



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

Discipline : Entomology

Discipline Code : 10

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. Insect groups hitherto not known from India
 a) Sialoidea
 b) Zoraptera and Sialoidea
 c) Grylloblattodea + Zoraptera + Mantophasmatodea
 d) Raphidoidea and Embioptera
32. In India, the first Entomologist to be posted as "Entomologist to the Government of India" during the British Colonial regime is
 a) Dr. D.G. Koenig
 b) Lionel de Nice Velle
 c) Maxwell Lefroy
 d) Sir Ronald Ross
33. Avermectins are
 a) Octopamine receptor agonists
 b) Chloride channel activators
 c) Nicotine acetylcholine receptor agonist
 d) Sodium channel modulator
34. One of the serious endoparasite of mulberry silkworm is
 a) Indian uzifly *Exorista sorbillans* of Tachinidae
 b) *Exorista bombycis* of Tachinidae, Diptera
 c) *Exorista* spp. of Eulophidae of Hymenoptera
 d) *Exorista sorbillans* (Tachinidae: Diptera) on the pupae
35. Mango stem borer complex belonging to the genus *Batocera* in India and adjacent S.E. Asian countries comprises of
 a) Only *rufomaculata* DeGeer
 b) *rufomaculata*, *rubus*, *royilei* and *numetor*
 c) Only *rubus* (Linnaeus)
 d) Only *rufomaculata* (DeGeer)
36. In mulberry silkworm, the life cycle is completed in
 a) Larvae with four moults and in 6 to 8 weeks
 b) Larvae with six moults and in 6 to 8 weeks
 c) Pupal period of 10-12 days and in 4 to 6 weeks
 d) Larvae with eight moults and in 8 to 10 weeks
37. An insecticide of new chemical class of spirocyclic phenyl substituted tetronic acid and active against whiteflies and spider mites is
 a) Imidacloprid
 b) Spinosad
 c) Spirodiclofen
 d) Spiromesifen
38. Of the following, an insect demonstrated to show a hygrokinetic response with increased activity in moist air compared with dry air is
 a) Wireworms
 b) Locust
 c) Hydrophilid beetle
 d) Ephemeropteran nymph
39. A complex form of phototaxis occurring in a moving insect and receiving a constant visual stimulus is called as
 a) Kinesis
 b) Menotaxis
 c) Photokinesis
 d) Mechanophototaxis
40. Indian Tea Association started the entomological investigations in 1905 at
 a) Tocklai (Assam)
 b) UPASI, Valparai (Tamil Nadu)
 c) Kannykorien (Assam)
 d) Kannykorien (Tamil Nadu)
41. Androconia found in wings of certain insects are
 a) Specialized scales
 b) Bristles
 c) Spots
 d) Specialized glands
42. DDT was synthesized by
 a) Zeidler, 1874
 b) Paul Muller, 1939
 c) Schrader, 1941
 d) Aucante, 1954

