1. Which one of the following combinations gives maximum energy in the metabolism of biomolecules?

   (A) Carbohydrates and Vitamins
   (B) Fats and Proteins
   (C) Vitamin and Proteins
   (D) Fats and Vitamins

2. If x, y and z are positive numbers such that x^2, y^2, z^2 are respectively the probability of success, the probability of failure and the square of the number of trials of a binomial distribution, the variance of the distribution is given by

   (A) $x^2 \times y^2 \times z^2$
   (B) $x \times y \times z^2$
   (C) $x^2 \times y^2 \times z$
   (D) $x \times y \times z$

3. The cell is said to be plasmolysed

   (A) when the outer environment is isotonic in nature.
   (B) when the outer environment is hypotonic in nature.
   (C) when the outer environment is hypertonic in nature.
   (D) when the outer environment is surrounded by water.

4. Which cell organelle is single membrane bound?

   (A) Ribosome
   (B) Mitochondria
   (C) Golgi bodies
   (D) Centrosome

5. Which nitrogenous bases of DNA contain double ring structure?

(A) Thymine and Cytosine

(B) Adenine and Guanine

(C) Adenine and Thymine

(D) Guanine and Cytosine

6. Phytoremediation process includes

(A) absorption of contaminant by plant roots.

(B) breakdown the contaminants by microbes.

(C) breakdown the contaminants by earthworm.

(D) None of the above.

7. Which of the following defines the 'type II error'?

(A) Acceptance of an incorrect null hypothesis

(B) Rejection of an incorrect null hypothesis

(C) Acceptance of a correct null hypothesis

(D) Rejection of a correct null hypothesis

8. When a mutant plant that does not produce carotenoid is grown under normal sunlight, then

(A) photosynthesis rate increases.

(B) photorespiration reduces.

(C) chlorophyll synthesis increases.

(D) chlorophyll oxidation and necrosis increases.

9. The diploid stage of a plant that exhibits an alternation of generation is known as

(A) antheridium.

(B) gametophyte.

(C) spore.

(D) sporophyte.

10. How many turns of Calvin cycle are needed for the formation of one molecule of hexose sugar?

(A) 6 (B) 1 (C) 36 (D) 1/6

11. DNA is usually dissolved in TRIS-EDTA buffer, EDTA is added to ensure that

(A) pH is kept neutral.

(B) divalent metal ions are chelated.

(C) monovalent metal ions are chelated.

(D) pH is kept alkaline.

12. Sodium dodecyl sulphate (SDS) is used while separating proteins by polyacrylamide gel electrophoresis because

(A) it helps in solubilisation of proteins.

(B) it binds to proteins and confers negative charge density.

(C) it decreases the surface tension of the buffer.

(D) it stabilizes the proteins.

13. A shortage of phosphorus in the soil would make it difficult for a plant to synthesise

(A) DNA. (B) amino acids. (C) glucose. (D) fatty acids.

14. Soil could be deficient in any of the following nutrients. If you have to supply one of them, which one of the following will be needed in the smallest amount?

(A) Iron (B) Phosphorus (C) Nitrogen (D) Potassium

15. The roots of many aquatic plants have special structures that project above the surface of the water. For example, cypress trees, that grow in swamps, have knees that extend upward above the water level. Which of the following is the most relevant function of these structures?

(A) Obtaining carbon dioxide for photosynthesis

(B) Nitrogen fixation

(C) Obtaining oxygen for the roots

(D) Transpiration

16. When the levels of juvenile hormone (JH) are maintained at artificially high levels, insects will

(A) be unable to moult.

(B) bypass some larval stages and pupate prematurely.

(C) moult more frequently.

(D) be unable to advance to the pupal stage.

17. A high BOD value in aquatic environment is indicative of

(A) a pollution free system.

(B) a highly polluted system due to excess of nutrients.

(C) a highly polluted system due to abundant heterotrophs.

(D) a highly pure water with abundance of autotrophs.

18. A researcher is trying to predict the population dynamics of an insect. He/she had the equations all worked out but then realized that he/she had grossly underestimated the amount of host plants available to the insect. To make the prediction more accurate, he/she will have to go back to the equations and

(A) decrease population size.

(B) increase population size.

(C) decrease carrying capacity.

(D) increase carrying capacity.

19. Milkweed plants produce bad-tasting and poisonous compounds that deter most plant eaters. But the caterpillars of Monarch butterflies are able to eat milkweed leaves without being harmed. In fact, the chemicals obtained from milkweed actually protect the Monarch from insect-eating birds. This is an example of

(A) coevolution.

(B) competitive exclusion.

(C) succession.

(D) mutualism.

20. Which of the following is an example of non-symbiotic N_2 fixer?

(A) *Escherichia*

(B) *Salmonella*

(C) *Azospirillum*

(D) *Rhizobium*

21. Two species of a bird live in a group of islands. Of the 33 islands, 14 have one species, six have the other, 13 have neither, and none has both. What might best explain this? The two species of birds could

(A) be on different trophic levels.

(B) have similar niches.

(C) have a mutualistic relationship.

(D) have different niches.

22. The microorganism responsible for the conversion of ammonium to nitrite N_2 in soil is

(A) *Derxia.*

(B) *Nitrobacter.*

(C) *Nitrosomonus.*

(D) *Azotobacter.*

23. The interlocking pattern of food chain is called

(A) ecology.

(B) food web.

(C) ecosystem.

(D) tritrophic interaction.

24. Wings modified into elytra in which insect order?

(A) Lepidoptra

(B) Hymenopter

(C) Coleoptera

(D) Diptera

25. The two sample t-test requires the assumptions:

(A) the observations are normally distributed in each group and the variance of each observation is the same.

(B) the observations need not be normally distributed in each group but the variance of each observation is the same.

(C) the observations are normally distributed in each group but the variance of each observation need not be the same.

(D) the observations need not be normally distributed in each group and the variance of each observation need not be the same.

26. Which of the following element plays an important role in nitrogen fixation?

(A) Manganese

(B) Molybdenum

(C) Zinc

(D) Copper

27. Which of the following enzymatic activities does not play a role in DNA mismatch repair?

(A) Helicase

(B) Single-stranded exonuclease

(C) DNA ligase

(D) Primase

28. Which of the following statement is true?

(A) The variance of two equal numbers is always less than the variance of two unequal negative numbers

(B) The variance of two equal numbers is always greater than the variance of two unequal negative numbers

(C) The variance of two equal numbers is always greater than the variance of two unequal positive numbers

(D) The variance of two equal negative numbers is always less than the variance of two equal positive numbers

29. Using whole genome DNA-sequencing, one can identify

(A) both common and rare variants.

(B) common but not rare variants.

(C) rare but not common variants.

(D) neither rare nor common variants.

30. If there is double bond between A & T and triple bond between G & C, then which sequence will be most stable at higher temperature

(A) ATTGTACCAAA

(B) AATTATATATA

(C) AGCAGAGAGTT

(D) AGGCCGGCCCTA