Post Graduate School
Indian Agricultural Research Institute, New Delhi

Examination for Admission to Ph.D. Programme 2013-2014

Discipline : Agricultural Physics

Discipline Code : 05 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. 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 B_{12}?
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 F_1 plant?
a) Homozygous
b) Heterozygous
c) Hemizygous
d) Nullizygous

21. The highest per capita consumption of flowers in the world is in
a) The USA
b) India
c) Switzerland
d) The Netherlands

22. Which of the following is a very rich source of betalain pigment?
a) Radish
b) Beet root
c) Carrot
d) Red cabbage

23. Dog ridge is
a) Salt tolerant rootstocks of mango
b) Salt tolerant rootstocks of guava
c) Salt tolerant rootstocks of grape
d) Salt tolerant rootstocks of citrus

24. Which of the following micronutrients are most widely deficient in Indian soils?
a) Zinc and boron
b) Zinc and iron
c) Zinc and manganese
d) Zinc and copper

25. Which of the following fertilizers is not produced in India?
a) DAP
b) Urea
c) Muriate of potash
d) TSP

26. What is the estimated extent of salt affected soils in India?
a) 5.42 mha
b) 7.42 mha
c) 11.42 mha
d) 17.42 mha

27. Which of the following is not a feature of watershed?
a) Hydrological unit
b) Biophysical unit
c) Socio-economic unit
d) Production unit

28. Correlation coefficient 'r' lies between
a) 0 and 1
b) -1 and 1
c) -1 and 0
d) 0 and ∞

29. For the data 1, -2, 4, geometric mean is
a) 2
b) 4
c) $-\frac{7}{3}$
d) -2

30. The relationship between Arithmetic mean (A), Harmonic mean (H) and Geometric mean (G) is
a) $G^2=AH$
b) $G=\sqrt{A+H}$
c) $H^2=GA$
d) $A^2=GH$

PART – II (Subject Paper)

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

31. The chemical potential of a system at constant temperature and pressure is given by
a) $\frac{\partial U}{\partial n_i}$
b) $\frac{\partial F}{\partial n_i}$
c) $\frac{\partial H}{\partial n_i}$
d) $\frac{\partial G}{\partial n_i}$

where n_i is the number of moles of the i^{th} species of chemicals.

32. Entropy of a system at 0^oK is
a) Negative
b) Positive
c) Zero
d) Infinite

33. In electron capture process, the nuclear charge Z changes to
a) Z+1
b) Z-1
c) Z+2
d) X-2

34. The half-life of radioactivity is given by
a) $\frac{2}{\lambda}$
b) $\frac{\ln 2}{\lambda}$
c) $\frac{\log 2}{\lambda}$
d) $\frac{0.5}{\lambda}$

35. In a Wilson cloud chamber, the sign of charge of an ion is determined by
a) Length of the track
b) Thickness of the track
c) Curvature of the track in a magnetic field
d) Straightness of the track without magnetic field

36. Proportional counter measures
a) Number of ions
b) Charges of the ions entering the counter
c) Volt-ampere characteristics of the working gas
d) A current pulse proportional to the primary ionization

37. The method of carbon dating works because
a) C^{14} has higher atomic weight than C^{12}
b) C^{14} is a stable isotope
c) C^{14} content of the dead bodies increases with time
d) A dead body ceases to receive C^{14} from the surroundings

38. In soil consistency, the liquid limit of soil is also termed as
a) Lower plastic limit
b) Upper plastic limit
c) Shrinkage limit
d) Plasticity index

39. A gas behaves as an ideal gas at
a) Very low pressure and high temperature
b) High pressure and high temperature
c) High pressure and low temperature
d) Low pressure and low temperature

40. First low of thermodynamics indicates that
a) Reducing pressure on liquids lowers the boiling point
b) Evaporation is a cooling process
c) A gas is heated when compressed
d) There is a mechanical equivalent of heat

41. Which of the following forces is strongest among atoms in aqueous environment?
a) Covalent
b) London-dispersion
c) Vander-Waal
d) Dipole-Dipole