43. In honey bee, brushes of stiff hairs are present in the inner surface of
- Basitarsus of all the three castes and these are useful for cleaning of all the parts and materials
 - Foretarsus of all the three castes and these are useful for cleaning of all the parts and materials
 - Tibiae of all the legs in workers and these are useful in collecting pollen
 - Abdominal segments 4 to 7 for the purpose of wax diffusion
44. Caudal breathing tube is the characteristic feature of
- Notonectidae
 - Nepidae
 - Corixidae
 - Naucoridae
45. Cells of haemolymph that take up foreign chemicals of high molecular weight
- Nephrocytes
 - Oenocytes
 - Phagocytes
 - Nidi cells
46. Bald brood is a diseased condition in honey bees associated with infection of
- Greater wax moth *Achroia grisella*
 - Lesser wax moth *Galleria mellonella*
 - Greater wax moth *Achroia innotata lankella*
 - Lesser wax moth *Achroia grisella*
47. The scientific name of the bee hunter wasp is
- Palarus orientalis*
 - Vespa cincta*
 - Vespa tropica haematoides*
 - Vespa orientalis*
48. Apneumone is produced by
- Host plant
 - Host insect
 - Dead organic matter
 - Parasitoid
49. Invaginations of integument in the head of an insect form
- Cibarium
 - Tentorium
 - Salivarium
 - Atrium
50. Haluthonde is a disease caused by a
- Rickettsiae in *Apis cerana indica*
 - Microsporidian in *Apis mellifera*
 - Nuclear polyhedrosis virus, also called Grasserie
 - Desonucleosis cytoplasmic polyhedrosis, also called as Grasserie
51. Johnston's organ is located in most of Pterygotes in
- Second antennal segment
 - Legs
 - Wings
 - Third antennal segment
52. Government of India through its GEAC approved Bt cotton hybrids for commercial cultivation in India for the first time in
- March 2002, under MOEF
 - March 2002, under Ministry of Agriculture
 - March 2003, under Ministry of Agriculture
 - March 2006, under MOEF
53. Kusmi and rangeeni cultures of lac insects are produced in the host plants
- Shorea oleosa* and *Zizyphus mauritiana*, respectively
 - Zizyphus mauritiana* and *Shorea oleosa*, respectively
 - Shorea oleosa* and *Butea monosperma*, respectively
 - Shorea robusta* and *Zizyphus mauritiana*, respectively
54. In case of lac insects, the host species for summer sustainability are
- Kusum for kusmi summer crop and Palas for rangeeni summer crop
 - Kusum for kusmi summer crop and *Ficus* spp. for rangeeni summer crop
 - Albizia lucida* for kusmi summer crop and Palas for rangeeni summer crop
 - Palas for kusmi summer crop and kusum for rangeeni summer crop
55. Of the following, the pest which feeds on the growing points of plants and thus retard the growth is
- Syllepta derogata* on cotton
 - Maruca vitrata* on red gram
 - Scelodonta strigicollis* on grapevine
 - Helicoverpa armigera* on chickpea
56. Speciation without geographic isolation results in
- Apomictic species
 - Parapatric species
 - Allopatric species
 - Palaeo species
57. In haemocoelic insemination, a special internal pouch for receiving sperms found in female is known as
- Mesospermalege
 - Spermatophore
 - Spermatheca
 - Bursa copulatrix

58. The fruit rust thrips infesting banana is
 a) *Panchetothrips indicus*
 b) *Helionothrips kadaliphilus*
 c) *Thrips florum*
 d) *Chaetanaphothrips signipennis*
59. Water dispersible granules differ from pelleted insecticides and are
 a) having particle size in a range of 0.25 mm to 2.38 mm in dia (usually 250-1250 microns)
 b) being impregnated or fused with toxicant and are flowables and without finely divided solids
 c) being dry flowables and dry formulations of particle size 0.25 mm to 2.38 mm, with finely divided solids that combine with suspending and dispersing agents
 d) being dry flowables and dry formulations, with finely divided solids that do not combine with suspending and dispersing agents
60. Lower and upper developmental thresholds for a species is respectively
 a) The temperature below which development stops and the temperature at which the rate of growth or development begins to decrease
 b) The temperature below which development stops and the temperature above which the rate of growth begins to decrease
 c) The temperature above which growth stops and the temperature below which the rate of growth begins to increase
 d) The temperature above which growth starts and the temperature above which the rate of growth begins to decrease
61. Niche of an organism refers to
 a) Physiological position
 b) Physical position
 c) Functional position
 d) Feeding position
62. *Sitophilus oryzae* lays eggs on
 a) Grain
 b) Frass
 c) Gunny bags
 d) Walls of container
63. In Embioptera, silk glands are situated on
 a) Mid-tarsus
 b) Hind-tarsus
 c) Fore-tarsus
 d) Abdomen
64. Grassy stunt virus disease of rice is transmitted by
 a) Gall midge
 b) Green leaf hopper
 c) Brown plant hopper
 d) White backed plant hopper
65. Indian Institute of Natural Resins and Gums was formerly known as, and belongs to
 a) Resin Research Institute, CSIR
 b) Indian Lac Research Institute, ICAR
 c) Indian Gum Research Institute, ICAR
 d) Gum & Resin Institute, CSIR
66. Japan has lifted in 2006, its two decade old ban on import of Indian mangoes on the condition that the fruits are subjected to
 a) Hot water treatment
 b) Irradiation
 c) Vapour heat treatment
 d) Fumigation
67. Various parts of the body increase in linear dimensions by a ratio, which is constant for a species is known as
 a) Pzibram law
 b) Bioclimatic law
 c) Dyar's law
 d) Gaia hypothesis
68. Which part of an insect moult does not occur during apolysis?
 a) Formation of new epicuticle
 b) Resorption of old endocuticle
 c) Formation of new quinone cross-linkages
 d) Activation of moulting fluid
69. During the process of light production, luciferin is converted to
 a) Adenyl oxyluciferin
 b) Adenyl epoxy luciferin
 c) Adenyl hydroxyluciferin
 d) Adenyl carboxyluciferin
70. Corium is a part of
 a) Elytra
 b) Tegmen
 c) Hemelytra
 d) Forewing
71. Spiracles are absent in
 a) Cecidomyid larvae
 b) Mycetophilid larvae
 c) Chironomid larvae
 d) Psycodid larvae
72. Internally foregut is lined with
 a) Taenidia
 b) Peritrophic membrane
 c) Epithelial membrane
 d) Intima
73. Number of abdominal legs in the mustard saw fly larvae is
 a) 2 pairs
 b) 3 pairs
 c) 8 pairs
 d) 10 pairs

