



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

Discipline : Agricultural Chemicals

Discipline Code : 01

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. rufipogon*
 - 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

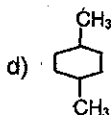
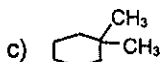
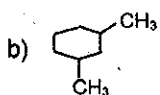
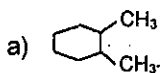
25. All weather phenomena like rain, fog and mist occur in
- Troposphere
 - Mesosphere
 - Ionosphere
 - Ozonosphere
26. Which of the following elements is common to all proteins and nucleic acids?
- Sulphur
 - Magnesium
 - Nitrogen
 - Phosphorous
27. Silt has intermediate characteristics between
- Sand and loam
 - Clay and loam
 - Loam and gravel
 - Sand and clay
28. Certified seed is produced from
- Nucleus seed
 - Breeder seed
 - Foundation seed
 - Truthful seed
29. Seedless banana is an
- Autotriploid
 - Autotetraploid
 - Allotriploid
 - Allotetraploid
30. Which one of the following is used to test the goodness-of-fit of a distribution?
- Normal test
 - t-test
 - Chi-square test
 - F-test

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. HBr reacts with $\text{CH}_2 = \text{CH}-\text{OCH}_3$ under anhydrous conditions at room temperature. What will be the products?
- $\text{CH}_3\text{CHO} + \text{CH}_3\text{Br}$
 - $\text{BrCH}_2\text{CHO} + \text{CH}_3\text{OH}$
 - $\text{BrCH}_2 - \text{CH}_2 - \text{OCH}_3$
 - $\text{CH}_3 - \text{CHBr} - \text{OCH}_3$
32. The term 'anomer of glucose' refers to
- Isomers of glucose that differ in configuration at carbon C-2
 - A mixture of (D)-glucose and (L)-glucose
 - Enantiomers of glucose
 - Isomers of glucose that differ in configuration at carbon C-1

33. Which of the following statements is true?
- H_3PO_3 is a stronger acid than H_2SO_3
 - In aqueous media HF is a stronger acid than HCl
 - HClO_4 is a weaker acid than HClO_3
 - HNO_3 is a stronger acid than HNO_2
34. A proton is exposed to a magnetic field strength of 23500 Gauss. Its precessional frequency will be
- 22.0 MHz
 - 42.6 MHz
 - 60.0 MHz
 - 100 MHz
35. Which of the following is not an amino acid?
- Serine
 - Proline
 - Tryptophan
 - Thyroxine
36. The ^{13}C -NMR of an unknown compound shows 4 absorptions. The ^1H -NMR also shows 4 absorptions. Identify the compound:



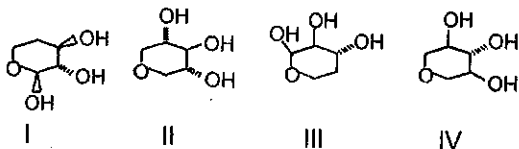
37. Why the O-H absorption of CH_3OH is a broad band in IR spectra?
- Rotational energy level broaden the absorption
 - Hyperconjugation resonance broaden the absorption
 - Resonance broaden the absorption
 - Hydrogen bonding broaden the absorption
38. Which of the following compounds is aromatic?



39. Which one of the following reactions correctly represent reduction?

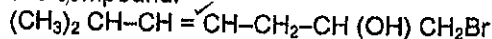
- a) $\text{Cr}^{+3} + 3\text{e}^- \rightarrow \text{Cr}(\text{s})$
 b) $\text{Cr}^{+3} \rightarrow \text{Cr}(\text{s}) + 3\text{e}^-$
 c) $\text{Cr}(\text{s}) \rightarrow \text{Cr}^{+3} + 3\text{e}^-$
 d) $\text{Cr}(\text{s}) + 3\text{e}^- \rightarrow \text{Cr}^{+3}$

40. Which of the following compounds are identical?



- a) I and II
 b) II and IV
 c) III and IV
 d) I and III

41. How many stereoisomers are possible for this compound:



- a) 2
 b) 3
 c) 4
 d) 5

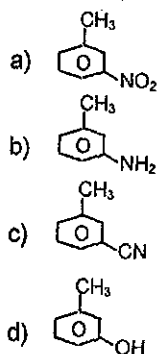
42. How many isomeric forms of dinitrobenzoic acid exist?