42. A radioactive nucleus A finally transforms with a stable nucleus B. Then A and B can be
a) Isobars
b) Isotones
c) Isotopes
d) Isotherm

43. When a nucleus with atomic number Z and mass number A, undergoes a radioactive decay process
a) Both Z and A will decrease, if it is α-decay
b) Z will decrease but A will not change, if the process is β-decay
c) Z and A will remain unchanged, if it is γ-decay
d) All of the above

44. The mass number of a nucleus is equal to the number of
a) Electron it contains
b) Protons it contains
c) Neutrons it contains
d) Nucleons it contains

45. Bond angle between H and O atoms in water molecule is
a) 105^o
b) 109^o
c) 120^o
d) 180^o

46. Water has maximum density at
a) 273^oK
b) 277^oK
c) 287^oK
d) 298^oK

47. Hydrogen bond is formed between
a) Oxygen and hydrogen atoms of the same water molecule
b) Oxygen atoms of neighbouring water molecules
c) Hydrogen atoms of neighbouring water molecules
d) Oxygen and hydrogen atoms of two neighbouring water molecules

48. The atmospheric windows are the bands in which the radiations are
a) Strongly absorbed by the atmosphere
b) Strongly reflected by the atmosphere
c) Strongly transmitted by the atmosphere
d) Strongly scattered by the atmosphere

49. The infrared radiations useful for remote sensing of vegetation lies in the wavelength band of
a) 200-300 μm
b) 14-100 μm
c) 3-14 μm
d) 0.7-3.0 μm

50. Radar systems of remote sensing operates in
a) Visible region
b) Near infrared region
c) Thermal infrared region
d) Microwave region

51. Spectrally resolved images in hyper spectral imaging are presented as data cube which is three dimensional representations of data. Three dimensions are
a) Two distances and one wavelength
b) Distance, time and wavelength
c) Two wavelength and one distance
d) Distance, wavelength and intensity

52. Actively growing vegetation will appear with dark tones in Thematic Mapper (TM) Bands 1,2,3 of landsat data. However, vegetation will be darker in TM bands 1 and 3 because the chlorophyll of actively growing vegetation absorbs the wavelengths corresponding to
a) Blue and red
b) Green only
c) Blue and green
d) Green and red

53. A camera with a red filter attached to the lens has been loaded with black and white film and a photograph of a red rose was taken. What shade of black to white (grey tones) might the image of rose be?
a) Black
b) White
c) Grey towards black
d) Grey towards white

54. In remote sensing, a 7 bit resolution may refer to
a) Spatial resolution
b) Spectral resolution
c) Radiometric resolution
d) Temporal resolution

55. Electromagnetic waves are produced by
a) A static charge
b) A moving charge
c) An accelerating charge
d) Oscillating chargeless particle

56. Normalized Difference Vegetation Index to monitor crop health is determined from
a) Reflectance in green band alone
b) Reflectance in blue and red bands
c) Reflectance in green and infrared bands
d) Reflectance in red and near infrared bands

57. Training data set is used to identify desired features in remote sensed image in
a) Classified methods used manually
b) Supervised classification method
c) Unsupervised classification method
d) Self-learning image analysis method

58. Which of the following is not an example of spatial data?
a) Lines showing the route of linear objects
b) Points showing location of discrete objects
c) Polygons showing the area occupied by a particular land use or variable
d) Times of particular events

59. Which of the following types of sensors uses a highly focused beam of light?
a) Sonar
b) Ground penetrating radar
c) Lidar
d) Side looking radar

60. What does GPS stands for?
a) Global potential satellite
b) Geographical position system
c) Geodial position satellite
d) Global positioning system

61. Which process requires water to gain heat energy from the environment?
a) Evaporation
b) Condensation
c) Infiltration
d) Precipitation

62. Which atmospheric effect causes the sky to appear blue?
a) Rayleigh scattering
b) Compton scattering
c) Mie scattering
d) Archimedes scattering

63. Which temperature zone of earth's atmosphere contains the most water vapour?
a) Mesosphere
b) Stratosphere
c) Thermosphere
d) Troposphere

