



**MH-CET-2014**  
**Subjects : Physics, Chemistry & Biology**

|  |   |                      |  |  |  |  |  |  |  |  |  |  |  |                  |  |  |  |  |  |  |  |  |  |  |  |  |
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| Question Booklet Version<br><br><div style="text-align: center; font-size: 24pt; font-weight: bold;">44</div> <p style="text-align: center; font-size: 10pt;">(Write this number on your Answer Sheet)</p> | <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td colspan="6" style="text-align: center; padding: 2px;">MH-CET-2014 Roll No.</td> </tr> <tr> <td style="width: 16.6%; height: 20px;"></td> <td style="width: 16.6%; height: 20px;"></td> <td style="width: 16.6%; height: 20px;"></td> <td style="width: 16.6%; height: 20px;"></td> <td style="width: 16.6%; height: 20px;"></td> <td style="width: 16.6%; height: 20px;"></td> </tr> </table> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td colspan="6" style="text-align: center; padding: 2px;">Answer Sheet No.</td> </tr> <tr> <td style="width: 16.6%; height: 20px;"></td> <td style="width: 16.6%; height: 20px;"></td> <td style="width: 16.6%; height: 20px;"></td> <td style="width: 16.6%; height: 20px;"></td> <td style="width: 16.6%; height: 20px;"></td> <td style="width: 16.6%; height: 20px;"></td> </tr> </table> | MH-CET-2014 Roll No. |  |  |  |  |  |  |  |  |  |  |  | Answer Sheet No. |  |  |  |  |  |  |  |  |  |  |  | Question Booklet Sr. No.<br><br><div style="text-align: center; font-size: 10pt;">(Write this number on your Answer Sheet)</div> |
| MH-CET-2014 Roll No.   |   |                      |  |  |  |  |  |  |  |  |  |  |  |                  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |   |                      |  |  |  |  |  |  |  |  |  |  |  |                  |  |  |  |  |  |  |  |  |  |  |  |  |
| Answer Sheet No.   |   |                      |  |  |  |  |  |  |  |  |  |  |  |                  |  |  |  |  |  |  |  |  |  |  |  |  |
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Day and Date : Thursday, 08<sup>th</sup> May, 2014

Time : 10.00 a.m. to 11.30 a.m.

Duration: 3.00 hours

Total Marks : 720

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 180 Objective Type Questions in the subjects of Physics (45), Chemistry (45) and Biology (90).
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. Select the correct answer from the four available options given for each question.
7. Mark 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 four (4) marks. There shall be negative marking. For wrong answers there will be deduction of one mark per question. One mark shall be deducted 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 Log-Antilog table will be 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.
15. No marks will be deducted if a particular question is not attempted.



- The masses of three copper wires are in the ratio 1 : 3 : 5 and their lengths are in the ratio 5 : 3 : 1. The ratio of their resistance is
  - 25 : 1 : 125
  - 1 : 125 : 25
  - 125 : 1 : 25
  - 125 : 25 : 1
- A body of mass 'm' is raised to a height '10 R' from the surface of earth, where 'R' is the radius of earth. The increase in potential energy is (G = universal constant of gravitation, M = mass of earth and g = acceleration due to gravity)
  - $\frac{GMm}{11R}$
  - $\frac{GMm}{10R}$
  - $\frac{mgR}{11G}$
  - $\frac{10GMm}{11R}$
- The angle  $\theta$  between the vector  $\vec{p} = \hat{i} + \hat{j} + \hat{k}$  and unit vector along x-axis is
  - $\cos^{-1}\left(\frac{1}{\sqrt{3}}\right)$
  - $\cos^{-1}\left(\frac{1}{\sqrt{2}}\right)$
  - $\cos^{-1}\left(\frac{\sqrt{3}}{2}\right)$
  - $\cos^{-1}\left(\frac{1}{2}\right)$
- A small metal ball of mass 'm' is dropped in a liquid contained in a vessel, attains a terminal velocity 'v'. If a metal ball of same material but of mass '8m' is dropped in same liquid then the terminal velocity will be
  - V
  - 2V
  - 4V
  - 8V
- A wooden block of mass 8 kg slides down an inclined plane of inclination  $30^\circ$  to the horizontal with constant acceleration  $0.4 \text{ m/s}^2$ . The force of friction between the block and inclined plane is ( $g = 10 \text{ m/s}^2$ )
  - 12.2 N
  - 24.4 N
  - 36.8 N
  - 48.8 N

## SPACE FOR ROUGH WORK



6. The moment of inertia of a thin uniform rod rotating about the perpendicular axis passing through one end is 'I'. The same rod is bent into a ring and its moment of inertia about the diameter is 'I<sub>1</sub>'. The ratio  $\frac{I}{I_1}$  is
- A)  $\frac{4\pi}{3}$       B)  $\frac{8\pi^2}{3}$       C)  $\frac{5\pi}{3}$       D)  $\frac{8\pi^2}{5}$
7. Three identical spheres each of mass 1 kg are placed touching one another with their centres in a straight line. Their centres are marked as A, B, C respectively. The distance of centre of mass of the system from A is
- A)  $\frac{AB + AC}{2}$       B)  $\frac{AB + BC}{2}$       C)  $\frac{AC - AB}{3}$       D)  $\frac{AB + AC}{3}$
8. The relation between force 'F' and density 'd' is  $F = \frac{x}{\sqrt{d}}$ . The dimensions of x are
- A)  $[L^{-1/2} M^{3/2} T^{-2}]$       B)  $[L^{-1/2} M^{1/2} T^{-2}]$
- C)  $[L^{-1} M^{3/2} T^{-2}]$       D)  $[L^{-1} M^{1/2} T^{-2}]$
9. When a wave travels in a medium, displacement of a particle is given by  $y = a \sin 2\pi(bt - cx)$  where 'a', 'b', 'c' are constants. The maximum particle velocity will be twice the wave velocity if
- A)  $b = ac$       B)  $b = \frac{1}{ac}$       C)  $c = \pi a$       D)  $c = \frac{1}{\pi a}$
10. Electromagnets are made of soft iron because soft iron has
- A) high susceptibility and low retentivity
- B) low susceptibility and high retentivity
- C) low susceptibility and low retentivity
- D) high susceptibility and high retentivity

