



Post Graduate School
Indian Agricultural Research Institute, New Delhi
Examination for Admission to Ph.D. Programme 2011-2012

Discipline : Entomology

Discipline Code : 09

Roll No

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. Which of the following crops have been approved for commercial cultivation in India?
 - a) Bt cotton and Bt brinjal
 - b) Bt cotton and Golden Rice
 - c) Bt maize and Bt cotton
 - d) Bt cotton only
2. This year (2010-11) the expected food grain production in India is
 - a) 212 million tonnes
 - b) 220 million tonnes
 - c) 235 million tonnes
 - d) 250 million tonnes
3. The genome of which of the following crops is still not completely sequenced?
 - a) Rice
 - b) Soybean
 - c) Sorghum
 - d) Wheat
4. According to the Approach Paper to the 12th Five Year Plan, the basic objective of the 12th Plan is
 - a) Inclusive growth
 - b) Sustainable growth
 - c) Faster, more inclusive and sustainable growth
 - d) Inclusive and sustainable growth
5. To address the problems of sustainable and holistic development of rainfed areas, including appropriate farming and livelihood system approaches, the Government of India has set up the
 - a) National Rainfed Area Authority
 - b) National Watershed Development Project for Rainfed Areas
 - c) National Mission on Rainfed Areas
 - d) Command Area Development and Water Management Authority
6. Which of the following sub-schemes are not covered under the Rashtriya Krishi Vikas Yojana?
 - a) Extending the Green Revolution to eastern India
 - b) Development of 60,000 pulses and oilseeds villages in identified watersheds
 - c) National Mission on Saffron
 - d) National Mission on Bamboo
7. The minimum support price for the common variety of paddy announced by the Government of India for the year 2010-11 was
 - a) ₹ 1030
 - b) ₹ 1000
 - c) ₹ 980
 - d) ₹ 950
8. According to the Human Development Report 2010 of the United Nations, India's rank in terms of the human development index is
 - a) 119
 - b) 134
 - c) 169
 - d) 182

9. Which of the following does not apply to SRI method of paddy cultivation?
- Reduced water application
 - Reduced plant density
 - Increased application of chemical fertilizers
 - Reduced age of seedlings
10. Which organic acid, often used as a preservative, occurs naturally in cranberries, prunes, cinnamon and cloves?
- Citric acid
 - Benzoic acid
 - Tartaric acid
 - Lactic acid
11. Cotton belongs to the family
- Cruciferae
 - Anacardiaceae
 - Malvaceae
 - Solanaceae
12. Photoperiodism is
- Bending of shoot towards source of light
 - Effect of light/dark durations on physiological processes
 - Movement of chloroplast in cell in response to light
 - Effect of light on chlorophyll synthesis
13. Ergot disease is caused by which pathogen on which host?
- Claviceps purpurea* on rye
 - Puccinia recondita* on wheat
 - Drechlera sorokiniana* on wheat
 - Albugo candida* on mustard
14. Rocks are the chief sources of parent materials over which soils are developed. Granite, an important rock, is classified as
- Igneous rock
 - Metamorphic rock
 - Sedimentary rock
 - Hybrid rock
15. Which one of the following is a *Kharif* crop?
- Pearl millet
 - Lentil
 - Mustard
 - Wheat
16. The coefficient of variation (C.V.) is calculated by the formula
- $(\text{Mean}/\text{S.D.}) \times 100$
 - $(\text{S.D.}/\text{Mean}) \times 100$
 - $\text{S.D.}/\text{Mean}$
 - $\text{Mean}/\text{S.D.}$
17. Which of the following is commonly referred to as muriate of potash?
- Potassium nitrate
 - Potassium chloride
 - Potassium sulphate
 - Potassium silicate
18. Inbred lines that have same genetic constitution but differ only at one locus are called
- Multi lines
 - Monohybrid
 - Isogenic lines
 - Pure lines
19. For applying 100 kg of nitrogen, how much urea would one use?
- 45 kg
 - 111 kg
 - 222 kg
 - 333 kg
20. The devastating impact of plant disease on human suffering and survival was first realized by epidemic of
- Brown spot of rice in Bengal
 - Late blight of potato in USA
 - Late blight of potato in Europe
 - Rust of wheat in India
21. The species of rice (*Oryza*) other than *O. sativa* that is cultivated is
- O. rufipugon*
 - O. longisteminata*
 - O. glaberrima*
 - O. nivara*
22. The enzyme responsible for the fixation of CO_2 in mesophyll cells of C-4 plants is
- Malic enzyme
 - Phosphoenol pyruvate carboxylase
 - Phosphoenol pyruvate carboxykinase
 - RuBP carboxylase
23. Which one of the following is a 'Vertisol'?
- Black cotton soil
 - Red sandy loam soil
 - Sandy loam sodic soil
 - Submontane (Tarai) soil
24. What is the most visible physical characteristic of cells in metaphase?
- Elongated chromosomes
 - Nucleus visible but chromosomes not
 - Fragile double stranded loose chromosomes
 - Condensed paired chromosomes on the cell plate

