SYBSC

ATKT

Examination

Sem IV

October 2024

SYBA, BCom, BSc
FC AIKT 3/10/24

मराठी रुपांतर

वेळ- २ तास ३० मिनिट. एकूण गुण - ७५

सूचना- १. सर्व प्रश्न अनिवार्य आहेत.

२.उजवीकडील अंक पूर्ण गुण दर्शवितात.

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

१.ग्राहकवाद.

२.ग्राहक न्यायालय.

३.जनहित याचिका.

४.सखोल परिस्थितिकी.

५.भौगोलिक माहिती प्रणाली.

६.काल व्यवस्थापन.

७.जिंकण्याचाच विचार.

८.सुसंगत युक्तिवाद.

किंवा

ब) पायाभूत अभ्यासक्रम सत्र चार साठी तुम्ही सादर केलेल्या प्रकल्पावर व्यापक टिप लिहा.

प्रश्न.२ अ) 'माहिती अधिकार कायदा २००५'च्या यशस्वीतेच्या कोणत्याही चार कथा लिहा. १५

किंवा

ब) जनहित याचिकांची गरज स्पष्ट करा.

प्रश्न.३ अ) महिला केंद्रित परिस्थितिकी स्पष्ट करा. १५

किंवा

ब) परिस्थितिकी शास्त्राचा एक दृष्टिकोण म्हणून जीवन केंद्रित आणि निसर्ग केंद्रित दृष्टिकोण यांचे परीक्षण करा.

प्रश्न.४.अ) सामाजिक विकासात तंत्रज्ञानाची भूमिका स्पष्ट करा. १५

किंवा

ब) सायबर गुन्ह्यांच्या विविध प्रकारांची चर्चा करा.

प्रश्न.५.अ) मास्लोचा अभिप्रेरण सिद्धांत सविस्तर स्पष्ट करा . १५

किंवा

ब) नेट-सेट परीक्षेबाबत सविस्तर चर्चा करा.

♦ ♦ ♦ ♦ ♦

DBT College chiplun
SEM-IV ATKT Exam 2024 October
Class - SY BA/Bcom/BSc
Sub - Foundation course - II
Date - 31/10/2024 Time - 2.00 to 4.30 pm

Time:- 2 Hours 30 Minutes. **Total marks -75**

N.B. 1) All Questions are Compulsory.
2) Figures to the Right Indicate Full Marks.

Q.1.A) Briefly Describe the Following Concept. (Any Five) 15

1.Consumerism.

2.Consumer court.

3.Public Interest Litigation.

4. Deep Ecology.

5.Geographical Information System.

6. Time Management.

7.Think Win-Win.

8..Logical Reasoning.

OR

B) Write Comprehensive note on the foundation course semester IV project submitted by you.

Q 2.A) Write any Four success story of 'Right to Information act 2005' 15

OR

B) Explain the need of 'public interest litigation'

Q 3.A) Explain the Eco-Feminism. 15

OR

B) Examine Biocentrism and Ecocentrism as an approach to ecology.

Q 4.A) Explain the role of Technology in social development. 15

OR

B) Discuss on Types of Cyber Crime.

Q 5.A) Explain in detail Maslow's theory of Self Actualization. (Motivation) 15

OR

B) Discuss in detail about NET -SET Examination.

♦ ♦ ♦ ♦ ♦ ♦

D. B. J. College, Chiplun. SYBSc 15/10/24

Semester:- IV ATKT Examination Oct.-2024

Class:- S.Y. B.Sc Sub:- Physics Paper - III

Date. 15/10/2024 Time:- 2:00 pm to 4:30 pm.

[Time: 2 ½ Hours] **[Marks: 75]**

N. B.: (1) **All** questions are **compulsory**.
(2) **Figures** to the **right** indicate **full** marks.
(3) Draw **neat labeled** diagrams wherever **necessary**.
(4) Symbols have usual meaning unless otherwise stated.
(5) Use of **non-programmable** calculator is allowed.

Q. 1 (A) Attempt ANY ONE. **10**

(i) Starting from one dimensional simple harmonic progressive wave, derive classical wave equation. Comment on it.

(ii) Derive Schrodinger's time independent steady state equation for a particle of mass 'm'. Show the time independency of probability of locating the particle in space.

