38

QUESTION PAPER SERIES CODE
A

Registration No. : | | | | | |

Centre of Exam. : _____

Name of Candidate : _____

Signature of Invigilator

ENTRANCE EXAMINATION, 2018

M.Sc. ENVIRONMENTAL SCIENCES

[Field of Study Code : SESM (223)]

Time Allowed : 3 hours

Maximum Marks : 100

INSTRUCTIONS FOR CANDIDATES

Candidates must read carefully the following instructions before attempting the Question Paper :

(i) Write your Name and Registration Number in the space provided for the purpose on the top of this Question Paper and in the Answer Sheet.

(ii) **Please darken the appropriate Circle of Question Paper Series Code on the Answer Sheet.**

(iii) The Question Paper is divided into two parts : Part—A and Part—B. Both parts have multiple-choice questions. All answers are to be entered in the Answer Sheet provided with the Question Paper for the purpose. The answer to each question is to be indicated by darkening the appropriate choice [i.e., (a), (b), (c) or (d)] in the circles, against each question number on the Answer Sheet.

(iv) Part—A consists of 45 questions. Answer any 30 questions. Each question carries 1 mark.

(v) Part—B consists of 95 questions. Answer any 70 questions. Each question carries 1 mark.

(vi) Calculators/Log Tables may be used.

(vii) Answer written by the candidates inside the Question Paper will not be evaluated.

(viii) Pages at the end have been provided for Rough Work.

(ix) Return the Question Paper and Answer Sheet to the Invigilator at the end of the Entrance Examination. **DO NOT FOLD THE ANSWER SHEET.**

INSTRUCTIONS FOR MARKING ANSWERS

1. Use only Blue/Black Ballpoint Pen (do not use pencil) to darken the appropriate Circle.
2. Please darken the whole Circle.
3. Darken ONLY ONE CIRCLE for each question as shown in example below :

Wrong	Wrong	Wrong	Wrong	Correct
● ⓑ ⓒ ●	⊘ ⓑ ⓒ ⓓ	⊘ ⓑ ⓒ ⊘	◉ ⓑ ⓒ ●	ⓐ ⓑ ⓒ ●

4. Once marked, no change in the answer is allowed.
5. Please do not make any stray marks on the Answer Sheet.
6. Please do not do any rough work on the Answer Sheet.
7. Mark your answer only in the appropriate space against the number corresponding to the question.
8. **Ensure that you have darkened the appropriate Circle of Question Paper Series Code on the Answer Sheet.**

PART—A

Answer *any* **thirty** questions

1. The coordinates of the focus of parabola $x^2 = -4ay$ are

(a) (0, 0)

(b) $(-a, 0)$

(c) $(0, -a)$

(d) $(0, a)$

2. If $I = \int_0^2 \frac{dx}{4 + x^2}$, the value of I is

(a) $\pi/2$

(b) $\pi/4$

(c) $2\pi/9$

(d) $\pi/8$

3. Electromagnetic wave consists of periodically oscillating electric and magnetic vectors

(a) in mutually perpendicular planes but vibrating with a phase difference of $\pi/2$

(b) in mutually perpendicular planes but vibrating with a phase difference of π

(c) in mutually perpendicular planes but vibrating in phase

(d) in randomly oriented planes but vibrating in phase

4. A vessel of volume $V = 30$ litres contains ideal gas at the temperature 0 °C. After a portion of the gas has been let out, the pressure in the vessel decreased by $\Delta P = 0{\cdot}78$ atm (the temperature remaining constant). The density of ideal gas is $1{\cdot}3$ g/l under normal conditions. The mass of the released gas is

(a) ~ 100 g

(b) ~ 60 g

(c) ~ 40 g

(d) ~ 30 g

5. A motorboat going downstream overcome a raft at a point X; $t = 60$ min later it turned back and after some time, passed the raft at a distance $l = 6$ km from the point X. Assuming the duty of the engine to be constant, the flow velocity would be