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**SPACE FOR ROUGH WORK**



11. Two charges of equal magnitude 'q' are placed in air at a distance '2a' apart and third charge '-2q' is placed at midpoint. The potential energy of the system is ( $\epsilon_0$  = permittivity of free space)

A)  $-\frac{q^2}{8\pi\epsilon_0 a}$       B)  $-\frac{3q^2}{8\pi\epsilon_0 a}$       C)  $-\frac{5q^2}{8\pi\epsilon_0 a}$       D)  $-\frac{7q^2}{8\pi\epsilon_0 a}$

12. An electron in potentiometer wire experiences a force  $2.4 \times 10^{-19}$  N. The length of potentiometer wire is 6m. The e.m.f. of the battery connected across the wire is (electronic charge =  $1.6 \times 10^{-19}$ C)

A) 6 V      B) 9 V      C) 12 V      D) 15 V

13. The dimensional formula for Reynold's number is

A)  $[L^0 M^0 T^0]$       B)  $[L^1 M^1 T^1]$   
C)  $[L^{-1} M^1 T^1]$       D)  $[L^1 M^1 T^{-1}]$

14. Calculate angular velocity of earth so that acceleration due to gravity at  $60^\circ$  latitude becomes zero. (Radius of earth = 6400 km, gravitational acceleration at poles =  $10 \frac{m}{s^2}$ ,  $\cos 60^\circ = 0.5$ )

A)  $7.8 \times 10^{-2}$  rad/s      B)  $0.5 \times 10^{-3}$  rad/s  
C)  $1 \times 10^{-3}$  rad/s      D)  $2.5 \times 10^{-3}$  rad/s

15. A stationary object explodes into masses  $m_1$  and  $m_2$ . They move in opposite directions with velocities  $V_1$  and  $V_2$ . The ratio of kinetic energy  $E_1$  to kinetic energy  $E_2$  is

A)  $\frac{m_2}{m_1}$       B)  $\frac{m_1}{m_2}$       C)  $\frac{2m_2}{m_1}$       D)  $\frac{2m_1}{m_2}$

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SPACE FOR ROUGH WORK



16. The velocity of water in river is  $9 \text{ km/hr}$  of the upper surface. The river is 10 m deep. If the coefficient of viscosity of water is  $10^{-2}$  poise then the shearing stress between horizontal layers of water is
- A)  $0.25 \times 10^{-2} \text{ N/m}^2$                       B)  $0.25 \times 10^{-3} \text{ N/m}^2$   
 C)  $0.5 \times 10^{-3} \text{ N/m}^2$                       D)  $0.75 \times 10^{-3} \text{ N/m}^2$
17. A sphere 'P' of mass 'm' moving with velocity 'u' collides head-on with another sphere 'Q' of mass 'm' which is at rest. The ratio of final velocity of 'Q' to initial velocity of 'P' is (e = coefficient of restitution)
- A)  $\frac{e-1}{2}$                       B)  $\left[ \frac{e+1}{2} \right]^{1/2}$                       C)  $\frac{e+1}{2}$                       D)  $\left[ \frac{e+1}{2} \right]^2$
18. Magnetic induction produced at the centre of a circular loop carrying current is 'B'. The magnetic moment of the loop of radius 'R' is ( $\mu_0$  = permeability of free space)
- A)  $\frac{BR^3}{2\pi\mu_0}$                       B)  $\frac{2\pi BR^3}{\mu_0}$                       C)  $\frac{BR^2}{2\pi\mu_0}$                       D)  $\frac{2\pi BR^2}{\mu_0}$
19. In air, a charged soap bubble of radius 'r' is in equilibrium having outside and inside pressures being equal. The charge on the drop is ( $\epsilon_0$  = permittivity of free space, T = surface tension of soap solution)
- A)  $4\pi r^2 \sqrt{\frac{2T\epsilon_0}{r}}$                       B)  $4\pi r^2 \sqrt{\frac{4T\epsilon_0}{r}}$   
 C)  $4\pi r^2 \sqrt{\frac{6T\epsilon_0}{r}}$                       D)  $4\pi r^2 \sqrt{\frac{8T\epsilon_0}{r}}$

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SPACE FOR ROUGH WORK



20. A block is pushed momentarily on a horizontal surface with initial velocity 'v'. If 'μ' is the coefficient of sliding friction between the block and surface, the block will come to rest after time ('g' = acceleration due to gravity)

A)  $\frac{v}{\mu g}$       B)  $\frac{vg}{\mu}$       C)  $\frac{v\mu}{g}$       D)  $\frac{\mu g}{v}$

21. In cyclotron, for a given magnet, radius of the semicircle traced by positive ion is directly proportional to

(v = velocity of positive ion)

A)  $v^{-2}$       B)  $v^{-1}$       C)  $v$       D)  $v^2$

22. A particle at rest is moved along a straight line by a machine giving constant power. The distance moved by the particle in time 't' is proportional to

A)  $t^{\frac{1}{2}}$       B)  $t^{\frac{2}{3}}$       C)  $t$       D)  $t^{\frac{3}{2}}$

23. In insulators (C.B. is conduction band and V.B. is valence band)

- A) V.B. is partially filled with electrons  
B) C.B. is partially filled with electrons  
C) C.B. is empty and V.B. is filled with electrons  
D) C.B. is filled with electrons and V.B. is empty

24. An object of radius 'R' and mass 'M' is rolling horizontally without slipping with speed 'V'.

It then rolls up the hill to a maximum height  $h = \frac{3v^2}{4g}$ . The moment of inertia of the object is (g = acceleration due to gravity)

A)  $\frac{2}{5} MR^2$       B)  $\frac{MR^2}{2}$       C)  $MR^2$       D)  $\frac{3}{2} MR^2$

