MH-CET-2015
Subjects : Physics, Chemistry & Biology

Question Booklet Version	MH-CET-2015 Roll No.	Question Booklet Sr. No.
11 (Write this number on your Answer Sheet)		(Write this number on your Answer Sheet)

Answer Sheet No.

Day and Date : Thursday, 07th May, 2015

Duration: 3.00 Hours
Total Marks : 200

This is to certify that, the entries of MH-CET Roll No. and Answer Sheet No. have been correctly written and verified.

Candidate's Signature *Invigilator's Signature*

Instructions to Candidates

1. This question booklet contains 200 Objective Type Questions (Multiple Choice Questions (MCQ)) in the subjects of Physics (50), Chemistry (50) and Biology (100).
2. The question paper and OMR (Optical Mark Reader) Answer Sheet is issued separately at the start of the examination.
3. Choice and sequence for attempting questions will be as per the convenience of the candidate.
4. Candidate should carefully read the instructions printed on the Question Booklet and Answer Sheet and make the correct entries on the Answer Sheet. As Answer Sheets are designed to suit the OPTICAL MARK READER (OMR) SYSTEM, special care should be taken to mark the entries correctly. Special care should be taken to fill QUESTION BOOKLET VERSION, SERIAL No. and MH-CET Roll No. accurately. The correctness of entries has to be cross-checked by the invigilators. **The candidate must sign on the Answer Sheet and Question Booklet**.
5. Read each question carefully.
6. Determine the one correct answer from out of the four available options given for each question.
7. Fill the appropriate circle completely like this ●, for answering a particular question. Mark with Black ink ball point pen only.
8. **Each question with correct response shall be awarded one (1) mark. There shall be no negative marking. No mark shall be granted for marking two or more answers of same question, scratching or overwriting.**
9. **Use of whitener or any other material to erase/hide the circle once filled is not permitted**.
10. Avoid overwriting and/or striking of answers once marked.
11. Rough work should be done only on the blank space provided on the Question Booklet. **Rough work should not be done on the Answer Sheet.**
12. The required mathematical tables (Log etc.) is provided along with the question booklet.
13. Immediately after the prescribed examination time is over, the Question Booklet and Answer sheet is to be returned to the Invigilator. Confirm that both the Candidate and Invigilator have signed on question booklet and answer sheet.
14. No candidate is allowed to leave the examination hall till the end of examination.

PHYSICS

1. In the expression for Boyle's law, the product 'PV' has dimensions of

   A) force B) impulse C) energy D) momentum

2. The difference between angular speed of minute hand and second hand of a clock is

   A) $\frac{59\pi}{900}$ rad/s B) $\frac{59\pi}{1800}$ rad/s

   C) $\frac{59\pi}{2400}$ rad/s D) $\frac{59\pi}{3600}$ rad/s

3. A metal rod of length 'L', cross-sectional area 'A', Young's modulus 'Y' and coefficient of linear expansion 'α' is heated to 't' °C. The work that can be performed by the rod when heated is

   A) $\frac{YA\alpha Lt^2}{2}$ B) $\frac{YA\alpha^2 Lt^2}{2}$

   C) $\frac{YA\alpha^2 L^2 t^2}{2}$ D) $\frac{YA\alpha Lt}{2}$

4. In sonometer experiment, the bridges are separated by a fixed distance. The wire which is slightly elastic, emits a tone of frequency 'n' when held by tension 'T'. If the tension is increased to '4T', the tone emitted by the wire will be of frequency

   A) n B) 2n

   C) Slightly greater than 2n D) Slightly less than 2n

5. A particle performs S.H.M. with amplitude 25 cm and period 3 s. The minimum time required for it to move between two points 12.5 cm on either side of the mean position is

   A) 0.6 s B) 0.5 s C) 0.4 s D) 0.2 s

SPACE FOR ROUGH WORK

6. The pitch of the whistle of an engine appears to drop to $\left(\frac{5}{6}\right)^{th}$ of original value when it passes a stationary observer. If the speed of sound in air is 350 m/s then the speed of engine is

A) 35 m/s B) 70 m/s

C) 105 m/s D) 140 m/s

7. A solid cylinder has mass 'M', radius 'R' and length '*l*'. Its moment of inertia about an axis passing through its centre and perpendicular to its own axis is

A) $\frac{2MR^2}{3}+\frac{Ml^2}{12}$ B) $\frac{MR^2}{3}+\frac{Ml^2}{12}$

C) $\frac{3MR^2}{4}+\frac{Ml^2}{12}$ D) $\frac{MR^2}{4}+\frac{Ml^2}{12}$

8. A particle is executing S.H.M. of periodic time 'T'. The time taken by a particle in moving from mean position to half the maximum displacement is (sin30°= 0.5)

A) $\frac{T}{2}$ B) $\frac{T}{4}$

C) $\frac{T}{8}$ D) $\frac{T}{12}$

9. The dimensions of Stefan's constant are

A) $[M^0 L^1 T^{-3} K^{-4}]$ B) $[M^1 L^1 T^{-3} K^{-3}]$

C) $[M^1 L^2 T^{-3} K^{-4}]$ D) $[M^1 L^0 T^{-3} K^{-4}]$

10. An open and closed organ pipe have the same length. The ratio of 'p'th mode of frequency of vibration of air in two pipes is

A) p(2p + 1) B) $\frac{2p}{2p-1}$ C) p D) 1

SPACE FOR ROUGH WORK

11. A cord is wound around the circumference of wheel of radius 'r'. The axis of the wheel is horizontal and moment of inertia about it is 'I'. The weight 'mg' is attached to the end of the cord and falls from rest. After falling through a distance 'h', the angular velocity of the wheel will be

A) $[mgh]^{1/2}$ B) $\left[\frac{2mgh}{I+2mr^2}\right]^{1/2}$

C) $\left[\frac{2mgh}{I+mr^2}\right]^{1/2}$ D) $\left[\frac{mgh}{I+mr^2}\right]^{1/2}$

12. A toy cart is tied to the end of an unstretched string of length 'l'. When revolved, the toy cart moves in horizontal circle with radius '2l' and time period T. If it is speeded untill it moves in horizontal circle of radius '3l' with period T_1, relation between T and T_1 is (Hooke's law is obeyed)

A) $T_1 = \frac{2}{\sqrt{3}}T$ B) $T_1 = \sqrt{\frac{3}{2}}T$

C) $T_1 = \sqrt{\frac{2}{3}}T$ D) $T_1 = \frac{\sqrt{3}}{2}T$

13. In a pipe open at both ends, 'n_1' and 'n_2' be the frequencies corresponding to vibrating lengths 'l_1' and 'l_2' respectively. The end correction is

A) $\frac{n_1l_1 - n_2l_2}{2(n_1 - n_2)}$ B) $\frac{n_2l_2 - n_1l_1}{2(n_2 - n_1)}$

C) $\frac{n_2l_2 - n_1l_1}{2(n_1 - n_2)}$ D) $\frac{n_1l_1 - n_2l_2}{(n_1 - n_2)}$

14. A mass is suspended from a spring having spring constant 'K' is displaced vertically and released, it oscillates with period 'T'. The weight of the mass suspended is (g = gravitational acceleration)

A) $\frac{KTg}{4\pi^2}$ B) $\frac{KT^2g}{4\pi^2}$ C) $\frac{KTg}{2\pi^2}$ D) $\frac{KT^2g}{2\pi^2}$

SPACE FOR ROUGH WORK

15. A satellite of mass 'm' is revolving in circular orbit of radius 'r' round the earth. Its angular momentum w.r.t. the centre of its orbit is (M = mass of earth, G = universal gravitational constant)

A) $(GMmr)^{1/2}$ B) $(GMm^2r)^{1/2}$

C) $(GMm^2r^2)^{1/2}$ D) $(GM^2m^2r)^{1/2}$

16. A liquid rises to a height of 1.8 cm in a glass capillary 'A'. Another glass capillary 'B' having diameter 90% of capillary 'A' is immersed in the same liquid. The rise of liquid in capillary 'B' is

A) 1.4 cm B) 1.8 cm C) 2.0 cm D) 2.2 cm

17. A particle of mass 'm' is moving in circular path of constant radius 'r' such that centripetal acceleration is varying with time 't' as $K^2 r t^2$ where K is a constant. The power delivered to the particle by the force acting on it is

A) $m^2 K^2 r^2 t^2$ B) $mK^2 r^2 t$ C) $m K^2 r t^2$ D) $m K r^2 t$

18. A simple pendulum is oscillating with amplitude 'A' and angular frequency 'ω'. At displacement 'x' from mean position, the ratio of kinetic energy to potential energy is

A) $\frac{x^2}{A^2-x^2}$ B) $\frac{x^2-A^2}{x^2}$ C) $\frac{A^2-x^2}{x^2}$ D) $\frac{A-x}{x}$

19. The equation of the progressive wave is $y = a \sin 2\pi\left(nt-\frac{x}{5}\right)$. The ratio of maximum particle velocity to wave velocity is

