M.Sc Environmental Science

INSTRUCTIONS TO CANDIDATES

*(Use only **blue/black ball-point pen** in the space above and on both sides of the Answer Sheet)*

1. Within 30 minutes of the issue of the Question Booklet, check the Question Booklet to ensure that it contains all the pages in correct sequence and that no page/question is missing. In case of faulty Question Booklet bring it to the notice of the Superintendent/Invigilators immediately to obtain a fresh Question Booklet.

2. Do not bring any loose paper, written or blank, inside the Examination Hall *except the Admit Card without its envelope.*

3. A separate Answer Sheet is given. It should not be folded or mutilated. A second Answer Sheet shall not be provided. Only the Answer Sheet will be evaluated.

4. Write your Roll Number and Serial Number of the Answer Sheet by pen in the space provided above.

5. On the front page of the Answer Sheet, write by pen your Roll Number in the space provided at the top and by darkening the circles at the bottom. Also, wherever applicable, write the Question Booklet Number and the Set Number in appropriate places.

6. *No overwriting is allowed in the entries of Roll No., Question Booklet no. and Set no. (if any) on OMR sheet and Roll No. and OMR sheet no. on the Question Booklet.*

7. *Any change in the aforesaid entries is to be verified by the invigilator, otherwise it will be taken as unfairmeans.*

8. *Each question in this Booklet is followed by four alternative answers. For each question, you are to record the correct option on the Answer Sheet by darkening the appropriate circle in the corresponding row of the Answer Sheet, by pen as mentioned in the guidelines given on the first page of the Answer Sheet.*

9. For each question, darken only one circle on the Answer Sheet. If you darken more than one circle or darken a circle partially, the answer will be treated as incorrect.

10. *Note that the answer once filled in ink cannot be changed. If you do not wish to attempt a question, leave all the circles in the corresponding row blank (such question will be awarded zero marks).*

11. For rough work, use the inner back page of the title cover and the blank page at the end of this Booklet.

12. Deposit only **OMR Answer Sheet** at the end of the Test.

13. You are not permitted to leave the Examination Hall until the end of the Test.

14. If a candidate attempts to use any form of unfair means, he/she shall be liable to such punishment as the University may determine and impose on him/her.

Total No. of Printed Pages : 48

[उपर्युक्त निर्देश हिन्दी में अन्तिम आवरण पृष्ठ पर दिये गए हैं।]

87

16P/290/7

ROUGH WORK
रफ़ कार्य

2

No. of Questions : 180

Time : 2 Hours   *Full Marks : 360*

Note : (1) Attempt as many questions as you can. Each question carries **3 (Three)** marks. *One mark will be deducted for each incorrect answer.* **Zero** mark will be awarded for each unattempted question.

(2) If more than one alternative answers seem to be approximate to the correct answer, choose the closest one.

(3) This Question Booklet comprises two Sections viz..Section-A and Section-B:

Section-A : This is compulsory. This contains two sub-sections having question of **two** disciplines viz.

(i) Basic Environmental Science

(ii) Chemistry

A candidate is required to attempt above both all sub-sections are compulsory.

Section-B : This contains three Sub-sections having questions of **three** disciplines viz.,

(i) Life Science

(ii) Physics

(iii) Geology

A candidate is required to attempt only **one** from above three Sub-sections.

P.T.O.

SECTION - A

(i) BASIC ENVIRONMENTAL SCIENCES

(Compulsory for all)

01. Which region of the sea oceans are the most polluted ?

    (1) Estuarine   (2) Sea depths

    (3) Sea surface   (4) Coastal

02. Demography is the statistical study of :

    (1) Bird population   (2) Human population

    (3) Human Society   (4) Human Life

03. Largest salt water lake in India is :

    (1) Chilka   (2) Lonar

    (3) Wullar   (4) Sambhar

04. Which elemental cycle has no atmospheric reservoir ?

    (1) Oxygen   (2) Carbon

    (3) Phosphorus   (4) Nitrogen

05. Concept of ecological pyramid was given by :

    (1) A.G. Tansley   (2) E.P. Odum

    (3) R. Mishra   (4) C. Elton

06. How many mega-bio diverse countries have been identified in the world ?

(1) 12   (2) 17   (3) 24   (4) 35

07. Ecological of physiological races are also known as :

(1) Ecads   (2) Ecotypes

(3) Ecophens   (4) Ectogens

08. Maximum amount of radiation per unit area is received in the :

(1) Tropical region   (2) Temperate region

(3) Higher latitude   (4) Mid latitude

09. Ecosystems regulation in nature is called :

(1) Homeostasis   (2) Succession

(3) Cybernetics   (4) Ecosystem function

10. The wave length of the atmospheric windows is :

(1) 4.0 - 6.0 μ   (2) 2.0 - 5.0 μ

(3) 8.0 - 13.0 μ   (4) 7.0 - 10.0 μ

P.T.O.

11. Government of India has enacted various Acts for protection & conservation of environment. However, more inclusive Act is :

    (1) Water (Prevention & Control of Pollution) Act 1974

    (2) Air (Prevention & Control of Pollution) Act 1981

    (3) The Biological Diversity Act 2002

    (4) Environment (Protection) Act 1986

12. Richael Carsson in her book *Silent Spring* has raised concerned on :

    (1) Economical & social impacts

    (2) Impacts of agro-chemicals on ecological functions

    (3) Deforestation

    (4) Climate change

13. Redox titration is used in determination of :

    (1) Dissolved oxygen   (2) Total hardness

    (3) Chemical oxygen demand   (4) Biochemical oxygen demand

14. Convention on International Trade in Endangered species was held in :

    (1) 1980   (2) 1973

    (3) 1962   (4) 1986

15. Species - Area Curve is record of :

    (1) Frequency and Area   (2) Density and Area

    (3) Number of species and Area   (4) Abundance and Area

16. Mauna Loa, in Hawaii is famous for :

    (1) Botanical Gardens

    (2) Monitoring sea level rise since 1950

    (3) Biggest collection of mammal's fossils

    (4) Continuous monitoring atmospheric CO_2 since 1957

17. Largest source fresh water on earth is :

    (1) Rivers   (2) Lakes

    (3) Glaciers   (4) Polar Ice

18. "Itai Itai" disease is caused by :

    (1) Mercury   (2) Cadmium

    (3) Lead   (4) Arsenic

19. Acetyl choline esterase enzyme is inhibited by :

    (1) Organophosphates   (2) Triazine

    (3) Phenylurea   (4) Organomercurals

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P.T.O.

