Set No. 1

18P/302/24(i)

02416

Total No. of Printed Pages : 64

Question Booklet No.

(To be filled up by the candidate by blue/black ball-point pen)

Roll No. | | | | | | | | | | |

2018

Serial No. of OMR Answer Sheet .....

Centre Code No. | | | | |

.....

(Signature of Invigilator)

Day and Date .....

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.***
3. ***A separate OMR Answer Sheet is given. It should not be folded or mutilated. A second OMR Answer Sheet shall not be provided. Only the OMR Answer Sheet will be evaluated.***
4. Write all entries by blue/black pen in the space provided above.
5. ***On the front page of the OMR Answer Sheet, write by pen your Roll Number in the space provided at the top and by darkening the circles at the bottom. Also, write the Question Booklet Number, Centre code Number and the Set Number whereever applicable in appropriate places.***
6. ***No overwriting is allowed in the entries of Roll No., Question Booklet no. and Set no. (if any) on OMR Answer Sheet and Roll No. and OMR Answer 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 OMR Answer Sheet by darkening the appropriate circle in the corresponding row of the OMR Answer Sheet, by pen as mentioned in the guidelines given on the first page of the OMR Answer Sheet.***
9. For each question, darken only one circle on the **OMR** 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. On completion of the Test, the candidate must handover the OMR Answer Sheet to the Invigilator in the examination room/hall. However, candidates are allowed to take away Test Booklet and copy of OMR Answer Sheet with them.
13. Candidates 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.

ROUGH WORK
रफ़ कार्य

No. of Questions : 240

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 paper contains **two** Sections, viz : **Section-A** and **Section-B**. Details of **Section-A** and **Section-B** are as follows :

(a) **Section-A** contains **60** questions from General Science and **20** questions of General Nature.

(b) **Section-B** contains **four** sub-sections namely : **Chemistry, Physics, Biology** and **Mathematics** with **40** questions in each. The candidate has to select **only one** of the **four** sub-sections of **Section-B**.

SECTION - A

01. Forensic science is a unique scientific endeavour acceptable to the Court of law having explanation :

(1) same to conventional field of science

(2) different to conventional field of science

(3) same to natural field of science

(4) different to natural field of science

02. The preventing/practicing forensics cannot play a role in :

(1) narco analysis
(2) brain/fingerprinting
(3) terrorist attack
(4) literacy

03. Principle of exchange in forensic investigation means :

(1) Unilateral exchange of traces by a criminal to object
(2) Unilateral exchange of traces by a object to the criminal
(3) Mutual exchange of traces by a criminal and a object
(4) Mutual exchange of traces between two objects

04. 'Cheiloscopy' is a forensic investigation technique that deals with identification of human based on :

(1) lip traces
(2) voice traces
(3) blood traces
(4) Gait patterns

05. Which may belong to chemistry division of forensic science ?

(1) Rape, murder, suicide and drowning
(2) Accident cases
(3) Food poisoning cases
(4) Explosion, arson, fire and acid burn

06. Penile plethysmography technique is used to indentify and evaluate

(1) Skull and facial imaging
(2) Sexual deviance
(3) Viscera test
(4) Speaker identification

07. 'Abrasion' is an :

(1) injury involving loss and damage of internal layer of the skin

(2) injury involving loss and damage of superficial layer of the skin

(3) injury involving loss and damage of finger bone

(4) injury involving loss and damage of leg bone

08 Abortifacient drugs are used to :

(1) terminate matured pregnancy

(2) terminate prematured pregnancy

(3) terminate pregnancy for ever

(4) terminate pregnancy for a known time

09. 'Algar mortis' is :

(1) the body cooling

(2) the body heating

(3) the body decomposing

(4) the body resting

10 'Ante mortem' is :

(1) after the death or after the life of an organism

(2) before the death or during the life of an organism

(3) at the time when death occurs

(4) at the time when illness approaches

11. 'Antigen' is :

(1) a molecule that upon entering the body stimulates a lymphocyte to provoke an immune response

(2) an act of producing the minimum amount of heat energy in the body

(3) a large protein molecule produced by the body's immune system

(4) a DNA system that is used to trace ancestral heritage

12. The vitamin, riboflavin, is also known as :

(1) Vitamin B_1 (2) Vitamin B_2

(3) Vitamin B_6 (4) Vitamin C

13. A good source of abscorbic acid is :

(1) meat (2) citrus fruits

(3) lettuce (4) coffee

14. Which of the following is a copolymer ?

(1) Natural rubbers (2) Nylon-6,6

(3) Orlon (4) Teflon

15. Which of the following terms is used in the repeating units of a polymer ?

(1) Unit structure (2) Condensation

(3) Unit residue (4) monomer

16. Latex is the source of :

(1) cellulose (2) nylon

(3) natural rubber (4) collagen

17. In which polymer is $\{CF_2\text{-}CF_2\}_n$ the repeating unit :

(1) Teflon (2) Orion

(3) Plexiglas (4) Lucite

18. Which of the following is the weaker base ?

(1) methylamine (2) aniline

(3) piperidine (4) acetonitrile

19. Which holds the two strands of DNA together ?

(1) dipole-dipole interaction (2) hydrogen bonds

(3) vander Waals forces (4) ionic bonds

20. Radioactivity is the characteristic feature of :

(1) Nucleus (2) Electrons

(3) Protons (4) Neutrons

21. A molecule can be excited to only the next higher rotational level by :

(1) absorption of energy (2) release of energy

(3) the electrice connection (4) applying magnetic field

22. Fathometer is used to measure :

(1) earthquake (2) rainfall

(3) ocean depth (4) sound intensity

23. Exposure to sunlight-helps a person to improve his health because

(1) the infrared light kills bacteria in the body

(2) resistance power increases

(3) the pigment cells in the skin get stimulated and produce a healthy tan

(4) the ultraviolet rays help in vitamin-D synthesis

24. At which particular place on earth are days and nights of equal length always ?

(1) Prime Meridian (2) Poles

(3) Equator (4) No where

25. According to WHO, the bird flu virus cannot be transmitted through food cooked above :

(1) 60°C (2) 70°C

(3) 90°C (4) 100°C

26. Cactus spines are modified :

(1) Stems (2) branches

(3) leaves (4) roots

27. Name the company that has recently created the world's smallest magnet using a single atom which can store one bit of data on it :

(1) TCS (2) Microsoft

(3) IBM (4) Infosys

28. Which among the following explains the radiation emitted by black bodies ?

(1) Big-bang theory (2) Quantum theory

(3) Piezoelectric effect (4) Beer's law

29. ACSII code is a 7-bit code for :

(1) letters (2) number

(3) other symbols (4) all of these

30. Entomology is the science that studies :

(1) behaviour of human beings

(2) Insects

(3) the origin and history of the technical and scientific terms

(4) the formation of rocks

31. In which layers of the atmosphere is the most weather phenomenon occur ?

(1) Exosphere (2) Stratosphere

(3) Ionosphere (4) Troposphere

32. Hereditary information is found in a cell's :

(1) Chloroplasts (2) Chromosomes

(3) Cytoplasm (4) membranes

33. Pituitary : Brain :: Thymus : ?

(1) Larynx (2) Spinal cord

(3) Throat (4) Chest

34. Which type of fire extinguisher is used for petroleum fire ?

(1) Powder type (2) Liquid type

(3) Soda acid type (4) Foam type

35. Paper is manufactured by :

(1) Wood and resin

(2) Wood, sodium and bleaching powder

(3) Wood, calcium, hydrogen sulphite and resin

(4) Wood and bleaching powder

36. Gravity setting chambers are used in industries to remove :

(1) SO_2

(2) NO_x

(3) Suspended particulate matters

(4) CO

37. Heavy water is :

(1) deuterium oxide (2) pH7

(3) rain water (4) titrium oxide

38. The intersecting lines drawn on maps and globes are :

(1) latitudes (2) Longitudes

(3) geographic grids (4) geographic curves

39. The device converts data from a binary code into telephonic analog signals is called :

(1) modular (2) modem

(3) electric wire (4) magnetic wire

40. Which of the following phenomenon is considered responsible for Global Warming ?

(1) Greenhouse effect (2) Fire in coal mines

(3) Monsoon (4) Trade winds

41. Which among the following of a catalyst does not change at the end of the reaction ?

(1) Quantity

(2) Chemical composition

(3) Both quantity and chemical composition

(4) surface

42. Which among the following statements about Ozone is incorrect ?

(1) It is found in the upper atmosphere which filters potentially damaging ultraviolet light from reaching the earth's surface

