Series HMJ/1 **SET-1**

कोड नं.
Code No. **56/1/1**

रोल नं.
Roll No. | | | | | | | | |

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

	नोट		NOTE
(I)	कृपया जाँच कर लें कि इस प्रश्न-पत्र में मुद्रित पृष्ठ **19** हैं ।	(I)	Please check that this question paper contains **19** printed pages.
(II)	प्रश्न-पत्र में दाहिने हाथ की ओर दिए गए कोड नम्बर को छात्र उत्तर-पुस्तिका के मुख-पृष्ठ पर लिखें ।	(II)	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.
(III)	कृपया जाँच कर लें कि इस प्रश्न-पत्र में **37** प्रश्न हैं ।	(III)	Please check that this question paper contains **37** questions.
(IV)	कृपया प्रश्न का उत्तर लिखना शुरू करने से पहले, उत्तर-पुस्तिका में प्रश्न का क्रमांक अवश्य लिखें ।	(IV)	Please write down the Serial Number of the question in the answer-book before attempting it.
(V)	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 ।	(V)	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 : 3 घण्टे *अधिकतम अंक : 70*

Time allowed : 3 hours *Maximum Marks : 70*

सामान्य निर्देश :

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

(i) *यह प्रश्न-पत्र* ***चार*** *खण्डों में विभाजित किया गया है –* ***क, ख, ग*** *एवं* ***घ*** *। इस प्रश्न-पत्र में* ***37*** *प्रश्न हैं ।* ***सभी*** *प्रश्न अनिवार्य हैं ।*

(ii) ***खण्ड क*** *में प्रश्न संख्या* ***1*** *से* ***20*** *तक अति लघु-उत्तरीय प्रकार के प्रश्न हैं, प्रत्येक प्रश्न* ***1*** *अंक का है । प्रत्येक प्रश्न का उत्तर एक शब्द या एक वाक्य में दीजिए ।*

(iii) ***खण्ड ख*** *में प्रश्न संख्या* ***21*** *से* ***27*** *तक लघु-उत्तरीय प्रकार के प्रश्न हैं, प्रत्येक प्रश्न* ***2*** *अंकों का है ।*

(iv) ***खण्ड ग*** *में प्रश्न संख्या* ***28*** *से* ***34*** *तक दीर्घ-उत्तरीय प्रकार-I के प्रश्न हैं, प्रत्येक प्रश्न* ***3*** *अंकों का है ।*

(v) ***खण्ड घ*** *में प्रश्न संख्या* ***35*** *से* ***37*** *तक दीर्घ-उत्तरीय प्रकार-II के प्रश्न हैं, प्रत्येक प्रश्न* ***5*** *अंकों का है ।*

(vi) *प्रश्न-पत्र में कोई समग्र विकल्प नहीं है । तथापि, दो-दो अंकों के दो प्रश्नों में, तीन-तीन अंकों के दो प्रश्नों में तथा पाँच-पाँच अंकों के तीनों प्रश्नों में आन्तरिक विकल्प दिया गया है । ऐसे प्रश्नों में से केवल एक ही विकल्प का उत्तर दीजिए ।*

(vii) *इसके अतिरिक्त, आवश्यकतानुसार, प्रत्येक खण्ड और प्रश्न के साथ यथोचित निर्देश दिए गए हैं ।*

(viii) *केल्कुलेटर अथवा लॉग टेबल के प्रयोग की अनुमति* ***नहीं*** *है ।*

खण्ड क

दिए गए अनुच्छेद को पढ़िए तथा प्रश्न संख्या ***1*** *से* ***5*** *के उत्तर दीजिए :* *1×5=5*

ऐल्किल हैलाइडों की प्रतिस्थापन अभिक्रिया मुख्यतया S_N1 अथवा S_N2 क्रियाविधि द्वारा होती है । प्रतिस्थापन अभिक्रियाएँ होने के लिए ऐल्किल हैलाइड किसी भी क्रियाविधि को अपनाएँ, उनके लिए कार्बन हैलोजन आबन्ध की ध्रुवणता ही उत्तरदायी होती है । S_N1 अभिक्रियाओं का वेग कार्बोकैटायन के स्थायित्व पर निर्भर करता है जबकि S_N2 अभिक्रियाओं का त्रिविमविन्यास कारक पर । यदि आरम्भिक पदार्थ किरेल यौगिक हो, तो उत्पाद या तो प्रतिलोमित होगा अथवा रेसिमिक मिश्रण, जो ऐल्किल हैलाइडों द्वारा अपनाई गई क्रियाविधि के प्रकार पर निर्भर करता है । ईथरों का HI से विदलन भी त्रिविमविन्यास कारक और कार्बोकैटायन के स्थायित्व से नियन्त्रित होता है, जो इस बात का द्योतक है कि कार्बनिक रसायन में यही दो प्रमुख कारक हैं जो हमें सहायता करते हैं कि उत्पाद किस प्रकार का बनेगा ?

General Instructions :

Read the following instructions very carefully and strictly follow them :

(i) *This question paper comprises **four** Sections – **A**, **B**, **C** and **D**. There are **37** questions in the question paper. **All** questions are compulsory.*

(ii) ***Section A** – Questions no. **1** to **20** are very short answer type questions, carrying **1** mark each. Answer these questions in one word or one sentence.*

(iii) ***Section B** – Questions no. **21** to **27** are short answer type questions, carrying **2** marks each.*

(iv) ***Section C** – Questions no. **28** to **34** are long answer type-I questions, carrying **3** marks each.*

(v) ***Section D** – Questions no. **35** to **37** are long answer type-II questions, carrying **5** marks each.*

(vi) *There is no overall choice in the question paper. However, an internal choice has been provided in 2 questions of two marks, 2 questions of three marks and all the 3 questions of five marks. You have to attempt only one of the choices in such questions.*

(vii) *In addition to this, separate instructions are given with each section and question, wherever necessary.*

(viii) *Use of calculators and log tables is **not** permitted.*

SECTION A

*Read the given passage and answer the questions number **1** to **5** that follow :* *1×5=5*

The substitution reaction of alkyl halide mainly occurs by S_N1 or S_N2 mechanism. Whatever mechanism alkyl halides follow for the substitution reaction to occur, the polarity of the carbon halogen bond is responsible for these substitution reactions. The rate of S_N1 reactions are governed by the stability of carbocation whereas for S_N2 reactions steric factor is the deciding factor. If the starting material is a chiral compound, we may end up with an inverted product or racemic mixture depending upon the type of mechanism followed by alkyl halide. Cleavage of ethers with HI is also governed by steric factor and stability of carbocation, which indicates that in organic chemistry, these two major factors help us in deciding the kind of product formed.

1. बनने वाले उत्पाद की त्रिविमरसायन की प्रागुक्ति कीजिए यदि कोई ध्रुवण घूर्णक (प्रकाशत: सक्रिय) ऐल्किल हैलाइड S_N1 क्रियाविधि से प्रतिस्थापन अभिक्रिया सम्पन्न करता है ।

2. उस यंत्र का नाम बताइए जो उस कोण के मापन के लिए प्रयुक्त होता है जिस पर समतल ध्रुवित प्रकाश घूर्णित हो जाता है ।

3. मुख्य उत्पाद की प्रागुक्ति कीजिए जब 2-ब्रोमोपेन्टेन, ऐल्कोहॉली KOH के साथ अभिक्रिया करता है ।

4. CHI_3 का एक उपयोग दीजिए ।

5. उन उत्पादों की संरचनाएँ लिखिए जब ऐनिसोल को HI के साथ अभिक्रियित किया जाता है ।

*प्रश्न संख्या **6** से **10** एक शब्द उत्तरीय हैं :* *1×5=5*

6. यदि द्रव A और B के क्वथनांक क्रमश: 140°C और 180°C हैं, तो उस द्रव की पहचान कीजिए जिसका 90°C पर वाष्प दाब उच्चतर होगा ।

7. लोहे की वस्तुओं को सुरक्षित रखने के लिए ज़िंक तथा टिन में से किसकी कोटिंग बेहतर है ?

8. क्या किसी अभिक्रिया का वेग स्थिरांक T पर निर्भर करेगा यदि अभिक्रिया की E_{act} (सक्रियण ऊर्जा) शून्य हो ?

