

**ENTRANCE EXAMINATION – 2017**  
**Ph.D. Plant Sciences**  
**(Subject Code: P-66)**

Time: 2 hours

Maximum Marks: 80

**HALL TICKET NO.**

**INSTRUCTIONS**

**Please read carefully before answering the questions:**

1. Enter your Hall Ticket number both on the top of this page and on the OMR answer sheet.
2. Answers are to be marked only on the **OMR answer sheet** following the instructions provided there upon.
3. Hand over the OMR answer sheet to the Invigilator before leaving the examination hall.
4. The question paper contains **80** questions. **Part-A:** Question Nos. **1-40** and **Part-B:** Questions Nos. **41-80** of multiple-choice printed in **19** pages, including this page. **One OMR answer sheet** is provided separately. **Please check.**
5. The marks obtained in **Part-A** will be used for resolving the tie cases.
6. Each question carries one mark.
7. Calculators and mobile phones are NOT allowed.

**PART - A**

1. The chemical that is used extensively in RNA preparations as a RNase inhibitor is
  - A. Diethyl pyrocarbamate
  - B. Phenyl methyl sulphonyl fluoride
  - C. Dieca
  - D. Guanidine isothio cyanide
  
2. If  $P = x\%$  of  $y$  and  $Q = y\%$  of  $x$ , than which of the following is **true**?
  - A. P is greater than Q
  - B. P is less than Q
  - C. P is equal to Q
  - D. Relationship between P and Q cannot be determined
  
3. A study is carried to identify polymorphic DNA markers among a set of pure lines using polymerase chain reaction (PCR). The DNA regions amplified were of same length in all the pure lines tested suggesting they were monomorphic markers. However, these DNA bands when restricted with restriction enzymes, showed polymorphism in band length. Which one of the following marker type could be developed to analyze the detected polymorphism among the pure lines?
  - A. Random amplified polymorphic DNA (RAPD) marker
  - B. Cleaved Amplified polymorphic sequence DNA (CAPS) marker
  - C. Sequence characterized amplified region (SCAR) marker
  - D. Single nucleotide polymorphic (SNP) marker
  
4. In two dimensional gel electrophoresis, a series of protein bands are separated in the first step by isoelectric focusing in a strip. However, in the second step, the same strip is turned 90 degree and placed on another gel containing SDS and electric current is applied and in this step
  - A. the individual bands become stained so that the isoelectric focus pattern can be visualized
  - B. the individual bands become visualized by interacting with protein-specific antibodies in the second gel
  - C. the proteins in the bands separate more completely because the second electric current is in the opposite polarity to the first one
  - D. the proteins with similar isoelectric points become further separated according to their molecular weights

5. A cross is made between two linked genes in yeast viz., *arg3 ura2* X *ARG3 URA2* and the resulting diploid (*arg3 ura2/ARG3 URA2*) was allowed to undergo meiosis and the products were analyzed. The meiotic product that represents non-parental ditype is
- A. *arg3 ura2*; *arg3 ura2*; *ARG3 URA2*; *ARG3 URA2*
  - B. *arg3 ura2*; *arg3 URA2*; *ARG3 ura2*; *ARG3 URA2*
  - C. *arg3 URA2*; *arg3 URA2*; *ARG3 ura2*; *ARG3 ura2*
  - D. *ARG3 URA2*; *ARG3 URA2*; *ARG3 URA2*; *ARG3 URA2*
6. This is a type of bioinformatics tool for biological sequence comparison. The same term is also a name of rice disease caused by a fungus. What is this term?
- A. String
  - B. Clustal
  - C. Blast
  - D. Blocks
7. Identify the mismatch
- A. Porins – Outer membrane of Gram-negative bacteria
  - B. Capsules – Indian ink
  - C. Teichoic acid – Cell walls of Gram-positive bacteria
  - D. Mesosomes – Storage inclusions
8. Plate count of bacteria in foods generally use the plating medium consisting of
- A. Peptone, yeast extract, glucose, sodium chloride, agar and distilled water
  - B. Yeast extract, glucose, sodium chloride, agar and distilled water
  - C. Peptone, yeast extract, glucose, sodium chloride and distilled water
  - D. Peptone, glucose, sodium chloride, agar and distilled water
9. In a sampling site, 20% of plants are below 8 feet height. The number of plants above 8 feet of height is  $\frac{2}{3}$  of the number of 8 feet height which is 48. What are the total number of plants sampled?
- A. 72
  - B. 80
  - C. 100
  - D. 120

