



Post Graduate School
Indian Agricultural Research Institute, New Delhi
Examination for Admission to Ph.D. Programme 2013-2014

Discipline : Plant Genetic Resources

Discipline Code : 17

Roll No.

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Please Note:

- (i) This question paper contains **13** pages. **Please check whether all the pages are printed in this set.** Report discrepancy, if any, **immediately** to the invigilator.
- (ii) **There shall be NEGATIVE marking for WRONG answers in the Multiple Choice type questions (No. 1 to 130) which carry one mark each. For every wrong answer 0.25 mark will be deducted.**

PART – I (General Agriculture)

Multiple choice questions (No. 1 to 30). Choose the correct answer (a, b, c or d) and enter your choice in the circle (by shading with a pencil) on the OMR - answer sheet as per the instructions given on the answer sheet.

1. Who is the present Chairman of Protection of Plant Varieties and Farmers' Right Authority (PPV&FRA)?
 - a) Dr. R.R. Hanchinal
 - b) Dr. P.L. Gautam
 - c) Dr. S. Nagarajan
 - d) Dr. Swapan K. Datta
2. Which among the following is another name for vitamin B₁₂?
 - a) Niacin
 - b) Pyridoxal phosphate
 - c) Cobalamin
 - d) Riboflavin
3. The largest share in India's farm export earning in the year 2011-12 was from
 - a) Basmati rice
 - b) Non-basmati rice
 - c) Sugar
 - d) Guar gum
4. The National Bureau of Agriculturally Important Insects was established by ICAR in _____, was earlier known as _____.
 - a) Bangalore; PDBC
 - b) New Delhi; National Pusa Collection
 - c) Ranchi; Indian Lac Research Institute
 - d) New Delhi; NCIPM
5. The most important sucking pests of cotton and rice are respectively
 - a) *Nilaparvata lugens* and *Aphis gossypii*
 - b) *Aphis gossypii* and *Thrips oryzae*
 - c) *Amrasca biguttula biguttula* and *Scirtothrips dorsalis*
 - d) *Thrips gossypii* and *Orseolia oryzae*
6. Which of the following microorganism causes fatal poisoning in canned fruits and vegetables?
 - a) *Aspergillus flavus*
 - b) *Penicillium digitatum*
 - c) *Clostridium botulinum*
 - d) *Rhizoctonia solani*
7. The cause of the great Bengal Famine was
 - a) Blast of rice
 - b) Brown spot of rice
 - c) Rust of wheat
 - d) Karnal bunt of wheat
8. Actinomycetes belong to
 - a) The fungi
 - b) Eukaryote
 - c) *Mycelia sterilia*
 - d) None of the above
9. A virus-free clone from a virus infected plant can be obtained by
 - a) Cotyledonary leaf culture
 - b) Axenic culture
 - c) Stem culture
 - d) Meristem tip culture
10. Which of the following is not an objective of the National Food Security Mission?
 - a) Sustainable increase in production of rice, wheat and pulses
 - b) Restoring soil fertility and productivity at individual farm level
 - c) Promoting use of bio-pesticides and organic fertilizers
 - d) Creation of employment opportunities