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SPACE FOR ROUGH WORK



25. In Wheatstone's bridge, three resistors P, Q, R are connected in three arms in order and 4<sup>th</sup> arm is formed by two resistors  $s_1$  and  $s_2$  connected in parallel. The condition for bridge to be balanced is  $\frac{P}{Q} =$
- A)  $\frac{R(s_1 + s_2)}{s_1 s_2}$       B)  $\frac{s_1 s_2}{R(s_1 + s_2)}$       C)  $\frac{R s_1 s_2}{(s_1 + s_2)}$       D)  $\frac{(s_1 + s_2)}{R s_1 s_2}$
26. If 'N' is the number of turns in a circular coil then the value of self inductance varies as
- A)  $N^0$       B)  $N$       C)  $N^2$       D)  $N^{-2}$
27. Surface density of charge on a sphere of radius 'R' in terms of electric intensity 'E' at a distance 'r' in free space is  
( $\epsilon_0$  = permittivity of free space)
- A)  $\epsilon_0 E \left( \frac{R}{r} \right)^2$       B)  $\frac{\epsilon_0 ER}{r^2}$       C)  $\epsilon_0 E \left( \frac{r}{R} \right)^2$       D)  $\frac{\epsilon_0 Er}{R^2}$
28. A body at rest starts sliding from top of a smooth inclined plane and requires 4 second to reach bottom. How much time does it take, starting from rest at top, to cover one-fourth of a distance ?
- A) 1 second      B) 2 second      C) 3 second      D) 4 second
29. In vacuum, to travel distance 'd', light takes time 't' and in medium to travel distance '5d', it takes time 'T'. The critical angle of the medium is
- A)  $\sin^{-1} \left( \frac{5T}{t} \right)$       B)  $\sin^{-1} \left( \frac{5t}{3T} \right)$       C)  $\sin^{-1} \left( \frac{5t}{T} \right)$       D)  $\sin^{-1} \left( \frac{3t}{5T} \right)$
30. In electromagnetic spectrum, the frequencies of  $\gamma$ -rays, X-rays and ultraviolet rays are denoted by  $n_1$ ,  $n_2$  and  $n_3$  respectively then
- A)  $n_1 > n_2 > n_3$       B)  $n_1 < n_2 < n_3$       C)  $n_1 > n_2 < n_3$       D)  $n_1 < n_2 > n_3$
31. If an electron in hydrogen atom jumps from an orbit of level  $n = 3$  to an orbit of level  $n = 2$ , emitted radiation has a frequency (R = Rydberg's constant, C = velocity of light)
- A)  $\frac{3RC}{27}$       B)  $\frac{RC}{25}$       C)  $\frac{8RC}{9}$       D)  $\frac{5RC}{36}$

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SPACE FOR ROUGH WORK



32. In electromagnetic wave, according to Maxwell, changing electric field gives  
 A) stationary magnetic field                      B) conduction current  
 C) eddy current                                      D) displacement current
33. The de-Broglie wavelength of an electron in 4<sup>th</sup> orbit is ( $r$  = radius of 1<sup>st</sup> orbit)  
 A)  $2\pi r$                       B)  $4\pi r$                       C)  $8\pi r$                       D)  $16\pi r$
34. A string of length 'L' and force constant 'K' is stretched to obtain extension ' $l$ '. It is further stretched to obtain extension ' $l_1$ '. The work done in second stretching is  
 A)  $\frac{1}{2} K l_1 (2l + l_1)$     B)  $\frac{1}{2} K l_1^2$                       C)  $\frac{1}{2} K (l^2 + l_1^2)$     D)  $\frac{1}{2} K (l_1^2 - l^2)$
35. The equiconvex lens has focal length 'f'. If it is cut perpendicular to the principal axis passing through optical centre, then focal length of each half is  
 A)  $\frac{f}{2}$                       B) f                      C)  $\frac{3f}{2}$                       D) 2f
36. In common base circuit of a transistor, current amplification factor is 0.95. Calculate the emitter current if base current is 0.2 mA  
 A) 2 mA                      B) 4 mA                      C) 6 mA                      D) 8 mA
37. The ratio of magnetic dipole moment of an electron of charge 'e' and mass 'm' in Bohr's orbit in hydrogen atom to its angular momentum is  
 A)  $\frac{e}{m}$                       B)  $\frac{m}{e}$                       C)  $\frac{2m}{e}$                       D)  $\frac{e}{2m}$
38. Gases exert pressure on the walls of the container because the gas molecules  
 A) have finite volume                      B) obey Boyle's law  
 C) possess momentum                      D) collide with one another
39. Two coherent sources of intensity ratio ' $\alpha$ ' interfere. In interference pattern  $\frac{I_{\max} - I_{\min}}{I_{\max} + I_{\min}} =$   
 A)  $\frac{2\alpha}{1 + \alpha}$                       B)  $\frac{2\sqrt{\alpha}}{1 + \alpha}$                       C)  $\frac{2\alpha}{1 + \sqrt{\alpha}}$                       D)  $\frac{1 + \alpha}{2\alpha}$

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SPACE FOR ROUGH WORK





40. Light of wavelength  $\lambda_A$  and  $\lambda_B$  falls on two identical metal plates A and B respectively. The maximum kinetic energy of photoelectrons in  $K_A$  and  $K_B$  respectively, then which one of the following relations is true ? ( $\lambda_A = 2\lambda_B$ )

A)  $K_A < \frac{K_B}{2}$       B)  $2K_A = K_B$       C)  $K_A = 2K_B$       D)  $K_A > 2K_B$

41. In LCR series circuit, an alternating e.m.f. 'e' and current 'i' are given by the equations  
 $e = 100 \sin(100t)$  volt,

$$i = 100 \sin\left(100t + \frac{\pi}{3}\right) \text{ mA.}$$

The average power dissipated in the circuit will be

A) 100 W      B) 10 W      C) 5 W      D) 2.5 W

42. A block resting on the horizontal surface executes S.H.M. in horizontal plane with amplitude 'A'. The frequency of oscillation for which the block just starts to slip is ( $\mu$  = coefficient of friction,  $g$  = gravitational acceleration)

