1. (a) Consider a set of 10 observations such that the sum of squares of all the observations is 100. The minimum of the set is 1 and the maximum is 40. When these two observations are removed, the mean of the new set remains the same. Examine what happens to the following measures:

    (i)   median

    (ii)   standard deviation

(b) Consider the following bivariate data on (X, Y)

X	0	-1	1	2	-2
Y	0	-1	-1	-4	-4

Calculate the correlation coefficient between X and Y. Comment on the nature of relationship between X and Y.

                                           [(3+6)+(6+3)]

2. Describe the photophosphorylation with diagrammatic sketch in which both PSI and PSII are involved. Why does FAD produce two molecules of ATP in electron transport chain in mitochondria? How and where is Acetyl CoA formed from pyruvic acid?

                                        [4+4+(3+1)]

3. What is organic farming? What is the need of organic farming? What are the key characteristics of organic farming?

                                        [2+5+5]

4. What causes global warming? What is climate change? Is it different than global warming? What is carbon footprint and how can you reduce your carbon footprint?

                                        [2+3+3+4]

5. Mention the class of genes involved in the development of floral organs and discuss their roles in such development.

                                           [12]

6. (a) Name a few enzymes (indicating their functions), other than DNA polymerase and ligase, that are involved in the replication of DNA with high degree of processivity and accuracy.

(b) What is meant by genetically modified crops? Brifely explain different strategies of gene therapy.

[3+(3+6)]

7. (a) Briefly describe how pathogens enter the host and establish an infection.

(b) What are xenobiotics? What do you mean by biodegradation of xenobiotics?

[6+6]

8. (a) Enhancers and classical promoters both act as positive regulators of gene expression. By what criteria can these two classes of regulatory sequences be distinguished?

(b) A specific gene is down-regulated in cancer cells compared to normal cells isolated from adjacent normal tissues. Describe at least three strategies to identify possible reasons for the down-regulation.

[6+6]

9. Distinguish between the following (any three):

   a) C3 and C4 plants
   b) interspecific and intraspecific interactions in plants
   c) respiration and photorespiration
   d) intracellular and extracellular enzymes
   e) Omega-6 fatty acids and Omega-3 fatty acids

[4+4+4]