11. Agmarknet, a portal for the dissemination of agricultural marketing information, is a joint endeavour of
 - a) DMI and NIC
 - b) DMI and Ministry of Agriculture
 - c) NIC and Ministry of Agriculture
 - d) DMI and Directorate of Economics and Statistics
12. The share of agriculture and allied activities in India's GDP at constant prices in 2011-12 was
 - a) 14.1%
 - b) 14.7%
 - c) 15.6%
 - d) 17.0%
13. The average size of land holding in India according to Agricultural Census 2005-06 is
 - a) 0.38 ha
 - b) 1.23 ha
 - c) 1.49 ha
 - d) 1.70 ha
14. 'Farmers First' concept was proposed by
 - a) Paul Leagans
 - b) Neils Rolling
 - c) Robert Chamber
 - d) Indira Gandhi
15. In the year 2012, GM crops were cultivated in an area of
 - a) 150 million hectare in 18 countries
 - b) 170 million hectare in 28 countries
 - c) 200 million hectare in 18 countries
 - d) 1.70 million hectare in 28 countries
16. The broad-spectrum systematic herbicide glyphosate kills the weeds by inhibiting the biosynthesis of
 - a) Phenylalanine
 - b) Alanine
 - c) Glutamine
 - d) Cysteine
17. At harvest, the above ground straw (leaf, sheath and stem) weight and grain weight of paddy crop are 5.5 and 4.5 tonnes per hectare, respectively. What is the harvest index of paddy?
 - a) 45%
 - b) 50%
 - c) 55%
 - d) 100%
18. Crossing over between non-sister chromatids of homologous chromosomes takes place during
 - a) Leptotene
 - b) Pachytene
 - c) Diplotene
 - d) Zygotene
19. The term 'Heterosis' was coined by
 - a) G.H. Shull
 - b) W. Bateson
 - c) T.H. Morgan
 - d) E.M. East
20. When a transgenic plant is crossed with a non-transgenic, what would be the zygosity status of the F₁ plant?
 - a) Homozygous
 - b) Heterozygous
 - c) Hemizygous
 - d) Nullizygous
21. The highest per capita consumption of flowers in the world is in
 - a) The USA
 - b) India
 - c) Switzerland
 - d) The Netherlands
22. Which of the following is a very rich source of betalain pigment?
 - a) Radish
 - b) Beet root
 - c) Carrot
 - d) Red cabbage
23. Dog ridge is
 - a) Salt tolerant rootstocks of mango
 - b) Salt tolerant rootstocks of guava
 - c) Salt tolerant rootstocks of grape
 - d) Salt tolerant rootstocks of citrus
24. Which of the following micronutrients are most widely deficient in Indian soils?
 - a) Zinc and boron
 - b) Zinc and iron
 - c) Zinc and manganese
 - d) Zinc and copper
25. Which of the following fertilizers is not produced in India?
 - a) DAP
 - b) Urea
 - c) Muriate of potash
 - d) TSP
26. What is the estimated extent of salt affected soils in India?
 - a) 5.42 mha
 - b) 7.42 mha
 - c) 11.42 mha
 - d) 17.42 mha
27. Which of the following is not a feature of watershed?
 - a) Hydrological unit
 - b) Biophysical unit
 - c) Socio-economic unit
 - d) Production unit

28. Correlation coefficient 'r' lies between
 a) 0 and 1
 b) -1 and 1
 c) -1 and 0
 d) 0 and ∞
29. For the data 1, -2, 4, geometric mean is
 a) 2
 b) 4
 c) $-\frac{7}{3}$
 d) -2
30. The relationship between Arithmetic mean (A), Harmonic mean (H) and Geometric mean (G) is
 a) $G^2=AH$
 b) $G=\sqrt{A+H}$
 c) $H^2=GA$
 d) $A^2=GH$

PART – II (Subject Paper)

Multiple choice questions (No. 31 to 130). Choose the correct answer (a, b, c or d) and enter your choice in the circle (by shading with a pencil) on the OMR - answer sheet as per the instructions given on the answer sheet.

31. The primary aim of collecting crop germplasm is
 a) Conservation of germplasm in the genebanks
 b) Tapping genetic variability in the entire genepool
 c) Strategic planning for gathering left over diversity
 d) Collection of trait-specific germplasm
32. In study of plant genetic resources, GIS is a useful tool for
 a) Knowing the location of germplasm
 b) Planning the future exploration programmes
 c) Framing the conservation policy
 d) Documentation and mapping the biodiversity
33. Rescue collecting is done when
 a) The genetic diversity is imminently threatened in an area
 b) The genetic diversity is in danger of depletion due to natural calamity
 c) The genetic diversity is depleting by use of high yielding varieties of crop
 d) The genetic diversity is in highest demand and needs to be collected fast

