

Series AABB2/4



SET-2

प्रश्न-पत्र कोड  
Q.P. Code 56/4/2

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 11 हैं।
- प्रश्न-पत्र में दाहिने हाथ की ओर दिए गए प्रश्न-पत्र कोड को परीक्षार्थी 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 11 printed pages.
- Q.P. Code 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 students 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

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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 खण्डों – क, ख और ग में विभाजित है ।
- (iii) खण्ड क में प्रश्न संख्या 1 से 3 तक अति लघु-उत्तरीय प्रकार के प्रश्न हैं । प्रत्येक प्रश्न 2 अंकों का है ।
- (iv) खण्ड ख में प्रश्न संख्या 4 से 11 तक लघु-उत्तरीय प्रकार के प्रश्न हैं । प्रत्येक प्रश्न 3 अंकों का है ।
- (v) खण्ड ग में प्रश्न संख्या 12 प्रकरण आधारित प्रश्न है । यह प्रश्न 5 अंकों का है ।
- (vi) लॉग सारणियाँ और कैल्कुलेटर के प्रयोग करने की अनुमति नहीं है ।

### खण्ड क

1. प्रबल और दुर्बल अपघट्यों के लिए  $\Lambda_m$  के विपरीत सांद्रता के वर्गमूल ( $C^{1/2}$ ) के आलेख में दुर्बल अपघट्य की सीमांत मोलर चालकता का मान आलेखी विधि द्वारा प्राप्त नहीं किया जा सकता है । इस मान को प्राप्त करने के लिए एक विधि सुझाइए । संबंधित नियम भी लिखिए, यदि कोई है । 2
2. निम्नलिखित कथनों के लिए कारण लिखिए : 2×1=2
  - (i) बेन्ज़ोइक अम्ल फ्रीडेल-क्राफ्ट्स अभिक्रिया नहीं देता है ।
  - (ii) कीटोनों की तुलना में ऐल्डिहाइडों का ऑक्सीकरण आसान होता है ।
3. निम्नलिखित कथनों के लिए कारण दीजिए : (कोई दो) 2×1=2
  - (i) नाभिकरागी योगज अभिक्रियाओं में प्रोपेनैल की तुलना में बेन्ज़ैल्डिहाइड कम अभिक्रियाशील होता है ।
  - (ii) कार्बोक्सिलिक अम्ल, कार्बोनिल समूह की अभिक्रियाएँ नहीं देता है ।
  - (iii) बेन्ज़ोइक अम्ल की तुलना में 4-नाइट्रोबेन्ज़ोइक अम्ल अधिक प्रबल अम्ल है ।

### खण्ड ख

4. (क) (i) मूल अवस्था में सिल्वर परमाणु के d-कक्षक पूर्णतया भरित होते हैं, फिर भी इसे संक्रमण तत्त्व माना जाता है । कथन की पुष्टि कीजिए ।
- (ii) Mn और Zn के  $E_{M^{2+}/M}^\ominus$  मान अपेक्षित मानों से अधिक ऋणात्मक क्यों होते हैं ?
- (iii) संक्रमण धातुएँ मिश्रातुएँ क्यों निर्मित करती हैं ? 3×1=3

### अथवा

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### 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 – **A, B** and **C**.
- (iii) **Section A** – Questions no. **1 to 3** are very short answer type questions, carrying **2** marks each.
- (iv) **Section B** – Questions no. **4 to 11** are short answer type questions, carrying **3** marks each.
- (v) **Section C** – Question no. **12** is case based question, carrying **5** marks.
- (vi) Use of log tables and calculators is **not** allowed.

### SECTION A

1. In a plot of  $\Lambda_m$  against the square root of concentration ( $C^{1/2}$ ) for strong and weak electrolyte, the value of limiting molar conductivity of a weak electrolyte cannot be obtained graphically. Suggest a way to obtain this value. Also state the related law, if any. 2
2. Write reasons for the following statements : 2×1=2
  - (i) Benzoic acid does not undergo Friedel-Crafts reaction.
  - (ii) Oxidation of aldehydes is easier than that of ketones.
3. Give reasons for the following statements : (Any **two**) 2×1=2
  - (i) Benzaldehyde is less reactive than propanal in nucleophilic addition reactions.
  - (ii) Carboxylic acids do not give reactions of carbonyl group.
  - (iii) 4-nitrobenzoic acid is a stronger acid than benzoic acid.