A)  $\frac{1}{2\pi} \sqrt{\frac{\mu g}{A}}$       B)  $\frac{1}{4\pi} \sqrt{\frac{\mu g}{A}}$       C)  $2\pi \sqrt{\frac{A}{\mu g}}$       D)  $4\pi \sqrt{\frac{A}{\mu g}}$

43. A plane sound wave travelling with velocity 'v' in a medium A reaches a point on the interface of medium A and medium B. If velocity of sound in medium B is  $2v$ , the angle of incidence for total internal reflection of the wave will be greater than ( $\sin 30^\circ = 0.5$  and  $\sin 90^\circ = 1$ )

A)  $15^\circ$       B)  $30^\circ$       C)  $45^\circ$       D)  $90^\circ$

44. A gas is compressed isothermally. The r.m.s. velocity of its molecules

A) increases      B) decreases  
 C) first increases and then decreases      D) remains the same

45. Two concentric spheres kept in air have radii 'R' and 'r'. They have similar charge and equal surface charge density ' $\sigma$ '. The electric potential at their common centre is

( $\epsilon_0$  = permittivity of free space)

A)  $\frac{\sigma(R+r)}{\epsilon_0}$       B)  $\frac{\sigma(R-r)}{\epsilon_0}$       C)  $\frac{\sigma(R+r)}{2\epsilon_0}$       D)  $\frac{\sigma(R+r)}{4\epsilon_0}$

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SPACE FOR ROUGH WORK



46. Benzene can be conveniently converted into n-propyl benzene by
- Friedel – Craft alkylation with n-propyl chloride
  - Friedel – Craft acylation with propionyl chloride followed by Wolff – Kishner reduction
  - Friedel – Craft acylation with propionyl chloride followed by catalytic hydrogenation
  - Friedel – Craft acylation with propionyl chloride followed by reduction with  $\text{LiAlH}_4$
47. Select the diamagnetic complex ion amongst the following complexes  
(Atomic No. Fe = 26, Co = 27)
- $\text{K}_3[\text{Fe}(\text{CN})_6]$
  - $[\text{Co}(\text{NH}_3)_6]\text{Cl}_3$
  - $\text{K}_3[\text{FeF}_6]$
  - $\text{K}_3[\text{CoF}_6]$
48. One mole of stachyose on hydrolysis yields
- 1 mole of glucose + 1 mole of fructose + 2 mole of galactose
  - 2 mole of glucose + 1 mole of fructose + 1 mole of galactose
  - 1 mole of glucose + 2 mole of fructose + 1 mole of galactose
  - 2 mole of glucose + 2 mole of fructose
49. An organic compound 'X' having molecular formula  $\text{C}_4\text{H}_{11}\text{N}$  reacts with p-toluene sulphonyl chloride to form a compound 'Y' that is soluble in aqueous KOH. Compound 'X' is optically active and reacts with acetyl chloride to form compound 'Z'. Identify the compound 'Z'

- $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{NHCOCH}_3$
- $$\begin{array}{c} \text{CH}_3 \\ | \\ \text{CH}_3\text{CH}_2\text{CHNHCOCH}_3 \end{array}$$
- $$\begin{array}{c} \text{CH}_3 \\ | \\ \text{CH}_3\text{CHCH}_2\text{NHCOCH}_3 \end{array}$$
- $$\begin{array}{c} \text{CH}_3 \\ | \\ \text{CH}_3 - \text{C} - \text{NHCOCH}_3 \\ | \\ \text{CH}_3 \end{array}$$

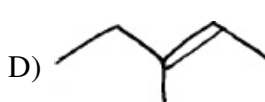
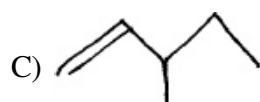
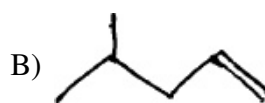
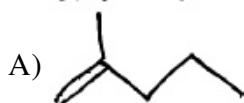
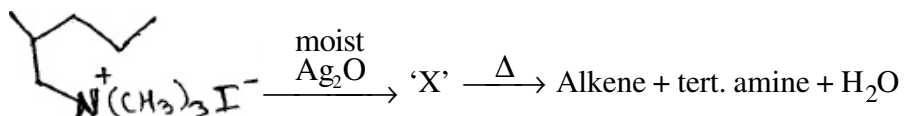
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SPACE FOR ROUGH WORK

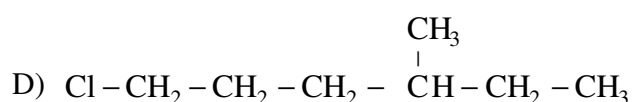
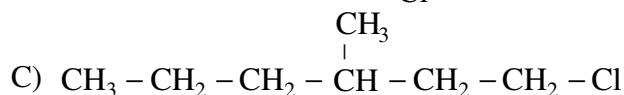
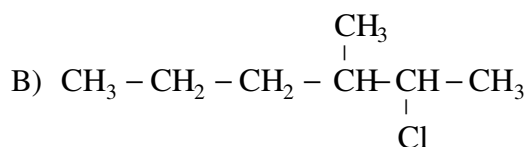
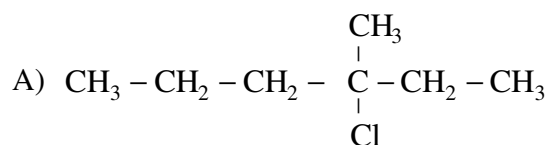


50. If average velocity of a sample of gas molecules at 300 K is  $5 \text{ cm s}^{-1}$ , what is RMS velocity of same sample of gas molecules at the same temperature? (Given,  $\alpha : u : v = 1 : 1.224 : 1.127$ )
- A)  $6.112 \text{ cm/s}$       B)  $4.605 \text{ cm/s}$       C)  $4.085 \text{ cm/s}$       D)  $5.430 \text{ cm/s}$

