Series : AABB4/3

SET-3

प्रश्न-पत्र कोड
Q.P. Code **56/3/3**

रोल नं.
Roll No.

परीक्षार्थी प्रश्न-पत्र कोड को उत्तर-पुस्तिका के मुख-पृष्ठ पर अवश्य लिखें ।
Candidates must write the Q.P. Code on the title page of the answer-book.

- कृपया जाँच कर लें कि इस प्रश्न-पत्र में मुद्रित पृष्ठ **12** हैं ।
- प्रश्न-पत्र में दाहिने हाथ की ओर दिए गए प्रश्न-पत्र कोड को छात्र उत्तर-पुस्तिका के मुख-पृष्ठ पर लिखें ।
- कृपया जाँच कर लें कि इस प्रश्न-पत्र में **12** प्रश्न हैं ।
- **कृपया प्रश्न का उत्तर लिखना शुरू करने से पहले, उत्तर-पुस्तिका में प्रश्न का क्रमांक अवश्य लिखें ।**
- इस प्रश्न-पत्र को पढ़ने के लिए 15 मिनट का समय दिया गया है । प्रश्न-पत्र का वितरण पूर्वाह्न में 10.15 बजे किया जाएगा । 10.15 बजे से 10.30 बजे तक छात्र केवल प्रश्न-पत्र को पढ़ेंगे और इस अवधि के दौरान वे उत्तर-पुस्तिका पर कोई उत्तर नहीं लिखेंगे ।

- Please check that this question paper contains **12** printed pages.
- Q.P. Code number given on the right hand side of the question paper should be written on the title page of the answer-book by the candidate.
- Please check that this question paper contains **12** questions.
- **Please write down the Serial Number of the question in the answer-book before attempting it.**
- 15 minute time has been allotted to read this question paper. The question paper will be distributed at 10.15 a.m. From 10.15 a.m. to 10.30 a.m., the candidates will read the question paper only and will not write any answer on the answer-book during this period.

रसायन विज्ञान (सैद्धान्तिक)
CHEMISTRY (Theory)

*निर्धारित समय : **2** घण्टे*
*Time allowed : **2** hours*

*अधिकतम अंक : **35***
*Maximum Marks : **35***

सामान्य निर्देश :

निम्नलिखित निर्देशों को बहुत सावधानी से पढ़िए और उनका सख्ती से पालन कीजिए :

(i) *इस प्रश्न-पत्र में कुल **12** प्रश्न हैं । **सभी** प्रश्न अनिवार्य हैं ।*

(ii) *यह प्रश्न-पत्र **तीन** खंडों में विभाजित हैं – खंड **क, ख** एवं **ग** ।*

(iii) ***खंड – क** प्रश्न संख्या **1** से **3** तक अति लघु उत्तरीय प्रकार के प्रश्न हैं । प्रत्येक प्रश्न **2** अंक का है ।*

(iv) ***खंड – ख** प्रश्न संख्या **4** से **11** तक लघु उत्तरीय प्रकार के प्रश्न हैं । प्रत्येक प्रश्न **3** अंक का है ।*

(v) ***खंड – ग** प्रश्न संख्या **12** केस आधारित प्रश्न है । यह प्रश्न **5** अंक का है ।*

(vi) *लॉग टेबल एवं कैल्क्युलेटर का प्रयोग वर्जित है ।*

*

खंड – क

1. C_3H_7NO अणुसूत्र वाला कोई कार्बनिक यौगिक (A), Br_2 और KOH के साथ गरम किए जाने पर यौगिक (B) बनाता है । यौगिक (B) $CHCl_3$ और ऐल्कोहॉलिक पोटैशियम हाइड्रॉक्साइड के साथ गर्म करने पर दुर्गन्ध युक्त यौगिक (C) बनाता है तथा $C_6H_5SO_2Cl$ के साथ अभिक्रिया करने पर यौगिक (D) बनाता है जो क्षार में विलेय होता है । (A), (B), (C) और (D) की संरचनाएँ लिखिए। **2**