10. Molecular chaperones are class of proteins that facilitate
- A. Protein folding of newly synthesized proteins
  - B. Unfolding of newly synthesized proteins
  - C. Degradation of newly synthesized proteins
  - D. Targeting of newly synthesized proteins
11. An experiment to resolve large segments of restricted DNA molecule of an entire genomic DNA of an organism is planned using gel electrophoresis method of separation using two but alternate electric fields to obtain a highly reproducible restriction profile of the nucleic acid molecule in a single gel. Choose one of the following electrophoresis techniques which would allow the above conditions
- A. Pulse field gel electrophoresis
  - B. Capillary electrophoresis
  - C. Polyacrylamide gel electrophoresis
  - D. DNA sequencing gel electrophoresis
12. A breeder is interested to map a recessive gene and needs to obtain large number of recessive homozygotes for gene mapping studies. Which of the mapping populations would be appropriate to generate plants homozygous for the recessive trait?
- A. Recombinant inbred line
  - B. Near-isogenic line
  - C. Open pollinated plants
  - D. Doubled haploid plants
13. One of the research scholar was working on molecular plant-pathogen interactions on a crop plant. One day, he isolated genomic DNA from both plants infecting bacteria and crop plant species. He wanted to check the quality of isolated genomic DNA using agarose gel electrophoresis. When he was preparing agarose gel, he realized that Ethidium bromide (ETBr) is finished in his lab, although his lab was fully equipped with all necessary chemicals and kits for molecular biology and genomics related experiments. At this junction what option you will suggest to use as a substitute for ETBr?
- A. Malachite green
  - B. SYBR green
  - C. Indocyanine green
  - D. Bromophenol blue

14. One of the research scholars was conducting PCR experiment in the lab. As per his requirements and availability of stock solution he planned his experiment. He had the following stock solutions in his lab. Genomic DNA = 100  $\mu\text{g}/\text{mL}$ , Forward primer = 500 pmol, Reverse primer = 500 pmol, PCR-buffer = 10X,  $\text{MgCl}_2$  = 25 mM, dNTPs = 10 mM, Taq Polymerase = 5 U/ $\mu\text{L}$ . He has prepared the reaction mixture as follows:

Genomic DNA = 10  $\mu\text{L}$   
 F Primer = 5  $\mu\text{L}$   
 R Primer = 5  $\mu\text{L}$   
 10X Buffer = 5  $\mu\text{L}$   
 $\text{MgCl}_2$  = 5  $\mu\text{L}$   
 dNTPs = 1  $\mu\text{L}$   
 Taq Polymerase = 0.4  $\mu\text{L}$   
 Sterile Milli Q water = 18.6  $\mu\text{L}$

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Total Volume = 50  $\mu\text{L}$

What was the final concentration of each components in the PCR-reaction mixture?

- A. DNA = 1000  $\mu\text{g}$ , Each Primer = 50 pmol, Buffer = 1X,  $\text{MgCl}_2$  = 2.5 mM, dNTPs = 200 nM, Taq Polymerase = 2U  
 B. DNA = 1  $\mu\text{g}$ , Each Primer = 50 pmol, Buffer = 1X,  $\text{MgCl}_2$  = 2.5 mM, dNTPs = 200 nM, Taq Polymerase = 2U  
 C. DNA = 1  $\mu\text{g}$ , Each Primer = 50 pmol, Buffer = 1X,  $\text{MgCl}_2$  = 2.5 mM, dNTPs = 200  $\mu\text{M}$ , Taq Polymerase = 2U  
 D. DNA = 100  $\mu\text{g}$ , Each Primer = 50  $\mu\text{mol}$ , Buffer = 1X,  $\text{MgCl}_2$  = 2.5 mM, dNTPs = 200  $\mu\text{M}$ , Taq Polymerase = 2U
15. The type of association that is found in between entomophilous flower and pollinating agent is
- A. Cooperation  
 B. Mutualism  
 C. Commensalism  
 D. Coevolution
16. Which of the following compounds can be used as a negative selection agent for selecting auxin auxotrophs in cultured plant cells?
- A. Sodium nitrate  
 B. Sodium chloride  
 C. Sodium arsenate  
 D. Sodium sulphate