51. Identify the alkene that is produced in the following series of reactions



52. 'X' is an optically active alkane having lowest molecular mass. Predict the structure of the major product obtained on monochlorination of 'X'




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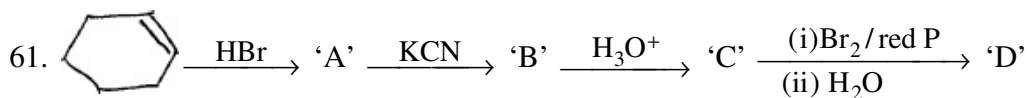
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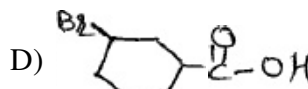
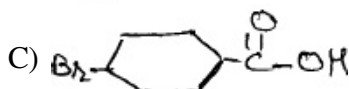
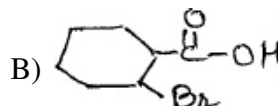
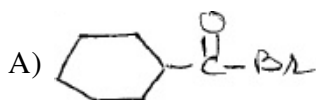
53. Butylated hydroxy toluene is used in  
A) preventing oxidative rancidity of fats    B) preserving food grains  
C) killing bacteria in living tissues    D) reducing stress and anxiety
54. Deficiency of which vitamin causes degeneration of spinal cord ?  
A) E    B) K    C) B<sub>12</sub>    D) A
55. Bond order of which among the following molecules is zero ?  
A) F<sub>2</sub>    B) O<sub>2</sub>    C) Be<sub>2</sub>    D) Li<sub>2</sub>
56. The compound that yields only ketonic compound/s on ozonolysis is  
A) But-2-ene    B) Pent-2-ene  
C) 2, 3-Dimethylbut-2-ene    D) 2-Methylbut-2-ene
57. Which among the following metals is refined by electrolytic method ?  
A) Aluminium    B) Bismuth    C) Tin    D) Lead
58. The two monomers used in the preparation of dextran are  
A) 3-hydroxy butanoic acid and 3-hydroxy pentanoic acid  
B)  $\epsilon$  amino caproic acid and glycine  
C) Isobutylene and isoprene  
D) Lactic acid and glycolic acid
59. Which oxyacid of sulphur contains S-S single bond ?  
A) Oleum    B) Marshall's acid  
C) Dithionic acid    D) Thiosulphuric acid
60. Amongst the followings, select the element having highest ionization enthalpy  
A) Sodium    B) Potassium    C) Beryllium    D) Magnesium

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Identify the compound 'D' in above mentioned series of reactions.



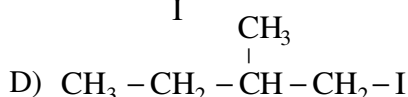
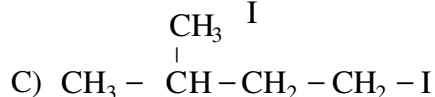
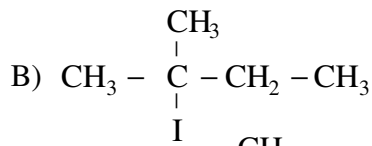
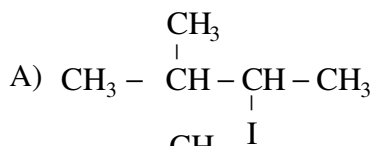
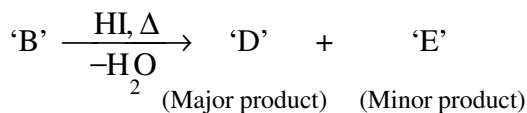
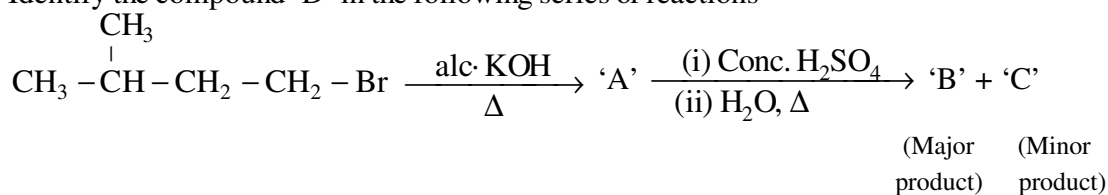
62. Which among the following gases can be liquified easily ?  
 A) Chlorine                      B) Nitrogen                      C) Oxygen                      D) Hydrogen
63. What is the mass of one molecule of yellow phosphorus ? (Atomic mass, P = 30)  
 A)  $1.993 \times 10^{-22}$  kg                      B)  $1.993 \times 10^{-19}$  mg  
 C)  $4.983 \times 10^{-20}$  mg                      D)  $4.983 \times 10^{-23}$  kg
64. Ozone is present as a chief constituent in which region of the atmosphere ?  
 A) Troposphere                      B) Stratosphere  
 C) Mesosphere                      D) Thermosphere
65. The plot of square root of frequency of X-ray emitted against atomic number led to suggestion of which law/rule ?  
 A) Periodic law                      B) Modern periodic law  
 C) Hund's rule                      D) Newland's law
66. Which of the following complexes has lowest molar conductance ?  
 A)  $\text{CoCl}_3 \cdot 3\text{NH}_3$                       B)  $\text{CoCl}_3 \cdot 4\text{NH}_3$   
 C)  $\text{CoCl}_3 \cdot 5\text{NH}_3$                       D)  $\text{CoCl}_3 \cdot 6\text{NH}_3$
67. The volume of oxygen evolved at STP, by decomposition of 0.68 g '20 volume' hydrogen peroxide solution, is  
 A) 2.24 mL                      B) 22.4 mL                      C) 224 mL                      D) 2240 mL

