1. Suppose a man walks along the four sides of a square ground with speeds v_1, v_2, v_3, and v_4 km/hr, respectively. Then his average speed can be measured

   (A) either by arithmetic mean or harmonic mean.
   (B) either by arithmetic mean or geometric mean.
   (C) only by harmonic mean.
   (D) only by geometric mean.

2. Let the regression equation of y on x is $y + x = 3$. The regression equation of x on y is either $2y + x = 0$ or $y + x = 0$. Then consider the following statements:

   (i) x and y have a perfectly linear relationship for the pair of regression equations $y + x = 3$ and $2y + x = 0$.
   (ii) The regression equations $y + x = 3$ and $y + x = 0$ are parallel.
   (iii) The correlation coefficient between x and y is -1, if we consider the two regression equations $y + x = 3$ and $y + x = 0$.

   Choose the correct alternative.

   (A) Only (i) is correct.
   (B) Both (ii) and (iii) are correct.
   (C) Only (ii) is correct.
   (D) None of the statements (i), (ii) and (iii) is correct.

3. In a $k \times k$ Latin square design, the error degrees of freedom in ANOVA is

   (A) $k^2 - 2$.
   (B) $k^2 - k - 2$.
   (C) $(k-1)(k-2)$.
   (D) $k(k-1)(k-2)$.

4. Which of the following assumptions is used in constructing ANOVA?

   (A) The Only requirement is samples must be independent.
   (B) Sample are not necessarily independent, but the population variations must be unequal.
   (C) Sample are not necessarily independent, but the population variations must be equal.
   (D) Sample must be independent, population variations must be equal, and the population must be normally distributed.

5. Bacteria are more sensitive to antibiotics at which phase of growth?

   (A) Lag phase.
   (B) Exponential phase.
   (C) Stationary phase.
   (D) None of the above.

6. Breaking of phosphodiester bond is done by

   (A) Endonuclease.
   (B) Hydrolase.
   (C) Exonuclease.
   (D) Hexokinase.

7. Biodiesel is produced from fats/oil through a process known as

   (A) Esterification.
   (B) Hydrolysis.
   (C) Transesterification.
   (D) Condensation.

8. Bacteria uses the complex molecules degraded by fungi in the soil is known as

   (A) Neutralism.
   (B) Mutualism.
   (C) Commensalism.
   (D) Antagonism.

9. Selecting the appropriate media for an experiment is crucial for obtaining reliable results. The following plausible pre-requisites may be considered when choosing a media:

   (a) Compatibility with organisms or cells.
   (b) Sterility.
   (c) PH and buffering capacity.
   (d) Osmolarity.

   Choose the correct alternative.

   (A) Only (a) is correct.
   (B) Both (a) and (b) are correct.
   (C) Both (a) and (c) are correct.
   (D) All are correct.

10. Consider the following statements for identifying the major contributor(s) for global warming.

    (a) Only Methane emission.
    (b) Only Carbon dioxide emission.
    (c) Only Water vapor emission.
    (d) Combined effect of the above three.

    Now, choose the correct alternative.

(A) Only (a) is correct.

(B) Both (a) and (b) are correct.

(C) Both (a) and (c) are correct.

(D) All are correct.

11. In leguminous plants, both the rhizobium genes and the plant genes influence nodulation and nitrogen fixation. Which one of the following functions is not encoded by the host plant genes?

(A) Production of inducers that modify rhizobial cell wall.

(B) Production of flavonoid inducers.

(C) Establishment of contact between bacteria and legume.

(D) Root hair curling.

12. Which of the following techniques relies on the spin angular momentum of a photon?

(A) CD spectroscopy.

(B) Fluorescence spectroscopy.

(C) IR spectroscopy.

(D) Raman spectroscopy.

13. Indicate which one of the following statements about nucleic acids and protein structures is correct?

(A) Hydrogen bonding between the bases in the major and minor grooves of DNA are absent.

(B) Both uracil and thymine have a methyl group but at different positions.

(C) The backbone dihedral angles of a-helices and B-sheets are very similar. Only the hydrogen bonding p is different.

(D) A-turn is formed by four amino acids. The type of B-turn is determined by the dihedral angles of the **s** and third amino acid.

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14. Which of the following are stress hormones?

    (A) Ethylene and IAA.
    (B) IAA and ethylene.
    (C) ABA and ethylene.
    (D) ABA and IBA.

15. When bacteria growing at 20℃ are warmed at 37℃, they are most likely to synthesize membrane lipids with more

    (A) short-chain saturated fatty acids.
    (B) short-chain unsaturated fatty acids.
    (C) long chain saturated fatty acids.
    (D) long chain unsaturated fatty acids.