74. Of the following, one pest of apple is
 a) *Sylepta lunalis*
 b) *Cydia hemidoxa*
 c) *Nodostoma subcostatum*
 d) *Eriosoma lanigerum*
75. Nozzle in which spray fluid is fed into air stream within the nozzle and splitted into spray droplets by the velocity of air is called
 a) Disc nozzle
 b) Annular nozzle
 c) Shear nozzle
 d) Low volume nozzle
76. Granular or pelleted insecticides have generally a size range from
 a) 0.25 to 2.38 mm or usually 250-1250 microns of which a range of 100-300 microns are referred to as microgranules
 b) 1250-2250 microns of which the range >300 are referred to as granules
 c) 100-300 microns of which the range <300 are referred to as granules
 d) 1250-2250 microns and those with the range of 100-300 are referred to as microgranules
77. Hypostomal bridge is part of the
 a) Sutures of frons and it is present in Hymenoptera and Coleoptera
 b) Sclerites of head and it is found in Diptera
 c) Sclerites of protocephalon and is retained in the gnathocephalon of all insects
 d) Sclerites of head only, in its posterior aspect where it is called epistomal suture
78. In storage godowns, where curative methods are more important, the 'minifume' is
 a) EDCT used at 24-32 kg/100 m³
 b) Ethylene dibromide developed as tablets and at a concentration of 56% and of 12 g
 c) Ethylene dibromide developed as tablets by CFTRI, Mysore
 d) Methyl bromide developed as tablets by CFTRI, Mysore at 2.5 to 3 kg/100 m³
79. The formulation with WDL means, and it is used when
 a) Water diluted liquid, used when the active ingredient is insoluble in either water or organic solvents
 b) Water dispersible liquid, used when the active ingredient is soluble in organic solvents and milled with a solid carrier
 c) Water dispensable liquid, used when the active ingredient is insoluble in organic solvents and milled with a solid carrier
 d) Water dispersible liquid, used when the active ingredient is insoluble in either water or organic solvents
80. Blister beetle and its product used in medicine are as follows
 a) *Mylabris* spp. and Cantharidin, and it is contained in the acrid oil excreted through the openings at the apex of legs
 b) *Meloe* and allantoin, and it is contained in the acrid oil excreted through the openings at the apex of legs
 c) *Mylabris* spp. and allantoin, which is used externally as a vesicant and counter irritant
 d) *Meloe* and *Mylabris* spp., and it is contained in the acrid oil excreted through the openings at the apex of legs
81. Froghoppers belong to the family
 a) Cercopsidae
 b) Amphibiidae
 c) Cicadellidae
 d) Cercopidae
82. Closely packed layer formed by tracheae at the back of the eye in many Lepidoptera is called
 a) Semper's cells
 b) Rhabdom
 c) Retinula
 d) Tapetum
83. Successful biological control of cassava mealy bug in Africa was contribution by
 a) Ray F. Smith
 b) Hans Herren
 c) C. Bushland
 d) Sweetman
84. The layer of egg that is formed when the egg is in the ovary itself
 a) Serosa
 b) Cement layer
 c) Chorion
 d) Yolk
85. Uncoupling of oxidative phosphorylation is the principal mode of action in the recently developed
 a) Pyrrole insecticides
 b) Organophosphates
 c) Synthetic pyrethroids
 d) Azadirachtin based insecticides
86. Spinosad as an insecticide is
 a) Derived from soil microorganisms and it is an acetylcholine receptor agonist similar to neonicotinoids
 b) An acetylcholine receptor agonist similar to neonicotinoids in the end result, but somewhat different from them
 c) A chloride channel inhibiting agent, affecting the GABA receptor
 d) A GABA gated chloride channel agonist and nerve impulses are then unable to travel down the chloride channel

