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BW-(O) BO-II/16

2016

Time Allowed : 3 Hours

BOTANY - PAPER-II

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.

Answers may be given in English or in Bengali or in Nepali but all answers must be in one and the same language.

Answer any five questions (40 x 5 = 200)

1. Answer any four of the following:

(a) Answer very briefly: 2x5

(i) What is "Open Reading Frame"?
(ii) What is "Facultative heterochromatin"?
(iii) What is "Day Neutral Plant"? Give one example.
(iv) What is "Lipid raft" in membrane system?
(v) What is "P-protein"?

(b) Explain the following in few words : 2x5

(i) Hypochromicity of DNA.
(ii) DNA is alkali stable but RNA is alkali labile.
(iii) What is the "linking number" in DNA structure.
(iv) Three dimensional structure of tRNA.
(vi) Structure and properties of water molecule.

(c) Write a brief note on: 5x2

(i) 'Motif' of structural and regulatory proteins.
(ii) 'Ramachandran plot' for allowable polypeptide conformation.

(d) (i) Discuss the similarities and differences between the *E.coli* RNA polymerase and Eukayotic RNA polymerases. 4+6

(ii) Rho dependent and Rho-independent signalling of termination of transcription.

(e) (i) "Hoogsteen pairing" is a non Watson-Crick pairing of DNA – explain. 4+6

(ii) The molecular weight of bacteriophage T4 is 1.3×10^8 (double stranded).
How many amino acids can be coded for by T4 DNA?
How many different proteins of MW 55,000 could be coded for by T4 DNA?
[MW of complementary pair of DNA = 617

P. T. O.

2. **Answer any four of the following:**

(a) Distinguish between : 5+5

i. Cellulose & Chitin

ii. Integral protein & carrier protein of cellular membranes

(b) Compare between : 5+5

i. α helix and β pleated sheet.

ii. A and P binding sites on the ribosomal-mRNA complex.

(c) i. What is photoinhibition? 1+3+6

ii. Enumerate the structure of RUBISCO?

iii. Draw the flow charts for chemical reactions of three enzymes-variants of C4 pathways for Carbon dioxide fixation.

(d) i. Present graphically the absorption spectra of Chlorophyll a & Chrlorophyll b 2+1+4+3

ii. What is pheophytin?

iii. Write down the regenerative steps with the name of the enzymes for the synthesis of 3-PGAld in Calvin cycle.

iv. Calculate the molecules of ATP generated by complete oxidation of palmitic acid by β oxidation.

(e) i. What is 'turn over number' of an enzyme? 1+3+1+5

ii. Illustrate Michaelis-Menten equation?

iii. What is Michaelis constant?

iv. The following data were recorded for the enzyme-catalysed reaction S to P.

[s] (M)	v (nmoles x litre $^{-1}$ x min $^{-1}$)
6.25×10^{-6}	15.0
7.50×10^{-5}	56.25
1.00×10^{-4}	60.0
1.00×10^{-3}	74.9
1.00×10^{-2}	75

a. Estimate V_{max} and K_m.

b. What would v be at [S] = 2.5×10^{-5} and at [S] = 5.0×10^{-5} M

Contd...P/3.

3. **Answer any four from the following :**

(a) Calculate :- 2.5 x 4

i. What is the pH of a lactic acid solution that contains 60% lactate form and 40% undissociated lactic acid form? [PKa of lactic acid = 3.85]

ii. A solution of purified DNA gave in the spectrophotometric assay A_{260} of 0.35 when measured in a 1-cm quartz cuvette. What is the approximate concentration of the DNA in µg/mL?

iii. You wish to centrifuge a biological sample so that it experiences an "Relative Centrifugal Force (RCF)" of 1,00,000 x g. At what rpm must you set the centrifuge assuming an average *'r'* value of 4?

iv. The absorbance, A of a 5×10^{-4} M solution of the amino acid trypsine, at a wave length of 280 nm, is 0.75. The path length of the cuvette is 1 cm. What is the molar absorption coefficient, *'e'*?

(b) 3+4+3

i. What is the principle of two-dimensional Gel electrophoresis?
ii. Explain (with diagram) the working module of confocal microscope?
iii. Differentiate between colorimetry and UV-vis spectrophotometry?

(c) 2+3+3+2

i. Differentiate between PCR and QPCR?
ii. What are basic ingredients of a reaction mixture for PCR reactions?
iii. What is the principle for elucidation of base sequences of nucleotides?
iv. What do you mean by "BLAST" in omics?

(d) 2+2+6

i. Determine the probability that a plant genotype CcWw will be produced from parental plants of the genotypes CcWw and Ccww.
ii. Distinguish between point mutation and frame shift mutation.
iii. Shade a light (in your own words) on "maintenance of germplasm" in our country for :
   1. aromatic basmati rice and
   2. medicinal plant of our country

(e) 2+2+4+2

i. Name two bioactive components of *Cinchona sp.*
ii. Write the different species names, family and order of the plant from which the active components are isolated.
iii. Draw and point out on a map of West Bengal (rough sketch needed) the location of *Cinchona* plantation and industry for extraction of mother liquor in West Bengal.
v. Draw a flow chart for extraction procedure of bioactive components.

