Subject:- Ordinary Differential Equations
Paper no - III
Max Marks:- 75
Time:- 9.00am to 11.30am
Date:- 05-03-2025

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 questions of the following. **(8)**

a) Let $f(D)$ be a polynomial in the linear operator D. Prove the following identity : $e^{ax} f(D)y = f(D-a)(e^{ax} y)$.
Where e^{ax} is the exponential function and f(D) represents a function of the operator $D = \frac{d}{dx}$

b) Let $P(x) and\ Q(x)$ be continuous functions on the interval (a, b). Suppose $x_0 \in (a,b)$ and y_1 is a solution to the second order differential equation $y'' + P(x)y' + Q(x)\,y = 0$ with $y_1(x_0) = 0\ and\ y_1'(x_0) = 0$. Show that $y_1(x) = 0\ \forall\ x \in (a,b)$.

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

a) Show that the set of polynomial functions $\{1+x, 3-2x, 8-6x\}$ is linearly independent on real numbers $\mathbb{R}$.

b) Prove that the set of functions $\{e^x, sinx, cosx\}$ is linearly independent using Wronskian.

c) Show that $y_1 = e^x\ and\ y_2 = xe^x$ are two linearly independent solutions to the differential equation $y'' - 2y' + y = 0$. Then, find the general solution to this differential equation.

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

a) Find particular solution to the system of differential equation :
$\frac{dx}{dt} = 7x + 6y, \frac{dy}{dt} = 2x + 6y$, satisfying x(0) = 1, y(0) = 4.

b) Prove the following identities:
i) $(D-a)^n(x^k e^{ax}) = 0$ for $k = 0,1,2,\ldots\ldots, n-1$.
ii) $(D-a)^n(x^n e^{ax}) = n!\ e^{ax}$, where $D = \frac{d}{dx}$ and a is a constant.

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

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

b) Evaluate $A + B, B + A\ and$ verify that $A + B = B + A$ where $A = xD^2 - 4D, B = 7x^3D + 5$. Also represent them in $\frac{d}{dx}$ form.

c) Using differential operator, evaluate $(D-2)(D+4)^2$, where $D = \frac{d}{dx}$

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

a) Using the fourth order Runge-Kutta method, find y(0.25) for the differential equation :
Given $\frac{dy}{dx} = y - x^2, y(0) = 1, with\ step\ size\ h = 0.25$.

b) Estimate the value of y(1.05) for the differential equation $y' = 3x - y$, given that y(1) = 2.5 using modified Euler method correct upto 3 decimal places, with step size h = 0.05.

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

a) Apply Picard's method for the eqaution $y' = 3x^2y$, where y(1) = 2 and estimate y(1.25) using the second approximation.

b) Use Taylor series method to obtain the solution of $\frac{dy}{dx} = x - y$, given that y(2) = 2. Find y(0.1).

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

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

a) Using the second order Runge-Kutta method, find y(0.2) for the differential equation :
Given $\frac{dy}{dx} = y + x,\ y(0) = 2$, with step size h = 0.1.

b) Check whether the following set is linearly dependent or independent
$\{4 - x^2, 3 - x, 4x - 3\}$

c) Use Taylor series method to obtain the solution of $\frac{dy}{dx} = 3x + y^2$, given that y(0)=1. Find y(0.1).

d) Factorize $D^2 - D - 30$ using differential operator.

e) Obtain the Picard's successive approximation formula for first order differential equation with initial conditions.

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D.B.J. College, Chiplun
Semester – III ATKT Examination March – 2025
class:-S.Y.B.Sc. Subject:-Chemistry-I Paper no.-I
Date:-06-03-2025 Time:-9.00am to 11.30am Max. Marks:-75

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.** 09
(Attempt **any nine**)

a) The sum of transport number of ions is always --------.
i) = 1 ii) < 1 iii) ≥ 1 iv) > 1

b) For spontaneous process free energy change is ----------.
i) $\Delta G > 0$ ii) $\Delta G < 0$ iii) $\Delta G = 0$ iv) $\Delta G \geq 0$

c) The unit of equivalent conductance is ----------.
i) S $cm^2eq.^{-1}$ ii) S $cm^{-2}eq.^{-1}$ iii) S $cm^{-1}eq.^{-1}$ iv) S $cm^{-3}eq.^{-1}$

d) Helmholtz free energy is a measure of ----------.
i) minimum work ii) net work iii) maximum work iv) Average work

e) Limiting radius ratio 0.225-0.414 is there in ionic compounds with co-ordination numbers --------.
i) 3 ii) 4 iii) 6 iv) 5

f) In sodium chloride structure both the ions haye..... coordination number.
i) 6:6 ii) 4:4 iii) 8:8 iv) 5:5

g) Homonuclear diatomic molecules formed from --------.
i) 2-atoms of same elements iii) 3-atoms of same elements
ii) 2-atoms of different elements iv) 4-atoms of different elements

h) ..... orbitals are ungerade orbitals.
i) d ii) s iii) p iv) f

i) 2-Bromoethanol can be prepared by reaction of HBr with ----------.
i) ethyl magnesium bromide iii) ethanol
ii) ethylene oxide iv) ethylene

j) Phenol is more acidic than ----------.
i) p-nitrophenol ii) alcohol iii) o-nitrophenol iv) m- nitrophenol

k) Dehydration of cyclohexanol using conc. H_2SO_4 at 140°C gives --------
i) Cyclohexane ii) Cyclohexene iii) Cyclohexadiene iv) Benzene

l) Phenyl magnesium chloride reacts with dry ice to form --------.
i) Benzyl alcohol ii) Phenol iii) Benzoic acid iv) Benzoyl chloride

m) The rate of SN^1 reaction depends upon -----.
i) non-polar solvent iii) conc. of base
ii) conc. of alkyl halide iv) conc. of alkyl halide and base

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

a) Fugacity is a measure of escaping tendency of a substance.
b) HCl is weak electrolyte.
c) Higher the resonance energy, greater is the stability of the molecule.
d) In antibonding MO, overlap integral is positive.
e) The electron releasing substituent decreases the acid strength of phenol.

