

Series : AAB4/3



SET-2

प्रश्न-पत्र कोड 56/3/2  
Q.P. Code

रोल नं.

Roll No.

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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

56/3/2

222 B

1

P.T.O.

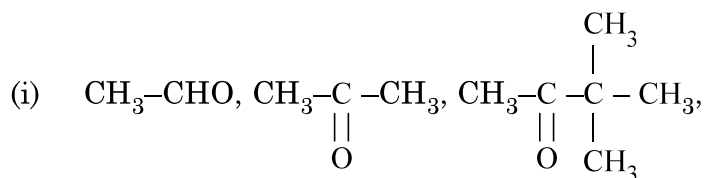
सामान्य निर्देश :

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

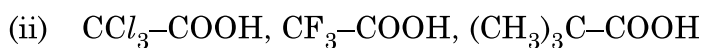
- (i) इस प्रश्न-पत्र में कुल 12 प्रश्न हैं। सभी प्रश्न अनिवार्य हैं।
- (ii) यह प्रश्न-पत्र तीन खंडों में विभाजित है – खंड क, ख एवं ग।
- (iii) खंड – क प्रश्न संख्या 1 से 3 तक अति लघु उत्तरीय प्रकार के प्रश्न हैं। प्रत्येक प्रश्न 2 अंक का है।
- (iv) खंड – ख प्रश्न संख्या 4 से 11 तक लघु उत्तरीय प्रकार के 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**

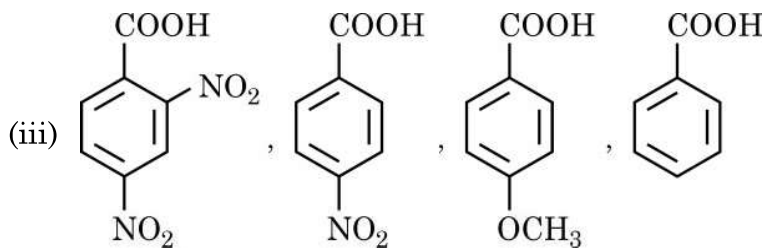
1. निम्नलिखित यौगिकों को उनसे संबंधित (कोष्ठकों में दिए गए) गुणधर्मों के बढ़ते क्रम में व्यवस्थित कीजिए :  
(कोई दो)



(HCN के प्रति अभिक्रियाशीलता)



(अम्लता की सामर्थ्य)



(अम्लता की सामर्थ्य)

1 × 2 = 2



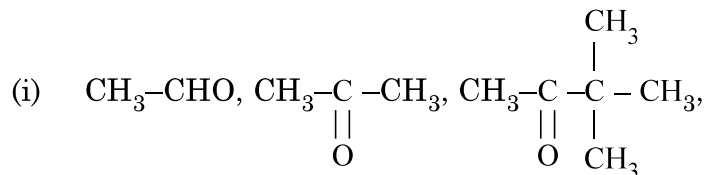
**General Instructions :**

**Read the following instructions very carefully and strictly follow them :**

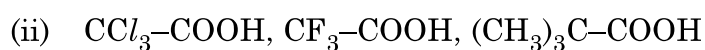
- (i) This question paper contains **12** questions. **All** questions are compulsory.
- (ii) This question paper is divided into **three** Sections – Section **A**, **B** and **C**.
- (iii) **Section - A** Q. Nos. **1** to **3** are very short answer type questions carrying **2** marks each.
- (iv) **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**

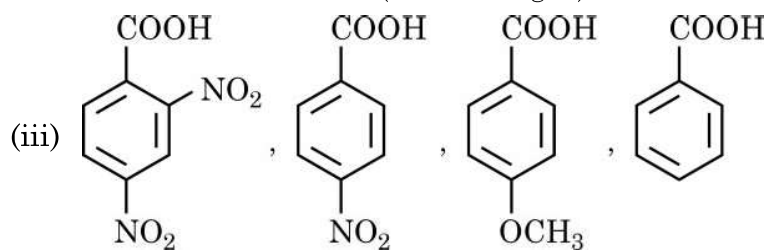
1. Arrange the following compounds in increasing order of their property as indicated in bracket : (Any **two**)