4. **Answer any four from the following :**

(a) (i) Illustrate Hardy-Weinberg principle for explaining relationship between Gene frequency and Genotype frequency. 4+1+3+2
(ii) What is gene pool?
(iii) What do you mean 'inbreeding depression'?
(iv) What do you mean by disomy and nullisomy of chromosome set?

(b) (i) What do you mean by incomplete dominance and co-dominance. 2+1+5+2
(ii) What is Centimorgan (cM) ?
(iii) Illustrate the organization of an 'OPERON' for expression of a gene.
(iv) What is attenuator?

(c) (i) Write a brief note on different check points of cell cycle. 3+2+2+3
(ii) Draw and label metaphase II stage of meiosis in plant cell.
(iii) What is siRNA and miRNA?
(iv) Write a brief note on RNA editing.

(d) (i) Define median and mode? 2+3+2+3
(ii) The duration of time from first exposure to HIV infection to AIDS diagnosis is called the incubation period. The incubation periods of a random sample of 7 HIV infected individuals is given below (in years):

12.0; 10.5; 9.5; 6.3; 13.5; 12.5; 7.2.

a. Calculate the sample median.
b. If the number 6.3 above was changed to 1.5, what would happen to the sample median.

(iii) What do you mean by normal distribution of data.
(iv) What is 'Skewness and Kurtosis' of data distribution.

(e) Write down the following reaction steps of glycolysis :- 3+3+4
1. Which are coupled to ATP hydrolysis and
2. Which are coupled to substrate level phosphorylation.

Explain the Peter Mitchell's "Chemiosmotic hypothesis" for ATP synthesis.

Contd...P/5.

5. **Answer any four from the following :**

(a) (i) Write down the characteristic features of mt DNA.
(ii) Write a brief note different types of vectors used for cloning different length of desired DNA fragments.
(iii) What is heterosis? 3+6+1

(b) (i) Shade a light on dynamic nature of Genome and its implication in Evolution.
(ii) Explain the phenomenon of RNA interfence (RNAi) & its biological role. 6+4

(c) Explain in few words : 2+1+4+3
(i) Illustrate the notation : $18{:}2\ \Delta^{tr6\ cis9}$.
(ii) What do you mean by ω3 fatty acids?
(iii) Fatty acid synthesis by an enzyme complex.
(iv) Intermediates in fatty acids are attached to a carrier protein.

(d) (i) Name one free living organism for nitrogen fixation. 1+1+4+4
(ii) Name of non-free living organism for nitrogen fixation.
(iii) Nitrogenase is the key enzyme for reduction of nitrogen gas to ammonia- Explain.
(iv) Nitrate is also reduced to ammonia by two important enzymes-Explain.

(e) (i) What are the three chemically distinct groups of secondary metabolites in plant system. 2+7+1
(ii) Write a brief note on major pathways for the synthesis of these compounds.
(iii) What is ROS?

6. **Answer any four from the following :**

(a) (i) Describe briefly the ABA-dependent stress response in plants.
(ii) Describe the pressure flow model for mechanism of translocation in the phloem.
(iii) What is Circadian rhythm? 4+4+2

(b) (i) Cytoplasmic NADH enters into mitochondria by some shuttle mechanism- Explain.
(ii) What is critical day length?
(iii) Write a brief note on influence of Gibberellins on growth and development of plant. 4+2+4

(c) (i) What is the relationship between standard free energy change and the change in reduction potential ?
(ii) Define and explain the following :
a. Shine-Dalgarno sequence
b. Klenow fragments
c. End problem of replication of linear chromosomes . 4+6

(d) (i) What is epigenetic inheritance?
(ii) What is Gynogenesis?
(iii) Write a brief note on anther culture.
(iv) Briefly describe the generalized classification of selection procedures. 2+1+3+4

(e) (i) Maltose, a disaccharide, is a reducing sugar but sucrose is not.
(ii) Nature of peptide bond in protein structure.
(iii) Optical isomerism in sugar molecules.
(iv) Draw a flow chart of oxidative pentose phosphate pathway of plant system and mention the name of enzymes. 2+2+2+4

Contd...P/7.

7. **Answer any four from the following :**

(a) (i) Write a brief note on enzymes involved in eukaryotic DNA synthesis.
(ii) Role of phytochrome in ecological functions of plants. 5+5

(b) Describe briefly :
(i) Euploidy and Aneuploidy. 5+5
(ii) Biological role of peroxisomes.

(c) (i) What do you mean by somoclonal variation? 2+1+4+3
(ii) What is Axenic culture?
(iii) Describe briefly the signal transduction mechanism by G-protein –coupled receptor.
(iv) What is programmed cell death?

(d) (i) What is Wax? 2+2+2+2+2
(ii) What is cristae?
(iii) What is Prion?
(v) Name one non-polar and a polar-amino acids?
(vi) Define Hydrogen Bond.

(e) Compare between:- 3+3+4
(i) Spontaneous mutation and induced mutation
(ii) Proteome and Transcriptome
(iii) Pribnow box and Gold berg-Hogness box

For Guidance of WBCS (Exe.) Etc. Preliminary , Main Exam and Interview,
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