64. The measure of intensity of heat is
a) Solar radiation
b) Atmospheric pressure
c) Humidity
d) Temperature

65. Vertical movement of air and heat from earth's surface to the atmosphere is
a) Advection
b) Conduction
c) Convection
d) Sublimation

66. Most of the solar radiation absorbed by earth's surface is later radiated back into space as which type of electromagnetic radiation?
a) X-ray
b) Infrared
c) Ultraviolet
d) Radio-waves

67. The equator is warmer than the poles. Why do the surface winds not blow directly from the poles to the equator?
a) Because the oceans deflect the air flow
b) Because the hot air rises
c) Because the mountain ranges deflect the air flow
d) Because the earth rotates

68. In which part of the earth's atmosphere ozone is found to be comparatively abundant?
a) Troposphere
b) Stratosphere
c) Mesosphere
d) Thermosphere

69. Which zone of earth's atmosphere contains maximum water vapour?
a) Mesosphere
b) Thermosphere
c) Stratosphere
d) Troposphere

70. If the temperature of India is lowered by $20^{o}C$ all the year round, you will experience
a) Mediterranean climate
b) Warm temperate oceanic climate
c) Cool temperate oceanic climate
d) Cold temperate climate

71. A sub-tropical region is situated in high pressure trade wind belt where the winds blow from land to the sea. Then this region is unerringly situated in a
a) Hot desert climate
b) Temperate desert climate
c) Westerly climate
d) Warm temperate oceanic climate

72. How many true soil horizons you can identify in the Gangetic plane?
a) Zero
b) One
c) Two
d) Three

73. Extremely sensitive atmosphere pressure recording instrument is called
a) Hygrometer
b) Microbarovariograph
c) Aneroid barometer
d) Thermograph

74. Precipitation in the Mediterranean type of climate is
a) Reliable
b) Unreliable
c) Extremely unreliable
d) Extremely reliable

75. During cloud formation, for condensation to occur, the
a) Cloud Condensation Nuclei (CCN) should be adequate in number
b) Cloud Condensation Nuclei (CCN) should be minimum in number
c) Cloud Condensation Nuclei (CCN) are not required
d) Cloud Condensation Nuclei (CCN) should be below a critical value

76. In a remote sensing image, a raster file contain data in the form of
a) Text format
b) Image format
c) Grid format
d) Data format

77. Growing Degree Days (GDD) is calculated as
a) $\frac{\text{Max. Temp. + Min. Temp.}}{2}$ - Base Temp.
b) $\frac{\text{Max. Temp. - Min. Temp.}}{2}$ - Base Temp.
c) $\frac{\text{Max. Temp. + Min. Temp.}}{2}$ + Base Temp.
d) $\frac{\text{Max. Temp. - Min. Temp.}}{2}$ + Base Temp.

(where, *Max.= Maximum, Min.=Minimum, Temp.=Temperature*)

78. The elements of weather and climate are
a) Different
b) Same
c) Mostly same
d) Mostly different

79. Troposphere extends upto
a) 5-10 km from the surface of earth
b) 10-16 km from the surface of earth
c) 10-20 km from the surface of earth
d) 15-20 km from the surface of earth

80. The atmospheric window through which most of earth's radiation goes out to the outer space is
a) 6-8 μm
b) 8-10 μm
c) 8-12 μm
d) 10-14 μm

81. In northern hemisphere Westerlies blow from
a) N-W
b) S-W
c) N-E
d) S-E

82. Anticyclonic wind in northern hemisphere blows
a) Radially outward
b) Clockwise spiralling outward
c) Anti-clockwise spiralling outward
d) Anti-clockwise spiralling inward

83. Surface winds around low pressure centers in the Northern hemisphere generally move in the direction
a) Counter clockwise, towards the center of low pressure
b) Clockwise, towards center of low pressure
c) Counter clockwise, away from center of low pressure
d) Clockwise, away from the center of low pressure

84. If a kg of air at constant pressure could hold 12 g of water vapour at a certain temperature, but contains only 8 g at that temperature, the relative humidity is
a) 33.33%
b) 50%
c) 66.66%
d) 75%