(a) 3 km/hr

(b) 6 km/hr

(c) 4 km/hr

(d) The flow velocity cannot be calculated from the given information

6. If equations

$$x + \sqrt{3}y + 4 = 0 \text{ and } x\cos\theta + y\sin\theta = p$$

are identical, then the values of θ and p are

(a) 180° and 4, respectively

(b) 90° and 2, respectively

(c) 240° and 2, respectively

(d) 240° and 4, respectively

7. The area of a parallelogram, whose adjacent sides are represented by the vectors $(3\hat{i} + \hat{j} - 2\hat{k})$ and $(\hat{i} - 3\hat{j} + 4\hat{k})$, is equal to

(a) $10\sqrt{3}$ sq. units

(b) 19 sq. units

(c) $20\sqrt{3}$ sq. units

(d) 10 sq. units

8. Which of the following statements is correct about the function $f(x) = |x|$?

(a) $f(x)$ is continuous and derivable for all x

(b) $f(x)$ is continuous and derivable at $x = 0$

(c) $f(x)$ is derivable but not continuous at $x = 0$

(d) $f(x)$ is continuous but not derivable at $x = 0$

9. The unit of electric conductivity is

(a) henry per metre

(b) siemens per metre

(c) faraday per metre

(d) henry

10. The value of the determinant

$$\begin{vmatrix} a-b-c & 2a & 2a \\ 2b & b-c-a & 2b \\ 2c & 2c & c-a-b \end{vmatrix}$$

is equal to

(a) zero

(b) $a^3 + b^3 + c^3 - 3abc$

(c) $(a + b + c)^3$

(d) $a^3 + b^3 + c^3 + 3abc$

11. The value of

$$\cos\left(\sin^{-1}\frac{3}{5} + \sin^{-1}\frac{5}{13}\right)$$

is

(a) $\frac{33}{65}$

(b) $\frac{34}{65}$

(c) $\frac{16}{65}$

(d) $\frac{48}{65}$

12. Water-loving colloids are called as

(a) hydrophilic

(b) hydrophobic

(c) dispersion

(d) flocculants

13. _____ is/are called Tsunami.

(a) Big tide created by rotation of moon, sun and earth

(b) Waves created by storms

(c) Large wave usually formed by under sea earthquake and landslide

(d) All of the above

14. Which is ***not*** a type of glacier?

(a) Valley glacier

(b) Ice sheet

(c) Ice cap

(d) Sea ice

15. _____ is/are categorized under hydro-meteorological hazards.

(a) Rainfall

(b) Greenhouse gases

(c) Wildfire, flood and hurricane

(d) Earthquake and volcanoes

16. The phosphate in water sample will be determined by adding HNO_3 and ammonium molybdate and phosphate is indicated by bright _____ precipitate layer of _____.

(a) blue, molybdenum blue

(b) green, ammonium heptamolybdate

(c) yellow, ammonium phosphomolybdate

(d) pink, ammonium permanganate

17. The water table contours show the direction of movement of groundwater at _____ to contours.

(a) parallel

(b) perpendicular

(c) oblique

(d) No relation

18. The most important source for the latent heat of evaporation is

(a) cloud

(b) fog

(c) ocean

(d) atmosphere

19. Soil amendments applied to irrigated lands alter _____ properties of the soil.

(a) biological

(b) physical and chemical

(c) biological and chemical

(d) radiological and physical

20. Which of the following statements about ionic compounds is false?

(a) They generally consist of ions

(b) They generally have high melting point and boiling point

(c) They are good conductors at room temperature

(d) They are generally soluble in polar solvents

21. Which of the following represents correct form of van der Waals equation?

(a) $PV = nRT$

(b) $\left(P + \frac{a}{V^2}\right)(V - b) = RT$

(c) $\left(P + \frac{an^2}{V^2}\right)(V + b) = RT$

(d) $\left(P + \frac{a}{V^2}\right)(V - b) = nRT$

22. The osmotic pressure of a 5% solution of cane sugar at 288 K, $R = 0 \cdot 082$ lit atm K^{-1} mol^{-1} will be _____.