17. NotI is a type of restriction enzyme. It is a/an
- A. Hexa-cutter restriction endonuclease
  - B. Penta-cutter restriction endonuclease
  - C. Tetra-cutter restriction endonuclease
  - D. Octa-cutter restriction endonuclease
18. Colchicine, extracted from *Colchicum autumnale* induces polyploidization by inhibiting
- A. Microtubule depolymerization
  - B. Microtubule polymerization
  - C. DNA replication
  - D. DNA translation
19. The agronomically important traits such as crop yield, height of the plant and grain weight are controlled by many genes referred as 'polygenes', with each gene contributing varying effects to the total variance of the traits. Which genotyping technique is applied in identifying and analyzing these traits for crop improvement through marker assisted selection (MAS)?
- A. Inheritance breeding
  - B. Quantitative trait loci
  - C. Resistance breeding
  - D. Qualitative inheritance
20. Holozoic nutrition observed in most of the pathogens are characterized by
- A. Phagocytosis of solid nutrients and subsequent formation of phagocytic vacuoles
  - B. Pinocytosis of solid nutrients and subsequent formation of phagocytic vacuoles
  - C. Phagocytosis of soluble nutrients and subsequent formation of phagocytic vacuoles
  - D. Photosynthesize the solid nutrients and translocate to various parts of the body
21. All of the following cryoprotectants are membrane permeating that can freely diffuse the membrane except
- A. Glycerol
  - B. Ethylene glycol
  - C. Sucrose
  - D. Dimethyl sulfoxide

22. In chain terminating DNA sequencing reaction how different nucleotides A, T, G, C are labelled
- A. Different fluorescent dyes are used to label different deoxynucleotides
  - B. Different fluorescent dyes are used to label different dideoxynucleotides
  - C. Different fluorescent dyes are used to label the primers
  - D. After completion of sequencing reaction, the sequencing products are stained with specific protein labelled with different dyes
23. A student is asked to identify proteins that do not need a localization signal for its functioning. Which among the following proteins would be the ideal protein that does not need localization signal?
- A. A cytosolic protein
  - B. A cell surface protein
  - C. A protein bound to the endoplasmic reticulum (ER) membrane
  - D. A nuclear protein
24. The proportion of genotypes that would be aaBb in the progeny produced after selfing a plant that is dihybrid A/a: B/b is (assume independent assortment of the genes)
- A.  $1/2$
  - B.  $1/4$
  - C.  $1/8$
  - D.  $1/16$
25. Which of the following is arranged in the ascending order of Linnaean hierarchy?
- A. Species – Genus – Family – Phylum – Order – Class - Kingdom
  - B. Species – Genus – Family – Order – Class – Phylum - Kingdom
  - C. Kingdom – Phylum – Order – Class – Family – Genus - Species
  - D. Kingdom – Phylum – Class – Order – Family – Genus - Species
26. If the genome of a newly isolated virus displays the base composition as A = 27%, G = 30%, T = 21%, C = 22%, the virus most likely consists of
- A. Single-stranded DNA
  - B. Double-stranded DNA
  - C. Single-stranded RNA
  - D. Double-stranded RNA