9. PVC के एकलक की संरचना दीजिए ।

10. किसी अपमार्जक में उपस्थित कौन-सी संरचनात्मक इकाई उसको अजैवनिम्नीकरणीय बना देती है ?

*प्रश्न संख्या **11** से **15** बहुविकल्पीय प्रश्न हैं :* *1×5=5*

11. जलीय विलयन में निम्नलिखित में से प्रबलतम क्षार है

(A) मेथिलऐमीन

(B) डाइमेथिलऐमीन

(C) ट्राइमेथिलऐमीन

(D) ऐनिलीन

1. Predict the stereochemistry of the product formed if an optically active alkyl halide undergoes substitution reaction by S_N1 mechanism.

2. Name the instrument used for measuring the angle by which the plane polarised light is rotated.

3. Predict the major product formed when 2-Bromopentane reacts with alcoholic KOH.

4. Give one use of CHI_3.

5. Write the structures of the products formed when anisole is treated with HI.

*Questions number **6** to **10** are one word answers :* *1×5=5*

6. Identify which liquid will have a higher vapour pressure at 90°C if the boiling points of two liquids A and B are 140°C and 180°C, respectively.

7. Out of zinc and tin, whose coating is better to protect iron objects ?

8. Will the rate constant of the reaction depend upon T if the E_{act} (activation energy) of the reaction is zero ?

9. Give the structure of the monomer of PVC.

10. Which structural unit present in a detergent makes it non-biodegradable ?

*Questions number **11** to **15** are multiple choice questions :* *1×5=5*

11. Out of the following, the strongest base in aqueous solution is

(A) Methylamine

(B) Dimethylamine

(C) Trimethylamine

(D) Aniline

12. निम्नलिखित में से किसके द्वारा आयोडोफॉर्म परीक्षण ***नहीं*** दिया जाता है ?

(A) एथेनॉल

(B) एथेनैल

(C) पेन्टेन-2-ओन

(D) पेन्टेन-3-ओन

13. निम्नलिखित संक्रमण तत्त्वों में से किसके द्वारा अधिकतम ऑक्सीकरण अवस्थाएँ प्रदर्शित की जाती हैं ?

(A) Sc (Z = 21)

(B) Cr (Z = 24)

(C) Mn (Z = 25)

(D) Fe (Z = 26)

14. चर्म संस्करण उद्योग में चर्म का कठोर होना निर्भर करता है

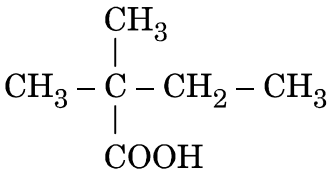
(A) वैद्युत कण-संचलन पर

(B) विद्युत्-परासरण पर

(C) पारस्परिक स्कंदन पर

(D) टिन्डल प्रभाव पर

15. दिए गए यौगिक का सही आई.यू.पी.ए.सी. नाम क्या है ?



(A) 2,2-डाइमेथिलब्यूटेनॉइक अम्ल

(B) 2-कार्बोक्सिल-2-मेथिलब्यूटेन

(C) 2-ऐथिल-2-मेथिलप्रोपेनॉइक अम्ल

(D) 3-मेथिलब्यूटेन कार्बोक्सिलिक अम्ल

12. Iodoform test is ***not*** given by

(A) Ethanol

(B) Ethanal

(C) Pentan-2-one

(D) Pentan-3-one

13. Out of the following transition elements, the maximum number of oxidation states are shown by

(A) Sc (Z = 21)

(B) Cr (Z = 24)

(C) Mn (Z = 25)

(D) Fe (Z = 26)

14. Hardening of leather in tanning industry is based on

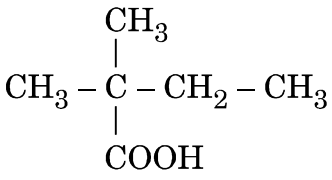
(A) Electrophoresis

(B) Electro-osmosis

(C) Mutual coagulation

(D) Tyndall effect

15. What is the correct IUPAC name of the given compound ?



(A) 2,2-Dimethylbutanoic acid

(B) 2-Carboxyl-2-methylbutane

(C) 2-Ethyl-2-methylpropanoic acid

(D) 3-Methylbutane carboxylic acid

प्रश्न संख्या 16 से 20 के लिए, दो कथन दिए गए हैं जिनमें एक को अभिकथन (A) तथा दूसरे को कारण (R) द्वारा अंकित किया गया है । इन प्रश्नों के सही उत्तर नीचे दिए गए कोडों (i), (ii), (iii) और (iv) में से चुनकर दीजिए : *1×5=5*

(i) अभिकथन (A) और कारण (R) दोनों सही कथन हैं और कारण (R), अभिकथन (A) की सही व्याख्या है ।

(ii) अभिकथन (A) और कारण (R) दोनों सही कथन हैं, परन्तु कारण (R), अभिकथन (A) की सही व्याख्या ***नहीं*** है ।

(iii) अभिकथन (A) सही है, परन्तु कारण (R) ग़लत कथन है ।

(iv) अभिकथन (A) ग़लत है, परन्तु कारण (R) सही कथन है ।

16. *अभिकथन (A) :* Au और Ag का निष्कर्षण उनके अयस्कों के NaCN के तनु विलयन द्वारा निक्षालन से किया जाता है ।

कारण (R) : इन अयस्कों से संबद्ध अशुद्धियाँ NaCN में घुल जाती हैं ।

17. *अभिकथन (A) :* F_2 अणु में F – F आबन्ध दुर्बल होता है ।

कारण (R) : F परमाणु का आकार छोटा होता है ।

18. *अभिकथन (A) :* उपसहसंयोजन यौगिकों में उभयदंती संलग्नी के कारण बन्धनी समावयवता उत्पन्न होती है ।

कारण (R) : उभयदंती संलग्नी जैसे NO_2 में दो भिन्न दाता परमाणु N और O होते हैं ।

19. *अभिकथन (A) :* सूक्रोस एक अनपचयी शर्करा है ।

कारण (R) : सूक्रोस में ग्लाइकोसिडिक बंध होता है ।

20. *अभिकथन (A) :* अभिक्रिया $H_2 + Br_2 \rightarrow 2HBr$ में आण्विकता 2 प्रतीत होती है ।

कारण (R) : दी हुई प्राथमिक अभिक्रिया में अभिकारकों के दो अणु भाग लेते हैं ।

खण्ड ख

21. निम्नलिखित पदों की परिभाषा लिखिए : *1×2=2*

(a) प्रशांतक

(b) पूतिरोधी

अथवा

साबुनों की शोधन क्रिया समझाइए । *2*

For questions number 16 to 20, two statements are given – one labelled Assertion (A) and the other labelled Reason (R). Select the correct answer to these questions from the codes (i), (ii), (iii) and (iv) as given below : *1×5=5*

(i) Both Assertion (A) and Reason (R) are correct statements, and Reason (R) is the correct explanation of the Assertion (A).

(ii) Both Assertion (A) and Reason (R) are correct statements, but Reason (R) is ***not*** the correct explanation of the Assertion (A).

(iii) Assertion (A) is correct, but Reason (R) is incorrect statement.

(iv) Assertion (A) is incorrect, but Reason (R) is correct statement.

16. *Assertion (A) :* Au and Ag are extracted by leaching their ores with a dil. solution of NaCN.

Reason (R) : Impurities associated with these ores dissolve in NaCN.

17. *Assertion (A) :* F – F bond in F_2 molecule is weak.

Reason (R) : F atom is small in size.

18. *Assertion (A) :* Linkage isomerism arises in coordination compounds because of ambidentate ligand.

Reason (R) : Ambidentate ligand like NO_2 has two different donor atoms i.e., N and O.

19. *Assertion (A) :* Sucrose is a non-reducing sugar.

Reason (R) : Sucrose has glycosidic linkage.

20. *Assertion (A) :* The molecularity of the reaction $H_2 + Br_2 \rightarrow 2HBr$ appears to be 2.

Reason (R) : Two molecules of the reactants are involved in the given elementary reaction.