(reactivity towards HCN)



(acid strength)



(acid strength)

**1 × 2 = 2**



2.  $C_3H_7NO$  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 गरम 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
3. किसी वैद्युत-अपघट्य के विलयन की चालकता की परिभाषा दीजिए। किसी विलयन की चालकता तनुता के साथ क्यों घटती है? 2

### खंड – ख

4. निम्नलिखित के कारण लिखिए :
- (i)  $Cr^{2+}$  एक प्रबल अपचायक है।
  - (ii) जलीय विलयन में  $Ti^{3+}$  रंगीन है जबकि  $Sc^{3+}$  रंगहीन है।
  - (iii)  $Zn$ ,  $Cd$  एवं  $Hg$  को संक्रमण तत्व नहीं माना जाता।  $1 \times 3 = 3$
5. (क) निम्नलिखित के मध्य अंतर कीजिए :
- (i) अधिशोषण एवं अवशोषण
  - (ii) द्रवविरागी सॉल और द्रवरागी सॉल
  - (iii) बहुआण्विक कोलॉइड एवं वृहदाण्विक कोलॉइड  $1 \times 3 = 3$

### 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



- 
2. 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

3. Define conductivity for the solution of an electrolyte. Why does the conductivity of a solution decrease with dilution ? 2

### SECTION – B

4. Account for the following :
- (i)  $Cr^{2+}$  is a strong reducing agent.
  - (ii)  $Ti^{3+}$  is coloured whereas  $Sc^{3+}$  is colourless in aqueous solution.
  - (iii)  $Zn$ ,  $Cd$  and  $Hg$  are not called transition elements. 1 × 3 = 3
5. (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



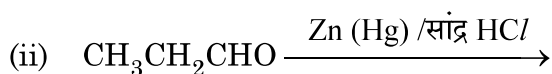
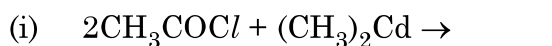
6. (क) क्या होता है जब

- (i) प्रोपेनोन की  $\text{CH}_3\text{MgBr}$  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

(ख) निम्नलिखित अभिक्रियाओं के मुख्य उत्पाद लिखिए :

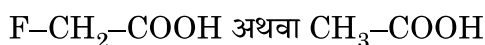


1 × 3 = 3

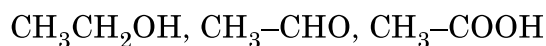
7. लैन्थेनॉयड आकुंचन क्या है ? लैन्थेनॉयड आकुंचन का क्या कारण है ? लैन्थेनॉयड आकुंचन के दो परिणाम लिखिए ।

3

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



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



(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) एथेनैल के सेमीकार्बेज़ोन की संरचना बनाइए ।

1 × 3 = 3



6. (a) What happens when

(i) Propanone is treated with  $\text{CH}_3\text{MgBr}$  and then hydrolysed ?

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

(iii) Methanal undergoes Cannizzaro reaction ?

$1 \times 3 = 3$

**OR**

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

(i)  $2\text{CH}_3\text{COCl} + (\text{CH}_3)_2\text{Cd} \rightarrow$

(ii)  $\text{CH}_3\text{CH}_2\text{CHO} \xrightarrow{\text{Zn (Hg) / Conc HCl}}$

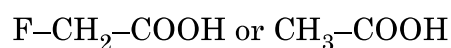
(iii)   $\text{COONa} + \text{NaOH} \xrightarrow[\Delta]{\text{CaO}}$

$1 \times 3 = 3$

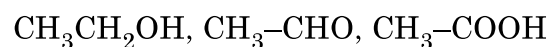
7. What is Lanthanoid contraction ? What is the cause of Lanthanoid contraction ? Write two consequences of Lanthanoid contraction.