(a) ~ 34·5 atm

(b) ~ 3·45 atm

(c) ~ 345 atm

(d) 1 atm

23. What is the degree of freedom F at the triple point in the phase diagram of water system?

(a) 1

(b) 2

(c) 3

(d) 0

24. Which of the following is ***not*** true for an electrochemical cell?

(a) It converts chemical energy into electrical energy

(b) It converts electrical energy into chemical energy

(c) It is based on redox reaction which is spontaneous

(d) A salt bridge or porous pot is used

25. In the equation $\Delta S_{system} + \Delta S_{surrounding} \geq 0$, signs = and > indicate

(a) reversible and irreversible process, respectively

(b) irreversible and reversible process, respectively

(c) reversible and non-feasible process, respectively

(d) non-feasible and irreversible process, respectively

26. Calamine is an ore of which of the following?

(a) Calcium

(b) Magnesium

(c) Zinc

(d) Lead

27. Which of the following is known as Teflon?

(a) Polytetrafluoroethylene

(b) Polypropylene

(c) Polytetrafluoroethane

(d) Polypropylene fluoride

28. At ordinary conditions, which of the following halogens is a solid?

(a) F_2

(b) I_2

(c) Br_2

(d) Cl_2

29. Dry ice is known as

(a) snow

(b) solid helium

(c) solid carbon dioxide

(d) solid nitrogen

30. Which of the following is a solid aerosol?

(a) Cloud

(b) Fog

(c) Mist

(d) Smoke

31. CH_3COOH is also known as

(a) methanoic acid

(b) ethanoic acid

(c) propanoic acid

(d) butanoic acid

32. Sea urchin belongs to which of the following classes?

(a) Asteroidea

(b) Ophiuroidea

(c) Echinoidea

(d) Crinoidea

33. Blood passes from the right atrium into right ventricle through one-way valve called as

(a) bicuspid valve

(b) pulmonary valve

(c) aortic valve

(d) tricuspid valve

34. Which of the following connects the cerebral hemispheres?

(a) Corpus callosum

(b) Infundibulum

(c) Hypothalamus

(d) Anterior commissure

35. The roots which develop from any portion of plant except radical are known as

(a) taproots

(b) stilt roots

(c) fibrous roots

(d) adventious roots

36. In human body, which of the following muscle types are striated containing sarcomeres that are packed into regular bundles?

(a) Only skeletal muscles

(b) Skeletal and cardiac muscles

(c) Skeletal and smooth muscles

(d) Cardiac and smooth muscles

37. Cobalt-containing vitamin is

(a) vitamin B_2

(b) vitamin B_4

(c) vitamin B_6

(d) vitamin B_{12}

38. If a turgid plant cell is placed in a solution that has more solutes, it exerts

(a) lower osmotic pressure

(b) higher osmotic pressure

(c) no osmotic pressure

(d) equal osmotic pressure

39. The interaction between shark and suckerfish is that of

(a) commensalism

(b) mutualism

(c) parasitism

(d) competition

40. The simplest measure of species diversity is

(a) species evenness

(b) species abundance

(c) species richness

(d) species evolution

41. The Red Data Book maintains a record of the

(a) plants and animals present in the whole world

(b) relationships between man and biosphere

(c) plants and animals which are known to be endangered

(d) forest wealth in the whole world

42. Lichens can be used as indicator of

(a) air pollution

(b) global warming

(c) chemical composition of wood

(d) soil fertility

43. Variation in gene frequencies within populations occurring by chance rather than by natural selection is referred as

(a) genetic drift

(b) genetic load

(c) genetic flow

(d) induced mutation

44. The _____ was the international treaty for the phase out of the substances causing depletion of ozone layer, signed in the year _____.

(a) Kyoto Protocol, 1997

(b) Montreal Protocol, 1987

(c) Kyoto Protocol, 1985

(d) Montreal Protocol, 1981

45. Consider the following :

London smog and Los Angeles smog are also known as

(1) reducing smog and oxidizing smog

(2) oxidizing smog and reducing smog

(3) sulfurous smog and photochemical smog

(4) photochemical smog and sulfurous smog

Choose the correct option.

(a) 1 and 3

(b) 2 and 4

(c) 1 and 4

(d) 2 and 3

PART—B

Answer *any* **seventy** questions

46. If $I = \int e^x \left\{\sin^{-1} x + \frac{1}{\sqrt{1-x^2}}\right\} dx$, which one of the following values of I satisfies the integral?