27. In one of the very popular molecular biology/genomics experiments some components are mixed and incubated as per the standard protocol. In the whole process, the quantification of final product formed is detected by several different types of detection chemistry such as using DNA binding dyes or using hybridization probe or using hydrolysis probe or using molecular beacons. What is the name of this experiment?
- A. PCR
  - B. Real-time PCR
  - C. AP-PCR
  - D. Northern hybridization
28. Contig, Minimum tiling path, shotgun, Coverage, assembly, annotation: these terms are best defined during
- A. Gene cloning and transformation studies
  - B. Microarray analysis of a gene family
  - C. Whole genome sequencing project
  - D. Comparative genomics and metabolomics analysis
29. An integral membrane protein will commonly be solubilized by extraction with
- A. a buffer of alkaline or acid pH
  - B. a solution of high ionic strength
  - C. a solution containing detergent
  - D. a chelating agent that removes divalent cations
30. The enzyme that is used to add mononucleotide triphosphates to the 3'OH group of a DNA fragment is
- A. Polynucleotide kinase
  - B. Terminal nucleotidyl transferase
  - C. Terminal phosphoryl transferase
  - D. DNA ligases
31. Unique coenzymes like coenzyme M and coenzyme F420 are present in
- A. Methanogenic bacteria
  - B. Acetogenic bacteria
  - C. Methanotrophic bacteria
  - D. Sulfate-reducing bacteria



32. Flagella are whip-like structures protruding from the bacterial cell wall and are responsible for bacterial motility. The arrangement of flagella on the bacterial cell is unique to the species observed. Find out the right order from the cartoon (From A to D)



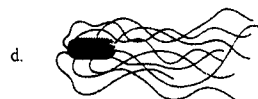
A. Monotrichous, Lopotrichous, Amphitrichous, Peritrichous



B. Monotrichous, Lopotrichous, Peritrichous, Amphitrichous



C. Monotrichous, Lopotrichus, Amphitrichous, Peritrichous



D. Monotrichous, Amphitrichous, Peritrichous, Lopotrichous

33. What could be expected outcome when two genes being studied for their phenotypic characters are demonstrated as a physical co-localization of genetic loci on the same chromosome?

- A. The percentage of crossing over between them would be very high
- B. The chiasmata formation would be increased
- C. No crossing over can ever take place between the loci
- D. Only double crossovers can take place between them

34. Which of the statements is **incorrect** with regard to pioneering experiments conducted by Gottlieb Haberlandt in plant tissue culture?

- A. He cultured fully differentiated palisade cells from leaves
- B. He used Knop's salt solution enriched with glucose for culturing cells
- C. He observed cell divisions in cultured cells without any expression of totipotency
- D. In the cultures initiated by him, the cells increased in size but failed to divide

35. Gregor Johann Mendel, the Father of Genetics was the first person to understand the principles of heredity. The success of Mendel's experiments can be ascribed to all of the following **except**

- A. He selected varieties that had clearly different forms of characters
- B. He selected seven characters which were inherited quantitatively
- C. He has used pure lines as parents in the crosses and kept careful numerical records of results
- D. He used mathematical approach in interpretation of the data

36. Which of the following type of interactions **is not** a part of tertiary structure?
- A. Hydrophobic interactions
  - B. Peptide bonds
  - C. Salt bridges
  - D. Hydrophilic interactions
37. Assimilatory sulphate reduction involves the nucleotide \_\_\_\_\_ during the incorporation of  $H_2S$  in the production of \_\_\_\_\_
- A. ATP, Cytosine
  - B. ATP, Methionine
  - C. UTP, Cytosine
  - D. GTP, Cytosine
38. Which of the following is important in carbohydrate and fat metabolism in plants?
- A. Citric acid
  - B. Pyruvate
  - C. Acetyl-CoA
  - D. 3-Phosphoglycerate
39. Which of the following statements is **correct** about 'Keystone species'?
- A. Keystone species are the small-sized plants and organisms which have large effect on the environment
  - B. Keystone species play critical role in maintaining the structure of an ecological community
  - C. Keystone species do not generally affect other organisms
  - D. Keystone species are very sensitive to environmental changes in their ecosystems
40. Which among the following **is not** an electron donor for anoxygenic photosynthesis?
- A.  $H_2$
  - B.  $H_2S$
  - C.  $S_2O_3^{2-}$
  - D.  $H_2O$

