MWC(O)-BOT-II/23

2023

BOTANY

PAPER-II

Time Allowed — 3 Hours *Full Marks — 200*

If the questions attempted are in excess of the prescribed number, only the questions attempted first up to the prescribed number shall be valued and the remaining ones ignored.

*Answer may be given either in **English** or in **Bengali** or in **Nepali** but all answers must be in one and same language.*

Answer *any five* of the following. 40×5=200

1. Answer *any four* of the following:

(a) Answer briefly:
(i) Water potential
(ii) RNA silencing
(iii) ABC model of flower development 3+3+4=10

(b) Distinguish between:
(i) Homeotic gene and Gatekeeper gene
(ii) Co-enzymes and Isoenzymes
(iii) Translocation and Crossing over 3+4+3=10

(c) Describe in brief:
(i) Jasmonate hormone and Salicylic acid signaling
(ii) Capping and polyadenylation of eukaryotic mRNA
(iii) Regeneration of Ribulose diphosphate 3+4+3=10

(d) Justify the following:
(i) 12 : 3 : 1 ratio is a non-mendelian inheritance involving non-allelic interaction.
(ii) Biopolymers are produced by cells of living organisms.
(iii) Positive control of lac-operon is an additional regulatory mechanism. 4+3+3=10

(e) Explain with diagram:
(i) Pericentric inversion and paracentric inversion and meiotic metaphase configuration.
(ii) Pathway of biosynthesis of chlorophyll.
(iii) Role of MPF in cell cycle regulation. 4+2+4=10

2. Answer *any four* of the following: 10×4=40

(a) (i) Explain Northern blotting and Southern blotting.
(ii) Explain one gene — one polypeptide concept 6+4=10

(b) (i) Define point mutation. Explain the induced mutation by – 5-Bromouracil, Proflavin, UV rays.
(ii) Write a brief note on overlapping gene. 8+2=10

(c) (i) Name different DNA markers and use of DNA markers in improvement of plant quality.
(ii) Concept on tautomerisation and dimerisation. 7+3=10

(d) (i) Write notes on principles of enzyme action and enzyme kinetics.
(ii) Basic concept of nif and nod gene and role of them in biological nitrogen fixation. 4+6=10

(e) (i) Explain in brief causes of Heterosis and hybrid seed production.
(ii) Justify the statement that inversions suppress crossovers, coupling and repulsion hypothesis both are present in linkage phenomenon. 5+5=10

3. Answer *any four* of the following:

(a) (i) What is linkage group? Are pseudogenes occur as defective copies of functional genes?
(ii) Enzymes involved and their functions in prokaryotic DNA replication. 4+6=10

(b) (i) Briefly write a note on Fidelity of DNA replication.
(ii) Role of ethylene and abscisic acid in plant growth and development. 4+6=10

(c) (i) Write down the role of auxin on seed germination and dormancy.
(ii) Role of cytokinin and gibberellin acid (GA). 5+5=10

(d) (i) Explain the statement that eukaryotic DNA has multiple origin of DNA replication.
(ii) Write down the origin of okazaki fragments. What are leading strand and lagging strands of DNA during replication? 5+5=10

(e) Answer the following in brief:
(i) Are humans influencing the process of evolution?
(ii) The four factors at work in evolution.
(iii) How the genetic causes are involved in evolution? 2+4+4=10

4. Answer *any four* of the following:

(a) Describe in brief with figure:
(i) Oxidative phosphorylation and glucose phosphorylation. Does ATP phosphorylate glucose?
(ii) Nuclear envelope and nuclear pore complex. 5+5=10

(b) Write notes on:
(i) Agrobacterium mediated gene transfer.
(ii) Plant's response to stresses-biotic and abiotic. 5+5=10

(c) Write down about:
(i) Steps of Kreb's cycle with illustration.
(ii) Principles, steps and applications of PCR; What is RT-PCR? Role of RT-PCR in COVID-19 virus detection. 5+5=10