- a) 3
 b) 4
 c) 5
 d) 6

43. The reason that the chemical shift for an alkyne hydrogen atom is downfield from an alkene hydrogen atom is that

- a) The alkyne carbon has a greater relative electro-negativity due to the fact that it is sp hybridized
 b) There are 2π bonds for resonance in the alkyne versus only one π bond in the alkene
 c) The anisotropic effect of π bond in alkyne bond shields the alkyne hydrogen atoms better than the double bond in alkene shields the hydrogen atoms
 d) All of the above

44. Which of the following compounds will show greatest downfield shift for the CH_3 absorption in NMR?



45. A tripeptide is composed of L-valine, L-tyrosine and L-alanine. How many isomeric tripeptides will be possible?

- a) 3
 b) 4
 c) 6
 d) 8

46. Which size range will have maximum number of granules per unit mass?

- a) 30/60
 b) 40/60
 c) 60/80
 d) 100/200

47. Which of the following is not a macronutrient?

- a) Nitrogen
 b) Sulfur
 c) Manganese
 d) Calcium

48. In a chemical equilibrium



How equilibrium can be shifted to left?

- a) Increase H_2 , increase CO
 b) Decrease H_2 , increase H_2O
 c) Increase CO_2 , decrease CO
 d) Decrease CO_2 , decrease H_2O

49. A basic solution can be defined as one

- a) $[\text{H}_3\text{O}]^+$ is not present
 b) $[\text{H}_3\text{O}]^+$ is equal to $[\text{OH}]^-$
 c) $[\text{H}_3\text{O}]^+$ is less than $[\text{OH}]^-$
 d) $[\text{H}_3\text{O}]^+$ is greater than $[\text{OH}]^-$

50. Nanoformulation of a pesticide is said to be more effective because it has

- a) Higher water/solvent solubility
 b) Large surface area
 c) Higher LD_{50} value
 d) Greater stability

51. Fumigant EDB stands for

- a) 1,1-ethylene-2,2-dipyridylum chloride
 b) 1,2-dibromo ethane
 c) 1,2-dibromo ethene
 d) 1,1-dibromo ethane

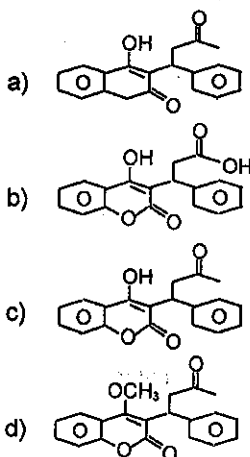
52. Bordeaux mixture has following composition

- a) $[\text{Ca}(\text{OH})_2]_2 \cdot \text{CuSO}_4$
 b) $[\text{Ca}(\text{OH})_2]_3 \cdot \text{CuSO}_4$
 c) $[\text{Ca}(\text{OH})_2] \cdot \text{CuSO}_4$
 d) $(\text{CaO})_3 \cdot \text{CuSO}_4$

53. Which among the following is not banned for use as pesticide in agriculture?

- a) EDB
 b) Ethyl parathion
 c) Methyl parathion
 d) Endrin

54. Structure of Warfarin is



55. Which of the following is not made up of 'isoprene'?

- Rubber
- Carotene
- Vitamin A
- Vitamin D

56. Which among the following is not a monoterpene?

- Geranial
- Limonene
- Sylvestrene
- Farnesene

57. Colour of anthocyanin pigments is affected by

- No. and position of OH group
- No. and position of OCH₃ group
- pH
- All of the above

58. Which statement is true with respect to nucleosides?

- They are usually stable towards acid hydrolysis
- They are usually stable towards alkaline hydrolysis
- They are prone to both acid and alkaline hydrolysis
- They are stable to both acid and alkaline hydrolysis

59. Which is the correct statement with respect to nucleic acids?

- Phosphate group is present between two sugar moieties
- Phosphate group connects sugar and base
- Phosphate group is terminal and is attached to base
- Phosphate group is terminal and is attached with sugar