A) $\frac{\pi a}{5}$ B) $\frac{2\pi a}{5}$ C) $\frac{3\pi a}{5}$ D) $\frac{4\pi a}{5}$

20. Let 'g_h' and 'g_d' be the acceleration due to gravity at height 'h' above the earth's surface and at depth 'd' below the earth's surface respectively. If $g_h = g_d$ then the relation between 'h' and 'd' is

A) d = h B) $d = \frac{h}{2}$ C) $d = \frac{h}{4}$ D) d = 2h

SPACE FOR ROUGH WORK

21. A rope 1 cm in diameter breaks if tension in it exceeds 500 N. The maximum tension that may be given to a similar rope of diameter 2 cm is

A) 2000 N B) 1000 N C) 500 N D) 250 N

22. The length and diameter of a metal wire is doubled. The fundamental frequency of vibration will change from 'n' to (Tension being kept constant and material of both the wires is same)

A) $\frac{n}{4}$ B) $\frac{n}{8}$ C) $\frac{n}{12}$ D) $\frac{n}{16}$

23. A hollow sphere of mass 'M' and radius 'R' is rotating with angular frequency 'ω'. It suddenly stops rotating and 75% of kinetic energy is converted to heat. If 'S' is the specific heat of the material in $\frac{J}{kg}K$ then rise in temperature of the sphere is (M.I. of hollow sphere = $\frac{2}{3}MR^2$)

A) $\frac{R\omega}{4S}$ B) $\frac{R^2\omega^2}{4S}$ C) $\frac{R\omega}{2S}$ D) $\frac{R^2\omega^2}{2S}$

24. A large number of liquid drops each of radius 'a' are merged to form a single spherical drop of radius 'b'. The energy released in the process is converted into kinetic energy of the big drop formed. The speed of the big drop is

[ρ = density of liquid, T = surface tension of liquid]

A) $\left[\frac{6T}{\rho}\left(\frac{1}{a}-\frac{1}{b}\right)\right]^{1/2}$ B) $\left[\frac{6T}{\rho}\left(\frac{1}{b}-\frac{1}{a}\right)\right]^{1/2}$

C) $\left[\frac{\rho}{6T}\left(\frac{1}{a}-\frac{1}{b}\right)\right]^{1/2}$ D) $\left[\frac{\rho}{6T}\left(\frac{1}{b}-\frac{1}{a}\right)\right]^{1/2}$

SPACE FOR ROUGH WORK

25. A black body radiates heat at temperatures 'T_1' and 'T_2' ($T_2 > T_1$). The frequency corresponding to maximum energy is

A) more at T_1 B) more at T_2

C) equal for T_1 and T_2 D) independent of T_1 and T_2

26. For diamagnetic materials, magnetic susceptibility is

A) small and negative B) small and positive

C) large and negative D) large and positive

27. For Balmer series, wavelength of first line is 'λ_1' and for Brackett series, wavelength of first line is 'λ_2' then $\frac{\lambda_1}{\lambda_2}$ is

A) 0.081 B) 0.162

C) 0.198 D) 0.238

28. The distance of a point on the screen from two slits in biprism experiment is 1.8×10^{-5} m and 1.23×10^{-5} m. If wavelength of light used is 6000 Å, the fringe formed at that point is

A) 10^{th} bright B) 10^{th} dark

C) 9^{th} bright D) 9^{th} dark

29. Same current is flowing in two a.c. circuits. First contains only inductance and second contains only capacitance. If frequency of a.c. is increased for both, the current will

A) increase in first circuit and decrease in second

B) increase in both circuits

C) decrease in both circuits

D) decrease in first circuit and increase in second

SPACE FOR ROUGH WORK

30. The difference in the effective capacity of two similar capacitors when joined in series and then in parallel is $6\,\mu F$. The capacity of each capacitor is

A) $2\,\mu F$ B) $4\,\mu F$ C) $8\,\mu F$ D) $16\,\mu F$

31. Which logic gate produces 'LOW' output when any of the inputs is 'HIGH' ?

A) AND B) OR C) NAND D) NOR

32. An electron of mass 'm' and charge 'q' is accelerated from rest in a uniform electric field of strength 'E'. The velocity acquired by it as it travels a distance 'l' is

A) $\left[\frac{2Eql}{m}\right]^{1/2}$ B) $\left[\frac{2Eq}{ml}\right]^{1/2}$

C) $\left[\frac{2Em}{ql}\right]^{1/2}$ D) $\left[\frac{Eq}{ml}\right]^{1/2}$

33. A light is travelling from air into a medium. Velocity of light in a medium is reduced to 0.75 times the velocity in air. Assume that angle of incidence 'i' is very small, the deviation of the ray is

A) i B) $\frac{i}{3}$ C) $\frac{i}{4}$ D) $\frac{3i}{4}$

34. The electric field intensity at a point near and outside the surface of a charged conductor of any shape is 'E_1'. The electric field intensity due to uniformly charged infinite thin plane sheet is 'E_2'. The relation between 'E_1' and 'E_2' is

A) $2E_1 = E_2$ B) $E_1 = E_2$

C) $E_1 = 2E_2$ D) $E_1 = 4E_2$

SPACE FOR ROUGH WORK

35. Sensitivity of a moving coil galvanometer can be increased by

A) decreasing the number of turns of coil

B) increasing the number of turns of coil

C) decreasing the area of a coil

D) by using a weak magnet

36. For the hydrogen atom, the energy of radiation emitted in the transition from 4^{th} excited state to 2^{nd} excited state, according to Bohr's theory is

A) 0.567 eV B) 0.667 eV C) 0.967 eV D) 1.267 eV

37. Two coherent monochromatic light beams of intensities '4 I' and '9 I' are superimposed. The maximum and minimum possible intensities in the resulting beam are

A) 3 I and 2 I B) 9 I and 5 I

C) 16 I and 3 I D) 25 I and I

38. The resistances in left and right gap of a meter bridge are $20\,\Omega$ and $30\,\Omega$ respectively. When the resistance in the left gap is reduced to half its value, the balance point shifts by

A) 15 cm to the right B) 15 cm to the left

C) 20 cm to the right D) 20 cm to the left

39. For the same angle of incidence, the angles of refraction in media 'P', 'Q', 'R' and 'S' are 50°, 40°, 30°, 20° respectively. The speed of light is minimum in medium

A) P B) Q C) R D) S

SPACE FOR ROUGH WORK

40. The process of regaining of information from carrier wave at the receiver is termed as

A) demodulation B) modulation

C) attenuation D) amplification

41. A potentiometer wire of length 10 m is connected in series with a battery. The e.m.f. of a cell balances against 250 cm length of wire. If length of potentiometer wire is increased by 1 m, the new balancing length of wire will be

A) 2.00 m B) 2.25 m C) 2.50 m D) 2.75 m

42. Two coils A and B have mutual inductance 2×10^{-2} henry. If the current in the primary is $i = 5 \sin (10\pi t)$ then the maximum value of e.m.f. induced in coil B is

A) π volt B) $\pi/2$ volt C) $\pi/3$ volt D) $\pi/4$ volt

43. For a transistor, the current ratio $\alpha_{dc} = \frac{69}{70}$. The current gain β_{dc} is

A) 66 B) 67 C) 69 D) 71

44. In Young's double slit experiment, the ratio of intensities of bright and dark bands is 16 which means

A) the ratio of their amplitudes is 5

B) intensities of individual sources are 25 and 9 units respectively

C) the ratio of their amplitudes is 4

D) intensities of individual sources are 4 and 3 units respectively

45. A range of galvanometer is 'V', when $50\,\Omega$ resistance is connected in series. Its range gets doubled when $500\,\Omega$ resistance is connected in series. Galvanometer resistance is

A) $100\,\Omega$ B) $200\,\Omega$ C) $300\,\Omega$ D) $400\,\Omega$

SPACE FOR ROUGH WORK

46. The capacity of a parallel plate air capacitor is $2\,\mu F$ and voltage between the plates is changing at the rate of 3 V/S. The displacement current in the capacitor is

A) $2\,\mu F$ B) $3\,\mu F$ C) $5\,\mu F$ D) $6\,\mu F$

47. A capacitor $C_1 = 4\,\mu F$ is connected in series with another capacitor $C_2 = 1\,\mu F$. The combination is connected across d.c. source of 200 V. The ratio of potential across C_2 to C_1 is

A) 2 : 1 B) 4 : 1 C) 8 : 1 D) 16 : 1

48. When monochromatic light of wavelength 'λ' is incident on a metallic surface, the stopping potential for photoelectric current is '$3V_0$'. When same surface is illuminated with light of wavelength '2λ', the stopping potential is 'V_0'. The threshold wavelength for this surface when photoelectric effect takes place is

A) λ B) 2λ C) 3λ D) 4λ

49. A coil carrying current 'I' has radius 'r' and number of turns 'n'. It is rewound so that radius of new coil is '$\frac{r}{4}$' and it carries current 'I'. The ratio of magnetic moment of new coil to that of original coil is

A) 1 B) $\frac{1}{2}$ C) $\frac{1}{4}$ D) $\frac{1}{8}$

50. The de-Broglie wavelength 'λ' of a particle

A) is proportional to mass

B) is proportional to impulse

C) is inversely proportional to impulse

D) does not depend on impulse

SPACE FOR ROUGH WORK

CHEMISTRY

51. Which of the following is the most stable diazonium salt ?

A) $C_6H_5CH_2N_2^+X^-$ B) $CH_3N_2^+X^-$ C) $CH_3CH_2N_2^+X^-$ D) $C_6H_5N_2^+X^-$

52. Electronic configuration of only one P block element is exceptional. One molecule of that element consists of how many atoms of it ?