## PART - B

41. Metagenomics refers to
- A. The genomics of a community of organisms
  - B. Methylation patterns of the organism
  - C. Comparing genomes of several members of the same species
  - D. The development and application of global experimental approaches to assess gene function.
42. Which of the following acts as an influx carrier for auxin?
- A. PIN1
  - B. ABCB protein
  - C. AUX1
  - D. TIR1
43. In glycoproteins, the carbohydrate moiety is always attached through the amino acid residues
- A. tryptophan, aspartate, or cysteine
  - B. asparagine, serine, or threonine
  - C. glycine, alanine or aspartate
  - D. aspartate or glutamate
44. Which of the following processes can generate recombinant gametes?
- A. Crossing over between two linked homozygous loci
  - B. Independent assortment of two unlinked heterozygous loci
  - C. Segregation of alleles in a heterozygote
  - D. Independent assortment of two unlinked homozygous loci
45. Which of the following is **not correct** about suppressor mutations?
- A. It suppresses the effect of another mutation
  - B. It occurs at a site that is distinct from the site of original mutation
  - C. An individual with a suppressor mutation is a double mutant exhibiting wild type phenotype
  - D. It occurs at the same site as that of the original mutation thus restoring the wild type phenotype

46. Basic difference(s) between a Bacteria, Virus, Viroid and Prion in the right order are
- A. A peptidoglycan located immediately outside of the cytoplasmic membrane, Particle is made up of many copies of the same protein called coat protein, Naked nucleic acid molecule, misfolded protein molecule
  - B. Particle is made up of many copies of the same protein called coat protein, A peptidoglycan located immediately outside of the cytoplasmic membrane, misfolded protein molecule, naked nucleic acid molecule
  - C. Naked nucleic acid molecule, misfolded protein molecule, A peptidoglycan located immediately outside of the cytoplasmic membrane, particle is made up of many copies of the same protein called coat protein
  - D. A peptidoglycan located immediately outside of the cytoplasmic membrane, Naked nucleic acid molecule, particle is made up of many copies of the same protein called coat protein, misfolded protein molecule
47. Which of the following statements about the amino acid cystine is correct?
- A. Cystine forms when the  $-\text{CH}_2\text{-SH}$  R group is oxidized to form a  $\text{CH}_2\text{-CH}_2$  disulphide bridge between two cysteines
  - B. Cystine is an example of non-standard amino acid, derived by linking two standard amino acids
  - C. Cystine is formed by the oxidation of the carboxylic acid group on cystine
  - D. Two cystines are released when a  $\text{CH}_2\text{-S-S-CH}_2$ -disulphide bridge is reduced to  $-\text{CH}_2\text{-SH}$
48. Two or more diverged populations that are substantially, but not completely, reproductively isolated are
- A. Paraphyletic
  - B. Monophyletic
  - C. Incipient species
  - D. Phylogenetic
49. A taxon containing the descendants of a common ancestor that retain shared primitive characters, but omitting descendants that have lost those characters is
- A. Paraphyletic
  - B. Ecotype
  - C. Allopatric
  - D. Phylogenetics

50. Match the *Escherichia coli* proteins associated with DNA replication given in Panel A with their roles during semiconservative replication given in Panel B and choose the right answer

**Panel A**

- a. Dna B helicase
- b. Dna G primase
- c. DNA ligase
- d. Polymerase I

**Panel B**

- i. Joins the okazaki fragments on the nascent lagging strand following synthesis
- ii. Separates and unwinds the two strands of DNA as replication progresses
- iii. Repeatedly synthesizes a short RNA primer that allows the lagging strand polymerase to reinitiate on the lagging strand template
- iv. Removes the RNA primer on each okazaki fragment and resynthesizes it with DNA on two lagging strands

- A. a (ii), b (iii), c (i), d (iv)
- B. a (ii), b (iv), c (i), d (iii)
- C. a (ii), b (iii), c (iv), d (i)
- D. a (ii), b (iv), c (iii), d (i)