(B) Attempt ANY TWO. **10**

(i) Normalize the wave function, $\Psi_n = \sin\frac{n\pi x}{l}$; $for\ 0 < x < l$, here n is an integer.

(ii) Discuss Max Born's interpretation of wave function.

(iii) Show that for stationary states in one dimensional motion, the expectation value of momentum is independent of time.

(iv) Discuss the concept of well-behaved wave function.

Q. 2 (A) Attempt ANY ONE. **10**

(i) What is meant by step potential? A particle approaches a step potential of height V_o with energy E_o. Discuss classically and quantum mechanically, the motion of the particle for $E_o > V_o$.

(ii) One dimensional rectangular potential is given by;
$V(x) = V_o$ for $0 < x < a$ and $V(x) = 0$ for $0 > x > a$.
A particle with energy E_o is incident on the barrier from left. For $E_o > V_o$, write down the Schrodinger's Time Independent Equation for the particle, solve it and obtain the expressions for reflection coefficient and the transmission coefficient.

(B) Attempt ANY TWO. **10**

(i) An α–particle with energy 10 MeV approaches a potential step of height 50 MeV from left. Find the relative probability density of finding the particle just as it crosses to the right of the step (at $\mathbf{x = 0}$) and also at $x = 10^{-15}$m.
$\hbar = 1.056\times10^{-34} Js$, $m_\alpha = 6.68\times10^{-27}\ kg$

(ii) The electrons in a beam, each of 3 eV is incident on a potential barrier of height 4 eV and width 2Å. Find the percentage transmission of the beam through the barrier.

(iii) A beam of monoenergic particles of energy E_o each, approaches a potential step of height V_o. Find the ratio $\frac{E_0}{V_0}$ for which the transmission probability is 50%.

(iv) Explain emission of alpha particles using tunnel effect.

10

Q. 3 (A) Attempt ANY ONE.

(i) Consider a particle trapped in one dimensional rigid box and show that its energy is quantized. Why is the lowest energy of the particle finite and zero? Comment.

(ii) Set up Schrodinger's equation for a particle confined to a cuboidal rigid box and obtain the normalized eigenfunction of the particle.

10

Q.3 (B) Attempt ANY TWO.

(i) The energy of a particle in a one dimensional box in the first excited state is 4 eV. Calculate its ground state energy.

(ii) Calculate the momentum of an electron in the ground state when it is confined to a one dimensional rigid box of width 10^{-10} m. Calculate the same for the proton.

(iii) For a particle in a one dimensional box, show that the fractional difference in the energy levels is given by; $\frac{\Delta E_n}{E_n} = \frac{2n+1}{n^2}$. Hence discuss the classical limit of the system.

(iv) In an infinite potential well, the de Broglie waves remain confined to the well only. Derive the law of quantization of energy of a particle in an infinite potential well directly using de Broglie hypothesis and by fitting an integral number of half de Broglie wavelengths into the width 'a' of the potential well.

15

Q. 4 Attempt ANY THREE.

(i) P and Q are two operators given by; $P = \frac{d}{dx}$ and $Q = x^2 \times$ Where '×' is the multiplication operator. Show that $PQ - QP \neq 0$.

(ii) The wave function for a free particle in a box is given by; $\Psi_n = A \sin\frac{n\pi x}{l}$; Here $n = 1, 2, 3...$ Find allowed energies.

(iii) An electron with 20 eV encounters a potential step of height V_o. If the probability of reflection of the electron is 50%, find V_o.

(iv) A deuteron of energy 3MeV attempts to penetrates a rectangular potential barrier of height 10 MeV and thickness 10^{-14} m. Calculate the probability that tunnels through the barrier. Mass of deuteron = 3.343×10^{-27} kg.

(v) The free particle of mass 'm' is confined to a cubical box of edge 'l'. Write down the energy, momentum and eigenfunction for the first excited state.

(vi) A free particle of mass 'm' is confined to a one dimensional rigid box of length 'l'. Show that its ground state energy is in conformity with Heisenberg's Uncertainty principle.

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D.B.J. College, Chiplun
A.T.K.T. Exam, Sem- IV, Oct-2024
Class- SYBSc, Sub – Physics, Paper – II (old course)
Date. 14/10/2024

SYBSc
14/10/24

– 2.00 pm to 5.00 pm

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 calculators is allowed.
4) Symbols have their usual meanings unless otherwise stated.