87. Adikokinetic hormone is
- Peptide hormone
 - Steroid activated by a terpenoid
 - Sesquiterpenoid activated by a peptide
 - Peptide hormone induced by amino peptidase
88. Hexythiazox is a
- PTTH synthesis interfering non-specific growth regulator and kills the eggs before hatching
 - Non-specific growth regulator affecting the eggs before hatching and killing the adults too
 - Non-specific growth regulator, kills the eggs before mites hatch, also immature and adult mites are not killed
 - Interferes with PTTH synthesis and production of ecdysone and thus a non-specific growth regulator
89. Of the following, example of quinoxaline organothiophosphate is
- Pirimiphos methyl
 - Diazinon
 - Fenitrothion
 - Quinalphos
90. Nontoxic to bees and decompose in water to yield fumigant vapour is characteristic of
- Propoxur
 - All dithiocarbamates
 - Dazomet
 - Dazomet (propoxur RTU)
91. Which of the following is correct?
- 1914 - Melander - San Jose Scale - lime sulphur
 - 1914 - Melander - San Jose Scale - hydrogen cyanide
 - 1914 - Melander - California Red Scale on Citrus - lime sulphur
 - 1916 - Quayle – California Red Scale - lime sulphur
92. The following are all examples of insecticides banned in India
- Aldrin, aldicarb, endrin, propoxur
 - Aldrin, benzene hexachloride, dieldrin, ethylene dibromide
 - Aldrin, dieldrin, endrin, propoxur
 - Benzene hexachloride, endrin, dieldrin
93. Some of the insecticides of restricted use in India are
- Monocrotophos (banned for agriculture), endosulfan (banned in Kerala state)
 - Fenthion (banned for vegetables), endosulfan (banned in Kerala state)
 - Monocrotophos (banned for vegetables), endosulfan (banned in Kerala state)
 - Fenthion and diazinon (banned for vegetables)
94. *Acerophagus papayae* is a parasite deployed for the biological control of
- lac insect parasites as hyperparasite
 - Papaya mealy bug *Paracoccus marginatus*
 - Papaya mealy bug *Phenacoccus papayae*
 - Apple wooly aphid *Icerya purchasi*
95. Examples of internal feeder + external feeder, respectively, occurring on stored cereals
- Sitophilus oryzae* + *Sitotroga cerealella*
 - Sitophilus oryzae* + *Lasioderma serricorne*
 - Callosobruchus oryzae* + *Callosobruchus chinensis*
 - Rhyzopertha dominica* + *Phthorimaea operculella*
96. *Glyphodes pulveruntalis* is a pest of
- Cucurbits, bores stems and is Crambidae: Lepidoptera
 - Mulberry, bores stems and is Crambidae: Lepidoptera
 - Cucurbits, folds leaves and buds and is a Glyphidae: Lepidoptera
 - Mulberry, folds leaves and buds, and is a Crambidae: Lepidoptera
97. The banana rhizome weevil is
- Odoiporus longicollis*, it oviposits in root stock or leaf sheath, feeds on rhizomes
 - Odoiporus longicollis*, it oviposits in pseudostem, feeds on pseudostem
 - Cosmopolites sordidus*, it oviposits on leaf sheath and feeds on pseudostem
 - Cosmopolites sordidus*, it oviposits in root stock/leaf sheath just above ground level and feeds on rhizomes
98. The National Institute of Communicable Diseases is located at
- Delhi and its old name is Malaria Institute of India
 - Kasauli and its old name is Malaria Survey of India
 - Tejpur and its old name is King Institute of Preventive Medicine
 - Kolkata and its old name is Institute of Nuclear Medicine and Allied Sciences
99. Of the following, who were both forest entomologists in India prior to independence?
- M.L. Roonwal and E.P. Stebbing
 - A.D. Imms and E.P. Stebbing
 - R.N. Mathur and E.P. Stebbing
 - C.F.C. Beeson and R.N. Mathur