### SECTION B

4. (a)
  - (i) Silver atom has completely filled d-orbitals in its ground state, it is still considered to be a transition element. Justify the statement.
  - (ii) Why are  $E_{M^{2+}/M}^\ominus$  values of Mn and Zn more negative than expected ?
  - (iii) Why do transition metals form alloys ? 3×1=3

OR

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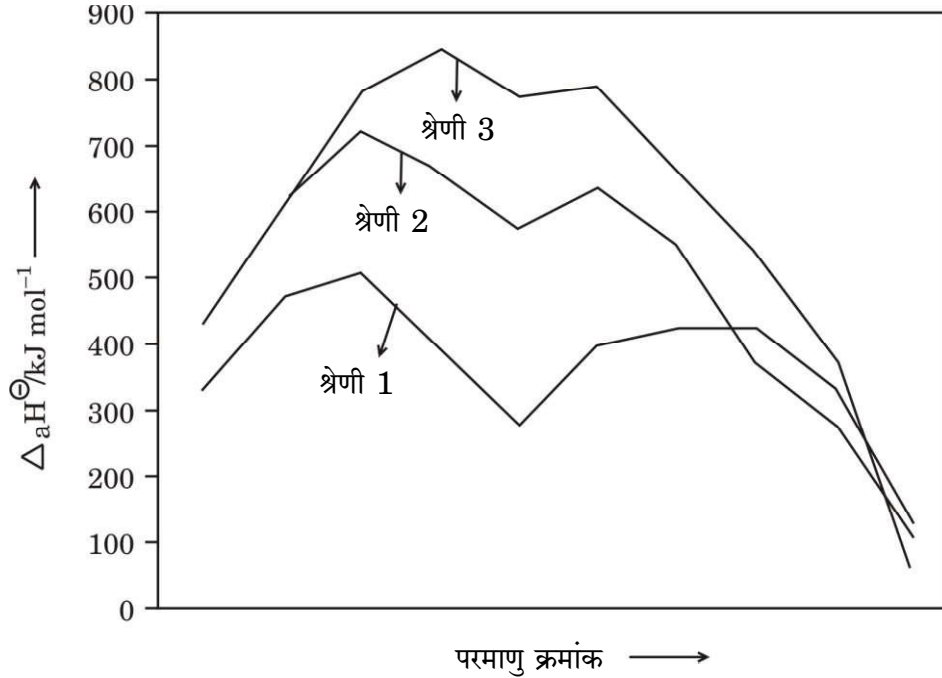
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(ख) नीचे दिए गए चित्र के आधार पर निम्नलिखित प्रश्नों के उत्तर दीजिए :

3×1=3



- 3d श्रेणी के किस तत्व की कणन एन्थैल्पी न्यूनतम होती है ?
- द्वितीय और तृतीय श्रेणियों के धातुओं की कणन एन्थैल्पी बृहत्तर क्यों होती हैं ?
- संक्रमण धातुओं की कणन एन्थैल्पी उच्च क्यों होती हैं ?

5. (क) (i) क्रिस्टल क्षेत्र विपाटन सिद्धांत के आधार पर  $d^4$  का इलेक्ट्रॉनिक विन्यास लिखिए, यदि  $\Delta_0 < P$  हो ।

(ii) वर्ग-समतली संरचना के साथ  $[\text{Ni}(\text{CN})_4]^{2-}$  प्रतिचुम्बकीय है जबकि चतुष्फलकीय ज्यामिति के साथ  $[\text{NiCl}_4]^{2-}$  अनुचुम्बकीय है । कथन के समर्थन के लिए कारण दीजिए । [परमाणु क्रमांक : Ni = 28]

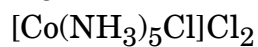
(iii) निम्नलिखित संकुल के विलयन में उत्पादित आयनों की संख्या लिखिए : 3×1=3



अथवा

(ख) (i) संकुल  $[\text{FeF}_6]^{3-}$  का केवल प्रचरण चुम्बकीय आघूर्ण परिकलित कीजिए । (Fe का परमाणु क्रमांक = 26)

(ii) दिए गए संकुल का IUPAC नाम लिखिए :

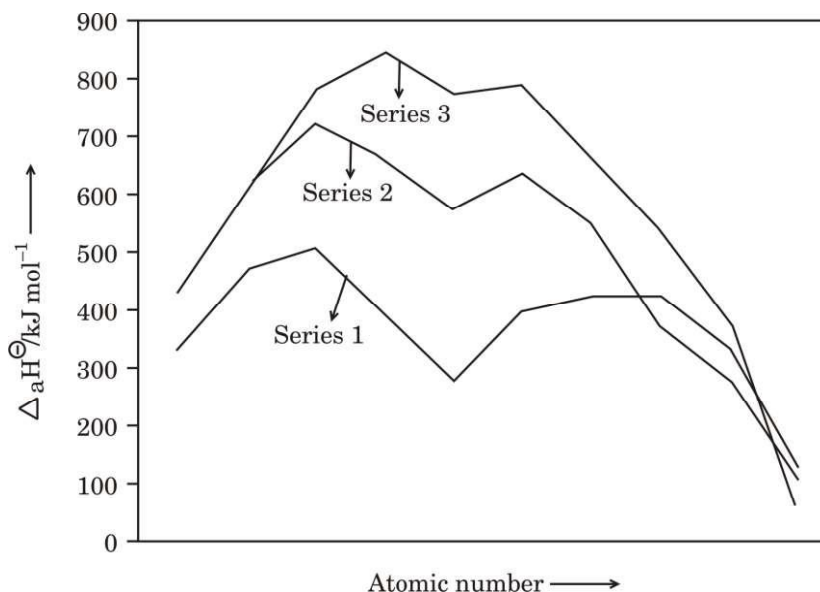


(iii)  $[\text{CoF}_6]^{3-}$  की तुलना में संकुल  $[\text{Co}(\text{en})_3]^{3+}$  अधिक स्थायी क्यों है ? 3×1=3