34. The term ethnobotany was coined by
 a) Vavilov
 b) Harshberger
 c) Faulks
 d) Schultes
35. *Perilla frutescens* is which type of crop?
 a) Cereals
 b) Oilseeds
 c) Fodder
 d) Vegetables
36. In free-central placentation, the ovary is
 a) Bilocular
 b) Multilocular
 c) Tetralocular
 d) Unilocular
37. Which of the following is correct when fruit is hypogynous?
 a) All the floral parts are at superior position as compared to ovary
 b) All the floral parts are at inferior position as compared to ovary
 c) Only anthers and stigma are above the ovary position
 d) Petals, anthers and stigma are below the ovary position
38. Zygomorphic flower is found in
 a) Mustard
 b) Amaltas
 c) Tomato
 d) Rose
39. When calyx and corolla cannot be differentiated structurally from each other, the term used is
 a) Pistillate
 b) Staminate
 c) Perianth
 d) Pedunculate
40. Which of the following pathogens cause hidden infestation in seeds?
 a) Thrips
 b) Bugs
 c) Bruchids
 d) Mites
41. Potato cyst nematodes introduced into India are confined to
 a) Vindhyaachal Hills
 b) Aravali Hills
 c) Nilgiri Hills
 d) Foot hills of Himalaya

42. Which of the following statements is true for "Global Distribution of Species Richness"?
- It increases with decreasing latitude
 - It decreases with decreasing latitude
 - It increases with increasing latitude
 - It decreases with decrease in seasonal variation
43. Which crop exhibits rich variability and presence of wild relatives in India?
- Groundnut
 - Sunflower
 - Tomato
 - Abelmoschus
44. Regeneration of germplasm takes care of genetic identity of accession by
- Producing seeds from few selected plants
 - Random bulking of seeds from large number of plants
 - Taking care of breeding system including controlled pollination
 - Taking selfed seeds from large number of plants
45. Which of the following crops is of polyphyletic origin?
- Wheat
 - Maize
 - Okra
 - Common bean
46. Edible part of pomegranate is
- Seed and juicy exocarp
 - Seed and juicy pulp
 - Juicy endocarp
 - Seed and aril
47. Which of the following pairs is incorrect?
- Tomato - berry
 - Mango - drupe
 - Walnut - nut
 - Smooth gourd – pepo
48. Which of the following food crops is not of Indian origin?
- Kodmillet
 - Ridged gourd
 - Horse gram
 - Pearlmillet
49. Indian rose wood belongs to the family
- Rosaceae
 - Meliaceae
 - Fabaceae
 - Pinaceae
50. The flower of marigold is called
- Catkin
 - Spike
 - Capitulum
 - Umbell
51. Which of the following is a cole crop?
- Beet root
 - Spinach
 - Cabbage
 - Radish
52. Domestication of cultivated species of plants is a/an
- Natural process
 - Evolutionary process
 - Artificial process
 - Fast process
53. White pepper is obtained from
- A variety of black pepper
 - Processing of black pepper
 - Chilli cultivar with white skin
 - A low pungency pepper introduced from America
54. Which of the following is the oldest oil yielding crop known to man?
- Castor
 - Mustard
 - Corn
 - Sesame
55. Which one of the following is a rich source of tannin?
- Oak
 - Mahogany
 - Chestnut
 - Mangrove
56. A commercial fibre considered to be the strongest vegetable fibre, used for marine cordage and fishing net is from
- Jute
 - Cannabis
 - Grasses
 - Manila hemp
57. SPS Agreement deals with issues relating to
- Plant health
 - Plant and animal health
 - Plant, animal and human health
 - Animal and human health
58. During seed germination, which part emerges first?
- Radicle
 - Plumule
 - Cotyledon
 - Hypocotyle
59. Which of the following terms is not directly linked to crop improvement?
- Breeding
 - Mutation
 - Hybridization
 - Introduction