60. Biomagnification is the characteristic of

- Organophosphate pesticides
- Organochlorine pesticides
- Organocarbamate pesticides
- Inorganic pesticides

61. Ziram belongs to which class of fungicides?

- Dithiocarbamic acid
- Thiocarbamic acid
- Thiourea
- Sulfide

62. Which among the following rays can pass through paper, but not through sheet of aluminium?

- Gamma rays
- Alpha rays
- Beta rays
- Beta and gamma rays

63. Among the following acids, which has lowest pK_a?

- CH₃COOH
- HCOOH
- CH₃CH₂COOH
- CH₃CH₂CH₂COOH

64. Among the following, which is most basic?

- Benzyl amine
- Aniline
- Acetanilide
- p-nitroaniline

65. The temperature levels in a nuclear reactor are maintained by the use of

- Shielding
- Coolants
- Moderators
- Control rods

66. The order of least dangerous to most dangerous rays is

- Gamma, beta, alpha
- Gamma, alpha, beta
- Alpha, beta, gamma
- Beta, gamma, alpha

67. Extrusion is a technique for preparation of

- EC
- Granule
- WP
- Dust formulation

68. An emulsion is lost when the oil droplets started to

- Cream
- Coalesce
- Float
- Disperse

69. Particle size of driftless dust should be
- 20-30 μm
 - 10-20 μm
 - 5-10 μm
 - 1-5 μm
70. In microencapsulation, chemical is enclosed in
- Monomeric envelope
 - Dimeric envelope
 - Trimeric envelope
 - Polymeric envelope
71. Choose the non-ionic surfactant:
- Tween
 - Dreft
 - Teepol
 - Dispersol
72. Which one of the following is the active insecticide principle of Derris plant?
- Nimbin
 - Nimbidin
 - Azadirone
 - Rotenone
73. Which one of the following fertilizers is least hygroscopic?
- Ammonium sulphate
 - Calcium ammonium nitrate
 - Diammonium phosphate
 - Urea
74. Use of phosphogypsum has been found useful for the amelioration of
- Sub-soil acidity
 - Sodic soils
 - Saline soils
 - Acid sulphate soils
75. Adsorbed H^+ and Al^{3+} are largely responsible for
- Soil sodicity
 - Soil acidity
 - Neutrality
 - Cation exchange capacity
76. How many natural pyrethroids were isolated from *Chrysanthemum cinerariaefolium*?
- 4
 - 6
 - 8
 - 10
77. Which one is a rice herbicide?
- Butachlor
 - Atrazine
 - Alachlor
 - Trifluralin
78. Phosphorous containing pesticides may be analyzed with GLC coupled with which detector?
- ECD
 - UV-VIS
 - RI
 - NPD
79. Vitamin D₂ is also called as
- Tocopherol
 - Cyanocobalamin
 - Nicotinamide
 - Ergocalciferol
80. Glucose on oxidation with HNO_3 gives
- Sorbitol
 - Saccharic acid
 - Gluconic acid
 - Oxalic acid
81. When benzaldehyde is heated with strong alkali solution, it undergoes simultaneous oxidation and reduction – it is known as
- Perkin's reaction
 - Benzoin condensation
 - Cannizzaro reaction
 - Claisen reaction
82. Which is the IUPAC name for
- $$(\text{CH}_3)_2 - \text{C} = \text{CH} - \text{CH}_2 - \text{CH}_2 - \underset{\text{OH}}{\text{CH}} - \text{CH}_3$$
- 6-methyl-5-hepten-2-ol
 - 1-methyl-2-hepten-5-ol
 - 1-methyl-2-hepten-6-ol
 - 1,1-dimethyl-2-hepten-5-ol
83. Aniline on reaction with CS_2 gives
- o-bromoaniline
 - 2,4-dibromoaniline
 - m-bromoaniline
 - Diphenyl thiourea
84. Which of the following monosaccharides is a pentose?
- Glucose
 - Fructose
 - Arabinose
 - Galactose
85. Anisotropic effect is related with
- IR
 - UV
 - Mass
 - NMR
86. A chemical reaction is at equilibrium when
- Reactants are completely transformed into products
 - The rate of forward and backward reactions are equal
 - Formation of products is minimised
 - Equal amounts of reactants and products are present

