Total Marks 75

N.B. 1) All questions are compulsory

2) Figures to the right indicate full marks.

Q.1) A) Explain the following concepts (Any Five) 15

1) Human Rights
2) Right to Equality
3) Drought
4) Disaster Management
5) Age of Reason
6) Blind Belief
7) Body Language
8) Team Building

OR

B) Discuss in detail on the Foundation Course for Semester - III project submitted by you.

Q.2) A) State the forms of Violation of the Human Rights of Scheduled Tribes. 15

OR

B) Explain in detail the 'Domestic Violence Act 2005'

Q.3) A) Describe the Physical and Psychological effects of disaster. 15

OR

B) State the Humanitarian approach to Rehabilitation and Resettlement.

Q.4) A) Comment on contribution of ' Newton' and 'Galileo' toward the growth of science. 15

OR

B) State the importance of science in everyday life

Q.5) A) Briefly explain the advantages and disadvantages of oral communication. 15

OR

B) Describe in detail 'importance of listening.'

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[illegible]

[illegible] मिनिटे एकूण गुण – ७५

सूचना - १) सर्व प्रश्न अनिवार्य आहेत.

२) उजवीकडील अंक पूर्ण गुण दर्शवितात

प्र.१) अ) खालील संकल्पना स्पष्ट करा. (कोणत्याही पाच) १५

१) मानवी हक्क

२) समतेचा अधिकार

३) अवर्षण

४) आपत्ती व्यवस्थापन

५) तर्कशक्ती युग

६) अंधविश्वास

७) देहबोली

८) संघ बांधणी

किंवा

ब) पायाभूत अभ्यासक्रम सत्र -३ साठी तुम्ही सादर केलेल्या प्रकल्पावर सविस्तर चर्चा करा.

प्र.२) अ) अनुसूचित जमातींच्या मानवी हक्कांच्या उल्लंघनाचे प्रकार सांगा १५

किंवा

ब) 'कौटुंबिक हिंसाचार कायदा २००५ सविस्तर स्पष्ट करा

प्र.३) अ) आपत्तीचे शारीरिक आणि मानसशास्त्रीय परिणाम विशद करा १५

किंवा

ब) पुनर्वसन आणि पुनर्रचना याविषयी मानवी दृष्टिकोन सांगा.

प्र.४) अ) 'न्यूटन' आणि 'गॅलिलिओ' शास्त्रज्ञांच्या विज्ञानाच्या विकासातील योगदानावर भाष्य करा. १५

किंवा

ब) दैनंदिन जीवनातील विज्ञानाचे महत्त्व सांगा.

प्र.५) अ) मौखिक संज्ञापनाचे फायदे आणि तोटे थोडक्यात स्पष्ट करा १५

किंवा

ब) श्रवण क्रियेचे महत्व विशद करा.

****

टिप:१ सर्व प्रश्न अनिवार्य आहेत

२. सर्व प्रश्नांना समान गुण आहेत.

३. Q.३, आणि Q.४ साठी अ आणि ब किंवा क आणि ड सोडावा

प्र.१ अ) रिकाम्या जागा भरा (०८)

१ ..... हे भारताचे संरक्षणमंत्री आहेत.

२ किरणोत्सर्गाच्या प्रभावाचा मुकाबला अग्नी आणि संरक्षित वस्तूयांच्यामध्ये.....पडदा तयार करून केला जाऊ शकतो.

३ .....पाऊस हा सल्फरडायऑक्साइड आणि नायट्रोजन ऑक्साईड यांसारख्या हानिकारक रसायनांच्या उत्सर्जनामुळे होतो.

४ ड्रिल के उसूल हैं-....., स्थिरता आणि समन्वय.

५ आर्मी कायमस्वरूपी आणि ..... दोन्ही ऑफर करते.

६ टीव्ही, रेफ्रिजरेटरआणि कॉम्प्युटरचे .....कचरा म्हणून वर्गीकरण केले जाते.

७ ट्रेनिंग अकादमी, ... खडकवासला, पुणे येथे आहे.

८ INSAS म्हणजे...

ब चूक किंवा बरोबरलिहा (०७)

१ 'आंतरराष्ट्रीय योगदिन' वर्षाच्या 21 जुलै रोजीसाजरा केला जातो.

२ एनसीसी कॅडेट राष्ट्रीय एकात्मता राखण्यासाठी महत्त्वाची भूमिका बजावू शकतात.

३ एखाद्या व्यक्तीचे व्यक्तिमत्व हे मानसिक वैशिष्ट्यांचे एक जटिल आहे जे त्याला अद्वितीय बनवते.

४ सेंद्रिय कचरा औद्योगिक स्त्रोतांकडून येतो.

५ इंडियन मिलिटरी अकादमी मुंबई येथे आहे.

६ सेक्शन सर्वात लहान लढाई युनिट आहे.

७ सहानुभूती म्हणजे दुसऱ्या व्यक्तीच्या परिस्थितीबद्दल असंवेदनशील होण्याची क्षमता.

प्र.2 अ) राष्ट्रीय एकात्मता राखण्यासाठी NCC कॅडेट कोणती भूमिका बजावू शकतात? (०८)

प्र.2 ब) राष्ट्रीय एकात्मता म्हणजे काय? त्याची गरज स्पष्ट करा. (०७)

किंवा

प्र.2 क) रेनवॉटर हार्वेस्टिंग म्हणजे काय? त्याचे प्रकार स्पष्ट करा. (०८)

प्र.2 ड) ध्वनी आणि जल प्रदूषणाचे परिणाम स्पष्ट करा. (०७)

प्र.3 अ) ट्रेकिंगच्या टिप्सचा उल्लेख करा आणि ट्रेकिंगसाठी सुरक्षिततेच्या उपायांवर एक टीप जोडा. (०८)

प्र.3 ब) ड्रिलचा इतिहास द्या. त्याचे तत्त्व स्पष्ट करा आणि ड्रिलमध्ये वाईट सवयींवर एक टीप जोडा. (०७)

किंवा

प्र.3 क) प्रदूषणाची व्याख्या करा. त्याचे दुष्परिणाम द्या. (०८)

प्र.3 ड) अग्नीची व्याख्या करा. आग पसरवण्याच्या पद्धती द्या. (०७)

प्र.४ अ) अडथळा प्रशिक्षण महत्वाचे का आहे? कोणतेही ४ अडथळा अभ्यासक्रम स्पष्ट करा. (०८)

प्र.४ ब) स्लिदरिंग म्हणजे काय? त्याचे फायदे सांगा.स्लिदरिंग उपकरणे स्पष्ट करा.. (०७)

किंवा

प्र.४ क) CV परिभाषित करा. मुलाखतीची पूर्व तयारी स्पष्ट करा.. (०८)

प्र.४ ड) व्यक्तींनी आणि नागरी संस्थांनी केलेल्या कृतींच्या संदर्भात कचराव्यवस्थापनाचे स्पष्टीकरण द्या. (०७)

प्र.५ टिपा लिहा. (कोणतेही तीन) (१५)

अ. कचऱ्याचे प्रकार.

ब ट्रेकिंगसाठी सुरक्षिततेचे उपाय.

क वेळ व्यवस्थापनाची तत्त्वे.

ड. राष्ट्रीय एकात्मतेची आव्हाने

ई. एक अच्छे आदेश देने के लिए जरूरी बातें.

Time- 2 hours Marks-75

Note: 1. Attempt all questions
2. All questions carry equal marks.
3. For Q.2,Q.3 and Q.4 attempt A and B OR C and D

Q.1 A) FILL IN THE BLANKS (08)

1. .....is the defence minister of India.
2. The effect of radiation can be countered by forming a ...curtain between fire and the object to be protected.
3. .....rain is caused by emission of harmful chemicals as sulphur dioxide and nitrogen oxide..
4. Drill k eusul hain-..... steadiness and coordination.
5. Army offers both Permanent and ..... Commission.
6. TVs,refrigerators and computers are classified as..... waste.
7. Training academy.....is located at khadakwasala , Pune.
8. INSAS stands for...

B) STATE TRUE OR FALSE (07)

1 'International yoga day' is celebrated on 21st July of the year.
2 NCC cadets can play important role to maintain national integration.
3 An individual's personality is the complex of mental characteristics that makes him unique.
4 Organic waste comes from industrial sources.
5 Indian Military Academy located at Mumbai.
6 Section is the smallest fighting unit.
7 Empathy is the ability to be insensitive to another person's situation.

Q.2 A) What role NCC cadets can play to maintain National Integration? (08)

Q.2 B) What is National Integration? Explain necessity of it. (07)

OR

Q.2 C) What is rain water harvesting? Explain its types. (08)

Q.2 D) Explain effects of sound and water pollution. (07)

Q.3 A) Mention the tips for trekking. and add a note on safety measures for trekking. (08)

Q.3 B) Give the history of drill. Explain its principle and add a note on bad habits in drill. (07)

OR

Q.3 C) Define pollution. Give its ill-effects. (08)

Q.3 D) Define fire. Give modes of spreading of fire. (07)

Q.4 A) Why obstacle training is important? Explain any 4 obstacle courses. (08)

Q.4 B) What is slithering? Give its advantages. Enlist slithering equipments. (07)

OR

Q.4 C) Define C.V.Explain pre-interview preparation. (08)

Q.4 D) Explain waste management with respect to actions taken by individuals and by civicbodies. (07)

Q.5 **Write short notes on.(ANY THREE)** (15)

a. Types of waste.
b. Safety measures for trekking.
c. Principles of time management.
d. Challenges of National Integration
e. Ek acche words of command dene ke liye zaroori batten.