SECTION B

21. Define the following terms : *1×2=2*

(a) Tranquilizers

(b) Antiseptic

OR

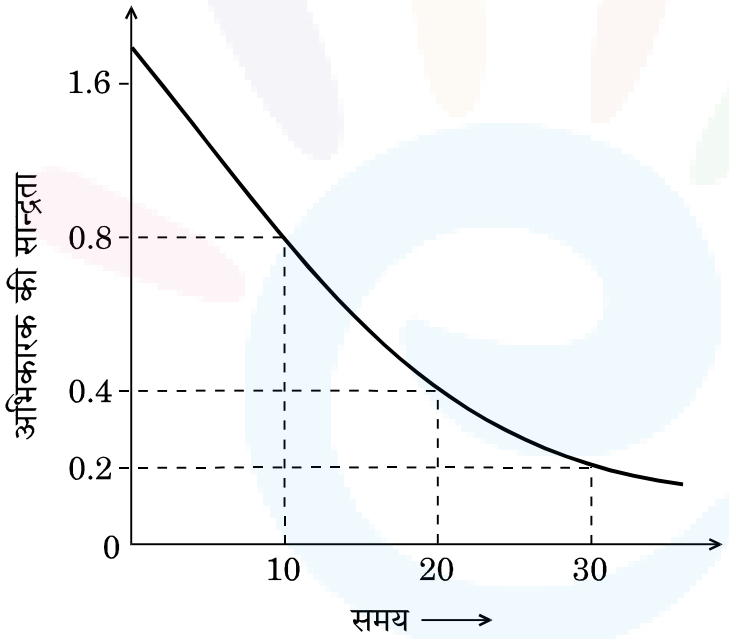
Explain the cleansing action of soaps. *2*

22. 300 K पर यूरिया (मोलर द्रव्यमान = 60 g/mol) के 5% विलयन का परासरण दाब परिकलित कीजिए । [R = 0·0821 L atm K^{-1} mol^{-1}] *2*

अथवा

विशा ने दो जलीय विलयन, एक में 100 g जल में यूरिया (मोलर द्रव्यमान = 60 g/mol) के 7·5 g और दूसरे में किसी पदार्थ Z के 42·75 g, 100 g जल में लिए । यह प्रेक्षित किया गया कि दोनों विलयन एकसमान ताप पर हिमीभूत हुए । Z का मोलर द्रव्यमान परिकलित कीजिए । *2*

23. अभिकारक की सान्द्रता और समय के बीच दिए गए ग्राफ का विश्लेषण कीजिए । *1×2=2*



(a) अभिक्रिया की कोटि की प्रागुक्ति कीजिए ।

(b) सैद्धान्तिक दृष्टि से क्या अनंतकाल के बाद किसी अभिकारक की सान्द्रता घटकर शून्य हो सकती है ? व्याख्या कीजिए ।

24. निम्नलिखित अणुओं की आकृति खींचिए : *1×2=2*

(a) $XeOF_4$

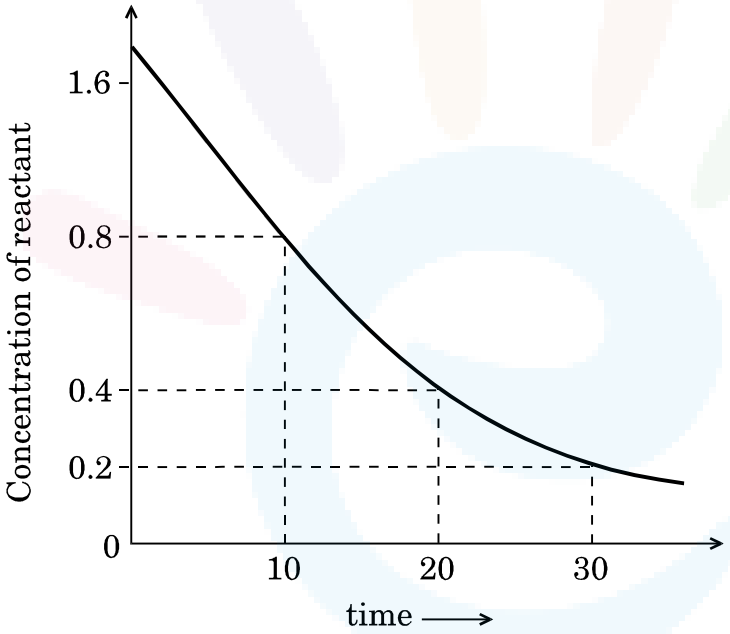
(b) BrF_3

22. For a 5% solution of urea (Molar mass = 60 g/mol), calculate the osmotic pressure at 300 K. [R = 0·0821 L atm K^{-1} mol^{-1}] *2*

OR

Visha took two aqueous solutions — one containing 7·5 g of urea (Molar mass = 60 g/mol) and the other containing 42·75 g of substance Z in 100 g of water, respectively. It was observed that both the solutions froze at the same temperature. Calculate the molar mass of Z. *2*

23. Analyse the given graph, drawn between concentration of reactant vs. time. *1×2=2*



(a) Predict the order of reaction.

(b) Theoretically, can the concentration of the reactant reduce to zero after infinite time ? Explain.

24. Draw the shape of the following molecules : *1×2=2*

(a) $XeOF_4$

(b) BrF_3

25. निम्नलिखित यौगिकों के सूत्र दीजिए : *1×2=2*

(a) पोटैशियम टेट्राहाइड्रोक्सिडोज़िंकेट (II)

(b) हेक्साऐम्मीनप्लैटिनम (IV) क्लोराइड

26. क्या होता है जब

(a) प्रोपेनोन को मेथिलमैग्नीशियम आयोडाइड के साथ अभिक्रियित करके जल-अपघटित किया जाता है, और

(b) बेन्ज़ीन को निर्जल $AlCl_3$ की उपस्थिति में CH_3COCl के साथ अभिक्रियित किया जाता है । *1×2=2*

27. निम्नलिखित बहुलकों में एकलकों के नाम और संरचनाएँ लिखिए : *1×2=2*

(a) बैकेलाइट

(b) निओप्रीन

खण्ड ग

28. निम्नलिखित अभिक्रियाओं के अनुक्रम में A और B की संरचनाएँ दीजिए : $\frac{1}{2}$*×6=3*

(a) $CH_3COOH \xrightarrow[\Delta]{NH_3} A \xrightarrow{NaOBr} B$

(b) $C_6H_5NO_2 \xrightarrow{Fe/HCl} A \xrightarrow[0^\circ - 5^\circ C]{NaNO_2 + HCl} B$

(c) $C_6H_5N_2^+Cl^- \xrightarrow[\Delta]{CuCN} A \xrightarrow{H_2O/H^+} B$

अथवा

(a) निम्नलिखित युगलों के यौगिकों के बीच आप विभेद कैसे करेंगे : *1×2=2*

(i) ऐनिलीन और एथेनेमीन

(ii) ऐनिलीन और N-मेथिलऐनिलीन

(b) निम्नलिखित यौगिकों को उनके क्वथनांक के घटते हुए क्रम में व्यवस्थित कीजिए : *1*

ब्यूटेनॉल, ब्यूटेनेमीन, ब्यूटेन

25. Give the formulae of the following compounds : *1×2=2*

(a) Potassium tetrahydroxidozincate (II)

(b) Hexaammineplatinum (IV) chloride

26. What happens when

(a) Propanone is treated with methylmagnesium iodide and then hydrolysed, and

(b) Benzene is treated with CH_3COCl in presence of anhydrous $AlCl_3$? *1×2=2*

27. Write the names and structures of monomers in the following polymers : *1×2=2*

(a) Bakelite

(b) Neoprene

SECTION C

28. Give the structures of A and B in the following sequence of reactions : $\frac{1}{2}$*×6=3*

(a) $CH_3COOH \xrightarrow[\Delta]{NH_3} A \xrightarrow{NaOBr} B$

(b) $C_6H_5NO_2 \xrightarrow{Fe/HCl} A \xrightarrow[0^\circ - 5^\circ C]{NaNO_2 + HCl} B$

(c) $C_6H_5\overset{+}{N}_2Cl^- \xrightarrow[\Delta]{CuCN} A \xrightarrow{H_2O/H^+} B$

OR

(a) How will you distinguish between the following pairs of compounds : *1×2=2*

(i) Aniline and Ethanamine

(ii) Aniline and N-methylaniline

(b) Arrange the following compounds in decreasing order of their boiling points : *1*