(a) $e^x \cos^{-1} x + C$

(b) $e^x \sin^{-1} x + C$

(c) $e^x \sin^{-1} x + \frac{1}{\sqrt{1-x^2}} + C$

(d) $e^{2x} \cos^{-1} x + \frac{1}{\sqrt{1-x^2}} + C$

47. The maximum value of $5\cos\theta + 12\sin\theta + 12$ for $0 < \theta < 2\pi$ is

(a) 29

(b) 17

(c) 19

(d) 25

48. Find the point of local maxima of the function $f(x) = \sin^4 x + \cos^4 x$ in $0 < x < \pi/2$.

(a) $\pi/2$

(b) $3\pi/4$

(c) $3\pi/8$

(d) $\pi/4$

49. Which of the following statements is true for the differential equation $\frac{dy}{dx} + e^y = 0$?

(a) Linear differential equation with order 1 and degree 1

(b) Non-linear differential equation with order 2 and degree 1

(c) Linear differential equation with order 1 and degree 2

(d) Non-linear differential equation with order 1 and degree 1

50. What will be the change (ΔT) in the melting point of ice, if the pressure is increased from 1 atm to 3 atm? Given that the specific volumes of ice and water at 0 °C are $1{\cdot}0908 \times 10^{-3}$ m^3 kg^{-1} and $1{\cdot}0010 \times 10^{-3}$ m^3 kg^{-1} and the latent heat of fusion of the water substance is $3{\cdot}34 \times 10^5$ J kg^{-1} at normal atmospheric pressure at 0 °C.

(a) + 0·007 °C

(b) − 0·007 °C

(c) − 0·30 °C

(d) − 0·015 °C

51. What will be the approximate wavelength of maximum radiation emission of an unknown planet having color-temperature about 1000 K? Given that Wien's displacement constant = $2{\cdot}897 \times 10^{-3}$ m-K.

(a) ~ 0·6 μm

(b) ~ 0·3 μm

(c) ~ 3 μm

(d) ~ 6 μm

52. An isochoric process is governed by

(a) Charles' law

(b) Boyle's law

(c) Gay-Lussac law

(d) None of these

53. If $x^y \cdot y^x = 1$, then $\frac{dy}{dx}$ is equal to

(a) $\frac{y(x\log y - y)}{x(y\log x - x)}$

(b) $\frac{-y(x\log y + y)}{x(y\log x + x)}$

(c) $\frac{y(x\log y + y)}{x(y\log x + x)}$

(d) $\frac{-y(x\log y - y)}{x(y\log x - x)}$

54. $\lim_{x \to 0} \frac{\sin^2 x - x^2}{x^2 \sin^2 x}$ is equal to

(a) 0 (b) 1

(c) $\frac{1}{2}$ (d) $-\frac{1}{3}$

55. The eccentricity of the ellipse $4x^2 + 9y^2 = 1$ is equal to

(a) $\frac{4}{9}$ (b) $\frac{2}{3}$

(c) $\frac{\sqrt{5}}{3}$ (d) $\frac{\sqrt{2}}{3}$

56. The area of the region bounded by the curve $y = 2x - x^2$ and the x-axis is equal to

(a) $\frac{2}{3}$ sq. unit (b) $\frac{3}{2}$ sq. units

(c) $\frac{3}{4}$ sq. unit (d) $\frac{4}{3}$ sq. units

57. Intensive usage of groundwater in agriculture, industry and domestic purposes is causing

(a) depletion of water level

(b) drying up of wells

(c) quality problems

(d) waterlogging

58. Taylor, based on occurrence of groundwater, grouped various stratigraphic units of India into _____ groundwater provinces lying in three major regions.

(a) four

(b) eight

(c) five

(d) ten

59. _____ energy stored in the earth's mantle can be used to heat and cool buildings and also to produce electricity.

(a) Geothermal (b) Crude oil

(c) Natural gas (d) Biomass

60. Which of the following statements regarding porosity is *wrong*?

(a) Porosity decreases with depth

(b) Angular breccia may have higher porosity than rounded conglomerate

(c) The porosity of sediments depends upon the type of packing

(d) Well-sorted sedimentary deposits have low porosity

61. Darcy's law can deviate where

(a) steep hydraulic gradients exist

(b) rocks contain large underground openings

(c) water flows through dense clay

(d) natural underground flow occurs with $N_R < 1$, where N_R is Reynolds' number

62. Which of the following statements is *wrong*?

(a) Pumping and recharging rates differ by more than a simple change of flow direction