M1910235509

SYBSC 200

Duration : 03 hrs

Marks-100 19/10/23

NB: 1. All the questions are compulsory.
2. Figures to the right indicate full marks.
3. Draw neat labeled diagrams wherever necessary.

Q. 1 A) Choose appropriate answer and rewrite the sentence. 05

i) ---------- is called Father of Genetics.
(George Mendel, Gregor Mendel, Lamarck, Sir Alexzander)

ii) Antigens are absent from the surface of RBC in ---------- blood group.
(A, B, AB, O)

iii) ---------- is not a structure of chromosome.
(Primary constriction, Secondary constriction, Tertiary constriction, Nucleolar organizer)

iv) ---------- is responsible for transmission of hypertrichosis.
(X chromosome, Y chromosome, Autosome, Satellite)

v) ---------- sugar is found in RNA.
(Ribose, Deoxyribose, Glucose, Fructose)

Q. 1 B) Match the following columns. 05

Column I	Column II
Alanine	a) Pattern baldness
Phenylketonuria	b) Women
Straight hair	c) CGA
Barr bodies	d) Biostatistics
Frequency	e) Inborn error of metabolism

Q. 1 C) Define the following terms. 05

i. Crossing over
ii. Mulattos
iii. Cloning
iv. Fermentation
v. Spectroscopy

Q. 1 D) State whether the following statements are **True or False**. 05

i) The combination of alleles inherited by an individual is called genotype.
ii) D-loop in tRNA has an enzyme recognition site.
iii) Telomeres do not prevent sticking of ends of chromosome.
iv) In repression the activity of the gene is suppressed and the synthesis of the specific protein is stopped.
v) More condensed region of chromosome shows euchromatin.

Q. 2 A) With the example of coat colour in rabbit, explain the concept of multiple alleles. 10

OR

Q. 2 A) With the suitable example describe the Mendel's dihybrid cross. 10

(P.T.O.)

Q. 2 B) Attempt **any TWO** of the following. 10

1. Enlist any ten common phenotypic traits in human.
2. With suitable example explain the idea of Co-Dominance.
3. Elaborate the modern concept of genes.
4. Enlist the factors affecting crossing over.

Q. 3 A) Describe the structure of chromosome. 10

OR

Q. 3 A) Describe the role of environmental factors in sex determination in *Bonellia.* 10

Q. 3 B) Attempt **any TWO** of the following. 10

i) Comment on genetic balance theory in Drosophila.
ii) Describe the ZZ - ZW mechanism of sex determination.
iii) Describe the structure of Polytene chromosome.
iv) Give the classification of chromosomes based on the position of centromere.

Q. 4 A) Describe the Griffith's transformation experiments. 10

OR

Q. 4 A) Describe the Harshey and Chase experiment. 10

Q. 4 B) Attempt **any TWO** of the following. 10

a) Draw the structures of Purine and Pyrimidine bases.
b) Draw the structural difference between nucleoside and nucleotide.
c) Enlist the biological significance of double helical model of DNA.
d) Give this salient features of H-DNA

Q. 5.Write short notes on **any FOUR**. 20

a) ABO blood group system
b) Test cross
c) Sex reversal
d) Haplodiploidy
e) Transcription
f) RNA polymerase

XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

SYBSC maths
19/10/23

M1910235 10

Time: 02.30 hours | Total Marks: 75

Instructions: 1) All questions are compulsory.
2) Figure to the right indicates full marks.
3) Use of calculator is not allowed.

Q.1 A) Attempt any one question of the following. **(8)**

a) Prove that a positive term series $\sum \frac{1}{n^p}$ is convergent for $p > 1$ and diverges for $p \leq 1$.

b) Prove that a positive term geometric series $\sum_{n=0}^{\infty} r^n$ converges for $r < 1$ and diverges to infinity for $r \geq 1$.

B) Attempt any two questions of the following. **(12)**

a) Prove that $\sum \frac{5^n+5}{3^n+2}$ is divergent.

b) Using sequence of partial sum show that $\sum_{n=1}^{\infty} (\frac{4}{5})^n$ is convergent.

c) Test the convergence of the series $\frac{1}{1*2*3} + \frac{3}{2*3*4} + \frac{5}{3*4*5} + \ldots\ldots\ldots$

Q.2 A) Attempt any one question of the following. **(8)**

a) A function $f: [a, b] \to \mathbb{R}$ be integrable function and $\alpha \in \mathbb{R}$, then αf is integrable and $\int_a^b \alpha . f(x)dx = \alpha \int_a^b f(x)\ dx$.

b) State and prove Riemann criterion for integrability.

B) Attempt any two questions of the following. **(12)**

a) Prove that every constant function is Riemann integrable.

b) Let $f: [0, 4] \to \mathbb{R}$ defined by $f(x) = 2x^2 + 4$. Prove that f is integrable on $[0, 4]$ and obtain $\int_0^4 f(x)\ dx$.

c) Show that $f(x) = x^3$ for $0 \leq x \leq 1$ is integrable on [a, b] and that $\int_0^1 f(x)\ dx = \frac{1}{4}$.

Q.3 A) Attempt any one question of the following. **(8)**

a) Prove that $\beta(m, n) = \int_0^1 \frac{x^{m-1}+x^{n-1}}{(1+x)^{m+n}}$.

b) The improper integral $\int_0^{\infty} x^{n-1}e^{-x}\ dx$ converges if and only if $n > 0$.

B) Attempt any two questions of the following. **(12)**

a) Show that $n\Gamma(n) = \Gamma(n + 1)\ for\ n > 0$.

b) Show that $\Gamma\left(\frac{1}{2}\right) = \sqrt{\pi}$.

c) Prove that $\beta(m, n) = \beta(m + 1, n) + \beta(m, n + 1)$

Q.4 **Attempt <u>any three</u> questions of the following.** (15)

a) Prove that $\sum \frac{1}{\sqrt{n+2}+\sqrt{n}}$ is divergent series.

b) Let $f:[a,b] \to \mathbb{R}$ be a bounded function and P be a partition then $L(P,f) \leq U(P,f)$.

c) Show that the series $\sum \frac{1}{(n+1)(n+2)}$ is convergent series.

d) Let $f:[0,1] \to \mathbb{R}$ defined by $f(x) = 1 - x$. Let $P = \{0, \frac{1}{4}, \frac{1}{2}, \frac{3}{4}, 1\}$, find $L(P,f), U(P,f)$ and $||P||$.

e) Prove that $\Gamma(1) = 1$.

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SYBSC 200
20/10/23

M201023518

Time: 3 Hrs. **Marks: 100.**

Please check whether you have got the right question paper.

NB: 1. All questions are compulsory and carry equal marks.
2. Figures to the right indicate full marks.
3. Draw neat and labeled diagrams wherever necessary.
4. Attempt the questions in order.

Que.1. A Fill in the blanks by choosing the correct options. **05**

a Organisms that synthesize their own food material from simple substances are called .....(Autotrophs, Heterotrophs, Saprophytes)

b Cnidarians possess an internal cavity called.....(Coelom, Spongocoel, Gastro vascular cavity)

c .....animals excrete urine as the main end product of nitrogen metabolism. (Uricotelic, Ammonotelic, Ureotelic)

d Presence of air sacs is an important feature of the respiratory system of .....(Birds, Mammals, Amphibians)

e .....have few granules in the cytoplasm that show affinity to both acidic dyes and basic dyes.(Eosinophils, Basophils, Neutrophils)

B Match the column I and II and rewrite. **05**

	Column I		**Column II**
a	Labyrinthine organ	i	Frog
b	Closed circulation	ii	Planaria
c	Buccopharyngeal respiration	iii	Sperm
d	Flame cells	iv	*Anabas*
e	Acrosome	v	Earthworm

C State whether true or false. **05**

a Foregut is also known as proctodaeum.
b The simplest type of excretory system is the septal nephridia.
c Interclavicular air sac is an unpaired air sac.
d Cockroach heart has 03 muscular chambers in abdomen.
e Simple binary fission occurs in Hydra.

D Define the following. **05**

a Rumen
b Arborescent organ
c Lymph
d Galvanotropism
e Spermiogenesis

Que.2. A Discuss the digestion in Cockroach. **10**

OR

A Explain the structure of kidney of man.

	B	**Explain any Two from the following:**	10
	a	Formation of food vacuole in Amoeba	
	b	Types of animals based on principal nitrogenous excretory products	
	c	Malpighian tubules in cockroach	
	d	Structure of book lung in spider.	
Que.3.	A	Discuss the physiology of respiration in man.	10
		OR	
	A	Discuss the different types of circulatory fluids in animals.	
	B	**Explain any Two from the following:**	10
	a	Respiration in spider	
	b	Flame cells	
	c	Heart of pigeon	
	d	Mechanism of working of heart in man.	
Que.4.	A	Describe the types of neurons based on structure and function.	10
		OR	
	A	Discuss the structure of female gamete in human.	
	B	**Explain any Two from the following:**	10
	a	Synaptic transmission	
	b	Fins in fishes	
	c	Gemmule formation in sponge	
	d	Ovoviviparity.	
Que.5.		**Write short notes on any four.**	20
	a	Ruminant stomach	
	b	Sol-Gel theory	
	c	Heart of Cockroach	
	d	Types of fertilization.	

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SYBSC maths
20/10/23

M201023519

Duration: 2.30hrs **Maximum marks: 75**

N.B. 1) All questions are compulsory.
2) Figures to right indicate full marks.
3) Use of calculator is not allowed.