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68. What is the molality of a solution containing 200 mg of urea (molar mass  $60 \text{ g mol}^{-1}$ ) dissolved in 40 g of water ?  
 A) 0.0825                      B) 0.825                      C) 0.498                      D) 0.0013
69. Alkaline hydrolysis of which among the following compounds leads to the formation of a racemate ?  
 A) 1-Bromo-1-phenylethane                      B) 1-Chloro-3-methylbutane  
 C) Bromoethane                      D) 1-Chloropropane
70. The work done when two mole of an ideal gas is compressed from a volume of  $5 \text{ m}^3$  to  $1 \text{ dm}^3$  at 300 K, under a pressure of 100 kPa is  
 A) 499.9 kJ                      B) - 499.9 kJ                      C) -99.5 kJ                      D) 42495 kJ
71. What is the geometry of molecule of bromine penta fluoride ?  
 A) square planar                      B) trigonal bipyramidal  
 C) square pyramidal                      D) octahedral
72. Identify the compound 'D' in the following series of reactions

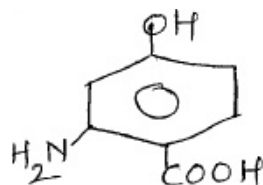



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73. Write IUPAC name of following compound



- A) 2-Amino-4-hydroxybenzoic acid      B) 6-Amino-4-hydroxybenzoic acid  
C) 3-Amino-4-carboxyphenol      D) 2-Carboxy-5-hydroxyaniline

74. Which among the following metals is employed to provide cathodic protection to iron ?

- A) Zinc      B) Nickel      C) Tin      D) Lead

75. Oxidation number of nitrogen in which among the oxides of nitrogen is the lowest ?

- A) Nitric oxide      B) Nitrous oxide  
C) Nitrogen dioxide      D) Nitrogen trioxide

76. Which statement is NOT correct about fullerene  $C_{60}$  ?

- A) It contains 20 six membered rings and 12 five membered rings  
B) All carbon atoms undergo  $SP^2$  hybridization  
C) A six membered ring is fused with six membered rings only  
D) A five membered ring is fused with six membered ring only

77. The product of molar concentrations of hydrogen ions and hydroxide ions in a 0.01 M aqueous solution of sodium chloride is known as

- A) Hydrolysis constant of salt      B) Dissociation constant of acid  
C) Dissociation constant of base      D) Ionic product of water

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78. Select the coloured compound amongst the following :  
(Atomic no. Ti = 22, Cr = 24, Cu = 29, Zn = 30)
- A)  $\text{TiCl}_4$                       B)  $\text{CrCl}_3$                       C)  $\text{ZnCl}_2$                       D)  $\text{CuCl}$
79. Which among the following solids crystalises as a face centred cube ?
- A) Iron                      B) Rubidium                      C) Uranium                      D) Platinum
80. What is the pH of millimolar solution of ammonium hydroxide which is 20% dissociated ?
- A) 3.699                      B) 10.301                      C) 4.691                      D) 9.301
81. Which among the following group 16 elements exists in more than two allotropic states ?
- A) Polonium                      B) Tellurium                      C) Selenium                      D) Oxygen
82. Solubility of which among the following substances in water increases slightly with rise in temperature ?
- A) Potassium bromide                      B) Potassium chloride  
C) Potassium nitrate                      D) Sodium nitrate
83. Assuming enthalpy of combustion of hydrogen at 273 K,  $-286 \text{ kJ}$  and enthalpy of fusion of ice at the same temperature to be  $+6.0 \text{ kJ}$ , calculate enthalpy change during formation of 100 g of ice
- A)  $+1622 \text{ kJ}$                       B)  $-1622 \text{ kJ}$                       C)  $+292 \text{ kJ}$                       D)  $-292 \text{ kJ}$
84. How is electrical conductance of a conductor related with length and area of cross section of the conductor ?
- A)  $G = l \cdot a \cdot k^{-1}$                       B)  $G = k \cdot l \cdot a^{-1}$   
C)  $G = k \cdot a \cdot l^{-1}$                       D)  $G = k \cdot l \cdot a^{-2}$

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85. What is the orbital angular momentum of an electron in 'f' orbital ?  
 A)  $\frac{1.5h}{\pi}$                       B)  $\frac{\sqrt{6}h}{\pi}$                       C)  $\frac{\sqrt{3}h}{\pi}$                       D)  $\frac{\sqrt{3}h}{2\pi}$
86. Select the ether among following that yields methanol as one of the products on reaction with cold hydroiodic acid  
 A) 1-Methoxybutane                      B) 1-Methoxy-2-methylpropane  
 C) 2-Methoxy-2-methylpropane                      D) Methoxybenzene
87. Rate law for the reaction  $A + B \rightarrow \text{product}$  is rate =  $k [A]^2 [B]$ . What is the rate constant, if rate of reaction at a given temperature is  $0.22 \text{ Ms}^{-1}$ , when  $[A] = 1 \text{ M}$  and  $[B] = 0.25 \text{ M}$ .  
 A)  $3.52 \text{ M}^{-2} \text{ s}^{-1}$                       B)  $0.88 \text{ M}^{-2} \text{ s}^{-1}$   
 C)  $1.136 \text{ M}^{-2} \text{ s}^{-1}$                       D)  $0.05 \text{ M}^{-2} \text{ s}^{-1}$
88. Presence of nitrogen in which among the following compounds can NOT be detected by Lassaigne method ?  
 A) Hydrazine                      B) Aniline                      C) p-Toluidine                      D) Picric acid
89. 20 ml solution of 0.1 M ferrous sulphate was completely oxidised using a suitable oxidising agent. What is the number of electrons exchanged ?  
 A)  $1.204 \times 10^{22}$                       B) 193                      C) 1930                      D)  $1.204 \times 10^{21}$
90. Among the following select the alkane that is expected to have lowest boiling point  
 A) Hexane                      B) 2-Methylpentane  
 C) 3-Methylpentane                      D) 2, 2-Dimethylbutane