25. All weather phenomena like rain, fog and mist occur in
 a) Troposphere
 b) Mesosphere
 c) Ionosphere
 d) Ozonosphere
26. Which of the following elements is common to all proteins and nucleic acids?
 a) Sulphur
 b) Magnesium
 c) Nitrogen
 d) Phosphorous
27. Silt has intermediate characteristics between
 a) Sand and loam
 b) Clay and loam
 c) Loam and gravel
 d) Sand and clay
28. Certified seed is produced from
 a) Nucleus seed
 b) Breeder seed
 c) Foundation seed
 d) Truthful seed
29. Seedless banana is an
 a) Autotriploid
 b) Autotetraploid
 c) Allotriploid
 d) Allotetraploid
30. Which one of the following is used to test the goodness-of-fit of a distribution?
 a) Normal test
 b) t-test
 c) Chi-square test
 d) F-test
33. Avermectins are
 a) Octopamine receptor agonists
 b) Chloride channel activators
 c) Nicotine acetylcholine receptor agonist
 d) Sodium channel modulator
34. Lufenuron is
 a) Electron transport inhibitor
 b) JH mimic
 c) Chitin synthesis inhibitor
 d) Water balance disruptor
35. *Aenasius bambawalei* is an endoparasitoid belonging to
 a) Trichogrammatidae and parasitising *Maconellicoccus hirsutus*
 b) Encyrtidae and parasitising *Phenacoccus solenopsis*
 c) Eulophidae and parasitising *Phenacoccus solenopsis*
 d) Eupelmidae and parasitising *Ceratovacuna bambawalei*
36. Insect development in which successive instars have quite different forms is known as
 a) Hemimetamorphosis
 b) Hypermetamorphosis
 c) Heteromorphosis
 d) Amorphosis
37. Spinosyn is derived from
 a) *Saccharopolyspora spinosa*
 b) *Polyspora spinosa*
 c) *Streptomyces avermitilis*
 d) *Streptomyces spinosa*
38. Emamectin benzoate is derived from
 a) *Streptomyces avermitilis*
 b) *Streptomyces scabies*
 c) *Saccharopolyspora spinosa*
 d) *Streptomyces emamectis*

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. Insect groups hitherto not known from India
 a) Sialoidea
 b) Zoraptera and Sialoidea
 c) Grylloblattodea + Zoraptera + Mantophasmatodea
 d) Raphidoidea and Embioptera
32. 'Pteralia' and 'Patagia' are present, respectively in
 a) Lower margin of wing and Hymenoptera
 b) Middle of wing surface and Neuroptera
 c) Base of wing and Lepidoptera
 d) Anal region of wing and Lepidoptera
39. In cyclorrhapous dipterans, the fusion of corpora cardiaca, corpora allata and prothoracic glands is referred to as
 a) Craber's organ
 b) Simpher's organ
 c) Weismann's organ
 d) Gyroscopic organ
40. In solid cone nozzle, the solid cone is formed due to
 a) Bigger size of the cap
 b) Bigger size of the orifice plate
 c) Central hole in swirl plate
 d) Small size of the strainer