Q 1. A] Attempt Any One. **(8)**

i) Define row echelon form of a matrix. Also, describe types of solutions for a system of linear equations by using graph.

ii) Define orthogonal matrix & idempotent matrix with one example each and convert the given matrix into row echelon form: $\begin{pmatrix} -3 & 1 & 2 \\ 3 & 0 & -1 \\ 2 & -4 & -4 \\ 4 & -1 & 0 \end{pmatrix}$

B] Attempt Any Two. **(12)**

i) Express the matrix $\begin{pmatrix} 6 & 0 \\ 7 & 2 \end{pmatrix}$ and its inverse as a product of elementary matrices.

ii) Determine the values of $'k'$ such that following system does not have unique solution.
$$kx + y + z = 1\,, x + ky + z = 2\,, x + y + kz = 3$$

iii) The ones digit of a three-digit number is four times the hundreds digit while the tens digit is seven more than the hundreds digit. If the sum of the three digits is 19, what is this three-digit number?

Q 2. A] Attempt Any One. **(8)**

i) State and prove subspace criteria.

ii) Prove that every subset of linearly independent set is linearly independent and every superset of linearly dependent set is linearly dependent.

B] Attempt Any Two. **(12)**

i) Extend $\{(0,1,0), (-1,0,1)\}$ to form a basis of $\mathbb{R}^3$.

ii) Show that $M_2(\mathbb{R})$ is vector space.

iii) Find basis and dimension of : a) $S = \{(x, y, z) : 3x - y - 2z = 0\}$

b) $W = \left\{ \begin{pmatrix} 0 & a \\ b & c \end{pmatrix} \mid a, b, c \in \mathbb{R} \right\}$

Q 3. A] Attempt Any One. **(8)**

i) Define invertible matrix. Also, show that an $n \times n$ real matrix A is invertible if and only if $|A| \neq 0$.

ii) State & prove Cramer's rule.

B| Attempt Any Two. (12)

i) Find $|A|$ by using Laplace expansion by 2nd row & 1st column.

$$A = \begin{pmatrix} 1 & -2 & -1 \\ -2 & 3 & 4 \\ 9 & 2 & 2 \end{pmatrix}$$

ii) Solve the following system by using Cramer's rule.

$$\frac{1}{x}+\frac{1}{y}+\frac{1}{z}=-2, \quad \frac{1}{x}-\frac{2}{y}+\frac{1}{z}=3, \quad \frac{2}{x}-\frac{1}{y}+\frac{3}{z}=-1$$

iii) Find A^{-1} by using adjoint method for $A = \begin{pmatrix} 0 & 3 & 0 \\ 4 & 1 & 2 \\ 0 & 1 & 6 \end{pmatrix}$

Q 4. Attempt any Three. (15)

i) Solve the following system by Gauss elimination method.

$$3x - 2y + z = 9, 6x + y - 3z = 14, y - z = 10$$

ii) Find k, if area of Δ LMN is 33/2 square unit and vertices are L (3, −5), (−2, k), (1, 4).

iii) Check whether it is possible to express $(-4, 12, 10)$ as a linear combination of $(-1, 3, 2)$ and $(-2, 6, 5)$.

iv) Check whether $S = \left\{ \begin{pmatrix} a & b \\ c & d \end{pmatrix} \middle| \; a, b, c, d \in \mathbb{R}, ad - bc \neq 0 \right\}$ is a vector space or not.

v) Prove that $\mathbb{R}^2$ is a vector space.

SYBSC maths
21/10/23

M2110033528

Time: 02.30 hours | Total Marks: 75

Instructions: 1) All questions are compulsory.
2) Figure to the right indicates full marks.
3) Use of scientific calculator is allowed.

Q.1 A) Attempt any one question of the following. (8)

a) Let $f(D)$ be a polynomial in linear operator D then $e^{ax} f(D)y = f(D-a)(e^{ax} y)$.

b) If $y_1, y_2, \ldots\ldots, y_k$ are k solutions to the nth order linear homogeneous differential equation $b_0(x)y^{(n)}(x) + b_1(x)y^{(n-1)} + \cdots + b_{n-1}(x)y'(x) + b_n(x)\, y(x) = 0$ then $c_1y_1 + c_2y_2 + \cdots + c_ky_k$ is also a solution where $c_1, c_2, \ldots\ldots, c_k \in \mathbb{R}$.

B) Attempt any two questions of the following. (12)

a) Show that $y_p = e^{3x}$ is a particular solution to $y'' - 2y' + y = 4e^{3x}$ and hence find the general solution to this differential equation.

b) Evaluate $(D-2)(D+4)^2$ using differential operator.

c) Obtain the differential equation whose solution is given below $y = xe^{-2x} + 4xe^{2x}cos3x$.

Q.2 A) Attempt any one question of the following. (8)

a) Let $P(x) and\ Q(x)$ are continuous functions on (a, b). Let $x_0 = (a, b)$ suppose y_1 is a solution to the differential equation $y'' + P(x)y' + Q(x)\, y = 0$ with $y_1(x_0) = 0\ and\ y_1'(x_0) = 0$, then $y_1(x) = 0\ \forall\ x \in (a, b)$.

b) Prove that,
i) $(D-a)^n\ (x^k\ e^{ax}) = 0$ for $k = 0,1,2, \ldots\ldots, n-1$.
ii) $(D-a)^n\ (x^n\ e^{ax}) = n!\ e^{ax}$.

B) Attempt any two questions of the following. (12)

a) Evaluate $(xD-1)(3x^2D+4)$ using differential operator.

b) Let $f(D)$ be a polynomial in linear operator D then $f(D)(e^{ax}) = f(a)(e^{ax})$.

c) Solve the differential equation $(D^2+1)^3y = 0$.

Q.3 A) Attempt any one question of the following. (8)

a) Given $\frac{dy}{dx} = \frac{y-x}{y+x}$, $y(0) = 1$. Find $y(0.1)$ using Runge-Kutta fourth order formula.

b) Using Euler's modified method solve the differential equation $\frac{dy}{dx} = 2 + \sqrt{xy}$, $y(1) = 1$ and find the value of $y(0.2)$ taking $h = 0.1$.

B) **Attempt <u>any two</u> questions of the following.** (12)

a) Obtain the solution of differential equation, $\frac{dy}{dx} = x(1 + x^3 y)$, $y(0) = 3$ using Picard's method (Up to second approximation).

b) Given $\frac{dy}{dx} = 1 + y^2,\ y(0) = 0$. Find $y(0.2)$ using Runge-Kutta fourth order formula.

c) Find the approximate solution of a differential equation $y'' + y + 1 = 0$ with the boundary conditions $y(0) = 0\ and\ y(1) = 0$ using finite difference method taking n=2.

Q.4 **Attempt <u>any three</u> questions of the following.** (15)

a) Prove that $\{3, 1 + x, 5 - x - x^2\}$ is linearly independent function using Wronskian.

b) Derive the formula for approximate solution of a first order differential equation by Euler's method.

c) Find the general solution of the differential equation $(D^3 + 2D^2 - 15D)y = 0$.

d) State the formula for approximate solution of a first order differential equation given by Runge-Kutta fourth order method.

e) Factorize $D^3 - 21D + 20$ using differential operator.

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S4BSc 200
21/10/23

P1211023527

Time: Three hours. Marks: 100

N. B. 1) All questions are **compulsory**.
2) All questions carry **equal marks**.
3) Draw neat labeled **diagrams** wherever **necessary**.

Q. 1. A) Fill in the blanks by choosing the correct option given in the bracket. 05

a) .....behaviour is transmitted unchanged to future generations.
(Learned, Innate, Sexual)

b) Animals choice of a place to live is called .....
(territorial behaviour, schooling behaviour, habitat selection)

c) Cysticercus larva of *Taenia solium* occurs in -
(Man, Pig, Sheep)

d) .....is a disease caused by the fungus and affects the honey bee brood.
(Chalk brood, Sac-brood, European foulbrood)

e) Cow's milk is most suitable for the manufacturing -- . . . . .
(Paneer, Chhena, Yogurt)

Q. 1. B) Match the columns I and II and rewrite. 05

Column I	Column II
1) Classical conditioning	a) Milk product
2) Instrumental learning	b) Vermiculture
3) Rabies	c) Thorndike
4) Windrows method	d) Ivan Pavlov
5) Chhena	e) Lyssavirus

Q. 1. C) State whether True or False. 05

a) The round dance in honey bees is shaped in the form of figure 'eight'.
b) In catadromous migration fishes migrate from marine water to fresh water.
c) Amoebiasis is caused by *Wuchereria bancrofti*.
d) H1N1 is causative influenza virus of Bird flu.
e) Yogurt is non fermented indigenous sweet made by mixing chenna.

Q. 1. D) Answer the following in one sentence only. 05

a) What is Mullerian mimicry?
b) What is kinship?
c) Define mechanical vector.
d) Write two names of ghee making methods.
e) What is toned milk?

(P.T.O.)

Q. 2. A) Describe the social behaviour in primates and add note on social behaviour in Hanuman langur. 10

OR

A) Describe different types of migration in fish with suitable example. 10

Q. 2. B) **Answer any two of the following:** 10

a) Explain the terrestrial behaviour in animals.

b) Describe the communication in bees.

c) Describe the Kinship in animals.

d) Explain the innate behaviour in animals.

Q. 3. A) Describe the life cycle, pathogenicity and control measures of *Fasciola hepatica*. 10

OR

A) Describe the life cycle, pathogenicity and treatment of *Taenia solium*. 10

Q. 3. B) **Write short notes on (any two)** 10

a) Parasitic adaptations in endoparasites.

b) Morphology of bed bug.

c) Filariasis.

d) Control measures and treatment of amoebiasis.