Butanol, Butanamine, Butane

29. निम्नलिखित के लिए विश्वसनीय स्पष्टीकरण दीजिए : *1×3=3*

(a) ग्लूकोस 2,4-डी.एन.पी. परीक्षण नहीं देता ।

(b) DNA के दो रज्जुक समान नहीं होते, परन्तु एक-दूसरे के पूरक होते हैं ।

(c) स्टार्च और सेलुलोस दोनों में एकलकों के रूप में ग्लूकोस इकाई होती है, फिर भी वे संरचनात्मक दृष्टि से भिन्न हैं ।

30. निम्नलिखित के कारण दीजिए : *1×3=3*

(a) सल्फ्यूरस अम्ल एक अपचायक है ।

(b) फ्लुओरीन केवल एक ऑक्सोअम्ल बनाती है ।

(c) उत्कृष्ट गैसों के क्वथनांक He से Rn तक बढ़ते हैं ।

अथवा

निम्नलिखित रासायनिक अभिक्रियाओं को पूर्ण कीजिए : *1×3=3*

(a) $MnO_2 + 4\ HCl \longrightarrow$

(b) $XeF_6 + KF \longrightarrow$

(c) $I^-(aq) + H^+(aq) + O_2(g) \longrightarrow$

31. निम्नलिखित की भूमिका की व्याख्या कीजिए : *1×3=3*

(a) ZnS और PbS को पृथक् करने में NaCN की ।

(b) अशुद्धि के रूप में लौहयुक्त Cu के धातुकर्म में SiO_2 की ।

(c) Ti के परिष्करण में आयोडीन की ।

32. भौतिक अधिशोषण और रसोवशोषण में विभेद के तीन बिन्दु दीजिए । *3*

33. अभिक्रिया का वेग किस प्रकार प्रभावित होगा जब

(a) अभिकारक का पृष्ठीय क्षेत्रफल कम कर दिया जाए,

(b) उत्क्रमणीय अभिक्रिया में उत्प्रेरक मिला दिया जाए, और

(c) अभिक्रिया का ताप बढ़ा दिया जाए ? *1×3=3*

34. 75 g ऐसीटिक अम्ल में घोले जाने वाली ऐस्कॉर्बिक अम्ल (मोलर द्रव्यमान = 176 g mol^{-1}) की मात्रा (द्रव्यमान) परिकलित कीजिए जिससे इसका हिमांक 1·5°C कम हो जाए । (K_f = 3·9 K kg mol^{-1}) *3*

29. Give the plausible explanation for the following : *1×3=3*

(a) Glucose doesn't give 2,4-DNP test.

(b) The two strands in DNA are not identical but are complementary.

(c) Starch and cellulose both contain glucose unit as monomer, yet they are structurally different.

30. Account for the following : *1×3=3*

(a) Sulphurous acid is a reducing agent.

(b) Fluorine forms only one oxoacid.

(c) Boiling point of noble gases increases from He to Rn.

OR

Complete the following chemical reactions : *1×3=3*

(a) $MnO_2 + 4\ HCl \longrightarrow$

(b) $XeF_6 + KF \longrightarrow$

(c) $I^-(aq) + H^+(aq) + O_2(g) \longrightarrow$

31. Explain the role of the following : *1×3=3*

(a) NaCN in the separation of ZnS and PbS.

(b) SiO_2 in the metallurgy of Cu containing Fe as impurity.

(c) Iodine in the refining of Ti.

32. Give three points of difference between physisorption and chemisorption. *3*

33. How will the rate of the reaction be affected when

(a) Surface area of the reactant is reduced,

(b) Catalyst is added in a reversible reaction, and

(c) Temperature of the reaction is increased ? *1×3=3*

34. Calculate the mass of ascorbic acid (Molar mass = 176 g mol^{-1}) to be dissolved in 75 g of acetic acid, to lower its freezing point by 1·5°C. (K_f = 3·9 K kg mol^{-1}) *3*

खण्ड घ

35. (a) अभिक्रिया

$$Zn\,(s) + Cu^{2+}\,(aq) \longrightarrow Zn^{2+}\,(aq) + Cu\,(s)$$

के लिए ΔG° परिकलित कीजिए । *3*

दिया गया है : Zn^{2+}/Zn के लिए $E^\circ = -0{\cdot}76$ V

Cu^{2+}/Cu के लिए $E^\circ = +0{\cdot}34$ V

$R = 8{\cdot}314\ JK^{-1}\ mol^{-1}$

$F = 96500\ C\ mol^{-1}$.

(b) ईंधन सेलों के दो लाभ दीजिए । *2*

अथवा

(a) निम्नलिखित युगलों में से, कारण सहित उस एक की प्रागुक्ति कीजिए जो विद्युत् धारा की अधिक मात्रा के चालन की अनुमति देता है : *1×3=3*

(i) 30°C पर चाँदी का तार अथवा 60°C पर चाँदी का तार ।

(ii) 0·1 M CH_3COOH विलयन अथवा 1 M CH_3COOH विलयन ।

(iii) 20°C पर KCl विलयन अथवा 50°C पर KCl विलयन ।

(b) विद्युत्-रासायनिक सेल और विद्युत्-अपघटनी सेल के मध्य अंतर के दो बिन्दु दीजिए । *2*

36. (a) निम्नलिखित के कारण लिखिए : *1×3=3*

(i) कॉपर (I) यौगिक सफेद होते हैं जबकि कॉपर (II) यौगिक रंगीन होते हैं ।

(ii) क्रोमेट अपना रंग अम्लीय विलयन में परिवर्तित कर देते हैं ।

(iii) Zn, Cd, Hg d-ब्लॉक तत्त्व तो माने जाते हैं परन्तु संक्रमण तत्त्व नहीं ।

(b) Co और Co^{2+} के इलेक्ट्रॉनिक विन्यास लिखकर Co^{2+} (Z = 27) के लिए प्रचक्रण-मात्र आघूर्ण परिकलित कीजिए । *2*

अथवा

(a) लैन्थेनॉयडों और ऐक्टिनॉयडों के मध्य अंतर के तीन बिन्दु दीजिए । *3*

(b) कारण देते हुए एक परमाणु/आयन छाँटिए जो पूछा गया गुणधर्म दर्शाता हो : *1×2=2*

(i) Sc^{3+} अथवा Cr^{3+} (प्रतिचुम्बकीय व्यवहार दर्शाता है)

(ii) Cr अथवा Cu (उच्च गलनांक और क्वथनांक)

SECTION D

35. (a) Calculate ΔG° for the reaction

$$Zn\ (s) + Cu^{2+}\ (aq) \longrightarrow Zn^{2+}\ (aq) + Cu\ (s).$$ *3*

Given : E° for $Zn^{2+}/Zn = -0{\cdot}76$ V and

E° for $Cu^{2+}/Cu = +0{\cdot}34$ V

$R = 8{\cdot}314\ JK^{-1}\ mol^{-1}$

$F = 96500\ C\ mol^{-1}$.

(b) Give two advantages of fuel cells. *2*

OR

(a) Out of the following pairs, predict with reason which pair will allow greater conduction of electricity : *1×3=3*

(i) Silver wire at 30°C or silver wire at 60°C.

(ii) 0·1 M CH_3COOH solution or 1 M CH_3COOH solution.

(iii) KCl solution at 20°C or KCl solution at 50°C.

(b) Give two points of differences between electrochemical and electrolytic cells. *2*

36. (a) Account for the following : *1×3=3*

(i) Copper (I) compounds are white whereas Copper (II) compounds are coloured.

(ii) Chromates change their colour when kept in an acidic solution.

(iii) Zn, Cd, Hg are considered as d-block elements but not as transition elements.