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

	Column A		Column B
a)	Kohlrausch's law of independent migration of ions	i)	Reducing agent
b)	Gibbs – Duhem equation	ii)	PCC
c)	SF_6	iii)	$\Sigma n_i d\mu_i = 0$
d)	Oxidizing agent	iv)	$\Delta G = \Delta H - T\Delta S$
e)	$NaBH_4$	v)	$\Lambda_M^{\infty} = \nu_+ \lambda_+^{\infty} + \nu_- \lambda_-^{\infty}$
		vi)	Octahedral geometry
		vii)	$LiAlH_4$

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

a) Define free energy. Show that, Gibbs free energy is a measure of network.

b) Define transference number. Discuss the factors that affect transference number.

c) Explain, ionic product of water. How will you determine the ionic product of water experimentally?

d) Define molar conductance.
The conductance of 0.1 M CH_3COOH solution is 0.450×10^{-3} S. Calculate the molar conductance of the CH_3COOH solution.
(Given: Cell constant of conductivity cell = 1.0 cm^{-1})

e) Derive Gibbs-Helmholtz equation.

f) The equilibrium constant for the reaction $N_{2(g)} + 3H_{2(g)} = 2NH_{3(g)}$ is 1.63×10^4 at 674 K and 0.145×10^4 at 770 K. Calculate the heat of formation of ammonia.
(Given: R = 8.314 J/K/mole)

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

a) Explain crystal structure of zinc blende.

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

c) Define formal charge. Calculate the formal charge on the C and O atom in $:C \overleftarrow{=} O:$ molecule.

d) Distinguish between bonding molecular orbital and antibonding molecular orbital.

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

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

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

a) Explain addition –elimination mechanism of nucleophilic substitution reaction with suitable example.

b) Prepare following compounds using suitable Grignard reagent.
i)Cyclohexane carboxylic acid ii) 2-methyl-2-butanol

c) How will you obtain the following compounds using ethylene oxide?
i) 2-chloroethanol ii) 2-cyano ethanol

d) How will you convert phenol into the following compounds?
i) Picric acid ii) 2,4,6- tribromo phenol iii) phenyl acetate

e) Explain the following terms with suitable examples.
i) Hydrolysis of alkyl halides ii) Esterification

f) Explain the following:
i) Alcohols are extremely weak acids.
ii) p-Nitrophenol is more acidic than phenol.

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.** 09

A. (Attempt **any nine**)

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

b) The ratio of weight average molecular weight to number average molecular weight is called --------.
i) degree of polymerization ii) polydispersity index
iii) viscosity average Molecular weight iv) Z-average molecular weight

c) The expression for Nernst distribution law, when solute associates in one of the two solvents are ----------.
i) $K = \frac{C_1}{C_2}$ ii) $K = \frac{C_1}{\sqrt[n]{C_2}}$ iii) $K = \frac{C_1}{C_2(1-\alpha)}$ iv) $K = \frac{C_1(1-\alpha)}{C_2(1-\alpha)}$

d) The monomer of polythene is ---------.
i) propylene ii) vinyl chloride iii) ethylene iv) methylene

e) Borax can be obtained by boiling boric acid with -------.
i) Na_2CO_3 ii) $NaHCO_3$ iii) CH_3COONa iv) NaOH

f) Floating zone technique is used for purification of --------.
i) Si ii) Ge iii) Sn iv) Ar

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

h) The general outer electronic configuration of the elements of group 14 is ----.
i) ns^2np^1 ii) ns^2np^2 iii) ns^2np^3 iv) ns^2np^4

i) IUPAC name of acetaldehyde is ----------.
i) methanal ii) ethanal iii) propanal iv) butanal

j) Propyne on hydration with H_2SO_4 and $HgSO_4$ gives ----------.
i) Acetaldehyde ii) Propanol iii) Acetone iv) Iso-propyl alcohol

k) The ------- is an example of active methylene compound.
i) Ethyl chloride ii) Malonic ester iii) Acetyl chloride iv) Ethanol

l) The sodium borohydride reduces an ketone into ----------.
i) Primary alcohol ii) secondary alcohol iii) tertiary alcohol iv) Carboxylic acid

m) Enols of β-diketones are stabilized by ----------.
i) solvation ii) intermolecular H-bonds iii) intramolecular H-bonds iii) hydration

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

a) The reactions that take place in only a single step are known as simple reactions.
b) Nicotine -water system has lower consolute temperature.
c) Arsenic is a poor conductor.
d) Melting and boiling point of elements of group 14 are increases in the down the group

from C to Pb.

c) Aliphatic primary amines react with ketones to give imines.

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

	Column A		Column B
a)	Nitration of phenol	i)	Separation of completely miscible liquid mixture
b)	Fractional distillation	ii)	Parallel reaction
c)	B_nH_{n+6}	iii)	CO + HCl
d)	Gattermann Koch reaction	iv)	Archnoboranes
e)	Acetophenone	v)	Aromatic ketone
		vi)	Aliphatic ketone
		vii)	Nidoboranes

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

a) With suitable example discuss the concept of elementary steps involved in the thermal chain reaction.

b) i) Explain polymerization.
ii) Distinguish between addition polymerization and condensation polymerization.