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

1. In the expression $\frac{d^2}{dx^2}\cos x$, which is operand?

   a) x b) x^2 c) sinx d) cosx

2. The probability density of the given function $\psi = e^{-ax}$ is _____

   a) 0 b) 1 c) e^x d) e^{-x}

3. The potential energy of a free particle is----

   a) zero b)Positive c)Negative d) none of these

4. Different quantum states of a system having the same energy eigenvalue are called---

   a) ground state b) excited states
   c) non-degenerate states d) degenerate states

5. The potential energy of SHM is always----

   a) positive b) negative
   c) zero d) neither continuous and nor discrete

6. $(\frac{d}{dy} + y)$ is which of the following?

   a) raising operator b) lowering operator c) derivative d) none of the above

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

1. What is the equation of probability flux?
2. Write the orthonormal function.
3. When a particle approaches the potential barrier from left to right, the potential energy V(x) in region three is?

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

1. The kinetic energy operator is----
2. The probability of finding a particle is called----
3. If quantum numbers $(n_1, n_2, n_3) = (1, 1, 2)$, then the degree of degeneracy is----
4. The amplitude of the wave after barrier penetration is ----
5. In SHM restoring force is ----- to the displacement of the body.

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

1. Set up the expression for Schrodinger's time-independent wave equation.
2. What are the conditions of normalization of wave function in quantum mechanics?

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

1. Explain in detail the superposition principle.
2. Derive an expression for an equation of continuity in quantum mechanics.

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

1. What is the physical meaning of wave function?
2. Explain observables and operators in quantum mechanics.

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

1. Write down STIE for a particle approaching a step potential with energy less than the height of the step. **(08)**
2. Write down STIE for a particle in a finitely deep potential well for three regions.

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

1. Derive an expression for the energy of a particle in the infinitely deep potential well is quantized.
2. Find the expression for the energy of a particle in a three-dimensional rigid rectangular box.

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

1. What is the degree of degeneracy? Write any three energy levels for particles in a cubical box with quantum numbers and degree of degeneracy.
2. An electron is put in a cubical box on each side is 10^{-10}m. Calculate the values of its energy for the ground state. (Given: Mass of electron = $9.1X10^{-31}$ Kg.)

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

1. Derive an expression for the energy of a particle in a rectangular potential barrier when $E_O < V_O$. **(08)**
2. Derive an expression for the potential energy of SHM is $1/2kx^2$.

B) Attempt any **one.**

1. What is an α-decay problem? **(08)**
2. Using the lowering operator shows that the lowest possible eigenfunction $U_0(y) = A_0 e^{\frac{-y^2}{2}}$

C) Attempt any **one.**

1. Discuss the tunnel effect in the case of α-particle. **(04)**
2. Show that the energy of the harmonic oscillator is quantized.

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

i) Write the analogy between the wave equation and Schrodinger's equation.

ii) What is meant by the normalization of the wave function? State the normalized condition.

iii) Show that the expectation value of momentum is zero.

iv) A particle is confined in a cubical box. If $E = 26\frac{\pi^2\hbar^2}{2mL^2}$, calculate the degeneracy of an energy state.

v) Find the probability that a particle trapped in a one-dimensional box of length 'a' can be found between 0.45a and 0.55a for the ground state.

vi) Show the graphical representation of eigenvalues and eigenfunctions of a quantum harmonic oscillator.

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D. B. J. College, Chiplun.
Semester - IV ATKT Examination Oct - 2024
Class :- S.Y.B.Sc. Subject: Physics - II (New) Paper :- II
Date :- 14/10/2024 Time :- 2:00 PM to 5:00 PM.

S4888
14/10/24

Time: $2\frac{1}{2}$ 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) Describe the line integral of a vector function with suitable examples.
ii) Explain how to convert Cartesian coordinates into Cylindrical coordinates.
B) Attempt any **TWO.** **(10)**
i) State and prove the fundamental theorem for curl.
ii) Calculate work done when a force $\vec{F} = 2xy\hat{i} - 3y^2\hat{j}$ moves a particle in the xy- plane from origin to a point P (1, 2) a parabola $y = x^2$.
iii) Obtain an expression for an infinitesimal surface area of a sphere of radius r and center of origin.
iv) Check the fundamental theorem for gradient for $\Phi = xy^2$ and a (0, 0, 0), b (2, 1, 0).