(2) It is lighter than oxygen that is why it is found on the upper atmosphere

(3) It is an allotrope of oxygen

(4) Ozone hole is an environmental problem

43. How many vertebrae does a human being have ?

(1) 33 (2) 36

(3) 29 (4) 19

44. Who is known as the father of Indian Missile Technology' ?

(1) Dr U.R. Rao (2) Dr. A.P.J. Abdul Kalam

(3) Dr. Chidambaram (4) Homi Bhabha

45. Bats can fly in the dark because :

(1) they have better vision in the dark

(2) the light startles in them

(3) they produce high pitched sounds called ultrasonics

(4) they have some vision in the dark

46. An astronaut in outer space will observe sky as :

(1) white (2) black

(3) blue (4) red

47. It is not advisable to sleep under a tree at night because of release of :

(1) oxygen in a lesser quantity (2) oxygen in larger amount

(3) carbon monoxide (4) carbon dioxide

48. A universal recepient belongs to the blood group :

(1) AB (2) O

(3) B (4) A

49. Which of the following disease is **not** caused by virus ?

(1) Chicken POX (2) Dengue

(3) Cholera (4) Polio

50. Which one of the following does **not** contain silver ?

(1) Horn silver (2) Ruby silver

(3) Lunar caustic (4) German silver

51. The planet nearest to the sun is :

(1) Venus (2) Mercury

(3) Jupiter (4) Saturn

52. Which of the following makes us know the exact age of a tree ?

(1) Height of the tree
(2) Width of the tree
(3) Rings of the tree
(4) Branches of the tree

53. Which of the following bacteria is found in Ganga water ?

(1) Colinform bacteria
(2) Streptococcus bacteria
(3) Staphylococcus bacteria
(4) Diplococcus bacteria

54. Which of the following does **not** conduct electricity ?

(1) Fused NaCl
(2) Solid NaCl
(3) Brine solution
(4) Copper

55. Which part of the eye is adjustable in accordance with the light condition ?

(1) Iris
(2) Retina
(3) Pupil
(4) Lens

56. If the mass of both bodies is reduced to half, the gravitational force between them becomes :

(1) Double
(2) Four times
(3) One fourth
(4) one-half

57. Which colour component of white light is deviated the most through a prism ?

(1) Red (2) Yellow

(3) Blue (4) Violet

58. Metal which is a constituent of Haemoglobin is :

(1) Cu (2) Al

(3) Zn (4) Fe

59. Hooke's theory is related to :

(1) Liquid pressure (2) Elasticity

(3) Radioactivity (4) Viscosity

60. Which radio active isotope is used to control leukemia :

(1) Phosphorus-32 (2) Cobalt-60

(3) Iodine-131 (4) Sodium-24

61. In a group of cows and hens the number of legs are 14 more than twice the number of heads. The number of cows is :

(1) 12 (2) 10

(3) 7 (4) 5

62. Set of rational numbers is a subset of :

(1) natural numbers (2) integers

(3) real numbers (4) irrational numbers

63. The value of $\left\{\frac{(0.1)^2-(0.01)^2}{0.0001}+1\right\}$ is :

(1) 1010 (2) 100

(3) 110 (4) 101

64. If $(a + b)^3 = a^3 + b^3$, then :

(1) $ab > 0$ (2) $ab < 0$

(3) $a = 0$ or $b = 0$ or $a = -b$ (4) None of these

65. Let m and n are whole numbers. If $m^n = 121$, the value of n^m is :

(1) 512 (2) 1024

(3) 2048 (4) 4096

66. The value of $\sqrt{0.01} + \sqrt{0.81} + \sqrt{1.21} + \sqrt{0.0009}$, is :

(1) 2.03 (2) 2.1

(3) 2.11 (4) 2.13

67. Two numbers are in the ratio 3:5. If 9 is subtracted from each, the new numbers are in the ratio 12:23. The smaller number is :

(1) 27 (2) 33

(3) 49 (4) 65

68. BGK is related to AFJ in the same way as PSV is related to :

(1) ORT (2) ORU

(3) ROU (4) ORV

69. If A is written as +, E is written -, I as × and O as ÷ and the consonants B, C, D, F .... are written as 1, 2, 3, 4, ... respectively then FILLER is :

(1) 396 (2) 382

(3) 368 (4) 372

70. Find the value $\sqrt{6+\sqrt{6+\sqrt{6+.....\infty}}}$:

(1) 3 (2) 4

(3) 5 (4) 6

71. The missing term of the sequence 1, 6, 13, ..., 33, 46, is :

(1) 19 (2) 21

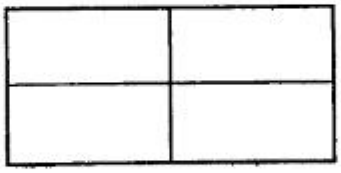
(3) 24 (4) 22

72. A man is facing north. He turns 135^0 in the anticlockwise direction and then 180^0 in the clockwise direction. He is now facing :

(1) North-East (2) North-West

(3) South-East (4) South-West

73. How many rectangles are there in the following figure ?



(1) 4 (2) 6

(3) 8 (4) 9

74. If the word TERMINATION is coded 12345671586, what should be the code for the word MOTION ?

(1) 438586 (2) 458586

(3) 485186 (4) 481586

75. To print a document :

(1) Select the Print command and then select OK

(2) Select the Ready printer command and then select OK

(3) type PRINT and the press Enter

(4) close the document, select the Print command and then select OK

76. In how many different ways can be letters of the word 'TRENDS' be arranged ?

(1) 720 (2) 120

(3) 740 (4) 5040

77. The perimeter of a circle is equal to the perimeter of a square. Then their areas are in the ratio : (use $\pi = \frac{22}{7}$)

(1) 4:1 (2) 11:7

(3) 14:11 (4) 22:7

78. ₹58,750 amounts to ₹ 79,900 in four years at simple interest. What is the rate of the interest paid ?

(1) 14 (2) 13

(3) 9 (4) 16

79. How many meaningful words (not ending with S), can be made with the alphabets A,D, and S, each being used only once in each word ?

(1) None (2) One

(3) Two (4) Three

80. If © denotes '–' and ∆ denotes '+' , what will be the value of 94∆27 © 44© 56∆ 20 ?

(1) 41 (2) 45

(3) 47 (4) 48

SECTION - B
(CHEMISTRY)

81. Ligand field theory is different from crystal field theory in respect of the following :

(1) Ligand field theory considers partial covalent character of metal-ligand bond.

(2) Ligand field theory considers ionic character of metal - ligand bond.

(3) Ligand field theory considers 100% covalent character of metal ligand bond.