Q. 4. A) Describe the different bacterial diseases of honey bee and their control measures. 10

OR

A) Describe the different methods used for processing of milk. 10

Q. 4) **Answer any two of the following:** 10

a) Describe the methods of harvesting worms in vermiculture.

b) Give account on the pests and enemies of honey bee.

c) Explain the Windrows method used in vermiculture.

d) Describe the composition of milk.

Q. 5) **Write short notes on (any four)** 20

a) Communication in ants.

b) Insight learning.

c) Anthrax.

d) Types of host.

e) Honey bee eater birds.

f) Ghee.

****

M23102 3 S 35

SYBSC
23/10/23

Duration: $2\frac{1}{2}$ hours

Total marks: 75

N. B

1) All questions are compulsory.
2) Figures to the write indicate full marks.
3) Use of log table / non-programmable calculator is allowed.

Q.1 **Select the correct option and complete the following sentences. (Attempt any nine)** 09

A. a) Escaping tendency of the system is a measure of ----------.
i) activity ii) fugacity iii) activity coefficient

b) Chemical potential is the ---------- property of system.
i) extensive ii) intensive iii) colligative

c) The unit of equivalent conductance is ----------.
i) S cm^2 $eq.^{-1}$ ii) S cm^{-2} $eq.^{-1}$ iii) S cm^{-1} $eq.^{-1}$

d) The van't Hoff reaction isochore gives the variation of ---------- with temperature.
i) equilibrium constant ii) activity iii) activity

e) The degree of ionization --------- with decrease in concentration of the solution.
i) increases ii) decreases iii) remain constant

f) .....orbitals are gerade orbitals.
i) d ii) s iii) p

g) .....hybrid orbitals results from the combination of one s and one p atomic orbitals of valence shell of central atom of a given molecule.
i) sp ii) sp^3 iii) sp^2

h) Limiting radius ratio 0.0225-0.414 is there in ionic compounds with co-ordination no.....
i) 3 ii) 4 iii) 6

i) Resonance energy of CO molecule is ---------- k J/mol, if its observed bond energy and actual bond energy respectively are 726 kJ/mol and 1057 kJ/mol
i) 395ii) 727 iii) 331

j) Chlorobenzene when treated with CuCN under pressure gives ----------.
i) Benzene ii) p-Cyanochlorobenzene iii) Benzonitrile

k) Cyclohexyl methanol can be prepared by reaction of cyclohexyl magnesium bromide with ---------.
i) Acetaldehyde ii) acetone iii) formaldehyde

l) Dehydration of cyclohexanol using conc. H_2SO_4 at 140°c gives --------.
i) Cyclohexane ii) cyclohexene iii) cyclohexadiene

m) Phenyl acetate can be prepared by reaction of --------
i) Phenol + Propanoyl chloride
ii) Phenol + Ethanoyl chloride
iii) Benzene + Acetic acid

B. **State whether the following statements are true or false. (Attempt any three)** 03

a) The activity coefficient is a dimensionless quantity.

b) Transport number depends upon the ionic conductance of ions present in the electrolytic solution.

c) In superoxide ion, bond order is 1.5.

d) Ethylene oxide is also known as oxirane.
e) Aryl halides undergo nucleophilic substitution under normal laboratory conditions.

C. **Match the following. (Attempt any three)** 03

	Column A		Column B
a)	Kohlrausch's law of independent migration of ions	i)	Racemic mixture
b)	Gibbs – Duhem equation	ii)	Retention in configuration
c)	Bond angle in BCl_3	iii)	$\Sigma n_i d\mu_i = 0$
d)	Bond angle in methane	iv)	$104^0.5'$
e)	SN^1	v)	Inversion in configuration
		vi)	$\Lambda_M^\infty = \upsilon_+ \lambda_+^\infty + \upsilon_- \lambda_-^\infty$
		vii)	120^0
		viii)	$109^0.28'$

Q.2 **Attempt any four of the following.** 20

a) Explain;
   i) Significance of free energy change
   ii) Cell constant of conductivity cell

b) The equilibrium constant for the reaction, $N_{2(g)} + 3H_{2(g)} = 2NH_{3(g)}$ is 1.54×10^4 at 670 K and 0.155×10^4 at 775 K. Calculate the heat of formation of two moles of ammonia from its elements in this temperature range.
   (Given: R = 8.314 J/K/mole)

c) Define free energy. Show that, Helmholtz free energy is a measure of maximum work.

d) In the determination of transport number of Potassium ions, 0.1 M solution of Potassium chloride was followed by cadmium chloride solution. The boundary moved through a distance of 4.4 cm in a tube of cross-sectional area 0.113 cm^2. A current of 0 005 ampere passed for 455 seconds. Calculate the transport number of K^+ and Cl^- ions.

e) Derive van't Hoff reaction isotherm.

f) Define chemical potential. Derive an expression for variation of chemical potential with pressure at constant of temperature.

Q.3 **Attempt any four of the following.** 20

a) Draw the structure of Caesium chloride and explain in brief.

b) On the basis of potential energy curve, explain the quantum mechanical treatment to the formation of hydrogen molecule.

c) Define formal charge. Calculate formal charge for
   i) CO molecule
   ii) N_2O molecule

d) On the basis of valence bond theory describe the structure of PCl_5.

e) Draw molecular orbital energy level diagram of Nitrogen molecule showing distribution of electrons. Calculate its bond order and state magnetic property.

f) Distinguish between
   bonding molecular orbital and antibonding molecular orbital.
   Define i) resonance energy and ii) bond order.

Q. 4 Attempt any four of the following. 20

a) Give the mechanism of action of sodamide in liquid ammonia on chlorobenzene.

b) How will you obtain the following compounds using ethylene oxide?
i) Ethylene glycol ii) 2-bromoethanol iii) 2-chloroethanol

c) Explain the following terms giving examples.
i) Hydroboration oxidation ii) Hydrolysis of alkyl halides

d) What is the action of following reagents on Phenyl lithium?
i) Ethyl iodide ii) Formaldehyde
How will you prepare 2-Phenyl ethanol using Grignard reagent?

e) Explain the following :
i) Lower alcohols are soluble in water.
ii) p-Cresol is weaker acid than phenol.

f) i) Explain- Why the nucleophilic substitution in chlorobenzene is difficult?
ii) How are α- and β- naphthols prepared by using the naphthalene sulphonic acids?

.....

D. B. J. College, Chiplun

S. Y. B.Sc. Sem-III ATKT examination October – 2023

SYBSc
23/10/23

Subject: Chemistry Paper - I

Duration: 3 hours Total marks: 100

N. B.

1) All questions are compulsory.
2) Figures to the right indicate full marks.
3) Use of log table / non-programmable calculator is allowed.

Q.1 **Select the correct option and complete the following sentences.** 12
(Attempt any **twelve**)

A. i) As the pressure of the system increases, its free energy ----------,
a) decreases b) increases c) remain same

ii) The sum of transport number of ions is always --------.
a) equal to one b) less than one c) greater than one

iii) For spontaneous process free energy change is ----------.
a) $\Delta G > 0$ b) $\Delta G < 0$ c) $\Delta G = 0$

iv) Transport number of ions increases with --------.
a) increase in concentration
b) decrease in concentration
c) decrease in temperature

v) The unit of molar conductance is ----------.
a) $S\ cm^{-1}mol^{-1}$ b) $S\ cm^2mol^{-1}$ c) $S\ cm^2mol$

vi) Partial molal property is applicable to ---------- system.
a) Open b) closed c) isolated

vii) In sodium chloride both the ions have -------- Co-ordination number.
a) 6:6 b) 4:4 c) 8:8

viii) Bond order in Ne_2 molecule is _____indicate it is noble gas element.
a) two b) one c) zero

ix) In resonating structures the sequence of atoms in molecule should remain_____
a) different b) same c) altemate

x) _____ hybrid orbitals results from the combination of one s & one p atomic orbitals of valence shell of central atom of given molecule.
a) sp b) sp^3 c) sp^2

xi) In wurtizite structure, sulphur atoms forms _____
a) fcc b) hcp c) ccp

xii) Resonance energy of CO molecule is _____ $kJmol^{-1}$ as its calculate bond energy & actual Bond energy respectively 726 $kJmol^{-1}$ & 1057 $kJmol^{-1}$
a)395 b)727 c)331

xiii) In SN^2 reaction, the rate of reaction depends on concentration of ----------.
a) alkyl halide b) base c) alkyl halide and base

xiv) Ethyl magnesium bromide reacts with water gives ----------.
a) Ethanol b) Ethane c) Butane

xv) Aryl ethers are prepared by heating sodium phenoxide with alkyl halide is known as ----------.
a) Fries reaction b) Claisen reaction c) Williamson synthesis

xvi) Dehydration of cyclohexanol using conc. H_2SO_4 at 140°c gives --------.
a) cyclohexane b) cyclohexene c) cyclohexadiene

xvii) The oxidation of ethanol using potassium dichromate gives ----
a) acetone b) acetic acid c) propanoic acid

xviii) Action of organic per acids on alkenes is known as ---------- reaction.
a) epoxidation
b) oxidation
c) reduction

B. **State whether the following statements are true or false.** 3
(Attempt any three)

a) The degree of dissociation of weak electrolyte is inversely proportional to square root of concentration.
b) The activity coefficient of an ideal gas is always equal to one.
c) In bonding MO, overlap integral is positive.
d) Lower the resonance energy, greater is the stability of molecule.
e) Sodium ethoxide is organometallic compound.
f) Ethanol has higher boiling point than dimethyl ether.