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- (b) Answer the following questions on the basis of the figure given below : 3×1=3



- (i) Which element in 3d series has lowest enthalpy of atomisation ?
- (ii) Why do metals of the second and third series have greater enthalpies of atomisation ?
- (iii) Why are enthalpies of atomisation of transition metals quite high ?
5. (a) (i) Write the electronic configuration of  $d^4$  on the basis of crystal field splitting theory, if  $\Delta_0 < P$ .
- (ii)  $[\text{Ni}(\text{CN})_4]^{2-}$  with square-planar structure is diamagnetic and  $[\text{NiCl}_4]^{2-}$  with tetrahedral geometry is paramagnetic. Give reason to support the statement.  
[Atomic number : Ni = 28]
- (iii) Write the number of ions produced in the solution from the following complex : 3×1=3  
 $[\text{PtCl}_2(\text{NH}_3)_4]\text{Cl}_2$
- OR**
- (b) (i) Calculate the spin only magnetic moment of the complex  $[\text{FeF}_6]^{3-}$ . (Atomic number of Fe = 26)
- (ii) Write the IUPAC name of the given complex :  
 $[\text{Co}(\text{NH}_3)_5\text{Cl}]\text{Cl}_2$
- (iii) Why is the complex  $[\text{Co}(\text{en})_3]^{3+}$  more stable than  $[\text{CoF}_6]^{3-}$  ? 3×1=3

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6. (क) निम्नलिखित अभिक्रियाओं से संबद्ध समीकरण लिखिए : 3×1=3
- (i) एथेनेमीन, ऐसीटल क्लोराइड के साथ अभिक्रिया करता है ।
- (ii) कक्ष ताप पर ऐनिलीन, ब्रोमीन जल के साथ अभिक्रिया करता है ।
- (iii) ऐनिलीन, क्लोरोफॉर्म और एथेनॉलिक पोटैशियम हाइड्रॉक्साइड के साथ अभिक्रिया करता है ।

**अथवा**

- (ख) (i) निम्नलिखित कार्बनिक यौगिक का IUPAC नाम लिखिए :  
(CH<sub>3</sub>CH<sub>2</sub>)<sub>2</sub>NCH<sub>3</sub>
- (ii) निम्नलिखित के लिए समीकरण लिखिए :
- (I) गैब्रिएल थैलिमाइड संश्लेषण
- (II) हॉफमान ब्रोमामाइड निम्नीकरण 1+2=3

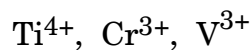
7. (क) निम्नलिखित के लिए कारण लिखिए : 3×1=3
- (i) एथिलऐमीन जल में विलेय है जबकि ऐनिलीन अविलेय है ।
- (ii) ऐरोमैटिक इलेक्ट्रॉनरागी प्रतिस्थापन अभिक्रियाओं में ऐमीनो समूह *o*- और *p*-निर्देशक होता है किन्तु ऐनिलीन के नाइट्रोकरण से *m*-नाइट्रोऐनिलीन की महत्वपूर्ण मात्रा बनती है ।
- (iii) ऐमीन नाभिकरागी की भाँति व्यवहार करते हैं ।

**अथवा**

- (ख) आप निम्नलिखित परिवर्तन कैसे करेंगे : 3×1=3
- (i) नाइट्रोबेन्ज़ीन से ऐनिलीन
- (ii) एथेनामाइड से मेथेनेमीन
- (iii) एथेननाइट्राइल से एथेनेमीन

8. एक यौगिक 'A' (C<sub>2</sub>H<sub>4</sub>O) ऑक्सीकृत होकर 'B' (C<sub>2</sub>H<sub>4</sub>O<sub>2</sub>) देता है । 'A' आयोडोफार्म अभिक्रिया द्वारा पीला अवक्षेप देता है तथा HCN से अभिक्रिया करके यौगिक 'C' बनाता है । 'C' जल-अपघटित होकर 2-हाइड्रॉक्सीप्रोपेनाइक अम्ल देता है । यौगिक 'A', 'B' और 'C' की पहचान कीजिए । संबद्ध अभिक्रियाओं के समीकरण लिखिए । 3

9. (i) निम्नलिखित में से कौन-सा आयन रंगहीन है और क्यों ?