2. जब बेन्जैल्डिहाइड निम्नलिखित अभिकर्मकों के साथ अभिक्रिया करता है तो निर्मित उत्पादों को लिखिए (कोई **दो**) :

   (i) तनु NaOH की उपस्थिति में CH_3CHO

   (ii) दुर्बल अम्ल की उपस्थिति में $H_2N–OH$

   (iii) टॉलेन अभिकर्मक **1 × 2 = 2**

3. 0.001M ऐसीटिक अम्ल की चालकता 7.8×10^{-5} S cm^{-1} है । यदि ऐसीटिक अम्ल के लिए $\wedge°m$ का मान 390 S cm^2 mol^{-1} है तो इसकी वियोजन मात्रा का परिकलन कीजिए । **2**

General Instructions :

Read the following instructions very carefully and strictly follow them :

(i) *This question paper contains **12** questions. **All** questions are compulsory.*

(ii) *This question paper is divided into **three** Sections – Section **A, B** and **C**.*

(iii) ***Section - A** Q. Nos. **1** to **3** are very short answer type questions carrying **2** marks each.*

(iv) ***Section - B** Q. Nos. **4** to **11** are short answer type questions carrying **3** marks each.*

(v) ***Section - C** Q. No. **12** is case based question carrying **5** marks.*

(vi) *Use of log tables and calculators is NOT allowed.*

SECTION – A

1. An Organic compound (A) with molecular formula C_3H_7NO on heating with Br_2 and KOH forms a compound (B). Compound (B) on heating with $CHCl_3$ and alcoholic KOH produces a foul smelling compound (C) and on reacting with $C_6H_5SO_2Cl$ forms a compound (D) which is soluble in alkali. Write the structures of (A), (B), (C) and (D). **2**

2. Write the products formed when benzaldehyde reacts with the following reagents (Any **two**) :

   (i) CH_3CHO in presence of dilute NaOH

   (ii) $H_2N–OH$ in presence of weak acid

   (iii) Tollen's reagent **1 × 2 = 2**

3. The conductivity of 0.001M acetic acid is 7.8×10^{-5} S cm^{-1}. Calculate its degree of dissociation if $\Lambda^\circ m$ for acetic acid is 390 S cm^2 mol^{-1}. **2**

खंड – ख

4. (i) संक्रमण धातुओं के गलनांक उच्च क्यों होते हैं ?

(ii) संक्रमण धातुएँ सामान्यतः रंगीन यौगिक क्यों बनाती हैं ?

(iii) Mn^{3+}/Mn^{2+} युग्म के लिए E° का मान बहुत धनात्मक क्यों होता है ? **1 × 3 = 3**

5. (क) (i) आपके विचार से नीचे दिए गए अम्लों के जोड़े (युगल) में से कौन सा अम्ल अधिक प्रबल होगा ?

$F–CH_2–COOH$ अथवा $CH_3–COOH$

(ii) निम्नलिखित यौगिकों को उनके क्वथनांकों के बढ़ते क्रम में व्यवस्थित कीजिए :

CH_3CH_2OH, $CH_3–CHO$, $CH_3–COOH$

(iii) बेन्ज़ैल्डिहाइड और ऐसीटोफीनॉन में विभेद करने के लिए सरल रासायनिक परीक्षण दीजिए। **1 × 3 = 3**

अथवा

(ख) (i) कौन नाभिकरागी योगज अभिक्रिया तीव्रता से देगा ?

ऐसीटैल्डिहाइड या प्रोपेनोन

(ii) फेलिंग अभिकर्मक का संयोजन क्या है ?