A) One B) Two C) Three D) Four

53. The correct IUPAC name of $[CO(NH_3)_3(NO_2)_3]$

A) Triammine trinitrito – N cobalt (III)
B) Triammine trinitrito – N cobalt (II)
C) Triammine cobalt (III) nitrite
D) Triammine trinitrito – N cobaltate (III)

54. If M, W and V represent molar mass of solute, mass of solute and volume of solution in litres respectively, which among following equations is true ?

A) $\pi = \frac{MWR}{TV}$ B) $\pi = \frac{TMR}{WV}$ C) $\pi = \frac{TWR}{VM}$ D) $\pi = \frac{TRV}{WM}$

55. Replacement of diazonium group by fluorine is known as

A) Gattermann reaction
B) Sandmeyer reaction
C) Balz-Schiemann reaction
D) Etard reaction

56. For which among the following reactions, change in entropy is less than zero ?

A) Sublimation of Iodine
B) Dissociation of Hydrogen
C) Formation of water
D) Thermal decomposition of Calcium Carbonate

57. $[Cr(NH_3)_6]$ $[Cr(SCN)_6]$ and $[Cr(NH_3)_2 (SCN)_4]$ $[Cr (NH_3)_4 (SCN)_2]$ are the examples of what type of isomerism ?

A) Ionisation isomerism
B) Linkage isomerism
C) Coordination isomerism
D) Solvate isomerism

SPACE FOR ROUGH WORK

58. For the reaction $O_{3\,(g)} + O_{(g)} \rightarrow 2O_{2\,(g)}$, if the rate law expression is, rate = $K[O_3]$ [O] the molecularity and order of the reaction are respectively

A) 2 and 2 B) 2 and 1.33 C) 2 and 1 D) 1 and 2

59. $R - C \equiv N + 2\,(H) \xrightarrow[(ii)\ H_3O^+]{(i)\ SnCl_2\ /dil\ HCl} RCHO + NH_4Cl$ this reaction is known as

A) Etard reaction

B) Stephen reaction

C) Hell-Vohlard-Zelinsky reaction

D) Balz-Schiemann reaction

60. Select a ferromagnetic material from the followings.

A) Dioxygen B) Chromium (IV) oxide

C) Benzene D) Dihydrogen monoxide

61. What is the volume of water consumed during acid hydrolysis of 1.368 Kg of sucrose ?

(Given – molar masses of sucrose = 342, water = 18, density of water = 1 g/cm^3)

A) 0.072 dm^3 B) 0.720 dm^3 C) 0.18 dm^3 D) 0.018 dm^3

62. The process in which metal surface is made inactive is called

A) Passivation B) Galvanizing C) Corrosion D) Pickling

63. Which among the following group 15 element forms most stable pentavalent compound ?

A) Phosphorus B) Antimony C) Bismuth D) Arsenic

64. Which among the following functional groups has been given the highest priority while assigning R-S configuration ?

A) $-C_6H_5$ B) $-CN$ C) $-C_2H_5$ D) $-CH_3$

SPACE FOR ROUGH WORK

65. Given R = 8.314 JK^{-1} mol^{-1}, the work done during combustion of 0.090 kg of ethane (molar mass = 30) at 300 K is

A) – 18.7 kJ B) 18.7 kJ C) 6.234 kJ D) – 6.234 kJ

66. Potassium dichromate is a good oxidizing agent, in acidic medium the oxidation state of chromium changes by

A) 2 B) 3 C) 4 D) 5

67. Diethyl amine when treated with nitrous acid yields

A) Diethyl ammonium nitrite B) Ethyl alcohol

C) N-nitroso diethyl amine D) Triethyl ammonium nitrite

68. What is the most abundant element on earth ?

A) Hydrogen B) Nitrogen C) Oxygen D) Silicon

69. The overall reaction taking place at anode during electrolysis of fused sodium chloride using suitable electrode is

A) Oxidation of chloride B) Reduction of sodium ions

C) Reduction of chlorine D) Oxidation of sodium atoms

70. The only radioactive element among the lanthanoids is

A) Gadolinium B) Holmium C) Promethium D) Neodynium

71. Identify a metalloid from the following list of elements.

A) Carbon B) Neon C) Sodium D) Tellurium

72. What is the chemical composition of Nicol's prism ?

A) Al_2O_3 B) $CaSO_4$ C) $CaCO_3$ D) Na_3AlF_6

73. Identify the heteropolymer from the list given below.

A) Polythene B) Nylon-6 C) Teflon D) Nylon-6, 6

74. What is the basicity of orthophosphorus acid ?

A) One B) Two C) Three D) Four

SPACE FOR ROUGH WORK

75. The correct order of reactivity of aldehydes and ketones towards hydrogen cyanide is

A) $CH_3COCH_3 \rangle CH_3CHO \rangle HCHO$ B) $CH_3COCH_3 \rangle HCHO \rangle CH_3CHO$

C) $CH_3CHO \rangle CH_3COCH_3 \rangle HCHO$ D) $HCHO \rangle CH_3CHO \rangle CH_3COCH_3$

76. Which among the following is a feature of adiabatic expansion ?

A) $\Delta V < 0$ B) $\Delta U < 0$ C) $\Delta U > 0$ D) $\Delta T = 0$

77. Molarity is defined as

A) the number of moles of solute dissolved in one dm^3 of the solution

B) the number of moles of solute dissolved in 1 kg of solvent

C) the number of moles of solute dissolved in 1 dm^3 of the solvent

D) the number of moles of solute dissolved in 100 ml of the solvent

78. What is the possible number of monohydroxy derivatives of a hydrocarbon consisting of five carbon atoms with one methyl group as a branch ?

A) 2 B) 3 C) 4 D) 5

79. What is the amount of work done when two moles of ideal gas is compressed from a volume of 1 m^3 to 10 dm^3 at 300 K against a pressure of 100 kPa ?

A) 99 kJ B) – 99 kJ C) 114.9 kJ D) – 114.9 kJ

80. Which among the following alloys is used in making instruments for electrical measurements ?

A) Stainless steel B) Manganin C) Spiegeleisen D) Duralumin

81. Which of the following proteins is globular ?

A) Collagen B) Albumin C) Myosin D) Fibroin

82. A mixture of benzaldehyde and formaldehyde when treated with 50% NaOH yields

A) Sodium benzoate and sodium formate

B) Sodium formate and benzyl alcohol

C) Sodium benzoate and methyl alcohol

D) Benzyl alcohol and methyl alcohol

SPACE FOR ROUGH WORK

83. Which among the following solutions is NOT used in determination of the cell constant ?
A) 10^{-2} M KCl B) 10^{-1} M KCl C) 1 M KCl D) Saturated KCl

84. Which halogen forms an oxyacid that contains the halogen atom in tripositive oxidation state ?
A) Fluorine B) Chlorine C) Bromine D) Iodine

85. Name the metal that is purified by placing the impure metal on sloping hearth of a reverberatory furnace and heating that above its melting point in absence of air.
A) Mercury B) Galium C) Zirconium D) Copper

86. Which among the following is a tranquilizer ?
A) Aspirin B) Valium C) Penicillin D) Sulphanilamide

87. Chlorination of ethane is carried out in presence of
A) anhydrous A$l$$Br_3$ B) mercuric chloride
C) ultraviolet light D) zinc chloride

88. Identify a 'Chemical twin' among the followings.
A) Zr-Ta B) Nb-Tc C) Hf-Re D) Nb-Ta

89. The relationship between rate constant and half life period of zero order reaction is given by
A) $t_{\frac{1}{2}} = [A]_0\, 2k$ B) $t_{\frac{1}{2}} = \frac{0.693}{k}$ C) $t_{\frac{1}{2}} = \frac{[A]_0}{2k}$ D) $t_{\frac{1}{2}} = \frac{2[A]_0}{k}$

90. Which polymer among the following polymers does NOT soften on heating ?
A) Bakelite B) Polythene C) Polystyrene D) PVC

91. Van't Hoff factor of centimolal solution of K_3 [$Fe(CN)_6$] is 3.333. Calculate the percent dissociation of K_3 [$Fe(CN)_6$].
A) 33.33 B) 0.78 C) 78 D) 23.33

92. Which of the following compounds is most acidic in nature ?
A) 4-Chlorobutanoic acid B) 3-Chlorobutanoic acid
C) 2-Chlorobutanoic acid D) Butanoic acid

SPACE FOR ROUGH WORK

93. How is ore of aluminium concentrated ?

A) roasting B) leaching

C) froth floatation D) using Wilfley table

94. Which of the following compounds has highest boiling point ?

A) Propan-1-ol B) n-Butane C) Chloroethane D) Propanal

95. Which metal among the followings has the highest packing efficiency ?

A) Iron B) Tungsten C) Aluminium D) Polonium

96. What oxoacid of sulphur contains S-S bond in its structure ?

A) Disulphurous acid B) Disulphuric acid

C) Perdisulphuric acid D) Hydrosulphurous acid

97. Which among the following detergents is non-ionic in character ?

A) Sodiumlauryl sulphate B) Pentaerythrityl stearate

C) Cetyltrimethyl ammonium chloride D) Sodium n-dodecyl benzene sulphonate

98. Reaction of which among the following ethers with HI in cold leads to formation of methyl alcohol ?

A) ethyl methyl ether B) methyl propyl ether

C) isopropyl methyl ether D) tert-butyl methyl ether

99. During conversion of glucose into glucose cyanohydrin, what functional group/atom of glucose is replaced ?

A) hydrogen B) aldehydic group

C) primary alcoholic group D) secondary alcoholic group

100. Half life period of a first order reaction, A $\rightarrow$ product is 6.93 hour. What is the value of rate constant ?