60. Plant nutrient medium used in tissue culture get brown due to oxidation of
- Iron salt
 - Sucrose
 - TDZ
 - Phenols
61. As a component of tissue culture medium, Zeatin should preferably be
- Dry heat-sterilized
 - Steam-sterilized
 - Filter-sterilized
 - Not to be sterilized
62. Which of the following is not essentially required in PCR?
- MgCl₂
 - DMSO
 - Buffer
 - Oligonucleotides
63. Which of the following is a co-dominant marker technique?
- AFLP
 - RAPD
 - SSR
 - ISSR
64. Which of the following software is not used for molecular genetic mapping and tagging?
- MapMaker
 - JoinMap
 - NTSYS
 - GMendel
65. Threat to genetic diversity exists due to
- Genetic erosion
 - Genetic vulnerability
 - Genetic wipeout
 - All of the above
66. Narrow genetic base of variety may lead to
- Low yield
 - High yield
 - Vulnerable to pest and pathogen
 - Resistant to pest and pathogen
67. "Nuclear Centres and Regions of Diversity" were given by _____ based on _____ evidences.
- Harlan and archaeological evidences
 - Hawkes and presence of wild species
 - Vavilov and centres and origin
 - Hawkes and archaeological evidences
68. What is CITES?
- The Convention on International Trade in Endangered Species of Wild Fauna and Flora
 - The Conference on International Trade in Endangered Species of Wild Fauna and Flora
 - The Committee on International Terms on Environment and Space
 - The Convention on International Trade in Endangered Species of Plants
69. The Strategic Plan for Biodiversity 2011-2020 and the Aichi Biodiversity Targets were taken up in following CoP meeting
- Hyderabad CoP 11
 - Nagoya CoP 10
 - Kuala Lumpur CoP 7
 - Nairobi CoP 5
70. Which of the following is the correct sequence in the increasing order of complexity?
- Molecules, tissues, community, population
 - Cell, tissues, community, population
 - Tissues, organisms, population, community
 - Molecules, tissues, community, cells
71. Which article of the International Treaty on Plant Genetic Resources recognizes the enormous contribution of local and indigenous communities and farmers?
- Article 1
 - Article 2
 - Article 5
 - Article 9
72. Which of the following crop do not possess intermediate seed storage behaviour?
- Citrus
 - Neem
 - Guava
 - Coffee
73. Which of the following category is believed to move into endangered category in future?
- Endangered
 - Vulnerable
 - Rare
 - Endemic
74. The fruit of sunflower is called
- Cremocarp
 - Cypsela
 - Capsule
 - Legume

75. Most of the endangered species are the victims of
- Habitat destruction
 - Over-hunting
 - Acid rain
 - Competition with introduced species
76. Ovule integument gets transformed into
- Seed
 - Fruit wall
 - Seed coat
 - Cotyledons
77. Identify the correctly matched pair
- Basal Convention - Biodiversity conservation
 - Montreal Protocol - global warming
 - Kyoto Protocol - climate change
 - Ramsar Convention - ground water pollution
78. Which bio-molecule is responsible for anti-cancer activity?
- Glucose
 - Fructose
 - Flavonoids
 - Calcium
79. Which of the following is not the property of *Phyllanthus niruri*?
- Anti-cancer
 - Cataract cure
 - Jaundice
 - Antioxidant
80. Which of the following enzymes are used to join bits of DNA?
- DNA polymerase
 - Primase
 - Ligase
 - Endonuclease
81. Biopiracy means
- Use of biopatents
 - Thefts of plants and animals
 - Stealing of bioresources
 - Exploitation of bioresources without authentic permission
82. In tissue culture, callus can be induced to form shoot or root by altering the ratio of
- Auxin to cytokinin
 - Cytokinin to ethylene
 - Auxin to gibberellin
 - Gibberellin to cytokinins
83. Plants developed by *in-vitro* culture from pollen grains are
- Androgenic plants
 - Pollen plants
 - Male plants
 - Sterile plants
84. Which of the following is not correctly matched?
- Buckwheat- *Fagopyrum esculentum*
 - Finger millet- *Eleusine corocana*
 - Proso millet- *Panicum miliare*
 - Fox tail millet- *Setaria italica*
85. What is the primer length used in RAPD?
- 10 nt
 - 11 nt
 - 12 nt
 - 15 nt
86. The D genome in bread wheat (*Triticum aestivum*) is obtained from which species?
- Triticum monococcum*
 - Triticum compactum*
 - Triticum tauschii*
 - Triticum turgidum*
87. The edible part of loquat (*Eriobotrya japonica*) is
- Mesocarp
 - Fleshy thalamus
 - Fleshy receptacle
 - Endocarp
88. Which of the following chemicals has been found most effective in breaking seed dormancy?
- KNO₃
 - GA₃
 - Thiourea
 - Ethyl ether
89. The International Day for Biodiversity is celebrated on
- May 22nd
 - May 24th
 - June 22nd
 - June 30th
90. The botanical Survey of India was established in the year
- 1840
 - 1880
 - 1890
 - 1930
91. Which type of sampling method is usually used for collecting wild species?
- Random sampling
 - Selective sampling
 - Coarse grid sampling
 - Biased sampling
92. The family of Nux-Vomica (*Strychnos nuxvomica*) is
- Apocynaceae
 - Plumbaginaceae
 - Lygophyllaceae
 - Loganiaceae