Q.2 A) Attempt any **ONE.** **(10)**
i) Derive an expression for the solution of Laplace's equation in one dimension.
ii) Solve the Laplace's equation when the potential V depends only on the distance from the z-axis.
B) Attempt any **TWO.** **(10)**
i) Distinguish between the first and second uniqueness theorem in electrostatics.
ii) Discuss the Poisson's and Laplace's equations.
iii) Solve the Laplace's equation when the potential V depends only on the distance r from the origin of the coordinate system.
iv) Deduce the important properties of the solution to Laplace's equation.

Q.3 A) Attempt any **ONE.** **(10)**
i) Considering a non-uniform current distribution in a region proves that $\nabla.\vec{B} = 0$
ii) Using Ampere's circuital law shows that the circumferential component of the magnetic field at a point inside a long current carrying in a solenoid is zero.
B) Attempt any **TWO.** **(10)**
i) List the differences between electrostatics and magnetostatics.
ii) Deduce the relation between magnetic susceptibility and magnetic permeability.
iii) Explain the term magnetic vector potential.
iv) Find the magnitude of the magnetic field due to an infinite straight conductor at a point 2 m away, when a current of 2 A is flowing through it.

Q4. Attempt any **THREE.** **(15)**
i) Explain the fundamental theorem for gradients.
ii) Find the expression for an infinitesimal surface element on the x -y plane.
iii) Explain Laplace's equation in two dimensions.
iv) Distinguish between the first and second uniqueness theorem.
v) Discuss the physical significance of $\nabla.\vec{B}=0$
vi) A long narrow solenoid consists of 2500 turns per meter of its length. Find the magnetic field at a point inside it, if a current of 2A flows through its windings.

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54858
11/10/24

D. B. J. College, Chiplun.

Choice Based and Grading System Examination, First Half April – 2024 (Regular, Revised Syllabus)

Class: S. Y. B. Sc. Semester: IV

Subject: Physics Paper - I

Time: 2 hours 30 min. Total Marks: 75

N.B:
(1) All questions are compulsory.
(2) Figures to the right indicate full marks.
(3) Draw neat labelled diagrams wherever necessary.
(4) Symbols have usual meaning unless otherwise stated.
(5) Use of non-programmable calculator is allowed.

Q-1 A) Attempt any one of the following **10**

i) State and explain the law of Malus.

ii) Derive the intensity formula at any point on the screen is given by $I = I_o(\sin\alpha/\alpha)^2$

B) Solve any two of the following **10**

i) Distinguish between interference and diffraction.

ii) Derive the formula for width of principles maxima in diffraction pattern.

iii) Show that fringe width decreases with increasing order of the number of bands.

iv) Distinguish between prism spectrum and grating spectra.

Q-2 A) Attempt any one of the following **10**

i) Using Michelson Interferometer, how will you determine the wavelength of the source and compare the two wavelength of source of light

ii) Explain the construction and working of Michelson Interferometer.

B) Solve any two of the following

i) Calculate the minimum plate separation in a Michelson Interferometer to obtain a free spectral range of 0.05 A^o in the wavelength region 6000 A^o. **10**

ii) What is mean resolution? State magnification.

iii) Determine the Resolving Power of a telescope which has an objective lens of 300 inches diameter, for a light of wavelength 6000 A^o.

iv) A simple table spectrometer uses a prism of base length 6 cm, the chromatic dispersion ($d\mu/d\lambda$) of a prism is 300 in the range of wavelength 6000 A^o. Calculate the smallest difference of wavelength in this range that can be just resolved by this spectrometer.

Q-3 A) Attempt any one of the following **10**

i) How many memory locations can be addressed by a microprocessor with 14 address lines?

ii) List the four operations performed by the 8085 Microprocessor Unit.

B) Solve any two of the following **10**

i) What is buffer and give its examples?

ii) The instruction code *0100 1111(4FH)* is stored in memory location 2005H. Illustrate the data flow and list the sequence of events when the instruction code is fetched by the MPU.

iii) Write a note on static memory and dynamic memory

iv) What are low level and high level languages?