A) 1.596 h^{-1} B) 0.1 h^{-1} C) 4.802 h^{-1} D) 10 h^{-1}

SPACE FOR ROUGH WORK

BIOLOGY

101. In the first step of Monohybrid cross experiment, Mendel selected pea plants which were
   A) pure tall as male and pure dwarf as female
   B) pure tall as female and pure dwarf as male
   C) heterozygous tall as male and pure dwarf as female
   D) heterozygous tall as female and pure dwarf as male

102. In Griffith's experiment, the conversion of R-type to S-type of Diplococcus Pneumoniae when mixed with heat killed S-type is called
   A) mutation B) transduction C) transfection D) transformation

103. Semidwarf rice variety IR-8 was developed in
   A) Taiwan B) Phillipines C) India D) China

104. Which one of the following is a non-endospermic seed ?
   A) sunflower B) coconut C) ground nut D) wheat

105. Which one of the following is NOT a mycoherbicide ?
   A) Phytophthora palmivora B) Xanthomonas sp.
   C) Alternaria crassa D) Fusarium sp.

106. During anaerobic respiration the conversion of pyruvate into acetaldehyde, along with co-enzyme TPP, the cofactor required is
   A) Mg^{++} B) Mn^{++} C) Fe^{++} D) Zn^{++}

107. An international treaty known as Montreal Protocol was signed to control emission of
   A) UV rays B) Ozone C) CFC D) Oxygen

108. Chloroplasts in higher plants are _____ shaped.
   A) kidney B) lens C) bean D) dome

109. Pollengrain develops from _____ of anther.
   A) epidermis B) endothecium C) tapetum D) sporogenous tissue

110. In processing of eukaryotic hn RNA, during protein synthesis tailing involves _____ of RNA.
   A) Addition of adenylate residues at 3′ end
   B) Addition of methyl guanosine triphosphate at 3′ end
   C) Addition of methyl guanosine triphosphate at 5′ end
   D) Removal of introns

111. In a cross between red kernelled and white kernelled varieties of wheat showing polygenic inheritance the phenotypic ratio in F_2 generation will be
   A) 1 : 6 : 15 : 20 : 15 : 6 : 1 B) 1 : 4 : 6 : 4 : 1
   C) 1 : 2 : 1 D) 2 : 1

112. In angiosperms during development of embryo the suspensor cells develop from
   A) oospore B) integument C) endosperm D) cotyledon

113. Manganese, calcium and chloride ions present in PS-II play an important role in
A) Absorption of light B) CO_2 assimilation
C) Photolysis of water D) ATP synthesis

114. Which process does the following equation represent ?
$C_6H_{12}O_6 + 2NAD + 2\ ADP + 2Pi \rightarrow 2\ CH_3 - CO - COOH + 2\ NADH_2 + 2\ ATP$
A) complete glycolysis B) complete aerobic respiration
C) complete anaerobic respiration D) complete fermentation

115. The cloning vector M13 has genetic material
A) ssRNA B) dsRNA C) ssDNA D) dsDNA

116. Earthworm is a
A) herbivore B) secondary consumer
C) tertiary consumer D) detrivore

117. To induce formation of organs in a callus it is necessary to provide
A) growth hormones B) water C) soil D) antibiotics

118. Anemophily is NOT observed in
A) Maize B) Jowar C) Sugarcane D) *Salvia*

119. In an ecosystem, the biotic components herbivorous are
A) photosynthetic B) chemosynthetic C) macro consumers D) micro consumers

120. The visible portion of light spectrum useful in photosynthesis is referred to as
A) RFLP B) PAR C) VAM D) VNTR

121. The microbe *Pseudomonas denitrificans* produces Vitamin
A) K B) D C) B_2 D) B_{12}

122. If there are 1280 microspores in a tetralocular anther, how many microspore mother cells will be there in its each pollen chamber ?
A) 80 B) 160 C) 240 D) 1280

123. Which one of the following plants DOES NOT help in vegetative propagation by leaves ?
A) *Begonia* B) *Kalanchoe* C) *Bryophyllum* D) *Oxalis*

124. Given below are some reactions and the enzymes involved.
Identify the CORRECT pairs.

I	**II**
1. Fructose 1,6 diphosphate $\rightarrow$ 3 PGAL + DHAP	a. enolase
2. Citrate $\rightarrow$ Cis – aconitate	b. thiokinase
3. Succinyl Co. A $\rightarrow$ succinate	c. aconitase
4. 2 PGA $\rightarrow$ PEPA	d. aldolase

A) 1-d, 2-c, 3-b, 4-a B) 1-a, 2-b, 3-c, 4-d
C) 1-b, 2-a, 3-d, 4-c D) 1-c, 2-d, 3-a, 4-b

125. Human skin colour is an example of
A) Intragenic interaction B) Interallelic interaction
C) Quantitative inheritance D) Pleiotropy

126. During DNA replication, the addition of nucleotides on the lagging strand occurs
A) towards the replicating fork B) at a faster rate than leading strand
C) continuously D) discontinuously

127. The technique of producing large number of genetically similar plants within short time by tissue culture is called
A) Organogenesis B) Somatic hybridization
C) Micropropagation D) Protoplast culture

128. How many sense codons code for 20 known essential amino acids ?
A) 61 B) 62 C) 63 D) 64

129. Which one of the following is NOT a natural method of vegetative propagation ?
A) runner B) foliar buds C) stem tuber D) grafting

130. Transposons are sequences of
A) DNA B) mRNA C) rRNA D) tRNA

131. A 340 Å long segment of DNA molecule has 20 thymine nitrogenous bases, what will be the number of guanine nitrogen bases in the same segment ?
A) 10 B) 40 C) 80 D) 160

132. The final electron acceptor during ETS in respiration is
A) Hydrogen B) Oxygen C) FMN D) Ubiquinone

133. The time taken from the fixation of CO_2 to the formation of one glucose molecule is about _____ seconds.
A) 20 B) 40 C) 60 D) 90

134. The secondary metabolite obtained from *Catharanthus roseus* is
A) vincristin B) anthocyanin C) menthol D) nicotine

135. Large stout, nocturnal flowers producing copious nectar and emitting fermenting fruity odor, are the adaptations for
A) Entomophily B) Ornithophily C) Chiropterophily D) Anemophily

136. During Biogas production acetic acid is transformed into the final product by the enzymes of
A) *Clostridium* B) *Pseudomonas* C) *Penicillium* D) *Methanobacillus*

137. The gymnospermic endosperm differs from an angiospermic endosperm because in gymnosperms it is
A) haploid and developed from female gametophyte
B) diploid and developed from female gametophyte
C) triploid and developed after fertilization
D) triploid and developed before fertilization

138. What is NOT true about emasculation of a flower while performing an artificial cross ?
A) It is removal of anthers from flower
B) It is done before anthesis
C) It is to avoid self pollination
D) It is done in flowers of plants selected as male parent

139. Pusa shubhra is a variety of
A) cauliflower B) chilli C) wheat D) cabbage

140. Which of the following is correct pair of pyrimidine bases ?
A) Adenine & Thymine B) Adenine & Guanine
C) Thymine & Cytosine D) Guanine & Cytosine

141. In the nomenclature of enzyme restriction endonuclease the Roman numeral indicates
A) number of times it is used B) the order of discovery from source
C) number of cuts on DNA D) number of recombinants formed

142. Environmental biotic factor that helps in pollination is
A) air B) water C) wind D) insects

143. How many types of gametes will be produced by an individual having genotype AaBbcc ?
A) four B) three C) two D) one

144. Self pollination which involves two different flowers of the same plant, is called
A) autogamy B) geitonogamy C) xenogamy D) hybridization

145. The initial step in preparation of beer is
A) malting B) carboxylation C) clarification D) distillation

146. A desirable change in genotype of an organism is obtained by
A) DNA replication B) protein synthesis
C) rDNA technology D) m-RNA formation