20. The Headquarter of UNEP is located at :

    (1) Paris   (2) Rio de Jenerio

    (3) Narobi   (4) Geneva

21. Permafrost soil is characteristic of :

    (1) Tundra biome   (2) Taiga biome

    (3) Tropical rain forest   (4) Savannah

22. The biggest hindrance in using biomass as an energy source is :

    (1) Lack of proven technology for commercialization

    (2) Energy yield is low

    (3) Large land area is required to grow energy crops

    (4) Air pollution due to combustion

23. Which of the following category of plants get benefited more due to elevation of CO_2 level ?

    (1) C_3 plants   (2) C_4 plants

    (3) CAM plants   (4) All of the above

24. The value of solar constant(S) is :

    (1) $20 \ W/m^2$ (2) $1372 \ W/m^2$

    (3) $1732 \ W/m^2$ (4) $1330 \ W/m^2$

25. The second most important source after fossil fuels contributing to India's energy needs is :

    (1) Solar energy   (2) Nuclear energy

    (3) Wind energy   (4) Hydropower

26. Which one of the following is an Ex-Situ method of biodiversity conservation ?

    (1) Seed storage   (2) Tissue culture

    (3) Gene bank   (4) All of the above

27. *Ramsar convention* on Wetland International Importance is effective since :

    (1) 1992   (2) 1971

    (3) 1972   (4) 1974

28. Natural source of polycyclic aromatic hydrocarbons (PAHs) is :

    (1) **Grass fire**   (2) Root exdudates

    (3) Aerobic bacteria   (4) Anaerobic bacteria

29. Cinabar is an ore of :

    (1) Iron   (2) Mercury

    (3) Gold   (4) Lead

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30. Most Productive zone in a freshwater Lake/Pond is :

(1) Profundal zone

(2) Limnetic zone

(3) Benthic zone

(4) Littoral zone

(ii) CHEMISTRY

(Compulsory for all)

31. The molecular structure of ozone is similar to that of :

    (1) Chlorine dioxide   (2) Carbon dioxide

    (3) Sulphur trioxide   (4) Borane

32. How many germs of oxygen will be obtained if one mole of water is fully electrolysed ?

    (1) 0.5 g   (2) 1 g   (3) 16 g   (4) 32 g

33. The bond angles in boron trifluoride molecule are :

    (1) 90^0 (2) 104^0 (3) 109^0 (4) 120^0

34. The bond dissociation energy of fluorine is :

    (1) Similar to that of chlorine   (2) Similar to that of bromine

    (3) Similar to that of iodine   (4) Highest among the halogens

35. If 10 ml of 0.1 M hydrochloride acid is added to 5ml of 0.1 M sulphuric acid and the mixture titrated against 0.2 M sodium hydroxide, what will be the titre value ?

    (1) 7.5 ml   (2) 10 ml   (3) 15 ml   (4) 30 ml

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P.T.O.

36. A list of which includes only gases that dissolve in water to give an acidic solution is :

    (1) CO_2, SO_2, SO_3, HI

    (2) CO_2, SO_2, F_2, N_2

    (3) NO_2, SO_2, HI, F_2

    (4) CO_2, SO_2, SO_3, HBr

37. What is the best way to describe the geometry of XeF_4 ?

    (1) Spherical

    (2) Octahedral

    (3) Tetrahedral

    (4) Planar

38. The anion and cation are iso-electronic in :

    (1) LiF   (2) NaF   (3) RbI   (4) CsCl

39. Which of the following is not a polymeric compound ?

    (1) Starch

    (2) Cellulose

    (3) Melanin

    (4) Tryptophan

40. How many unpaired electrons are there in an atom of C ?

    (1) None   (2) 1   (3) 2   (4) 3

41. Which of the following is not a paramagnetic compound ?

    (1) O_2

    (2) NO_2

    (3) $CuCl_2$

    (4) $C_6H_6^-$ (anion)

42. What is the oxidation number of Fe in $(NH_4)_3[Fe(CN)_6]$

    (1) +2   (2) -2   (3) +3   (4) +4

43. What is the C-H bond-order in benzene :

    (1) 0   (2) 1   (3) 1.5   (4) 2

44. Identify the pair in which both molecules have sp^2 hybridised atoms :

    (1) C_2H_4 and CO_2 (2) C_6H_6 and $CHCl_3$

    (3) C_2H_4 and C_3H_4 (4) HCN and C_2H_2

45. What is the total number of orbital associated with the principal quantum number, n=4 ?

    (1) 3   (2) 4   (3) 16   (4) 24

46. The name of de Brogile is associated with :

    (1) The uncertainty principle   (2) Matter waves

    (3) Atomic orbitals   (4) Electron spin

47. An element crystallizes in FCC lattice. How many atoms are there per unit cell ?

    (1) 1   (2) 2   (3) 3   (4) 4

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P.T.O.

48. A sample of water contains 200 ppm of Ca^{2+} in it. What is the molality of the solution with respect to Ca (at. wt. 40) ?