87. According to Le Chatelier's principle, adding heat to a solid and liquid in equilibrium will cause the
- Amount of solid to decrease
 - Amount of liquid to decrease
 - Temperature to rise
 - Temperature to fall
88. Tyndal effect is shown by
- Colloidal solution
 - Osmotic solution
 - Hypertonic solution
 - Isotonic solution
89. Colloids can be purified by
- Peptization
 - Coagulation
 - Dialysis
 - Bredic Arc method
90. The critical temperature of water is higher than that of O_2 because the H_2O molecule has
- Fewer electrons than O_2
 - Two covalent bonds
 - V-shape
 - Dipole moment
91. A gas will approach ideal behaviour at
- Low temperature and low pressure
 - Low temperature and high pressure
 - High temperature and low pressure
 - High temperature and high pressure
92. Which gas is necessary for GC-MS analysis?
- Hydrogen
 - Air
 - Acetylene
 - Helium
93. Insulin is a compound under the class of
- Amino acid
 - Alkaloid
 - Protein
 - Terpenoid
94. In which of the following compounds does ionic bonding predominate?
- NH_4Cl
 - CO_2
 - CH_4
 - $LiBr$
95. Which of the following is an example of cycloaddition reaction?
- Perkin reaction
 - Michael addition
 - Reimer-Tiemann reaction
 - Diels-Alder reaction
96. Enantiomers are
- Stereoisomers having non-identical mirror configurations
 - Stereoisomers that do not have non-identical mirror image configurations
 - Stereoisomers having a mirror plane if symmetry
 - Achiral stereoisomers
97. The 1H -NMR spectrum of diethylether shows
- Two peaks, one a triplet, the other a quartet
 - Two peaks, one a triplet, the other a doublet
 - Four peaks, all doublets
 - Four peaks, all triplets
98. Malathion is oxidised to a product by carboxyesterases
- Isomalathion
 - Malathion α -monoacid
 - Malathion β -monoacid
 - Malaoxon
99. A compound which contains two ring structures having one common carbon atom is known as
- Spiro compound
 - Non-polar compound
 - Interstitial compound
 - Inner compound
100. Which of the following is the most toxic pesticide?
- Endosulfan
 - Aldicarb
 - Monocrotophos
 - Phorate
101. Value of coupling constant (J-value) for orthocoupled aromatic protons in 1H NMR is
- 9-10 Hz
 - 7-8 Hz
 - 2-4 Hz
 - 1-2 Hz
102. When the following reaction equation is properly balanced, the number of moles of O_2 will be
- $$C_3H_8 + O_2 \rightarrow CO_2 + H_2O$$
- 1.5 moles
 - 3.0 moles
 - 3.5 moles
 - 5.0 moles
103. How many milliliters of 2 M NaCl solution are required to make 1 liter of 0.4 M NaCl solution?
- 0.2 ml
 - 200 ml
 - 500 ml
 - 800 ml