51. Casparian strips in the root endodermal cells are rich in

- A. Lignin
- B. Suberin
- C. Cellulose
- D. Chitin

52. Match the following related to Lichens

- |                |                    |
|----------------|--------------------|
| a. Saxicolous  | i. Wood lovers     |
| b. Corticolous | ii. Soil lovers    |
| c. Terricolous | iii. Rock dwellers |
| d. Lignicolous | iv. Bark lovers    |

The correct match is

- A. a (ii), b (i), c (iii) d (iv)
- B. a (iv), b (ii), c (i), d (iii)
- C. a (i), b (iii), c (iv), d (ii)
- D. a (iii), b (iv), c (ii), d (i)

53. The term homeobox refers to
- A group of genes that determine polarity during development
  - Peptide sequences of 60 amino acids that turn other genes on or off
  - Zones of polarizing activity commonly observed during flower development
  - A specific nucleotide sequence present within certain genes that regulate development
54. Agar, a commercial product that is used in ice creams as a gelling agent and to culture the bacteria and other microorganisms, is extracted from the following red algal genera
- Laminaria* and *Ectocarpus*
  - Gelidium* and *Gracilaria*
  - Oedogonium* and *Ulothrix*
  - Trichodesmium* and *Polysiphonia*
55. For protein synthesis, an amino acid needs to be attached by its \_\_\_\_\_ group to the \_\_\_\_\_ of the tRNA molecule
- amino; phosphoryl group on the 5'-end
  - carboxyl; phosphoryl group on the 3'-end
  - carboxyl; hydroxyl group on the 5'-end
  - carboxyl; hydroxyl group on the 3'-end
56. 'Porogamy' is defined as
- Fertilization in which the pollen tube enters the ovule through the integument
  - Fertilization without a pollen grain
  - Fertilization in which the pollen tube enters the ovule through the chalaza
  - Fertilization in which the pollen tube enters the ovule through the micropyle
57. Which of the following statements is **not true** about somatic embryogenesis?
- Somatic embryos are bipolar structures and arise from somatic cells
  - They usually require a hormonal or stress stimuli for induction
  - Somatic embryos have closed vascular system in dicotyledonous plants
  - They have open vascular system in monocotyledonous plants

58. Match the research institutes given in Panel A with their locations given in Panel B and mark the correct answer

**Panel A**

- a. National Rice Research Institute
- b. National Botanical Research Institute
- c. Tropical Botanical Garden and Research Institute
- d. National Bureau of Plant Genetic Resources

**Panel B**

- i. Lucknow
- ii. Thiruvananthapuram
- iii. Pusa Campus
- iv. Cuttack

- A. a (iv), b (iii), c (i), d (ii)
  - B. a (iv), b (iii), c (ii), d (i)
  - C. a (i), b (iv), c (ii), d (iii)
  - D. a (iv), b (i), c (ii), d (iii)
59. Yoshinori Ohsumi received the 2016 Nobel Prize in Physiology or Medicine for the discoveries concerning
- A. Novel therapy against infections caused by roundworm parasites
  - B. Activation of innate immunity
  - C. Reprogramming of mature cells to become pluripotent
  - D. Mechanisms for autophagy
60. One of the following is a hydrocarbon plant
- A. *Elaeis guinensis*
  - B. *Jatropha curcas*
  - C. *Musa paradisiaca*
  - D. *Calotropis gigantia*
61. Enzymes of oxidative phosphorylation are present in
- A. Grana
  - B.  $F_0 - F_1$  particles
  - C. Ribosomes
  - D. Endoplasmic reticulum
62. Which one of the following **is not** used as a genome-editing tool?
- A. S1 nuclease
  - B. Zinc finger nucleases
  - C. Transcription activator-like effector nucleases
  - D. Clustered regularly interspaced short palindromic repeats