(b) In the pumped well, fine material present in the aquifer is carried through the coarser particles into the well

(c) Any silt carried by water into a recharge well is filtered out and tends to clog the aquifer surrounding the well

(d) Recharge water may carry large amounts of dissolved air, tending to increase the permeability of the aquifer by air binding

63. Which of the following relationships is *incorrect*?

(a) $\Delta G = -nFE$

(b) $\Delta S = \dfrac{\Delta H - \Delta G}{T}$

(c) $\Delta G = \Delta H - T\Delta S$

(d) $\Delta G = \Delta H + \left(\dfrac{\partial \Delta G}{\partial T}\right)_p$

where G is the Gibbs free energy, H is the enthalpy, T is the temperature, S is the entropy, n is the number of moles, E is the cell potential and F is the Faraday constant.

64. At 15 °C, an aqueous solution of oxalic acid containing 5 g of oxalic acid per 100 cm^3 of water in equilibrium with an ethanol solution containing 0·50 g per 100 cm^3, the solubility of oxalic acid in water at 15 °C is 10 g per 100 cm^3. The solubility in ethanol solution will be _____.

(a) ~ 1 g/100 cm^3

(b) ~ 10 g/100 cm^3

(c) ~ 5 g/litre

(d) ~ 50 g/litre

65. Nuclides having same number of neutrons but different mass numbers and different atomic numbers are called

(a) isomers

(b) isotopes

(c) isobars

(d) isotones

66. Which of the following can be used for ripening of fruits?

(a) Ethene (b) Ethane

(c) Methane (d) Cyclopropane

67. Which of the following is used for manufacturing of paper?

(a) Starch (b) Xylose

(c) Maltose (d) Cellulose

68. Nucleic acids are polymers of which of the following?

(a) D-ribose

(b) Amino acids

(c) Nucleotides

(d) Nucleosides

69. Which of the following is called as oil of bitter almond?

(a) Benzaldehyde (b) Benzoic acid

(c) Nitrobenzene (d) Methyl salicylate

70. The correct order of increasing acidity of CH_4, H_2O, HF and NH_3 is

(a) $H_2O > CH_4 > HF > NH_3$

(b) $HF > H_2O > CH_4 > NH_3$

(c) $CH_4 > NH_3 > H_2O > HF$

(d) $CH_4 < NH_3 < H_2O < HF$

71. Three isotopes of oxygen are

(a) ^{16}O, ^{17}O, ^{19}O

(b) ^{17}O, ^{19}O, ^{20}O

(c) ^{18}O, ^{20}O, ^{21}O

(d) ^{16}O, ^{17}O, ^{18}O

72. From strongest to weakest, the correct order of CO bonds is

(a) C=O > C—O > C≡O

(b) C≡O > C—O > C=O

(c) C≡O > C=O > C—O

(d) All of the above

73. The shape of BF_3 is

(a) linear

(b) trigonal planar

(c) tetrahedral

(d) octahedral

74. Which one of the following has the largest atomic radius?

(a) Rb (b) Na

(c) K (d) Ca

75. The active ingredient of aspirin is

(a) salicylic acid (b) acetic acid

(c) ascorbic acid (d) aspartic acid

76. Chloramphenicol is produced from which of the following?

(a) *Streptomyces erythraeus*

(b) *Micromonospora purpurea*

(c) *Streptomyces venezuelae*

(d) *Pseudomonas aeruginosa*

77. Which of the following is a C_4 plant?

(a) Pineapple

(b) Sugarcane

(c) Wheat

(d) Oats

78. Which of the following enzyme deficiencies causes 'Tay-Sachs disease'?

(a) Sphingomyelinase

(b) Glucocerebrosidase

(c) Galactocerebrosidase

(d) Hexosaminidase-A

79. The number of chromosomes present in the cell of *Arabidopsis thaliana* is

(a) 4

(b) 10

(c) 18

(d) 43

80. Fire blight of apple is caused by

(a) *Erwinia amylovora*

(b) *Xanthomonas campestris*

(c) *Pseudomonas solanacearum*

(d) *Clavibacter michiganensis*

81. The alpha helix is an example of which of the following structural properties of proteins?

(a) Quaternary structure

(b) Secondary structure

(c) Primary structure

(d) Tertiary structure

82. The unique cyclic structure of which of the following amino acids plays a central role in the formation of alpha helices and beta sheets?