85. Maximum light intensity at which respiration rate equals photosynthesis rate is called
a) Extinction coefficient
b) Saturation light intensity
c) Photoperiodism
d) Compensation point

86. Differences between the maximum and minimum temperature of a day is called
a) Daily mean temperature
b) Diurnal temperature variation
c) Diurnal range
d) Temperature lag period

87. Under which atmospheric conditions will water most likely evaporate at the fastest rate?
a) Hot, humid and calm
b) Hot, dry and windy
c) Cold, humid and windy
d) Cold, dry and calm

88. A landmass near sea gets heated by the morning sun on a clear, calm day. After few hours, a surface wind develops. The direction of this wind will be
a) Horizontally from land to water
b) Horizontally from water to land
c) Vertically upward on land and water both
d) Vertically downward on land and water both

89. Which of the following weather change usually occurs when the difference between the air temperature and the dew point temperature decreases?
a) The amount of cloud cover decreases
b) The probability of precipitation decreases
c) The relative humidity increases
d) The pressure increases

90. During which process does heat transfer occur because of density differences?
a) Conduction
b) Radiation
c) Convection
d) Reflection

91. Which of the following surfaces absorb maximum insolation?
a) Light coloured and smooth surface
b) Light coloured and rough surface
c) Dark coloured and smooth surface
d) Dark coloured and rough surface

92. The land surfaces on earth heat up more rapidly than water surfaces because
a) Less of earth's surface is covered by land than water
b) Radiation penetrates to greater depths in land than in water
c) More energy from sun falls on land than on water
d) Land has lower specific heat than water

93. Most water vapour enters the atmosphere by the process of
a) Convection and radiation
b) Condensation and precipitation
c) Evaporation and transpiration
d) Erosion and conduction

94. Widely spaced isobars indicate a
a) Steep change in pressure
b) Weak change in pressure
c) No change in pressure
d) Steep change in temperature

95. The air near the center of a low pressure system usually will
a) Evaporate into a liquid
b) Reverse direction
c) Rise and form clouds
d) Get condensed at the surface

96. Which of the following processes does not take place at the soil surface?
a) Infiltration
b) Run-off
c) Evaporation
d) Transpiration

97. Which is the correct statement?
a) Soils from different parent materials have different structure
b) Soils having different structures are at different temperatures
c) Soils having different temperatures show different permeability
d) Soils having different texture have different field capacity and permanent wilting point

98. As compared to mulched surface, the heat flow into the bare soil surface is
a) Higher
b) Lower
c) Equal
d) Zero

99. The measurement range of tensiometer generally covers the following percent of amount of plant available water
a) 0-20%
b) 20-50%
c) 50-75%
d) 0-100%

100. The matric suction which can be created using a pressure membrane apparatus is
a) Less than 10 kPa
b) Less than 30 kPa
c) Less than 100 kPa
d) More than 100 kPa

101. The porosity of a soil mass is 32.10%. What is its void ratio expressed in percent?
a) 47.28
b) 52.38
c) 67.90
d) 72.80

102. In a soil plant system, water and nutrient rise due to capillary action. If suddenly the acceleration due to gravity is reduced to half, the capillary rise will be
a) Double
b) Half
c) Remain same
d) Becomes zero

103. The equation representing the flow of water in saturated soil is
a) Poiseuille's equation
b) Bernoulli's equation
c) Darcy's equation
d) Navier-Stokes equation

104. Water use efficiency of a crop variety growing in a particular soil and climatic condition is
a) A constant
b) Variable, since crop production depends on the total water used
c) Difficult to quantify how the total water is partitioned for processes of run-off, drainage, evaporation during delivery, evaporation from soil and transpiration from plants and weeds
d) It is a blind man's guess

105. Different soil horizons in the same profile generally
a) Exhibit the same type of soil structure
b) Exhibit the same extent and type of cleavage
c) Exhibit the same nature of aggregates resulting from cleavage
d) Do not exhibit the same type of soil structure

106. State the physical quantity represented by $L^2T^2\theta^{-1}$, where θ is the dimension for temperature
a) Thermal capacity of the body
b) Thermal conductivity
c) Specific thermal capacity
d) Specific latent heat of vaporization