**3**

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



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



(iii) Give simple chemical test to distinguish between Benzaldehyde and Acetophenone.

$1 \times 3 = 3$

**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.

$1 \times 3 = 3$

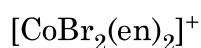


9. कारण दीजिए :

- (i) शुद्ध प्राथमिक ऐमीनों के विरचन के लिए ऐल्किल हैलाइडों का अमोनी अपघटन एक अच्छी विधि नहीं है।
- (ii) ऐनिलीन फ्रीडेल-क्राफ्ट्स 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 महत्वपूर्ण मात्रा बनती है।  $1 \times 3 = 3$

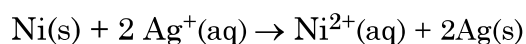
10. (a) संयोजकता आबंध सिद्धांत का उपयोग करते हुए  $[CoF_6]^{3-}$  के संकरण एवं चुम्बकीय व्यवहार की प्राप्ति कीजिए। [परमाणु क्रमांक : Co = 27]

(b) निम्नलिखित संकुल का IUPAC नाम लिखिए :



(c) विलयन में संकुल  $[Co(NH_3)_6]Cl_2$  द्वारा कितने आयन उत्पादित होते हैं ?  $1 \times 3 = 3$

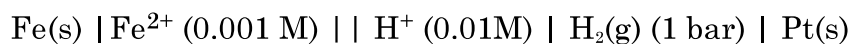
11. (क) निम्नलिखित सेल के लिए  $\Delta_r G^\circ$  और  $\log K_c$  परिकलित कीजिए :



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

**अथवा**

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



दिया है :  $E^\circ$  सेल = +0.44 V

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



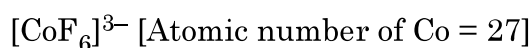


9. Give reasons :

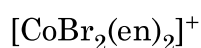
- (i) Ammonolysis of alkyl halides is not a good method to prepare pure primary amines.
- (ii) Aniline does not give Friedel-Crafts reaction.
- (iii) Although  $-\text{NH}_2$  group is o/p directing in electrophilic substitution reactions, yet aniline on nitration gives good yield of m-nitroaniline.

**1 × 3 = 3**

10. (a) Using valence bond theory, predict the hybridization and magnetic character of following :



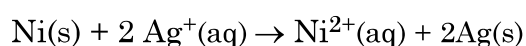
(b) Write IUPAC name of the following complex :



(c) How many ions are produced from the complex  $[\text{Co}(\text{NH}_3)_6]\text{Cl}_2$  in solution ?

**1 × 3 = 3**

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

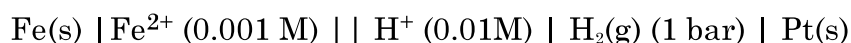


Given that  $E^\circ_{\text{cell}} = 1.05\text{V}$ ,  $IF = 96,500 \text{ Cmol}^{-1}$ .

**3**

**OR**

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



Given that  $E^\circ_{\text{cell}} = +0.44 \text{ V}$

$$[\log 2 = 0.3010 \quad \log 3 = 0.4771 \quad \log 10 = 1]$$

**3**



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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।

जब प्राथमिक अभिक्रियाएँ कई पदों में सम्पन्न होकर उत्पाद बनाती हो, तब ऐसी अभिक्रियाओं को जटिल अभिक्रिया कहते हैं। किसी प्राथमिक अभिक्रिया की आविष्कता 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  $A + B \rightarrow \text{उत्पाद}$ , के लिए वेग नियम है –

$$\text{वेग} = k[A]^2 [B]^{1/2}$$

अभिक्रिया की कोटि क्या है ?

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

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

अथवा

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

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

$$1 + 1 + 1 + 2$$



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## 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 :

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

$x$  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.