(iii) ऐथेनैल के सेमीकार्बेज़ोन की संरचना बनाइए। **1 × 3 = 3**

6. कारण दीजिए :

(i) शुद्ध प्राथमिक ऐमीनों के विरचन के लिए ऐल्किल हैलाइडों का अमोनी अपघटन एक अच्छी विधि नहीं है।

(ii) ऐनिलीन फ्रीडेल–क्राफ्टस अभिक्रिया नहीं देता है।

(iii) यद्यपि – NH_2 समूह इलेक्ट्रॉनरागी प्रतिस्थापन अभिक्रियाओं में o/p निर्देशक होता है फिर भी ऐनिलीन के नाइट्रीकरण से m-नाइट्रोऐनिलीन की महत्त्वपूर्ण मात्रा बनती है। **1 × 3 = 3**

7. (क) क्या होता है जब

(i) प्रोपेनोन की CH_3MgBr के साथ अभिक्रिया करने के पश्चात् जल–अपघटित किया जाता है ?

(ii) एथेनैल को एथेनॉल के आधिक्य और अम्ल के साथ अभिकृत किया जाता है ?

(iii) मेथेनैल कैनिज़ारो अभिक्रिया देता है ? **1 × 3 = 3**

अथवा

SECTION – B

4. (i) Why are melting points of transition metals high ?

   (ii) Why the transition metals generally form coloured compounds ?

   (iii) Why E° value for Mn^{3+}/Mn^{2+} couple is highly positive ? **1 × 3 = 3**

5. (a) (i) Which acid of the following pair would you expect to be stronger ?

   $F–CH_2–COOH$ or $CH_3–COOH$

   (ii) Arrange the following compounds in increasing order of their boiling points :

   CH_3CH_2OH, $CH_3–CHO$, $CH_3–COOH$

   (iii) Give simple chemical test to distinguish between Benzaldehyde and Acetophenone. **1 × 3 = 3**

OR

   (b) (i) Which will undergo faster nucleophilic addition reaction ?

   Acetaldehyde or Propanone

   (ii) What is the composition of Fehling's reagent ?

   (iii) Draw structure of the semicarbazone of Ethanal. **1 × 3 = 3**

6. Give reasons :

   (i) Ammonolysis of alkyl halides is not a good method to prepare pure primary amines.

   (ii) Aniline does not give Friedel-Crafts reaction.

   (iii) Although $–NH_2$ group is o/p directing in electrophilic substitution reactions, yet aniline on nitration gives good yield of m-nitroaniline.

1 × 3 = 3

7. (a) What happens when

   (i) Propanone is treated with CH_3MgBr and then hydrolysed ?

   (ii) Ethanal is treated with excess ethanol and acid ?

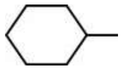
   (iii) Methanal undergoes Cannizzaro reaction ? **1 × 3 = 3**

OR

(ख) निम्नलिखित अभिक्रियाओं के मुख्य उत्पाद लिखिए :

(i) $2CH_3COCl + (CH_3)_2Cd \rightarrow$

(ii) $CH_3CH_2CHO \xrightarrow{\text{Zn (Hg) /सांद्र HCl}}$

(iii)  $-COONa + NaOH \xrightarrow[\Delta]{CaO}$ **1 × 3 = 3**

8. (क) निम्नलिखित के मध्य अंतर कीजिए :

(i) अधिशोषण एवं अवशोषण

(ii) द्रवविरागी सॉल और द्रवरागी सॉल

(iii) बहुआण्विक कोलॉइड एवं वृहदाण्विक कोलॉइड **1 × 3 = 3**

अथवा

(ख) (I) निम्नलिखित पदों को परिभाषित कीजिए :

(i) जीटा विभव

(ii) स्कंदन

(II) जब $AgNO_3$ विलयन को KI विलयन में मिलाया जाता है तो ऋण आवेशित सॉल क्यों प्राप्त होता है ? **3**

9. संक्रमण धातुओं को परिभाषित कीजिए । Zn, Cd और Hg संक्रमण धातुएँ क्यों नहीं कहलाती हैं ? संक्रमण धातुओं की ऑक्सीकरण अवस्थाओं में परिवर्तनशीलता p-ब्लॉक तत्त्वों की ऑक्सीकरण अवस्थाओं में परिवर्तनशीलता से किस प्रकार भिन्न है ? **3**

10. (a) संयोजकता आबंध सिद्धान्त का उपयोग करते हुए निम्नलिखित संकुल $[Ni(CO)_4]$ के संकरण एवं चुंबकीय लक्षण की प्रागुक्ति कीजिए । (परमाणु क्रमांक : Ni = 28)

