electrons from a nucleophile

(2) Electrophile is a negatively charged species and can form a bond by acepting a pair of electrons from another electrophile

(3) Electrophiles are generally neutral species and can form a bond by accepting a pair of electrons from a nucleophile

(4) Electrophile can be either neutral or positively charged species and can form a bond by accepting a pair of electrons from a nucleophile

Ans. (4)

157. A gas is allowed to expand in a well insulated container against a constant external pressure of 2.5 atm from an initial volume of 2.50 L to a final volume of 4.50 L. The change in internal energy ΔU of the gas in joules will be:
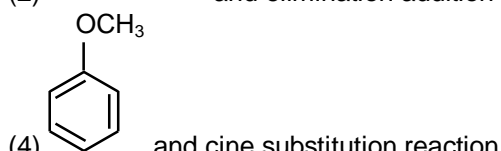
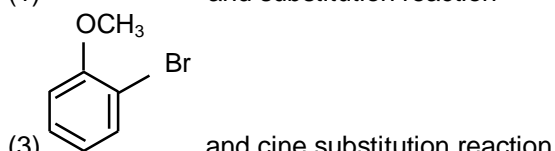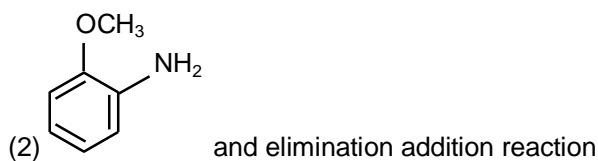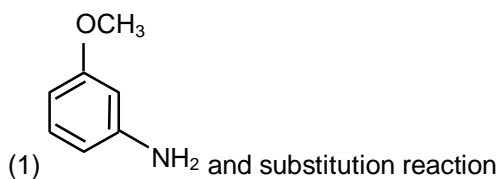(1) 1136.25 J   (2) –500 J   (3) –505 J   (4) +505 J

Ans. (3)

Code :

	(a)	(b)	(c)	(d)		(a)	(b)	(c)	(d)
(1)	(iii)	(iv)	(i)	(ii)	(2)	(iii)	(i)	(iv)	(ii)
(3)	(v)	(iv)	(iii)	(ii)	(4)	(iv)	(iii)	(ii)	(i)

Ans. (2)

149. Identify A and predict the type of reaction :

(1) and substitution reaction

(2) and elimination addition reaction

(3) and cine substitution reaction

(4) and cine substitution reaction

Ans. (2)

150. Which one of the following statements is not correct?
(1) Catalyst does not initiate any reaction.
(2) The value of equilibrium constant is changed in the presence of a catalyst in the reaction at equilibrium.
(3) Enzymes catalyse mainly bio-chemical reactions
(4) Coenzymes increase the catalytic activity of enzyme.

Ans. (2)
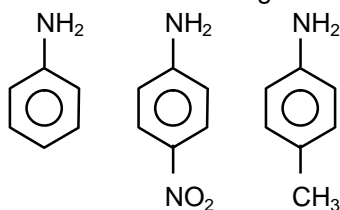
151. Name the gas that can readily decolourise acidified $KMnO_4$ solution:
(1) CO_2 (2) SO_2 (3) NO_2 (4) P_2O_5

Ans. (2)

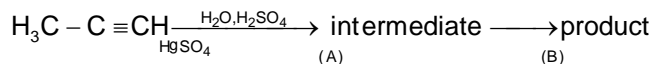**152.** The correct increasing order of basic strength for the following compounds is :

(I)   (II)   (III)

(1) II < III < I   (2) III < I < II   (3) III < II < I   (4) II < I < III

Ans. (4)

142. Predict the correct intermediate and product in the following reaction :

$H_3C - C \equiv CH \xrightarrow[HgSO_4]{H_2O,H_2SO_4}$ intermediate $\longrightarrow$ product
     (A)   (B)

(1) A : $H_3C-\underset{\underset{SO_4}{|}}{C}=CH_2$ B : $H_3C-\underset{\underset{O}{||}}{C}-CH_3$ (2) A : $H_3C-\underset{\underset{OH}{|}}{C}=CH_2$ B : $CH_3-\underset{\underset{SO_4}{|}}{C}-CH_2$

(3) A : $CH_3-\underset{\underset{O}{||}}{C}-CH_3$ B : $H_3C-C\equiv CH$ (4) A : $H_3C-\underset{\underset{OH}{|}}{C}=CH_2$ B : $H_3C-\underset{\underset{O}{||}}{C}-CH_3$

Ans. (4)

143. Which of the following is a sink for CO ?

(1) Haemoglobin   (2) Micro organisms present in the soil.