41. What will be the amount of cartap 50 SP required to prepare 10 litres of 0.1% spray material?
- 2.0 g
 - 10 g
 - 20 g
 - 30 g
42. Insecticide fogs produced by thermal energy nozzles using a stream of hot gas to vapourise liquid pesticide form
- Fogs of droplet size > 15 μm dia
 - Aerosol droplets of size < 15 μm dia
 - High volume sprays
 - Mist droplet of size 20-500 μm dia
43. Mango stem borer complex belonging to the genus *Batocera* in India and adjacent S.E. Asian countries comprises of
- Only *rufomaculata* DeGeer
 - rufomaculata*, *rubus*, *roylei* and *numetor*
 - Only *rubus* (Linnaeus)
 - Only *rufomaculata* (DeGeer)
44. The hosts on which parasitoids oviposit readily, that they do not attack normally in the field are termed as
- Facititious hosts
 - Alternate hosts
 - Laboratory hosts
 - Mass culture hosts
45. *Phyllocnistis citrella* is a leaf miner pest of
- Citrullus vulgaris*
 - Only *Citrus* sp., and it is a specific pest
 - Citrus* spp. + other Rutaceae
 - All Rutaceae
46. Vapour heat treatment as a quarantine measure is to be done between temperature range of
- 40 and 47°C and hours of exposure is important
 - 50 and 57°C and hours of exposure is immaterial
 - 40 and 47°C and time and flow rate not important
 - 30 and 57°C and density of load is immaterial
47. Computer generated IPM models as practiced in developed countries like USA have synthesized menu based IPM systems comprising of
- Input of weather data + developmental models of significant pests
 - Pest risk analysis data
 - IPM protocols of a single major pest
 - Simulated host phenology + input of weather data + developmental models of significant pests
48. Pest Risk Analysis (PRA) is a sanitary and phytosanitary measure typically to be done by
- Recipient/importing country on the information largely given by the producer/exporting country
 - Producer/exporting country on the information given by recipient/importing country
 - Plant quarantine machinery of the producer/exporting country
 - Only the Govt. of India for export of wheat
49. Total Population Management (TPM) is the term framed by the proponents of
- Genetic control – Knippling (1955)
 - Genetic control – Knippling (1966)
 - Wide area management of fruit flies
 - Genetic engineering
50. Sprays with a higher number of droplets of <1100 μm dia are categorized as 'very fine' and are
- Recommended for crops due to high field efficacy
 - Efficient as these entirely deposit on plants effectively without any drift hazard
 - Not recommended for crops due to drift hazard
 - Recommended as these do not cause any pollution
51. The oxadiazine insecticide now picking up for pest control is
- Indoxacarb
 - Indoxycarb
 - Indoxadiazine
 - Spinosad
52. An insecticide of new chemical class of spirocyclic phenyl substituted tetronic acid and active against whiteflies and spider mites is
- Imidacloprid
 - Spinosad
 - Spirodiclofen
 - Spiromesifen
53. Neonicotinoids act on the central nervous system of insects through binding at the
- Synaptic nicotinic acetylcholine receptor
 - Post synaptic nicotinic acetyl choline receptor
 - Synaptic anticholinesterases
 - Synaptic acetylcholine
54. Monarch (model) and the viceroy (mimic) butterflies are classical examples of
- Batesian mimicry named after Batesian
 - Mullerian mimicry named after Fritz Muller
 - Mullerian mimicry named after V. Mullerian
 - Batesian mimicry named after H.W. Bates