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  $A + B \rightarrow \text{Product}$ , the rate law is given by,  $\text{Rate} = k[A]^2 [B]^{1/2}$ . 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  $2 \times 10^{-3} \text{s}^{-1}$ . How long will 6g of this reactant take to reduce to 2g ?

**OR**

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

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

$$1 + 1 + 1 + 2$$



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\*



**Strictly Confidential: (For Internal and Restricted use only)**

**Senior Secondary School Term–II Examination, 2022**

**Marking Scheme: CHEMISTRY (Subject Code: 043)**

**[ Paper Code: 56/3/2]**

**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:-

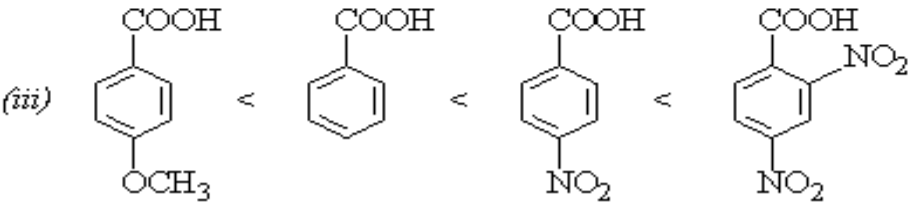
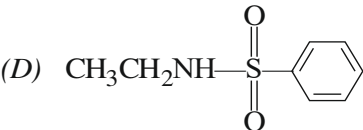
- Leaving answer or part thereof unassessed in an answer book.
  - Giving more marks for an answer than assigned to it.
  - Wrong totaling of marks awarded on a reply.
  - Wrong transfer of marks from the inside pages of the answer book to the title page.
  - Wrong question wise totaling on the title 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: 56/3/2]

Q. No.	EXPECTED ANSWER / VALUE POINTS	Marks
	<b>SECTION—A</b>	
1.	<p>(i) <math>\text{CH}_3-\text{C}(=\text{O})-\text{C}(\text{CH}_3)_2-\text{CH}_3 &lt; \text{CH}_3-\text{C}(=\text{O})-\text{CH}_3 &lt; \text{CH}_3-\text{CHO}</math></p> <p>(ii) <math>(\text{CH}_3)_3\text{C}-\text{COOH} &lt; \text{CCl}_3-\text{COOH} &lt; \text{CF}_3-\text{COOH}</math></p> <p>(iii) </p> <p style="text-align: right;">(Any two)</p>	1×2
2.	<p>(A) <math>\text{CH}_3\text{CH}_2\text{CONH}_2</math></p> <p>(B) <math>\text{CH}_3\text{CH}_2\text{NH}_2</math></p> <p>(C) <math>\text{CH}_3\text{CH}_2\text{NC}</math></p> <p>(D) </p>	$\frac{1}{2} \times 4$
3.	<p>Conductivity is the conductance of one unit volume of solution kept between two platinum electrodes with unit area of cross-section and at a distance of unit length.</p> <p>Because of decrease in the number of ions per unit volume.</p>	1 1
	<b>SECTION—B</b>	
4.	<p>(i) Because Cr is more stable in +3 oxidation state due to stable <math>t_{2g}^3</math> configuration</p> <p>(ii) Because of the presence of unpaired electron in 3d-orbital of <math>\text{Ti}^{3+}</math> whereas <math>\text{Sc}^{3+}</math> has no unpaired electron / <math>\text{Ti}^{3+}</math> shows d-d transition while <math>\text{Sc}^{3+}</math> does not.</p> <p>(iii) Because of completely filled d-orbital in the ground state or in any of its</p>	