16. Disaccharide molecules that contain beta (1-4) glycosidic linkage are

    (A) sucrose and maltose.
    (B) sucrose and isomaltose.
    (C) maltose and isomaltose.
    (D) lactose and cellobiose.

17. Oxidoreductase class of enzymes does not include which of the following?

    (A) Aldolase.
    (B) Dehydrogenase.
    (C) Oxidase.
    (D) Peroxidase.

18. Consider Column A and Column B as stated below. Column A consists of four entities, P, Q, R, S, and Column B consists of four entities 1, 2, 3, 4.

Column A	Column B
P. SARNAS	1. turn off gene expression by directing the degradation of selective mRNAs.
Q. SiRNAS	2. regulate gene expression by blocking the translation of selective mRNAs.
R. miRNAS	3. function in a variety of processes, including splicing of pre-mRNA.
S. SnoRNAS	4. used to process and chemically modify rRNAs.

Choose the correct combination.

(A) P-4, Q-2, R-1, S-3
(B) P-3, Q-1, R-2, S-4
(C) P-4, Q-1, R-2, S-3
(D) P-3, Q-2, R-1, S-4

19. Identify the correct match between the animal (flatworm, earthworm, roundworm) and (acoelomate, coelomate, pseudo-coelomate):

(A) Roundworm - pseudocoelomate; Earthworm - acoelomate; Flatworm - coelomate

(B) Roundworm - acoelomate; Earthworm - coelomate; Flatworm - acoelomate

(C) Roundworm - pseudocoelomate; Earthworm - coelomate; Flatworm - acoelomate

(D) Roundworm - coelomate; Earthworm - pseudocoelomate; Flatworm – acoelomate

20. Which of the following statements is incorrect about Keystone species?

   (A) Species other than consumers can be a keystone species.
   (B) Keystone species has an influence on a community proportionate to its abundance.
   (C) Removing a keystone species can reduce the species richness of a community.
   (D) Removing a keystone species can affect successive trophic levels, causing a trophic.

21. These bacteria generally respire aerobically but switch over to anaerobic mode of respiration if oxygen becomes deficient.

   (A) Obligate Aerobes.
   (B) Obligate Anaerobes.
   (C) Facultative Aerobes.
   (D) Facultative Anaerobes.

22. Name the phase in cell division wherein the paternal and maternal chromosomes exchange their genetic material with each other.

   (A) Zygotene.
   (B) Leptotene.
   (C) Pachytene.
   (D) Diakinesis.

23. Which reagent is used as a mordant in gram staining?

   (A) Crystal violet.
   (B) Saffranine.
   (C) Iodine solution.
   (D) Ethanol.

24. Which of the following is not an irreversible reaction of glycolysis?

 (A) Glucose to glucose-6-phosphate.
 (B) Fructose-6-phosphate to fructose-1, 6-diphosphate.
 (C) 3-phospho-glyceraldehyde to 1, 3-diphosphoglyceric acid.
 (D) 2-phospho-enol-pyruvate to pyruvic acid.

25. Below are some of the proposed roles of reactive oxygen species (ROS) in plant defense.

 I. H_2O_2 may be directly toxic to pathogens.
 II. In the presence of iron, H_2O_2 gives rise to an extremely reactive hydroxyl radical.
 III. H_2O_2 leads to induce biosynthesis of salicylic acid. (SA)
 IV. H_2O_2 production is always delayed during incompatible reactions.

 Which of the following options represents the combination of all correct statements?

 (A) I, II and III
 (B) II, III and IV
 (C) I, III and IV
 (D) I, II and IV

26. Molality is defined as

 (A) Number of moles of solute present per liter of solution.
 (B) Number of moles of solute present per kilogram of solvent.
 (C) Number of gram formula mass of solute dissolved per liter of solution.
 (D) None of the above.

27. Which one of the following amino acid residues will destabilize an alpha-helix when inserted in the middle of the helix?

    (A) Pro.
    (B) Val.
    (C) Ile.
    (D) Leu.

28. Name the cell organelle to which the term sedimentation coefficient is associated.

    (A) Mitochondria.
    (B) Endoplasmic reticulum.
    (C) Ribosome.
    (D) Lysosome.

29. Which plasmid can be inserted into the chromosomal DNA?

    (A) F plasmid.
    (B) R plasmid.
    (C) V plasmid.
    (D) D plasmid.

30. Ideal condition of agricultural field experiment–

    (A) Homogeneous in both directions.
    (B) Heterogenous in one direction.
    (C) Heterogenous in both directions.
    (D) Homogeneity or heterogeneity is not at all considered.