Time: 2.30 Hours **Marks: 75**

Instructions:

i) All questions are compulsory
ii) All questions carry equal marks
iii) Figures to the right indicates full marks
iv) Draw neat labeled diagrams wherever necessary

Q. 1: Do as directed (any 15) **15**

Fill in the blank

1. The CO_2 acceptor in C_4 plants is_____
2. Light harvesting complex-II is located in the _____
3. Carbon assimilation phase is also called as _____
4. _____ promotes growth of shoots at a relatively higher concentration.
5. The C_4 cycle may also be referred to as_____
6. _____ is the only gaseous hydrocarbon hormone
7. _____are also called as man-made or man engineered ecosystem

Define:

8. Photosynthesis
9. Enzymes
10. Assimilation of food
11. Anticoagulants
12. Blood pressure
13. Decomposers
14. Food chain
15. Water cycle
16. Primary productivity

Answer the following:

17. Give the function of efferent renal arteriole
18. Give the importance of pulmonary vein in mammalian heart
19. Give the significance of Vitamin K in clotting
20. Give the role of salivary amylase in digestion

Q. 2:

a) Write the Interrelationships between Light and Dark Reaction **8**
b) Write short note on C_4 cycle **7**

OR

c) Write short note on Photorespiration **8**
d) Write the important roles of Abscissic acid **7**

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Q. 3:

a) Describe the internal structure of a mammalian heart with a neat labelled diagram 8

b) Give an account of structure of haemoglobin and its polymorphism **7**

OR

c) Define and explain aerobic and anaerobic respiration **8**

d) Describe the structure and function of Nephron **7**

Q. 4:

a) Elaborate on non-living and living components of an ecosystem. **8**

b) Explain in detail about any one type of ecological pyramid. **7**

OR

c) Explain in detail about parasitism with suitable examples **8**

d) Describe carbon cycle in detail. **7**

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

1. Secondary Metabolites
2. Auxins
3. Gastric digestion
4. RBC
5. Function of an ecosystem.

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Q. P. Code: 31306

2 ½ Hours

Total Marks: 75

1. Attempt **all** questions.
2. **All questions** carry **equal** marks.
3. Draw **neat labeled diagrams** wherever necessary.
4. Use of **log tables** and **non-programmable calculator** is **allowed**.
5. For **Q.2, Q.3 and Q.4** attempt A and B **OR** C and D.

Q. 1 Do as directed (Any fifteen) **15**

1. Define Genotype.
2. _____ genes are the genes which when mutated can result in the lethal phenotype.
3. The ratio for dominant epistasis is _____.
4. State true or false: Environmental factors influence expression of genes.
5. Define Dominant trait.
6. A cross between a homozygous dominant individual and a homozygous recessive individual will always result in a _____ individual.
7. ABO blood type in humans is a characteristic due to multiple _____.
8. Define Transductant.
9. State true or false: In a HFr X F^- cross, the frequency of recombination is low.
10. Give the term for an extra-chromosomal self-replicating circular DNA in bacteria.
11. Give an example of bacterial transposon.
12. Griffith's experiment on transforming principle was conducted using virulent and non virulent strains of _____.
    (*E.coli*/ *Pneumococci*/ Lambda phage)
13. Bacterial transposable elements have _____ at the ends.
    (inverted repeats/ poly A tails/ poly C-G pairs)
14. Define Gene flow.
15. When a wild type of a phenotype undergoes mutation to give a mutant type of a phenotype the mutation is _____mutation.

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16. Calculate proportion of polymorphic loci for a population of 25 frogs wherein 10 were polymorphic.
17. Give the full form of AGE.
18. Give an example of a restriction enzyme.
19. State true or false: Random mating is mating between genotypes occurring in proportion to the frequencies of the genotypes in the population.
20. _____ is a type of genetic drift in which population is initially established by a small number of breeding individuals.
(bottleneck effect, founder effect)

Q. 2 A In a pea plant, Purple flowers (P) are dominant over white flowers (p) and round seeds (R) are dominant over wrinkled seeds (r). Perform the following cross using Punnett square method to obtain the phenotype and genotype ratios of F1 and F2 generations. **08**
A pea plant homozygous dominant for both the colour of the flower and shape of the seed was crossed with a pea plant homozygous recessive for both the colour of the flower and shape of the seeds.