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

d) A sample of polymer contains molecules with molecular weight 1000, 10000, and 20000 in the proportion of 3:2:1 respectively. Calculate the number average and weight average molecular weight of the sample.

e) What are the complex reactions? Explain consecutive reactions with suitable example.

f) Write a note on azeotropic liquid mixtures showing minimum boiling point.

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

a) Explain the structure and bonding in tetraborane.

b) Write a note on halides of Boron.

c) Explain the structure and bonding in SiO_2.

d) Explain the trends in physical properties of hydrides of elements of nitrogen family.

e) Explain the preparation and properties of nitrogen dioxide.

f) Describe the zone refining technique for the purification of germanium and silicon.

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

a) How will you prepare carbonyl compounds using following methods? Give suitable examples.
i) Rosenmund reaction ii) Hydration of alkyne

b) What is Cannizzaro's reaction? Explain its mechanism with suitable example.

c) What is the effect of following reagents on acetaldehyde? (reactions are expected)
i) CH_3MgBr ii) CH_3-NH_2 iii) $LiAlH_4$ iv) HCN v) 2,4-DNP

d) Complete the following reactions and name the products.

i) Benzaldehyde $\xrightarrow{HCN}$ A $\xrightarrow{HCl}$ B

ii) Acetophenone + $NaHSO_3$ $\longrightarrow$ A

e) What is Benzoin condensation reaction? Explain its mechanism.

f) How will you convert ethyl aceto acetate into
i) 2-Butanone ii) 3-Methyl-2-butanone?

D. B. J. College, Chiplun

Semester – III ATKT Examination March 2025

Class: S.Y.B.Sc. **Subject: Chemistry** **Paper no.- II**

Date: 07/03/2025 Time: 09.00 to 12.00 Max. Marks: 100

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. 12
(Attempt any twelve)

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

b) Decomposition of ethylene oxide is an example of ---------- reaction.
i) reversible ii) consecutive iii) parallel

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

d) The liquid mixture which distill with a change in composition is called ---- ------ mixture.
i) azeotorpic ii) zeotropic iii) homogenous

e) ---------- step extraction process is more efficient.
i) Single ii) double iii) multiple

f) Steam distillation is used for ---------- of organic compound.
i) purification ii) separation iii) mixing

g) Cassiterite is the ore of.....
i) Germanium ii) Silicon iii) Tin

h) Tetraborane contain .....no. of three centre two electrons hydrogen bridge bonds
i) 3 ii) 4 iii) 2 iv)5

i) The general outer electronic configuration of the elements of group 14 is .....
i) ns^2p^1 ii) ns^2p^2 iii) ns^2p^3

j) Boron trihalides are .....in nature and their solutions in organic solvents are bad conductor of electricity.
i) covalent ii) ionic iii) dimeric

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

l) Floating zone technique is used for purification of.....
i) silicon ii) germanium iii) tin

m) IUPAC name of acetaldehyde is ----------.
i) methanal ii) ethanal iii) propanal

n) In the carbonyl group both carbon and oxygen atoms are ----------.
i) sp^3 ii) sp^2 iii) sp

o) A primary alcohol is oxidized by a solution of PCC to give ----------.
i) Carboxylic acid ii) Aldehyde iii) Ketone

p) Rosenmund reduction is carried out with H_2 in presence of Pd catalyst supported on ----------.
i) $CaSO_4$ ii) $BaSO_4$ iii) $BaCl_2$

q) Gattermann Koch formylation of aromatic hydrocarbon is carried out by mixture of ----------.
i) $CO_2 + HCl$ ii) $CO_2 + AlCl_3$ iii) $CO + HCl(g)$

r) Acetophenone is ---------- Ketone.
i) aliphatic ii) cyclic iii) aromatic

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

a) H and Br atoms are known as chain carriers in the thermal chain reaction.
b) Triethylamine-water system has upperconsolute temperature.
c) Arsenic is a poor conductor.
d) Melting and boiling point of elements of group 14 are increases in the down the group from C to Pb.
e) Aldehydes and ketones undergo electrophilic addition to the carbonyl group.
f) $NaBH_4$ is less reactive than $LiAlH_4$.

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

	Column A		Column B
a)	Fractional distillation	i)	Mild oxidizing agent
b)	Raoult's law	ii)	Cyanide ion
c)	B_nH_{n+6}	iii)	$P_A = P^0_A \times X_A$
d)	B_nH_{n+4}	iv)	Ga
e)	PCC	v)	Separation of miscible liquid mixture
f)	Benzoin condensation	vi)	Strong oxidizing agent
		vii)	$P_A = P^0_A + X_A$
		viii)	archnoboranes
		ix)	nidoboranes

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

a) State the important assumptions of collision theory of bimolecular reaction.
b) Define ideal solutions. What are the criteria for the solution to be an ideal?
c) i) Explain parallel reaction with suitable example.
ii) Explain any one experimental method to determine the activation energy
d) Explain the variation of mutual miscibility with temperature for phenol-water system.
e) For a given reaction, the energy of activation was found to be 112.6 kJ/mol at 300 K and the frequency factor is 5.5×10^{13} per second. Calculate the rate constant of reaction.
(R = 8.314 J/K/mol)
f) State Nernst distribution law and write its applications.

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

a) Give the uses of borax.
b) Write a note on halides of Boron.
c) Explain the structure and bonding in Silica.
d) Describe the floating zone process for the purification of silicon.
e) Explain the trends in physical properties of hydrides of elements of nitrogen family.
f) Explain the preparation and properties of nitric oxide.