(परमाणु क्रमांक : Ti = 22, Cr = 24, V = 23)

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6. (a) Write equations involved in the following reactions : 3×1=3
- (i) Ethanamine reacts with acetyl chloride.
  - (ii) Aniline reacts with bromine water at room temperature.
  - (iii) Aniline reacts with chloroform and ethanolic potassium hydroxide.

**OR**

- (b) (i) Write the IUPAC name for the following organic compound :  
 $(\text{CH}_3\text{CH}_2)_2\text{NCH}_3$
- (ii) Write the equations for the following :
- (I) Gabriel phthalimide synthesis
  - (II) Hoffmann bromamide degradation 1+2=3

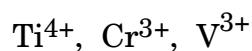
7. (a) Write reasons for the following : 3×1=3
- (i) Ethylamine is soluble in water whereas aniline is insoluble.
  - (ii) Amino group is *o*- and *p*-directing in aromatic electrophilic substitution reactions, but aniline on nitration gives a substantial amount of *m*-nitroaniline.
  - (iii) Amines behave as nucleophiles.

**OR**

- (b) How will you carry out the following conversions : 3×1=3
- (i) Nitrobenzene to Aniline
  - (ii) Ethanamide to Methanamine
  - (iii) Ethanenitrile to Ethanamine

8. A compound 'A' ( $\text{C}_2\text{H}_4\text{O}$ ) on oxidation gives 'B' ( $\text{C}_2\text{H}_4\text{O}_2$ ). 'A' undergoes Iodoform reaction to give yellow precipitate and reacts with HCN to form the compound 'C'. 'C' on hydrolysis gives 2-hydroxypropanoic acid. Identify the compounds 'A', 'B' and 'C'. Write down equations for the reactions involved. 3

9. (i) Which ion amongst the following is colourless and why ?



(Atomic number of Ti = 22, Cr = 24, V = 23)

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P.T.O.



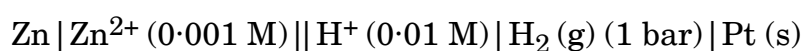
(ii) ऑक्सीकरण के प्रति  $\text{Fe}^{2+}$  की तुलना में  $\text{Mn}^{2+}$  बहुत अधिक प्रतिरोधी क्यों है ?

(iii) किसी धातु की उच्चतम ऑक्सीकरण अवस्था उसके केवल ऑक्साइड अथवा फ्लूओराइड में प्रदर्शित होती है ? इस कथन की पुष्टि कीजिए ।

3×1=3

10. 298 K पर निम्नलिखित सेल के लिए नेन्स्ट समीकरण लिखिए और वि.वा. बल (emf) परिकलित कीजिए :

3



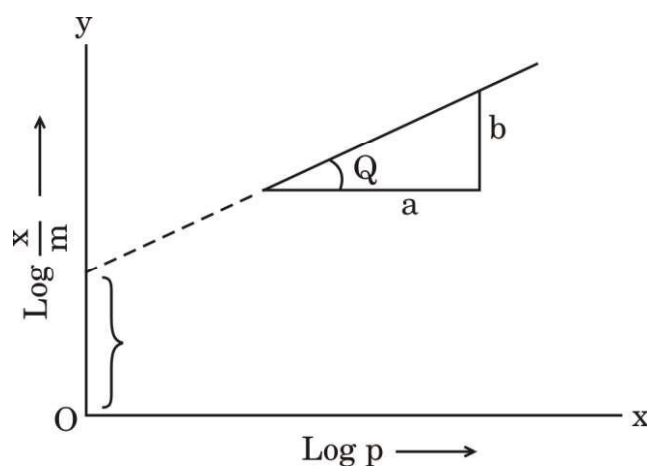
दिया गया है :  $E_{\text{Zn}^{2+}/\text{Zn}}^{\ominus} = -0.76 \text{ V}$

$E_{\text{H}^+/\text{H}_2}^{\ominus} = 0.00 \text{ V}$

[log 10 = 1]

11. दिए गए चित्र का अवलोकन कीजिए और निम्नलिखित प्रश्नों के उत्तर दीजिए :

3×1=3



(i) ठोसों पर गैसों के अधिशोषण के व्यंजक को समीकरण रूप में लिखिए ।

(ii) आलेख की ढाल क्या है ?

(iii) रेखा का अंतःखण्ड क्या निरूपित करता है ?