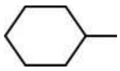
(b) $[Pt(NH_3)_2 Cl(NO_2)]$ का IUPAC नाम लिखिए ।

(c) $[Co(NH_3)_6]^{3+}$ की तुलना में संकुल $[Co(en)_3]^{3+}$ क्यों अधिक स्थायी है ? **1 × 3 = 3**

(b) Write the main product in the following reactions :

(i) $2CH_3COCl + (CH_3)_2Cd \rightarrow$

(ii) $CH_3\ CH_2\ CHO \xrightarrow{\text{Zn (Hg) /Conc HC}l}$

(iii)  $COONa + NaOH \xrightarrow[\Delta]{CaO}$ **1 × 3 = 3**

8. (a) Differentiate between the following :

(i) Adsorption and Absorption

(ii) Lyophobic Sol and Lyophilic Sol

(iii) Multimolecular Colloid and Macromolecular colloid. **1 × 3 = 3**

OR

(b) (I) Define the following terms :

(i) Zeta Potential

(ii) Coagulation

(II) Why a negatively charged sol is obtained when $AgNO_3$ solution is added to KI solution ? **3**

9. Define transition metals. Why Zn, Cd and Hg are not called transition metals ? How is the variability in oxidation states of transition metals different from that of p-block elements ? **3**

10. (a) Using valence bond theory, predict the hybridization and magnetic character of the complex : $[Ni(CO)_4]$ (Atomic number : Ni = 28)

(b) Write IUPAC name of $[Pt(NH_3)_2\ Cl(NO_2)]$.

(c) Why $[Co(en)_3]^{3+}$ is a more stable complex than $[Co(NH_3)_6]^{3+}$? **1 × 3 = 3**

11. (क) निम्नलिखित सेल के लिए $\Delta_r G^\circ$ और log Kc परिकलित कीजिए :

$$Ni(s) + 2\,Ag^+(aq) \rightarrow Ni^{2+}(aq) + 2Ag(s)$$

दिया है : E° सेल = 1.05V, IF = 96,500 $Cmol^{-1}$. **3**

अथवा

(ख) 298K पर निम्नलिखित सेल के लिए e.m.f. परिकलित कीजिए :

$$Fe(s)\ |\,Fe^{2+}\ (0.001\ M)\ |\,|\ H^+\ (0.01M)\ |\ H_2(g)\ (1\ bar)\ |\ Pt(s)$$

दिया है : E°सेल = +0.44 V

[log 2 = 0.3010   log 3 = 0.4771   log 10 = 1] **3**

खंड – ग

12. नीचे दिए गए अनुच्छेद को पढ़िए और दिए गए प्रश्नों के उत्तर लिखिए :

अभिक्रिया वेग, इकाई समय में अभिकारकों की सांद्रता घटने तथा उत्पादों की सांद्रता वृद्धि से संबंधित होता है । इसे किसी क्षण विशेष पर तात्क्षणिक वेग के रूप में और किसी दीर्घ समय अंतराल में औसत वेग से प्रदर्शित किया जा सकता है । अभिक्रिया वेग पर अनेक कारक, जैसे ताप, अभिकारकों की सांद्रता तथा उत्प्रेरक प्रभाव डालते हैं । अभिक्रिया वेग का गणितीय निरूपण वेग नियम द्वारा किया जाता है :

$$\text{वेग} = k[A]^x\,[B]^y$$

x एवं y इंगित करते हैं कि अभिक्रिया का वेग, A एवं B के सांद्रता परिवर्तन से कैसे प्रभावित होता है । x + y का योग अभिक्रिया की कुल कोटि को दर्शाता है ।