(4) Ligand field theory considers no interaction between metal and ligand.

82. Crystal field stabilization energy for ReF_6 showing crystal field splitting energy of 32500 cm^{-1} is :

(1) 37.37 k cal (2) 37.037 k cal

(3) 27.037 k cal (4) 37.027 k cal

83. V_2O_5 (vanadium pertoxide) is used as a catalyst :

(1) for the manufacture of H_2SO_4

(2) to decompose $KClO_3$ to give O_2

(3) in production of CCl_4 from CS_2 and Cl_2.

(4) for hydrogenation of phenol to cyclohexanone.

84. On the basis of shape of (a) $XeOF_4$,(b) PCl_5, (c) XeO_3 and (d) NH_3, which one of the following is correct ?

(1) a and b have square pyramidal and trigonal bipyramidal shape, respeclively.

(2) a and b have trigonal bipyramidal and square pyramidal shape, respectively.

(3) a and c have pyramidal and square pyramidal shape, respectively.

(4) b and d have pyramidal and triganal bipyramidal shape, respectively.

85. Which one of the following is peroxo acid ?

(1) H_2SO_4 (2) $H_2S_2O_4$

(3) H_2SO_5 (4) $H_2S_2O_7$

86. Which one of the following is a stable free radical ?

(1) NO (2) NO^-

(3) NO^+ (4) N_2O_2

87. In a qualitative test of fluoride, when salt/mixture is heated with SiO_2 and conc. H_2SO_4 in a test tube and a moistened glass rod is brought to mouth of the test tube, white solid deposited on glass rod is :

(1) $H_2[SiF_6]$ (2) SiF_4

(3) HF (4) SiO_2

88. Which one of the following has no donor properties ?

(1) NF_3 (2) PF_3

(3) NH_3 (4) PH_3

89. Marcasite is an ore of :

(1) Hg (2) Cu

(3) Zn (4) Fe

90. Which one of the following is **not** diamagnetic and has no metal-metal bond ?

(1) $Cr_2(CH_3COO)_4(H_2O)_2$ (2) $Cu_2(CH_3COO)_4(H_2O)_2$

(3) $Mo_2(CH_3COO)_4(H_2O)_2$ (4) $Re_2Cl_8^{2-}$

91. The rotational constant (B) of gaseous HCl is 10.59 cm^{-1}. The ratio of the rotational partition functions of HCl at 100 K and 500 K is :

(1) 0.2 (2) 0.5

(3) 2 (4) 5

92. The liquid pair having both upper critical solution temperature and lower critical solution temperature is :

(1) Phenol-water (2) Aniline-hexane

(3) Triethylamine-water (4) Nicotine-water

93. The ratio of the rate constants of second order reaction is 10 at 27 °C and 47 °C, respectively. The activation energy of the reaction (in KJ mol^{-1}) will be ($R = 8.314\ JK^{-1}\ mol^{-1}$)

(1) 9191 (2) 919.1

(3) 91.91 (4) 9.191

94. The number of α and β particles emitted in the nuclear reaction $_{90}Th^{228} \longrightarrow {}_{83}B_i^{212}$ is :

(1) 8 α and 1 β (2) 3 α and 7 β

(3) 4 α and 7 β (4) 4 α and 1 β

95. Raman lines on the low frequency side of the excitation frequency are called :

(1) Stokes lines (2) Anti-Stokes lines

(3) Rayleigh lines (4) All of the above

96. If 0.1 M aqueous solutions of each electrolyte are taken and if all electrolytes are completely dissociated, then whose boiling point will be highest ?

(1) LiCl (2) KCl

(3) $BaCl_2$ (4) $K_4[Fe(CN)_6]$

97. The translational molecular partition function of a He atom at 298 K in a container of volume 1.00 m^3 is :

(1) 1.25×10^{31} (2) 7.75×10^{30}

(3) 5.5×10^{29} (4) 2.25×10^{28}

98. Calculate the e.m.f.(V) of the following cell :

$Pt(s) | H_2(g, 1 atm) | HCl (aq., a_{H^+} = 0.2) || KCl (aq., a_{Cl^-} = 0.4) | AgCl(s) | Ag(s)$

Given : Standard cell potential, $E^0_{cell} = 0.222$ V at 298 K and $\log_{10} 2 = 0.301$

(1) 0.487 (2) 0.378

(3) 0.287 (4) 0.178

99. The ratio of the distances from the origin among the three planes with Miller indices of (100),(110) and (111) in a cubic lattice is :

(1) $\sqrt{6} : \sqrt{3} : \sqrt{2}$ (2) 1 : 2 : 3

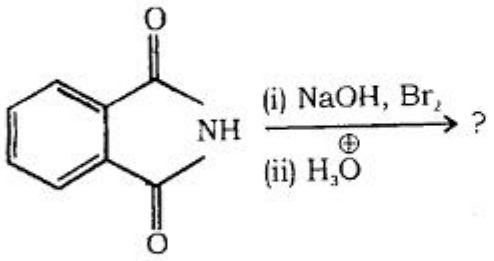
(3) $\sqrt{3} : \sqrt{2} : \sqrt{1}$ (4) $\sqrt{2} : \sqrt{3} : \sqrt{6}$

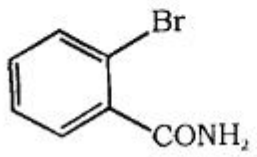
100. The specific counductance of a saturated solution of CaF_2 at 25°C after subtracting the specific conductance of water is 4.05×10^{-3} S m^{-1}. Assuming $A^0_m(CaF_2) = 200 \times 10^{-4}$ S m^2 mol^{-1}, the solubility product of CaF_2 (in mol^3 dm^{-9}) will be :

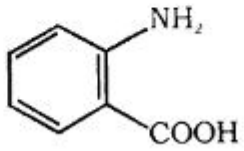
(1) 3.32×10^{-7} (2) 3.32×10^{-9}

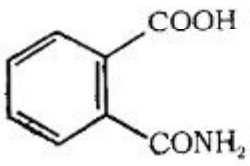
(3) 3.32×10^{-11} (4) 1.16×10^{-9}

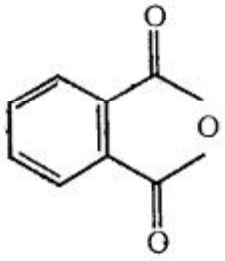
101. The major product resulting in the given below reaction is :



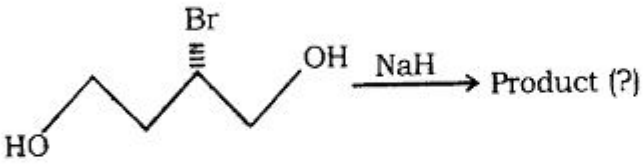
(1) 

(2) 

(3) 

(4) 

102. In the following cyclization reaction :



The major reaction product is :

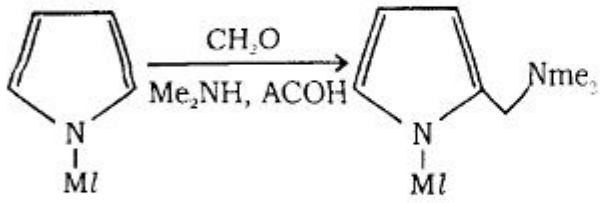
(1) 

(2) 

(3) 

(4) 