(d) Write down on:
(i) Illustrate molecular mechanism of crossing over -- Holliday model.
(ii) Water potential and properties of water chemistry in plant.
(iii) Michaelis constant. 5+3+2=10

(e) (i) Describe with evidence that the genetic code is degenerate and Wobble hypothesis.
(ii) Function of magnesium and its deficiency symptoms in plants. 5+5=10

5. Answer *any four* of the following:

(a) Write down about:
(i) The organoleptic and chemical evaluation of drugs.
(ii) The scientific name, family and constituents of ginger and sarpagandha. 5+5=10

(b) Distinguish between:
(i) Co-enzyme and Holoenzyme
(ii) Embolism and Cavitation.
(iii) Glycosides and Disaccharides. 3+4+3=10

(c) Write down on:
(i) Drug adulteration and alkaloids with examples (at least one)
(ii) Discuss the role of calcium – channel of plant in signal transduction
(iii) Difference between C_3 and C_4 plants 3+4+3=10

(d) Brief concept on:
(i) DNA repair through photoreactivation
(ii) Amphidiploidy and evolution of wheat 5+5=10

(e) Write down brief note on – with figure:
(i) Formation of metaphase chromosome on the basis of nucleosomes model
(ii) Steps of micropropagation in tissue culture 5+5=10

6. Answer *any four* of the following:

(a) (i) Hardy – Weinberg principle and factors affecting it.
(ii) In a population of 100 persons tested for their MN blood types, the genotypic data found were MM = 66, MN = 20 and NN = 14. Prove that the population was in Hardy Weinberg's equilibrium.
(iii) How do you calculate allele and genotype frequency using Hardy Weinberg? 4+3+3=10

(b) (i) Briefly explain allosteric inhibion of an enzyme and what happens through it. – Give an example.
(ii) Explain the three main stages of Calvin cycle. 4+6=10

(c) (i) Define dispersion, measures of dispersion.
(ii) Define with formula Standard Deviation.
Length of 55 seedlings of a species in cm were as follows:

Length of Plants	6-10	11-15	16-20	21-25	26-30
Number of Plants	5	10	11	9	20

Calculate standard deviation and standard error of frequency distribution.
(iii) What is the frequency of heterozygotes A_a in a randomly mating population in which the frequency of all dominant phenotypes is 0·19? 3+1+4+2=10

(d) Answer the following:

(i) What is the function of RecA protein? Why are the polyploids frequently sterile?

(ii) The following three recessive genes are found in plants:

pl-purple leaf, gl-glossy seedlings and t-dwarf variety. A trihybrid was test-crossed and the following proportions were obtained when a sample of 1000 plants were counted-wild type (+ + +) : 475, pl gl t (469); pl + + (8); + gl t (7); pl + t (18); + gl + (23), + + t (0); pl gl + (0). Determine the relative order and map distance. Is there any cross over interference? Justify your answer. 3+7=10

(e) (i) What is the difference between CAM idling and CAM cycling? Discuss the role of Calcium-Calmodulin in signal transduction.

(ii) Write short note on drug adulteration. 6+4=10

7. Answer *any four* of the following:

(a) (i) What are the products of light reaction of photosynthesis? How reduction of NADP is carried out?

(ii) Write note on photolysis and photorespiration. 2+3+5=10

(b) (i) Distinguish between light reaction and dark reaction.

(ii) Explain Richmond and Lang effect. 5+5=10

(c) (i) Explain production of Shikimic acid.

(ii) Role of Brassinosteroid in cell expansion and cell division in shoots of plants. 5+5=10

(d) (i) Explain protein sequencing.

(ii) What is miRNA and guide RNA? Role of guide RNA and CRISPR guide. 4+6=10

(e) (i) Explain the rules of probability.

(ii) Briefly explain – aminoacylation of tRNA, initiation of translation in prokaryotes with reference of roles of ribosomes and factors involved in it. 4+6=10