    (1) 0.2 m

    (2) 2 m

    (3) 5×10^{-3} m

    (4) 0.05 m

49. Coke is often used in extractive metallurgy. Its major role is :

    (1) As an oxidizing agent

    (2) As a reducing agent

    (3) As a fuel

    (4) To form slag

50. Which of the following is not a crystalline substance ?

    (1) Glass

    (2) Quartz

    (3) Chalk

    (4) Diamond

51. How many neutrons are than in the nucleus of a ^{17}O atom ?

    (1) 6

    (2) 8

    (3) 9

    (4) 11

52. Which element exists in the +2 oxidation state in all its common compounds ?
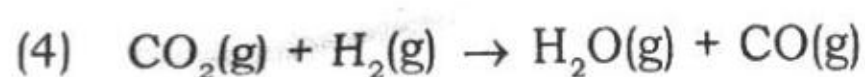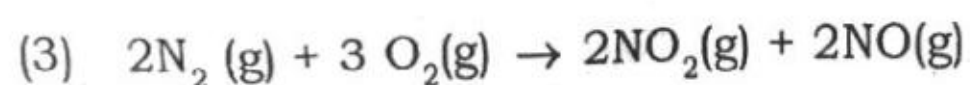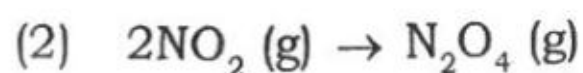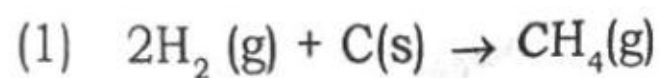
    (1) Mn

    (2) Mg

    (3) Mo

    (4) Eu

53. from each pair given below identify the ion which is smaller in size .

    $[Fe^{2+}, Fe^{3+}]$ $[K^+, Ca^{2+}]$ $[Na^+, F^-]$ $[Se^{2-}, S^{2-}]$:

    (1) $Fe^{2+}, K^+ F^-, S^{2-}$

    (2) $Fe^{3+}, Ca^{2+} Na^+, S^{2-}$

    (3) $Fe^{2+}, Ca^{2+}, F^-, Se^{2-}$

    (4) $Fe^{3+}, K^+ Na^+, Se^{2-}$

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54. Which one of the following set contains one element each from s-block, p-block and d-block ?

   (1) Rb, K, Ru

   (2) Li, W, Bi

   (3) C, Cl, Sr

   (4) Sc, Pd, Te

55. Which of the following is not a Lewis acid ?

   (1) S^{2-}

   (2) Zn^{2+}

   (3) BF_3

   (4) Co^{3+}

56. Potassium permanganate solution may be standardised by titration against :

   (1) Sodium carbonate

   (2) Chromic acid

   (3) Phthalic acid

   (4) Sodium oxalate

57. Which of the following compounds does not contain a C=O group ?

   (1) Acetic acid

   (2) Formaldehyde

   (3) Cyclobutanone

   (4) Furan

58. Which group is present in a secondary amine ?

   (1) $-NR_2$

   (2) $-NHR$

   (3) $-NH_2$

   (4) $=NH$

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59. For which one among the following reactions does ΔH^0 of the reaction represent an enthalphy of formation ?

   (1) $2H_2(g) + C(s) \rightarrow CH_4(g)$

   (2) $2NO_2(g) \rightarrow N_2O_4(g)$

   (3) $2N_2(g) + 3 O_2(g) \rightarrow 2NO_2(g) + 2NO(g)$

   (4) $CO_2(g) + H_2(g) \rightarrow H_2O(g) + CO(g)$

60. Consider the following three reactions :

   $NH_4NO_3(s) \qquad = N_2O(g) \quad + \quad 2H_2O(g)$ (1)

   $2H_2(g) \ + \ O_2(g) \quad = 2H_2O(g)$ (2)

   $2H_2(g) \ + \ O_2(g) \quad = 2H_2O(l)$ (3)
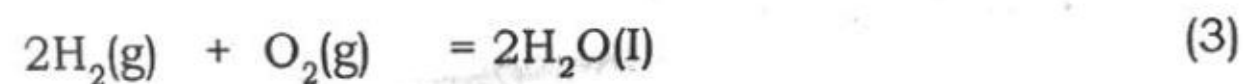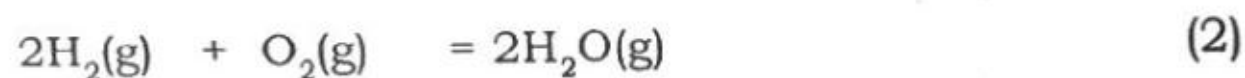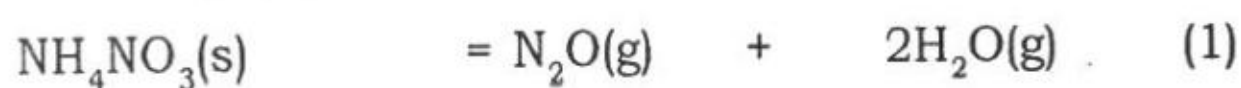
   which statement regarding the entropy changes (ΔS) in the above reactions is correct ?

   (1) $\Delta S_1 > \Delta S_2 > \Delta S_3$

   (2) $\Delta S_1 > \Delta S_2 = \Delta S_3$

   (3) $\Delta S_1 < \Delta S_2 < \Delta S_3$

   (4) $\Delta S_1 > \Delta S_2 < \Delta S_3$

61. Which one of the following compounds does not decolourise potassium permaganate solution ?

   (1) Styrene

   (2) Benzene

   (3) Propionaldehyde

   (4) Oxalic acid

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62. Which one of the following compound is optically active ?

  (1) Ethyl benzoate   (2) Succinic acid

  (3) Salicylaldehyde   (4) Sucrose

63. Which of the following compounds is acidic ?

  (1) Allyl alcohol   (2) Aniline

  (3) Acetophenone   (4) Phenol

64. How many isomers are there for dichlorobenzene ?

  (1) 1 (no isomer)   (2) 2

  (3) 3   (4) 4

65. Which one of the following statement is false ?

  (1) Cis and trans isomers of a compound will, in general, have different melting points

  (2) Enantiomers will have same dipole moments

  (3) Diastereomers will always have same solubilities

  (4) Asymmetric centre is not essential for chirality

66. The number of degree of freedom at the triple point of water is :

  (1) 0   (2) 1   (3) 2   (4) 3

P.T.O.