55. Example of a selective carbamate insecticide toxic to aphids and Diptera
- Indoxacarb
 - Pirimicarb
 - Endosulfan
 - Indoxycarb
56. Two or more identical scientific names that could cause a conflict of interpretation in taxonomy are
- Primary homonyms
 - Synonyms
 - Homonyms
 - Holonyms
57. Speciation without geographic isolation results in
- Apomictic species
 - Parapatric species
 - Successional species
 - Palaeospecies
58. Identification, nomenclature and classification as simplest components without analysis of any relationships at any level constitute what is called as
- Biosystematics
 - Systematics
 - Taxonomy
 - International Code of Zoological Nomenclature and its articles
59. *Cactoblastis cactorum* is an example of an insect used in biological control of weed *Opuntia*, which was brought from
- Australia to Argentina
 - Argentina to Australia
 - Australia to India
 - California to Australia
60. Example of a protein used as a major source of nitrogen for formation of adult tissues in the pupal stage is
- Resilin
 - Pupiparin
 - Hox protein
 - Calliphorin
61. Uric acid is deposited permanently in the epidermal cells of the abdomen forming distinct
- Black transverse bands in *Dysdercus*
 - White transverse bands in *Dysdercus*
 - Black transverse bands in *Periplaneta*
 - White transverse bands in *Periplaneta*
62. Important and strongly stimulating phagostimulants for phytophagous insects are
- Sugars especially glucose
 - Amino acids
 - Sugars especially sucrose
 - l-proline
63. Of the following, an insect demonstrated to show a hygrometric response with increased activity in moist air compared with dry air is
- Wireworms
 - Locust
 - Hydrophilid beetle
 - Ephemeropteran nymph
64. A complex form of phototaxis occurring in a moving insect and receiving a constant visual stimulus is called as
- Kinesis
 - Menotaxis
 - Photokinesis
 - Mechanophototaxis
65. The innermost component of the integument attached by hemidesmosomes to the epidermal cells is
- Epidermis
 - Endocuticle
 - Procuticle
 - Basal lamina
66. "An insect that requires and eats only one animal in its life span but may be ultimately responsible for killing many" is a
- Parasitoid
 - Parasite
 - Koinobiont endoparasite
 - Koinobiont ectoparasite
67. Formation of hyperosmotic urine occurs in
- All terrestrial insects
 - Saltwater mosquitoes
 - All aquatic insects
 - All insects living in ultra cold temperature
68. An insect in which neck is distinct, it is mainly derived from the
- Last part of head
 - Head and thorax both
 - First part of thorax
 - Clear segment of thorax
69. The body temperature of insects normally follows closely the temperature of the surroundings and hence it is termed as
- Hyperthermic
 - Warm blooded
 - Cold hardiness
 - Poikilothermic
70. Cold hardiness in insects is enabled due to
- Poikilothermic nature
 - Polyhydroxyl substances like trehalose
 - Hydroxyl substances like alcohols
 - Cryoprotectants which evaporate at low temperature

