Total No. of Printed Pages—7

5 SEM TDC CHMH (CBCS) C 12

2022

(Nov/Dec)

CHEMISTRY

(Core)

Paper : C–12

(Physical Chemistry, Quantum Chemistry and Spectroscopy)

Full Marks : 53
Pass Marks : 21

Time : 3 hours

The figures in the margin indicate full marks for the questions

1. Choose the correct answer from the following : 1×4=4

(a) The expression for Hamiltonian operator $\hat{H}$ is

(i) $\frac{h^2}{8\pi^2 m}\nabla^2 + V$

(ii) $-\frac{h^2}{8\pi^2 m} + V$

(iii) $\frac{h^2}{8\pi^2 m}\nabla^2 - V$

(iv) $-\frac{h^2}{8\pi^2 m}\nabla^2 - V$

(b) The eigenvalue of the function $\psi = 8e^{4x}$ is

(i) e^{4x}

(ii) 32

(iii) 8

(iv) 4

(c) The rotational spectrum of a rigid diatomic rotator consists of equally spaced lines with spacing equal to

(i) B

(ii) $2B$

(iii) $B/2$

(iv) $4B$

(d) Intersystem crossing refers to

(i) transition between two states of a system

(ii) radiationless transition between states of different spin multiplicities

(iii) transition between excited and ground states with same multiplicity

(iv) All of the above

(Continued)

2. Answer any *four* questions from the following : 2×4=8

(a) HBr molecule is microwave active. Explain, why.

(b) Describe Larmor frequency.

(c) Water is a good solvent for UV and visible spectroscopy, but not for IR spectroscopy. Explain.

(d) Distinguish photochemical reaction from thermal reaction.

(e) State whether the function

$$\psi = \sin(k_1 x)\sin(k_2 y)\sin(k_3 z)$$

is an eigenfunction of the operator ∇^2. If it is an eigenfunction, find eigenvalue.

UNIT—I

3. Answer any *four* questions from the following : 4×4=16

(a) Solve Schrödinger's wave equation for a particle having mass m moving freely in a one-dimensional box of length a. Find out the energy expression. 3+1=4

(Turn Over)

(b) What is a simple harmonic oscillator? Deduce an expression for the fundamental frequency of a harmonic oscillator. 1+3=4

(c) (i) What is an operator? Write quantum mechanical operator corresponding to momentum. 1+1=2

(ii) Examine if the function

$\psi_1(x) = N_1(a^2 - x^2)$ and $\psi_2(x) = N_2 x(a^2 - x^2)$

are orthogonal within $-a < x < a$. 2

(d) (i) Show that Hamiltonian operator $(\hat{H})$ for a rigid rotator is given by $\hat{H} = L^2 / 2I$, where L is the angular momentum and I is the moment of inertia. 2

(ii) Write the energy expression for second energy-level of a rigid rotator. 2

(e) (i) Write Schrödinger wave equation for hydrogen atom in Cartesian and polar coordinate. 1+1=2

(ii) What does the term 'degenerate level' mean? Calculate degeneracy of the level having energy $\frac{5h^2}{8ma^2}$ for a free particle moving in a two-dimensional box of two equal side lengths. 1+1=2

(f) (i) What is zero point energy? Calculate zero point energy of a molecule if it is considered as a simple harmonic oscillator. 2

(ii) Sketch and explain the wave functions for the first three energy levels for the particle in one-dimensional box. 2

UNIT—II

4. Answer any *four* questions from the following : 4×4=16

(a) Describe different types of electronic transitions with one example of each.

(b) State Frank-Condon principle. Explain the effects of change of solvents on $n \rightarrow \pi^*$ and $\pi \rightarrow \pi^*$ transitions. Write the significance of molar extinction coefficient. 1+2+1=4

(c) The C—H vibration (stretching) in chloroform occurs at 3000 cm^{-1}. Calculate the C—D frequency (stretching) in deutero chloroform. It is supposed force constants remain same during isotopic substitution.