67. Which one of the following statements is false ?

(1) *p*-nitrophenol has an higher melting point than *o*-nitrophenol

(2) Aniline is less basic than benzyl amine

(3) *t*-butanol forms a more stable carbonium ion than isopropanol

(4) Pyridine is more basic than ammonia

68. Markonikof's rule applies to :

(1) Electrophilic substitution of aromatic compounds

(2) Electrophilic addition of alkenes

(3) Steric strain

(4) Relative stabilities of carbanions

69. What is the major product when *t*- butylbenzene is nitrated ?

(1) *p*-nitro-*t*-butylbenzene

(2) 2,6-nitro-*t*- butylbenzene

(3) *o*-nitro-*t*-butylbenzene

(4) *m*- nitro-*t*- butylbenzene

70. What product will be obtained if acetaldehyde is oxidized ?

(1) Ethanol

(2) Menthanol

(3) Acetic acid

(4) Acetamide

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71. What is the main compound of cooking gas ?

    (1) Propane   (2) Ethanol

    (3) Butane   (4) Methane

72. The boat and chair from of cyclohexane are :

    (1) Isomers   (2) Enantiomers

    (3) Diasteromers   (4) Conformers

73. S_N1 reaction involves a.................as an Intermediate :

    (1) Carbanion   (2) Carbonium ion

    (3) Pentavalent carbon species (4) Free radical

74. Which one of the crystal unit cells does not have all axes orthogonal to one another ?

    (1) Tetragonal cell   (2) Rhombohedral cell

    (3) Orthorhombic cell   (4) Cubic cell

75. If the half life of a radioactive particle is 12 minutes what percentage of the total number of particles will remain after 10 minutes ?

    (1) 56   (2) 54   (3) 17   (4) 60

P.T.O.

76. The RMS speed of nitrogen molecules at 300 K is 516 m/s. What will be the RMS speed of helium atoms ?

    (1) 3612 m/s   (2) 1365 m/s

    (3) 965 m/s   (4) 1806 m/s

77. The cryoscopic constant of water is 2 °C/m. What will be the freezing point of 1 kg of water in which 1.1 kg of ethylene glycol $(C_2H_6O_2)$ is dissolved ?

    (1) -36 °C   (2) -12 °C   (3) -24 °C   (4) 23 °C

78. What solid products is obtained when calcium carbide reacts with water ?

    (1) $CaCO_3$ (2) $Ca(OH)_2$ (3) Ca   (4) $CaCl_2$

79. Which of the following are exothermic processes ?

    (a) A match burns;

    (b) molten candle wax solidifies;

    (c) kerosene evaporates

    (1) All three   (2) (a) and (b)

    (3) (a) and (c)   (4) (b) and (c)

80. What will be the main product in the following reaction ?

$(H_3C)_3C-Cl$ + $C_2H_5O^-$ ------------>

(1) $C_2H_5O-C(CH_3)_3$

(2) $(H_3C)(C_2H_5)C=CH_2$

(3) $(H_3C)_3 C-OH$

(4) $(H_3C)_2C=CH_2$

81. Other things being equal, how will the rate of the forward reaction in the following system change if the volume of the reaction vessel is halved ?

$CO(g)$ + $Cl_2(g)$ = $COCl_2(g)$
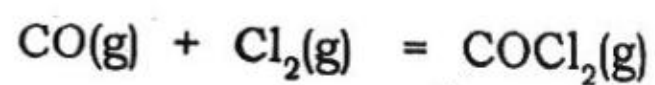
(1) The rate will be halved

(2) The rate will be decrease to $1/4$ of the original value

(3) The rate will be double

(4) The rate will be increase four times

82. What product is obtained when CH_3CONH_2 is treated with bromine and sodium hydroxide ?

(1) CH_3COOH

(2) CH_3NH_2

(3) $C_2H_5NH_2$

(4) CH_3CH_2Br

P.T.O.

83. How many stereoisomers are possible for **butane-2,3-dicarboxylic** acid ?

(1) 1 (2) 2 (3) 3 (4) 4

84. What changes will increase the equilibrium concentration of product C in the system, $A(g) + B(g) = C(g)$, if the $\Delta H°$ of the reaction is negative ? Choose from the following conditions :

(a) The adding of a catalyst,

(b) The addition of an extra amount of substance A,

(C) Raising of the temperature,

(d) Lowering the temperature

(1) (b) and (d) (2) (a) and (d)

(3) (c) (4) (a) and (b)

85. What is the pH of a 0.001 M solution of sodium hydroxide ?

(1) -3 (2) 3 (3) 11 (4) 7

86. The reaction of copper sulphate with potassium iodide in aqueous medium is an example of :

(1) Redox reaction

(2) Disproprtionation reaction

(3) Double decomposition reaction

(4) Halogenation reaction

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87. CsF adopts the NaCl crystal structure. If the unit cell edge is length 4.02 $\overset{\circ}{A}$, what is the shortest distance between the Cs^+ and F^- ions in the crystal ?

(1)   2.01 $\overset{\circ}{A}$ (2)   2.84 $\overset{\circ}{A}$ (3)   3.48 $\overset{\circ}{A}$ (4)   4.02 $\overset{\circ}{A}$

88. Steady state approximation for the reaction A $\dashrightarrow$ B $\dashrightarrow$ C makes the assumption,

(1) $d[C]/dt = -d[A]/dt$

(2) $[A] + [C]$ is a constant

(3) $d[B]/dt = 0$

(4) $[A] - [C] = 0$

89. Which of the following hydrocarbons has the most acidic H atom ?

(1)   Ethane

(2)   Ethylene

(3)   Acetylene

(4)   Benzene

90. Select the reagent(s) suitable for converting benzoic acid to bezoyl chloride ?

$SOCl_2$; Cl_2; PCl_5; HCl

(1) $SOCl_2$ and PCl_5

(2) $SOCl_2$ and Cl_2

(3) PCl_5

(4) Cl_2 and HCl

SECTION - B

(i) LIFE SCIENCE

(Optional)