71. In most insects, the concentration of trehalose in the haemolymph is
- Dynamic but not related to the glycogen in the fat body
 - Constant and in dynamic equilibrium with glycogen in fat body
 - Always stable, never related to any activity
 - Constant but not related to the glycogen in fat body
72. Much of endocuticle formation, tanning and wax formation in insects is essentially part of
- Pre-ecdysis
 - Moulting/ecdysis
 - Post ecdysis
 - Metamorphosis
73. The classic "Mosaic theory" of insect vision was propounded by
- V.B. Wigglesworth (1965)
 - Von Frisch (1967)
 - Wehner and Bernard (1980)
 - Muller (1829)
74. Widely distributed form of proprioceptors of chordotonal nature in insect is
- Scolopidia
 - Companiform sensilla
 - Sensilla trichoidea
 - Trichogen/generative hair cell
75. DDT was synthesized by
- Zeidler, 1874
 - Paul Muller, 1939
 - Schrader, 1941
 - Aucante, 1954
76. The chemical converted to cholesterol in higher animals and JH in insects in
- Paraterpenoid
 - Farnesyl pyrophosphate
 - Bacterial endochitinase
 - Histidine
77. Caudal breathing tube is the characteristic feature of
- Notonectidae
 - Nepidae
 - Corixidae
 - Naucoridae
78. Name the chemical spray used in identification of amino acids:
- Phenol
 - Ninhydrin
 - Iodine
 - Butanol
79. Bunchy top in sugarcane is formed by
- Chilo auricilius*
 - Scirpophaga excerptalis*
 - Melanopsis glomerata*
 - Chilo infuscatellus*
80. Droplet size in ultra low volume (ULV) spraying varies from
- 0.5 – 15 microns
 - 30 – 150 microns
 - 250 – 350 microns
 - 500 – 600 microns
81. Androconia found in wings of certain insects are
- Specialized scales
 - Bristles
 - Spots
 - Specialized glands
82. In regular distribution of an insect species, which of the following holds true?
- Variance equal to mean density
 - Variance greater than mean
 - Variance less than mean
 - Variance and mean are above SD
83. Honey bee venom contains
- Mellitin
 - Kinins
 - Sclerotin
 - Arthropodin
84. Muscardine disease in silkworm is caused by
- Nosema bombycis*
 - Beauveria bassiana*
 - Bacillus bombysepticus*
 - Beauveria muscardina*
85. Destructive Insect Pest Act (DIPA) was first passed in
- 1914
 - 1920
 - 1937
 - 1968
86. Among the following, which is the best suited for bee culture?
- Apis dorsata* and *Apis mellifera*
 - Apis florea*
 - Apis cerana indica*
 - Milipona mellifera*
87. Female aphids that produce eggs after mating
- Fundatrix
 - Vivipara
 - Ovipara
 - Virginopara

88. The mean azadirachtin content of neem seed kernels by weight
- 0.3%
 - 0.6%
 - 0.03%
 - 0.06%
89. Suborder Caelifera is distinguished from Ensifera based on
- Enlarged hind femur and short antenna
 - Enlarged hind femur and long antenna
 - Elongate antenna
 - Forceps like ovipositor
90. Cells of haemolymph that take up foreign chemicals of high molecular weight
- Nephrocytes
 - Oenocytes
 - Phagocytes
 - Nidi cells
91. The first systemic organophosphate produced is
- TEPP
 - Methyl parathion
 - Schradan
 - Ethyl parathion
92. Polyhedra of the baculoviruses are of the size of
- 1-15 μm
 - 15-30 μm
 - 1-15 nm
 - 15-30 nm
93. Economic Injury Level as defined by an integrated pest management worker is the level at which
- Damage can no longer be tolerated
 - Damage can be tolerated
 - Loss is less than cost of control
 - Control measures must be stopped
94. For an efficient integrated pest management, the economic threshold of a pest shall always be made to settle at a level
- Equivalent to economic injury level
 - Lower than economic injury level
 - Higher than economic injury level
 - Fluctuating to be higher or lower than economic injury level
95. Any manipulation of environment intended to reduce pest numbers is referred to as
- Habitat manipulation
 - Ecological control
 - Ecosystem control
 - Biointensive control
96. Situation where a pest population after having been suppressed rebounds to numbers greater than that before suppression had occurred is called as
- Secondary pest outbreak
 - Pest replacement
 - Pest resurgence
 - Pest epidemic
97. Currently the crystal toxins obtained from *Bacillus thuringiensis* are classified on the basis of
- Serology
 - Transgenic capabilities
 - Amino acid sequence
 - Specificity
98. The use of gamma radiation for the eradication of insects is an example of
- Mechanical control
 - Biological control
 - Cultural control
 - Physical control
99. The Journal "Insect Science and its Application" is published
- As International Journal of Tropical Insect Science and published by Cambridge Journals
 - Continued in the same name by ICIPE, Nairobi
 - Continued in the same name and published by Cambridge Journals
 - As International Journal of Tropical Entomology and published by CABI, Wallingford
100. The "nucleocapsid" is always associated with the structure of insect pathogenic
- Entomopox viruses
 - Non-occluded viruses
 - Baculoviruses
 - Irido viruses
101. The chemical compound produced by millipedes for their own defense is
- Cardenolides
 - Iridoid glycosides
 - Hydrogen cyanide
 - Hydrogen chloride
102. An allelochemical involved in the biology of an organism (A), when it contacts another organism (B), evoking a behavioural /physiological response that is favourable to both (A and B) is a
- Synamone
 - Kairomone
 - Pheromone
 - Allomone