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

a) Explain the mechanism of Benzoin condensation.
b) Prepare Acetaldehyde and 2-Butanone using suitable Grignard reagent.
c) i) What is the action of following reagents on Acetophenone?
a) HCN b) $NaHSO_3$ c) Phenyl hydrazine
ii) Discuss the reduction of acetone by using NaBH4.
d) i) Write a note on Rosenmund reduction.
ii) What are active methylene compounds? Give any one example with structure.
e) i) Explain the general mechanism of nucleophilic addition to carbonyl compound
ii) How will you prepare benzophenone from benzene?
f) i) Prepare succinic acid from acetoacetic ester.
ii) What are stabilized enols?

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

a) Define activation energy and derive Arrhenius equation
b) Write a note on azeotropic liquid mixture showing maximum boiling point
c) Explain the structure and bonding in diborane.
d) i)Write a short note on oxidation state of 13 group elements.
ii)What are electron deficient compounds? Give one example.
e) Explain the mechanism of Cannizzaro's reaction.
f) i) Explain reduction of Benzaldehyde by using $LiAlH_4$
ii) How will you prepare acetone by using suitable Grignard reagent?

Duration: 2 ½ hours Total Marks: 75

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

a During the titration, the solution taken in burette is called_____
i) indicator ii) titrand iii) titrant iv) solute

b The _____ indicators are used in complexometric titration.
i) adsorption ii) neutralization iii)metallochromic iv) absorption

c The _____ is secondary standard.
i) succinic acid ii) potassium dichromate iii) sodium hydroxide iv) borax

d The _____is classical method of analysis
i) optical method ii) chromatographic method iii) gravimetric method
iv) thermogravimetric method

e Visible spectrophotometry use radiation in _____ region of electromagnetic spectrum.
i) 400-750nm ii) 180-400nm iii) 750-950nm iv) 400-950nm

f If the concentration is in g/cm^3 and path length in cm, the unit of absorptivity would be _.
i) g^{-1}dm^{3}cm^{-1} ii)mol^{-1} dm^3 cm^{-1} iii) gdm^{3}cm^{-1} iv) gdm^{3}cm

g UV region of electromagnetic spectrum is from _____nm.
i) 1-180nm ii) 200-400nm iii) 400-780nm iv) 200-800 nm

h In thermogravimetry, the weight of sample is recorded as a function of _____
i)mass ii) temperature iii) concentration iv) volume

i Absorbance and transmittance of an absorbing solution related by expression _____.
i) A= 1/T ii) A= $\log_{10}$1/T iii) A= -$\log_{10}$ T iv) A= $\log_{10}$T

j Error due to wrong judgement of burette reading is _____
i) personal error ii) instrumental error iii) methodical error iv) operational error

k Selection of every fifth tablet from the batch for the analysis is a type of _____
i) Gross sampling ii) systematic sampling iii) batch sampling iv) random sampling

l The error in which relative error varies inversely to sample size is known as _____error.
i) constant ii) proportionate iii) absolute iv) random

m The sample is prepared by mixing the increment is known as _____.
i) lab sample ii) gross sample iii) analysis sample iv) sub-sample

Q.1 B State whether the following sentences are **true** or **false. (Attempt any three)** **3**

a Co-precipitation is phenomenon in which the impurity which is normally soluble is precipitated along with the main precipitate.

b Spectrophotometers are more sensitive than colorimeters.

c Generally UV-radiations are absorbed by colored as well as colorless solutions.

d Analytical sample is gross sample.

e Mean is arithmetic average of a set of observations.

Q.1 C Match the following (Attempt any three)

Column A	Column B
i) Colorimeter	a) Standard deviation
ii) Redox indicator	b) Absolute error
iii) Metallochromic indicator	c) Murexide
iv) Precision	d) Visible region
v) Accuracy	e) Diphenylamine
	f)Methyl orange
	g) Constant error

Q.2 Attempt any four questions of the following

a What is quantitative and qualitative analysis?

b Define the following terms –i) Proximate analysis ii) partial analysis iii) trace analysis

c Explain – Random sampling and systematic sampling with examples.

d Explain the terms constant and proportionate errors.

e To test a new method for the estimation of chlorine in industrial environment, a standard sample was prepared by diluting chlorine with air so that 100 ml of air at NTP contains 9.7 ppm of chlorine. 100ml aliquots of the standard sample were analyzed by the new method with the following results

Sample No.	1	2	3	4	5
Chlorine (ppm)	9.9	9.7	10.1	9.6	9.5

For the set of data, calculate i)mean ii)median iii) spread iv) absolute error and relative error in ppt for the 4th sample

f Arsenic in the water was analysed by AAS. The values of Arsenic in ppm for seven replicate measurements are as follows.
Arsenic in ppm : 10.12, 10.56, 11.54, 11.03, 11.59, 10.43, 10.89
Calculate i) mean, ii) standard deviation iii) variance iv) coefficient of variance for the given data set.

g What is sampling? Define the following terms :
i.Sub-sample ii. Gross sample iii. Analysis sample iv. Sampling unit

Q.3 Attempt any four questions of the following

a Explain the concept of pH and it important in neutralization titration.

b Distinguish between primary and secondary standard.

c Explain the effect of diverse ion during gravimetric analysis.

d Explain conductometric titration of strong acid Vs Strong base.

e Calculate the equivalent weight of each – $Na_2C_2O_4$, the reducing agent , and $K_2Cr_2O_7$, the oxidizing agent in the following reaction :

$$3C_2O_4^{2-} + Cr_2O_7^{2-} + 14H^+ \longrightarrow 2Cr^{3+} + 6CO_2 + 7H_2O$$

f What are colloids? Explain the formation of electrical double layer on colloids.