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103. The arrangement of vascular tissue in hadrocentric vascular bundle is \_\_\_\_\_  
 A) concentric                      B) radial                      C) collateral                      D) bicollateral
104. 'Cry' gene is obtained from  
 A) *Agrobacterium tumefaciens*                      B) *Bacillus thuringiensis*  
 C) *Rhizobium leguminosarum*                      D) *Rhizobium phaseoli*
105. Identify the incorrect match between the protein and its role.  
 A) Keratin – structural component of hair  
 B) Immunoglobulins – protection of body against diseases  
 C) Haemoglobin – transport of O<sub>2</sub> in muscles  
 D) Thrombin – blood clotting
106. The inactive protoxin is activated in the gut of the insect by  
 A) acidic pH                      B) alkaline pH  
 C) low temperature                      D) high temperature
107. In angiosperms, the formation of two male gametes from a pollen grain involves \_\_\_\_\_ divisions.  
 A) one meiotic and one mitotic                      B) two meiotic and two mitotic  
 C) only two mitotic                      D) only two meiotic
108. In a plant cell the Diffusion Pressure Deficit is zero when it is \_\_\_\_\_  
 A) plasmolysed                      B) turgid                      C) flaccid                      D) incipient
109. The life cycle of algae such as *Spirogyra* is  
 A) haplontic                      B) diplontic  
 C) haplo-diplontic                      D) diplo-haplontic
110. During which stage of Prophase I, genetic recombination of parental characters, takes place ?  
 A) Zygotene                      B) Pachytene                      C) Diplotene                      D) Diakinesis
111. Animals obtain all their carbon through  
 A) plants                      B) soil                      C) air                      D) water
112. Which one of the following is NOT true about monocotyledonae ?  
 A) embryo has single cotyledon  
 B) leaves show parallel venation  
 C) flowers are generally trimerous  
 D) vascular bundles are conjoint, collateral and open
113. How many NAD molecules get reduced in complete oxidation of one glucose molecule ?  
 A) 2                      B) 5                      C) 10                      D) 12

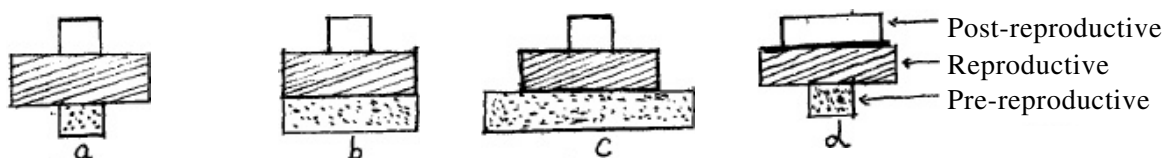


114. Which one of the following is used in the production of citric acid ?  
 A) *Aspergillus niger* B) *Rhizopus arrhizus*  
 C) *Acetobacter aceti* D) *Saccharomyces cerevisiae*
115. What will be the number of histone molecules in a chromatin fibre having 50 nucleosomes ?  
 A) 400 B) 450 C) 500 D) 1000
116. In *Albizia*, vegetative propagation takes place with the help of  
 A) fasciculated tuberous roots B) epiphyllous buds  
 C) subaerial branches D) nonfleshy roots
117. Which of the following cross will give recessive progeny in  $F_1$  generation ?  
 A)  $TT \times tt$  B)  $Tt \times TT$  C)  $tt \times tt$  D)  $TT \times TT$
118. Select the correct statements from the following :  
 I. Endosperm is generally triploid in angiosperms.  
 II. All angiosperms have monosporic and endosporic embryo sac.  
 III. Angiosperms are characterised by double-fertilization.  
 IV. All angiosperms show-indirect pollination and siphonogamy.  
 A) I, II and III B) II, III and IV C) I, III and IV D) I, II, III and IV
119. The structure producing basidium in Basidiomycetes is formed by the fusion of  
 A) two vegetative cells B) two male gametes  
 C) two female gametes D) male and female gametes
120. The sequence of nucleotides AUGCUUCUC indicates that it is a segment of  
 A) sense strand of DNA B) anti sense strand of DNA  
 C) RNA D) polypeptide chain
121. In plant breeding, the entire collection of plants/seeds having the diverse alleles of all genes in a particular organism is called  
 A) gene bank B) cDNA library C) genomic library D) germ plasm
122. Acetylation of Pyruvate takes place in the \_\_\_\_\_  
 A) perimitochondrial space B) mitochondrial matrix  
 C) cristae D)  $F_1$  particles
123. Cross pollination does not occur in  
 A) allogamous flowers B) geitonogamous flowers  
 C) cleistogamous flowers D) chasmogamous flowers
124. Which one of the following is a dicot weedicide ?  
 A) 2, 4-D B) NAA C) IBA D) IAA
125. Senescence in plants leads into \_\_\_\_\_ of cells.  
 A) increase in size B) increase in number  
 C) death D) differentiation

- [illegible]



136. Which of the following store proteins ?  
 A) Chromoplasts      B) Aleuroplasts      C) Amyloplasts      D) Elaioplasts
137. Pneumotaxic centre is located in \_\_\_\_\_  
 A) Medulla oblongata      B) Pons  
 C) Cerebrum      D) Diencephalon
138. In case of a couple where a man is having very low sperm count, which of the following technique will be suitable for fertilization ?  
 A) Infra uterine transfer  
 B) Gamete intra cytoplasmic fallopian transfer  
 C) Artificial insemination  
 D) Intracytoplasmic sperm injection
139. The rise of 1<sup>st</sup> primates occurred in \_\_\_\_\_ epoch.  
 A) Palaeocene      B) Oligocene      C) Miocene      D) Eocene
140. Which of the following statements correctly correlates with the diagrams ?