93. Botanical name of Indian rose wood tree and desert teak are
 a) Acacia and Shorea
 b) Dalbergia and Shorea
 c) Dalbergia and Tecomella
 d) Shorea and Tecomella
94. The main alkaloid obtained from *Dioscorea deltoids* is _____ and used for cure of _____.
 a) Diosgenin; high cholesterol
 b) Digitoxin; high uric acid
 c) Quinone; malaria
 d) Serpentine; high cholesterol
95. Saffron (*Kesar*) belongs to the family _____ and propagated by _____.
 a) Lauraceae; seeds
 b) Apiaceae; corms
 c) Orchidaceae; tubers
 d) Iridaceae; bulbs
96. Perisperm in the seed is a _____ and found in _____.
 a) Persistent endosperm; maize
 b) Persistent nucellus; black pepper
 c) Persistent hypostase; wheat
 d) Persistent epistase; cumin
97. Asafetida is _____ and extracted from _____ of *Ferula asafoetida*.
 a) Alkaloid; stem
 b) Terpenoid; root
 c) Oleoresin; root
 d) Steroid; capsule
98. GURT, a term suggested to be used instead of terminator technology refers to
 a) Genetic Use Restriction Technology
 b) Genomic Universal Reuse Technology
 c) Genotype Use Restriction Technology
 d) Genetically Utilized Reliable Technology
99. _____ is an example of multilocus dominant DNA marker.
 a) AFLP
 b) RFLP
 c) STMS
 d) SSR
100. One of the several alternate forms or sequence that resides at the same locus on the chromosome and controls the same phenotype is referred as
 a) Gene
 b) Allele
 c) Transposon
 d) Cistron
101. A high density array of short DNA molecules bound to solid surface for detecting a biological sample to determine gene expression or a nucleotide sequence is
 a) Probe
 b) DNA chip
 c) Southern blot
 d) Denaturing gradient gel
102. An identifiable physical location on a chromosome whose inheritance can be monitored is called as
 a) Gene
 b) Molecular marker
 c) Reporter gene
 d) Genotype
103. In the context of crop varieties, EDV refers to
 a) Economical Domestic Variety
 b) Essentially Derived Variety
 c) Environmentally Deviated Variety
 d) Essentially Domestic Variety
104. The process of introgression of a trait from an undomesticated or agronomically inferior source to a superior source is called as
 a) Prebreeding
 b) Plant introduction
 c) Germplasm regeneration
 d) Genetic erosion
105. The international Agricultural Institute where cassava germplasm holdings are maintained is
 a) IRRI
 b) CIMMYT
 c) IITA
 d) AVRDC
106. Genome decoding of which crop has been carried out completely by Indian scientists in the year 2012?
 a) Rice
 b) Chickpea
 c) Pigeonpea
 d) Banana
107. The major Act which governs the regulation of import of plant germplasm into India is
 a) Foreign Trade Act, 1992
 b) Protection of Plant Varieties and Farmers' Rights Act, 2001
 c) Biological Diversity Act, 2002
 d) Plant Quarantine Order, 2003