(b) Calculate the spin-only moment of Co^{2+} (Z = 27) by writing the electronic configuration of Co and Co^{2+}. *2*

OR

(a) Give three points of difference between lanthanoids and actinoids. *3*

(b) Give reason and select one atom/ion which will exhibit asked property : *1×2=2*

(i) Sc^{3+} or Cr^{3+} (Exhibit diamagnetic behaviour)

(ii) Cr or Cu (High melting and boiling point)

37. (a) t-ब्यूटिल ऐल्कोहॉल और n-ब्यूटेनॉल में से कौन-सा अम्ल उत्प्रेरित निर्जलन तीव्रता से देगा और क्यों ? *2*

(b) निम्नलिखित रूपान्तरण सम्पन्न कीजिए : *1×3=3*

(i) फ़ीनॉल से सैलिसिलऐल्डिहाइड

(ii) t-ब्यूटिलक्लोराइड से t-ब्यूटिल एथिल ईथर

(iii) प्रोपीन से प्रोपेनॉल

अथवा

(a) एथीन से एथेनॉल बनने की क्रियाविधि दीजिए । *2*

(b) निम्नलिखित रूपांतरण सम्पन्न करने के लिए अभिकर्मक की प्रागुक्ति कीजिए : *1×3=3*

(i) फ़ीनॉल से बेन्ज़ोक्विनोन

(ii) ऐनिसोल से p-ब्रोमोऐनिसोल

(iii) फ़ीनॉल से 2,4,6-ट्राइब्रोमोफ़ीनॉल

37. (a) Out of t-butyl alcohol and n-butanol, which one will undergo acid catalyzed dehydration faster and why ? *2*

(b) Carry out the following conversions : *1×3=3*

(i) Phenol to Salicylaldehyde

(ii) t-butylchloride to t-butyl ethyl ether

(iii) Propene to Propanol

OR

(a) Give the mechanism for the formation of ethanol from ethene. *2*

(b) Predict the reagent for carrying out the following conversions : *1×3=3*

(i) Phenol to benzoquinone

(ii) Anisole to p-bromoanisole

(iii) Phenol to 2,4,6-tribromophenol

Strictly Confidential: (For Internal and Restricted use only)
Senior School Certificate Examination-2020
Marking Scheme – CHEMISTRY
(SUBJECT CODE -043) (PAPER CODE – 56/1/1,2,3)

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. **Evaluation is a 10-12 days mission for all of us. Hence, it is necessary that you put in your best efforts in this process.**
2. 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.**
3. 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.
4. 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.**
5. 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 totaled up and written in the left-hand margin and encircled. This may be followed strictly.
6. 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.
7. If a student has attempted an extra question, answer of the question deserving more marks should be retained and the other answer scored out.
8. No marks to be deducted for the cumulative effect of an error. It should be penalized only once.
9. A full scale of marks 0-70 has to be used. Please do not hesitate to award full marks if the answer deserves it.
10. Every examiner has to necessarily do evaluation work for full working hours i.e. 8 hours every day and evaluate 20 answer books per day in main subjects and 25 answer books per day in other subjects (Details are given in Spot Guidelines).
11. 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.

12. 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.

13. Any unassessed portion, non-carrying over of marks to the title page, or totaling 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.

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

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

16. 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.

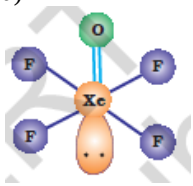
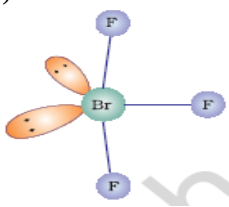
56/1/1 – Set

MARKING SCHEME

Sr. SECONDARY SCHOOL EXAMINATION, 2020

Subject: CHEMISTRY

Q.No.	Expected Answer / Value Points	Distribution of Marks
	SECTION - A	
1.	Racemic Mixture	1
2.	Polarimeter	1
3.	Pent-2-ene / $CH_3CH=CHCH_2CH_3$	1
4.	Antiseptic	1
5.	$CH_3I + C_6H_5OH$	1
6.	A	1
7.	Zn	1
8.	No	1
9.	$CH_2=CH-Cl$	1
10.	Branched hydrocarbon part	1
11.	B	1
12.	D	1
13.	C	1
14.	C	1
15.	A	1
16.	iii	1
17.	ii	1
18.	i	1
19.	ii	1
20.	i	1

	SECTION – B	
21.	(a) The drugs which are used to control stress / anxiety / tension / mild or severe mental diseases	1
	(b) The drugs which are used to kill or to prevent the growth of micro-organism, applied externally on living tissues.	1
	OR	
21	Soap molecules form micelle around the oil droplet or dirt in such a way that hydrophobic part interacts with the oil droplet and hydrophilic part projects out. Micelles can be washed away on rinsing with water. Thus soap helps in emulsification and washing away of oil and fats.	2
22.	$\pi = CRT$ (Volume of solution = 100 mL)	½
	$\pi = \frac{n}{V} RT$	
	$\pi = \frac{5}{60} \times \frac{0.0821 \times 300}{0.1}$	½
	$\pi = 20.5$ atm. (½ mark may be deducted for no or incorrect unit)	1
	OR	
22.	ΔT_f (urea) = ΔT_f (Z)	½
	$kf \times \frac{w\ urea}{Murea} \times \frac{1000}{w\ solvent} = kf \times \frac{wz}{Mz} \times \frac{1000}{Wsolvent}$	½
	$\frac{7.5}{60} \times \frac{1000}{100} = \frac{42.75}{Mz} \times \frac{1000}{100}$	
	$Mz = \frac{42.75 \times 60}{7.50} = 342\ g/mol$ (or by any other correct method)	1
	(½ mark may be deducted for no or incorrect unit)	
23.	(a) 1st order	1
	(b) No, due to exponential relation / the curve never touches the x-axis.	½ + ½
24.	a) 	1
	b) 	1
25.	(a) $K_2[Zn(OH)_4]$	1
	(b) $[Pt(NH_3)_6]Cl_4$	1
26.	a) $(CH_3)_3C$-OH / tertiary butyl alcohol is formed.	1

	b) $C_6H_5COCH_3$ / acetophenone is formed (or correct chemical equation)	1
27.	a) C_6H_5OH + HCHO , Phenol + formaldehyde b) CH_2= C(Cl) – CH=CH_2, Chloroprene	½ + ½ ½ + ½
	SECTION - C	
28.	(a) (A) → CH_3CONH_2 (B) → CH_3NH_2 (b) (A) → $C_6H_5NH_2$ (B) → $C_6H_5N_2Cl$ (c) (A) → C_6H_5CN (B) → C_6H_5COOH	½ + ½ ½ + ½ ½ + ½
28	**OR** a) (i) Add Ice cold ($NaNO_2$ + HCl) followed by phenol or β-Naphthol to both the compounds. Aniline forms orange red dye while ethylamine doesn't. ii) Add $CHCl_3$ and KOH (alc.) to both the compounds. Aniline gives foul smelling isocyanide while N-Methylaniline doesn't. (or any other suitable chemical test) b) Butanol > Butanmine > Butane	1 1 1
29.	(a) Because the – CHO group in glucose is involved in hemiacetal formation and thus is not free / due to cyclic structure of glucose -CHO group is not free. (b) Because the hydrogen bonds are formed between specific pairs of bases. (c) Starch is a polymer of α - glucose while cellulose is a polymer of β - glucose.	1 1 1
30.	(a) Because sulphur readily gets oxidized itself to more stable +6 state. (b) Because of absence of d-orbital in Fluorine. (c) Because size increases from Helium to Radon. / dispersion or van der Waal forces increase from Helium to Radon.	1 1 1
30	**OR** (a) MnO_2+ 4HCl → $MnCl_2$ + Cl_2 + $2H_2O$ (b) XeF_6 + KF → $K^+[XeF_7]^-$ (c) $4I^-_{(aq.)} + 4H^+_{(aq.)} + O_{2(g)} \rightarrow 2I_{2(s)} + 2H_2O_{(l)}$	1 1 1
31.	(a) NaCN act as a depressant. (b) SiO_2 act as a flux. / used to remove FeO as slag (c) I_2 is used to convert Ti into volatile compound (TiI_4).	1 1 1
32.	**Physisorption** / **Chemisorption** 1. It arises because of van der Waals' forces. / 1. It is caused by chemical bond formation. 2. It is not specific in nature. / 2. It is highly specific in nature. 3. It is reversible in nature. / 3. It is irreversible. (or any other correct differences)	1 x 3

33.	(a) Decreases. (b) Increases (c) Increases	1 1 1
34.	$\Delta T_f = K_f \ m$ $1.5 = \frac{3.9 \times w_B}{176} \times \frac{1000}{75}$ Mass of ascorbic acid = 5.08 g.	1 1 1
	SECTION – D	
35	(a) $E^0cell = E^oC - E^oA$ $= 0.34 - (-0.76)$ $= 1.10V$ $\Delta G^o = -nFE^o$ $= -2 \times 1.10 \times 96500$ $= -212300$ J/mol or -212.3 kJ/mol (b) (i) Pollution free (ii) High efficiency. **OR**	½ ½ ½ ½ 1 1 1
35.	(a) (i) Silver wire at 30°C because as temperature decreases, resistance decreases so conduction increases. (ii) 0.1 M CH_3COOH, because on dilution degree of ionization increases hence conduction increases. (iii) KCl solution at 50°C, because at high temperature mobility of ions increases and hence conductance increases (b)	1 1 1