147. Considering mode of asexual reproduction, match the Column **I** with **II** and select the correct option :

I	**II**
a. Yeast	i. fragmentation
b. *Penicillium*	ii. zoospores
c. Filamentous algae	iii. budding
d. *Chlamydomonas*	iv. conidia

A) a-iii, b-iv, c-i, d-ii B) a-ii, b-iii, c-i, d-iv
C) a-iv, b-iii, c-ii, d-i D) a-iii, b-ii, c-i, d-iv

148. How much of the energy released during aerobic respiration is approximately conserved in the form of ATP ?
A) 20% B) 40% C) 60% D) 100%

149. The deflection of pitch angle between two successive steps (rungs) of DNA is
A) 72° B) 54° C) 36° D) 18°

150. Which one of the following is a CAM plant ?
A) Maize B) *Kalanchoe* C) Sugarcane D) Jowar

151. One of the following cells secretes a hormone
A) Cells of Leydig B) Cells of Sertoli
C) Primary spermatocyte D) Secondary spermatocyte

152. Find the odd one out, with respect to X-linkage.
A) Haemophilia B) Myopia C) Nephritis D) Night blindness

153. The first fossil of *Australopithecus* was discovered in
A) Olduvai Gorge, Tanzania B) Fayum deposits of Egypt
C) Siwalik hills in India D) Taung in South Africa

154. Which of the following options are CORRECT ?
1. Heroin – Stimulant
2. Marijuana – Cardiovascular
3. Cocaine – Hallucinations
4. Morphine – Sedative
A) 1, 2 and 3 B) 1, 3 and 4 C) 2, 3 and 4 D) 1, 2 and 4

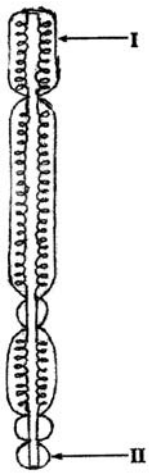
155. Serotonin and Melatonin are hormones, secreted by
A) Pancreas B) Pineal body C) Pituitary gland D) Thymus

156. The characters such as pointed elongated snout, strong and stout forelimbs, well developed claws are observed in _____ adaptation.
A) Arboreal B) Aerial C) Cursorial D) Fossorial

157. Deposition of _____ in the joints causes gout.
A) Urea B) Uric acid C) Guanine D) Ammonia

158. The glycoprotein, fertilizin is secreted by
A) Ovum B) Ovary C) Sperm D) Testis

159. In the given diagram I and II indicate



A) Chromomere and chromonemata B) Centromere and secondary constriction
C) Secondary constriction and satellite D) Telomere and satellite

160. Find the CORRECT match :

	Column A	Column B	Column C
i.	Mackeral	Rastrelliger	Freshwater fish
ii.	Honey bee	Apis	Wax
iii.	Mirgala	Tacchardia	Marine waterfish
iv.	Silkworm	Bombyx	Mulberry silk

A) ii and iv B) i and ii C) iv only D) i and iii

161. A Red list of endangered species is maintained by
A) CSIR B) IUCN C) NEERI D) WLS

162. The Human Genome Project (HGP) was initiated in
A) 1988 B) 1990 C) 1992 D) 1994

163. Ectoderm gives rise to
A) cornea, heart, bronchi, dentine
B) adrenal cortex, tongue, liver, retina
C) lungs, adrenal medulla, dermis, thyroid
D) enamel of teeth, nails, adrenal medulla, hair

164. Helper T – cells : Lymphokines as
Killer T – cells : _____
A) Interferons B) Lysozymes C) Perforins D) Prostaglandins

165. Epicanthal skin fold and simian crease are characteristics of
A) Down's syndrome B) Klinefelter's syndrome
C) Thalassemia D) Turner's syndrome

166. Following are all breeds of cows EXCEPT
A) Jersey B) Nagpuri C) Sahiwal D) Sindhi

167. More than 95 % of transgenic animals are
A) Rabbits B) Mice C) Fish D) Cows

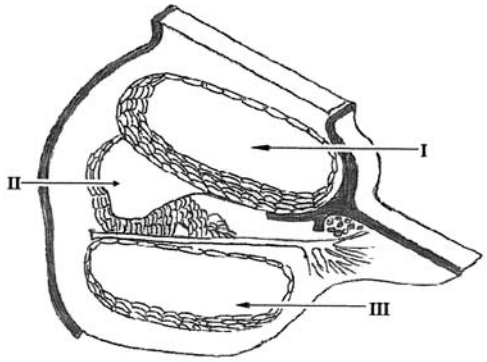
168. Pick the ODD homologous pair out.
A) Bartholin's Gland – Cowper's Gland B) Clitoris – Penis
C) Mons pubis – Glans penis D) Labia majora – Scrotum

169. Which is NOT the function of lymph ?
A) Transport R.B.C.s B) Drain excess tissue fluid
C) Transport lymphocyte and antibodies D) Transport absorbed fat

170. A cuckoo laying eggs in the nest of other species of birds, is an example of
A) Adelphoparasitism B) Broodparasitism
C) Ectoparasitism D) Hyperparasitism

171. The reptiles, like dinosaurs were dominant in _____ period.
A) Cretaceous B) Jurassic C) Tertiary D) Triassic

172. Select the CORRECT identification group of labelled parts I, II, III



A) I – Scala vestibuli, II – Scala media, III – Scala tympani
B) I – Scala vestibuli, II – Scala tympani, III – Scala media
C) I – Scala tympani, II – Scala media, III – Scala vestibuli
D) I – Scala media, II – Scala tympani, III – Scala media

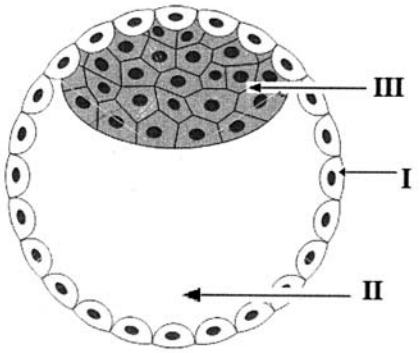
173. The Transgenic animals are generally produced for all of the following needs EXCEPT
A) Testing of chemical safety
B) Testing of vaccine safety
C) Stimulation of pathogenicity
D) Production of pharmacologically important proteins

174. Match the following :

i. Mercury	a. Low blood pressure, blindness
ii. Lead	b. Hyperkeratosis, Liver cirrhosis
iii. Arsenic	c. Bone deformation, testicular atrophy
iv. Cadmium	d. Abdominal pain, haemolysis
	e. Anaemia, convulsions

A) i-e, ii-d, iii-c, iv-b
B) i-d, ii-e, iii-b, iv-c
C) i-c, ii-b, iii-d, iv-a
D) i-b, ii-c, iii-d, iv-e

175. Choose the CORRECT group of labellings



A) I – Trophoblast, II – Archenteron, III – Micromeres
B) I – Trophoblast, II – Blastocoel, III – Megameres
C) I – Trophoblast, II – Archenteron, III – Inner mass cells
D) I – Trophoblast, II – Blastocoel, III – Inner mass cells

176. All of the following animals are ureotelic EXCEPT
A) Frog B) Snake C) Turtle D) Toad

177. The study of blood vessels is termed as
A) Angiology B) Cardiology C) Haematology D) Histology

178. Plasma cells are derived from
A) Cytotoxic T – cells B) Helper T – cells
C) Memory B – cells D) Memory T – cells

179. Darwin's theory of Evolution CANNOT explain
A) Arrival of fittest B) Natural selection
C) Prodigality of production D) Struggle for existence

180. During ovulation, the ovary releases
A) Oogonia B) Ootid C) Primary oocyte D) Secondary oocyte

181. Juxta glomerular cells of kidney secrete hormone
A) Angiotensinogen B) Angiotensin II
C) Coherin D) Renin

182. The marine fish among the following varieties is
A) Stromateus B) Labeo C) Cirrhina D) Catla

183. Which of the following animal was selected by Morgan for studying linkage ?
A) *Apis indica* B) *Agrobacterium tumafaciens*
C) *Drosophila melanogaster* D) *E. Coli*

184. The increase in blood flow to heart stimulates secretion of
A) Renin B) Oxytocin
C) Antidiuretic hormone D) Atrial natriuretic factor

185. Heaviness with severe chest pain which may disappear with rest indicates
A) Angina pectoris B) Atherosclerosis C) Arteriosclerosis D) Hyperthyroidism

186. The co-ordinator between Nervous and endocrine system is
A) Thalamus B) Hypothalamus C) Epithalamus D) Colliculus

187. Match the pairs of diseases and pathogens :

I	II
1. Malaria	a. Wuchereria bancrofti
2. Filariasis	b. Helminth
3. Typhoid	c. Plasmodium falciparum
4. Schistosomiasis	d. Salmonella typhi

A) 1-c, 2-b, 3-a, 4-d B) 1-d, 2-a, 3-b, 4-c
C) 1-a, 2-b, 3-c, 4-d D) 1-c, 2-a, 3-d, 4-b