108. To import transgenic seed/planting material for research purpose into India, which of the following is mandatory?
- Issuance of Import Permit by Director, National Bureau of Plant Genetic Resources (NBPGR)
 - Issuance of Import Permit by Director General, Indian Council of Agricultural Research (ICAR)
 - Issuance of Import Permit by Director, NBPGR, subject to approval by the Review Committee on Genetic Manipulation (RCGM) in the Department of Biotechnology (DBT)
 - Issuance of Import Permit by Director, NBPGR, subject to approval by the Genetic Engineering Appraisal Committee (GEAC) of the Ministry of Environment and Forests (MoEF)
109. Indian gene centre holds diversity in which of the following oilseed crops?
- Groundnut and sunflower
 - Safflower and sunflower
 - Rapeseed-mustard and sesame
 - In all above crops
110. As per recent estimates of the FAO in 2010, the total number of plant genetic resource accessions conserved *ex situ* worldwide has reached
- 6.0 million
 - 6.5 million
 - 7.4 million
 - 8.2 million
111. Germplasm exchange under the International Treaty on Plant Genetic Resources for Food and Agriculture is carried out after the donor and recipient signs a
- Prior Informed Consent Form
 - Material Transfer Agreement
 - Standard Material Transfer Agreement
 - Memorandum of Understanding
112. "The number of individuals of any species per sampling unit of occurrence" is the definition of
- Density
 - Frequency
 - Dominance
 - Abundance
113. Heterozygous tall plants were crossed with dwarf plants. What will be the ratio of dwarf plants in the following progeny?
- 25%
 - 50 %
 - 75%
 - 100%
114. Taxonomically a species is
- A group of evolutionary related population
 - A fundamental unit in the phylogeny of organisms
 - Classical evolutionary taxonomy
 - A community taken into consideration as an evolutionary base
115. Regulation of plant growth is due to
- Growth hormones
 - Environment
 - Genetics of plants
 - Environment and growth hormones
116. A nail was driven into the trunk of a tree at a point 1.5 m above the soil level. After 3 years the nail will
- Move up
 - Move down
 - Move sideways
 - Remain where it was
117. Indian sugarcane is
- Saccharum officinarum*
 - Saccharum barberi*
 - Saccharum sinensis*
 - Saccharum spontaneum*
118. Carbohydrates are commonly found as starch in plant storage organs. Which of the following five properties of starch make it useful as a storage material?
- Easily transported
 - Chemically non-reactive
 - Easily digested by animals
 - Osmotically inactive
 - Synthesized during photosynthesis
- (i), (iii) and (v)
 - (i) and (v)
 - (ii) and (iii)
 - (ii) and (v)
119. The edible portion of which of the following vegetables is not a stem?
- Solanum tuberosum*
 - Ipomea batatas*
 - Zingiber officinale*
 - Colocasia esculenta*
120. The characteristic smell of garlic is due to
- Allicin
 - Hydrogen sulphide
 - Allyl methyl sulfide
 - Cortisteroid

121. Which of the following statements is false?
- Climacteric fruits ripen on the plant, before plucking
 - The alkaloid codeine (analgesic properties), is found in *Papaver somniferum*
 - Legumes are rich in thiamine, niacin and riboflavin
 - Barley grain used for brewing of beer as well as liquors like whisky and brandy
122. Safflower (*Carthamus tinctorius*) seeds are a source of
- Vegetable fats
 - Drying oil
 - Semi-drying oil
 - Non-drying oil
123. Which of the following is not included in characterization traits?
- Seed patterns
 - Flower colours
 - Isozyme patterns
 - Protein content
124. While carrying out germplasm characterization, the following traits are assessed
- DDS (distinctiveness, uniformity and stability) traits
 - Heritable traits
 - Traits influenced by environment
 - All of the above
125. Which amongst the following is a popular portal for information about plant genetic resources for food and agriculture?
- GIS
 - NTSYS
 - GENESYS
 - GenBank
126. What is the type of dormancy in which embryo do not differentiate into various tissue at the time of fruit maturation?
- Internal dormancy
 - Physiological dormancy
 - External dormancy
 - Mixed dormancy
127. Which method amongst the following is the most commonly used for germplasm conservation in *in vitro* Genebanks, globally?
- Mineral oil overlay in cultures
 - Use of osmoticum in media
 - Use of growth retardants in media
 - Low temperature (4-15°C) storage of cultures
128. Which group is included in Macronutrients?
- S, H, Mn
 - S, P, Ca, Mg
 - Mn, Cu, N
 - Na, Cl
129. Cryoprotective effect of glycerol in biological tissues was demonstrated first by
- Woodcock *et al.* (1941)
 - Polge *et al.* (1949)
 - Lovelock & Bishop (1959)
 - Sakai *et al.* (1990)
130. Which of the following is a false statement?
- Downy mildew of soybean caused by *Peronospora manshurica* is not found in India
 - Cotton boll weevil *Anthonomus grandis* is an intercepted pest in India
 - The causal organism of Karnal bunt of wheat is *Neovossia indica*
 - Ug99, a lineage of wheat stem rust (*Puccinia graminis* f. sp. *tritici*), present in wheat fields in several countries in Africa, is also found in India
- Matching type questions (No. 131 to 140); all questions carry equal marks. Choose the correct answer (a, b, c, d or e) for each sub-question (i, ii, iii, iv and v) and enter your choice in the circle (by shading with a pencil) on the OMR - answer sheet as per the instructions given on the answer sheet.**
- 131.
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|--|---------|
| i) Trade-Related Intellectual Property Rights (under the World Trade Organization) Agreement (TRIPs) | a) 1992 |
| ii) Convention on Biological Diversity (CBD) | b) 2000 |
| iii) International Treaty on Plant Genetic Resources (ITPGRFA) | c) 2001 |
| iv) Nagoya Protocol | d) 1994 |
| v) Cartagena Protocol on Biosafety | e) 2010 |
- 132.
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|----------------------------|----------------------------------|
| i) Betelnut palm | a) <i>Vinca rosea</i> |
| ii) Cluster bean | b) <i>Zizania aquatica</i> |
| iii) Madagascar periwinkle | c) <i>Trapa natans</i> |
| iv) Wild rice | d) <i>Cymopsis tetragonoloba</i> |
| v) Water chestnut | e) <i>Areca catechu</i> |