Q-4 **Attempt any three from the following.** 15

i) Distinguish between negative crystal and positive crystal.

ii) Note on 'Selective Absorption'.

iii) For calcite crystal μ_o =1.565 and μ_E = 1.452. Find light of wavelength if the thickness of plate is 30×10^{-17} m.

iv) What is mean resolution? State magnification.

v) Draw figure of intensity distribution due to diffraction at two parallel slits.

D.B.J. College, Chiplun
Semester - IV PTKT Examination October - 2024 SYBSC
Class :- S.Y.B.Sc. Subject :- Zoology - III Paper no - III 10/10/24
Date :- 10-10-24 Time :- 2.00 pm to 5.00 pm

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**.
4) Figures to the right indicate full marks.

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

a).....egg contain moderate amount of yolk.
i) Polylecithal ii) Mesolecithal iii) Oligolecithal iv) Isolecithal

b) The .....cleavage occurs in equal holoblastic division of an egg.
i) Radial ii) Spiral ii) Bilateral iv) Rotational

c) .....cells provides nourishment to the developing sperms.
i) Leydig ii) Rete testis iii) Sertoli iv) Epididymus

d).....involves the avoidance of sexual intercourse.
i) Rhythm method ii) Temperature method iii) Billing method iv) Abstinence

e) .....layer of earth contains deposits of minerals, mineral ores, and organic matter.
i) Biosphere ii) Hydrosphere iii) Lithosphere iv) Mesosphere

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

Column I	Column II
1) Microlecithal eggs	a) Female infertility
2) Spiral cleavage	b) Male infertility
3) Salpingitis	c) Eutrophication
4) Oligozoospermia	d) Tunicates
5) Water pollution	e) Flatworms

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

a) Mesolecithal eggs contain very little amounts of yolk.
b) In extension the cells are stretched to increase the length of germ layer.
c) Development of secondary sexual characters in male is under control of estrogen.
d) Abstinence involves avoidance of sexual intercourse.
e) Stratosphere is also thin ozone layer.

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

a) Define alecithal eggs.
b) What is emboly?
c) What is mini-pill?
d) Define the Azoospermia.
e) What is global warming?

(P.T.O.)

Q. 2. A) Explain the types of morphogenetic movements in epiboly and emboly. 10

OR

A) Describe types of cleavages based on symmetry. 10

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

a) Explain the process of coelom formation.

b) Describe the types of eggs on the basis of amount of yolk.

c) Give an account on process of gastrulation.

d) Describe the basic structure of sperm.

Q. 3. A) Describe the hormonal regulation of female reproductive system. 10

OR

A) Discuss the causes of male infertility. 10

Q. 3. B) Answer any two of the following: 10

a) Explain the termination of pregnancy.

b) Describe the endometriosis and PCOS.

c) Give an account on natural methods of contraception.

d) Describe the sexually transmitted infections.

Q. 4. A) Describe the sources of air pollutants and their effects on organisms. 10

OR

A) Describe the sources, effects and control measures of solid waste pollution. 10

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

a) Explain the types and sources of water pollution.

b) Describe the effects of sound pollution.

c) Give an account on the sources and effects of soil pollution.

d) Explain the radioactive substances pollution and its effects.

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

a) Gastrulation in birds.

b) Holoblastic cleavage.

c) Male reproductive system of human.

d) *In-vitro* fertilization.

e) Soil profile.

f) Control measures of sound pollution.

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SYBSc
9/10/24

D.B.J. College, Chiplun
Semester - IV AIKT examination October - 2024
Class :- S.Y.B.Sc. Subject :- Zoology - II Paper no. II
Date :- 09-10-2024 Time :- 2.00pm to 5.00pm

Time: 3 Hrs **Total Marks: 100**

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 A eukaryotic cell is a cell that has a membrane bound .....and other membrane bound compartments or sacs, called organelles, which have specialized functions.
(Nucleus, Nucleolus , Nuclei)

b The Biological model, which was devised by SJ Singer and G. L. Nicolson in....., describes the cell membrane as a two dimensional liquid.
(1975, 1972, 1872)

c Communication between plant cells takes place through fine strands of actin passing through the cytoplasm which are called as.....
(Plasmodesmata, Microvilli, Desmosomes)

d ..... is a specific type of diffusion; it is the passage of water from a region of high water concentration through a semi permeable membrane to a region of low water concentration.
(Diffusion, Filtration, Osmosis)

e Pompe's disease is a rare genetic disorder in which the body is not able to break down complex....., which affects organs and tissues, particularly muscles.
(Protein, Lipid, Glycogen)