103. The following conversion is an example of :

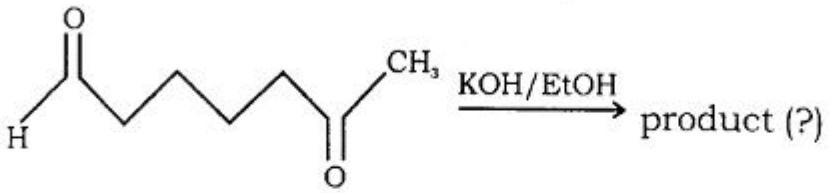


(1) Chichibabin Amination reaction
(2) Arndt-Eistert Homologation
(3) Michel Addition
(4) Monnich reaction

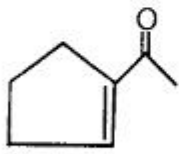
104. The compound that can be used as a formyl anion equivalent (in the presence of strong base) is :

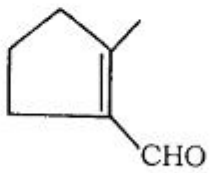
(1) Ethylene
(2) Nitroethane
(3) 1,3-dithiane
(4) 1,4-dithiane

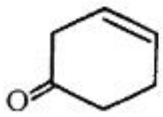
105. In the following reaction :



The Product obtained is :

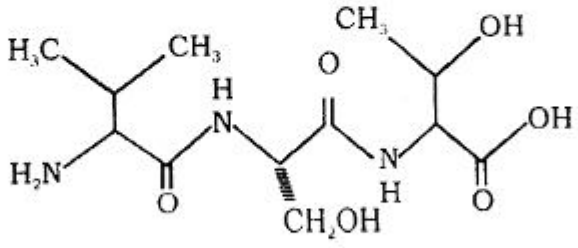
(1) 

(2) 

(3) 

(4) 

106. The correct sequence of the amino acids present in the following tripeptide is :



(1) Val-Thr-Ser

(2) Leu-Thr-Ser

(3) Leu-Ser-Thr

(4) Val-Ser-Thr

107. Tollen's Test is negative for :

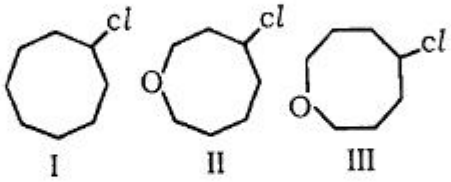
(1) Lactose

(2) Maltose

(3) Sucrose

(4) Cellobiose

108. The order of the rate of sollysis for the following compounds in Acetic Acid is :



I II III

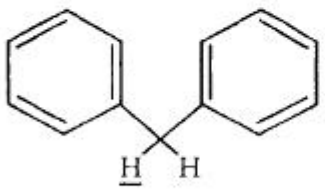
(1) II > I > III

(2) III > II > I

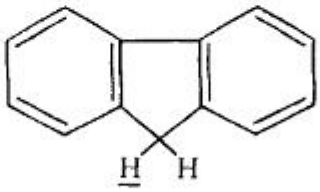
(3) III > I > II

(4) I > III > II

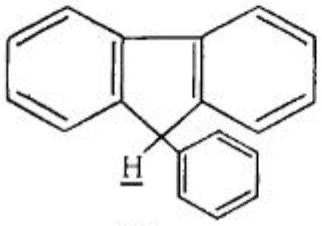
109. The decreasing order of acidity of the marked H (hydrogen) of the following molecules is :



(I)



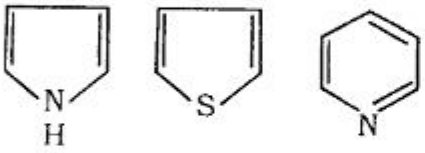
(II)



(III)

(1) III > II > I
(2) III > I > II
(3) I > II > III
(4) I > III > II

110. The decreasing order of the reactivity of the following compounds towards electrophiles is :



I II III

(1) II > I > III
(2) II > III > I
(3) III > I > II
(4) I > II > III

111. The criteria for selection of an acid-base indicator is :

(1) $pH = pK_{In}$ (2) $pH = pK_{In} \pm 1$

(3) $pH = \frac{1}{pk_{I_n}}$ (4) $pH = 1 - pK_{In}$

112. The salt of a weak acid and a weak base is :

(1) Neutral (2) Strong acid

(3) Strong base (4) Weak acid

113. Which of the following reagents is used as source of molecular bromine ?

(1) Potassium bromate

(2) Potassium bromide

(3) Potassium bromate + Potassium bromide

(4) Hydrobromic acid

114. Which of the following reagents is used for determination of moisture in a sample ?

(1) Malaprade reagent (2) Oxine

(3) Chloramine-T (4) Karl-Fischer reagent

115. Which of the following relationships is used to convert potentials *versus* SCE to the corresponding potentials *versus* NHF, and *vice versa* ?

(1) E $\underline{v}$s SCE = E $\underline{v}$s NHE + 0.242 (2) E $\underline{v}$s SCE = E $\underline{v}$s NHE – 0.242

(3) E $\underline{v}$s NHE = E $\underline{v}$s SCE (4) E $\underline{v}$s NHE = 1/E $\underline{v}$s SCE

116. A sample in a 1.0-cm cell is determined with a spectrometer to transmit 80% light at a certain wavelength. If the absorptrvity of the substance at this wavelength is 2.0, the concentration of the *substance is* :

(1) 5.0 g/L (2) 0.5 g/L

(3) 0.05 g/L (4) 0.005 g/L

117. Twenty milli liters of an aqueous soluition of 0.10 M butyric acid is shaken with 10 mL ether. After the layers are separated, it is determind by titration that 0.5 in mL butyric acid remained in the aqueous layer. The distribution ratio and the precent extraction are :

(1) 0.60, 75% (2) 0.06, 76%

(3) 6. 75% (4) 60, 76%

118. The number of theoretical plates can be obtained from any **one** of the following expression in column chromatography.

(1) $n = 16\left(\frac{t_R}{w}\right)^2$ (2) $n = 16\left(\frac{w}{t_R}\right)^2$

(3) $n = 61\left(\frac{t_R}{w}\right)^2$ (4) $n = 61\left(\frac{w}{t_R}\right)^2$

(where n = the number of theoretical plates of a column, tR = the retention time, W = width of peak)

119. What must be the concentration of added Ag^+ to just start precipitation of Ag Cl in a 1.0×10^{-3} M solution of NaCl ?

(1) 1.0×10^{-3} (2) 1.0×10^{-7}

(3) 1.0×10^{-10} (4) 0.1×10^{-7}

120. Handerson – Hasselbalch equation is :

(1) $P^Ka = P^H + \log\frac{[acid]}{[conjugated\ base]}$

(2) $P^Ka = P^H + \log\frac{[conjugated\ acid]}{[Base]}$

(3) $P^H = P^Ka + \log\frac{[conjugated\ base]}{[acid]}$

(4) $P^H = P^Ka + \log[acid][conjugated\ base]$

SECTION - B
(PHYSICS)

121. If the error in the measurement of the momentum of a particle is (+ 100%), then the error in the measurement of kinetic energy is :

(1) 400 %
(2) 300 %
(3) 100 %
(4) 200 %

122. A car travels first half of the distance between two places with a speed of 30km/hr and the remaining half with a speed of 50km/hr. The average speed of the car is :

(1) 45 Km/hr
(2) 42.8 Km/hr
(3) 37.5 Km/hr
(4) 48 Km/hr

123. Which of the following particle is responsible for carrying away the missing energy and momentum in a nuclear decay process ?