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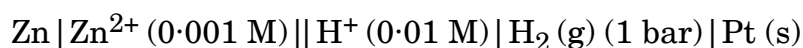
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- (ii) Why is  $\text{Mn}^{2+}$  much more resistant than  $\text{Fe}^{2+}$  towards oxidation ?
- (iii) Highest oxidation state of a metal is shown in its oxide or fluoride only. Justify the statement. 3×1=3

10. Write the Nernst equation and calculate the emf of the following cell at 298 K : 3

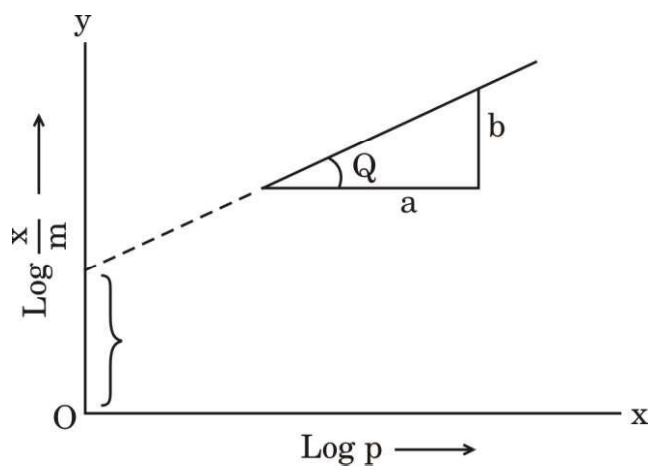


Given :  $E_{\text{Zn}^{2+}/\text{Zn}}^{\ominus} = -0.76 \text{ V}$

$$E_{\text{H}^+/\text{H}_2}^{\ominus} = 0.00 \text{ V}$$

[log 10 = 1]

11. Observe the given figure and answer the following questions : 3×1=3



- (i) Write the expression for adsorption of gases on solids in the form of an equation.
- (ii) What is the slope of the graph ?
- (iii) What does the intercept of the line represent ?

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P.T.O.

## खण्ड ग

12. नीचे दिए गए अनुच्छेद को पढ़िए और निम्नलिखित प्रश्नों के उत्तर दीजिए : 1+1+1+2=5

किसी रासायनिक अभिक्रिया के लिए वेग नियम, अभिक्रिया वेग को अभिकारकों की सांद्रता अथवा आंशिक दाब से संबंधित करता है। एक सामान्य अभिक्रिया  $aA + bB \longrightarrow C$  जिसमें इसकी अभिक्रिया कार्यविधि में कोई मध्यवर्ती चरण नहीं हैं, अर्थात् यह एक प्राथमिक अभिक्रिया है, वेग नियम दिया जाता है  $r = k[A]^x[B]^y$  जहाँ [A] और [B], A और B की सांद्रताओं को मोल प्रति लीटर में निरूपित करते हैं। घातांक  $x$  और  $y$  प्रत्येक अभिक्रिया के लिए परिवर्तित होते हैं जिन्हें प्रयोग द्वारा निर्धारित किया जाता है।  $k$  के मान उन परिस्थितियों के साथ परिवर्तित होते हैं जो अभिक्रिया वेग को प्रभावित करती हैं जैसे ताप, दाब, पृष्ठीय क्षेत्रफल, आदि। इन घातांकों का जोड़ अभिक्रिया की कुल कोटि के रूप में जाना जाता है। शून्य कोटि की अभिक्रिया का वेग स्थिर रहता है और यह अभिकारकों की सांद्रता पर निर्भरता से स्वतंत्र होता है। प्रथम कोटि की अभिक्रिया केवल एक अभिकारक की सांद्रता पर निर्भर करती है। एक अभिक्रिया द्वितीय कोटि की कही जाती है जब इसकी कुल कोटि दो हो। एक बार यदि हमने अभिक्रिया की कोटि निर्धारित कर ली, तो हम वापस जाकर किसी भी प्रारम्भिक मानों के एक समुच्चय से  $k$  हल कर सकते हैं।

- (i) निम्नलिखित वेग व्यंजक वाली अभिक्रिया की कुल कोटि परिकलित कीजिए : 1  
वेग =  $k[A]^{1/2} [B]^{3/2}$
- (ii) अभिक्रिया के वेग पर ताप का क्या प्रभाव होता है ? 1
- (iii) अभिक्रिया वेग से क्या अभिप्राय है ? 1
- (iv) (क) एक प्रथम कोटि की अभिक्रिया को 50% पूर्ण होने में 77.78 मिनट लगते हैं। इस अभिक्रिया के 30% पूर्ण होने में लगने वाले समय का परिकलन कीजिए। ( $\log 10 = 1$ ,  $\log 7 = 0.8450$ ) 2

### अथवा

- (ख) एक प्रथम कोटि की अभिक्रिया का वेग स्थिरांक  $1 \times 10^{-3}$  प्रति सेकण्ड है। इस अभिक्रिया में अभिकारक की मात्रा 5 g से घटकर 3 g होने में कितना समय लगेगा ? ( $\log 3 = 0.4771$ ,  $\log 5 = 0.6990$ ) 2