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

	Column I		**Column II**
a	Microfilaments	i	Accumulation of lipids
b	Carrier proteins	ii	Permeases
c	Tay-Sachs disease	iii	DNA
d	Histones	iv	Actin
e	Vision, immune system	V	Vitamin A

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

a Van Leeuwenhoek described a live animal cell.

b Defect in lysosomal enzymes often results in storage diseases.

c Golgi apparatus is not responsible for transporting, modifying, and packaging proteins into vesicles for delivery to targeted destinations.

d Glucose energy is stored as glycogen with the majority of it in the muscle and liver.

e Vitamin Strengthens blood vessels and gives skin elasticity, functions as anti-oxidant and iron absorption.

(P.T.O.)

			05
	D	**Define the following.**	
	a	Nucleus	
	b	Biomolecule	
	c	Microfilament	
	d	Protein	
	e	Vitamin.	10
Que.2.	**A**	Distinguish prokaryotic and eukaryotic cell.	
		OR	10
	A	Discuss junctional complexes.	10
	B	**Explain any Two from the following:**	
	a	Structure of nuclear pore complex	
	b	Fluid Mosaic Model	
	c	Exocytosis	
	d	Composition and Functions of microtubules.	10
Que.3.	**A**	Describe polymorphism in lysosomes.	
		OR	10
	A	Describe structure of endoplasmic reticulum.	10
	B	**Explain any Two from the following:**	
	a	General morphology of nucleus	
	b	Functions of endoplasmic reticulum	
	c	Ultra structure of mitochondria	
	d	Bioenergetics.	10
Que.4.	**A**	Explain the concept of Biomolecules and give its significance.	
		OR	10
	A	Discuss biological role and clinical significance of proteins.	10
	B	**Explain any Two from the following:**	
	a	Properties of carbohydrates	
	b	Properties and classification of amino acids on the basis of nutritional requirements.	
	c	Classification of fatty acids	
	d	Fat soluble vitamins.	20
Que.5.		**Write short notes on any four.**	
	a	Biological role and clinical significance of carbohydrate	
	b	Basic structure of Amino acids	
	c	Nucleolus	
	d	Peroxisomes	
	e	General morphology of Golgi complex	
	f	Origin and occurrence of lysosomes.	

SYBSc
4/10/24
ATKT

D. B. J. College, Chiplun

Semester – IV ATKT Examination October – 2024

Class: S.Y.B.Sc. Subject: Chemistry Paper no. I
Date: 04/10 / 2024 Time: 2.00 pm to 5.00 pm 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. a) The electrode where ----- takes place is written to the right hand side of the galvanic cell.
i) reduction ii) oxidation iii) decomposition iv) hydrogenation

b) For spontaneous cell reaction E^0_{cell} must be ---------
i) > 0 ii) < 0 iii) $= 0$ iv) ≥ 0

c) The standard electrode potential of hydrogen gas electrode is ----------.
i) 1.0 volt ii) 0.0 volt iii) 1.2 volts.

d) Sulphur system has ---------- stable curves.
i) 4 ii) 6 iii) 5

e) The number of phases for $CaCO_{3(s)} \rightarrow CaO_{(s)} + CO_{2(g)}$, is---.
i) 1 ii) 2 iii) 3

f) The Gibbs phase rule is given by the relation ----------.
i) $F = C - P + 1$ ii) $F = C - P + 2$ iii) $F = C + P - 2$

g) Oxidation state of central metal ion in $[Fe(CN)_6]^{4-}$ is .....
i) +3 ii) +4 iii) +2 iv) +1

h) In charge transfer spectra when metal reduced and ligand oxidized is called .....
i) MLCT ii) LMCT iii) ILCT iv) NLCT

i) Siderite is the ore of .....
i) Ni ii) Co iii) Fe iv) Zn

j) Solution of ..... gives reddish brown precipitate with α-nitroso-β-napthol.
i) Cobalt ii) Copper iii) Zinc iv) Nickel

k) Dien is a ..... ligand.
i) tridentate ii) tetradentate iii) bidentate iv) monodentate

l) In complexes with co-ordination no. 6, the arrangement of six Ligands is always .....
i) octahedral ii) tetrahedral iii) pyramidal iv) square planar