100. Of the following, who is associated with Arcana Entomologica?
- Dr. J.G. Koenig
 - Fabricius
 - Donovan
 - Westwood
101. Of the following, with C=cost of control; P=marker value of crop; D_1 and D_2 =damage functions, the EIL is given by the two equations, namely
- $EIL = C/PD_1$; $EIL = C/PD_2$
 - $EIL = C \times PD_1$; $EIL = C/PD_1$
 - $EIL = C \times PD_2$; $EIL = C/PD_2$
 - $EIL = C - PD_2$; $EIL = C/PD_1$
102. The first BPH resistant variety of rice is
- Mudgo and it is resistant to all populations of BPH
 - IR26 and it is resistant to all populations of BPH
 - Mudgo and it was not resistant to populations from India
 - Mudgo and it was resistant to populations from India
103. Grapevine stem borer and stem girdler are respectively
- Sthenias grisator* (Cerambycidae), *Scelodonta strigicollis* (Chrysomelidae)
 - Sthenias grisator* and *Coelosterna scabrator* (both Cerambycidae)
 - Coelosterna scabrator* and *Sthenias grisator* (both Cerambycidae)
 - Coelosterna scabrator* (Chrysomelidae), *Sthenias grisator* (Cerambycidae)
104. Of the following, the correct combination is
- Potato - *Cylas formicarius* - Apionidae; Sweet potato - *Phthorimaea operculella* - Gelechiidae
 - Sweet potato - *Omphisa anastomosalis* - Pyralidae; potato - *Phthorimaea operculella* - Gelechiidae
 - Potato - *Epilachna vigintioctopunctata* - Coccinellidae; brinjal - *Epilachna vigintioctopunctata* - Coccinellidae
 - Sweet potato - *Epilachna vigintioctopunctata* - Coccinellidae; potato - *Aspidomorpha miliaris* - Chrysomelidae
105. Of the following, the singing insect is
- Cybister japonicus*
 - Gryllotalpa gryllotalpa*
 - Katydid *Gampsocleis gratiosa* Tang
 - Katydid *Gampsocleis gratiosa* Brunner
106. Of the following, example of a persistent pest is
- Fruit borers on brinjal and okra
 - Aphids on mustard
 - Grasshoppers on rice
 - Scales and mealy bugs on horticultural crops
107. Systems analysis and modeling for prediction of damage and yield loss depends on the following
- Qualitative techniques, understanding interactions, in components of cropping system, relationship with management practice
 - Qualitative and quantitative techniques, understanding interactions, in components of crop-pest system, relationship with management practice
 - Qualitative and quantitative techniques, understanding interactions, in components of crop-pest system, and relationship with management practice is not involved
 - Qualitative and quantitative techniques, understanding interactions, relationship with management practice but components of crop-pest system is not involved
108. FIK and RTU are respectively used with regard to
- Flying insect killer sprays and ready to use aerosols
 - Fly instant killer aerosols and ready to use sprays
 - Flying insect killer aerosols and ready to use sprays
 - Flying insect killer aerosols and ready total use sprays
109. Removing of excess water from the extra cellular compartment in insect is known as
- Diuresis
 - Osmotic homeostasis
 - Osmoregulation
 - Antidiuresis
110. Apple woolly aphid causes damage to
- Root
 - Stem
 - Root and stem
 - Inflorescence
111. By addition of two toxic compounds, when combined toxicity is increased more than the combined effect, the effect is termed as
- Synergism
 - Antagonism
 - Additive effect
 - Potentiation