(a) Lysine

(b) Arginine

(c) Valine

(d) Proline

83. Which of the following properties of a protein is least likely to be affected by changes in pH?

(a) Net charge

(b) Primary structure

(c) Secondary structure

(d) Tertiary structure

84. The inner leaflet of erythrocyte has

(a) sphingomyelin and phosphatidylcholine

(b) phosphatidylserine and phosphatidylethanolamine

(c) sphingomyelin and phosphatidylserine

(d) phosphatidylserine and phosphatidylcholine

85. Which of the following processes is similar in prokaryotes and eukaryotes?

(a) RNA polymerase produces RNA which grows in 5′–3′ direction

(b) RNA polymerase binds to ribosome for synthesis of new RNA

(c) Polyadenylation takes place

(d) Splicing of introns takes place

86. Xerophthalmia is caused due to the deficiency of

(a) vitamin A
(b) vitamin B_6
(c) vitamin D
(d) vitamin E

87. Membrane proteins that are embedded directly in the fluid mosaic are known as

(a) peripheral membrane proteins
(b) integral membrane proteins
(c) hydrophobic proteins
(d) hydrophilic proteins

88. Direct support for semiconservative DNA replication was obtained from experiments performed by

(a) Watson and Crick
(b) Meselson and Stahl
(c) Tatum and Lederberg
(d) Avery and McCarty

89. The first step in the process of translation in bacteria is

(a) ribosome 30S subunit binding to initiation factors
(b) ribosome 50S subunit binding to initiation factors
(c) ribosome 30S subunit binding to mRNA
(d) ribosome 50S subunit binding to mRNA

90. During oxidative phosphorylation, electrons are transported to the electron transport chain by which of the following molecule(s)?

(a) NADH
(b) $FADH_2$
(c) NADH and $FADH_2$
(d) Coenzyme Q

91. Choose the correct combination.

(a) Bacteria : peptidoglycan :: Fungi : cellulose
(b) Fungi : cellulose :: Algae : chitin
(c) Algae : peptidoglycan :: Bacteria : cellulose
(d) Bacteria : peptidoglycan :: Algae : cellulose

92. Which one of the following is likely to have the highest level of DDT concentration in tissue?

(a) Phytoplankton

(b) Zooplankton

(c) Eel

(d) Seagull

93. Which one of the following is an aquatic weed?

(a) *Cyperus rotundus*

(b) *Chlorella vulgaris*

(c) *Trapa bispinosa*

(d) *Eichhornia crassipes*

94. Algal bloom is an indicator of

(a) heavy metal pollution

(b) intense sedimentation

(c) eutrophication

(d) both heavy metal pollution and eutrophication

95. Nitrifiers produce

(a) nitrogen

(b) nitrous oxide

(c) nitrous acid

(d) nitrate

96. _____ elements with an electron shell that is being filled up and are generally ferromagnetic and paramagnetic.