C. **Match the following. (Attempt any five)** 5

	Column A		Column B
a)	Chemical potential	i)	Square planar geometry
b)	Fugacity	ii)	Reducing agent
c)	XeF_4	iii)	Intensive property of the system
d)	SF_6	iv)	Escaping tendency of the substance
e)	Sodium borohydride	v)	Organometallic compound
f)	Diethyl zinc	vi)	Octahdral geometry
		vii)	Extensive property of the system
		viii)	Tetrahedral geometry
		ix)	Oxidizing agent

Q.2 **Attempt any four of the following.**

a) Derive Gibbs-Helmholtz equation. 5
b) Define free energy. Show that, Helmholtz free energy is a measure of maximum work. 5
c) Explain the variation of molar conductance of an electrolyte with the concentration. 5
d) The conductance of 0.1N acetic acid solution is 0.465×10^{-3} S at 298 K. Calculate the equivalent conductance of acetic acid solution, if the electrodes in the cell are 1.0 cm apart and have cross sectional area of 1.10 cm^2. 5
e) The equilibrium constant for a gaseous reaction is 450 at 303 K. Calculate the standard free energy change. ($R = 8.314\ J\ K^{-1}\ mol^{-1}$) 5
f) Define degree of dissociation. Explain the conductometric method used to determine the dissociation constant of weak electrolyte. 5

Q.3 **Attempt any four of the following.**

a) State the applications of Born-Haber cycle. 5
b) What is formal charge? Calculate it for CO molecule. 5
c) What is Born Lande's equation? Explain it in brief. 5
d) Explain the shape of NH_3 molecule on the basis of valence bond theory. . 5
e) Define the following terms 5
a) Sigma-molecular orbital b) pi–Molecular orbital c) Hybridization d) Resonance energy e) Resonance
f) With the help of MOT, explain paramagnetic nature of B_2 molecule. 5

Q.4		**Attempt any four of the following.**	
	a)	How will you obtain the following compounds using ethylene oxide? i) Ethylene glycol ii) 2-bromoethanol iii) 2-chloroethanol	5
	b)	How are the following compounds prepared by using Grignard reagent? a) Benzyl alcohol b) 1-Phenyl ethanol	5
	c)	How do alcohols are prepared from aldehydes and ketones?	5
	d)	Explain the mechanism of alkaline hydrolysis of methyl bromide giving energy profile diagram.	5
	e)	How are α- and β- naphthols prepared by using the naphthalene sulphonic acids?	5
	f)	How do alcohols prepared by using hydration of alkenes and hydroboration reaction?	5
Q.5		**Attempt any four of the following.**	
	a)	**Explain:** i) Specific conductance ii) Equivalent conductance	5
	b)	Derive Gibbs-Duhem equation.	5
	c)	Distinguish between bonding molecular orbital & antibonding molecular orbital.	5
	d)	Explain the hybridization & structure of BF_3.	5
	e)	Explain the mechanism of action of sodamide in liquid ammonia on chlorobenzene.	5
	f)	Explain the following : i) p-Nitrophenol is more acidic than phenol. ii) Alcohols are extremely weak acids.	5

M251023S44

SYBSc - 25/10/23

Q.P. Code:

Duration: 2 $\frac{1}{2}$ hours

Total marks: 75

N. B.

1) All questions are compulsory.
2) Figures to the write indicate full marks.
3) Use of log table / non-programmable calculator is allowed.

Q.1 A. Select the correct option and complete the following sentences. (Attempt any nine) 09

a) The reaction of the type A → B → C is called ---------- reactions.
i) reversible ii) consecutive iii) parallel

b) In the thermal chain reactions, chain carriers are produced in ---------- step.
i) initiation ii) propagation iii) inhibition

c) Phenol –water system has ---------- consolute temperature.
i) upper ii) lower iii) upper and lower

d) ---------- represents the number of monomer units from which polymer is formed.
i) Addition polymerisation
ii) Condensation polymerisation
iii) Degree of polymerization

e) Polyethylene is ---------- polymer.
i) natural ii) semisynthetic iii) synthetic

f) Diborane molecule has ..... centers, two electrons, hydrogen bridge bonds.
i) four ii) two iii) three

g) In the nitrogen family only.....element forms diatomic molecule.
i) Arsenic ii) Phosphorus iii) Nitrogen

h) Argyrodite is the ore of.....
i) Germanium ii) Silicon iii) Tin

i) ..... exist in solid or liquid state and dissociated into nitric oxide and nitrogen dioxide.
i) nitrogen dioxide ii) dinitrogen trioxide iii) nitrous oxide

j) Aldehydes are ---------- reactive towards nucleophilic reagents than ketones.
i) less ii) non iii) more

k) Which of the following ketones form stable enol?
i) Acetone ii) 2-Butanone iii) Acetyl acetone

l) Aldehydes are ---------- reactive towards nucleophilic reagents than ketones.
i) less ii) non iii) more

m) ---------- reacts with $NaHSO_3$ to give crystalline solid.
i) Ethanol ii) Acetic acid iii) Benzaldehyde

B. **State whether the following statements are true or false.** 03
(Attempt any three)

a) Nitration of phenol is an example of parallel reaction.
b) Nicotine -water system has lower consolute temperature.
c) Diborane is electron rich molecule.
d) The carbonyl compounds react with sodium bisulphate to form addition product.
e) In the carbonyl group both 'C' and 'O' are sp hybridized.

C. **Match the following. (Attempt any three)** 03

	Column A		Column B
a)	Polyvinyl chloride	i)	Hydroxide ion
b)	Nernst distribution law	ii)	active methylene compound
c)	NO	iii)	$K = \frac{C_1}{C_2}$
d)	NO_2	iv)	Polymer
e)	Malonic ester	v)	Monomer
		vi)	Colourless gas
		vii)	Brown gas
		viii)	Complexing agent

Q.2 **Attempt any four of the following.** 20

a) Define ideal solutions. What are the criteria for the solution to be an ideal?
b) Define, lower consolute temperature and explain the variation of mutual miscibility with temperature for triethylamine – water system
c) Explain,
i) Parallel reaction with suitable example.
ii) Degree of polymerization
d) State Raoult's law and explain the positive deviation shown by non-ideal solution from it.
e) Define polymer. How will you classify polymers on the basis of their structure?
f) A polymer sample contains 20% molecules of molecular weight 5000, 30% molecules of molecular weight 10000 and 50% molecules of molecular weight of 20000. Calculate number average and weight average molecular weights.

Q.3 **Attempt any four of the following.** 20

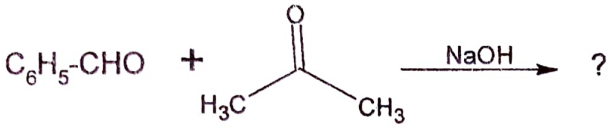
a) Explain the preparation, properties, structure of nitrogen dioxide.
b) Explain Crochralski pulling technique for silicon.
c) Explain the structure and bonding in tetraborane.
d) Explain preparation of Borax.
e) Explain the structure of silica.
f) Explain the trends in physical properties of elements of nitrogen family.

Q.4 **Attempt any four of the following.** 20

a) Explain the use of following reagents in preparation of aldehydes and ketones;
i) Pd /$BaSO_4$ ii) Grignard reagent

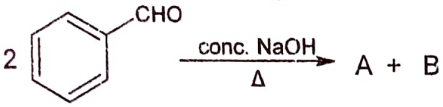
b) What are stabilized enols? Explain with examples.

c) Complete the following reaction and name the reaction involved. Give its mechanism.



d) How is acetyl acetone converted into 2-Butanone and 2-Pentanone?

e) Complete the following reaction and name the reaction. Give its mechanism.



f) i) What is the action of following reagents on acetone? (Reactions expected)
a) HCN b) ethanol /HCl
ii) How will you convert benzene into benzaldehyde?

5YBSC
25/10/23

D. B. J. College, Chiplun

S. Y. B.Sc. Sem-III ATKT examination October – 2023

Subject: Chemistry Paper - II

Duration: 3 hours Total marks: 100

N. B.

1) All questions are compulsory.
2) Figures to the right indicate full marks.
3) Use of log table / non-programmable calculator is allowed.

Q.1 **Select the correct option and complete the following sentences.** 12
(Attempt any **twelve**)

A. i) The reactions of type, aA + bB = cC + dD, is called ---- reactions.
a) consecutive b) parallel c) reversible

ii) The chain carriers in the reaction, $H_2 + Br_2 \rightarrow 2HBr$ are ----------.
a) H_2 and Br_2 b) H and Br c) HBr molecules

iii) When chemical reaction obeys collision theory probability factor---------.
a) P = 1 b) p < 1 c) p > 1

iv) The liquid mixture which distills with a change in composition is called ---
------- mixture.
a) azeotorpic b) zeotropic c) homogenous

v) Nicotine –water system has ---------- consolute temperature.
a) upper b) lower c) upper and lower

vi) A completely miscible solution can be separated by --------- process.
a) distillation b) evaporation c) filtration

vii) Argyrodite is the ore of _____.
a) Germanium b) Silicon c) Tin

viii) Boron trihalides are _____ in nature & their solutions in organic solvents are bad conductor of electricity.
a) covalent b) ionic c) dimeric

ix) The best method of refining the silicon would be using _____ techniques.
a) graphite crucible b) crucibleless c) platinum crucibles

x) The type of hybridization boron undergoes in tetraborane is _____
a) sp b) sp^3 c) sp^2

xi) In the nitrogen family only ____ element forms diatomic molecule.
a) Arsenic b) phosphorus c) Nitrogen

xii) In the Hydrides of nitrogen family elements thermal stability _____
a) increases b) remain same c) decreases

xiii) Enols of β-diketones are stabilized by ----------.
a) solvation b) intermolecular H-bonds c) intramolecular H-bonds

xiv) The correct statement of the following is ---------.
a) In the carbonyl group both C and O atoms are sp^3 hybridized
b) In the carbonyl group both C and O atoms are sp^2 hybridized
c) In the carbonyl group C-atom is sp^2 and O- atom is sp^3 hybridized

xv) Ketones may be prepared by oxidation of ----------
a) primary alcohols b) secondary alcohols c) tertiary alcohols

xvi) Aldehydes are ---------- reactive towards nucleophilic reagents than ketones.
a) less b) non c) more

xvii) The products of Cannizzaro's reaction are ----------.
a) alcohol + salt of acid
b) alkoxide ion + acid
c) alkoxide ion + salt of acid

xviii) ---------- is an example of aromatic aldehyde.
a) Glyoxal b) Succinaldehyde c) o-Anisaldehyde

B. **State whether the following statements are true or false.** 3
(Attempt any three)

a) Collision theory is applicable to gaseous state reactions.
b) Nitration of phenol is an example of consecutive reaction.
c) Tetraborane belong to archnoborane class of boron hydrides.
d) In case of gallium, solid is less dense than liquid.
e) Grignard reagent reacts with ketones to give primary alcohols.
f) Sodium borohydride is milder hydride reducing agent.