112. Insect order with panarpooid origin
 a) Siphonoptera
 b) Odonata
 c) Strepsiptera
 d) Siphunculata
113. When only last pair of abdominal spiracles are open, it is termed as
 a) Peripneustic
 b) Propneustic
 c) Amphipneustic
 d) Metapneustic
114. One Galleria unit represents the activity of JH which results in
 a) Half of the (50%) treated insects retain pupal characters at the sight of treatment
 b) Half of the (50%) treated insects retain larval characters at the sight of treatment
 c) Complete (100%) of the treated insects retain pupal characters at the sight of treatment
 d) Complete (100%) of the treated insects retain larval characters at the sight of treatment
115. Apterygotes that do not have entognathus mouth parts
 a) Diptura
 b) Protura
 c) Thysanura
 d) Collembola
116. Blood of insects differs from human blood due to presence of high amount of
 a) Haemoglobin
 b) Pigments
 c) Free amino acids
 d) Globulin proteins
117. Among the following, chitin synthesis inhibitor of plant origin is
 a) Muscarone
 b) Plumbagin
 c) Nuvaluron
 d) Canvanine
118. A hormone mainly responsible for melanization of cuticle in Diptera is
 a) Juvenile hormone
 b) Ecdysone
 c) Proctolin
 d) Bursicon
119. The pure culture is called
 a) Axenic
 b) Xenic
 c) Synxenic
 d) Gnotobiotic
120. Prothoracic glands persist even in adults of
 a) Cockroaches
 b) Beetles
 c) Moths and butterflies
 d) Silverfish
121. "Probits" used in bioassay were first termed so by
 a) Bliss
 b) Panse & Sukhatme
 c) Finney
 d) Fisher
122. Rotenone interferes with electron transport between
 a) Reduced cyt. a and cyt. a₃
 b) Cyt. a and reduced NAD
 c) Cyt. c and reduced FAD
 d) Cyt. a₃ and oxygen
123. Which of the following insects is a root borer of sugarcane?
 a) *Chilo tumidicostalis*
 b) *Chilo infuscatellus*
 c) *Raphimetopus ablutellus*
 d) *Emmalocera depressella*
124. Commercially used non-ester type JH mimic
 a) Methoprene
 b) Hydroprene
 c) Pyriproxyfen
 d) Flufenxuron
125. Regeneration of broken legs in nymphal stage is a characteristic feature of
 a) Isoptera
 b) Orthoptera
 c) Phasmida
 d) Lepidoptera
126. Insect classification presently followed is mostly based on the classification given by
 a) Comstock and Comstock
 b) Handlirsch modified by Imms
 c) Linnaeus
 d) Tillyard
127. 'Propodeum' in Hymenoptera is formed by the fusion of
 a) Pro thorax and meta thorax
 b) Meta thorax and abdomen
 c) Meso thorax and meta thorax
 d) Thorax and abdomen
128. Maximum Residual Limits of pesticides are fixed by the
 a) Food and Drug Administration Authority
 b) Codex Alimentarius Commission
 c) Environmental Protection Agency
 d) World Health Organization

129. In which one of the larvae of endopterygotes, compound eyes are noticed?

- a) Lepidoptera
- b) Mecoptera
- c) Hymenoptera
- d) Diptera

130. Snowdrop lectin, which is effective against aphids is obtained from

- a) *Phaseolus vulgaris*
- b) *Galanthus nivalis*
- c) *Lycopersicon peruvianum*
- d) *Solanum berthaltii*

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. Match each behaviour with its function

- | | |
|-------------------------------|--------------------------|
| i) Trophallaxis in ants | a) Location of food |
| ii) Waggle dance in honey bee | b) Alarm |
| iii) Hissing in cockroach | c) Courtship |
| iv) Light flash in firefly | d) Dispersal |
| v) Stridulation in cricket | e) Nest mate recognition |

132. Match the insecticide with their site of action

- | | |
|-----------------|---|
| i) Fipronil | a) Nicotinic acetylcholine receptors |
| ii) Pyrethroids | b) Acetyl cholinesterase inhibitor |
| iii) Spinosad | c) Sodium channel modulator |
| iv) Carbamate | d) Chloride channel activator |
| v) Avermectins | e) GABA gated chloride channel antagonist |

133.