104. The half-life of francium-212 is 19 minutes. How many minutes will it take for 1 gram of this isotope to decay to 0.125 grams?
- 4.75 minutes
 - 9.50 minutes
 - 38.0 minutes
 - 57.0 minutes
105. Which of the following was the first synthetic pyrethroid known?
- Permethrin
 - Cypermethrin
 - Deltamethrin
 - Allethrin
106. Monocrotophos is synthesized using
- Michaelis-Arbuzov reaction
 - Perkow reaction
 - Reimer-Tieman reaction
 - Bayer condensation
107. Which one of the following is a non-ester pyrethroid?
- Allethrin
 - Cypermethrin
 - Fenvalerate
 - Ethofenprox
108. Pymetrozine is a/an
- Antifeedant
 - Repellent
 - Sterilant
 - Insect growth regulator
109. Tebufenozide is an example of
- J.H. Mimic
 - Ecdysone agonist
 - Chitin synthesis inhibitor
 - Repellent
110. Which one of the following fungicides is not systemic in nature?
- Vitavax
 - Thiram
 - Benlate
 - Topsin
111. Buprofezin is an example of
- Herbicide
 - Chitin synthesis inhibitor
 - Insect growth regulator
 - Fungicide
112. 2-PAM is used as
- Synergist
 - Herbicides safener
 - Antidote
 - Insect growth regulator
113. Recently, which of the following pesticides in Kerala became suspect when linked to a series of abnormalities noted in local children?
- Propanil
 - Ethion
 - Endosulfan
 - Diuron
114. Paclobutrazol is a/an
- Plant growth regulator
 - Insect growth regulator
 - Synergist
 - Insect moulting hormone
115. What is the phenomenon called when a pest population that is resistant to one pesticide also becomes resistance to other chemically related pesticides?
- Cross resistance
 - Synergism
 - Pesticide tolerance
 - Multiple resistance
116. Why is it generally preferred to apply pesticides in early morning or in the evening?
- Wind velocity is higher, thus crop canopy penetration is better
 - Insect pests are more active at these times
 - Coverage will be better when leaves are wet from dew
 - Wind velocity is usually lower thus drift is reduced
117. Cloquintocet-mexyl is a
- Herbicide
 - Herbicide safener
 - Plant growth regulator
 - Proherbicide
118. Which one of the following minerals is an expanding type of clay mineral?
- Montmorillonite
 - Kaolinite
 - Allophane
 - Talc
119. In a nanoformulation of a pesticide, the particle size range between
- 0.1-100 nm
 - 500-1500 nm
 - 2000-3000 nm
 - 0.1-100 mm
120. How many optical and geometrical isomers are theoretically possible for the synthetic pyrethroid – fluvalinate?
- 4
 - 8
 - 12
 - 16

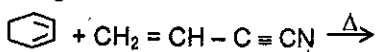
121. In ^{13}C NMR, the carbonyl carbon ($\text{C}=\text{O}$) shows a signal at

- δ 1-10
- δ 20-50
- δ 51-80
- δ 100-150

122. Jasmolin-II, one of the insecticidal constituents of pyrethrum flower, is the ester of

- Chrysanthemic acid and jasmolone
- Pyrethric acid and jasmolone
- Non-pyrethric acid and jasmolone
- Dichlorovinyl cyclopropane carboxylic acid and jasmolone

123. What is the major product obtained from the following reaction



-
-
-
-

124. Which desiccant can be used for drying acetone?

- Calcium chloride
- Potassium carbonate
- Sodium sulphide
- Calcium carbonate

125. How many double bonds are present in β -carotene molecule?

- 7
- 9
- 11
- 13

126. A 50 mg Iodine-131 used in a hospital was kept for 32.4 days. If the half-life of Iodine-131 is 8.1 days, then how many mg remains?

- 1.7 mg
- 3.12 mg
- 6.25 mg
- 8.2 mg

127. How many signals (different δ values) will be given by



- 2
- 3
- 4
- 6

128. An insecticide named after a Nobel Laureate

- Endrin
- Dieldrin
- Quinalphos
- Bordeaux mixture

129. C:N ratio in humus is

- 1:10
- 10:1
- 20:1
- 30:1

130. In the mass spectrum, the base peak is

- Molecular ion peak
- Most stable peak
- Most reactive fragment ion
- Most intense peak

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) Ocimene | a) Rose oil |
| ii) Menthol | b) Basil oil |
| iii) Citral | c) Lemon oil |
| iv) Geraniol | d) Mint oil |
| v) Alphapinene | e) Turpentine oil |

132.

- | | |
|--------------------------|-----------------------|
| i) Antifreezing agent | a) Butylacetate |
| ii) Antioxidant | b) Isoamylacetate |
| iii) Odour masking agent | c) Diatomaceous earth |
| iv) Anticaking agent | d) Hydroxyquinone |
| v) Antifoaming agent | e) Ethylene glycol |

133.

- | | |
|-------------------|-------------------------------|
| i) Dimilin | a) Anti-juvenile hormone |
| ii) Precocene-I | b) Ecdysone inhibitor |
| iii) Tebufenozide | c) Chitin synthesis inhibitor |
| iv) Grandlure | d) Aggregation pheromone |
| v) Methoprene | e) Juvenile hormone mimics |

134.