Electrochemical	Electrolytic	
(1) Anode -ve Cathode +ve	Anode +ve Cathode -ve	1
(2) Convert chemical Energy to electrical energy	Convert electrical Energy to chemical energy	1

(or any other correct differences)

36. (a) (i) $Cu^{+1}(3d^{10})$ compounds are white because of absence of unpaired electrons while Cu^{+2} $(3d^9)$ compounds are coloured due to unpaired e^- / shows d-d transition. — 1

(ii) chromate (CrO_4^{2-}) changes to dichromate $(Cr_2O_7^{2-})$ ion in acidic medium. — 1

(iii)due to completely filled d-orbitals in their ground state as well as in oxidized state. — 1

(b) Co = $[Ar]4s^2 3d^7$, Co^{+2} =$[Ar]\ 3d^7$ — ½ + ½

$\mu = \sqrt{n(n+2)}$ — ½

$= \sqrt{3(3+2)} = \sqrt{15} = 3.92\ B.M.$ — ½

OR

36. (a)

Lanthanoids	**Actinoids**
(1) most of them are not radioactive	All are radioactive
(2) don't show a wide range of oxidation state	Show a wide range of oxidation states
(3) Most of their ions are colourless	Most of their ions are coloured

1x3

(or any other correct differences)

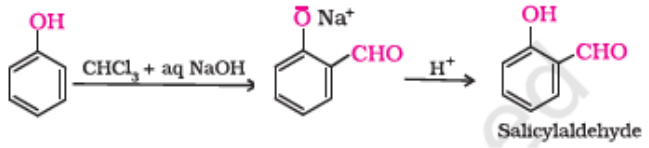
(b) (i) Sc^{+3}, because of absence of unpaired electron. — ½ + ½

(ii) Cr, because of presence of strong intermetallic bonding than Cu. — ½ + ½

37. (a) Tert-butyl alcohol, 1

because it forms more stable 3^o carbocation than 1^o carbocation. 1

(b) i)



1

ii) $(CH_3)_3CCl + NaOH_{(aq.)} \rightarrow (CH_3)_3COH \xrightarrow{Na} (CH_3)_3CONa \xrightarrow{C_2H_5Cl} (CH_3)_3COC_2H_5$ 1

iii) $CH_3CH{=}CH_2 \xrightarrow[ii)\ H_2O_2/OH^-]{i)\ B_2H_6} CH_3CH_2CH_2OH$ 1

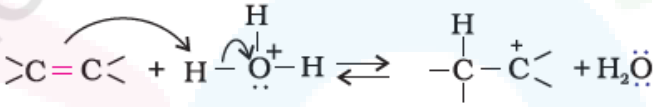
(or by any other suitable method)

OR

37. a)

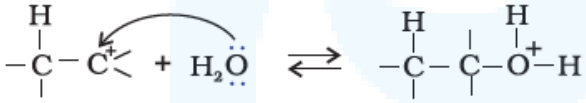
Step 1: Protonation of alkene to form carbocation by electrophilic attack of H_3O^+.

$H_2O + H^+ \rightarrow H_3O^+$



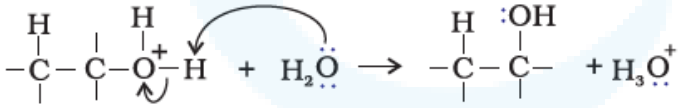
1

Step 2: Nucleophilic attack of water on carbocation.



½

Step 3: Deprotonation to form an alcohol.



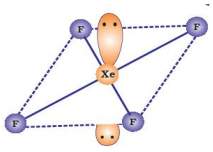
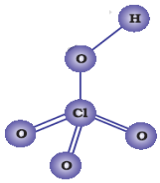
½

b) i) $K_2Cr_2O_7 + H_2SO_4$ / $Na_2Cr_2O_7 + H_2SO_4$ 1

ii) Br_2 in CH_3COOH 1

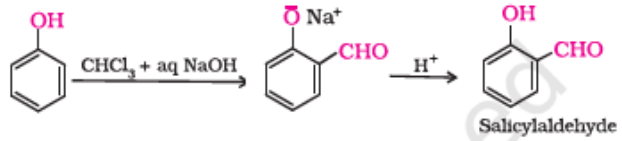
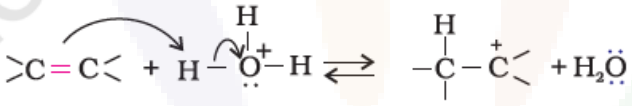
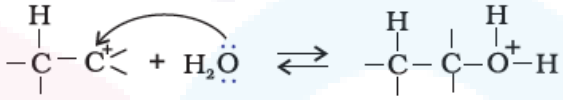
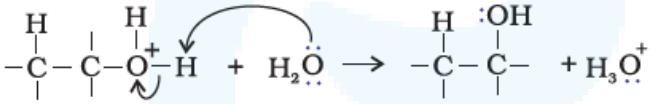
iii) Br_2 aq. / Bromine water 1

56/1/2 – Set – I
MARKING SCHEME
SR. SECONDARY SCHOOL EXAMINATION, 2020
Subject: CHEMISTRY

Q.No.	Expected Answer / Value Points	Distribution of Marks
	SECTION - A	
1.	Inversion	1
2.	$CH_3I + C_6H_5OH$	1
3.	But-2-ene / $CH_3CH=CHCH_3$	1
4.	Polarimeter	1
5.	Antiseptic	1
6.	Branched hydrocarbon part	1
7.	$CH_3CH=CH_2$	1
8.	A	1
9.	No	1
10.	Zn	1
11.	A	1
12.	C	1
13.	C	1
14.	B	1
15.	B	1
16.	i	1
17.	i	1
18.	iii	1
19.	ii	1
20.	ii	1
	SECTION – B	
21.	(a) 1^{st} order (b) No, due to exponential relation / the curve never touches the x-axis.	1 1
22.	a.  b. 	1 1
23.	(a) The drugs which are used to control stress / anxiety / tension / mild or severe mental diseases (b) The drugs which are used to kill or to prevent the growth of micro-organism, applied externally on living tissues.	1 1

	OR Soap molecules form micelle around the oil droplet or dirt in such a way that hydrophobic part interacts with the oil droplet and hydrophilic part projects out. Micelles can be washed away on rinsing with water. Thus soap helps in emulsification and washing away of oil and fats.	2
24.	(a) $K_3[Al(C_2O_4)_3]$ (b) $[Co(NH_3)_4(H_2O)Cl]Cl_2$	1 1
25.	$\pi = CRT$ (Volume of solution = 100 mL) $\pi = \frac{n}{V}RT$ $\pi = \frac{5}{60} \times \frac{0.0821 \times 300}{0.1}$ $\pi = 20.5$ atm. (½ mark may be deducted for no or incorrect unit) **OR** ΔT_f (urea) = ΔT_f (Z) $kf \times \frac{w\ urea}{Murea} \times \frac{1000}{w\ solvent} = kf \times \frac{wz}{Mz} \times \frac{1000}{Wsolvent}$ $\frac{7.5}{60} \times \frac{1000}{100} = \frac{42.75}{Mz} \times \frac{1000}{100}$ $Mz = \frac{42.75 \times 60}{7.50} = 342\ g/mol$ (or by any other correct method) (½ mark may be deducted for no or incorrect unit)	½ ½ 1 ½ ½ 1
26.	a. $NH_2(CH_2)_6NH_2$ – Hexamethylenediamine, $HOOC(CH_2)_4COOH$ – Adipic acid b. CH_2=CH-CH=CH_2 – Butadiene, C_6H_5CH=CH_2 – Styrene	½+½ ½+½
27.	a. 2-Methylbutan-2-ol / $(CH_3)_2C(OH)CH_2CH_3$ is formed / $CH_3COCH_2CH_3 \xrightarrow[ii)\ H_2O]{i)\ CH_3MgBr} (CH_3)_2C(OH)CH_2CH_3$ b. Benzene / C_6H_6 is formed $C_6H_5COONa \xrightarrow{NaOH + CaO,\ \Delta} C_6H_6$	1 1
	SECTION - C	
28.	$\Delta T_f = K_f\ m$ $1.5 = \frac{3.9 \times w_B}{176} \times \frac{1000}{75}$ Mass of ascorbic acid = 5.08 g.	1 1 1
29.	(a) Because sulphur readily gets oxidized itself to more stable +6 state. (b) Because of absence of d-orbital in Fluorine. (c) Because size increases from Helium to Radon. / dispersion or van der Waal forces increase from Helium to Radon.	1 1 1