188. The clot formation can be prevented by treatment with _____ in gene therapy.
A) DNase B) Recombinant vaccine
C) TPA D) TGF-B

189. Select the CORRECT match :
A) Gibbon – Cercopithecoidea
B) Lemur – Prosimii
C) New World Monkey – Hominoidea
D) Tarsier – Anthropoidea

190. Atrial Natriuretic Factor (ANF) decreases
A) Blood pressure
B) Secretion of renin
C) Na^+ excretion
D) Vasodilation

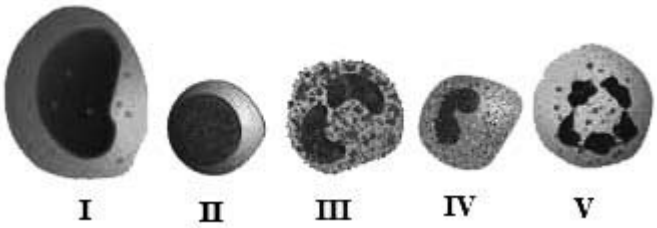
191. Morula formed at the end of cleavage is _____ celled.
A) 14 B) 16 C) 18 D) 20

192. Select the CORRECT pair
A) Adaptive Radiation – Darwin's Finches
B) Connecting Link – Sewall – Wright effect
C) Genetic drift – Peppered moth
D) Industrial Melanism – *Archeopteryx*

193. How many pairs of sympathetic ganglia are present in ANS ?
A) 10 B) 12 C) 22 D) 31

194. The first vaccine produced by Edward Jenner, was for protection against
A) Hepatitis B) Influenza C) Chicken pox D) Small pox

195. Which are the phagocytic cells from given diagram ?



A) I and V B) I and III C) I and IV D) I and II

196. Forceful muscular contractions of uterine wall is involved in
A) Implantation B) Lactation C) Micturition D) Parturition

197. In mechanism of hormone action, which of the following is NOT a second messenger ?
A) Cyclic AMP B) IP_3 C) Ca^{++} D) Mg^{++}

198. One of the following pair of animals is an example of commensalism
A) *Sacculina* – crab
B) *Plasmodium – Anopheles*
C) Golden Jackal – Tiger
D) Ascaris – Man

199. What is "After birth" referred to ?
A) Amniotic fluid passing out
B) Expulsion of baby
C) Expulsion of placenta, umbilical cord and foetal membrane
D) Secretion of hormone relaxin

200. Which group of cranial nerves control eye ball movements ?
A) Optic, Abducens, Pathetic
B) Optic, Oculomotor, Trochlear
C) Oculomotor, Abducens, Auditory
D) Oculomotor, Abducens, Trochlear

LOGARITHMS

	0	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9
10	0000	0043	0086	0128	0170						5	9	13	17	21	26	30	34	38
						0212	0253	0294	0334	0374	4	8	12	16	20	24	28	32	36
11	0414	0453	0492	0531	0569						4	8	12	16	20	23	27	31	35
						0607	0645	0682	0719	0755	4	7	11	15	18	22	26	29	33
12	0792	0828	0864	0899	0934						3	7	11	14	18	21	25	28	32
						0969	1004	1038	1072	1106	3	7	10	14	17	20	24	27	31
13	1139	1173	1206	1239	1271						3	6	10	13	16	19	23	26	29
						1303	1335	1367	1399	1430	3	6	10	13	16	19	22	25	29
14	1461	1492	1523	1553	1584						3	6	9	12	15	19	22	25	28
						1614	1644	1673	1703	1732	3	6	9	12	14	17	20	23	26
15	1761	1790	1818	1847	1875						3	6	9	11	14	17	20	23	26
						1903	1931	1959	1987	2014	3	6	8	11	14	17	19	22	25
16	2041	2068	2095	2122	2148						3	6	8	11	14	16	19	22	24
						2175	2201	2227	2253	2279	3	5	8	10	13	16	18	21	23
17	2304	2330	2355	2380	2405						3	5	8	10	13	15	18	20	23
						2430	2455	2480	2504	2529	3	5	8	10	12	15	17	20	22
18	2553	2577	2601	2625	2648						2	5	7	9	12	14	17	19	21
						2672	2695	2718	2742	2765	2	4	7	9	11	14	16	18	21
19	2788	2810	2833	2856	2878						2	4	7	9	11	13	16	18	20
						2900	2923	2945	2967	2989	2	4	6	8	11	13	15	17	19
20	3010	3032	3054	3075	3096	3118	3139	3160	3181	3201	2	4	6	8	11	13	15	17	19
21	3222	3243	3263	3284	3304	3324	3345	3365	3385	3404	2	4	6	8	10	12	14	16	18
22	3424	3444	3464	3483	3502	3522	3541	3560	3579	3598	2	4	6	8	10	12	14	15	17
23	3617	3636	3655	3674	3692	3711	3729	3747	3766	3784	2	4	6	7	9	11	13	15	17
24	3802	3820	3838	3856	3874	3892	3909	3927	3945	3962	2	4	5	7	9	11	12	14	16
25	3979	3997	4014	4031	4048	4065	4082	4099	4116	4133	2	3	5	7	9	10	12	14	15
26	4150	4166	4183	4200	4216	4232	4249	4265	4281	4298	2	3	5	7	8	10	11	14	15
27	4314	4330	4346	4362	4378	4393	4409	4425	4440	4456	2	3	5	6	8	9	11	13	14
28	4472	4487	4502	4518	4533	4548	4564	4579	4594	4609	2	3	5	6	8	9	11	12	14
29	4624	4639	4654	4669	4683	4698	4713	4728	4742	4757	1	3	4	6	7	9	10	12	13
30	4771	4786	4800	4814	4829	4843	4857	4871	4886	4900	1	3	4	6	7	9	10	11	13
31	4914	4928	4942	4955	4969	4983	4997	5011	5024	5038	1	3	4	6	7	8	10	11	12
32	5051	5065	5079	5092	5105	5119	5132	5145	5159	5172	1	3	4	5	7	8	9	11	12
33	5185	5198	5211	5224	5237	5250	5263	5276	5289	5302	1	3	4	5	6	8	9	10	12
34	5315	5328	5340	5353	5366	5378	5391	5403	5416	5428	1	3	4	5	6	8	9	10	11
35	5441	5453	5465	5478	5490	5502	5514	5527	5539	5551	1	2	4	5	6	7	9	10	11
36	5563	5575	5587	5599	5611	5623	5635	5647	5658	5670	1	2	4	5	6	7	8	10	11
37	5682	5694	5705	5717	5729	5740	5752	5763	5775	5786	1	2	3	5	6	7	8	9	10
38	5798	5809	5821	5832	5843	5855	5866	5877	5888	5899	1	2	3	5	6	7	8	9	10
39	5911	5922	5933	5944	5955	5966	5977	5988	5999	6010	1	2	3	4	5	7	8	9	10
40	6021	6031	6042	6053	6064	6075	6085	6096	6107	6117	1	2	3	4	5	6	8	9	10
41	6128	6138	6149	6160	6170	6180	6191	6201	6212	6222	1	2	3	4	5	6	7	8	9
42	6232	6243	6253	6263	6274	6284	6294	6304	6314	6325	1	2	3	4	5	6	7	8	9
43	6335	6345	6355	6365	6375	6385	6395	6405	6415	6425	1	2	3	4	5	6	7	8	9
44	6435	6444	6454	6464	6474	6484	6493	6503	6513	6522	1	2	3	4	5	6	7	8	9
45	6532	6542	6551	6561	6571	6580	6590	6599	6609	6618	1	2	3	4	5	6	7	8	9
46	6628	6637	6646	6656	6665	6675	6684	6693	6702	6712	1	2	3	4	5	6	7	7	8
47	6721	6730	6739	6749	6758	6767	6776	6785	6794	6803	1	2	3	4	5	5	6	7	8
48	6812	6821	6830	6839	6848	6857	6866	6875	6884	6893	1	2	3	4	4	5	6	7	8
49	6902	6911	6920	6928	6937	6946	6955	6964	6972	6981	1	2	3	4	4	5	6	7	8