(d) Write brief notes on the following : 2×2=4

(i) Chemical shift

(ii) Spin-spin coupling

(e) (i) Discuss the effect of isotopic substitution on the rotational spectra of a diatomic molecule. 2

(ii) Roughly sketch the fundamental vibrations of water molecule and show the infrared active vibrations. 2

UNIT—III

5. Answer any *two* questions from the following : 4½×2=9

(a) What is quantum yield of a photochemical reaction? Under what condition is its value 1? A certain system absorbs 3×10^{20} quanta of light per second. On irradiation for 20 minutes, 0·02 mole of the reactant was found to have reacted. Calculate the quantum yield of the reaction. 1+1+2½=4½

(b) What are photochemical reactions? Write the differences between photochemical and thermal reactions. Discuss the reasons for high and low quantum yields of photochemical reactions. ½+2+2=4½

(Continued)

(c) (i) Write a short note on any *one* of the following : 2

(1) Actinometry

(2) Chemiluminescence

(ii) Write the differences between phosphorescence and fluorescence. 2½

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Total No. of Printed Pages—7

5 SEM TDC CHMH (CBCS) C 11

2022

(Nov/Dec)

CHEMISTRY

(Core)

Paper : C–11

(Organic Chemistry)

Full Marks : 53

Pass Marks : 21

Time : 3 hours

The figures in the margin indicate full marks for the questions

1. Choose the correct answer : 1×4=4

(a) Which of the following sets of bases is present both in DNA and RNA?

(i) Adenine, uracil, thymine

(ii) Adenine, guanine, cytosine

(iii) Adenine, guanine, uracil

(iv) Adenine, guanine, thymine

(b) The sequence of bases in DNA is TGAACCCTT, then the sequence of bases in m-RNA is

(i) ACUUGGGAA

(ii) TCUUGGGTT

(iii) ACUUCCCAA

(iv) None of the above

(c) The triglycerides of which of the following saturated fatty acids are not present in oils and fats?

(i) Palmitic acid

(ii) Stearic acid

(iii) Myristic acid

(iv) Acetic acid

(d) Which of the following statements best describes a synthon?

(i) A synthetic reagent used in a reaction

(ii) A key intermediate in a reaction sequence

(iii) A transition state involved in a reaction mechanism

(iv) A hypothetical structure that would result in a given reaction if it existed

UNIT—I

2. (a) Write the name and structure of the bases that are present only in DNA and RNA. 2

Or

Synthesize any one important purine base present in DNA.

(b) Show the complementary base pairing in DNA by a suitable diagram. 2

(c) Write a short note on transcription with proper diagram. 3

Or

Explain the secondary structure of DNA.

UNIT—II

3. (a) How can you determine the C-terminal and N-terminal residue of a peptide chain? 2

(b) Synthesize glycine with the help of Gabriel's phthalimide reaction. 2

(c) Write the name and structure of the compounds that are used to protect the amino group and to activate the —COOH group of amino acid during peptide synthesis. 2

(d) Write a short note on denaturation of protein with examples. 2

UNIT—III

4. (a) Define enzyme. Name an enzyme that digests fat. 1+1=2

Or

Discuss the Lock and Key model of enzyme action. 2

(b) What do you mean by inhibitors? Describe the competitive and non-competitive inhibitors. 1+2=3

(c) What are coenzymes? Discuss the role of NAD and FAD coenzymes. 3

UNIT—IV

5. (a) What are fats and oils? What is the importance of hydrogenation and hydrolysis of fats and oils? Explain with examples. 1+1=2

(b) Define acid value. What does it indicate? 1+1=2

Or

What is iodine value? What is its significance? 2

(c) Define soap. Give one example each of simple glycerides and mixed glycerides. 1+1=2

(d) Give a brief account of detergent and their washing action. 2

UNIT—V

6. (a) Write the synthetic equivalents of the following synthons (any *two*) : 2

(i) $\overset{\ominus}{C}H_3$

(ii) $\overset{\ominus}{C}H_2COOH$

(iii) $\overset{\oplus}{C}H_2CH_2OH$

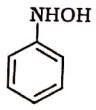
(iv) $H_3C-\overset{O}{\overset{\|}{C}}\overset{\ominus}{}$

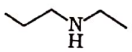
(b) What do you mean by FGI? Give an example. 2

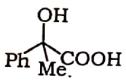
(c) With the help of the retrosynthetic analysis, write down the synthesis of the following TMs (any *three*) : 2×3=6

(i) 

(ii) 

(iii) 

(iv) 

(v) 

(vi) 

UNIT—VI

7. Answer any *four* of the following questions : 2×4=8

(a) Describe the synthesis of chloramphenicol.