29	**OR** (a) $MnO_2 + 4HCl \rightarrow MnCl_2 + Cl_2 + 2H_2O$ (b) $XeF_6 + KF \rightarrow K^+[XeF_7]^-$ (c) $4I^-_{(aq.)} + 4H^+_{(aq.)} + O_{2(g)} \rightarrow 2I_{2(s)} + 2H_2O_{(l)}$	 1 1 1
30.	(a) (A) $\rightarrow CH_3CONH_2$ (B) $\rightarrow CH_3NH_2$ (b) (A) $\rightarrow C_6H_5NH_2$ (B) $\rightarrow C_6H_5N_2Cl$ (c) (A) $\rightarrow C_6H_5CN$ (B) $\rightarrow C_6H_5COOH$	½ + ½ ½ + ½ ½ + ½
30	**OR** a) (i) Add Ice cold ($NaNO_2$ + HCl) followed by phenol or β-Naphthol to both the compounds. Aniline forms orange red dye while ethylamine doesn't. ii) Add $CHCl_3$ and KOH (alc.) to both the compounds. Aniline gives foul smelling isocyanides while N-Methylaniline doesn't. (or any other suitable chemical test) b) Butanol > Butanmine > Butane	1 1 1
31.	(a) Because the – CHO group in glucose is involved in hemiacetal formation and thus is not free / due to cyclic structure of glucose -CHO group is not free. (b) Because the hydrogen bonds are formed between specific pairs of bases. (c) Starch is a polymer of α - glucose while cellulose is a polymer of β - glucose.	1 1 1
32.	(a) Increases (b) Decreases (c) Increases	1 1 1
33. a.	**Physiorption** / **Chemisorption** (i) Not specific / Highly specific (ii) Low $\Delta H_{adsorption}$ / High $\Delta H_{adsorption}$	1 1
b.	In adsorption, the substance is concentrated only at the surface while in absorption, the substance is uniformly distributed throughout the bulk of the solid / adsorption is a surface phenomenon while absorption is a bulk phenomenon	1
34.	(a) It converts Ni into its volatile compound, $Ni(CO)_4$. (b) It provides flux to remove impurities. (c) It selectively prevents one of the sulphide ore from coming to the froth.	1 1 1
	SECTION – D	
35.	(a) Tert-butyl alcohol, because it forms more stable 3^o carbocation than 1^o carbocation. (b) i)	1 1

35. a)		1
	ii) $(CH_3)_3CCl + NaOH_{(aq.)} \rightarrow (CH_3)_3COH \xrightarrow{Na} (CH_3)_3CONa \xrightarrow{C_2H_5Cl} (CH_3)_3COC_2H_5$	1
	iii) $CH_3CH=CH_2 \xrightarrow[iv)\ H_2O_2/OH^-]{iii)\ B_2H_6} CH_3CH_2CH_2OH$ (or by any other suitable method)	1
	OR	
	Step 1: Protonation of alkene to form carbocation by electrophilic attack of H_3O^+. $H_2O + H^+ \rightarrow H_3O^+$ 	1
	Step 2: Nucleophilic attack of water on carbocation. 	½
	Step 3: Deprotonation to form an alcohol. 	½ ½
	b) i) $K_2Cr_2O_7 + H_2SO_4$ / $Na_2Cr_2O_7 + H_2SO_4$ ii) Br_2 in CH_3COOH iii) Br_2 aq. / Bromine water	1 1 1
36.	(a) $E^0cell = E^o_C - E^o_A$ $= 0.34 - (-0.76)$ $= 1.10V$	½ ½
	$\Delta G^o = -nFE^o$ $= -2 \times 1.10 \times 96500$ $= -212300$ J/mol Or -212.3 kJ/mol	½ ½ 1
	(b) (i) Pollution free (ii) High efficiency.	1 1
	OR	

36. (a)(i) Silver wire at 30°C because as temperature decreases, resistance decreases so conduction increases. — 1

(ii) 0.1 M CH_3COOH, because on dilution degree of ionization increases hence conduction increases. — 1

(iii) KCl solution at 50°C, because at high temperature mobility of ions increases and hence conductance increases — 1

(b)

Electrochemical	Electrolytic
(1) Anode -ve Cathode +ve	Anode +ve Cathode -ve — 1
(2) Convert chemical energy to electrical energy	Convert electrical energy to chemical energy — 1

(or any other correct differences)

37. (a) (i) $Cu^{+1}(3d^{10})$ compounds are white because of absence of unpaired electrons while Cu^{+2} $(3d^9)$ compounds are coloured due to unpaired e^- / shows d-d transition. — 1

(ii) Chromate (CrO_4^{2-})changes to dichromate $(Cr_2O_7^{2-})$ ion in acidic medium. — 1

(iii) due to completely filled d-orbitals in their ground state or in oxidized state. — 1

(b) Co = $[Ar]4s^2 3d^7$, Co^{+2} =$[Ar]\ 3d^7$ — ½ + ½

$\mu = \sqrt{n(n+2)}$ — ½

$= \sqrt{3(3+2)} = \sqrt{15} = 3.92\ B.M.$ — ½

OR

37. (a)

Lanthanoids	Actinoids
(1) most of them are not radioactive	All are radioactive — 1x3
(2) don't show a wide range of oxidation state	Show a wide range of oxidation states
(3) Most of their ions are colourless	Most of their ions are coloured

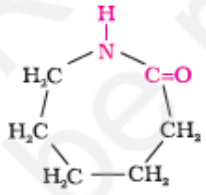
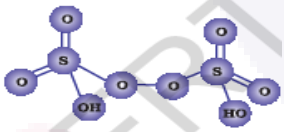
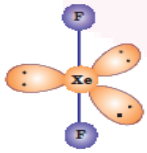
(or any other correct differences)

(b) (i) Sc^{+3} is diamagnetic because of absence of unpaired electron. — 1

(ii) Cr has high M.P. & B.P. because of presence of strong intermetallic bonding than Cu. — 1

56/1/3
MARKING SCHEME
SR. SECONDARY SCHOOL EXAMINATION, 2020
Subject: CHEMISTRY

Q.No.	Expected Answer / Value Points	Distribution of Marks
	SECTION - A	
1.	Racemic Mixture	1
2.	Monochromatic Light vibrating in one plane.	1
3.	$C_2H_5I + C_6H_5OH$	1
4.	Pent-2-ene / $CH_3CH=CHCH_2CH_3$	1
5.	Antiseptic	1
6.	B	1
7.	Branched hydrocarbon part	1
8.	$CF_2=CF_2$	1
9.	Zn	1
10.	No	1
11.	A	1
12.	C	1
13.	B	1
14.	A	1
15.	C	1
16.	i	1
17.	i	1
18.	iii	1
19.	ii	1
20.	i	1
	SECTION – B	
21.	π = CRT (volume of Solution = 100 mL) $\pi = \frac{n}{V}$ RT $\pi = \frac{5}{60} \times \frac{0.0821 \times 300}{0.1}$ π = 20.5 atm. (½ mark may be deducted for no or incorrect unit) **OR**	½ ½ 1 ½
21.	ΔT_f (urea) = ΔT_f (Z) $kf \times \frac{w\ urea}{Murea} \times \frac{1000}{w\ solvent} = kf \times \frac{wz}{Mz} \times \frac{1000}{Wsolvent}$ $\frac{7.5}{60} \times \frac{1000}{100} = \frac{42.75}{Mz} \times \frac{1000}{100}$ $Mz = \frac{42.75 \times 60}{7.50} = 342\ g/mol$ (OR any other correct method) (½ mark may be deducted for no or incorrect unit)	½ 1
22.	(a) 1st order (b) No, due to exponential relation / the curve never touches the x-axis.	1 ½ + ½