Q. 2 B Elaborate on Dominant epistasis. **07**

OR

Q. 2 C What are multiple alleles? Discuss briefly on the inheritance of ABO blood group in man. **08**

Q. 2 D Explain the phenomenon of modification of law of dominance with a suitable example. **07**

Q. 3 A Discuss significance of `F factor' and `sex pili' in bacteria. **08**

Q. 3 B Explain the process of `specialized transduction' with one example. **07**

OR

Q. 3 C Compare and contrast between `transduction' and `transformation'. **08**

Q. 3 D Illustrate the interrupted mating experiment for conjugation in bacteria **07**

Q. 4 A Discuss with example the theory of Natural Selection. **08**

Q. 4 B Discuss Speciation with suitable examples. **07**

OR

Q. 4 C Give full form of PAGE? How PAGE is used by geneticist in measuring genetic variations at the protein level in a population? **08**

Q. 4 D Elaborate on Hardy Weinberg law and its assumptions. **07**

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Q 5 Write Short notes on **any three** of the following **15**

a. Monohybrid cross.

b. Recessive epistasis.

c. Generalized transduction.

d. Lysogeny in bacteriophages.

e. Computation of Allelic frequencies.

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Q. P. Code:31320

2 ½ Hours

Total Marks: 75

1. Attempt **all** questions.
2. **All questions** carry **equal** marks.
3. Draw **neat labeled diagrams** wherever necessary.
4. Use of **log tables** and **non-programmable calculator** is **allowed**.
5. For **Q.2, Q.3 and Q.4** attempt A and B **OR** C and D.

Q.1 Do as directed (Any fifteen) **15**

1. _____ means integrating the national economy with the world economy. (Privatization, Liberalization, Globalization)
2. _____ is the process of selling government equity in PSUs to private parties. (Liberalization, Globalization, Disinvestment)
3. _____ is undertaken by large corporate firms either by buying the land or taking land on lease basis. (Contract farming, Corporate farming, Government farming)
4. The government of India has given autonomy to the Board of Directors of PSUs in _____. (selection, recruitment, decision making)
5. The UDHR consists of preamble and _____ articles highlighting human rights and freedoms entitled to everyone in the world. (20,10, 30)
6. Article 21(A) has made _____ education as a fundamental right. (higher, secondary, primary)
7. Human rights are those conditions of ____ life without which no man can seek in general to be himself at his best. (economic, social, personal)
8. The National Rights theory first germinated in _____ Theory of Ethics as the basis for politics. (Grotius, Locke, Hobbes)
9. Acid rain is one of the harmful effects of _____ pollution. (air, water, noise)
10. _____development focuses on improving the quality of human life without increasing the use of natural resources. (Environment, Sustainable, Human)
11. The _____ is the layer of gases surrounding our planet. (hydrosphere, biosphere, atmosphere)
12. The area near the surface of the earth can be divided into _____ interconnect geo-spheres. (three, four, five)
13. _____ is the situation in which two or more parties feel themselves in opposition. (Stress, Conflict, Frustration)
14. _____ provide moral principles and rules of good conduct to be followed by individuals in a society. (Behaviour, Ethics, Prejudice)
15. _____ implies a preconceived and unreasonable judgement or opinion, usually an unfavourable one, arising out of fear, hatred or suspicion. (Values, Behaviour, Prejudice)

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16. _____ refers to behaviour by individuals that intentionally threaten, attempt, or inflict physical harm on others. (Conflict, Violence, Aggression)
17. Maslow identified _____ set of needs. (three, four, five)
18. In the method of _____, the stress victim is under the medical guidance. (networking, biofeedback, social support)
19. _____ means forming close associations with trusted friends and co-workers. (Networking, Biofeedback, Social support)
20. _____ needs include appreciation and search for beauty, love for art and architect forms. (Cognitive, Aesthetic, Transcendence)