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### SECTION C

12. Read the passage given below and answer the questions that follow : 1+1+1+2=5

The rate law for a chemical reaction relates the reaction rate with the concentrations or partial pressures of the reactants. For a general reaction  $aA + bB \rightarrow C$  with no intermediate steps in its reaction mechanism, meaning that it is an elementary reaction, the rate law is given by  $r = k[A]^x[B]^y$ , where  $[A]$  and  $[B]$  express the concentrations of A and B in moles per litre. Exponents  $x$  and  $y$  vary for each reaction and are determined experimentally. The value of  $k$  varies with conditions that affect reaction rate, such as temperature, pressure, surface area, etc. The sum of these exponents is known as overall reaction order. A zero order reaction has a constant rate that is independent of the concentration of the reactants. A first order reaction depends on the concentration of only one reactant. A reaction is said to be second order when the overall order is two. Once we have determined the order of the reaction, we can go back and plug in one set of our initial values and solve for  $k$ .

- (i) Calculate the overall order of a reaction which has the following rate expression : 1  
$$\text{Rate} = k[A]^{1/2} [B]^{3/2}$$
- (ii) What is the effect of temperature on rate of reaction ? 1
- (iii) What is meant by rate of a reaction ? 1
- (iv) (a) A first order reaction takes 77.78 minutes for 50% completion. Calculate the time required for 30% completion of this reaction. ( $\log 10 = 1$ ,  $\log 7 = 0.8450$ ) 2

**OR**

- (b) A first order reaction has a rate constant  $1 \times 10^{-3}$  per sec. How long will 5 g of this reactant take to reduce to 3 g ? ( $\log 3 = 0.4771$ ;  $\log 5 = 0.6990$ ) 2



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

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

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

**[ Paper Code: 56/4/2 ]**

**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

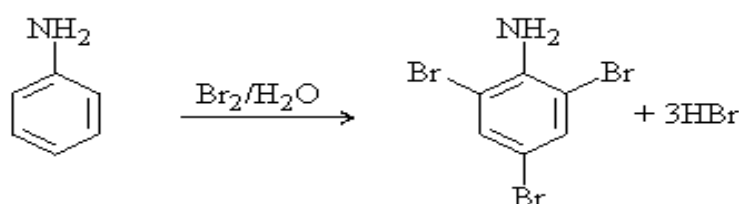
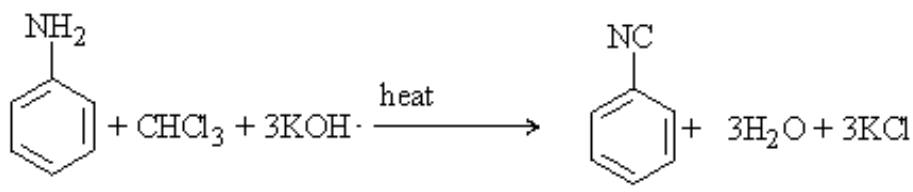
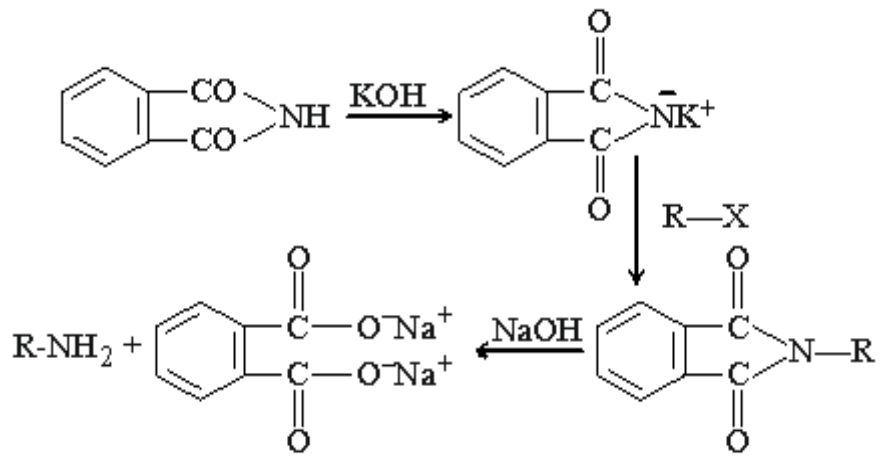
Senior Secondary School Examination TERM–II, 2022