- | | |
|--------------------|-----------------------------------|
| i) Scaly leg mite | a) <i>Boselaphus tragocamelus</i> |
| ii) Mange mite | b) <i>Knemidocoptes mutans</i> |
| iii) Nilgai | c) <i>Hyalomma aegyptium</i> |
| iv) Sheep ear tick | d) <i>Sarcoptes scabiei</i> |
| v) Cattle tick | e) <i>Otobius megnini</i> |

134.

- | | |
|-----------------------------|--------------------------------------|
| i) Red spider mite | a) <i>Steneotarsonenus spinki</i> |
| ii) Yellow mite | b) <i>Tetranychus neocaledonicus</i> |
| iii) Sweet potato rust mite | c) <i>Calacarus carinatus</i> |
| iv) Purple mite | d) <i>Phytotarsonemus latus</i> |
| v) Rice tarsonemid mite | e) <i>Oxypleurites convolvuli</i> |

135.

- | | |
|---|----------------------------------|
| i) Tea mosquito bug | a) Sandalwood tree |
| ii) Coffee borer (<i>Zeuzera coffeae</i>) | b) <i>Azadirachta indica</i> |
| iii) Teak borer | c) <i>Aleterogystia cadambae</i> |
| iv) Teak defoliator | d) <i>Leptocyba invasa</i> |
| v) Eucalyptus gall wasp | e) <i>Hyblaea purea</i> |

136.

- | | |
|-------------------------------|--------------------------|
| 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. Ananthkrishnan |

137.

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

138.

- | | |
|---------------------|-----------------|
| i) Book lice | a) Mecoptera |
| ii) Caddis flies | b) Siphunculata |
| iii) Scorpion flies | c) Psocoptera |
| iv) Biting lice | d) Mallophaga |
| v) Sucking lice | e) Trichoptera |

139.

- | | |
|------------------|---|
| i) Spines | a) Macrotrichia, multicellular, specialized |
| ii) Setae | b) Unicellular |
| iii) Acanthae | c) Subcellular |
| iv) Microtrichia | d) Multicellular movable |
| v) Spurs | e) Multicellular immovable |

140.

- | | |
|---|-----------------------|
| i) Two or more distinct forms of larvae | a) Thelytoky |
| ii) Reproduction without fertilization | b) Paedogenesis |
| iii) Reproduction with two or more offsprings from single egg | c) Parthenogenesis |
| iv) Reproductive capacity in the immature stage | d) Polyembryony |
| v) Reproduction without fertilization producing only females | e) Hypermetamorphosis |

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. (a) What is the scientific name of rice gall midge and write its family and order? How much yield loss is caused by this pest in rice?
(b) When was the first occurrence of its biotype noticed and where? How many biotypes of this pest are known, so far? Write in detail about these biotypes.
142. Give five examples of formulations of mixtures of active substances or premixes or combination products which include cypermethrin or deltamethrin. Give three advantages of such mixtures. List and explain briefly the four types of action in these.

143. Explain, how the chloride channel and sodium channel modulators affect the neurophysiology of insects? What is the role of GABA in this reaction? Give two examples in each of these modulators. How these differ from cholinesterase inhibition?

144. What are the kinds of insect parasitisms, relevant to biological control? Name five families of insect parasitoids. Name five important species of insect parasitoids used in augmentative biological control.

145. What are the steps involved in establishing an IPM programme? What does IPM mean with regard to use of insecticides? State who are the stakeholders in India for the promotion of validated IPM technologies and explain their role?

146. List the causes for insects assuming pest status. Explain three of these with a suitable example each. Give the names of a pest each of (i) Hymenoptera, (ii) Causing damage in adult stage in Lepidoptera.