(b) What are antibiotics and tranquilizers? Give one example in each case.

(c) Write in brief about the medicinal importance of curcumin present in haldi.

(d) Discuss the mode of action of sulphanilamides.

(e) What is antimalarial drug? Write the synthesis of an antimalarial drug.

★★★

5 SEM TDC DSE CHM (CBCS) 2 (H)

2022

(Nov/Dec)

CHEMISTRY

(Discipline Specific Elective)

(For Honours)

Paper : DSE–2

(Green Chemistry)

Full Marks : 53

Pass Marks : 21

Time : 3 hours

The figures in the margin indicate full marks for the questions

1. Choose the correct answer : 1×6=6

(a) The Minamata disease has been attributed to

(i) lead poisoning

(ii) arsenic poisoning

(iii) cadmium poisoning

(iv) mercury poisoning

(b) The 'methaemoglobinaemia' (blue baby syndrome) has been attributed to

(i) nitrous oxide poisoning

(ii) nitrite poisoning

(iii) nitrate poisoning

(iv) carbon monoxide poisoning

(c) The concept of 'atom economy' was developed by

(i) Paul T. Anastas

(ii) John C. Warner

(iii) B. M. Trost

(iv) John R. Asthana

(d) The addition of HBr to propene is an example of

(i) chemoselective reaction

(ii) regioselective reaction

(iii) enantioselective reaction

(iv) diastereoselective reaction

(e) Solar energy is considered to be a

(i) renewable source of energy

(ii) non-renewable source of energy

(iii) Both renewable and non-renewable sources of energy

(iv) None of the above

(f) Which of the following is considered as green solvent?

(i) Supercritical CO_2

(ii) Ionic liquids

(iii) Water

(iv) All of the above

UNIT—I

2. Answer the following questions (any *seven*) : 2×7=14

(a) What is Bhopal Gas Tragedy? Write the greener approach to the Bhopal Gas Tragedy. 1+1=2

(b) Write one 100% atom economical reaction.

(c) What is regioselective reaction? Give one example of it. 1+1=2

(d) What is diastereoselective reaction? Give one example of it. 1+1=2

(e) Mention four advantages of using biocatalysis in relevance to green chemistry. ½×4=2

(f) Write the green approach of synthesis of methyl methacrylate with 100% atom economy.

(g) Write a method of preparation of urethane eliminating the use of hazardous chemical, phosgene.

(h) Give one example of Hofmann elimination using microwave irradiation.

UNIT—II

3. Answer the following questions (any *five*) : 3×5=15

(a) Explain any two principles of green chemistry. 1½+1½=3

(b) Synthesis of 3°-alcohol from Grignard reagent gives 100% yield but the reaction is not considered to be a green synthesis. Explain.

(c) What are solid-state reactions? Write the synthesis of imidazole using KSF clay under solvent-free conditions in microwave. 1+2=3

(d) What are sonication reactions? Explain with a suitable reaction. 1+2=3

(e) What is biocatalyst? Write the biocatalytic conversion of penicillin into 6-APA. 1+2=3

(f) "Catalysts can control the stereo-chemistry of a reaction." Explain with conversion of 2-butanone into (*R*)-alcohol with biocatalyst as a typical enantioselectivity of reduction.

UNIT—III

4. Answer the following questions (any *three*) : 3×3=9

(a) Explain the green approach of synthesis of catechol. Why is it considered as green process? 2+1=3

(b) Explain the green approach of synthesis of citral. Why is it considered as green process? 2+1=3

(c) Explain the green approach of synthesis of paracetamol. Why is it considered as green process? 2+1=3

(d) Explain the green approach of conversion ethanol into ethanoic acid. Why is it considered as green process? 2+1=3

UNIT—IV

5. Answer the following questions (any *three*) : 3×3=9

(a) Mention some green chemistry works towards sustainability.