103. The overall rate of JH synthesis by corpora allata in insects is regulated by peptides, of which the increase in synthesis is always by
- Allostatis
 - Allatotropins
 - Atropine
 - FMR Famide
104. The mobilisation of lipids from the fat body is known to be effected by the
- Allatostatis
 - Vitellogenins
 - Octopamine
 - Adipokinemine
105. Chemicals produced by insects, which circulate in blood to regulate all the long term physiological, developmental and behavioural activities are
- Moulting hormones
 - Insect neuropeptides
 - Insect hormones
 - Pheromones
106. Occurrence of different phenotypes within a species, where the development of phenotype is governed exclusively by environmental conditions is referred to as
- Polymorphism
 - Polyphenism
 - Polyandry
 - Polyethelism
107. Diflubenzuron, teflubenzuron and chlorfluazuron are examples of
- Pyrrrole insecticides
 - Neonicotinoids
 - Avermectins
 - Phenyl urea insecticides
108. A novel chitin synthesis inhibitor affecting specifically the plant hoppers, whiteflies and scale insects is
- Diflubenzuron
 - Dimilin
 - Buprofezin
 - Benzoyl phenyl urea
109. Epigynial shield and setae are important in the identification of
- Families of Acarina
 - Only Amerosiidae and Ascidae
 - Families of Diptera
 - Subfamilies of Cyclorhapha
110. The invaginations of body wall, strengthening exoskeleton and providing areas for attachment of muscles in insects are
- Tentorium
 - Apophyses
 - Apodemes
 - Occiput
111. In the males of many insects, the sperms that pass through the vas deferens are then held in a storage structure
- Spermatheca
 - Spermatophore
 - Vasa efferentia
 - Seminal vesicle
112. "Imms General Textbook of Entomology" 10th edition (1977) is authored by
- O.W. Richards and R.G. Davies
 - A.D. Imms and O.W. Richards
 - O.W. Richards and R.C. Davies
 - O.V. Richards and R.G. Davies
113. Dr. M.L. Roonwal had contributed immensely to the taxonomy of
- Thysanoptera
 - Locusts and grasshoppers
 - Isoptera
 - Diptera
114. In endopterygote insects, the wing development is
- Internal occurring at postembryonic stage
 - External occurring at postembryonic stage
 - Internal occurring in the embryonic stage itself
 - Internal occurring in the larval stage only
115. First entomologist to the Govt. of India was
- de Lionel Niceville
 - Lionel de Niceville
 - Maxwell Lefroy
 - T.B. Fletcher
116. Entomological investigations on tea were started in
- 1905 at Kannykorien (West Bengal)
 - 1905 at Kannykorien (Assam)
 - 1913 at Tocklai (Assam) by UPASI
 - 1913 at Valparai (Tamil Nadu) by UPASI
117. NBAll and NCIPM are located at
- Bangalore and Hyderabad, respectively
 - Bangalore and Faridabad, respectively
 - Bangalore and New Delhi, respectively
 - Hyderabad and Faridabad, respectively
118. Honey bee species whose nests consist of multiple combs and single combs are
- Apis nigrocincta* and *Apis nuluensis*, respectively
 - Apis koschevnikovi* and *Apis mellifera*, respectively
 - Apis andreniformis* and *Apis nigrocincta*, respectively
 - Apis nuluensis* and *Apis brevilingula*, respectively