Class of compound	Name of the compound
i) Alkaloid	a) Sucrose
ii) Terpenoid	b) Alanine
iii) Carbohydrate	c) Tocopherol
iv) Amino acid	d) Menthol
v) Vitamin	e) Nicotine

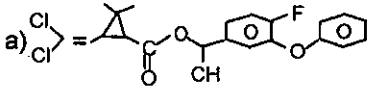
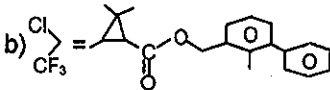
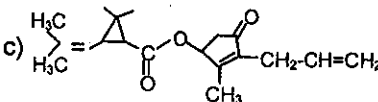
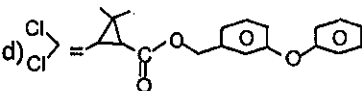
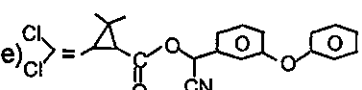
135.

Class of compound	Name of the compound
i) Biopesticide	a) Carbofuran
ii) Neo-nicotinoid	b) Fenvalerate
iii) Carbamate	c) Azadirachtin
iv) Synthetic pyrethroid	d) Mancozeb
v) Dithiocarbamate	e) Imidachloprid

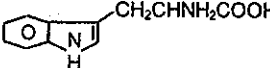
136.

i) Calcium	a) Component of chlorophyll
ii) Iron	b) A cofactor for an enzyme in chlorophyll biosynthesis
iii) Magnesium	c) Serves as growth hormones
iv) Nitrogen	d) Component of chlorophyll, protein and nucleic acids
v) Zinc	e) Formation of cell wall, maintenance of membrane integrity

137. Match the following pyrethroids with the structure

i) Bifenthrin	a) 
ii) Permethrin	b) 
iii) Cypermethrin	c) 
iv) Cyfluthrin	d) 
v) Allethrin	e) 

138. Match the amino acids with their names

i) Tryptophan	a) $\text{CH}_3\text{CHOHCHNH}_2\text{COOH}$
ii) Glutamine	b) $(\text{CH}_3)_2\text{CHCH}_2\text{CHNH}_2\text{COOH}$
iii) Threonine	c) $\text{NH}=\text{C}-\text{NH}(\text{CH}_2)_3\text{CHNH}_2\text{COOH}$
iv) Leucine	d) $\text{NH}_2\text{COCH}_2\text{CH}_2\text{CHNH}_2\text{COOH}$
v) Arginine	e) 

139.

i) $E = hc/\lambda$	a) Aufbau principle
ii) $\Delta x, \Delta p = \frac{h}{4\pi}$	b) Energy of a quantum
iii) 4d orbitals are filled after 5s orbitals	c) Aldehydes containing no α -hydrogen
iv) Claisen Schmidt reaction	d) Heisenberg's uncertainty principle
v) Cannizzaro's reaction	e) α, β -unsaturated compounds

140.

i) Free radical	a) $\text{CHCl}_3 + \text{NaOH} \rightarrow$
ii) Carbene	b) $\text{CH}_4 \xrightarrow{h\nu}$
iii) Carbanion	c) $\text{CH}_3\text{I} + \text{KOH} \rightarrow$
iv) Carbocation	d) $(\text{CH}_3)_3\text{C-Br} + \text{NaOH (aq)}$
v) Nucleophile	e) $\text{CH}_3\text{CHO} + \text{NaH}$

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) Briefly state the structural features of natural pyrethrins isolated from *Chrysanthemum cinerariaefolium*.

(b) What happens when Pyrethrin-I and Jasmolin-II are hydrolyzed with alkali? Write down the structures of the products.

142. Why agrochemicals are formulated? Mention the sequence involved in their preparation. Write down the characteristic of solvents used in pesticide formulation.

143. Botanical pesticides are being promoted as good alternatives to chemical pesticides. Why?

144. What is the difference between a systemic and non-systemic fungicide? List the advantages and limitations of systemic fungicides.

145. What is insecticide resistance? How are synergists useful in combating development of resistance in insect pests?

146. Outline the synthesis of butachlor from diethylaniline.