(b) Mention some guidelines to be followed to control the pollution due to industrial effluents.

(c) What will be the future trends in green chemistry in the field of catalysts?

(d) What will be the future trends in green chemistry in the field of multi-functional reagents?

★★★

Total No. of Printed Pages—11

5 SEM TDC DSE CHM
(CBCS) 1 (H/NH)

2022

(Nov/Dec)

CHEMISTRY

(Discipline Specific Elective)

(For Honours/Non-Honours)

Paper : DSE–1

(Analytical Methods in Chemistry)

Full Marks : 53
Pass Marks : 21

Time : 3 hours

The figures in the margin indicate full marks for the questions

1. শুদ্ধ উত্তৰটো বাছি উলিওৱা : 1×7=7

Choose the correct option :

(a) 12·6, 12·7, 12·9, 12·7, 12·6, 12·8, 13·0, 12·5, 12·6 এই সাংখ্যিক মানবোৰৰ বহুলক হ'ব

The mode of the set of data 12·6, 12·7, 12·9, 12·7, 12·6, 12·8, 13·0, 12·5, 12·6 is

(i) 12·7 *(ii)* 12·6

(iii) 12·71 *(iv)* 12·75

(b) তলৰ কোনটো অতিবেঙুণীয়া-দৃশ্যমান ৰশ্মিৰ উৎস নহয় ?

All of the following are useful as a source for UV-visible radiation, *except*

(i) গ্লৱাৰ উৎস
globar source

(ii) জেনন ডিছচার্জ চাকি
xenon discharge lamp

(iii) ডিউটেৰিয়াম ডিছচার্জ চাকি
deuterium discharge lamp

(iv) টাংষ্টেন ফিলামেণ্ট চাকি
tungsten filament lamp

(c) IR spectroscopy ত 'hot band' তলৰ কোনটো পৰিৱৰ্তনৰ লগত জড়িত ?

A hot band in IR spectroscopy is corresponding to the transition

(i) $\upsilon = 0$ ৰ পৰা $\upsilon = 1$
from $\upsilon = 0$ to $\upsilon = 1$

(ii) $\upsilon = 0$ ৰ পৰা $\upsilon = 2$
from $\upsilon = 0$ to $\upsilon = 2$

(iii) $\upsilon = 1$ ৰ পৰা $\upsilon = 0$
from $\upsilon = 1$ to $\upsilon = 0$

(iv) $\upsilon = 1$ ৰ পৰা $\upsilon = 2$
from $\upsilon = 1$ to $\upsilon = 2$

(Continued)

(d) তাপ-ভৰমাপক অনুসন্ধানত ভৰ বনাম উষ্ণতা চিত্ৰৰ নাম হ'ল

The mass vs. temperature plot in thermogravimetric analysis is called

(i) থাৰ্ম'গ্ৰাফ
thermograph

(ii) ক্ৰ'মেট'গ্ৰাফ
chromatograph

(iii) থাৰ্ম'গ্ৰাম
thermogram

(iv) ক্ৰ'মেট'গ্ৰাম
chromatogram

(e) প'টেনচিওমেট্ৰিক টাইট্ৰেচন হ'ল

Potentiometric titration is

(i) প্ৰত্যক্ষ প'টেনচিওমেট্ৰি
direct potentiometry

(ii) পৰোক্ষ প'টেনচিওমেট্ৰি
indirect potentiometry

(iii) 'ইলেক্ট্ৰ'গ্ৰেভিমেট্ৰি
electrogravimetry

(iv) ভ'ল্টামেট্ৰি
voltametry

(Turn Over)

(f) কাগজ বর্ণলেখন পদ্ধতিত গতিশীল আৰু স্থিৰ পর্যায় দুটা হ'ল ক্রমে

In paper chromatography, the moving and stationary phases are

(i) পানী আৰু চেলুল'জ
water and cellulose respectively

(ii) দ্রাৱক আৰু চেলুল'জ
solvent and cellulose respectively

(iii) দ্রাৱক আৰু পানী
solvent and water

(iv) ওপৰৰ এটাও নহয়
None of the above

(g) আধান-বিনিময় বর্ণলেখন পদ্ধতি তলৰ কোনটো কাৰকৰ ওপৰত নির্ভৰ কৰে ?