11. (a) Calculate $\Delta_r G^\circ$ and log Kc for the following cell :

$$Ni(s) + 2\,Ag^{+}(aq) \rightarrow Ni^{2+}(aq) + 2Ag(s)$$

Given that E°cell = 1.05V, IF = 96,500 $Cmol^{-1}$. **3**

OR

(b) Calculate the e.m.f. of the following cell at 298K :

$$Fe(s)\ |\ Fe^{2+}\ (0.001\ M)\ ||\ H^{+}\ (0.01M)\ |\ H_2(g)\ (1\ bar)\ |\ Pt(s)$$

Given that E°cell = +0.44 V

[log 2 = 0.3010 log 3 = 0.4771 log 10 = 1] **3**

SECTION – C

12. Read the following passage and answer the questions that follow :

The rate of reaction is concerned with decrease in concentration of reactants or increase in the concentration of products per unit time. It can be expressed as instantaneous rate at a particular instant of time and average rate over a large interval of time. A number of factors such as temperature, concentration of reactants, catalyst affect the rate of reaction. Mathematical representation of rate of a reaction is given by rate law :

$$Rate = k[A]^{x}\,[B]^{y}$$

x and y indicate how sensitive the rate is to the change in concentration of A and B. Sum of x + y gives the overall order of a reaction.

जब प्राथमिक अभिक्रियाएँ कई पदों में सम्पन्न होकर उत्पाद बनाती हो, तब ऐसी अभिक्रियाओं को जटिल अभिक्रिया कहते हैं । किसी प्राथमिक अभिक्रिया की आण्विकता एवं कोटि एक समान होती है । शून्य कोटि की अभिक्रियाएँ अपेक्षाकृत असामान्य हैं, किंतु विशेष परिस्थितियों में यह घटित होती हैं । अस्थायी नाभिकों के सभी प्राकृतिक एवं कृत्रिम रेडियोसक्रिय क्षय प्रथम कोटि की बलगतिकी द्वारा होते हैं ।

(a) किसी अभिक्रिया के वेग स्थिरांक पर ताप का क्या प्रभाव होता है ?

(b) किसी अभिक्रिया $A + B \rightarrow$ उत्पाद, के लिए वेग नियम है –

वेग = $k[A]^2 [B]^{1/2}$

अभिक्रिया की कोटि क्या है ?

(c) जटिल अभिक्रियाओं के लिए कोटि और आण्विकता किस प्रकार भिन्न हैं ?

(d) एक प्रथम कोटि की अभिक्रिया का वेग स्थिरांक $2 \times 10^{-3}\ s^{-1}$ है । इस अभिक्रिया में अभिकारक के 6g को घटकर 2g होने में कितना समय लगेगा ?

अथवा

^{14}C की रेडियोसक्रिय क्षय की अर्धायु 6930 वर्ष है । लकड़ी से युक्त एक पुरातात्विक अश्मोपकरण (युक्ति) में ^{14}C की मात्रा जीवित वृक्ष की अपेक्षा केवल 75% है । नमूने की आयु ज्ञात कीजिए ।

[log 4 = 0.6021   log 3 = 0.4771   log 2 = 0.3010   log 10 = 1]

1 + 1 + 1 + 2

When a sequence of elementary reactions gives us the products, the reactions are called complex reactions. Molecularity and order of an elementary reaction are same. Zero order reactions are relatively uncommon but they occur under special conditions. All natural and artificial radioactive decay of unstable nuclei take place by first order kinetics.

(a) What is the effect of temperature on the rate constant of a reaction ?

(b) For a reaction $A + B \rightarrow$ Product, the rate law is given by, Rate = $k[A]^2 [B]^{1/2}$. What is the order of the reaction ?

(c) How order and molecularity are different for complex reactions ?

(d) A first order reaction has a rate constant $2 \times 10^{-3} s^{-1}$. How long will 6g of this reactant take to reduce to 2g ?

OR

The half life for radioactive decay of ^{14}C is 6930 years. An archaeological artifact containing wood had only 75% of the ^{14}C found in a living tree. Find the age of the sample.