91. The oldest organisms are considered to be :

    (1) PPLO

    (2) Archaea

    (3) Animals

    (4) Bacteria

92. Gram staining was introduced by :

    (1) Robert Gram

    (2) Christian Gram

    (3) Robert Koch

    (4) Louis Pasteur

93. When a virus enters a cell but does not replicate immediately, the situation is called ?

    (1) Synergism

    (2) Symbiosis

    (3) Mutualism

    (4) Lysogency

94. The organism which obtain their energy from chemicals are designated as :

    (1) Chemotrophs

    (2) Autotrophs

    (3) Organotrophs

    (4) Prototrophs

95. An organism that expends energy to grow in a habitat with a low water activity in order to maintain internal solute concentrations to retain water is :

   (1) Alkalophile

   (2) Aerotolerant

   (3) Acidophile

   (4) Osmotolerant

96. The plasmids can be eliminated from a cell by the process known as :

   (1) Fixing

   (2) Curing

   (3) Expulsion

   (4) Breaking

97. Protein content in dry weight of SCP is :

   (1) 80-90%   (2) 40-50%   (3) 60-80%   (4) 20-30%

98. T-phages are a specific class of bacteriophages with :

   (1) Double stranded DNA

   (2) Single stranded DNA

   (3) Double stranded RNA

   (4) Single stranded RNA

99. Sulfonamide is synthetic..............compound :

   (1) Antiviral

   (2) Antibacterial

   (3) Antifungal

   (4) None of the above

P.T.O.

100. Alcohol that is derived from fermentation of germinated barley grains, is known as :

(1) Beer

(2) Wine

(3) Vodka

(4) Rum

101. The tuberculosis is caused by :

(1) *Mucobacterium*

(2) *Mycobacterium*

(3) *Campylobacter*

(4) *Salmonella*

102. Germ theory fo disease was first demonstrated by :

(1) Robert Koch

(2) L. Pasteur

(3) P.A. Micheli

(4) Benedict Prevost

103. Causal agents of severe rusts of all cereal grains and cultivated gasses are :

(1) *Puccinia spp*

(2) *Salmonella spp*

(3) *Pseudomonas spp*

(4) *Fusarium spp*

104. When a disease present more or less constantly in a particular location in moderate or severe form is called as :

(1) Pandemic disease

(2) Epidemic disease

(3) Endemic disease

(4) Sporadic disease

105. Which of the following reflects the correct order of events that take place during the multiplication of a virus ?

   (1)   Attachment, release, biosynthesis, maturation, penetration

   (2)   Attachment, penetration, maturation, biosynthesis, release

   (3)   Penetration, attachment, biosynthesis, maturation, release

   (4)   Attachment, penetration, biosynthesis, maturation, release

106. Which of the following groups of animals does not come under deuterostomes :

   (1)   Chordata   (2)   Arthropoda

   (3)   Protochordata   (4)   Echinodermata

107. Water vascular system is found in which of the following group of animals ?

   (1)   Echinodermata   (2)   Ctenophora

   (3)   Mollusca   (4)   Platyhelminthis

108. The lateral line system of bony fishes and sharks functions in :

   (1)   Osmoregulation

   (2)   Gas exchange

   (3)   hydrodynamics

   (4)   Sensory preception

109. The first set of genes to be activated for axis specification of *Drosophila* is during early embryonic development is :

   (1) Gap genes
   (2) Pair rule gene
   (3) Homeotic genes
   (4) Segment polarity genes

110. During gastrulation the movement of ectodermal cells to cover the entire embryo is known as :

   (1) Epiboly
   (2) Delamination
   (3) Ingression
   (4) Invagination

111. Slow block to polyspermy resulting in removal of sperms from vitelline membrane is accomplished by :

   (1) Changes in membrane potential
   (2) Cortical rotation
   (3) Cortical reaction
   (4) Acrosomal reaction

112. If you need to prepare 5M NaCl (MW 58.4), you will dissolve :

   (1) 1 gm of NaCl in a total volume of 100 ml of water
   (2) 1 gm of NaCl in a total volume of 1000 ml of water
   (3) 58.4 gm of NaCl in a total volume of 200 ml of water
   (4) 5.84 gm of NaCl in a total volume of 100 ml of water

113. Which of the following is the major source of blood glucose during an overnight fasting ?

    (1) Hepatic glycogenolysis

    (2) Gluconeogenesis

    (3) Dietary glucose from intestine

    (4) Muscles glycogenolysis

114. Pearl is formed in oysters :

    (1) In the shell following the entry of an irritant

    (2) By the mantle

    (3) Between the mantle and inner body

    (4) By calcium carbonate deposition at any site

115. Immunoprecipation is done to study :

    (1) DNA-protein interaction   (2) Protein- Protein interaction

    (3) Protein - RNA interaction   (4) DNA-RNA interaction

116. Circadian rhythm in our body is regulated by :

    (1) TSH   (2) Melatonin

    (3) Prostaglandins   (4) ADH

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117. In ovarian cycle :

 (1) Preovulatory phase occurs mainly due to section of LH

 (2) LH surge causes ovulation

 (3) Regulation of water balance in the blood

 (4) Filteration of blood

118. Drinking alcoholic beverages on hot days in not safe because alcohol *inhibits* release of the following hormone which normally help to conserve water during dehydration ?