Ion-exchange chromatography is based on the

(i) ৰেজিনৰ ওপৰত কণাসমূহৰ অধিশোষণ
adsorption of molecules on resin

(ii) আয়নীয় কণিকাৰ বৈদ্যুতিক গতি
electrical mobility of ionic species

(iii) ইলেক্ট্ৰ'ষ্টেটিক আকর্ষণ
electrostatic attraction

(iv) ৰেজিন আৰু দ্রাৱকৰ মাজত বিভাজন
partition between resin and solvent

(Continued)

2. তলৰ প্ৰশ্নবোৰৰ উত্তৰ দিয়া : 2×6=12

Answer the following questions :

(a) প'টেনচিওমেট্ৰিক টাইট্ৰেচনৰ অন্তিম বিন্দু কেনেকৈ নির্ণয় কৰা হয় ? উপযুক্ত লেখচিত্ৰৰ সহায়ত ব্যাখ্যা কৰা।
How can the equivalence point in a potentiometric titration be detected? Explain with suitable graphs.

(b) ক্রমাগত আৰু বিপৰীত-প্রৱাহ নিষ্কাশনৰ মাজত পার্থক্য লিখা।
Differentiate between continuous and counter-current extractions.

(c) চিলেত গঠনৰ সহায়ত জলীয় দ্রৱ/পর্যায়ৰ পৰা ধাতুৰ আধান নিষ্কাশন পদ্ধতিটো আলোচনা কৰা।
Discuss the extraction of metal ions from aqueous phase by chelation.

(d) IR স্পেক্ট্ৰ'স্কপিত কঠিন পদার্থৰ নমুনা প্রস্তুতকৰণ কৰোতে 'চাপকৃত বড়ি/গুলি' পদ্ধতিটো আলোচনা কৰা।
Discuss the 'pressed pellet' technique used in sampling of solid sample in IR spectroscopy.

(e) UV-vis স্পেক্ট্ৰ'স্কপিত এবজ'ৰবেন্স আৰু ট্রান্সমিটেন্স কি ? ইহঁত কেনেদৰে সম্পর্কিত ?
What are absorbence and transmittance in UV-vis spectroscopy? How are they related?

(f) ফ্রাংক-কনড'ন নীতি কি ?
What is Franck-Condon principle?

(Turn Over)

3. তলৰ ফলাফলসমূহৰ সৰ্বোচ্চ মানটো প্ৰত্যাখ্যানযোগ্য নেকি Q-পৰীক্ষাৰ সহায়ত ঠিৰাং কৰা :

2·18, 2·19, 2·30, 2·15 আৰু 2·20;

দিয়া আছে, 90% আত্মবিশ্বাস স্তৰত $n = 5$ ৰ কাৰণে $Q_{tab} = 0 \cdot 64$.

Apply Q-test to check the rejection of the highest value in the following results :

2·18, 2·19, 2·30, 2·15 and 2·20

Given, for $n = 5$, $Q_{tab} = 0 \cdot 64$ at 90% confidence level.

নাইবা / Or

বিশ্লেষিত নমুনা এটাৰ আকাংক্ষিত উপাদানটোৰ প্ৰকৃত মান 2·62 গ্ৰাম। তিনিটা মাপৰ ফলাফলসমূহ হ'ল 2·50 গ্ৰাম, 2·54 গ্ৰাম আৰু 2·52 গ্ৰাম। মাপবোৰৰ গড় ত্ৰুটি, আপেক্ষিক ত্ৰুটিৰ শতাংশ আৰু গড় মানৰ আপেক্ষিক যথাৰ্থতা/সঠিকতা নিৰ্ণয় কৰা।

A sample was analyzed for desired constituent having 2·62 g as the true value. The results of three measurements were 2·50 g, 2·54 g and 2·52 g. Find the error of the mean (mean error), the percent relative error and the relative accuracy of the mean of the measurements.