(a) Lithophilic

(b) Thiophilic

(c) Chalcophilic

(d) Siderophilic

97. Deccan Traps are predominantly tholeiitic and are characterized by

(a) low Fe and Ti

(b) high Al and Ca

(c) high Fe and Ti

(d) high Na and Ca

98. Zoned crystals are formed from the magma under the condition of

(a) rapid cooling

(b) slow cooling

(c) varied rate of cooling

(d) intensive cooling

99. Forsterite and quartz react to form

(a) olivine

(b) diopside

(c) ferrosilite

(d) enstatite

100. The average percentage of SiO_2 in the igneous rocks is

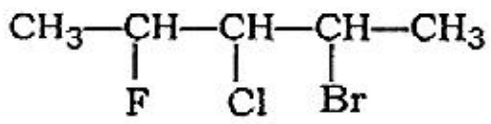
(a) 55·14

(b) 60·18

(c) 59·14

(d) 70·14

101. How many optically active stereoisomers are possible for the following compound?



(a) 6 (b) 8

(c) 4 (d) 2

102. Which of the following is ***not*** having ionic character?

(a) HCl (b) Anhydrous $AlCl_3$

(c) $AlCl_3 \cdot 6H_2O$ (d) HBr

103. Rules of assembly are more likely to be detected in

(a) the late stages of an autogenic succession

(b) the early stages of a primary succession

(c) the late stages of an allogenic succession

(d) the early stages of a secondary succession

104. One theory suggests that nutrient capture is limited in late successional communities because

(a) there is intense competition for these resources

(b) rates of weathering limit nutrient availability

(c) there are few species able to invade these communities

(d) rates of primary production limit the energy available for nutrient capture

105. Compensation by a plant to herbivory includes

(a) production of secondary metabolites used as general toxins only

(b) production of secondary metabolites used as anti-feedants only

(c) production of secondary metabolites and changes in growth form

(d) changes in growth form only

106. The water temperature of a lake being modelled for its energetics represents a/an

(a) parameter

(b) state variable

(c) external variable

(d) process variable

107. The population of an insect species shows an explosive increase in numbers during rainy season followed by its disappearance at the end of the season. What does this show?

(a) The food plants mature and die at the end of the rainy season

(b) Its population growth curve is of J-type

(c) The population of its predators increases enormously

(d) S-shaped or sigmoid growth of this insect

108. Which of the following is the reason for highest biomass in aquatic ecosystem?

(a) Benthic and brown algae

(b) Diatoms

(c) Nanoplankton, blue-green algae and green algae

(d) Sea grass and slime moulds

109. Minamata Bay where mercury poisoning was reported is located in

(a) Indian Ocean

(b) West Coast of Kyushu Island

(c) Arabian Sea

(d) Black Sea

110. Competition for light, nutrients and space is most severe between

(a) closely related organisms growing in different niches

(b) closely related organisms growing in the same area/niche

(c) distantly related organisms growing in different niches

(d) distantly related organisms growing in the same habitat

111. Which of the following is absent in polluted water?

(a) Blue-green algae

(b) Hydrilla

(c) Larva of stone fly

(d) Water hyacinth

112. When addition across an unsymmetrical ethylenic bond takes place, the positive part of attacking reagent goes to the carbon with greater number of hydrogen atoms. The rule is called as

(a) Markownikoff's rule

(b) anti-Markownikoff's rule

(c) exhaustive methylation

(d) Hoffmann reaction

113. Species that occur in different geographical regions separated by special barrier are

(a) allopatric

(b) sympatric

(c) sibling

(d) None of the above

114. The term 'biocoenosis' was proposed by

(a) Arthur George Tansley

(b) Charles Sutherland Elton

(c) Eugenius Warming

(d) Karl August Mobius

115. P and K mostly move into roots by

(a) mass flow

(b) diffusion

(c) reduction

(d) mass flow and oxidation

116. Most hazardous pollutant in automobile exhausts is

(a) nickel

(b) molybdenum

(c) lead

(d) chromium

117. Evolution of similar phenotypic adaptations in organisms with different evolutionary histories is called as

(a) natural selection

(b) adaptive radiation

(c) convergent evolution

(d) speciation

118. All the statements are correct regarding ecological succession, ***except***

(a) it is a random process

(b) species diversity increases as succession proceeds

(c) the food chain relationships become more complex

(d) the role of decomposers becomes more and more important

119. Respiratory roots are known as

(a) velamen

(b) pneumatophores

(c) hydathodes

(d) prop roots

120. In the pentose phosphate pathway during the early stages of glycolysis, glucose-6-P is oxidized into

(a) phosphogluconate

(b) glucose phosphatase

(c) 6-P-dehydrogenase

(d) 6-phosphogluconate

121. The word 'ecology' was coined by

(a) Sergei Winogradsky

(b) Norman Pace

(c) Ernst Haeckel

(d) Robert Hooke

122. Monocot plants can be distinguished with dicot plants in terms of

(a) phyllotaxy

(b) venation

(c) vernation

(d) aestivation

123. An open-circulatory system is found in

(a) some arthropods

(b) amphibians

(c) birds

(d) mammals

124. Tetracycline blocks protein synthesis by

(a) inhibiting binding of aminoacyl tRNA to the ribosome

(b) inhibiting binding of initiation factor to the ribosome

(c) inhibiting peptidyl transferase

(d) inhibiting translation termination

125. In lac operon system of *E. coli*, which of the following genes is required for cleavage of lactose into glucose and galactose?