133.

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|--------------|-------------------------------|
| i) PVS2 | a) Growth regulator |
| ii) Mannitol | b) Sterilant |
| iii) DSC | c) Cryoprotectant |
| iv) Ethanol | d) Osmotic agent |
| v) TDZ | e) Thermoanalytical technique |

134.

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|-------------------------|-----------------------------------|
| i) Pyrethrum | a) <i>Cannabis sativa</i> |
| ii) Ergotaxine | b) <i>Chrysanthemum coccineum</i> |
| iii) Hyoscyamine | c) <i>Claviceps purpurea</i> |
| iv) Morphine | d) <i>Datura stramonium</i> |
| v) Tetrahydrocannabinol | e) <i>Papaver somniferum</i> |

135.

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|--------------|------------------|
| i) Tapioca | a) Musaceae |
| ii) Cumin | b) Meliaceae |
| iii) Banana | c) Asteraceae |
| iv) Mahogany | d) Apiaceae |
| v) Safflower | e) Euphorbiaceae |

136.

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|------------------|------------------|
| i) Invasive weed | a) Bark |
| ii) Pseudocereal | b) Inflorescence |
| iii) Saffron | c) Coix |
| iv) Cauliflower | d) Flower |
| v) Cinnamon | e) Eichhornia |

137.

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|-------------|-------------------|
| i) Opium | a) Lock |
| ii) Cashew | b) Receptacle |
| iii) Almond | c) Mesocarp |
| iv) Mango | d) Cotyledon |
| v) Cotton | e) Unripe capsule |

138.

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|-------------------|--------------------|
| i) Maize | a) South East Asia |
| ii) Pointed gourd | b) Central America |
| iii) Mango | c) China |
| iv) Kiwi fruit | d) India |
| v) Sunflower | e) North America |

139.

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|-------------|----------------|
| i) IFPRI | a) Philippines |
| ii) ICRAF | b) Sri Lanka |
| iii) IIMI | c) Kenya |
| iv) ICRISAT | d) USA |
| v) IRRI | e) India |

140.

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|------------------|-------------|
| i) Lerma rajo | a) Oats |
| ii) UPO 94 | b) Rice |
| iii) IR 64 | c) Mungbean |
| iv) Pusa Barsati | d) Wheat |
| v) Jalgaon | e) Cowpea |

Short questions (No. 141 to 146); each question carries FIVE marks. Write answers, including computation / mathematical calculations if any, in the space provided for each question on the question paper itself.

141. What is the need to develop a 'core collection' in genebanks with large number of accessions? Briefly describe the process and techniques involved in development of core collection.

142. Briefly mention the national and international regulatory regimes governing the plant quarantine system in India. Also mention the major organizations involved in plant quarantine in India.

143. Describe the use of biotechnological tools in managing plant genetic resources.

144. Write botanical names, family and distribution of ten tropical under-utilized fruits of India.

145. Comment on "Dynamic Conservation" of plant diversity and describe the role of various stakeholders.

146. Plant collection and conservation are of continuous need to protect our genetic resources. How uses of modern tools including GIS are relevant in these activities?