C. **Match the following. (Attempt any five)** 5

	Column A		Column B
a)	Triethylamine – water mixture	i)	Colourless gas
b)	Chlorination to toluene	ii)	Brown gas
c)	NO	iii)	Parallel reaction
d)	NO_2	iv)	Partially miscible liquids
e)	Malonic ester	v)	Oxidizing agent
f)	PCC	vi)	Completely miscible liquid mixture
		vii)	Active methylene compound
		viii)	Purple gas
		ix)	Reducing agent

Q.2 **Attempt any four of the following.**

a) State the important assumptions of collision theory of bimolecular reaction. 5

b) Define ideal solutions. What are the criteria for the solution to be an ideal? 5

c) Explain the variation of mutual miscibility with temperature for phenol-water system. 5

d) For a given reaction, the energy of activation was found to be 11265 J/mol at 298 K and the frequency factor is 5.3×10^{13} per second. Calculate the rate constant of reaction. 5
(R = 8.314 J/K/mol)

e) Define energy of activation. Explain the experimental methods to determine the energy of activation. 5

f) State Raoult's law and explain the positive deviation shown by non-ideal solution from it. 5

Q.3 **Attempt any four of the following.**

a) Explain the bonding & structure of silicon dioxide. 5

b) Explain the synthesis of ammonia by Haber-Boschs process. 5

c) Explain zone refining technique. 5

d) Explain the bonding & structure of diborane. 5

e) Explain the trends in physical properties of elements of nitrogen family. 5

f) Explain inert pair effect in Boron group elements. 5

Q.4 **Attempt any four of the following.**

a) Complete the following reactions and name the products. 5

i) $\text{Benzaldehyde + Ethyl magnessium bromide} \xrightarrow[\text{ether}]{\text{Dry}} A \xrightarrow{HCl} B + C$

ii) $\text{Benzaldehyde + 2,4-DNP} \longrightarrow A$

b) i) What is the action of following reagents on acetone? 3
(Reactions expected)
a) HCN b) ethanol /HCl

ii) How will you convert benzene into benzaldehyde? 2

c) Explain the use of following reagents in preparation of aldehydes and ketones : 5
i) PCC ii) $HgSO_4$ / dil. H_2SO_4

d) i) How will you convert aceto acetic ester into succinic acid? 3
ii) How will you prepare 2-butanone from acetyl acetone? 2

e) Write a short note on Knoevenagel reaction. 5

f) What is Claisen-Schmidt reaction? Explain it with mechanism. 5

Q.5 **Attempt any four of the following.**

a) The energy of activation of a gaseous reaction is 52440 J/mol. Calculate the rate constant at 318 K, if it is 4.5×10^{-3} per second at 298 K. (R = 8.314 J/K/mol) 5

b) Write a note on azeotropic liquid mixture showing minimum boiling point. 5

c) Explain the preparation & properties of Nitric oxide (NO) 5

d) i) What are electron deficient compounds? 5
ii) Write a note on oxidation of silicon group elements.

e) What are stabilized enols? Explain with examples. 5

f) What is Benzoin condensation reaction? Explain its mechanism. 5

S Y B Sc
26/10/23

Duration: $2\frac{1}{2}$ hours

Marks: 75

N.B. : 1. All questions are compulsory
2. Figures to the right indicate full marks.
3. The use of log table/ non programmable calculator is allowed.

Q.1 A Select the correct option and complete the following sentences. 09

(Attempt any nine)

i Error is a measurement of _____.
a) deviation b) reproducibility c) accuracy

ii The plot of pH against volume of titrant added is known as_____.
a) standard curve b) neutralization curve c) calibration curve

iii Which of the following is used as a primary standard in acid base titration?
a) Acetic acid b) Sulphuric acid c) Succinic acid

iv During titration, the solution taken in burette is called _____.
a) indicator b) titrand c) titrant

v In thermogravimetry the weight of sample is recorded as a function of _____
a) mass b) temperature c) concentration

vi Precipitation of ionic solid takes place if _____.
a) solubility product > ionic product
b) solubility Product < ionic Product
c) solubility Product = ionic Product

vii Relative error can be expressed in terms of _____
a)ppm b) grams c) pph

viii Semi-micro analysis refers to the sample size of_____.
a)0-10 mg b) 10-100 mg c)more than 100 mg

ix _____ is an example of methodic error.
a) Improper response of the instrument
b) Weighing of hot crucible
c) Addition of excess amount of the titration

x Sample is a small representative replica of the _____.
a)universe b)error c)analytical sample

xi The wavelength range of visible light is from _____
a) 380-780nm b) 450-800nm c) 180-380nm

xii The neutralization of weak acid and strong base titration will be at pH _____.
a) 7 b) less than 7 c) more than 7

xiii In titrimetric analysis the solution of known concentration is known as --------.
a) Titrant b) titrand c) sample

B **State whether the following sentences are true or false. (Attempt any three)** 03

i Equivalence point and end point are always the same

ii Colorimeters are more sensitive than Spectrophotometers

iii Analytical sample is a gross sample

iv Primary standard substance may be hygroscopic or efflorescent

v In gravimetric analysis drying & ignition is one and same

C Match the following (**Attempt any three**) 03

Column A	Column B
1. Diphenylamine	a. Thermal method
2. Phenolphthalein	b. Impurities in precipitation
3. Co precipitation	c. Instrumental method
4. Iodimetry	d. Acid - base indicator
5. DTA	e. Redox indicator
	f. Titration with direct iodine
	g. Impurities in analytical precipitation
	h. Titration with liberated iodine

Q.2 **Attempt any four of the following** 20

A Explain the following methods sampling of gases,
(a) Ambient sampling (b) Stack sampling

B Describe in brief instrumental and methodic errors.

C What is qualitative and quantitative analysis? Give steps involved in analysis of sampling

D Distinguish between constant and proportionate error. Define analysis sample and sampling unit

E Explain the use of concentric tube thief and hand scoop for the sampling.

F A sample of steel was analysed for chromium content. Calculate absolute error, relative error, relative error in pph and ppt. The actual chromium content is 56.27%

Sample No.	1	2	3	4	5	6
Content of Chromium	56.28	56.25	56.31	56.31	56.30	56.26

Q.3 **Attempt any four of the following** 20

A What are the steps involved in precipitation gravimetry analysis? Enlist the types of precipitate.

B Write a note on complexometric titrations.

C Explain any two neutralization reaction by conductometric titration.

D Distinguish between primary and secondary standards.

E Discuss in brief co precipitation and post precipitation.

F At 298 K, 10.0 cm^3 of 0.1 M acetic acid is titrated against 0.1 M sodium hydroxide. Calculate the pH of the solution on
(i) Addition of 7.0 cm^3 sodium hydroxide from the burette
(ii) Addition of 13.0 cm^3 sodium hydroxide from the burette
($Ka = 1.8 \times 10^{-5}$, $Kw = 10^{-14}$).

Q.4 Attempt **any four** of the following 20

A State Beer's law. Derive mathematical expression for Beer's law

B What are the optical methods? Explain any two optical methods

C Explain the important application of UV-visible spectroscopy in qualitative analysis.

D With the help of neat and labeled diagram, explain the construction and working of double beam spectrophotometer

E Explain calibration curve method in context of qualitative analysis

F 3.2×10^{-4} M solution of substance has a transmittance of 0.805 when measured at 525 nm in a cell with path length of 1 cm. Calculate the absorbance of the solution if its concentration is double of its original concentration

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S.Y.B.Sc
26/10/23

V. B. J. College, Chiplun

S. Y. B.Sc. Sem III A.K.T. examination October 2023

Subject: Chemistry Paper - III

Duration: 03 hours Marks: 100

N.B. :

1. All questions are compulsory.
2. Figures to the right indicate full marks.
3. The use of log table/ non programmable calculator is allowed.