 (1) Oxytocin

 (2) Antidiuretic hormone

 (3) Thyroxine

 (4) Tri-iodothyronine

119. The bulk of CO_2 is transported in arterial blood as :

 (1) Dissolved CO_2

 (2) Bicarbonate

 (3) Carbamino haemoglobulin

 (4) Carboxyhaemoglobulin

120. The volume of air breathed in and out during quite respiration is known as :

 (1) Respiratory minute volume

 (2) Inspiratory capacity

 (3) Residual volume

 (4) Tidal wave

(ii) PHYSICS

(Optional)

121. When some work is done then there will be some wastage of heat energy, this is in accordance with :

    (1) Zeroth law of thermodynamics

    (2) First law of thermodynamics

    (3) Second law of thermodynamics

    (4) Third law of thermodynamics

122. A sample of 100 gm of water is slowly heated from 27 °C to 87 °C. If the specific heat capacity of water is 4200 J/kg K then the change in the entropy of the water is :

    (1) 7.6 J/K   (2) 36 J/K   (3) 42 J/K   (4) 65 J/K

123. Newton's law of cooling is a special case of :

    (1) Stefan's law   (2) Kirchhaff's law

    (3) Rayleigh Jean's law   (4) Joule's law

124. The temperature below which a gas must be cooled to be liquiefied by pressure alone is called :

    (1) Boyle temperature   (2) Critical temperature

    (3) Curie temperature   (4) Inversion temperature

P.T.O.

125. If a particle is projected at an angle 30° to the horizontal with kinetic energy E then the kinetic energy at the highest point of its trajectory will be :

(1) E/4 (2) E/2 (3) 3E/4 (4) $\dfrac{E}{\sqrt{2}}$

126. A bird alights on a telephone wire stretched between two poles. The additional tension produced in the wire will be :

(1) Equal to the weight of the bird

(2) less than the weight of the bird

(3) Greater than the weight of the bird

(4) Zero

127. The length of a metal wire is l_1 when the tension in it is T_1 and is l_2 when the tension is T_2. The natural length of the wire is :

(1) $\dfrac{l_1 T_2 - l_2 T_1}{T_2 - T_1}$

(2) $\dfrac{l_1 T_2 + l_2 T_1}{T_1 + T_2}$

(3) $\dfrac{l_1 T_2 - l_2 T_1}{T_1 + T_2}$

(4) $\dfrac{l_1 T_2 + l_2 T_1}{T_1 - T_2}$

128. A shell fired from a canon with a velocity v m/sec at an angle θ with the horizontal. It explodes into two pieces of equal masses at highest point of its path. One of the pieces retraces its path to the canon. The speed of the other piece immediately after the explosion is :

(1) $3\,v\cos\theta$ m/sec (2) $4\,v\cos\theta$ m/sec

(3) $2\,v\cos\theta$ m/sec (4) $v\cos\theta$ m/sec

129. Two uniform circular discs A and B of equal masses and thickness are made of materials of densities d_A and d_B respectively. If their moments of inertia about an axis passing through the center and normal to the circular surface are I_A and I_B respectively then :

(1) $\dfrac{I_A}{I_B} = \dfrac{d_A}{d_B}$

(2) $\dfrac{I_A}{I_B} = \dfrac{d_{A^2}}{d_{B^2}}$

(3) $\dfrac{I_A}{I_B} = \dfrac{d_B}{d_A}$

(4) $\dfrac{I_A}{I_B} = \dfrac{d_{B^2}}{d_{A^2}}$

130. In the half life time of radon (^{222}Rn) is 3.8 days then how long does it take for 60% of sample of radon to decay ?

(1) 4 days

(2) 4.5 days

(3) 5 days

(4) 6.5 days

131. A particle is executing simple harmonic motion with time period $T = \dfrac{2\pi}{3}$ and amplitude A=2 meters. What is its maximum acceleration during its motion :

(1) 6 m/sec²

(2) 18 m/sec²

(3) 9 m/sec²

(4) 36 m/sec²

132. A pure Ge crystal has intrensic carrier concent ration $N_i = 10^{13}$ /cm³ at room temperature when it is doped with antimony the hole density is found to be 10^{11} /cm³ at room temperature the doping density, assuming that all impurity atoms are ionized, is :

(1) 10^{11} /cm³

(2) 10^{13} /cm³

(3) 10^{15} /cm³

(4) 10^{12} /cm³

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P.T.O.

133. For a transistor the current gain α =0.98. If the transistor is used as an amplifier in common emitter configuration and the base current changes by 0.1 mA on applying the input signal then the collector current will changes by :

(1)   5 mA

(2)   4.8 mA

(3)   9.8 mA

(4)   4.9 mA

134. Which of the following statement is wrong :

(1)   Voltmeter should have very high resistance

(2)   Ammeter should have very high resistance

(3)   Voltmeter should be connected parallel to the device across which voltage isto be measured

(4)   Ammeter should be connected in series with the electric circuit

135. If two electric heaters rated P_1 and P_2 watts of voltage are connected in parallel across a power supply of V volts then the total power drown would be :

(1) $\dfrac{P_1 P_2}{P_1 + P_2}$

(2) $\dfrac{P_1 + P_2}{P_1 P_2}$

(3) $P_1 + P_2$

(4) $\sqrt{P_1 P_2}$

136. If the frame around which wire is wound in a moving cell galvanecemeter is metallic then its :

(1)   damping is increased

(2)   damping is decreased

(3)   hysterisis loss is decreased

(4)   sensitivity is increased

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137. For a polentiometer to be very sensitive the :

    (1) Wire must be long

    (2) Wire must be small

    (3) Potential drop per unit length must be small

    (4) Potential drop per unit length must be large

138. Two linearly polarized light waves with their polarization planes at right angles two each other give rise to :

    (1) Circular polarization

    (2) elleptical polarization

    (3) Linear polarization

    (4) Unpolarized light

139. The decomposition of a ray of light into two different rays when it passes through calcite crystal is known as :

    (1) Diffraction

    (2) Refraction

    (3) Interference

    (4) Bifringence

140. A thin needle of steel can be made to float in a bowl filled with pure water without any external support because its weight is balanced by :