(Continued)

4. *(a)* তলৰ যি কোনো এটা প্ৰশ্নৰ উত্তৰ লিখা : 3

Answer any *one* question from the following :

(i) শিখা পাৰমাণৱিক শোষণ/নিৰ্গমন স্পেক্ট্ৰ'স্কপিত নমুনা উপস্থাপন আৰু পৰমাণুকৰণ পদ্ধতি আলোচনা কৰা।

Discuss the sample introduction and atomization technique used in flame atomic absorption/emission spectroscopy.

(ii) এটা অনৈক্যতানযুক্ত দোলকৰ অনুকম্পনীয় স্থানান্তৰৰ বাবে নিৰ্বাচন বিধি লিখা। মুখ্য শোষণ আৰু অতিস্বৰ/অ'ভাৰট'ন কি? অতিস্বৰৰ তীব্ৰতা ক্ষীণ কিয়?

Write down the selection rules for vibrational transition of an anharmonic oscillator. What are the fundamental absorption and overtones? Intensities of overtone absorptions are weak. Why?

(b) তলৰ যি কোনো তিনিটা প্ৰশ্নৰ উত্তৰ লিখা : 4×3=12

Answer any *three* questions from the following :

(i) এটা UV-vis স্পেক্ট্ৰ'ফ'টোমিটাৰৰ প্ৰধান উপাংশবোৰ কি কি? উপাংশবোৰৰ গঠন আৰু কাৰ্যসমূহ চমুকৈ আলোচনা কৰা।

(Turn Over)

What are the main components of a UV-vis spectrophotometer? Briefly discuss their construction and works.

(ii) জৈৰ যৌগ এটাৰ জ্যামিতীয় আইচ'মাৰবোৰ পার্থক্য উলিয়াওঁতে UV-vis স্পেক্ট্ৰ'স্কপি কিদৰে ব্যৱহাৰ কৰা হয়? উপযুক্ত উদাহৰণসহ ব্যাখ্যা কৰা।

How can the UV-vis spectroscopy be used to distinguish the geometrical isomers of an organic compound? Explain with suitable examples.

(iii) IR-স্পেক্ট্ৰ'স্কপিত আইচ'টপিক প্ৰতিস্থাপনৰ প্ৰভাৱ আলোচনা কৰা। বেনযিন চক্ৰৰ C—H বান্ধনিৰ নমন অনুকম্পনীয় কম্পনাংক 1192 cm^{-1}ত পোৱা গ'ল। যদি হাইড্ৰ'জেন পৰমাণুটো ডিউটেৰিয়াম পৰমাণুৰ দ্বাৰা প্ৰতিস্থাপন কৰা হয়, তেন্তে ইয়াৰ অনুকম্পনীয় কম্পনাংক কি হ'ব? 3+1=4

Discuss the effect of isotopic substitution in IR spectroscopy. The bending vibrational frequency of C—H bond of benzene ring is found at 1192 cm^{-1}. If the hydrogen atom is substituted with deuterium, what will be the vibrational frequency of the bond?

(Continued)

(iv) পাৰমাণৱিক শোষণ স্পেক্ট্ৰ'স্কপিত আয়নীয় হস্তক্ষেপ কি? ইয়াক কিদৰে নিয়ন্ত্ৰণ কৰিব পাৰি? 2+2=4

What is ionization interference in atomic absorption spectroscopy? How can the ionization interference be minimized?

(v) Jobsৰ ক্ৰমাগত পৰিৱৰ্তন পদ্ধতিৰ সহায়ত দ্ৰৱত গঠন হোৱা জটিল আয়নৰ গঠন-সংকেত কিদৰে নির্ণয় কৰা হয়? ব্যাখ্যা কৰা।

How can the composition of the complex ion formed in solution be determined by Jobs continuous variation method? Explain.