m) Ethyl benzene on oxidation with alkaline $KMnO_4$ gives ----------.
i) Acetophenone ii) Phenyl acetic acid iii) Benzoic acid iv) Phenol

n) Soda lime is a mixture of solid NaOH and ----------.
i) CaO ii) $Ca(OH)_2$ iii) CuO iv) $CaCl_2$

o) Common name of 2-hydroxybenzoic acid is ----------.
i) p-Anisic acid ii) o-Toluic acid iii) Salicylic acid iv) Acetyl salicylic acid

p) Acetic acid can be prepared by oxidation of ---------- using $K_2Cr_2O_7$ and dil. H_2SO_4.
i) ethene ii) ethanol iii) ethane iv) ethyl chloride

q) Oxalic acid is ---------- dioic acid.
i) ethane ii) propane iii) butane iv) methane

r) ---------- group increases acidity of carboxylic acid.
i) $-CH_3$ ii) $-CH_2-CH_3$ iii) $-NO_2$ iv) $-OCH_3$

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

a) A salt bridge is used to minimize the liquid junction potential
b) Lead- silver system is an example of one component system.
c) Valence bond theory cannot explain or predict the relative energies of different stereoisomers.
d) Cu shows only +2 oxidation state.
e) Formic acid is weaker acid than acetic acid.
f) The carboxylic acids when treated with LiAlH4 gives a secondary alcohol.

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

	Column A		Column B
a)	Condensed phase rule	i)	Reference electrode
b)	$Ag_{(s)} - AgCl_{(s)} \mid KCl_{(aq)}$	ii)	F = C- P + 2
c)	Chromate ion	iii)	Dicarboxylic acid
d)	Dichromate ion	iv)	Soda lime
e)	Adipic acid	v)	Yellow colour
f)	Decarboxylation	vi)	F = C- P + 1
		vii)	two isomers
		viii)	Monocarboxylic acid
		ix)	Orange colour

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

a) Discuss the applications of phase rule to water system. 5
b) What are the conventions to represent a galvanic cell? 5
c) Derive Nernst equation for the electrode potential of single electrode. 5
d) i) Distinguish between reversible and irreversible cells. 5
ii) Calculate the number of phases and number of components for the following system.

$$NH_4Cl_{(s)} \rightarrow NH_{3(g)} + HCl_{(g)}$$

e) Explain the term congruent melting point. 5
f) Calculate the emf of the following cell at 298K. 5
$Cu \mid Cu^{2+}(a = 0.1) \parallel Ag^+ (a = 0.01) \mid Ag$
(Given: $E^o_{Cu2+/Cu} = 0.34$ V, $E^o_{Ag+/Ag} = 0.80$ V)

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

a) State characteristics properties of transition elements. 5

b) Name the elements of first transition series and give their electronic configuration. 5

c) Calculate the magnetic moment for elements with d^1, d^5, d^7 and d^9 configuration 5

d) Write a note on origin of colour for transition metals and their compounds. 5

e) State and explain in brief application of co-ordination compound. 5

f) Define terms: i) Complex ion ii) Co-ordination no. iii) Co-ordination compound 5
iv) Ligands v) Co-ordination sphere

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

a) Give any two methods of preparation of carboxylic acids. 5

b) What is nucleophilic acyl substitution? Write the mechanism of conversion of acetyl chloride to acetamide. 5

c) Explain Dieckmann condensation with suitable reaction. 5

d) What is sulphonation? Give the mechanism of sulphonation benzene. 5

e) What is the effect of following reagents on acetic acid? Give chemical reactions. 5
i) $SOCl_2$ ii. methanol in H_2SO_4 iii) NH_3, Δ iv) $NaHCO_3$ v) Soda lime

f) Explain Hell-Volhard-Zelinsky reaction with mechanism 5

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

a) Derive Clapeyron equation. 5

b) Explain the use of quinhydrone electrode for determination of pH of the solution. What are the advantages of quinhydrone electrode? 5

c) State ores of vanadium and describe its extraction. 5

d) State the assumption involved in application of valence bond theory to coordination compounds. 5

e) i) Give sulphonation products of naphthalene at different temperature. 5
ii) Explain 'mono-chloroacetic acid is stronger than acetic acid.

f) Explain Claisen condensation with mechanism. 5