    (1) The surface tension of water

    (2) The viscosity of water

    (3) The buayancy of water

    (4) The stream energy of water

141. Sterm-Gerlach experiment shows :

    (1) Discrete values for the physical quantities

    (2) Continuous values for the physical quantities

    (3) Uncertainty in simultaneous measurement of position and momentum of electron

    (4) Wave nature of electron

142. Which of the following combinations of three identical capacitors will store maximum energy for the same voltage :

    (1) Two in series and one in parallel across them

    (2) Two in parallel and one in series

    (3) All three in series

    (4) All three in paralle

143. For a medium the response of conduction electrons to an electromagnetic field is determined by the relation $\vec{j} = \sigma \vec{E}$ where symbols have their usual meaning. If σ increases with temperature the medium is :

    (1) A conductor   (2) A semiconductor

    (3) An insulator   (4) A dielectric

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144. In a full-wave rectifier circuit being operated from $50H_z$ A.C. mains frequency the second harmonic frequency in the repple would be :

   (1) 25 H_z (2) 50 H_z

   (3) 100 H_z (4) 200 H_z

145. The width of the depletion layer of a P-N jucntion diode :

   (1) Is increased under reverse bias

   (2) Is increased under forward bias

   (3) Is independent of applied bias

   (4) Is increased with high doping

146. The moderator in a nuclear reactor is used for :

   (1) Absorting neutrons   (2) Absorting thermal energy

   (3) Slowing down neutrons   (4) Accelerating neutrons

147. A measurement establishes the position of a proton with an accuracy of $\pm 1.0 \times 10^{-11}$ m. The uncertainty in the proton's position 1.00 sec later will be (Assume velocity of proton to be very-very less than velocity of light and h = 1.054×10^{-34} J.sec)

   (1) 2.35×10^{-12} m

   (2) 1.15×10^{-13} m

   (3) 3.15×10^{-19} m

   (4) 3.25×10^{-16} m

P.T.O.

148. Ultraviolet light of wave length 350 nm and intensity 1.00 w/m² is directed at a potassium surface. If the work function for potassium surface is 2.2 eV then the maximum K.E of the photoelectrons emitted from the surface will be :

(1) 1.2 eV   (2) 1.3 eV   (3) 1.4 eV   (4) 1.5 eV

149. An electron collides with a hydrogen atom in its ground state and excites it to a state of n=3. How much energy was given to the hydrogen atom in this collision (Given that ionization energy of hydrogen atom is 13.6 eV)

(1) 10.4 eV   (2) 9.5 eV   (3) 12.1 eV   (4) 6.1 eV

150. Which of the following statement is not correct about LASER light beams :

(1) The light is very nearly monochromatic

(2) All the waves in the light are exactly in phase with each other

(3) A LASER beam courages hardly at all

(4) The beam is extremely intense

(iii) GEOLOGY

(Optional)

151. As per the principle of cirs-cross cutting :

    (1) Intruded rock is older than intruding rock

    (2) Intruded rock is younger than intruding rock

    (3) Both are of same age

    (4) There is no time relationship between them

152. Which of the following physical divisions of India is represented by a triangular plateau ?

    (1) Extra peninsular   (2) Peninsular

    (3) Indo-gangetic Plains   (4) None of these

153. "Structural highs" in Indo-gangetic plains are :

    (1) Thrust faults   (2) Flysch zone

    (3) Buried hills   (4) Synclinorium

154. Siwalik rocks are present in :

    (1) Outer Himalaya zone

    (2) Lasser Himalaya zone

    (3) Central crystalline axis

    (4) Tethyan Himalaya zone

P.T.O.

155. Indus suture zone has characteristic rock type known as :

(1) Ophiolite   (2) Gondite

(3) Charnockite   (4) Khondalite

156. Select a lithostratigraphic unit from the following :

(1) System   (2) Lithodeme

(3) Formation   (4) Biozone

157. Which of the following eras has three periods ?

(1) Hadean   (2) Mesozoic

(3) Palaeozoic   (4) Cenozoic

158. Mesozoic Era is also known as :

(1) Age of Mammals   (2) Age of reptiles

(3) Age of birds   (4) Age of fishes

159. When the most primitive fishes did first appeared ?

(1) Devonian   (2) Permian

(3) Ordovician   (4) Cambrian

160. In which type of preservation, the hard parts of the organism becomes heavier and denser ?

(1) Replacement   (2) Petrifaction

(3) Recrystallisation   (4) Carbonisation

161. Which of the following is a pseudofossil ?

    (1)   Dendrites   (2)   Chondrites

    (3)   Graptolite   (4)   Trilobite

162. The impression produced in the sediments due to behavioural activities of ancient organisms is known as :

    (1)   Body fossils   (2)   Leaked fossil

    (3)   Psuedofossil   (4)   Trace fossil

163. What is meaning of extinction in fossil record ?

    (1)   It has suddenly disappeared and never recur

    (2)   It has suddenly disappeared but recurs again

    (3)   It number has suddenly increased and then decreased

    (4)   Its number has suddenly decreased and then increased

164. Which is the greatest period of coal formation ?

    (1)   Permian   (2)   Carboniferous

    (3)   Eocene   (4)   Miocene

165. Which of the following horizons of Lower Gondwana is devoid of coal seams ?

    (1)   Barakar Formation

    (2)   Raniganj Formation

    (3)   Karharbari Formation

    (4)   Barren Measure Formation

P.T.O.