(1) α-particle
(2) Neutrino
(3) Lepton
(4) Proton

124. A bread gives a boy of mass 40kg an energy of 21kJ. If the efficiency is 28% then the height can be climbed by him using this energy is :

(1) 22.5 m
(2) 15 m
(3) 10 m
(4) 5 m

125. Two springs of spring constant 1500 N/m and 3000 N/m respectively are stretched with the same force. They will have the potential energies in the ratio of :

(1) 1:2 (2) 1:4

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

126. Two particles of equal mass are revolving in circular paths of radii r_1 and r_2 respectively with the same angular velocity. The ratio of their centripetal force will be :

(1) r_1/r_2 (2) r_2/r_1

(3) $(r_2/r_1)^{1/2}$ (4) $(r_2/r_1)^2$

127. The distance of two planets from the sun are 10^{13} meter and 10^{12} meter respectively. The ratio of time periods of these two planets is :

(1) $1/\sqrt{10}$ (2) 100

(3) $10\sqrt{10}$ (4) $\sqrt{10}$

128. For a satellite escape velocity is 11km/s. If the satellite is launched at an angle of 60^0 with the vertical, then escape velocity will be :

(1) 11 km/s (2) $11\sqrt{3}$ km/s

(3) $11/\sqrt{3}$ km /s (4) 33 km/s

134. The optical length of an astronomical telescope with magnifying power of 10 for normal vision is 44 cm. What is the focal length of the objective ?

(1) 4 cm
(2) 40 cm
(3) 44 cm
(4) 440 cm

135. The original temperature of black body is 727°C. The temperature to which that black body must be raised so as to double the total radiant energy, is :

(1) 917°C
(2) 1190°C
(3) 1454°C
(4) 2000°C

136. The temperature of source and sink of a heat engine are 127° C and 27°C respectively. An inventor claims its efficiency to be 26%. Comment on his claim.

(1) It is impossible
(2) It is possible with high probability
(3) It is possible with low probability
(4) Data is insufficient

137. Three capacitors of 2.0 μF , 3.0 μF and 6.0 μF are connected in series to a 10V source. The charge on 3.0 μF capacitor is :

(1) 15 μC
(2) 12 μC
(3) 5 μC
(4) 10 μC

138. A 100 W, 200V bulb is connected to a 160V supply. The actual power consumption would be :

(1) 185 W (2) 100 W

(3) 54 W (4) 64 W

139. A current of 2A passing through a conductor produces 80J of heat in 10 seconds. The resistance of conductor in ohm is :

(1) 0.5 (2) 2

(3) 4 (4) 20

140. A 10 eV electron is circulating in a plane at right angle to uniform field of magnetic induction 10^{-4} Wb/m^2. The orbital radius of the electron is :

(1) 12 cm (2) 16 cm

(3) 11 cm (4) 18 cm

141. Which of the following is **not** transducer ?

(1) Loudspeaker (2) Amplifier

(3) Microphone (4) All of these

142. A.C supply gives 30 V r.m.s. which passes through a 10Ω resistance. The power dissipated in it is :

(1) $90\sqrt{2}$ W (2) 90 W

(3) $45\sqrt{2}$ W (4) 45 W

143. The half life of a radioactive substance is 3.6 days. How much of 20 mg of that radioactive substance will remain after 36 days :

(1) 0.0019 mg (2) 1.109 mg

(3) 1.019 mg (4) 0.019 mg

144. A transistor has an $\alpha = 0.95$, it has change in emitter current of 100 mA, then the change in the collector is :

(1) 95 mA (2) 99.05 mA

(3) 100.95 mA (4) 100 mA

145. A body covers 1/4 journey with a speed of 40 km/h, 1/2 of it with 50 km/h and remaining with the speed of 60 km/h. The average speed for entire journey is :

(1) 32.4 km/h (2) 55.6 km/h

(3) 12.3 km/h (4) 23.8 km/h

146. In a double slit experiment, the slit separation is 3 times the slit width. How many bright interference fringes in the central diffraction envelope ?

(1) 9 (2) 6

(3) 12 (4) 3

129. Two wires A and B are of the same material. Their lengths are in the ratio 1:2 and the diameter are in the ratio 2:1. If they are pulled by the same force, then increase in length will be in the ratio :

(1) 2:1 (2) 1:4

(3) 1:8 (4) 8:1

130. A soap bubble has radius r and volume V. If the excess pressure inside the bubble is P, then PV is proportional to :

(1) r (2) r^2

(3) r^3 (4) r^4

131. Light of wave length 5000 Angstrom falls on a sensitive plate with photoelectric work function of 1.9 eV. The maximum kinetic energy of the photo electron emitted will be :

(1) 1.16 eV (2) 2.38 eV

(3) 0.58 eV (4) 2.98 eV

132. The de-Broglie wave length of an electron of energy 600 eV is :

(1) 4 Angstrom (2) 2 Angstrom

(3) 1 Angstrom (4) 0.5 Angstrom

133. The diameter of the object lens of telescope is 5.0 m and wavelength of light is 6000 $\mathring{A}$. The limit of resolution of this telescope is :

(1) 0.15 sec (2) 0.06 sec

(3) 0.03 sec (4) 3.03 sec

147. A light wave has wavelength of 600 nm in vacuum. What is the wavelength of the light as it travels through water (index of refraction = 1.33) ?

(1) 451 nm (2) 897 nm

(3) 221 nm (4) 123 nm

148. A copper cylinder is initially at 20.0 degree Celsius. At what temperature will its volume be 0.15% larger than it is at 20.0 degree Celsius.

(1) 49.4°C (2) 52.6°C

(3) 32.3°C (4) 89.1°C

149. Two long straight wires carrying the same current of 15 Ampere exert a force of 0.001 N per unit length on each other. What is the distance between the wires ?

(1) 7.3 cm (2) 4.5 cm

(3) 2.3 cm (4) 3.6 cm

150. A conducting straight wire of length 20 cm is moving with a constant speed perpendicular to uniform 0.1 T magnetic field. The wire is perpendicular to the magnetic field. The voltage across the wire is 0.5 V. Find the speed of the wire.

(1) 25 m/s (2) 34 m/s

(3) 67 m/s (4) 11 m/s

151. A 50 mH inductor is connected to 10 V battery. The resistance of the inductor is 5 ohm. What is the energy stored in the inductor ?

(1) 4.3 J (2) 8.3 J

(3) 0.1 J (4) 2.2 J

152. As one goes away from the center of an atom, the electron density :

(1) decreases like a Gaussian

(2) decreases exponentially

(3) oscillates with slowly decreasing amplitude

(4) none of the above

153. The hyperfine structure of hydrogen :

(1) is too small to be detected

(2) arises from nuclear spin

(3) arises from finite nuclear size

(4) none of the above

154. The average speed of an electron in the first Bohr orbit of an atom of atomic number Z is, in units of the velocity of light is :

(1) $Z^{1/2}$ (2) Z

(3) Z/137 (4) Z/13

155. A temperature difference of 5 K is equal to :

(1) a difference of 7.6 on the Celsius scale

(2) a difference of 9.0 on the Fahrenheit scale

(3) a difference of 2.8 on the Rankine scale

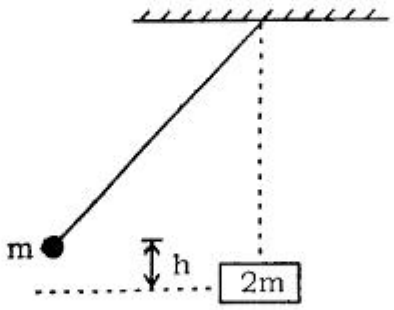
(4) a difference of 6.5 on the Fahrenheit scale

156. At what depth under the earth's surface, the value of acceleration due to gravity will reduce by 1% with respect to that on the earth's surface ?