[log 4 = 0.6021 log 3 = 0.4771 log 2 = 0.3010 log 10 = 1]

1 + 1 + 1 + 2

*

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Senior Secondary School Term–II Examination, 2022

Marking Scheme: CHEMISTRY (Subject Code: 043)

[Paper Code: 56/3/3]

General Instructions: -

1. You are aware that evaluation is the most important process in the actual and correct assessment of the candidates. A small mistake in evaluation may lead to serious problems which may affect the future of the candidates, education system and teaching profession. To avoid mistakes, it is requested that before starting evaluation, you must read and understand the spot evaluation guidelines carefully.
2. **"Evaluation policy is a confidential policy as it is related to the confidentiality of the examinations conducted, Evaluation done and several other aspects. Its' leakage to public in any manner could lead to derailment of the examination system and affect the life and future of millions of candidates. Sharing this policy/document to anyone, publishing in any magazine and printing in News Paper/Website etc may invite action under IPC."**
3. Evaluation is to be done as per instructions provided in the Marking Scheme. It should not be done according to one's own interpretation or any other consideration. Marking Scheme should be strictly adhered to and religiously followed. **However, while evaluating, answers which are based on latest information or knowledge and/or are innovative, they may be assessed for their correctness otherwise and marks be awarded to them. In class-X, while evaluating two competency-based questions, please try to understand given answer and even if reply is not from marking scheme but correct competency is enumerated by the candidate, marks should be awarded.**
4. The Head-Examiner must go through the first five answer books evaluated by each evaluator on the first day, to ensure that evaluation has been carried out as per the instructions given in the Marking Scheme. The remaining answer books meant for evaluation shall be given only after ensuring that there is no significant variation in the marking of individual evaluators.
5. Evaluators will mark(√) wherever answer is correct. For wrong answer 'X" be marked. Evaluators will not put right kind of mark while evaluating which gives an impression that answer is correct and no marks are awarded. **This is most common mistake which evaluators are committing.**
6. If a question has parts, please award marks on the right-hand side for each part. Marks awarded for different parts of the question should then be totalled up and written in the left-hand margin and encircled. This may be followed strictly.
7. If a question does not have any parts, marks must be awarded in the left-hand margin and encircled. This may also be followed strictly.
8. If a student has attempted an extra question, answer of the question deserving more marks should be retained and the other answer scored out.
9. No marks to be deducted for the cumulative effect of an error. It should be penalized only once.
10. A full scale of marks 0-35 has to be used. Please do not hesitate to award full marks if the answer deserves it.
11. Every examiner has to necessarily do evaluation work for full working hours i.e., 8 hours every day and evaluate 30 answer books per day in main subjects and 35 answer books per day in other subjects (Details are given in Spot Guidelines). This is in view of the reduced syllabus and number of questions in question paper.
12. Ensure that you do not make the following common types of errors committed by the Examiner in the past:-
    - Leaving answer or part thereof unassessed in an answer book.

- Giving more marks for an answer than assigned to it.
- Wrong totaling of marks awarded on a reply.
- Wrong transfer of marks from the inside pages of the answer book to the title page.
- Wrong question wise totaling on the title page.
- Wrong totaling of marks of the two columns on the title page.
- Wrong grand total.
- Marks in words and figures not tallying.
- Wrong transfer of marks from the answer book to online award list.
- Answers marked as correct, but marks not awarded. (Ensure that the right tick mark is correctly and clearly indicated. It should merely be a line. Same is with the X for incorrect answer.)
- Half or a part of answer marked correct and the rest as wrong, but no marks awarded.

13. While evaluating the answer books if the answer is found to be totally incorrect, it should be marked as cross (X) and awarded zero (0) Marks.

14. Any unassessed portion, non-carrying over of marks to the title page, or totalling error detected by the candidate shall damage the prestige of all the personnel engaged in the evaluation work as also of the Board. Hence, in order to uphold the prestige of all concerned, it is again reiterated that the instructions be followed meticulously and judiciously.

15. The Examiners should acquaint themselves with the guidelines given in the Guidelines for spot Evaluation before starting the actual evaluation.

16. Every Examiner shall also ensure that all the answers are evaluated, marks carried over to the title page, correctly totalled and written in figures and words.