(a) Lac A

(b) Lac Z

(c) Lac Y

(d) Lac I

126. In India, brow-antlered deer (Sangai) is found only in the floating landmasses of

(a) Wular lake

(b) Dal lake

(c) Loktak lake

(d) Sasthamkotta lake

127. Which of the following equations describes the exponential population growth?

(a) $\frac{dN}{dt} = rN$

(b) $N_t = N_0 e^{rt}$

(c) $\frac{dN}{dt} = rN\left(\frac{K - N}{K}\right)$

(d) $\frac{dN}{dt} = rN \times \frac{N}{K}$

128. In Lotka and Volterra's two species (1 and 2) competition model

$$\frac{dN_1}{dt} = r_1 N_1 \left(\frac{K_1 - N_1 - N_2 \alpha_{12}}{K_1} \right)$$

and

$$\frac{dN_2}{dt} = r_2 N_2 \left(\frac{K_2 - N_2 - \alpha_{21} N_1}{K_2} \right)$$

where

N = population size

r = growth rate

K = carrying capacity

the interspecific competition coefficient $\alpha_{12} < 1$ indicates

(a) individuals of species 2 have less inhibiting effect on individuals of species 1 than individuals of species 1 on others of their own species

(b) individuals of species 2 have greater inhibiting effect on individuals of species 1 than individuals of species 1 on others of their own species

(c) individuals of species 1 have less inhibiting effect on individual members of species 2 than individuals of species 2 on others of their own species

(d) individuals of species 1 have greater inhibiting effect on individuals of species 2 than individuals of species 2 on others of their own species

129. Consider the following :

Salinity stress

(1) results from salt accumulation in the soil

(2) causes injury due to decrease in the water potential of the soil that makes soil-water less available

(3) causes toxicity due to accumulation of specific ions

(4) inhibits sensitive plants' growth and photosynthesis

Choose the correct option.

(a) 1 and 4

(b) 2 and 3

(c) 2, 3 and 4

(d) All of the above

130. An insect predator species population is being assessed by capture-mark-release method. On the first day, 100 individuals of insect predator species were captured from a given area in 1 hour time, marked and released. On the next day during recapture, 10 marked and 90 unmarked individuals of insect predator species could be found in the same time period from same area. What will be the estimated population size in a given area?

(a) 80 (b) 100

(c) 1000 (d) 10000

131. Which of the following wavelengths is used for DNA estimation?

(a) 480 nm (b) 260 nm

(c) 560 nm (d) 680 nm

132. Anoxic conditions develop at depth in temperate lakes because

(a) decomposition dominates over photosynthesis

(b) limiting nutrients do not allow photosynthesis at depth

(c) waters do not get overturned, so the oxygenated water from above does not reach the bottom

(d) lower waters are too cold for photosynthesis

133. The high diversity of insects in most terrestrial habitats has been attributed to

(a) their short generation times and fast rate of evolution

(b) their ease with which they can disperse and colonize new habitats

(c) the ease with which they become isolated leading to allopatric speciation

(d) high niche differentiation with sympatric speciation

134. Ontology is

(a) an indexing method

(b) cataloguing of Internet-based documents

(c) classification of Internet-based documents

(d) documentation service

135. In the equation $L = 24{\cdot}2 \pm (0{\cdot}5\ \text{cm})$ for measurement of length, the value marked in circle represents

(a) standard deviation (b) absolute error

(c) relative error (d) relative uncertainty

136. What is the area under a probability density (distribution) curve of randomly taken sample, if samples are normally distributed?

(a) $\pi/4$

(b) $\pi/2$

(c) π

(d) None of the above

137. A set of observations recorded at equal interval of time is called

(a) array data

(b) geometric series

(c) data

(d) time-series data

138. A set of rules that govern overall data communication system is popularly known as

(a) agreement

(b) memorandum

(c) pact

(d) protocol

139. Which one of the following is a feature of a biological community?

(a) Morbidity

(b) Mortality

(c) Stratification

(d) Natality

140. Which of the following amino acids has a net negative charge at physiological pH 7·4?

(a) Lysine

(b) Histidine

(c) Glutamic acid

(d) Asparagine