(1) 75 km (2) 75 m

(3) 75.5 m (4) 64 km

157. As shown in the picture, a ball of mass m, suspended on the end of a wire, is released from height h and collides elastically, when it is at its lowest point, with a block of mass 2m at rest on a frictionless surface. After the collision, the ball rises to a final height equal to



(1) 1/7 h (2) 1/9 h

(3) 1/5 h (4) 1/8 h

158. A particle of mass *m* undergoes harmonic oscillation with period T_0. A force f proportional to the speed v of the particle, f = -bv, is introduced. If the particle continues to oscillate, the period with f acting is :

(1) Larger than T_0
(2) Smaller than T_0
(3) Independent of b
(4) Dependent linearly on b

159. In the spectrum of Hydrogen, what is the ratio of the longest wavelength in the Lyman series (n_f = 1) to the longest wavelength in the Balmer series (n_f = 2) ?

(1) 5/27
(2) 1/3
(3) 4/9
(4) 3/2

160. A 4.0 cm tall light bulb is placed at a distance of 35.5 cm from a convex mirror having a focal length of – 12.2 cm. The image distance is :

(1) + 4.04 cm
(2) -4.04 cm
(3) -9.08 cm
(4) + 9.08 cm

SECTION - B
(BIOLOGY)

161. Basic unit of classification is :

(1) Variety (2) Species

(3) Genus (4) Family

162. Decreased B.O.D. of the pond is an indication of :

(1) High O_2 content

(2) High microbial activity

(3) Low microbial activity

(4) High CO_2 content

163. Pneumatophores are found in :

(1) Hydrophytes (2) Mangroves

(3) Xerophytes (4) Bryophytes

164. Golden rice is rich source of :

(1) Vitamin -A (2) Vitamin -C

(3) Vitamin -D (4) Vitamin -E

165. Core metal of chlorophyll is :

(1) Fe (2) Mg

(3) Zn (4) Ni

166. Tetradynamous stamens are found in the family :

(1) Solanaceae (2) Asteraceace

(3) Brassicaceae (4) Malvaceae

167. Which one of the following is correct for family Asteraceae :

(1) Inferiour ovary (2) Hypogynous flower

(3) Axile placentation (4) Multilocular ovary

168. Opium is extracted from which part of *Papaver somniferum* :

(1) Mature leaves (2) Bark

(3) Ripe capsule (4) Unripe capsule

169. Polyembryony was first discovered in :

(1) Orchids (2) *Pinus*

(3) Mangroves (4) *Citrus*

170. Gynobasic style is found in family :

(1) Ranunculaceae (2) Lamiaceae

(3) Asteraceae (4) Schrophulariaceae

171. Which of the following plant is known for anther culture :

(1) *Rauvolfia serpentina* (2) *Solanum nigrum*

(3) *Datura innoxia* (4) *Nerium indicum*

172. Myrosin glands are found in family :

(1) Brassicaceae (2) Solanaceae

(3) Rubiaceae (4) Asteraceae

173. Which enzyme is used as molecular scissor in genetic engineering ?

(1) Helicase (2) Polymerase

(3) Ligase (4) Restriction endonuclease

174. Reserpene drug is extracted from which part of *Rauvolfia serpentina* ?

(1) Bark (2) Leaves

(3) Roots (4) Fruits

175. Which of the following step in transcription is catalysed by RNA polymerase ?

(1) Initiation

(2) Elongation

(3) Termination

(4) Both Initiation and termination

176. 'Western Ghats' of India is known for ?

(1) Temperate forest (2) Dry deciduous forest

(3) Alpine forest (4) Humid tropical forest

177. Link between glycolysis and Kreb's cycle is :

(1) Acetyl CO-A (2) Citric acid

(3) Succinic acid (4) Fumaric acid

178. CO_2 fixation in C_4 plants occurs in :

(1) Bundle sheath cells (2) Guard cells

(3) Mesophyll cells (4) Spongy pavenchyma

179. Which of the following is a Bryophyte :

(1) Bog Moss (2) Club Moss

(3) Reindeer Moss (4) Iris Moss

180. Milky water of coconut fruit is :

(1) Liquid chalaza

(2) Liquid nucellus

(3) Liquid nuclear endosperm

(4) Liquid female gametophyte

181. What organelle processes and packages proteins before sending them out of cell during secretion ?

(1) Outer memberane of nucleus (2) Endoplasmic reticulum

(3) Golgi complex (4) Plasma membrane

182. Which of the following cell organelle is associated with a protein skeleton composed of lamins ?

(1) Mitochondrion (2) Chloroplast

(3) NOR (4) Nucleus

183. In which phase of cell cycle DNA becomes 4C from 2C ?

(1) S (2) GI

(3) Metaphase (4) Anaphase

184. In hybridization experiments, high stringency washing means washing in presence of :

(1) Low salt concentration and high temperature

(2) High salt concentration and high temperature

(3) High salt concentration and low temperature

(4) Only water

185. If you wish to study the region of binding of a transcription factor in promoter DNA which of the following technique will be most appropriate ?

(1) Microarray (2) Immunoprecipitation

(3) Chromosome walking (4) DNA footprinting

186. Which one of the following cell type does not divide in adult organisms ?

(1) Primary germ cell
(2) Neuron
(3) Intestinal epithelium
(4) Corneal epithelium

187. Polysomes are many :

(1) Ribosomes attached to an individual mRNA
(2) Chain of nucleosomes forming chromatin
(3) Several lysosomes fusing during phagocytosis
(4) Centrosomes clustering during mitotic division

188. During meiosis when does a cell actually become haploid ?

(1) At the end of second division
(2) During recombination in pachytene
(3) During chiasmata terminalization at diakinesis
(4) At the end of first division

189. Which one of the following organelles is rich in acid hydrolases ?

(1) Lysosomes
(2) Golgi complex
(3) Peroxisomes
(4) Rough endoplasmic reticulum

190. Most of the membrane lipids are synthesized on :

(1) Rough endoplasmic reticulum

(2) Nucleolus

(3) Smooth endoplasmic reticulum

(4) Nucleus

191. The dorsal-most vegetal cells of amphibian blastula capable of inducing the organizer is called as :

(1) Dorsl lip

(2) Nieuwkoop centre

(3) Dorsal marginal zone

(4) Primary organizer

192. 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

193. During gastrulation the movement of ectodermal cells to cover the entire embryo is known as ;

(1) Epiboly

(2) Delamination

(3) Ingression

(4) Invagination

194. Acrosomal vesicle in a mature sperm is derived from :

(1) Endoplasmic reticulum

(2) Golgi complex

(3) Lysosomes

(4) Mitochondria

195. 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

196. If a sample of DNA is found to have the base composition (mole ratios) of adenine, 40; thymine, 22; guanune, 21; and cytosine 17, which of the following conclusions will be most appropriate ?