	oxidation state.	1×3=3												
5.	<div>(a) (i)</div> <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> <div>(ii)</div> <table><tr><th>Lyophobic sol</th><th>Lyophilic sol</th></tr><tr><td>Solvent repelling</td><td>Solvent loving</td></tr></table> <div>(iii)</div> <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> <div>(or any other suitable difference)</div>	Adsorption	Absorption	The accumulation of molecular species at the surface rather than in the bulk of a solid or liquid.	The substance is uniformly distributed throughout the bulk of the solid.	Lyophobic sol	Lyophilic sol	Solvent repelling	Solvent loving	Multimolecular colloid	Macromolecular colloid	On dissolution, a large number of atoms or smaller molecules of a substance aggregate together to form species having size in the colloidal range.	When a colloid is formed by macromolecules in suitable solvents having size in the colloidal range.	<div>1</div> <div>1</div> <div>1</div>
Adsorption	Absorption													
The accumulation of molecular species at the surface rather than in the bulk of a solid or liquid.	The substance is uniformly distributed throughout the bulk of the solid.													
Lyophobic sol	Lyophilic sol													
Solvent repelling	Solvent loving													
Multimolecular colloid	Macromolecular colloid													
On dissolution, a large number of atoms or smaller molecules of a substance aggregate together to form species having size in the colloidal range.	When a colloid is formed by macromolecules in suitable solvents having size in the colloidal range.													
5.	<div>Or</div> <div>(b) (I) (i) The potential difference between the fixed layer and the diffused layer of opposite charges is called zeta potential.</div> <div>(ii) The settling of colloidal particles / conversion of colloidal sol into precipitate.</div> <div>(II) Because of preferential adsorption of I<sup>-</sup> ions on AgI colloid</div>	<div>1</div> <div>1</div> <div>1</div>												
6.	<div>(a)</div> <div>(i)</div> <div><div><div>CH<sub>3</sub></div><div>CH<sub>3</sub>—C—CH<sub>3</sub></div><div>OH</div></div><div>/ 2-Methylpropan-2-ol</div></div> <div>(ii)</div> <div><div><div>CH<sub>3</sub></div><div>CH<sub>3</sub>—C—OC<sub>2</sub>H<sub>5</sub></div><div>H</div><div>OC<sub>2</sub>H<sub>5</sub></div></div><div>/ Diethoxy ethane / Acetal of ethanal</div></div> <div>(iii)</div> <div><div>HCOO<sup>-</sup> + CH<sub>3</sub>OH</div><div>/ Methanoate and Methanol</div></div>	<div>1×3</div>												
6.	<div>OR</div> <div>(b)</div> <div>(i)</div> <div><div><div>CH<sub>3</sub>—C—CH<sub>3</sub></div><div>O</div></div><div>/ Propanone</div></div> <div>(ii)</div> <div><div>CH<sub>3</sub>CH<sub>2</sub>CH<sub>3</sub></div><div>/ Propane</div></div>	<div>1 x 3</div>												