Q. 2 A Explain the term Liberalization in detail. **08**

Q. 2 B Explain the concept of human rights. Elaborate its origin and evolution. **07**

OR

Q. 2 C Describe in brief the concept of corporate farming. **08**

Q. 2 D Describe any 14 articles from Universal Declaration of Human Rights. **07**

Q. 3 A Explain the components of sustainable development. **08**

Q. 3 B Elaborate on poverty and environment. **07**

OR

Q. 3 C Describe the components of the environment. **08**

Q. 3 D Describe in detail structure and function of an ecosystem. **07**

Q. 4 A Critically evaluate Maslow's theory of self-actualisation. **08**

Q. 4 B Explain the Hierarchy of Needs Theory. **07**

OR

Q. 4 C Explain the meaning and causes of stress. **08**

Q. 4 D Explain the term Prejudice along with its positive and negative roles. **07**

Q 5 Write Short notes on **any three** of the following **15**

a. Effects of migration.

b. Right to freedom of Religion.

c. Behavioural Ecology.

d. Time management.

e. Physiological needs.

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Time: 2.30 Hours **Marks: 75**

1. **Attempt all questions.**
2. **All questions carry equal marks.**
3. **Draw neat labelled diagram wherever necessary.**
4. **Use of log table & non programmable calculator is allowed.**
5. **For Q.2,Q.3 & Q.4 attempt A&B OR C&D**

Q. 1 **Do as directed. (any fifteen)**

Define the following terms: 15M

1 System
2 Adiabatic wall
3 Exothermic reaction
4 Unimolecular reaction
5 Chemical kinetics
6 Redox reaction
7 Reduction

Fill in the blanks:

8 Enthalpy of the system is represented by the symbol --------.
9 If work is done by the system, W is ---------. (Positive/ Negative)
10 S.I. unit of internal energy is ----------.
11 In Second order reaction, the rate of the reaction is proportional to the product of ---------- concentration.
12 The minus sign indicating that concentration of the reactant ---------- with time.

Name the following :

13 A process in which volume of the system remains constant.

State True or False:

14 Decomposition of hydrogen peroxide is an example of first order reaction.
15 The half time require to complete reaction is same for first & second order reaction.
16 An element that loses an electron to another chemical species in a redox chemical reaction is known as reductant.

Balance the following reaction:

17 $Fe_3O_4 + C \rightarrow Fe + CO$

18 $S + HNO_3 \rightarrow SO_2 + NO_2 + H_2O$

Give one word for the following:

19 A chemical reaction in which reactant involves more than one phase.
20 A molecule that gain electrons.

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Q.2 A i)	Classify the thermodynamic systems based on the nature of the boundary.	4M
Q.2.A ii)	Calculate q, w and ΔE, when one mole of monoatomic gas expands adiabatically against constant external pressure of 1 atm. from volume of 2.0 dm^3 to 8.0 dm^3 at 300K.	4M
Q.2 B	Explain the term 'Entropy' and enlist its characteristics.	7M
	OR	
Q.2 C	Discuss the four steps of Carnot Cycle.	8M
Q.2 D	State the objective and limitations of thermodynamics	7M
Q.3 A	Derive integrated rate equation for first order reaction.	8M
Q.3 B	Discuss the kinetic characteristics of second order reaction.	7M
	OR	
Q.3 C	Show that for first order reaction time to complete first order reaction is independent of initial concentration.	8M
Q.3 D	A second order reaction with equal initial concentration is 66.67 % complete in 2 hours. Calculate specific reaction rate.	7M
Q.4 A	Justify oxidation and reduction reaction proceed side by side.	8M
Q.4 B	Write the balanced chemical equation of following reaction. $Cr_2O_7^{-2} + Fe^{+2}$ (aq.) $\longrightarrow$ Cr^{+3} (aq.) + Fe^{+3}(aq.)	7M
	OR	
Q.4 C	Explain the ion electron method of balancing equations.	8M
Q.4 D	What are addition reactions? Explain using suitable examples.	7M
Q.5	**Write short note on (any three)**	15M
a	Zeroth law of thermodynamics.	
b	Graphical method for determining order of reaction.	
c	Order of reaction.	
d	Oxidizing agents.	
e	Oxidation number of C in CO_2 and S in H_2S.	

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Time: 2:30 hours **Total Marks: 75**

(1) All questions are compulsory.

(2) All questions carry equal marks.

(3) Figures to the right indicate marks.

(4) Draw neat labelled diagrams / structures wherever necessary.

(5) Use of log table and non-programmable calculator is allowed.