### CHEMISTRY (Subject Code–043)

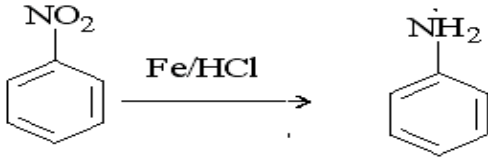
[ Paper Code: 56/4/2]

| Q. No. | EXPECTED ANSWER / VALUE POINTS   | Marks                          |
|--------|--|--------------------------------|
| 1.     | Limiting molar conductivity for weak electrolyte can be obtained by using Kohlrausch law.<br>It states that limiting molar conductivity of an electrolyte is the sum of conductivity of constituent ions.  | 1<br><br>1                     |
| 2.     | (i) Benzoic acid do not undergo Friedel-Crafts reaction because the carboxyl group is deactivating and the catalyst aluminium chloride gets bonded to the carboxyl group.<br>(ii) Because of oxidation of aldehyde involves cleavage of C—H bond which is weaker than C—C bond of ketone.  | 1<br><br>1                     |
| 3.     | (i) Carbon atom of carbonyl group of benzaldehyde is less electrophilic and polarity is reduced due to resonance.<br>(ii) Because of resonance by —OH of COOH which reduces the electrophilicity of carboxyl carbon / Because of resonance in COOH group due to which carbon loses its carbonyl nature.<br>(iii) Due to -I effect /electron withdrawing nature of NO <sub>2</sub> group.<br><span style="float: right;">(Any two)</span> | 1 x 2                          |
| 4.     | (a) (i) Silver has incompletely filled d-orbitals / d <sup>9</sup> configuration in +2 oxidation state.<br>(ii) Mn <sup>2+</sup> and Zn <sup>2+</sup> has stable half-filled and fully filled configurations / relatively less sublimation enthalpy of Mn and Zn.<br>(iii) Because of similar atomic radii.  | 1<br><br>1<br><br>1            |
| 4.     | <b>OR</b>  |                                |
|        | (b) (i) Zn<br>(ii) It is because of frequent metal-metal bonding.<br>(iii) Due to strong intermetallic bonding / strong interatomic interaction.   | 1<br><br>1<br><br>1            |
| 5.     | (a) (i) $t_{2g}^3 e_g^1$<br>(ii) Ni <sup>2+</sup> is 3d <sup>8</sup> and has $dsp^2$ hybridisation. Cyanide is a strong field ligand; electrons pair up so it is diamagnetic. In [NiCl <sub>4</sub> ] <sup>2-</sup> , Cl <sup>-</sup> is a weak field ligand, electrons do not pair up, hence hybridisation is $sp^3$ . Thus, it is paramagnetic.<br>(iii) 3   | 1<br><br>1<br><br>1            |
| 5.     | <b>OR</b>  |                                |
|        | (b) (i) Fe <sup>3+</sup> —No. of unpaired electrons = 5<br>$\mu = \sqrt{n(n+2)} = \sqrt{5(5+2)}$<br>$= 5.916 \text{ BM}$   | <br><br><br><br>1/2<br><br>1/2 |



|    |  |   |
|----|--|---|
|    | (ii) Pentaamminechloridocobalt(III) chloride   | 1 |
|    | (iii) $[\text{Co}(\text{en})_3]^{3+}$ , chelate effect / formation of cyclic structure.  | 1 |
| 6. | (a) (i) $\text{C}_2\text{H}_5\text{NH}_2 + \text{CH}_3\text{COCl} \xrightarrow{\text{Base}} \text{C}_2\text{H}_5\text{NHCOCH}_3 + \text{HCl}$  | 1 |
|    | (ii)   | 1 |
|    | (iii)    | 1 |
| 6. | <b>OR</b>  |   |
|    | (b) (i) N-Ethyl-N-methylethanamine   | 1 |
|    | (ii) (I)    | 1 |
|    | (II) $\text{CH}_3\text{—}\overset{\text{O}}{\parallel}\text{C—NH}_2 + \text{Br}_2 + 4\text{NaOH} \downarrow \text{CH}_3\text{NH}_2 + \text{Na}_2\text{CO}_3 + 2\text{NaBr} + 2\text{H}_2\text{O}$<br>(or any other correct reaction) | 1 |
| 7. | (a) (i) Ethylamine forms strong hydrogen bonds with water molecules whereas in aniline due to the large hydrocarbon part, the extent of H-bonding decreases.   | 1 |
|    | (ii) Because of protonation of aniline / formation of anilinium ion which deactivates the ring.  | 1 |
|    | (iii) Amines behaves as nucleophiles due to the presence of a lone pair of   |   |