(3) Oceans   (4) Plants

Ans. (1)

144. Which of the following reactions is appropriate for converting acetamide to methanamine ?

(1) Carbylamine reaction   (2) Hoffmann hypobromamide reaction

(3) Stephens reaction   (4) Gabriels phthalimide synthesis

Ans. (2)

145. The species, having bond angles of 120^0 is :

(1) PH_3 (2) CIF_3 (3) NCl_3 (4) BCl_3

Ans. (4)

146. The correct of order the stoichiometries of AgCl formed when $AgNO_3$ in excess is treated with the complexes $CoCl_3.6NH_3$, $CoCl_3. 5NH_3$, $CoCl_3. 4NH_3$ respectively is :

(1) 1 AgCl, 3AgCl, 2AgCl   (2) 3AgCl, 1 AgCl, 2AgCl

(3) 3AgCl, 2AgCl, 1 AgCl   (4) 2 AgCl, 3 AgCl, 1 AgCl

Ans. (3)

147. For a given reaction $\Delta H = 35.5$ kJ mol^{-1} and $\Delta S = 83.6$ JK^{-1} mol^{-1}. The reaction is spontaneous at : (Assume that ΔH and ΔS do not vary with temperature)

(1) T < 425 K   (2) T > 425 K   (3) All temperatures   (4) T > 298 K

Ans. (2)

148. Match the interhalogen compounds of Column I with the geometry in column II and Assign the correct code.

	Column I		**Column II**
(a)	XX'	(i)	T-shape
(b)	XX_3'	(ii)	Pentagonal bipyramidal
(c)	XX_5'	(iii)	Linear
(d)	XX_7'	(iv)	Square-pyramidal
		(v)	Tetrahedral

136. The reason for greater range of oxidation states in actinoids is attributed to :
(1) The radioactive nature of actinoids
(2) Actinoid contraction
(3) 5f, 6d and 7s levels having comparable energies
(4) 4f and 5d levels being close in energies
Ans. (3)

137. An example of a sigma bonded organometallic compound is
(1) Ruthenocene (2) Grignard's reagent (3) Ferrocene (4) Cobaltocene
Ans. (2)

138. Which one is the **wrong** statement ?

(1) de-Broglie's wavelength is given by $\lambda = \dfrac{h}{m\upsilon}$, where m = mass of the particle, υ = group velocity of the particle.

(2) The uncertainty principle is $\Delta E \times \Delta t \geq \dfrac{h}{4\pi}$

(3) Half filled and fully filled orbitals have greater stability due to greater exchange energy, greater symmetry and more balanced arrangement.
(4) The energy of 2s orbital is less than the energy of 2p orbital in case of Hydrogen like atoms.
Ans. (4)

139. Mixture of chloroxylenol and terpineol acts as :
(1) Analgesic (2) Antiseptic (3) Antipyretic (4) Antibiotic
Ans. (2)

140. The element Z = 114 has beeen discovered recently. It will belong to which of the following family/ group and electronic configuration ?
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(3) Oxygen family, $[Rn] 5f^{14}6d^{10}7s^2 7p^4$ (4) Nitrogen family, $[Rn] 5f^{14}6d^{10}7s^2 7p^6$
Ans. (2)

141. A 20 litre container at 400 K contains $CO_2(g)$ at pressure 0.4 atm and an excess of SrO neglect the volume of solid SrO). The volume of the container is now decreased by moving the movable piston fitted in the container. The maximum volume of the container, when pressure of CO_2 attains its maximum value, will be :
(Given that : $SrCO_3(s) \rightleftharpoons SrO(s) + CO_2(g)$, $Kp = 1.6$ atm$)$
(1) 5 litre (2) 10 litre (3) 4 litre (4) 2 litre
Ans. (1)