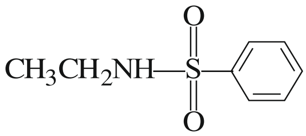
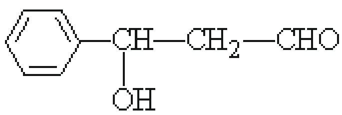
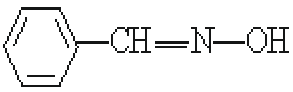
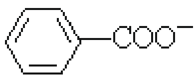
17. The Board permits candidates to obtain photocopy of the Answer Book on request in an RTI application and also separately as a part of the re-evaluation process on payment of the processing charges.

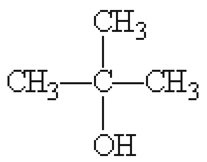
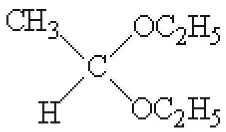
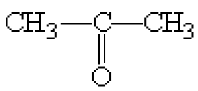
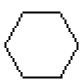
MARKING SCHEME

Senior Secondary School Examination TERM–II, 2022

CHEMISTRY (Subject Code–043)

[Paper Code: 56/3/3]

Q. No.	EXPECTED ANSWER / VALUE POINTS	Marks
	SECTION—A	
1.	(*A*) $CH_3CH_2CONH_2$ (*B*) $CH_3CH_2NH_2$ (*C*) CH_3CH_2NC (*D*) 	½×4=2
2.	(*i*)  / 3-Hydroxy-3-phenylpropanal (*ii*)  / Benzaldehyde oxime (*iii*)  / Benzoate ion (Any *two*)	1×2=2
3.	$\Lambda_m = \frac{k}{C} \times 1000\ \Omega^{-1}\ cm^2\ mol^{-1}$ $= \frac{7{\cdot}8 \times 10^{-5}}{0{\cdot}001} \times 1000\ \Omega^{-1}\ cm^2\ mol^{-1}$ $= 78\ \Omega^{-1}\ cm^2\ mol^{-1}$ or $78\ S\ cm^2\ mol^{-1}$ $\alpha = \frac{\Lambda_m}{\Lambda_m^\circ}$ $= \frac{78}{390} = 0{\cdot}2$	½ ½ ½ ½
	SECTION—B	
4.	(*i*) Because of strong intermetallic bonding / strong interatomic interactions forces. (*ii*) Because of the presence of unpaired electrons in *d*-orbital / due to *d*-*d* transition. (*iii*) Because of much larger third ionization enthalpy of Mn / stable half-filled $3d^5$ configuration in Mn^{2+}.	1×3

<table>
<tr><td>5.</td><td>(a)(i) $F-CH_2COOH$
(ii) $CH_3CHO < CH_3CH_2OH < CH_3COOH$
(iii) On warming with Tollens' reagent, benzaldehyde forms silver mirror whereas acetophenone does not. (Or any other suitable test)</td><td>1
1
1</td></tr>
<tr><td>5.</td><td>OR
(b) (i) Acetaldehyde
(ii) Aqueous copper sulphate solution and alkaline solution of sodium-potassium tartarate (Rochelle's salt).
(iii) $CH_3CH = NNHCONH_2$</td><td>1
1
1</td></tr>
<tr><td>6.</td><td>(i) Because it gives a mixture of amines which is difficult to separate
(ii) Aniline is a Lewis base and it reacts with $AlCl_3$ to form a salt / N of aniline acquires positive charge with $AlCl_3$ and hence is a deactivating group.
(iii) Because of protonation of aniline / formation of anilinium ion which deactivates the ring</td><td>1×3</td></tr>
<tr><td>7.</td><td>(a)
(i)  / 2-Methylpropan-2-ol
(ii)  / Diethoxy ethane / Acetal of ethanal
(iii) $HCOO^- + CH_3OH$ / Methanoate and Methanol</td><td>1×3</td></tr>
<tr><td>7.</td><td>OR
(b)
(i)  / Propanone
(ii) $CH_3CH_2CH_3$ / Propane
(iii)  / Cyclohexane</td><td>1 x3</td></tr>
<tr><td>8.</td><td>(a) (i)
<table><tr><th>Adsorption</th><th>Absorption</th></tr><tr><td>The accumulation of molecular species at the surface rather than in the bulk of a solid or liquid.</td><td>The substance is uniformly distributed throughout the bulk of the solid.</td></tr></table>(ii)
<table><tr><th>Lyophobic sol</th><th>Lyophilic sol</th></tr><tr><td>Solvent repelling</td><td>Solvent loving</td></tr></table></td><td>1
1</td></tr>
</table>