|     |   |  |
|-----|---|--|
|     | electrons on the nitrogen atom.   | 1  |
| 7.  | <p style="text-align: center;"><b>OR</b></p> <p>(b) (i)</p>  <p style="text-align: center;"><math>\text{NO}_2</math><br/> <math>\xrightarrow{\text{Fe/HCl}}</math><br/> <math>\text{NH}_2</math></p> <p>(ii) <math>\text{CH}_3\text{CONH}_2 \xrightarrow{\text{Br}_2/\text{KOH}} \text{CH}_3\text{NH}_2</math></p> <p>(iii) <math>\text{CH}_3\text{CN} \xrightarrow{\text{LiAlH}_4} \text{CH}_3\text{CH}_2\text{NH}_2</math></p> <p style="text-align: right;">(or any other suitable method of conversion)</p>  | <p style="text-align: center;">1</p> <p style="text-align: center;">1</p> <p style="text-align: center;">1</p>   |
| 8.  | <p>A = Acetaldehyde / <math>\text{CH}_3\text{CHO}</math></p> <p>B = Ethanoic acid / <math>\text{CH}_3\text{COOH}</math></p> <p>C = Acetaldehyde cyanohydrin / <math>\text{CH}_3\text{CH}(\text{OH})\text{CN}</math></p> <p style="text-align: center;"> <math>\text{CH}_3\text{CHO} \xrightarrow{[\text{O}]} \text{CH}_3\text{COOH}</math><br/> (A) (B)</p> <p style="text-align: center;"> <math>\text{CH}_3\text{CHO} \xrightarrow{\text{I}_2/\text{NaOH}} \text{CHI}_3</math><br/> (A) Yellow ppt</p> <p style="text-align: center;"> <math>\text{CH}_3\text{CHO} \xrightarrow{\text{HCN}} \text{CH}_3\text{—CH—OH}</math><br/> (A)   CN (C)</p> <p style="text-align: center;"> <math>\text{CH}_3\text{—CH—OH} \xrightarrow{\text{H}_2\text{O}/\text{H}^+} \text{CH}_3\text{—CH—OH}</math><br/>   CN   COOH (C)</p> <p style="text-align: right;">(any three correct reactions)</p> | <p style="text-align: center;"><math>\frac{1}{2}</math></p> <p style="text-align: center;"><math>\frac{1}{2}</math></p> <p style="text-align: center;"><math>\frac{1}{2}</math></p> <p style="text-align: center;"><math>\frac{1}{2} \times 3</math></p> |
| 9.  | <p>(i) <math>\text{Ti}^{4+}</math><br/>no unpaired electrons in d-orbital / no d-d transition.</p> <p>(ii) <math>\text{Mn}^{2+}</math> is <math>d^5</math> and is more stable than <math>\text{Mn}^{3+}(d^4)</math> whereas <math>\text{Fe}^{3+}(d^5)</math> is more stable than <math>\text{Fe}^{2+}(d^4)</math>.</p> <p>(iii) Because fluorine and oxygen are highly electronegative / both are strong oxidising agents.</p>  | <p style="text-align: center;"><math>\frac{1}{2}</math></p> <p style="text-align: center;"><math>\frac{1}{2}</math></p> <p style="text-align: center;">1</p> <p style="text-align: center;">1</p>  |
| 10. | $E_{\text{cell}} = E_{\text{cell}}^0 - \frac{0.059}{2} \log \frac{[\text{Zn}^{2+}]}{[\text{H}^+]^2}$ $E_{\text{cell}}^0 = 0.0 - (-0.76) = 0.76 \text{ V}$   | <p style="text-align: center;"><math>\frac{1}{2}</math></p> <p style="text-align: center;"><math>\frac{1}{2}</math></p>  |





|            |   |                                 |
|------------|---|---------------------------------|
|            | $= 0.76 - \frac{0.059}{2} \log \frac{[0.001]}{[0.01]^2}$ $= 0.76 - 0.0295 \times 1$ $= 0.7305 \text{ V}$ <p style="text-align: right;">(Deduct ½ mark for no or incorrect unit)</p>   | 1<br>1                          |
| <b>11.</b> | <p>(i) <math>\log \frac{x}{m} = \log K + \frac{1}{n} \log P</math></p> <p>(ii) Slope = <math>\frac{1}{n}</math> or b/a</p> <p>(iii) Intercept = log K</p>   | 1<br>1<br>1                     |
| <b>12.</b> | <p>(i) Order = <math>\frac{1}{2} + \frac{3}{2} = 2</math></p> <p>(ii) The rate of reaction increases with the increase in temperature.</p> <p>(iii) Rate of a reaction is the change in concentration of the reactants or products per unit time.</p> <p>(iv) (a)</p> $k = \frac{0.693}{t_{\frac{1}{2}}} = \frac{0.693}{77.78} = 0.008909 \text{ min}^{-1}$ $t = \frac{2.303}{k} \log \frac{a}{a-x}$ $t = \frac{2.303}{0.008909} \log \frac{100}{100-30}$ $t = 258.5026 (\log 10 - \log 7)$ $= 258.5026 \times 0.155$ $= 40.06 \text{ min or } 40.02 \text{ min}$ | 1<br>1<br>1<br>½<br>½<br>½<br>½ |
|            | <b>OR</b>   |                                 |
|            | <p>(b)</p> $k = \frac{2.303}{t} \log \frac{[R]_0}{[R]}$ $t = \frac{2.303}{1 \times 10^{-3}} \log \frac{5}{3}$ $t = 2.303 \times 10^3 [0.699 - 0.4771]$ $t = 511 \text{ s}$  | ½<br>½<br>½<br>½                |

\* \* \*