23.	(a) The drugs which are used to control stress / anxiety / tension / mild or severe mental diseases (b) The drugs which are used to kill or to prevent the growth of micro-organism, applied externally on living tissues. **OR**	1 1
23	Soap molecules form micelle around the oil droplet or dirt in such a way that hydrophobic part interacts with the oil droplet and hydrophilic part projects out. Micelles can be washed away on rinsing with water. Thus soap helps in emulsification and washing away of oil and fats.	2
24.	(a) CH_2=CH-CH=CH_2 , Butadiene; CH_2=CH–CN , Acrylonitrile (b)  Caprolactam / Aminocaproic acid , $NH_2(CH_2)_5COOH$	½+½ ½+½
25.	(a)  (b) 	1 1
26.	a. $[Co(NH_3)_5(CO_3)]Cl$ b. $K_2[Ni(CN)_4]$	1 1
27.	a. Propane or $CH_3CH_2CH_3$ is formed / $CH_3COCH_3 \xrightarrow{Zn-Hg,\ HCl(conc.)} CH_3CH_2CH_3$ b. Propan-2-ol or Isopropyl alcohol or $(CH_3)_2CHOH$ is formed / $CH_3CHO \xrightarrow[ii)\ H_2O]{i)\ CH_3MgBr} (CH_3)_2CHOH$	1 1

	SECTION – C	
28.	(a) Because sulphur readily gets oxidized itself to more stable +6 state.	1
	(b) Because of absence of d-orbital in Fluorine.	1
	(c) Because size increases from Helium to Radon. / dispersion or van der Waal forces increase from Helium to Radon.	1
	OR	
28.	(a) $MnO_2 + 4HCl \rightarrow MnCl_2 + Cl_2 + 2H_2O$	
	(b) $XeF_6 + KF \rightarrow K^+[XeF_7]^-$	1
	(c) $4I^-_{(aq.)} + 4H^+_{(aq.)} + O_{2(g)} \rightarrow 2I_{2(s)} + 2H_2O_{(l)}$	1
		1
29.	$\Delta T_f = K_f \ m$	1
	$1.5 = \frac{3.9 \times w_B}{176} \times \frac{1000}{75}$	1
	Mass of ascorbic acid = 5.08 g.	1
30.	(a) Decreases.	1
	(b) Increases	1
	(c) Increases	1
31.	(a) (A) $\rightarrow CH_3CONH_2$ (B) $\rightarrow CH_3NH_2$	½ + ½
	(b) (A) $\rightarrow C_6H_5NH_2$ (B) $\rightarrow C_6H_5N_2Cl$	½ + ½
	(c) (A) $\rightarrow C_6H_5CN$ (B) $\rightarrow C_6H_5COOH$	½ + ½
	OR	
31	a) (i) Add Ice cold ($NaNO_2$ + HCl) followed by phenol or β-Naphthol to both the compounds. Aniline forms orange red dye while ethylamine doesn't.	1
	ii) Add $CHCl_3$ and KOH (alc.) to both the compounds. Aniline gives foul smelling isocyanides while N-Methylaniline doesn't.	1
	(Or any other suitable chemical test)	
	b) Butanol > Butanmine > Butane	1
32.	(a) Because the – CHO group in glucose is involved in hemiacetal formation and thus is not free / due to cyclic structure of glucose -CHO group is not free.	1
	(b) Because the hydrogen bonds are formed between specific pairs of bases.	1
	(c) Starch is a polymer of α - glucose while cellulose is a polymer of β - glucose.	1
33.	(a) It selectively prevents one of the sulphide ore from coming to the froth.	1
	(b) Helps in converting Zr into its volatile compound ZrI_4.	1
	(c) Provides flux to remove impurities.	1

34.

Physiorption	Chemisorption
(i) Weak van der Waal forces	Strong chemical bonds
(ii) Favourable at low temperature	Increases till a certain temperature and then decreases afterwards.
(iii) low $\Delta H_{adsorption}$	High $\Delta H_{adsorption}$

1
1
1

SECTION – D

35. (a) (i) $Cu^{+1}(3d^{10})$ compounds are white because of absence of unpaired electrons while Cu^{+2} $(3d^9)$ compounds are coloured due to unpaired e^- / shows d-d transition. 1

(ii) chromate (CrO_4^{2-})changes to dichromate $(Cr_2O_7^{2-})$ ion in acidic medium. 1

(iii)due to completely filled d-orbitals in their ground state or in oxidized state. 1

(b) Co = $[Ar]4s^2 3d^7$, Co^{+2} =[Ar] $3d^7$

$\mu = \sqrt{n(n+2)}$ ½ + ½

$= \sqrt{3(3+2)} = \sqrt{15} = 3.92\ B.M.$ ½ ½

OR

35. (a)

Lanthanoids	Actinoids
(1) most of them are not radioactive	All are radioactive
(2) don't show a wide range of oxidation state	Show a wide range of oxidation states
(3) Most of their ions are colourless	Most of their ions are coloured

1x3

(or any other correct differences)

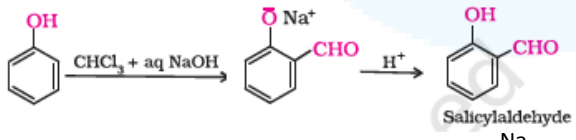
(b) (i) Sc^{+3}, because of absence of unpaired electron. ½ +½

(ii) Cr, because of presence of stronger intermetallic bonding than Cu. ½ +½

36. (a) Tert-butyl alcohol, 1

because it forms more stable 3^o carbocation than 1^o carbocation. 1

b) i)



1

ii) $(CH_3)_3CCl + NaOH_{(aq.)} \rightarrow (CH_3)_3COH \xrightarrow{Na} (CH_3)_3CONa \xrightarrow{C_2H_5Cl} (CH_3)_3COC_2H_5$

1

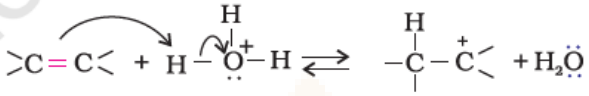
iii) $CH_3CH=CH_2 \xrightarrow[\text{vi) } H_2O_2/OH^-]{\text{v) } B_2H_6} CH_3CH_2CH_2OH$ — 1

(or by any other suitable method)

OR

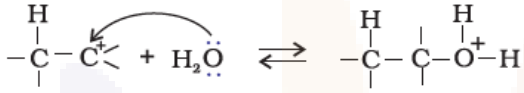
36. a) Step 1: Protonation of alkene to form carbocation by electrophilic attack of H_3O^+.

$H_2O + H^+ \rightarrow H_3O^+$



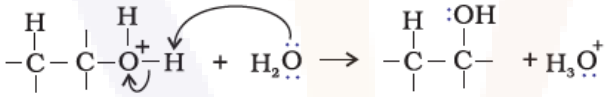
1

Step 2: Nucleophilic attack of water on carbocation.



½

Step 3: Deprotonation to form an alcohol.



½

b) i) $K_2Cr_2O_7 + H_2SO_4$ / $Na_2Cr_2O_7 + H_2SO_4$ — 1

ii) Br_2 in CH_3COOH — 1

iii) Br_2 aq. / Bromine water — 1

37. (a) $E^0cell = E^o_C - E^o_A$ — ½

$= 0.34 - (-0.76)$

$= 1.10V$ — ½

$\Delta G^o = -nFE^o$ — ½

$= -2 \times 1.10 \times 96500$ — ½

$= -212300$ J/mol Or -212.3 kJ/mol — 1

(b) (i) Pollution free — 1

(ii) High efficiency. — 1

OR

37. (a) (i) Silver wire at 30°C because as temperature increases, resistance increases so conduction decreases. — 1

(ii) 0.1 M CH_3COOH, because on dilution degree of ionization increases hence conduction increases. — 1

(iii) KCl solution at 50°C, because at high temperature mobility of ions increases and hence conductance increases — 1

(b)

Electrochemical	Electrolytic
(1) Anode -ve Cathode +ve	Anode +ve Cathode -ve
(2) Convert chemical Energy to electrical energy	Convert electrical Energy to chemical energy

(or any other correct differences) — 1 + 1