Q.4 Attempt any four questions of the following

a Explain the construction and working of photomultiplier tube detector.

b What are electro analytical methods? Give classification of it.

c With the help of diagram explain the principle and working of double beam spectrophotometer.

d Explain the important application of UV-visible spectroscopy.

e i) Explain the terms- Transmittance and wavelength of maximum absorbance (λmax)
ii) State and explain Beer-Lambert's law.

f Over what concentration range analysis could be performed for Fe (III) complex possesses a molar absorptivity of 12000 $dm^3mol^{-1}cm^{-1}$ if it is desired to confine transmittance reading to within the range 0.4 and 0.85? Assume optical path length of 1 cm.

D. B. J. College, Chiplun.
Sem- III ATKT Exam May - 2025
S.Y. B.Sc. Physics Paper - I
Date:- 10/03/2025 Time: 9:00 am to 12:00 PM

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 a 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 $\mu = \frac{1}{C_p}(\frac{2a}{RT} - b)$
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' equation.

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.

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) What are types of pyrometer? Explain the Total Radiation Pyrometer.

B] Attempt **any two** of the following. **(15)**
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.
i) Write the four Maxwell's thermodynamic relations. Give any one application of it.
ii) Calculate the efficiency of a Carnot engine working between the boiling point and freezing point of water
iii) Write a short 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) Give any five points to compare between a Petrol engine and Diesel engine

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D. B. J. College Chiplun
Sem - III AT KT Exam Mar - 2015
S.Y. B.Sc. Physics Paper - II
Date: 11/03/2015 Time: 9:00 to 12:00 am pm

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

Q1. A) Attempt any **one** (10)

i) Discuss the reasons for the stabilization of the operating point.

ii) Using the block diagram, explain the general theory of feedback.

B) Attempt any **two** (10)

i) Explain the inherent variations of transistor parameters.

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

iii) A germanium transistor is to be operated at zero signal $I_C = 1mA$. If $V_{CC} = 12$ V. What is the value of R_B in the base resistor method? Take $\beta = 100$.

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

i) With a neat diagram explain the action of Colpitt's oscillator. Find the feedback fraction.

ii) Show that Op-amp as phase reversal.

B) Attempt any **two** (10)

i) Discuss the basic principle of the R-C phase shift oscillator.

ii) Explain Op-amp as zero crossing detector.

iii) The Wien bridge oscillator R_1 and R_2 in the bridge network are $R_1 = R_2 = 220$ KΩ and $C_1 = C_2 = 250\ \mu f$. Determine the frequency of oscillations.

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

i) Draw the logic circuit of an R-S flip-flop using NOR gates. Write down its truth table.

ii) Construct a 4-bit serial in parallel out shift register using JK flip-flop and explain its operation with waveforms.

B) Attempt any **two** (10)

i) Using AND gate design D-type flip-flop.

ii) Design and explain MOD-8 synchronous parallel binary counter and draw the output waveform.

iii) How does the PIPO shift register work?

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

i) What is meant by the term output impedance of an amplifier?

ii) If an amplifier, the output power is 1.5 watts at 2 KHz and 0.3 watts at 20 KHz while the input power is constant at 10 mW. Calculate how many decibels gain at 20 Hz is below that at 2 KHz.

iii) The phase shift oscillator $R_1 = R_2 = R_3 = 1000$ KΩ and $C_1 = C_2 = C_3 = 68 \times 10^{-12} f$. At what frequency does the circuit oscillate?

iv) Explain the critical frequency of integrators.

v) Explain 3-bit binary synchronous parallel binary counter.

vi) Draw the circuit diagram of the MOD-5 counter and write down the truth table.

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D. B. J. College, Chiplun

Sem - III ATKT Exam Mar - 2021

S.Y.B.Sc. Physics Paper - III

Date :- 12/03/2021 Time :- 9:00 am to 12:00 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) Explain the method of solving Exact differential equation.

(ii) Show that, $y = (C_1x + C_2)e^{mx}$ is the solution of $\frac{d^2y}{dx^2} + a_1\frac{dy}{dx} + a_2y = 0$. 10

(B) **Attempt ANY TWO.**

(i) Test the exactness of the differential equation, $\frac{x}{y}\ln x\frac{dy}{dx} + \frac{1}{2} = 0$.

(ii) Solve the differential equation of radioactive decay, $\frac{dN}{dt} = -\lambda N$.

(iii) Find the order, degree and homogeneity of the following differential equations;

$$(i)\frac{d^2y}{dx^2} + 2\frac{dy}{dx} = 0 \qquad (ii)(1+y)\frac{d^2y}{dx^2} + x\frac{dy}{dx} + x = e^x$$

(iv) Solve the differential equation, $L\frac{di}{dt} + iR = E$ for the growth of current. 10

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

(i) Heat flows through a conduction bar of length 'L' and thermal conductivity 'σ' is given by, $\frac{\partial^2\theta}{\partial x^2} = \frac{1}{\sigma}\frac{\partial\theta}{\partial x}$; solve for the temperature 'θ'.

(ii) Solve Helmholtz equation by using the method of separation of variables. 10

(B) **Attempt ANY TWO.**

(i) Write a short note on Schrodinger's equations.

(ii) Solve two dimensional Laplace's equation; $\frac{\partial^2\phi}{\partial x^2} + \frac{\partial^2\phi}{\partial y^2} = 0$,

(iii) Write a short note on 'method of direct Integration'.

(iv) Solve one dimensional wave equation, $\frac{\partial^2\phi}{\partial x^2} = \frac{1}{c^2}\frac{\partial^2\phi}{\partial t^2}$. 10

Q. 3(A) **Attempt ANY ONE.**

(i) With a neat block diagram, describe the main components of a communication system.