Q.1 A Select the correct option and complete the following sentences. 12

(Attempt any twelve)

i Increment is definite portion withdrawn from _____.
a) sampling unit b) universe c) sample

ii Blowing of a pipette is _____ error.
a) Operational b) instrumental c) methodic

iii Sample is a small representative replica of the _____ .
a) universe b) error c) analytical sample

iv _____indicator is used in neutralization titration.
a) EBT b) phenolphthalein c) Xylenol orange

v _____ is an example of methodic error.
a) Improper response of the instrument
b) Weighing of hot crucible
c) Addition of excess amount of the titration

vi By calibration of apparatus _____ errors can be minimized.
a) Instrumental b) operational c) personal

vii Solution in burette is called as_____.
a) indicator b) titrand c) titrant

viii Precipitation of ionic solid takes place if _____.
a) solubility product > ionic product
b) solubility Product < ionic Product
c) solubility Product = ionic Product

ix Which of the following is used as a primary standard in acid base titration?
a) Acetic acid b) Sulphuric acid c) Succinic acid

x When ionic product is greater than solubility product it gives _____
a) Saturated solution b) unsaturated solution c) precipitate

xi In the titration of weak acid against strong base pH at equivalent point is___.
a) >7 b) <7 c) =7

xii Complexo metric titrations are titration between EDTA and _____.
a) Oxidizing agents b) metal ions c) anions

xiii Wavelength region of vacuum UV is _____.
a) 1 to180 nm b) 180 to 400 nm c) 400 to 780 nm

xiv Spectrophotometric measurements belong to _____ method of analysis.
a) electro analytical b) titrimetric c) optical

xv The difference between end point and equivalence point is called as-----.
a) absolute error b) titration error c) relative error

xvi Absorbance and transmittance of an absorbing solution are related by the expression _____ .

a) $A = 1 / T$ b) $A = \log_{10} T$ c) $A = -\log_{10} T$

xvii ---------- cuvettes are used for the analysis in the visible region.

a) Glass b) Quartz c) Metal

xviii In thermogravimetry the weight of sample is recorded as a function of ____.

a) mass b) temperature c) concentration

B State whether the following sentences are **true** or **false. (Attempt any three)** 03

i Precision can be obtained only for a set of observations.

ii Primary standard substance may be hygroscopic or efflorescent.

iii Diffraction grating is used as a monochromator in photometers.

iv Iodometry is one of the most important redox titration methods.

v Conductometer is used to measure the absorbance of the sample solution.

C Match the following (**Attempt any five**) 05

Column A	Column B
1. Iodometry	a. Methodic error
2. Iodimetry	b. Common ion effect
3. Co-precipitation	c. Titration with direct iodine
4. DTA	d. $\log_{10}$ Io/It
5. Decrease in Solubility	e. Thermal method
6. Absorbance	f. Personal error
	g. $\log_{10}$ It/Io
	h. Titration with liberated iodine

Q.2 Attempt **any four** of the following 20

A Explain classical methods of analysis with suitable example.

B Define qualitative and quantities analysis. Give steps involved in analysis of sampling.

C Distinguish between accuracy & precision. Define the term sampling unit and sub sampling.

D Explain the term error. What is determinate & indeterminate error?

E Write a short note on sampling of heterogeneous liquid.

F Three samples of alloy were analyzed for Ni content by gravimetric method, following results were obtained.

The actual Nickel content in each sample is 90% of the mass of respective sample, Calculate absolute error, relative error and relative error in pph, also comment on the result.

Sample No.	01	02	03
Mass of sample in mg	100	200	300
Amount of Ni in mg	88	176	264

Attempt any four of the following 20

A Distinguish between primary standard and secondary standard.

B Write a note on co precipitation.

C Explain the theory of acid base indicators.

D What are primary and secondary standard? What conditions must they satisfy?

E What are the steps involved in precipitation gravimetry analysis? Explain the types of precipitate.

F At 298 K, 10.0 cm^3 of 0.1 M Acetic acid is titrated against 0.1 M Sodium hydroxide. Calculate the pH of the solution on-

(i) Addition of 7.0 cm^3 sodium hydroxide from the burette

(ii) Addition of 13.0 cm^3 sodium hydroxide from the burette

($Ka = 1.8 \times 10^{-5}$, $Kw = 10^{-14}$).

Q.4 Attempt **any four** of the following 20

A State Beer's law. Derive mathematical expression for Beer's law.

B What is thermal method of analysis? Give the classification of thermal methods.

C Explain calibration curve method in context of qualitative analysis.

D Discuss the principle, instrumentation and working of single beam photoelectric colorimeter.

E Define the term analyte. Draw the block diagram of analytical instrument and explain the function of each component.

F 3.2×10^{-4} M solution of substance has a transmittance of 0.805, when measured at 525 nm in a cell with path length of 1 cm. Calculate the absorbance of the solution, if its concentration is double of its original concentration.

Q.5 Attempt **any four** of the following 20

A Explain the term 1) universe 2) gross sampling 3) sample 4) sub sampling 5) Analysis sample.

B Describe any three methods adopted to minimize determinate errors.

C Explain conductometric titration of strong acid versus strong base.

D What are the types of gravimetric analysis? Explain in brief precipitation gravimetry.

E The absorbance of a 2×10^{-4}M solution when placed in a cell of length 1cm was found to be 0.234 at 535nm, calculate molar absorptivity. If the same solution is placed in cell of length 2cm calculate i) absorbance ii) transmittance and iii) % transmittance

F State Lambert's law. Derive mathematical expression for Lambert's law

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S4BSc
27/10/23

M271023S61

Total Marks: 75 **Duration: 2 hrs 30 min**

N.B: (1) All questions are compulsory.

(2) Figures to the right indicate full marks.

(3) Draw neat diagram wherever necessary.

(4) Symbols have usual meaning unless otherwise stated.

Q.1 A] Attempt **any one** of the following. **(10)**

i) Describe in brief the working of a Petrol engine. Derive an expression for its efficiency

ii) Describe how a Carnot engine operating in reverse acts as a heat pump/refrigerator. Hence, define the term 'coefficient of performance'

B] Attempt **any two** of the following. **(10)**

i) Show that for a Van der Waals' gas $C_p - C_v = R(1 + \frac{2a}{vRT})$

ii) Write expression for Joule Thomson cooling.

iii) State and prove the Carnot's theorem.

iv) Derive an expression for the Clausius- Clapeyron relation using Maxwells' second relation.

Q.2 A] Attempt **any one** of the following. **(10)**

i) Explain the principle of producing low temperatures by evaporation of a liquid under reduced pressure.

ii) Describe Carnot's reversible heat engine. Deduce an expression for its efficiency. Is Carnot's cycles practical possibility? Explain

B] Attempt **any two** of the following. **(10)**

i) Obtain an expression for the change in entropy when ice changes in to steam

ii) What are the practical uses and applications of low temperatures?

iii) Show that during a reversible adiabatic process the entropy of the system remains constant.

iv) What is refrigerator? Describe vapour compressor machine.

Q.3 A] Attempt **any one** of the following. (10)

i) Explain the working principle of a resistance temperature detector.

ii) How many types of pyrometer. Explain the Total radiation Pyrometer.

B] Attempt any two of the following. (10)

i) Write down the advantages and limitations of thermometer.

ii) What is the difference between a thermocouple and a thermistor?

iii) Write the advantages of thermocouple.

iv) Write a short note on: Platinum thin film Sensors.

Q.4 Attempt **any three** of the following. (15)

i) Write the four Maxwell's thermodynamic relations. Give any two applications.

ii) Calculate the efficiency of a Carnot engine working between the boiling point and freezing point of water

iii) Write a note on : Three lead wire resistance temperature detector.

iv) Write short note on Pyrometer.

v) What is the difference between a thermocouple and a thermistor?

vi) Write a note on: third law of thermodynamics.

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S4BSC
28/10/23

M2810235G3

Time: 2½ hours

Max. Marks: 75

NB.:- 1) All questions are compulsory.
2) Figures to the right indicate full marks.
3) Use of log tables and non-programmable calculator is allowed.
4) Symbols have their usual meanings unless otherwise stated.

Q1. A) Attempt any one. (10)

i) What is faithful amplification? Explain the conditions to be fulfilled to achieve faithful amplification in a transistor amplifier.

ii) Describe the general theory of feedback.

B) Attempt any two. (10)

i) Explain the essentials of transistor biasing circuit and stability circuit.

ii) Discuss the term frequency response of an amplifier.

iii) Define voltage gain, current gain, and power gain in an amplifier.

iv) An amplifier has a voltage amplification A_V, and a fraction β of its output is feedback in opposition to the input. If $\beta = 0.1$ and $A_V = 100$, Calculate the percentage change in the gain of the system if A_V falls 6 dB due to ageing.

Q.2 A) Attempt any one. (10)

i) With a neat diagram explain the working of Colpitt's oscillator.

ii) Show that the Op-amp comparator as a square wave generator and zero-crossing detector.

B) Attempt any two. (10)

i) Explain the term positive feedback amplifier oscillator.

ii) Show that OP-amp as an averaging amplifier.

iii) A 1 mH inductor is available. Choose the capacitor values in a Colpitt's oscillator so that $f = 1$ MHz and $\beta = 0.25$

iv) Two voltages of +0.6 V and -1.4 V are applied to the two input resistors of the summing amplifier. The respective resistors are 400 KΩ and 100 KΩ and the feedback resistor is 200 KΩ. Determine output voltage.

Q.3 A) Attempt any one. (10)

i) Draw the logic circuit of an R-S flipflop using NAND gates. Write down its state transition table.

ii) Construct a 4-bit serial in serial out (SISO) shift register using JK flipflop and explain its operation.

B) Attempt any two. (10)

i) With the help of the truth table explain clocked R-S flip-flop.

ii) Design a 4-bit parallel in parallel out (PIPO) shift register.

iii) Explain the operation of the Mod -10 counter.

iv) What is an asynchronous and synchronous counter?

Q4. Attempt any **three**. (15)

i) Explain the term output resistance of an amplifier.

ii) It is desired to set the operating point at 4 V, 1.2 mA by biasing the silicon transistor with collector feedback resistor R_B. If $\beta = 100$, find the value of R_B.

iii) Explain the Barkhausen criterion in the case of the sinusoidal oscillator.

iv) Discuss OP-amp comparator as a level detector.

v) Explain Mod-8 Synchronous counter.

vi) Explain the operation of the MOD-3 counter with the help of a block diagram.