	 (iii) / Cyclohexane	
7.	<p>*The filling of the 4f orbital before the 5d orbital resulting into regular decrease in atomic radii is called lanthanoid contraction.</p> <p>*Cause: This is due to poor screening effect of 4f-orbitals.</p> <p>*Consequences:</p> <p>(i) Similarity in the radii of the atoms of the elements of 2<sup>nd</sup> / 4d and 3<sup>rd</sup> / 5d transition series.</p> <p>(ii) Difficulty in separation of Lanthanoids in pure state.</p> <p>(iii) Similar physical and chemical properties.</p> <p>(iv) Basic character of the lanthanoid hydroxides M(OH)<sub>3</sub> decreases with increase in atomic number. (Any two consequences)</p>	1 1      1/2 + 1/2
8.	<p>(a) (i) F — CH<sub>2</sub>COOH</p> <p>(ii) CH<sub>3</sub>CHO &lt; CH<sub>3</sub>CH<sub>2</sub>OH &lt; CH<sub>3</sub>COOH</p> <p>(iii) On warming with Tollens' reagent, benzaldehyde forms silver mirror whereas acetophenone does not. (Or any other suitable test)</p>	1 1  1
8.	<p style="text-align: center;"><b>OR</b></p> <p>(b) (i) Acetaldehyde</p> <p>(ii) Aqueous copper sulphate solution and alkaline solution of sodium-potassium tartarate (Rochelle's salt).</p> <p>(iii) CH<sub>3</sub>CH = NNHCONH<sub>2</sub></p>	1 1  1
9.	<p>(i) Because it gives a mixture of amines which is difficult to separate</p> <p>(ii) Aniline is a Lewis base and it reacts with AlCl<sub>3</sub> to form a salt / N of aniline acquires positive charge with AlCl<sub>3</sub> and hence is a deactivating group.</p> <p>(iii) Because of protonation of aniline / formation of anilinium ion which deactivates the ring</p>	   1×3
10.	<p>(a) sp<sup>3</sup>d<sup>2</sup>, paramagnetic</p> <p>(b) dibromidobis(ethane-1,2-diamine)cobalt (III) ion</p> <p>(c) 3</p>	1/2+1/2 1 1
11.	<p>(a)</p> $\Delta_r G^\circ = -nFE_{\text{cell}}^\circ$ $= -2 \times 96500 \times 1.05 \text{ J mol}^{-1}$ $= -202,650 \text{ J mol}^{-1} \text{ Or } -202.65 \text{ kJ mol}^{-1}$ <p style="text-align: right;">(Deduct 1/2 marks if no or incorrect unit)</p> $\log K_C = \frac{nE_{\text{cell}}^\circ}{0.059}$ $= \frac{2 \times 1.05}{0.059}$ $= 35.6$	1/2  1  1/2

	<p style="text-align: center;"><b>OR</b></p> <p>(b)</p> $E_{\text{cell}} = E_{\text{cell}}^{\circ} - \frac{0.059}{2} \log \frac{[\text{Fe}^{2+}]}{[\text{H}^+]^2}$ $E_{\text{cell}} = 0.44 \text{ V} - \frac{0.059}{2} \log \frac{[0.001]}{[0.01]^2}$ $E_{\text{cell}} = 0.44 \text{ V} - \frac{0.059}{2} \log 10$ $E_{\text{cell}} = 0.44 \text{ V} - 0.0295 \text{ V} = 0.4105 \text{ V}$ <p style="text-align: right;">(Deduct ½ marks if no or incorrect unit)</p>	<p>½</p> <p>½</p> <p>1</p> <p>1</p> <p>1</p>
12.	<p>(a) The rate constant increases.</p> <p>(b) <math>2 + \frac{1}{2} = \frac{5}{2}</math></p> <p>(c) Order is applicable for complex reaction whereas molecularity has no meaning for complex reaction.</p> <p>(d) <math>k = \frac{2.303}{t} \log \frac{[R]_0}{[R]}</math></p> $t = \frac{2.303}{2 \times 10^{-3}} \log \frac{6}{2}$ $t = \frac{2.303}{2 \times 10^{-3}} \times 0.4771$ $t = 549.38 \text{ s}$ <p style="text-align: right;">(Deduct ½ mark for incorrect unit or no unit)</p>	<p>1</p> <p>1</p> <p>1</p> <p>½</p> <p>½</p> <p>1</p>
12.	<p style="text-align: center;"><b>OR</b></p> $k = \frac{2.303}{t} \log \frac{[R]_0}{[R]}$ $t_{1/2} = \frac{0.693}{k}$ $k = \frac{0.693}{6930} \text{ year}^{-1} = 10^{-4} \text{ year}^{-1}$ $t = \frac{2.303}{10^{-4}} \log \frac{100}{75}$ $= \frac{2.303}{10^{-4}} [0.6021 - 0.4771]$ $t = 2878.75 \text{ years}$	<p>½</p> <p>½</p> <p>½</p> <p>½</p>

\* \* \*