(1) The given DNA is a double stranded circular molecule

(2) It is a linear double stranded molecule

(3) It is a single stranded molecule

(4) It has high melting point

197. 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

198. Which of the following group of organisms does not have bilateral symmetry ?

(1) Platyhelminthes
(2) Mollusca
(3) Cnideria
(4) Echinodermata larvae

199. Which of the following groups of animals does not come under deuterostomes ?

(1) Chordata
(2) Arthropoda
(3) Protochordata
(4) Echinodermata

200. In coelomates, the body cavity is lined by :

(1) Ectoderm
(2) Mesoderm
(3) Endoderm
(4) Coelom

SECTION - B
(MATHEMATICS)

201. Consider the function :

$$f(x) = \begin{cases} x, \text{ if } x \text{ is rational} \\ 0, \text{ if } x \text{ is irrational} \end{cases}$$

Then f is

(1) differentiable at x = 0 with derivative 0

(2) not differentiable but continuons at x = 0

(3) not continuous but limit at x = 0 exists

(4) limit of the function at x = 0 does not exist

202. $\lim\limits_{(x,y) \to (0,0)} \frac{2xy^2}{x^2 + y^4}$

(1) does not exist

(2) exists and is 2

(3) exists and is 1

(4) exists and is 0

203. For the function :

$$f(x,y) = \begin{cases} \frac{xy}{\sqrt{x^2+y^2}}, & when\ (x,y) \neq (0,0) \\ 0 & ,when\ (x,y) = (0,0) \end{cases}$$

which of the following is **not** true :

(1) f_x (0, 0) exists

(2) f_y (0, 0) exists

(3) f is differentiable at (0,0)

(4) f is not differentiable at (0,0)

204. The sequence $\left\{a_n = (1+\frac{1}{n})^n\right\}$ is :

(1) monotone decreasing and bounded

(2) monotone but limit does not exist

(3) monotone increasing bounded and limit exists

(4) not monotone

205. Which of the following functions satisfies the conditions of Rolle's theorem in [-1,1] ?

(1) $|x|$ (2) $\frac{1}{x^2}$

(3) x (4) x^2

206. If Cauchy's mean value theorem is applied to the functions $f(x) = x$ and $g(x) = x$, in $[-1,1]$, then c is equal to :

(1) 1 (2) 0

(3) -1 (4) $\frac{1}{2}$

207. The function $f(x) = \begin{cases} \frac{x^2}{|x|}, & x \neq 0 \\ 0, & x = 0 \end{cases}$ is :

(1) Continuous and differentiable at x = 0

(2) Continuous but not differentiable at x = 0

(3) differentiable but not continuous at x = 0

(4) neither continuous nor differentiable at x = 0

208. The remainder, when Z^{2018} is divided by 31, is :

(1) 6 (2) 7

(3) 8 (4) 11

209. The rank of the matrix $\begin{bmatrix} 1 & 2 & 3 \\ \lambda & 2 & 3 \\ 2 & -3 & 1 \end{bmatrix}$ is less than 3 if :

(1) $\lambda = \frac{18}{11}$ (2) $\lambda = \frac{11}{18}$

(3) $\lambda = \frac{-18}{11}$ (4) $\lambda = \frac{-11}{18}$

210. The domain of the function $f(x)\frac{1}{\sqrt{3x - x^2 - 2}}$ is :

(1) [1, 2] (2) (1,2)

(3) (-2, -1) (4) $(2, \infty)$

211. The partial differential equation obtained by eliminating the arbitrary function f from $z = f(x^2 - y^2)$ is :

(1) $x\frac{\partial z}{\partial x} - y\frac{\partial z}{\partial y} = 0$ (2) $x\frac{\partial z}{\partial x} + y\frac{\partial z}{\partial y} = 0$

(3) $y\frac{\partial z}{\partial x} - x\frac{\partial z}{\partial y} = 0$ (4) $y\frac{\partial z}{\partial x} + x\frac{\partial z}{\partial y} = 0$

212. Complete integral of partial differential equation $z = \frac{\partial z}{\partial x} \cdot \frac{\partial z}{\partial y}$, is :

(1) $z = (x + a)(y + b)$ (2) $z = (x + a)^3 + (y + b)^3$

(3) $z = (x + a)^2 + (y + b)^2$ (4) $z = (x + a) + (y + b)$

213. The general solution of the partial differential equation $\frac{\partial^4 z}{\partial x^4} - \frac{\partial^4 z}{\partial y^4} = 0$ is :

(1) $z = \phi_1 (x - y) + x \phi_2 (x - y) + \phi_3 (x + y) + x \phi_4 (x + y)$

(2) $z = \phi_1 (y - x) + \phi_2 (x + y) + \phi_3 (y - ix) + \phi_4 (y + ix)$

(3) $z = \phi_1 (y + x) t + x \phi_2 (y + x) + x^2 \phi_3 (y + x) + x^3 \phi_4 (x + y)$

(4) $z = \phi_1 (y - x) + x \phi_2 (y - x) + x^2 \phi_3 (y - x) + x^3 \phi_4 (y - x)$

214. The partial differential equation :

$2\frac{\partial^2 u}{\partial x^2} + 4\frac{\partial^2 u}{\partial x \partial y} + 3\frac{\partial^2 u}{\partial y^4} = 4$ is :

(1) Hyperbolic (2) Parabolic

(3) Elliplic (4) none of these

215. A particle is falling under gravity between two points A and B lying in a vertical plane but not in the same vertical line. The curve described by the particle from A to B in shortest time is are of a :

(1) cycloid (2) circle

(3) parabola (4) hyperbola

216. If one member of a coplanar system of forces has components (2,3) along the axes of coordinates and acts at the point (4,5) then its moment about the point (2,3) is :

(1) 1 (2) -1

(3) 2 (4) -2

217. If a particle at the point (4,5) is displaced to the point (6,6) under the application of the force (1,-2) then the work done by the force during the displacement is :

(1) -2 (2) 0

(3) 2 (4) 4

218. If the radial and transverse velocities of a particle are always proportional to each other then the particale moves in :

(1) a parablola

(2) an equilateral hyperbola

(3) a cardioid

(4) an equiangular spiral

219. If a partials describes uniformly a given straight line then its angular velocity about a fixed point varies as ;

(1) r (2) $1/r$ (3) r^2 (4) $1/r^2$

where r is the distance of the particle from the fixed point.

220. A particle is projected from the lowest point with velocily u and moves along the inside of a smooth vertical circle of radius r. If the particle oscillates through a quadrant on each side of the vertical through the lowest point then :

(1) $u^2 < 2\ gr$ (2) $u^2 > 2\ gr$

(3) $u^2 = gr$ (4) $u^2 = 2\ gr$

221. The equation of the plane through the points (1,0,1), (1,2,3) and perpendicular to the plane $2x + 3y - z = 3$, is :

(1) $2x - y - z = 1$ (2) $2x - y + z = 3$

(3) $2x - 3y + 3z = 5$ (4) $x - y + z = 2$

222. If the lines $\frac{x}{1}=\frac{y-1}{2}=\frac{z-4}{4}$ and $\frac{x-\lambda}{2}=\frac{y-1}{1}=\frac{z-2}{3}$ are coplanar, then the value of λ is :

(1) -3 (2) -2

(3) 3 (4) 1

223. The angle between the line $\frac{x-2}{5}=\frac{y-1}{-4}=\frac{z-5}{2}$ and the plane $4x + 2y = 1$, is :

(1) $\cos^{-1}(\frac{2}{5})$ (2) $\sin^{-1}(\frac{2}{5})$

(3) $\cos^{-1}(\frac{1}{5})$ (4) $\sin^{-1}(\frac{1}{5})$

224. If the plane $x + y + z = a$ touches the sphere $x^2 = y^2 + z^2 - 2x - 2y - 2z - 6 = 0$ then the value of a is :

(1) $2(1\pm\sqrt{2})$ (2) $2(1\pm\sqrt{3})$

(3) $3(1\pm\sqrt{2})$ (4) $3(1\pm\sqrt{3})$

225. If the cone $2x^2 - 3y^2 + c z^2 + 4yz - 8zx + 2xy = 0$ has three mutually perpendicular generators, then the value of c is :