LOGARITHMS

	0	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9
50	6990	6998	7007	7016	7024	7033	7042	7050	7059	7067	1	2	3	3	4	5	6	7	8
51	7076	7084	7093	7101	7110	7118	7126	7135	7143	7152	1	2	3	3	4	5	6	7	8
52	7160	7168	7177	7185	7193	7202	7210	7218	7226	7235	1	2	2	3	4	5	6	7	7
53	7243	7251	7259	7267	7275	7284	7292	7300	7308	7316	1	2	2	3	4	5	6	6	7
54	7324	7332	7340	7348	7356	7364	7372	7380	7388	7396	1	2	2	3	4	5	6	6	7
55	7404	7412	7419	7427	7435	7443	7451	7459	7466	7474	1	2	2	3	4	5	5	6	7
56	7482	7490	7497	7505	7513	7520	7528	7536	7543	7551	1	2	2	3	4	5	5	6	7
57	7559	7566	7574	7582	7589	7597	7604	7612	7619	7627	1	2	2	3	4	5	5	6	7
58	7634	7642	7649	7657	7664	7672	7679	7686	7694	7701	1	1	2	3	4	4	5	6	7
59	7709	7716	7723	7731	7738	7745	7752	7760	7767	7774	1	1	2	3	4	4	5	6	7
60	7782	7789	7796	7803	7810	7818	7825	7832	7839	7846	1	1	2	3	4	4	5	6	6
61	7853	7860	7868	7875	7882	7889	7896	7903	7910	7917	1	1	2	3	4	4	5	6	6
62	7924	7931	7938	7945	7952	7959	7966	7973	7980	7987	1	1	2	3	3	4	5	6	6
63	7993	8000	8007	8014	8021	8028	8035	8041	8048	8055	1	1	2	3	3	4	5	5	6
64	8062	8069	8075	8082	8089	8096	8102	8109	8116	8122	1	1	2	3	3	4	5	5	6
65	8129	8136	8142	8149	8156	8162	8169	8176	8182	8189	1	1	2	3	3	4	5	5	6
66	8195	8202	8209	8215	8222	8228	8235	8241	8248	8254	1	1	2	3	3	4	5	5	6
67	8261	8267	8274	8280	8287	8293	8299	8306	8312	8319	1	1	2	3	3	4	5	5	6
68	8325	8331	8338	8344	8351	8357	8363	8370	8376	8382	1	1	2	3	3	4	4	5	6
69	8388	8395	8401	8407	8414	8420	8426	8432	8439	8445	1	1	2	2	3	4	4	5	6
70	8451	8457	8463	8470	8476	8482	8488	8494	8500	8506	1	1	2	2	3	4	4	5	6
71	8513	8519	8525	8531	8537	8543	8549	8555	8561	8567	1	1	2	2	3	4	4	5	5
72	8573	8579	8585	8591	8597	8603	8609	8615	8621	8627	1	1	2	2	3	4	4	5	5
73	8633	8639	8645	8651	8657	8663	8669	8675	8681	8686	1	1	2	2	3	4	4	5	5
74	8692	8698	8704	8710	8716	8722	8727	8733	8739	8745	1	1	2	2	3	4	4	5	5
75	8751	8756	8762	8768	8774	8779	8785	8791	8797	8802	1	1	2	2	3	3	4	5	5
76	8808	8814	8820	8825	8831	8837	8842	8848	8854	8859	1	1	2	2	3	3	4	5	5
77	8865	8871	8876	8882	8887	8893	8899	8904	8910	8915	1	1	2	2	3	3	4	4	5
78	8921	8927	8932	8938	8943	8949	8954	8960	8965	8971	1	1	2	2	3	3	4	4	5
79	8976	8982	8987	8993	8998	9004	9009	9015	9020	9025	1	1	2	2	3	3	4	4	5
80	9031	9036	9042	9047	9053	9058	9063	9069	9074	9079	1	1	2	2	3	3	4	4	5
81	9085	9090	9096	9101	9106	9112	9117	9122	9128	9133	1	1	2	2	3	3	4	4	5
82	9138	9143	9149	9154	9159	9165	9170	9175	9180	9186	1	1	2	2	3	3	4	4	5
83	9191	9196	9201	9206	9212	9217	9222	9227	9232	9238	1	1	2	2	3	3	4	4	5
84	9243	9248	9253	9258	9263	9269	9274	9279	9284	9289	1	1	2	2	3	3	4	4	5
85	9294	9299	9304	9309	9315	9320	9325	9330	9335	9340	1	1	2	2	3	3	4	4	5
86	9345	9350	9355	9360	9365	9370	9375	9380	9385	9390	1	1	2	2	3	3	4	4	5
87	9395	9400	9405	9410	9415	9420	9425	9430	9435	9440	0	1	1	2	2	3	3	4	4
88	9445	9450	9455	9460	9465	9469	9474	9479	9484	9489	0	1	1	2	2	3	3	4	4
89	9494	9499	9504	9509	9513	9518	9523	9528	9533	9538	0	1	1	2	2	3	3	4	4
90	9542	9547	9552	9557	9562	9566	9571	9576	9581	9586	0	1	1	2	2	3	3	4	4
91	9590	9595	9600	9605	9609	9614	9619	9624	9628	9633	0	1	1	2	2	3	3	4	4
92	9638	9643	9647	9652	9657	9661	9666	9671	9675	9680	0	1	1	2	2	3	3	4	4
93	9685	9689	9694	9699	9703	9708	9713	9717	9722	9727	0	1	1	2	2	3	3	4	4
94	9731	9736	9741	9745	9750	9754	9759	9763	9768	9773	0	1	1	2	2	3	3	4	4
95	9777	9782	9786	9791	9795	9800	9805	9809	9814	9818	0	1	1	2	2	3	3	4	4
96	9823	9827	9832	9836	9841	9845	9850	9854	9859	9863	0	1	1	2	2	3	3	4	4
97	9868	9872	9877	9881	9886	9890	9894	9899	9903	9908	0	1	1	2	2	3	3	4	4
98	9912	9917	9921	9926	9930	9934	9939	9943	9948	9952	0	1	1	2	2	3	3	4	4
99	9956	9961	9965	9969	9974	9978	9983	9987	9991	9996	0	1	1	2	2	3	3	3	4

ANTILOGARITHMS

	0	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9
0.00	1000	1002	1005	1007	1009	1012	1014	1016	1019	1021	0	0	1	1	1	1	2	2	2
0.01	1023	1026	1028	1030	1033	1035	1038	1040	1042	1045	0	0	1	1	1	1	2	2	2
0.02	1047	1050	1052	1054	1057	1059	1062	1064	1067	1069	0	0	1	1	1	1	2	2	2
0.03	1072	1074	1076	1079	1081	1084	1086	1089	1091	1094	0	0	1	1	1	1	2	2	2
0.04	1096	1099	1102	1104	1107	1109	1112	1114	1117	1119	0	1	1	1	1	2	2	2	2
0.05	1122	1125	1127	1130	1132	1135	1138	1140	1143	1146	0	1	1	1	1	2	2	2	2
0.06	1148	1151	1153	1156	1159	1161	1164	1167	1169	1172	0	1	1	1	1	2	2	2	2
0.07	1175	1178	1180	1183	1186	1189	1191	1194	1197	1199	0	1	1	1	1	2	2	2	2
0.08	1202	1205	1208	1211	1213	1216	1219	1222	1225	1227	0	1	1	1	1	2	2	2	3
0.09	1230	1233	1236	1239	1242	1245	1247	1250	1253	1256	0	1	1	1	1	2	2	2	3
0.10	1259	1262	1265	1268	1271	1274	1276	1279	1282	1285	0	1	1	1	1	2	2	2	3
0.11	1288	1291	1294	1297	1300	1303	1306	1309	1312	1315	0	1	1	1	2	2	2	2	3
0.12	1318	1321	1324	1327	1330	1334	1337	1340	1343	1346	0	1	1	1	2	2	2	2	3
0.13	1349	1352	1355	1358	1361	1365	1368	1371	1374	1377	0	1	1	1	2	2	2	3	3
0.14	1380	1384	1387	1390	1393	1396	1400	1403	1406	1409	0	1	1	1	2	2	2	3	3
0.15	1413	1416	1419	1422	1426	1429	1432	1435	1439	1442	0	1	1	1	2	2	2	3	3
0.16	1445	1449	1452	1455	1459	1462	1466	1469	1472	1476	0	1	1	1	2	2	2	3	3
0.17	1479	1483	1486	1489	1493	1496	1500	1503	1507	1510	0	1	1	1	2	2	2	3	3
0.18	1514	1517	1521	1524	1528	1531	1535	1538	1542	1545	0	1	1	1	2	2	2	3	3
0.19	1549	1552	1556	1560	1563	1567	1570	1574	1578	1581	0	1	1	1	2	2	3	3	3
0.20	1585	1589	1592	1596	1600	1603	1607	1611	1614	1618	0	1	1	1	2	2	3	3	3
0.21	1622	1626	1629	1633	1637	1641	1644	1648	1652	1656	0	1	1	2	2	2	3	3	3
0.22	1660	1663	1667	1671	1675	1679	1683	1687	1690	1694	0	1	1	2	2	2	3	3	3
0.23	1698	1702	1706	1710	1714	1718	1722	1726	1730	1734	0	1	1	2	2	2	3	3	4
0.24	1738	1742	1746	1750	1754	1758	1762	1766	1770	1774	0	1	1	2	2	2	3	3	4
0.25	1778	1782	1786	1791	1795	1799	1803	1807	1811	1816	0	1	1	2	2	2	3	3	4
0.26	1820	1824	1828	1832	1837	1841	1845	1849	1854	1858	0	1	1	2	2	3	3	3	4
0.27	1862	1866	1871	1875	1879	1884	1888	1892	1897	1901	0	1	1	2	2	3	3	3	4
0.28	1905	1910	1914	1919	1923	1928	1932	1936	1941	1945	0	1	1	2	2	3	3	4	4
0.29	1950	1954	1959	1963	1968	1972	1977	1982	1986	1991	0	1	1	2	2	3	3	4	4
0.30	1995	2000	2004	2009	2014	2018	2023	2028	2032	2037	0	1	1	2	2	3	3	4	4
0.31	2042	2046	2051	2056	2061	2065	2070	2075	2080	2084	0	1	1	2	2	3	3	4	4
0.32	2089	2094	2099	2104	2109	2113	2118	2123	2128	2133	0	1	1	2	2	3	3	4	4
0.33	2138	2143	2148	2153	2158	2163	2168	2173	2178	2183	0	1	1	2	2	3	3	4	4
0.34	2188	2193	2198	2203	2208	2213	2218	2223	2228	2234	1	1	2	2	3	3	4	4	5
0.35	2239	2244	2249	2254	2259	2265	2270	2275	2280	2286	1	1	2	2	3	3	4	4	5
0.36	2291	2296	2301	2307	2312	2317	2323	2328	2333	2339	1	1	2	2	3	3	4	4	5
0.37	2344	2350	2355	2360	2366	2371	2377	2382	2388	2393	1	1	2	2	3	3	4	4	5
0.38	2399	2404	2410	2415	2421	2427	2432	2438	2443	2449	1	1	2	2	3	3	4	4	5
0.39	2455	2460	2466	2472	2477	2483	2489	2495	2500	2506	1	1	2	2	3	3	4	5	5
0.40	2512	2518	2523	2529	2535	2541	2547	2553	2559	2564	1	1	2	2	3	4	4	5	5
0.41	2570	2576	2582	2588	2594	2600	2606	2612	2618	2624	1	1	2	2	3	4	4	5	5
0.42	2630	2636	2642	2649	2655	2661	2667	2673	2679	2685	1	1	2	2	3	4	4	5	6
0.43	2692	2698	2704	2710	2716	2723	2729	2735	2742	2748	1	1	2	3	3	4	4	5	6
0.44	2754	2761	2767	2773	2780	2786	2793	2799	2805	2812	1	1	2	3	3	4	4	5	6
0.45	2818	2825	2831	2838	2844	2851	2858	2864	2871	2877	1	1	2	3	3	4	5	5	6
0.46	2884	2891	2897	2904	2911	2917	2924	2931	2938	2944	1	1	2	3	3	4	5	5	6
0.47	2951	2958	2965	2972	2979	2985	2992	2999	3006	3013	1	1	2	3	3	4	5	5	6
0.48	3020	3027	3034	3041	3048	3055	3062	3069	3076	3083	1	1	2	3	4	4	5	6	6
0.49	3090	3097	3105	3112	3119	3126	3133	3141	3148	3155	1	1	2	3	4	4	5	6	6