(ii) Explain, how a massage signal is Amplitude Modulated? Why it is necessary?

Q.3 (B) Attempt ANY TWO. 10

(i) What is the maximum distance between two transmitting and receiving towers of same erected height of 64 m for a line of site communication?

(ii) Write a short note on 'Noise Factor' in communication.

(iii) What are the categories of 'Communication Systems'?

(iv) Write a short note on 'Pulse Code Modulation (PCM)'.

Q. 4 **Attempt ANY THREE.** 15

(i) Solve, $\frac{d^2y}{dx^2} - 2\frac{dy}{dx} + y = 2cos\, x$

(ii) $(4x^3 + 6xy + y^2)dx + (3x^2 + 2xy + 2)dy = 0$; Is the equation an exact? If so, find its solution.

(iii) What are partial differential equations? Give the examples.

(iv) A receiver has input signal power of 2.0 μW and noise power is of 0.6 μW. Find the signal to noise ratio.

(v) Write down the advantages of Modulation.

(vi) Write a short note on 'Pulse Amplitude Modulation (PAM)'.

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D.B.J. College, Chiplun

Semester - III ATKT Examination March-2025

Class:- S.Y.B.Sc. Subject:- Zoology-I Paper no. I

Date:- 03-03-25 Time:- 9.00am to 11.30am Max. Marks:- 75

Time: 2.30 hrs. Marks: 75

N.B: 1.All Questions are compulsory.
2. Figures in the right indicates full marks.
3. Draw neat labelled diagrams wherever necessary.

.....

Q.1 Solve multiple choice questions (Any Fifteen) 15

Q1. A Solve the following using correct option. 5

1) A monohybrid Cross involves .....pair of contrasting characters.
(1)2 (2)3 (3)1 (4) 4

2) Who is known as father of genetics?
A. Gregor Mendel B. Augustinian Fria C. Norman Borlaug D. M.S.Swaminathan

3) Sex determination method in grasshopper is .....
(1) XX-XY (2) XX-X0 (3) ZZ-ZW (4) Haplodiplody

4) The phenotypic ratio of a dihybrid cross is.....
A. 1:2:1 B. 3:1 C. 2:1:1 D. 9:3:3:1

5) rRNA Occurs in.....
A. mRNA B. Amino acid C. Ribosome D. ER

Q.1 B) Match the pair from column A and column B. 5

Column A	Column B
1) Dominant	a) Thread like structure
2) Phenotype	b) Masking effect
3) Mutation	c) Protein Synthesis
4) Chromosomes	d) Physical Appearance
5) Translation	e) Change in Nucleotide sequence

Q.1 C) Write true or false from following Statements. 5

1. RNA is a double -stranded molecule.
2. The gene is the basic unit of heredity.
3. Thymine (T) is a base found in RNA.
4. Natural selection acts on genetic variation within populations.
5. The phosphate group in nucleotides forms the back bone of nucleic acid.

Q.1 D) Write answers in one sentence 5

1) What is gene?
2) What is the role of DNA in genetic inheritance?
3) Define mitosis.
4) Define telocentric chromosome.
5) Define the term mutation.

Q.2 A) Discuss the concept of dominant and recessive alleles. 8

OR

A) Discuss the role of epistasis in shaping the phenotype.

Q.2 B) Describe the ABO blood groups in man. 7

OR

B) Explain the various types of linkages.

Q.3 A) Describe the Structure and function of chromosome and write the role of centromere, telomeres and histone proteins. 8

OR

A) Explain the deferent types of Autosome and sex chromosomes.

Q.3 B) Explain the ZZ-ZW and XX-XY of Sex determination. 7

OR

B) Comment on inheritance of hemophilia.

Q.4 A) Explain Avery, MacLeod and McCarty's experiments? 8

OR

A) Comment on polytene chromosome and sex chromosome.

Q.4 B) Explain the deferent types of DNA. 7

OR

B) Write the difference between DNA and RNA.

Q.5 Write a Short note on any three of the followings. **15**

A) Test cross.

B) Gynandromorphs.

C) Comment on lampbrush chromosome.

D) Double dominant epistasis.

E) Silent feature of Watson and Crick model.

F) Mechanism of RNA relication.

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Semester – III D.B.J. College, chiplun
Class:- SY Biotechnology ATKT Examination March - 2025
Date :- 04-03-2025 Subject:- Molecular Biology - III Paper no. VI
Time – 2 1/2 hours Time:- 9.00 am to 11.30 am Max. Marks - 75
Marks–75

Note:

1. **All questions are compulsory.**
2. **Figures** to the **rights indicates** full marks.
3. Draw **neat labeled diagrams** wherever necessary.

Q.1 **A)** **Answer the following. (Any fifteen)** (15)

1. Define translation.
2. What is closed promoter complex?
3. Give the role of release factor in eukaryotes.
4. State the function of B- galactosidase enzyme in lac operon.
5. State the function of ribosomal binding site.
6. Bacteria contain only one RNA polymerase. (State true or false)
7. Define constitutive genes.
8. Give examples of NTPs.
9. Mention the role of GTP in elongation.
10. Give the function of lacI gene.
11. TATA box is also called as----------. (Fill in the blank)
12. RNA polymerase I is located in ----------. (Fill in the blank)
13. The Q protein is another antiterminator, permitting transcription to continue into the late genes involved in the lytic pathway. (State True or False)
14. What is the role of enhancer?
15. Give the role of protein Rho in transcription.
16. Define coordinate induction.
17. Define RNA editing.
18. The entire trp operon is approximately 7,000 base pairs long. (State true or false)
19. Enlist structural genes in ara operon.
20. Give the significance of P –site in translation process.