107. Which of the following statement is wrong?
a) Infiltration rate is lower if the soil is dominant in montmorillonite clay mineral
b) Infiltration rate is higher in course textured and well aggregated soils
c) Vegetative cover reduces infiltration
d) Impervious subsoil layer reduces infiltration

108. Clay is defined as the fraction of soil particles less than 0.05 mm in
a) USDA (United States Department of Agriculture)
b) ISSS (International Society of Soil Science)
c) USPRA (United States Public Roads Administration)
d) DIN (German Standards)

109. The property of thixotropy is exhibited by
a) Sandy soils
b) Loamy soils
c) Clay soils
d) Organic soils

110. Blocky-type structure occurs most commonly
a) In the A horizon
b) In the B horizon
c) In both A and B horizons
d) Throughout the soil profile

111. In Bingham flow, the material remains rigid until
a) The shear stress exceeds the threshold value
b) The shear stress is below the threshold value
c) The shear strain exceeds the threshold value
d) The shear strain is below the threshold value

112. In ice structure, water molecules tend to form
a) Hexagonal pattern
b) Tetrahedral pattern
c) Octahedral pattern
d) Triangular pattern

113. Dielectric constant of water in dry soil ranges between
a) 2-5
b) 10-20
c) 20-30
d) 60-80

114. If the soil water energy is expressed on weight basis, the potential will be in
a) Joules/kg
b) Meters
c) Bars
d) Independent of the units of water content

115. Tensiometers are effective to record soil matric suction up to
a) 0.33 bars
b) 0.75 bars
c) 0.85 bars
d) 1.00 bars

116. Darcy's law is valid
a) For all conditions of liquid flow in porous media
b) At high flow velocities
c) When hydraulic gradients are much in excess of unity
d) Only when the flow is laminar

117. The advantage of using diffusivity rather than hydraulic conductivity under unsaturated conditions is due to the fact that
a) Its range of variation is more in a given wetness range
b) Its range of variation is less in a given wetness range
c) The variation is uniform throughout the wetness range
d) It varies in the same proportion as the hydraulic conductivity

118. Hydrodynamic dispersion occurs due to
a) Concentration gradients
b) Stationary state of soil's liquid phase
c) Microscopic non-uniformity of flow velocity
d) Inhomogeneously distributed solutes

119. Intrinsic permeability is an exclusive property of
a) Porous medium
b) Fluid
c) Both porous medium and fluid
d) Neither porous medium nor fluid

120. Redistribution process of soil water
a) Ceases after soil attains field capacity
b) Occurs between saturation and filed capacity
c) Occurs only after soil attains field capacity
d) is a continuous process

121. Irrigation scheduling is done using infrared thermometer through the concept of
a) Growing degree days
b) Stress degree days
c) Soil moisture deficit
d) Plant water potential

122. Specific heat of soil constituents increases in the order of
a) Iron oxide, sand, clay, humus
b) Clay, humus, sand, iron oxide
c) Humus, clay, sand, iron oxide
d) Sand, iron oxide, humus, clay

123. The law relating heat flux to temperature gradient is known as
a) Stefan's law
b) Fourier law
c) Boltzman law
d) Newton's law

124. If the thermal conductivity of top layer of soil of thickness L_1 is K_1 and that of bottom layer of thickness L_2 is K_2, then the heat flux of the compound layer of thickness $L_1 + L_2$ will be modified by
a) $K_1 + K_2$
b) $L_1K_1 + L_2K_2$
c) $K_1/L_1 + K_2/L_2$
d) $K_1K_2 / (L_1K_2+L_2K_1)$

125. The greatest difference in the composition of soil air from the external atmosphere is in the concentration of
a) N_2
b) O_2
c) CO_2
d) Water vapour

126. The radioisotope commonly used in the study of ground water is
a) Tritium
b) Phosphorous
c) Chloride
d) Nitrogen

127. The efficiency of water use in crop production is influenced by
a) Climatic factors
b) Soil factors
c) Nutrition factors
d) All the above factors