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	0	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9
0.50	3162	3170	3177	3184	3192	3199	3206	3214	3221	3228	1	1	2	3	4	4	5	6	7
0.51	3236	3243	3251	3258	3266	3273	3281	3289	3296	3304	1	2	2	3	4	5	5	6	7
0.52	3311	3319	3327	3334	3342	3350	3357	3365	3373	3381	1	2	2	3	4	5	5	6	7
0.53	3388	3396	3404	3412	3420	3428	3436	3443	3451	3459	1	2	2	3	4	5	6	6	7
0.54	3467	3475	3483	3491	3499	3508	3516	3524	3532	3540	1	2	2	3	4	5	6	6	7
0.55	3548	3556	3565	3573	3581	3589	3597	3606	3614	3622	1	2	2	3	4	5	6	7	7
0.56	3631	3639	3648	3656	3664	3673	3681	3690	3698	3707	1	2	3	3	4	5	6	7	8
0.57	3715	3724	3733	3741	3750	3758	3767	3776	3784	3793	1	2	3	3	4	5	6	7	8
0.58	3802	3811	3819	3828	3837	3846	3855	3864	3873	3882	1	2	3	4	4	5	6	7	8
0.59	3890	3899	3908	3917	3926	3936	3945	3954	3963	3972	1	2	3	4	5	5	6	7	8
0.60	3981	3990	3999	4009	4018	4027	4036	4046	4055	4064	1	2	3	4	5	6	6	7	8
0.61	4074	4083	4093	4102	4111	4121	4130	4140	4150	4159	1	2	3	4	5	6	7	8	9
0.62	4169	4178	4188	4198	4207	4217	4227	4236	4246	4256	1	2	3	4	5	6	7	8	9
0.63	4266	4276	4285	4295	4305	4315	4325	4335	4345	4355	1	2	3	4	5	6	7	8	9
0.64	4365	4375	4385	4396	4406	4416	4426	4436	4446	4457	1	2	3	4	5	6	7	8	9
0.65	4467	4477	4487	4498	4508	4519	4529	4539	4550	4560	1	2	3	4	5	6	7	8	9
0.66	4571	4581	4592	4603	4613	4624	4634	4645	4656	4667	1	2	3	4	5	6	7	9	10
0.67	4677	4688	4699	4710	4721	4732	4742	4753	4764	4775	1	2	3	4	5	7	8	9	10
0.68	4786	4797	4808	4819	4831	4842	4853	4864	4875	4887	1	2	3	4	6	7	8	9	10
0.69	4898	4909	4920	4932	4943	4955	4966	4977	4989	5000	1	2	3	5	6	7	8	9	10
0.70	5012	5023	5035	5047	5058	5070	5082	5093	5105	5117	1	2	4	5	6	7	8	9	11
0.71	5129	5140	5152	5164	5176	5188	5200	5212	5224	5236	1	2	4	5	6	7	8	10	11
0.72	5248	5260	5272	5284	5297	5309	5321	5333	5346	5348	1	2	4	5	6	7	9	10	11
0.73	5370	5383	5395	5408	5420	5433	5445	5458	5470	5483	1	3	4	5	6	8	9	10	11
0.74	5495	5508	5521	5534	5546	5559	5572	5585	5598	5610	1	3	4	5	6	8	9	10	12
0.75	5623	5636	5649	5662	5675	5689	5702	5715	5728	5741	1	3	4	5	7	8	9	10	12
0.76	5754	5768	5781	5794	5808	5821	5834	5848	5861	5875	1	3	4	5	7	8	9	11	12
0.77	5888	5902	5916	5929	5943	5957	5970	5984	5998	6012	1	3	4	5	7	8	10	11	12
0.78	6026	6039	6053	6067	6081	6095	6109	6124	6138	6152	1	3	4	6	7	8	10	11	13
0.79	6166	6180	6194	6209	6223	6237	6252	6266	6281	6295	1	3	4	6	7	8	10	11	13
0.80	6310	6324	6339	6353	6368	6383	6397	6412	6427	6442	1	3	4	6	7	9	10	12	13
0.81	6457	6471	6486	6501	6516	6531	6546	6561	6577	6592	2	3	5	6	8	9	11	12	14
0.82	6607	6622	6637	6653	6668	6683	6699	6714	6730	6745	2	3	5	6	8	9	11	12	14
0.83	6761	6776	6792	6808	6823	6839	6855	6871	6887	6902	2	3	5	6	8	9	11	13	14
0.84	6918	6934	6950	6966	6982	6998	7015	7031	7047	7063	2	3	5	6	8	10	11	13	15
0.85	7079	7096	7112	7129	7145	7161	7178	7194	7211	7228	2	3	5	7	8	10	12	13	15
0.86	7244	7261	7278	7295	7311	7328	7345	7362	7379	7396	2	3	5	7	8	10	12	13	15
0.87	7413	7430	7447	7464	7482	7499	7516	7534	7551	7568	2	3	5	7	9	10	12	14	16
0.88	7586	7603	7621	7638	7656	7674	7691	7709	7727	7745	2	4	5	7	8	11	12	14	16
0.89	7762	7780	7798	7816	7834	7852	7870	7889	7907	7925	2	4	5	7	9	11	13	14	16
0.90	7943	7962	7980	7998	8017	8035	8054	8072	8091	8110	2	4	6	7	9	11	13	15	17
0.91	8128	8147	8166	8185	8204	8222	8241	8260	8279	8299	2	4	6	8	9	11	13	15	17
0.92	8318	8337	8356	8375	8395	8414	8433	8453	8472	8492	2	4	6	8	10	12	14	15	17
0.93	8511	8531	8551	8570	8590	8610	8630	8650	8670	8690	2	4	6	8	10	12	14	16	18
0.94	8710	8730	8750	8770	8790	8810	8831	8851	8872	8892	2	4	6	8	10	12	14	16	18
0.95	8913	8933	8954	8974	8995	9016	9036	9057	9078	9099	2	4	6	8	10	12	15	17	19
0.96	9120	9141	9162	9183	9204	9220	9247	9268	9290	9311	2	4	6	8	11	13	15	17	19
0.97	9333	9354	9376	9397	9419	9441	9462	9484	9506	9528	2	4	7	9	11	13	15	17	20
0.98	9550	9572	9594	9616	9638	9661	9683	9705	9727	9750	2	4	7	9	11	13	16	18	20
0.99	9772	9795	9817	9840	9863	9886	9908	9931	9954	9977	2	5	7	9	11	14	16	18	20