Q.2 **A)** Explain elongation and termination of an RNA chain in prokaryotes. (08)

Q.2 **B)** Elaborate eukaryotic RNA polymerase. (07)

OR

Q.2 **C)** Describe in detail initiation of transcription in Prokaryotes. (08)

Q.2 **D)** Elaborate process of pre-mRNA to mature mRNA in eukaryotes. (07)

Q.3 **A)** Describe nature of Genetic code. (08)

Q.3 **B)** Compare between prokaryotic and eukaryotic translation process. (07)

OR

Q.3 **C)** Describe the aminoacylation cycle. (08)

Q.3 D) Give an account on transfer RNA.

Q.4 A) Discuss in brief The Lysogenic pathway.

Q.4 B) Describe in detail regulation of trp Operon.

OR

Q.4 C) Describe regulation of gene expression in phage lambda.

Q.4 D) Elaborate effects of lacI Gene mutations.

Q.5 **Write short notes on any three of the following.**

a. Positive control of lac operon.
b. Self-splicing introns.
c. Translocation.
d. Lytic pathway.
e. Ribosomal RNA genes.

D.B.J. College, Chiplun
Semester - III ATKT Examination March - 2025
lass :- S.Y.B.Sc. Subject :- Zoology - II Paper no - II
ate :- 04-03-2025 Time :- 9.00 am to 11.30 am Max. marks :- 75

Time: 2. 30 Hrs. **Marks: 75**

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. **Solve Multiple Choice Questions (Any Fifteen).** **15**

A **Fill in the blanks by choosing the correct options. (Any Fifteen)** **05**

a Cnidarians possesses an internal cavity called as .....
(Coelom, Spongocoel, Gastro Vascular Cavity)

b Organisms that are unable to synthesize their own food material and depend on other plants and animals are called .....(Autotrophs, Heterotrophs, Saprophytes)

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

d .....have few granules in the cytoplasm that shows affinity to basic dyes. (Eosinophils, Basophils, Neutrophils)

e .....are primitive neurons having neither of cytoplasmic dentrites nor axon. (Unipolar, Multipolar, Apolar)

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

	Column I	**Column II**
a	Arborescent organ	i Sperm
b	Open circulation	ii Amoeba
c	Haemocyanin	iii *Clarius*
d	Contractile vacuole	iv Cockroach
e	Acrosome	v Crustaceans

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

a Foregut is also known as mesenteron.
b The simplest type of excretory system is the protonephridia.
c Abdominal air sac is an unpaired air sac.
d Cockroach heart has 10 muscular chambers in thorax.
e Simple binary fission occurs in Hydra.

D **Define the following.** **05**

a Rumen
b Indirect respiration
c Lymph
d Thermotropism
e Spermiogenesis.

Que.2. **A** Discuss the digestion in ruminants. **08**

OR

A Describe physiology of urine formation in man. 08

B Explain the process of food vacuole formation in Amoeba. **07**

OR

B Types of animals based on principle nitrogenous excretory products. **07**

Que.3.	A	Discuss the physiology of respiration in man.	08
		OR	
	A	Distinguish between open and closed type of circulations.	08
	B	Explain respiratory system of Amoeba.	07
		OR	
	B	Annotate structure of Heart in frog.	07
Que.4.	A	Describe the types of neurons based on structure and function.	08
		OR	
	A	Discuss the structure of male and female gametes in human.	08
	B	Explain the Sol - Gel theory.	07
		OR	
	B	Briefly explain legs of Cockroach.	
Que.5.		**Write short notes on any Three.**	15
	a	Ruminant stomach	
	b	Lung of man	
	c	Blood as a circulating fluid	
	d	Structure of uriniferous tubule	
	e	Classification of fertilization	
	f	Budding in Hydra.	

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Time: 2 1/2 hours. Marks: 75

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

Q. 1. Attempt the following sub-questions (any 15). 15

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

a) The animals learn to make new associations between past experiences and solve the problem is -.....
(Altruism, Insight learning, Imprinting)

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

c) .....is blood sucking insect.
(Leech, Bat, Bedbug)

d) American foulbrood is a.....disease affecting the brood of honey bees.
(Bacterial, Viral, Protozoan)

e) ..... is prepared from Pindi khoa.
(Rasogulla, Barfi, Gulab jamun)

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

Column I	Column II
1) Ritualization	a) Hydrophobia
2) Displacement activities	b) Viral disease of honey bee
3) Rabies	c) Milk product
4) Sac-brood disease	d) Man scratching head hairs
5) Yogurt	e) Julian Huxley

C) State whether True or False. 05

a) The Waggle dance in honey bees is shaped in the form of figure 'eight'.
b) Instrumental learning is called as habituation.
c) Filariasis is caused by *Wuchereria bancrofti.*
d) Toxoplasmosis is a common parasitic disease of man caused by Lyssavirus.
e) Shrikhand is non fermented indigenous sweet made by mixing chenna.

D) Answer the following in one sentence only. 05

a) What is Batesian mimicry?
b) What is Allomothering?
c) Define facultative parasite.
d) Write two names of bacterial diseases of honey bee.
e) What is toned milk?

(P.T.O.)