119. The secretion of the following glands are supposed to have the functions of softening the wax and production of royal jelly, respectively in honey bees
- Glands in 4th abdominal segment and lateral pharyngeal glands, respectively
 - Glands in 4-7 abdominal segments and mandibular glands, respectively
 - Mandibular glands and lateral pharyngeal glands, respectively
 - Alkaline glands and accessory glands, respectively
120. Of the following, the coleopterans consumed as food are
- Cybister japonicus* and *Crocothemis servilia*
 - Graptopsaltria nigrofasciata* and *Anax guttatus*
 - Cybister tripunctatus* and *Aulonogyrus strigosus*
 - Gonimbrasia belina* and *Rhynchophorus phoenicis*
121. Pick the right and sensible combination in the following:
- Degree days – temperature control – diurnal temperature curve
 - Degree days – life history – developmental rate
 - Degree days – minimum temperature – maximum temperature
 - Degree days – temperature control – developmental rate
122. The following is one of the models used in systems analysis as a prelude to IPM
- Statistical through regression models
 - Optimization through mechanistic models
 - Optimization through simulation models
 - Statistical through pest development models
123. The plant quarantine activity leading to issue of import permits for seeds and germplasm for research and experimental purposes is looked after as a nodal agency by the
- National Seeds Corporation and ICRISAT
 - National Plant Quarantine Station, New Delhi
 - NBPGR, New Delhi
 - NBPGR + IARI, New Delhi
124. Pick the right and sensible sequential combination out of the following:
- Cry IAc; npt II, Tn5; and aad, Tn7
 - B.t.k.; aad, TN7; and npt II, Tn5
 - Cry IAc; npt II, aad; and Tn5, Tn7
 - Bt; Cry IAc; npt II, Tn5; and aad, Tn7
125. Pick the right and sensible combination in the following:
- Gypsy moth: trans 10 cis-12 hexadecadienol; pink bollworm : 10 propyl-trans-5,9, tridecadienyl acetate
 - Gypsy moth: 10 propyl-trans-5,9, tridecadienyl acetate; pink bollworm : trans 10 cis-12 hexadecadienol
 - Gypsy moth: trans 12 cis-10 hexadecadienol; pink bollworm : 10 propyl-trans-5,9, tridecadienyl acetate
 - Gypsy moth: 10 acetoxy-cis-7- hexadecenol; pink bollworm : 10 propyl-trans-5,9, tridecadienyl acetate
126. Concentrate Insecticide Liquids essentially include
- Non-volatile solvents
 - Emulsifier
 - High viscosity emulsifier
 - Emulsion of oil in water type solvents
127. Mosquito mat vapourisers, which repel and kill mosquitoes have their active ingredients dissolved in
- Base made of only wood powder/starch/coconut shell powder
 - Base made of cellulose fibre board or cardboard or plastic mat with evaporation inhibitors
 - Base made of only cellulose fibre board but evaporation inhibitors are not important
 - Base made of cellulose fibre boards or cardboard or plastic mat but traces of perfumes not important
128. Of the following an exact example of acetyl choline mimics is
- Neonicotinoids but not spinosad
 - Neonicotinoids and spinosad
 - Bifenazate and abamectin
 - Pyrethrins and pyrethroids
129. Of the following example of quinazolone acaricide is
- Chlorfenapyr
 - Fenpyroximate
 - Fenazaquin
 - Fipronil
130. Concentration of insecticide required to inhibit 50% of cholinesterases is
- Ce I₅₀
 - Ch I₅₀
 - Ic₅₀
 - I₅₀

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.

- | | |
|---------------------|-------------------------------|
| i) Mantophasmatodea | a) Tropical, warm temperate |
| ii) Grylloblattodea | b) Namibia, Tanzania |
| iii) Mantodea | c) Galloisiana |
| iv) Phasmatodea | d) Sister group of Blattodea |
| v) Zoraptera | e) Sister group of Orthoptera |

132.

- | | |
|------------------------|-----------------------------|
| i) M.L. Roonwal | a) National Pusa Collection |
| ii) M.S. Mani | b) Microlepidoptera |
| iii) M.G. Ramdas Menon | c) Isoptera |
| iv) T.B. Fletcher | d) Plant galls |
| v) H.M. Lefroy | e) South Indian Insects |

133.