63. Identify the mismatch
- A. *Nitrosococcus* – Oxidizing ammonia
  - B. Biological dinitrogen fixation – Require 18 ATP
  - C. Nitrobacter - Chemoorganoheterotroph
  - D. Inundation – An abundant, usually overwhelming flow or fall, as of a river or rain
64. Members of two or more populations occurring in separate non-overlapping geographical areas are
- A. Phylogenetic
  - B. Sympatric
  - C. Allopatric
  - D. Monophyletic
65. Salicylic acid, an important phenolic compound was first isolated from the bark of
- A. *Quercus alba*
  - B. *Magnolic grandiflora*
  - C. *Musa paradisiaca*
  - D. *Salix alba*
66. The RNA polymerase that functions in the nucleus and transcribes siRNAs that play a role in DNA methylation and chromatin structure is
- A. RNA polymerase I
  - B. RNA polymerase II
  - C. RNA polymerase III
  - D. RNA polymerase IV
67. Phylogenetic system of classification is based on several constant characters along with evolutionary sequence being considered. This is an example of
- A. Linnaeus system
  - B. Bentham and Hooker's system
  - C. Engler and Prantl
  - D. De Candolles system



68. When a gene diverges after a speciation event but the gene and its main function are conserved then it is
- A. Homologous
  - B. Heterologous
  - C. Orthologous
  - D. Paralogous
69. When the haploids are derived through the process of ovule androgenesis, they would exhibit
- A. Characters of male parent only
  - B. Characters of female parent only
  - C. Combination of male and female characters
  - D. Predominantly female characters with few male characters
70. The amount of NADPH required for fatty acid biosynthesis can be produced from
- A. HMP pathway
  - B. TCA cycle
  - C. Glycolysis
  - D. Calvin cycle
71. In *Agrobacterium*-mediated genetic transformation process, one major problem is the overgrowth of *Agrobacterium* that could significantly reduce the plant transformation efficiency. Which of the following antibiotics has been found to be effective in eliminating or inhibiting the growth of *Agrobacterium* in such experiments?
- A. Penicillin
  - B. Timentin
  - C. Lancomycin
  - D. Streptomycin
72. Which mineral element is essential for the activity of the enzyme nitrate reductase?
- A. Copper
  - B. Iron
  - C. Molybdenum
  - D. Magnesium

73. Match the following and choose the correct answer

**Panel A**

- a. Isoenzyme
- b. Coenzyme
- c. Holoenzyme
- d. Apoenzyme

**Panel B**

- i. The part of an enzyme that consists of wholly of protein
- ii. Active forms of enzyme
- iii. Non-protein compounds that are necessary for the functioning of enzymes
- iv. Enzymes that differ in amino acid sequence but catalyze the same chemical reaction

- A. a (iv), b (iii), c (i), d (ii)
- B. a (iv), b (iii), c (ii), d (i)
- C. a (iv), b (i), c (ii), d (iii)
- D. a (iv), b (ii), c (iii), d (i)

74. Which of the following amino acid undergoes oxidative deamination at a highest rate?

- A. Glutamate
- B. Aspartate
- C. Alanine
- D. Glutamine

75. Broad sense heritability is defined as

- A. The proportion of phenotypic variance that is due to genetic variance
- B. The proportion of phenotypic variance that is due to environmental variance
- C. The proportion of phenotypic variance that is equal to additive genetic variance
- D. The proportion of phenotypic variance that is due to maternal genetic variance

76. Trypsin specifically cleaves peptide bonds in which site of the amino acids

- A. Arg, Lys
- B. Tyr, Phe
- C. Ile, Met, Arg
- D. Arg, Try

77. Synecology is the study of

- A. Individual organism
- B. Interaction of individual organism with environment
- C. Effect of different environments on one organism
- D. Community of living organisms

78. Identify the mismatch
- A. Homolographic – a type of equal area map projection
  - B. Thermal Radiation – Infrared radiation emitted by objects
  - C. Ionosphere – Layer of Earth's atmosphere that is ionized by solar and cosmic radiation
  - D. Great Victoria Desert – the largest desert in West Africa
79. Callose is one of the cell wall polysaccharides of the following cells
- A. Mesophyll cells
  - B. Pollen mother cells
  - C. Companion cells
  - D. Guard cells
80. A genetically engineered crop species containing *Bt cry* gene referred as 'Bollgard' pertains to
- A. *Gossypium hirsutum* L.
  - B. *Zea mays* L.
  - C. *Solanum tuberosum* L.
  - D. *Oryza sativa* L.