(1) 0 (2) -1

(3) 1 (4) 2

226. Arc-length of the curve $\gamma(t) = (e^t \cos t, e^t \sin t)$ starting at the point (1, 0) is :

(1) $\sqrt{2}(e^t+1)$ (2) $\sqrt{3}(e^t-1)$

(3) $\sqrt{3}(e^t+1)$ (4) $\sqrt{2}(e^t-1)$

227. Curvature of the curve $\gamma(t) = (\frac{4}{5}\cos t, 1 - \sin t, -\frac{3}{5}\cos t)$, is :

(1) 0 (2) -1

(3) 1 (4) 2

228. Which of the following curve γ is not regular ?

(1) $\gamma(t) = (2t^2 + 3, 4t^3)$ (2) $\gamma(t) = (t, t^2)$

(3) $\gamma(t) = (t, \cos h\ t)$ (4) $\gamma(t) = (5t, 3t^2)$

229. If $\vec{a}(x,y,z)$ and $\vec{b}(x,y,z)$ are two differentiable vector functions, then :

(1) $\text{div}(\vec{a} \times \vec{b}) = \vec{a}.\text{curl}\ \vec{b} - \vec{b}\ \text{div}\ \vec{a}$

(2) $\text{div}(\vec{a} \times \vec{b}) = \vec{b}.\text{curl}\ \vec{a} - \vec{a}\ \text{div}\ \vec{b}$

(3) $\text{div}(\vec{a} \times \vec{b}) = \vec{a}.\ \text{div}\ \vec{b} - \vec{b}\ \text{div}\ \vec{a}$

(4) $\text{div}(\vec{a} \times \vec{b}) = \vec{b}.\text{curl}\ \vec{a} - \vec{a}\ \text{curl}\ \vec{b}$

230. The line integral $\int_C \vec{F}.dr$ of a continuous vector function $\vec{F}$ having continuous first prtial derivatives in a simply connected region D, is independent of path C in D if and only if :

(1) $\text{div}\ \vec{F} = 0$ (2) $\text{div}\ \vec{F} = 1$

(3) $\text{curl}\ \vec{F} = 1$ (4) $\text{curl}\ \vec{F} = 0$

231. The differential equation of the circle having centre on the x-axis and touches the y – axis at the origin :

(1) $2xy\frac{dy}{dx} - x^2 + y^2 = 0$ (2) $2xy\frac{dy}{dx} + x^2 - y^2 = 0$

(3) $xy\frac{dy}{dx} - 2x^2 + y^2 = 0$ (4) $2xy\frac{dy}{dx} - x^2 + 2y^2 = 0$

232. Solution of the differential equation :

$\frac{dy}{dx} + y = e^{-x}$, y (x) = 0 at x = 0 is :

(1) $y = xe^x$ (2) $y = x + e^x$

(3) $y = xe^{-x}$ (4) $y = x - e^x$

233. The particular solution of the differential equation :

$\frac{d^2y}{dx^2} + \frac{dy}{dx} + y = \sin 2x$ is :

(1) $\frac{-1}{13}(2\cos 2x + 3\sin 2x)$ (2) $\frac{-1}{13}(\cos 2x + 3\sin 2x)$

(3) $\frac{1}{13}(2\cos 2x + 3\sin 2x)$ (4) $\frac{-1}{13}(\cos 2x - 3\sin 2x)$

234. The family of the curve orthogonal to the family of rectangular hyperbolas $y = \frac{c}{x}$ (where c is a parameter) is :

(1) $x^2 + y^2 = c$ (2) $y^2 - x^2 = c$

(3) $x^2 + 2y^2 = c$ (4) $y^2 - 2x^2 = c$

235. The solution of the differential equation $\frac{d^2x}{dt^2} - 3\frac{dx}{dt} + 2x = 0$, given that when t = 0, x = 0 and $\frac{dx}{dt} = 1$ is :

(1) $x = -e^{2t} + e^t$ (2) $x = e^{2t} + e^t$

(3) $x = te^t$ (4) $x = e^{2t} - e^t$

236. The general solution of the differenual equation

$$x\left(\frac{dy}{dx}\right)^2 - 2y\frac{dy}{dx} + ax = 0 \text{ is :}$$

(1) $2y = cx^2 + (a/c)$ (2) $x = cy^3 + (a/c)$

(3) $y = cx^3 + (a/c)$ (4) $x = cy^2 + (c/a)$

237. If the Laplace transform of sint/t is $\tan^{-1}(1/p)$, then the Laplace transform of sin at/t is :

(1) $\tan^{-1}(1/p)$ (2) $\tan^{-1}(a/p)$

(3) $\tan^{-1}(ap)$ (4) $\cot^{-1}(ap)$

238. If $L\{F(t)\} = f(p)$, and $u(t-a)$ is a unit step function for fix $a \in \mathbb{R}$, where L denotes the Laplace transform, then $L\{F(t-2)\,u(t-2)\}$ is :

(1) $e^{ap} f(p)$ (2) $e^{2p} f(p)$

(3) $e^{-ap} f(p)$ (4) $e^{-2p} f(p)$

239. If L^{-1} denotes the inverse Laplace transform, then $L^{-1}\left\{\frac{1}{(p^2-2p+5)}\right\}$ is

(1) $\frac{1}{3}e^{t^2}\sin t$ (2) $\frac{1}{2}e^{t}\sin 2t$

(3) $-\frac{1}{2}e^{t}\sin 2t$ (4) $\frac{1}{2}e^{t}\sin t$

240. If the Laplace transform of Y (t) is y (s), then for initial value problem $\frac{d^2Y}{dt^2} + Y = 6\cos 2t, Y(t) = 3, \frac{dY}{dt} = 1$, when t = 0, the value of y(s) is

(1) $\frac{3s}{s^2+1} - \frac{2s}{s^2+4}$

(2) $\frac{3s}{s^2+1} + \frac{1}{s^2+1} - \frac{2s}{s^2+4}$

(3) $\frac{5s}{s^2+1} + \frac{1}{s^2+1} - \frac{2s}{s^2+4}$

(4) $\frac{5s}{s^2+1} + \frac{1}{s^2+1} - \frac{s}{s^2+4}$

ROUGH WORK

रफ़ कार्य

ROUGH WORK
रफ़ कार्य

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 ***प्रवेश-पत्र के अतिरिक्त,*** लिखा या सादा कोई भी खुला कागज साथ में न लायें।
3. ***ओ.एम.आर. उत्तर-पत्र अलग से दिया गया है। इसे न तो मोड़ें और न ही विकृत करें। दूसरा ओ.एम.आर. उत्तर-पत्र नहीं दिया जायेगा। केवल ओ.एम.आर. उत्तर-पत्र का ही मूल्यांकन किया जायेगा।***
4. सभी प्रविष्टियाँ प्रथम आवरण-पृष्ठ पर नीली/काली पेन से निर्धारित स्थान पर लिखें।
5. ***ओ० एम० आर० 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, केन्द्र कोड नम्बर तथा सेट का नम्बर उचित स्थानों पर लिखें।***
6. ***ओ० एम० आर० उत्तर पत्र पर अनुक्रमांक संख्या, प्रश्नपुस्तिका संख्या व सेट संख्या (यदि कोई हो) तथा प्रश्नपुस्तिका पर अनुक्रमांक और ओ० एम० आर० उत्तर 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 ओ० एम० आर० 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 की समाप्ति के बाद अभ्यर्थी अपना ओ.एम.आर. उत्तर-पत्र परीक्षा कक्ष/हाल में कक्ष निरीक्षक को सौंप दे। अभ्यर्थी अपने साथ प्रश्न पुस्तिका तथा ओ.एम.आर. उत्तर-पत्र की प्रति ले जा सकते हैं।
13. अभ्यर्थी को 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।