Q.1. Do as directed: **(Any fifteen)** (15M)

Define the following terms-

i) Carbohydrate

ii) Saponification number

iii) Zwitter ion

iv) Pitch of the helix

Fill in the blanks-

v) Proteins are the polymers of --------.

vi) The three-letter symbol for Glycine is ----------.

vii) The phospho-protein found in milk is ----------.

Give examples of

viii) Amino acids with hydroxyl group.

ix) Storage proteins.

x) Keto Sugar

xi) Essential fatty acid

xii) Lipoprotein

Enlist one function of

xiii) hnRNA.

xiv) Glutathione

Draw structure of

xv) Triacylglycerol

xvi) D – Ribulose

xvii) Pyrimidine base.

State true or false

xviii) rRNA carries information from DNA for protein synthesis.

Name the following

xix) Sugar present in DNA.

xx) Type of bond present between base pair.

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Q.2. a) Explain the structure and function of cholesterol in detail. (08M)

b) Explain the structure and function of cellulose. (07M)

OR

Q.2. c) What are carbohydrates? Give its classification in detail. (08M)

d) Distinguish between unsaturated fatty acid and saturated fatty acid. (07M)

Q.3. a) Discuss classification of amino acids based on the structure. (08M)

b) Write a note on denaturation of proteins. (07M)

OR

Q3. c) Enlist the properties of proteins. (08M)

d) Write a note on β pleated sheet structure of proteins. (07M)

Q4. a) Diagrammatically explain Watson-Crick model of DNA. (08M)

b) Give detailed account of the components and functions of nucleotide. (07M)

OR

Q.4. c) Explain clover leaf structure of tRNA using a suitable diagram. (08M)

d) Compare and contrast the A and B form of DNA (07M)

Q5. Write a note on **any three** of the following. (15M)

a) Types of triacylglycerol.
b) Compare and contrast between maltose and lactose.
c) Peptides and their importance.
d) Ribosomal RNA.
e) Chargaff's rule.

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

1. All questions are compulsory.
2. Figures to right indicate marks.
3. Draw neat labeled diagrams/structures wherever necessary.

Q.1 Do as directed **(ANY 15)** (15)

1. Name one method for the isolation of single cell from plant organ in plant tissue culture.
2. _____is the cell characteristics in which the potential for forming all the cell types in an adult plant is retained.
3. Give one example of plant tissue culture medium.
4. Give the significance of antibiotic used in PTC medium.
5. Name the German scientist who developed the concept of *invitro* cell cultures of the plant tissue.
6. Define–Callus.
7. What does MLMH stands for in plant tissue culture medium?
8. Define:Feeding of cells.
9. Define: Passage in animal cell culture.
10. State true or false: Tumor cells give rise to continuous cell lines
11. State true or false: Cells from normal tissues show density dependency and contact inhibition at confluency.
12. Give one example of intracellular activity in animal cell.
13. Fill in the blank:

Tissue culture was first developed by _____.

14. Fill in the blank:

_____ tissue was first used as first source for cell culture.

15. Power point presentation is used for writing the research report.(State True or False)
16. Explain the term plagiarism.
17. Language is one of the physiological barrier of communication. (State true or false)
18. Enlist any two examples of verbal communication.
19. _____ is a type of communication that employs gestures and body language.
20. Communication is _____ way process.

Q.2 A) Explain in detail the organization and role of culture room and transfer area in plant tissue culture laboratory. (08)

Q.2 B) Discuss the importance of totipotency in plant science. (07)

OR

Q.2C)What are macronutrients? Discuss the role of macronutrients and any two plant growth hormone in plant tissue culture medium. (08)

Q.2 D) Discuss the protocol for callus culture of the carrot root in detail. (07)

Q.3 A) Define primary culture? Explain how to obtain a primary cell culture. (08)

Q.3 B) Give methods of sterilization of animal tissue culture media. (07)

OR

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Q.3 C) Write a note on any eight applications of animal tissue culture. (08)

Q.3 D) Draw a neat labeled diagram of carbon dioxide incubator and explain its use in animal cell culturing. (07)

Q.4 A) Explain the process of communication in brief. (08)

Q.4 B) Enlist the components of research paper and elaborate any two components. (07)

OR

Q.4 C) Read the following abstract and answer the following questions. (08)