128. A shift of a breakthrough curve to its left indicates
a) That the incoming liquid is interacting with the soil
b) The process of anion exclusion
c) That the sample is not completely saturated
d) A piston flow

129. Thermocouple psychrometer is used to measure soil moisture potential in the range of about
a) 0 to 2 bars
b) 2 to 50 bars
c) More than 50 bars
d) 50 to 100 bars

130. The actual range of specific water capacity $C_\theta = \frac{-d\theta}{d\psi}$ depends upon
a) Wetness range, texture and hysteresis effect of soil
b) Concentration of electrolytes
c) Cation exchange capacity
d) pH of the soil solution

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 the quantities with their units

Quantities	Units
i) Reynold's number	a) dyne-sec/cm^2
ii) Viscosity	b) cm/sec
iii) Hydraulic conductivity	c) Dimensionless
iv) Intrinsic permeability	d) Nt/m^2
v) Soil water potential per unit volume	e) cm^2

132. Match the instruments with the measurements they are used for

i) Quantum sensor	a) Soil moisture potential
ii) Triaxial apparatus	b) Soil moisture
iii) Neutron meter	c) PAR
iv) Lux meter	d) Shear strength
v) Thermocouple psychrometer	e) Visible light intensity

133. Match the problem soils with the possible reclamation methods

i) Saline soils	a) Liming
ii) Alkali soils	b) Afforestion/Terracing
iii) Sandy soils	c) Leaching
iv) Ravine/sloppy soils	d) Addition of bentonite
v) Acid soils	e) Addition of gypsum

134.

i) Primary mineral	a) Dolomite
ii) Secondary mineral	b) Essential mineral
iii) Calcium carbonate	c) Quartz
iv) Feldspar S	d) Silica
v) Aluminosilicates	e) Layers in most clay minerals

135. In the Thornthwaite's classification of climate, match the symbols with humidity province and characteristic vegetation

i) A	a) Semi-arid steppe
ii) B	b) Humid forest
iii) C	c) Wet rainforest
iv) D	d) Arid desert
v) E	e) Sub -humid grassland

136. Match the units with the quantities for which they are used

i) amu	a) Magnetic moment of a proton
ii) Bohr magneton	b) Nuclear activity
iii) Fermi	c) Nuclear mass
iv) Nuclear magneton	d) Magnetic moment of an electron
v) Curie	e) Nuclear distance

137. Rank the types of energy according to their quality

Energy type	Quality grading
i) Heat energy	a) I
ii) Electricity	b) II
iii) Light	c) III
iv) Gravitational	d) IV
v) Microwave	e) V

138.

i) Savanna	a) Dry climate
ii) Steppes	b) High pressure centre
iii) Tundra	c) Tropical rain climate
iv) Anticyclone	d) Excessive dryness
v) Foehn	e) Polar climate

139.

i) Coriolis	a) Climate classification
ii) Köppen	b) Earth's rotational effect
iii) Stefan	c) Sensible/latent heat
iv) Bowen	d) Diffusion
v) Fick	e) Temperature

140. Match the following seasons/place with weather systems/climate

i) November to January	a) Western disturbances
ii) October to May	b) Northwesters
iii) July to September	c) Northeast monsoon
iv) April to May	d) Maritime
v) Nicobar islands	e) Southwest monsoon

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 freshly prepared radioactive source of half-life of 1 hour emits radiation of intensity which is 32 times, the permissible safe limit. What will be the minimum time after which it would be possible to work safely with the source?

142. (a) What do you mean by the terms tension and suction? What are the factors responsible for soil moisture tension?
(b) Convert 0, 0.33, 15 and 31 bar of soil water tension to height of water column in cm.

143. Calculate the steady state flux and volume of discharge of water from a two layered soil column having 12 cm water load above it. The thickness of the top and bottom layers are 10 cm and 20 cm and the hydraulic conductivity of those layers are 10 and 2 cm/hr, respectively. The soil column has cross sectional area of 100 cm^2.

144. Differentiate between cyclones and anticyclones.

145. Draw radiation spectrum and indicate wavelength for various bands and the radiometer for measurement of that band.

146. What are reversible and irreversible processes? Give some example of each.