	(iii) <table><tr><th>Multimolecular colloid</th><th>Macromolecular colloid</th></tr><tr><td>On dissolution, a large number of atoms or smaller molecules of a substance aggregate together to form species having size in the colloidal range.</td><td>When a colloid is formed by macromolecules in suitable solvents having size in the colloidal range.</td></tr></table>(or any other suitable difference)	1
8.	**OR** *(b) (I) (i)* The potential difference between the fixed layer and the diffused layer of opposite charges is called zeta potential. *(ii)* The settling of colloidal particles / conversion of colloidal sol into precipitate. (II) Because of preferential adsorption of I^- ions on AgI colloid	1 1 1
9.	* Metals which have incomplete *d*-orbital in ground state or in its oxidation state. *Because of completely filled *d*-orbitals in ground state or in its oxidation state. *Oxidation states differ by +1 unit in transition metals whereas by +2 units in *p*-block elements / heavier elements are stable in higher oxidation state in transition elements whereas heavier elements are stable in lower oxidation states in p-block elements.	1 1 1
10.	*(a)* sp^3, diamagnetic *(b)* diamminechloridonitrito-*N*-platinum (II) *(c)* Because of chelate effect / due to cyclic structure.	½+½ 1 1
11.	*(a)* $\Delta_r G^\circ = -nFE^\circ_{cell}$ $= -2 \times 96500 \times 1.05 \text{ J mol}^{-1}$ $= -202,650 \text{ J mol}^{-1}$ *Or* $-202.65 \text{ kJ mol}^{-1}$ (Deduct ½ marks if no or incorrect unit) $\log K_C = \frac{nE^\circ_{cell}}{0.059}$ $= \frac{2 \times 1.05}{0.059}$ $= 35.6$	½ 1 ½ ½ ½
11.	***OR*** *(b)* $E_{cell} = E^\circ_{cell} - \frac{0.059}{2} \log \frac{[Fe^{2+}]}{[H^+]^2}$ $E_{cell} = 0.44 \text{ V} - \frac{0.059}{2} \log \frac{[0.001]}{[0.01]^2}$ $E_{cell} = 0.44 \text{ V} - \frac{0.059}{2} \log 10$ $E_{cell} = 0.44 \text{ V} - 0.0295 \text{ V} = 0.4105 \text{ V}$ (Deduct ½ marks if no or incorrect unit)	1 1 1

12.	*(a)* The rate constant increases. *(b)* $2+\frac{1}{2}=\frac{5}{2}$ *(c)* Order is applicable for complex reaction whereas molecularity has no meaning for complex reaction. *(d)* $k=\frac{2.303}{t}\log\frac{[R]_0}{[R]}$ $t=\frac{2.303}{2\times10^{-3}}\log\frac{6}{2}$ $t=\frac{2.303}{2\times10^{-3}}\times0.4771$ $t=549.38\text{ s}$ (Deduct ½ mark for incorrect unit or no unit)	1 1 1 ½ ½ 1
12.	**OR** $k=\frac{2.303}{t}\log\frac{[R]_0}{[R]}$ $t_{½}=\frac{0.693}{k}$ $k=\frac{0.693}{6930}\text{ year}^{-1}=10^{-4}\text{ year}^{-1}$ $t=\frac{2.303}{10^{-4}}\log\frac{100}{75}$ $=\frac{2.303}{10^{-4}}[0.6021-0.4771]$ $t=2878.75\text{ years}$	½ ½ ½ ½

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