Abstract: A wide range of medicinal and aromatic plants (MAPs) have been explored for their essential oils in the past few decades. Essential oils are complex volatile compounds, synthesized naturally in different plant parts during the process of secondary metabolism. The goals of the study were to determine and compare the phytochemical screening, antioxidant and antimicrobial activities of the essential oils of *Azadirachta indica* and *Vitex negundo*. The phytochemical screening of the twoplants showed presence of alkaloids, carbohydrates, glycosides, phenolic andtannin compounds, flavonoids, saponins, lipids and terpenoids. About the antioxidant potential, *Azadirachta indica* showed a higher ability to scavenge free radicals as compared to *Vitex negundo*, which was investigated by (DPPH) radical scavenging assay. Regarding the antimicrobial activity, *Vitex negundo* showed a better ability to inhibit the growth of pathogenic micro-organisms as compared to *Azadirachta indica*, which was investigated by the Agar diffusion method.

i.Suggest a suitable title to the research work.

ii.What is the goal of the study?

iii.Which among the two plant exhibited better antioxidant activity?

iv.Give four key words for the research work based on the abstract.

Q.4 D) Explain the important differentiating points of verbal and non-verbal communication. (07)

Q.5 Write short notes on**: (Any three)** (15)

1. Use of rotary shakers in PTC lab.
2. Importance of callus culture.
3. Inverted microscope.
4. Importance of effective communication.
5. Growth factors.

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Time: 2 ½ Hours **Marks: 75**

N.B.: 1) All questions are compulsory.
2) Figures to the right indicate full marks.
3) Draw neat labelled diagram wherever necessary.

Q. 1 **Do as directed: (any fifteen)** **15 M**

1) Define: Holoenzyme.
2) The class of enzymes involved in oxidation-reduction reactions are ---------.
3) The enzyme ------- the energy of activation.
   a. Increases b. Decreases
4) Define: Temperature coefficient.
5) Explain the term: Homotropic effect.
6) Give one example of Irreversible inhibitor.
7) Enzymes are --------.
   a. Proteins b. Carbohydrates
8) What is zymogen?
9) The lymphocyte that produces antibodies ----------.
   a. B cell b. T cell
10) The immunity in which the T lymphocytes participate is ---------.
   a. Humoral Immunity b. Cell Mediated Immunity
11) Lysozyme is present in ----------.
   a. Tears b. Sweat
12) A type of traditional vaccine ----------.
   a. Live attenuated vaccine b. Peptide vaccine
13) Any one secondary lymphoid organ.
   a. Bone marrow b. Lymph node
14) Anti Rh antibodies are --------.
   a. Complete antibodies b. Incomplete antibodies
15) ---------- is square of standard deviation.
16) Define – Range.
17) Give the term – Data.
18) What is meant by class width?
19) Define – Standard error.
20) The values of variable tend to concentrate around the central value and it is the central part of distribution, they are called as -------.

Q.2 A Describe classification of enzymes with example. **8M**
Q.2 B Give an account of the various factors affecting enzyme activity. **7M**

OR

Q.2 C Explain mechanism of enzyme action. **8M**
Q.2 D With example explain competitive inhibition. **7M**

Q.3 A Explain any two mechanisms of Innate Immunity. **8M**
Q.3 B Explain the structure of an antibody molecule with a neat labelled diagram. **7M**

OR

Q.3 C Explain with a diagram the structure of IgA. **8M**
Q.3 D Describe Hybridoma technology. **7M**

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Q.4 A Define – Biostatistics. Discuss the importance of biostatistics in biology. **8M**

Q.4 B Explain median and compute for the following data: **7M**

Income (Rs.)	100	150	80	200	250	180	Total
No. of Persons	24	26	16	20	6	30	122

OR

Q.4 C Explain representation of data using Pie charts, Histogram and Frequency Curve. **8M**

Q.4 D Calculate the mode of the following frequency distribution: **7M**

Height in inches	58	59	60	61	62	63	64	65	66	67	Total
No. of Persons	4	6	5	10	20	22	24	6	2	1	100

Q.5 Write short note: (Any three) **15M**

1 Feed-back inhibition.
2 Active site.
3 Any one modern vaccine.
4 Any one precipitation technique.
5 Merits, demerits and uses of standard deviation.

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