- | | |
|------------------------------|---|
| i) Forecasting | a) Environmental resistance |
| ii) Roving surveys | b) Pest surveillance |
| iii) Reproductive potential | c) Abundance |
| iv) Assessment of population | d) Loss as a function of population density |
| v) Estimation of damage | e) Sampling, number and size of samples |

134.

- | | |
|---|--------------------------|
| i) Region of head supporting mouth, labrum and eyes | a) Post occipital suture |
| ii) Region of head supporting mandibles, maxillae, labium | b) Tentorium |
| iii) Suture in head with some relation to original metamerism | c) Gnathocephalon |
| iv) Suture, which is a combination of craneal and frontal sutures | d) Protocephalon |
| v) Two pairs of cuticular apophyses in the head forming ridges and arms | e) Epicranial suture |

135.

- | | |
|---|----------------|
| i) Hormone involved in cuticle hardening and darkening | a) Ecdysone |
| ii) Lipoprotein layer of epicuticle | b) Formamidine |
| iii) Mosquito and fly repellent | c) Cuticulin |
| iv) Hormone from prothoracic gland initiating growth, moulting of cuticle | d) Bursicon |
| v) Synthetic organic amine insect neurotransmitter | e) DEET |

136.

- | | |
|--|----------------------------|
| i) Low reproductive and high survival rate | a) K strategist |
| ii) High reproductive rate and low survival rate | b) Secondary pest outbreak |
| iii) Interplay between populations and environment | c) r strategist |
| iv) Pest with general equilibrium position far below economic injury level | d) Population dynamics |
| v) One pest suppressed and replaced by another innocuous pest | e) Sub-economic pest |

137.

- | | |
|--------------|---------------------|
| i) Ants | a) Laksha |
| ii) Bees | b) Pipilika |
| iii) Lac | c) Makshika |
| iv) Shadpada | d) Amarakusa |
| v) Silkworm | e) Yogayajna valkya |

138.

- | | |
|---------------|-------------------------------|
| i) Linnaeus | a) Natural History of Insects |
| ii) Fabricius | b) Arcana Entomologica |
| iii) Westwood | c) Indian Ants |
| iv) Donovan | d) Entomologia Systematica |
| v) Rothney | e) Systema Naturae |

139.

- | | |
|-------------------------------|--------------------------|
| i) Indian Thysanoptera | a) G.M. Das |
| ii) Tubulifera of India | b) R.N. Mathur |
| iii) Pests of Tea in NE India | c) Ayyar and Margabandhu |
| iv) Psyllidae of India | d) Sardara Singh |
| v) Bee Keeping in India | e) T.N. Ananthakrishnan |

140.

- | | |
|------------------------------------|-------------------------------|
| i) Periodical cicada | a) <i>Spoladea recurvalis</i> |
| ii) Painted lady butterfly | b) Coccinia |
| iii) <i>Dactylethrella candida</i> | c) <i>Tephrosia purpurea</i> |
| iv) <i>Lasioptera cephalandrae</i> | d) <i>Pyrameis cordui</i> |
| v) Leaf skeletoniser | e) Seventeen year locust |

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. (i) What is an artificial diet?
(ii) List the three types of insect diets.
(iii) Give the composition of any example.
(iv) Explain the role of artificial diet in entomological studies.

142. Explain briefly, the physiological changes in the integument of an insect at moult.

143. State the different aspects of thermoregulation in insects and bring out how insects adjust to the extremes, giving suitable examples?

144. (i) Define IPM. Explain how it differs from Integrated Pest Control.
(ii) Write any two equations for calculating Economic Injury levels.
(iii) Write two important detailed information that will be required for validation of IPM technologies.

145. (i) List the type of actions of insecticides that are mixtures of active substances.
(ii) Explain what are combination products or premixes.
(iii) Give two examples of each of these.

146. (i) What are invasive pest species?
(ii) Give three examples of introduced pests in India.
(iii) Explain one such hemipterous pest species giving its background, hosts, biology and at least two important management measures.