Q. 2. Answer the following. 15

A) Describe the types of imprinting with suitable example. 08

OR

A) What is mimicry? Describe the types of mimicry with suitable example. 08

B) Explain the types of breeding migration in fish with suitable example. 07

OR

B) Describe the instrumental learning. 07

Q. 3. Answer the following. 15

A) Describe the life cycle of *Fasciola hepatica.* 08

OR

A) Describe the life cycle of *Taenia solium.* 08

B) Explain the Parasitic adaptations in ectoparasites. 07

OR

B) Describe the control measures and treatment of Filariasis. 07

Q. 4. Answer the following. 15

A) Describe the methods of bee keeping and its management. 08

OR

A) Comment on the different varieties of milk products. 08

B) Explain the Windrows method used in Vermiculture. 07

OR

B) Describe the insect pest enemies of honey bees. 07

Q. 5. Write short notes on (any three). 15

a) Classical conditioning.

b) Altruism.

c) Rabies.

d) Physiological adaptations in endoparasites.

e) Structure of natural bee hive.

f) Ghee.

College, Chiplun
Semester – III ATKT Examination March-2025
Class:- SY-Biotechnology Subject:- Fundamentals in Biophysics Paper no:- IV
Date:- 01/03/2025 Time:- 9.00am to 11.30am Maxi Marks:- 75

Time – 2 1/2 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.

Q.1 **Answer the following questions. (Any fifteen)** **(15)**

1. Define refraction of light.
2. Give components of LASER.
3. What is electromagnetic radiation?
4. Enlist types of electron microscopy.
5. What dispersive power indicates?
6. Give application of immunoelectron microscopy.
7. Which technique is used in TEM for examining cellular structure?
8. Give any one application of ultrasonic wave.
9. Define capillarity.
10. What is nuclear magnetism?
11. State the term terminal velocity.
12. Give an example of ferromagnetism.
13. Enlist different methods for measuring temperature.
14. Define surface tension.
15. What is chemiluminescene?
16. Mention types of vibrations in infrared spectroscopy.
17. Give advantages of fluorescence spectroscopy.
18. State Lambert's law.
19. Name any two detectors used in spectrophotometer.
20. Define spectrum.

Q.2 A) Discuss the principle and construction of SEM in detail. **(08)**

Q.2 B) Explain the properties and applications of LASER. **(07)**

OR

Q.2 C) Discuss in detail spontaneous and stimulated emission. **(08)**

Q.2 D) Explain in detail specimen preparation for TEM. **(07)**

Q.3 A) Explain viscosity estimation by an Oswald's viscometer in detail. **(08)**

Q.3 B) Discuss in brief modes of heat transfer. **(07)**

OR

Q.3 C) Explain the Doppler effect in details. **(08)**

Q.3 D) Give an account on diamagnetism. **(07)**

Q.4 A) Discuss the principle and working of fluorescence spectroscopy. **(08)**

Q.4 B) Discuss the sampling technique of IR spectroscopy and its applications. **(07)**

OR

Q.4 **C)** Explain the principle and instrumentation in light scattering spectroscopy. (08)

Q.4 **D)** Discuss the principle and working of UV spectroscopy. (07)

Q.5 **Write short notes on <u>any three</u> of the following.** (15)

a. Construction of fluorescence microscopy
b. Interference
c. Applications of surface tension
d. Biomagnetism
e. Types and properties of spectra

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Time: 2 1/2 hours Marks: 75

Note: 1) All questions are compulsory.
2) For Q.2, Q.3 andQ.4 attempt A and B OR C and D.
3) Draw neat labeled diagrams wherever necessary.
4) Figures to the right indicate full marks.

(15)

Q. 1 A) Answer the following. (Any fifteen)

1. Mast cells contain ------- in their cytoplasmic granules has major role in the development of allergies. (Fill in the blank)
2. Define hematopoiesis.
3. State the relationship of CD4 + and CD8+ cells with respect to T-cells.
4. Macrophages in lungs are called as microglial cells. (State true or false)
5. Define phagolysosome
6. Lobules of thymus are separated from each other by strands of connective tissue called as ----------. (Fill in the blank)
7. State the role of Factor B in alternate pathway of complement system.
8. -------- is the pair of distal domains in class I MHC. (Fill in the blank)
9. Which cells are effective antigen presenting cells if antigen concentration drops?
10. Avidin protein binds to ---- with much higher affinity than ag-ab interaction. (Fill in the blank)
11. Give the role of protein phosphatase.
12. ---- ions are involved in many functions including vision and muscle contraction. (Fill in the blank)
13. The pH of early endosome is 6-6.5 (State true or false)
14. Antigen recognition by CD4+ cells is restricted for------ molecule. (Fill in the blank)
15. MHC genes are present on chromosome number 6 in humans. (State true or false)
16. State the application of western blotting.
17. Enlist the enzymes which can be applied for ELISA test.
18. Define passive agglutination reaction.
19. Typing of ABO blood group is example of ---------- reaction.
20. What is precipitin?

Q. 2A) Explain the structure and function of lymph node with suitable diagram. (8)

Q. 2 B) Describe in detail the lectin pathway of complement system. (7)

OR

Q. 2 C) Discuss in brief about the hematopoieis process. (8)

Q. 2 D) Explain in detail the regulation of complement system. (7)

Q. 3 A) Discuss in brief the significance of MHC complex in disease susceptibility. (8)

Q. 3 B) Describe in detail about the alloreactivity of T-cells. (7)

OR

Q. 3 C) Explain in detail the regulation of MHC gene expression. (8)

Q. 3 D) Elaborate on the regulation of B-cell development. (7)

Q.4 A) Explain in detail the precipitation reactions. (8)

Q.4 B) Discuss in brief the technique of RIA. (7)

OR

Q.4 C) Give an account on the technique of 2D immunoelectrophoresis. (8)

Q.4 D) Explain in detail the principle of direct and indirect ELISA. (7)

Q. 5 Write short notes from the following. (Any 3) (15)

A) Passive agglutination

B) T_H cell activation

C) Coomb's test

D) MHC class II molecule

E) Cutaneous associated lymphoid tissue