166. The lignite coalfield of Tamil Nadu is known as :

    (1) Panadhro Lignite   (2) Neyveli Lignite

    (3) Palna Lignite   (4) None of these

167. Which of the following oilfields is situated in Assam ?

    (1) Digboi   (2) Nawagam

    (3) Ankleshwar   (4) Nagapatinam

168. In Bombay High, the age of hydrocarbon bearing liomestone is:

    (1) Oligocene   (2) Eocene

    (3) Miocene   (4) Palaeocene

169. Which of the following areas is famous for iron ore deposits ?

    (1) Malanjkhand   (2) Kudremukh

    (3) Zawar   (4) Sukinda

170. Find a copper-ore mineral from the following :

    (1) Chamosite   (2) Chalcopyrite

    (3) Pyrite   (4) Galena

171. Maganite is a mineral of :

    (1) Carbon   (2) Magnesium

    (3) Iron   (4) Manganese

172. Blue dust is variety of :

    (1) Iron ore   (2) Copper ore

    (3) Manganese ore   (4) Chromite ore

173. Which of the following is **not** mechanically disintegrated sedimentary rock ?

    (1) Sandstone   (2) Conglomerate

    (3) Shale   (4) Limestone

174. In the clastic sediments, the size of cobbles of range in between :

    (1) 4-64 mm   (2) 64-256 mm

    (3) 2-4 mm   (4) 2-1/16 mm

175. The sandstones with more feldspar than quartz are called :

    (1) Arkose   (2) Greywacke

    (3) Quartz arenite   (4) None of these

176. Which of the following is a primary sedimentary structure ?

    (1) Convolute bedding   (2) Concretions

    (3) Solution structure   (4) Stratification

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177. The epizone of metamorphism is characterized by :

    (1) Low grade metamorphism

    (2) Medium grade metamorphism

    (3) High garde metamorphism

    (4) Load metamorphism

178. Which of the following metamorphic rocks is equivalent of shales and mudstone ?

    (1) Schist   (2) Geneiss

    (3) Quartzite   (4) Slate

179. Select from the following an acidic igeous rock :

    (1) Basalt   (2) Granite

    (3) Syenite   (4) Diorite

180. Which of the following is considered as quartz free igneous rock ?

    (1) Nephaline Syenite   (2) Lamprophyre

    (3) Dolerite   (4) Rhyolite

2,500

ROUGH WORK
रफ़ कार्य

45

P.T.O.

16P/290/7

ROUGH WORK
रफ़ कार्य

ROUGH WORK
रफ़ कार्य

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P.T.O.

अभ्यर्थियों के लिए निर्देश

(इस पुस्तिका के प्रथम आवरण पृष्ठ पर तथा उत्तर-पत्र के दोनों पृष्ठों पर
केवल नीली-काली बाल-प्वाइंट पेन से ही लिखें)

1. प्रश्न पुस्तिका मिलने के 30 मिनट के अन्दर ही देख लें कि प्रश्नपत्र में सभी पृष्ठ मौजूद हैं और कोई प्रश्न छूटा नहीं है। पुस्तिका दोषयुक्त पाये जाने पर इसकी सूचना तत्काल कक्ष-निरीक्षक को देकर सम्पूर्ण प्रश्नपत्र की दूसरी पुस्तिका प्राप्त कर लें।

2. परीक्षा भवन में *लिफाफा रहित प्रवेश-पत्र के अतिरिक्त*, लिखा या सादा कोई भी खुला कागज साथ में न लायें।

3. *उत्तर-पत्र अलग से दिया गया है। इसे न तो मोड़ें और न ही विकृत करें। दूसरा उत्तर-पत्र नहीं दिया जायेगा।*
    केवल उत्तर-पत्र का ही मूल्यांकन किया जायेगा।

4. अपना अनुक्रमांक तथा उत्तर-पत्र का क्रमांक प्रथम आवरण-पृष्ठ पर पेन से निर्धारित स्थान पर लिखें।

5. *उत्तर-पत्र के प्रथम पृष्ठ पर पेन से अपना अनुक्रमांक निर्धारित स्थान पर लिखें तथा नीचे दिये वृत्तों को गाढ़ा कर दें। जहाँ-जहाँ आवश्यक हो वहाँ प्रश्न-पुस्तिका का क्रमांक तथा सेट का नम्बर उचित स्थानों पर लिखें।*

6. ओ० एम० आर० पत्र पर अनुक्रमांक संख्या, प्रश्नपुस्तिका संख्या व सेट संख्या (यदि कोई हो) तथा प्रश्नपुस्तिका पर अनुक्रमांक और ओ० एम० आर० पत्र संख्या की प्रविष्टियों में उपरिलेखन की अनुमति नहीं है।

7. *उपर्युक्त प्रविष्टियों में कोई भी परिवर्तन कक्ष निरीक्षक द्वारा प्रमाणित होना चाहिये अन्यथा यह एक अनुचित साधन का प्रयोग माना जायेगा।*

8. प्रश्न-पुस्तिका में प्रत्येक प्रश्न के चार वैकल्पिक उत्तर दिये गये हैं। प्रत्येक प्रश्न के वैकल्पिक उत्तर के लिए आपको उत्तर-पत्र की सम्बन्धित पंक्ति के सामने दिये गये वृत्त को उत्तर-पत्र के प्रथम पृष्ठ पर दिये गये निर्देशों के अनुसार पेन से गाढ़ा करना है।

9. प्रत्येक प्रश्न के उत्तर के लिए केवल एक ही वृत्त को गाढ़ा करें। एक से अधिक वृत्तों को गाढ़ा करने पर अथवा एक वृत्त को अपूर्ण भरने पर वह उत्तर गलत माना जायेगा।

10. ध्यान दें कि एक बार स्याही द्वारा अंकित उत्तर बदला नहीं जा सकता है। यदि आप किसी प्रश्न का उत्तर नहीं देना चाहते हैं, तो संबंधित पंक्ति के सामने दिये गये सभी वृत्तों को खाली छोड़ दें। ऐसे प्रश्नों पर शून्य अंक दिये जायेंगे।

11. रफ कार्य के लिए प्रश्न-पुस्तिका के मुखपृष्ठ के अंदर वाला पृष्ठ तथा उत्तर-पुस्तिका के अंतिम पृष्ठ का प्रयोग करें।

12. परीक्षा के उपरान्त केवल **ओ एम आर उत्तर-पत्र** परीक्षा भवन में जमा कर दें।

13. परीक्षा समाप्त होने से पहले परीक्षा भवन से बाहर जाने की अनुमति नहीं होगी।

14. यदि कोई अभ्यर्थी परीक्षा में अनुचित साधनों का प्रयोग करता है, तो वह विश्वविद्यालय द्वारा निर्धारित दंड का/की, भागी होगा/होगी।