5. TGAৰ পৰীক্ষণীয় বিন্যাস আলোচনা কৰা। 3

Describe the experimental setup of TGA.

নাইবা / Or

এক ধাপযুক্ত ভৰ হ্ৰাস প্ৰক্ৰিয়াৰ বাবে এটা আদর্শ TG ৰেখা আৰু ইয়াৰ অনুৰূপ অৱকলন DTG ৰেখা অংকন কৰা। ৰেখাবোৰৰ বিভিন্ন অংশসমূহ চিনাক্ত কৰি চমুকৈ ব্যাখ্যা কৰা।

Sketch a typical TG curve and the corresponding derivative thermogravimetric (DTG) curve for single-step mass loss process. Label and briefly explain the different regions of the thermogravimetric curves.

(Turn Over)

6. *(a)* পৰিৱাহী কোষ এটাৰ 'কোষ ধ্ৰুৱক' কি? ইয়াৰ একক কি? 25 °C উষ্ণতাত 0·01 *M* KCl দ্ৰৱ যাৰ বিশিষ্ট পৰিৱাহিতা 0·001409 S cm^{-1} এটাৰ ৰোধকৰ মান 161·8 Ω। একেটা কোষৰ বাবে 0·005 *M* NaOH দ্ৰৱ এটাৰ ৰোধকৰ মান 190 Ω পোৱা গ'ল। কোষটোৰ কোষ ধ্ৰুৱক, NaOH দ্ৰৱৰ বিশিষ্ট পৰিৱাহিতা আৰু ম'লাৰ পৰিৱাহিতা নিৰ্ণয় কৰা। 1+1+3=5

What is 'cell constant' of a conductivity cell? What is its unit? A certain conductivity cell was filled with 0·01 *M* solution of KCl (whose specific conductance is 0·001409 S cm^{-1}) at 25 °C; a resistance of 161·8 Ω is recorded at the conductivity metre. When is the same cell filled with 0·005 *M* NaOH, its resistance is found to be 190 Ω . Calculate the cell constant, specific conductivity and molar conductivity of NaOH solution.

নাইবা / Or

(b) প্ৰমাণ হাইড্ৰ'জেন বিদ্যুৎদ্বাৰ (SHE)ৰ গঠন আৰু কাৰ্যপ্ৰণালী আলোচনা কৰা। ইয়াৰ সুবিধা আৰু অসুবিধাসমূহ উল্লেখ কৰা। 2+2+1=5

Discuss the construction and working principle of standard hydrogen electrode (SHE). Mention the advantages and disadvantages of SHE.

(Continued)

7. তলৰ যি কোনো দুটা প্ৰশ্নৰ উত্তৰ লিখা : 4×2=8

Answer any *two* questions from the following :

(a) জৈৱ যৌগৰ দ্ৰৱণীয়তা বৈশিষ্ট্য আৰু আম্লিক/ক্ষাৰকীয় ধৰ্মৰ ভিত্তিত এটা মিশ্ৰণৰ পৰা বিভিন্ন জৈৱ যৌগৰোৰ কেনেকৈ পৃথক কৰিব পাৰি, উপযুক্ত উদাহৰণসহ ব্যাখ্যা কৰা।

Explain with suitable examples how we can separate different organic compounds from a mixture depending upon the solubility characteristics of these compounds and using acidic/ basic behaviour.

(b) অধিশোষণ আৰু বিভাজন বৰ্ণলেখনৰ পাৰ্থক্যসমূহ আলোচনা কৰা। অধিশোষণ আৰু বিভাজন বৰ্ণলেখনৰ একোটাকৈ উদাহৰণ দিয়া।

Discuss the differences between adsorption and partition chromatography. Give one example of adsorption and partition chromatography.

(c) স্তম্ভ বৰ্ণলেখনৰ দ্বাৰা মিশ্ৰণ এটাৰ উপাদানসমূহ পৃথকীকৰণ পদ্ধতিত isocratic elution আৰু gradient elution কি, আলোচনা কৰা।

Discuss the isocratic elution and gradient elution for separating the components of a mixture using column chromatography.

★★★