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S4BSC
28/10/23

Time: 3 hours Max. Marks: 100

NB.: - 1) All questions are compulsory.
2) Figures to the right indicate full marks.
3) Use of log-tables and non-programmable calculator is allowed.
4) Symbols have their usual meanings unless otherwise stated.

Q1. A) **Select correct answer.** (12)

1. If the flux of vector point function across any close surface is zero, then it is----
a) solenoid b) conservative c) nonconservative d) irrotational
2. Which of the theorems allow to transform surface integral into a line integral?
a) Green's theorem b) Gauss Theorem c) Stoke's theorem d) None of above
3. For proper operation of the transistor, its collector-base junction should be ----
a) revised biased b) forward biased
c) forward or reversed biased d) none of above
4. The power gain of the amplifier is a product of----
a) resistance and current gain b) resistance and voltage gain
c) voltage and current gain d) none of above
5. In a phase shift oscillator phase shifts by each R -C network is?
a) 0° b) 60° c) 90° d) 180°.
6. Emitter follower gives output?
a) half of input b) double of input c) same as input d) inverting input

B) **Answer in one sentence.** (03)

1. A particle located at a point $(5,30^\circ,50^\circ)$ is in which coordinate system?
2. State any one characteristic of the decibel system.
3. Write the formula for the frequency of the Wien-Bridge oscillator.

C) **Fill in the blanks.** (05)

1. Integration of vector function along the curve is called----
2. The self-destruction of an unstabilized transistor is called----
3. In the collector feedback method V_{CE} =----
4. Doubling of power all sound to same increase -----
5. The tank circuit consists of ---- and ----

Q.2 A) Attempt any **one.** (08)

1. Check the fundamental theorem for gradient for $\Phi = xy^2$ and $a = (0, 0, 0)$, $b = (2,1,0)$.
2. With the help of a diagram define spherical polar coordinates. How they are converted from the cartesian coordinates system?

B) Attempt any **one.** (08)

1. Use divergence theorem to evaluate $\iint$ (xdydz + ydzdx + zdxdy) where s is the portion of a plane x + 2y + 3z = 6 which lies in the first octant.
2. Explain the surface integral of a vector function by giving examples.

C) Attempt any one (04)

1. If a force $\vec{F} = 2x^2y\hat{i} + 3xy\hat{j}$ displaces a particle in the xy-plane from (0,0) to (1,4) along a curve $y = 4x^2$. Find the work done.
2. Find the expression for the infinitesimal surface element of the x-y plane.

Q3. A) Attempt any **one.** (08)

1. Describe any two conditions for faithful amplification.
2. Explain the practical circuit of a transistor amplifier.

B) Attempt any **one.** (08)

1. With a neat circuit diagram, discuss circuit analysis of the emitter bias method.
2. Deduce the general theory of feedback.

C) Attempt any **one.** (04)

1. A transistor uses the potential divider method of biasing. $R_1 = 50\ K\Omega$, $R_2 = 10\ K\Omega$ and $R_E = 1\ K\Omega$. If $V_{CC} = 12$ V. Find the value of I_C, having $V_{BE} = 0.1$ V
2. Express the following gains as a number: i) Power gain of 40 dB ii) Power gain of 43 dB.

Q4. A) Attempt any **one.** (08)

1. Derive an expression for the frequency of the Hartley oscillator.
2. With circuit diagram, show that the gain of non-inverting Op-amp is $A_V = (1 + R_f/R_i)$

B) Attempt any **one.** (08)

1. Describe the positive feedback amplifier -oscillator.
2. Using an Op-amp circuit, show that output voltage is equal to differentiation of input voltage.

C) Attempt any **one.** (04)

1. A Colpitt's oscillator has L = 1 mH, C_1 = 1000 pf. Find the frequency of oscillation. If the output voltage is 2 volts, find the feedback voltage.
2. Op-amp as an integrator uses following components R = 100 K Ω, C = 1 F, $V_{CC} = \pm 15$ V. Obtain the output voltage of an Op-amp integrator after 0.5 sec, for the input voltage of 2.5 V dc. Given: $R = 100X10^3\ \Omega$, C = 1 μF, $V_i = 2.5$ V, dt = 0.5 sec. Find Vo.

Q5. Attempt any **Four** of the following. (20)

i) Use divergence theorem to evaluate ∫∫(xdydz + ydzdx + zdxdy)over the surface of the sphere of radius 'a'.

ii) Obtain an expression for the infinitesimal surface area of a sphere of radius r and center at the origin.

iii) In voltage divider bias circuit, $V_{CC} = 15$ V, $R_1 = 6\ K\Omega$, $R_2 = 3\ K\Omega$, $R_C = 470\ \Omega$, $R_E = 1\ K\Omega$, $V_{BE} = 0.6$ V and $\beta = 100$, using this data find stability factor.

iv) What is meant by the frequency response of an amplifier?

v) 1 *pf* capacitor is available. Choose the inductor values in a Hartley oscillator so that $f = 1$ MHz and $\beta = 0.2$.

vi) Show that the Op-amp comparator can be used as a square wave generator.

Choice Based and Grading System Examination, Semester-III (Regular, Revised Syllabus), November-2022

Class S. Y. B. Sc.

Subject : Physics (USPH303) (Paper - III)

Total Marks : 100 Duration : 3 Hours

N.B. 1) All questions are compulsory.
2) Figures to the right indicate full marks.
3) Draw neat diagrams wherever necessary.
4) Symbols have usual meanings unless otherwise stated.

Q 1 A Select correct **ONE OPTION.** **12**

i) Through holography we can produce, ... diamensional images of object.
a) one b) two c) three d) none of the above

ii) The unit of absorption coefficient of sound is .....
a) Phon b) Sone c) Sobine d) watt/m^2

iii) The number of lattice points in a primitive cell are .....
a) ½ b) 32 c) 1 d) 2

iv) The co-ordination number of body centered cubic crystal is .....
a) 8 b) 4 c) 12 d) 2

v) Iron has Curie temperature about .....
a) 768^{0}C b) 0^{0}C c) 293^{0}C d) 27^{0}C

vi) The use of Pyro electricity in .....
a) Capacitors b) Binary memories
c) Sonar detection d) Infrared detection

B Answer in **ONE SENTENCE.** **3**

i) Which material is used as porous absorbers?
ii) Define nearest neighbor distance.
iii) Above the Curie temperature, what is behavior of ferromagnetism?

C Fill in the **BLANKS.** **5**

i) 1 torr = 1 mm of Hg = ... N/m^2
ii) In step index optical fibre, n(r) = ... is the condition for cladding.
iii) Lattice points at all corners as well as at the face center of unit cell, called ..... centered lattice structure.
iv) μ is called ..... of carriers.
v) Hard magnetic materials has susceptibility and permeability are .....

Q 2 A Answer **ANY ONE.** **8**

i) Describe the construction and working of a He-Ne laser. Draw energy level diagram.
ii) Describe the structure of a step-index optical fibre. Explain the propagation of light through it. How it is differ from graded index optical fibre?

B Answer **ANY ONE.** **8**

i) What is numerical aperture (NA) of an optical fibre? Derive necessary expression for NA.
ii) Explain the factors affecting the acoustic quality of building.

C Answer **ANY ONE.** **4**

i) The auditorium volume is 5000 m^3. The wall area is 345 m^3, the floor area is 110 m^2 and the ceiling area is 220 m^2. The average sound absorption coefficient for the walls is 0.038, for the ceiling is 0.48 and for the floor is 0.07. Calculate the average sound absorption coefficient and the reverberation time.
ii) Write a note on industrial applications of laser.

Q 3 A Answer **ANY ONE.** 8

i) Determine the relation between the edge of the unit cell, the atomic radius for b.c.c. and f.c.c. lattices.

ii) Explain in short -
(a) Unit cell
(b) space lattice
(c) Atomic radius
(e) Co-ordination number

B Answer **ANY ONE.** 8

i) Explain the following concepts with references to crystals.
(a) Single crystal
(b) Basis of a crystal
(c) Space lattice
(d) Density of crystals

ii) Show that in a crystal of cubic structure, the interplaner spacing between the planes with Miller indices is given by $d = a/\sqrt{h^2 + k^2 + l^2}$ Where 'a' is the lattice constant.

C Answer **ANY ONE.** 4

i) Draw a schematic diagram to show different common planes in simple cubic structure.

ii) Explain the light propagation through an optical fibre.

Q 4 A Answer **ANY ONE.** 8

i) Write a note on magnetic hysteresis.

ii) Explain the effect of temperature on conductivity of metals and intrinsic semiconductors.

B Answer **ANY ONE.** 8

i) How the materials are classified on the basis of band theory? Explain intrinsic and extrinsic semiconductors.

ii) What is meant by OLED? Explain the construction and working of typical OLED panel.

C Answer **ANY ONE.** 4

i) 'Ferroelectric materials are special class of pyroelectrics which are special class of piezoelectrics'. Explain.

ii) Differentiate between soft and hard magnetic materials.

Q 5 Answer **ANY FOUR.** 20

i) Define absorption coefficient of a material and hence determine the relation between reverberation time of a hall and absorption coefficient.

ii) The core and the cladding of an optical fibre has refractive indices 1.5 and 1.47 respectively. Find the acceptance angle in air and the critical angle for core/cladding interface.

iii) Draw (101) and (111) planes in a unit cubic cell. Obtain the Miller indices of directions that are common to both the planes.

iv) Prove that five-fold axis of rotation is not compatible with lattice.

v) Explain the origin of magnetism in solids.

vi) What is flat panel display? Explain different categories of flat panel displays.

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