- A) a and b are steady population      B) a and d are declining population  
 C) c and d are growing population      D) b and d are declining population
141. The structure which prevents the entry of food particles into the respiratory passage is \_\_\_\_  
 A) Epiglottis      B) Glottis      C) Larynx      D) Pharynx
142. Identify vertebrochondral ribs from the following :  
 A) All 12 pairs of ribs      B) 1<sup>st</sup> to 7<sup>th</sup> pairs of ribs  
 C) 8<sup>th</sup>, 9<sup>th</sup> and 10<sup>th</sup> pairs of ribs      D) 11<sup>th</sup> and 12<sup>th</sup> pairs of ribs
143. “Testis are extraabdominal in position”. Which of the following is most appropriate reason ?  
 A) Narrow pelvis in male  
 B) Special protection for testis  
 C) Prostate gland and seminal vesicles occupy maximum space  
 D) 2.0 – 2.5° C lower than the normal body temperature
144. The Malignant malaria is caused by \_\_\_\_\_  
 A) *Plasmodium vivax*      B) *Plasmodium malariae*  
 C) *Plasmodium ovale*      D) *Plasmodium falciparum*



145. The total number of podomeres in each leg of cockroach is \_\_\_\_\_  
 A) 5 B) 6 C) 7 D) 8
146. In cockroach, the common duct of salivary reservoir opens at the base of the \_\_\_\_\_  
 A) Pharynx B) Maxilla C) Mandible D) Hypopharynx
147. The wall of urinary bladder in humans shows a thick layer of smooth muscle called \_\_\_\_\_  
 A) Dartos B) Detrusor C) Deltoid D) Depressor

148. Identify the correct match :

**Accessory glands**

**Functions**

- |                     |   |
|---------------------|---|
| i. Seminal vesicles | a. Lubricates vagina                    |
| ii. Prostate gland  | b. Provide energy, coagulation of sperm |
| iii. Cowper's gland | c. Neutralizes acidity of vagina        |
| A) i-b, ii-c, iii-a | B) i-c, ii-b, iii-a                     |
| C) i-a, ii-c, iii-b | D) i-c, ii-a, iii-b                     |

149. The technique used to block the passage of sperm in male \_\_\_\_\_  
 A) Tubectomy B) Vasectomy  
 C) Coitus interruptus D) Rhythm method

150. Find the incorrect match :

- | <b>I</b>         | <b>II</b>     | <b>III</b>      |            |
|------------------|---------------|-----------------|------------|
| i. Crab          | Sacculina     | Interaction + + |            |
| ii. Human being  | Mosquito      | Interaction – + |            |
| iii. Sea anemone | Hermit crab   | Interaction + 0 |            |
| A) i only        | B) ii and iii | C) iii and i    | D) ii only |

151. Which of the following produces erythropoietin ?  
 A) Kidney B) Pancreas C) Pineal gland D) Thyroid gland

152. Identify the correct match from the Columns I, II and III.

- | <b>I</b>                          | <b>II</b>                          | <b>III</b>                      |
|-----------------------------------|------------------------------------|---------------------------------|
| 1. Interstitial cells             | a. Cortex of ovary                 | i. Follicular fluid             |
| 2. Sertoli cells                  | b. Ovarian follicle                | ii. Progesterone                |
| 3. Granulosa cells                | c. Testis                          | iii. Attachment of sperm bundle |
| 4. Cells of corpus luteum         | d. Seminiferous tubules            | iv. Testosterone                |
| A) 2-a-iii, 1-c-iv, 3-b-i, 4-d-ii | B) 1-c-iv, 2-d-iii, 3-b-i, 4-a-ii  |                                 |
| C) 1-d-iii, 2-a-iv, 3-b-i, 4-c-ii | D) 2-d-iii, 1-c-iv, 3-a-ii, 4-b-iv |                                 |



153. Which of the following is correct match ?

| I                         | II             | III                         |
|---------------------------|----------------|-----------------------------|
| A) Thalassemia            | a) XO          | i) Flat nose, simian crease |
| B) Down's syndrome        | b) 42 AA + XY  | ii) Webbing of neck         |
| C) Turner's syndrome      | c) 44 AA + XXX | iii) Anaemia, jaundice      |
| D) Klinefelter's syndrome | d) 44 AA + XXY | iv) Tall thin eunuchoid     |

154. Which is CORRECT regarding genetically engineered insulin using *E. coli* ?

- A) Difficult to purify
- B) Obtained in large unlimited quantities
- C) Possibility of transmission of animal diseases
- D) Insulin obtained varies in chemical structure

155. Dobson unit is used in measurement of \_\_\_\_\_ level.

- A) Chlorofluoro carbons
- B) Nitrous oxide
- C) Ozone
- D) UV – B radiation

156. Cellular organization of body is present in

- A) Annelida
- B) Platyhelminthes
- C) Porifera
- D) Urochordata

157. In the following process of digestion, the enzymes at location 'X' and 'Y' are respectively

proteins  $\xrightarrow{X}$  proteoses and peptones  $\xrightarrow{Y}$  Dipeptides

- A) Chymotrypsin and pepsin
- B) Pepsin and trypsin
- C) Ptyalin and pepsin
- D) Trypsin and di-peptidase

158. Find out the correct match from the following table :

| Column I          | Column II     | Column III                     |
|-------------------|---------------|--------------------------------|
| i. Corpus luteum  | Progesteron   | Degeneration of endometrium    |
| ii. Pineal gland  | Vasopressin   | Intracellular transport        |
| iii. Pars nervosa | Coherin       | Induces contraction of jejunum |
| A) i only         | B) i and ii   |                                |
| C) iii only       | D) ii and iii |                                |

159. The colostrum provides \_\_\_\_\_

- A) Naturally acquired active immunity
- B) Naturally acquired passive immunity
- C) Artificially acquired active immunity
- D) Artificially acquired passive immunity





160. Identify and select the correct Match in the Columns I, II and III.

| I            | II            | III          |
|--------------|---------------|--------------|
| A) Earthworm | – Annelida    | – Superclass |
| B) Frog      | – <i>Rana</i> | – Species    |
| C) Lancelet  | – Vertebrata  | – Division   |
| D) Walrus    | – Mammalia    | – Class      |

161. The correct match is

|                  |       |  |       |
|------------------|-------|--|-------|
| I. DCT           | –     | Secretion of $H^+$ and $K^+$ ions                                |       |
| II. Henle's loop | –     | Reabsorption of glucose, water and $Na^+$ ions                   |       |
| III. Podocytes   | –     | Attached to parietal layer of Bowman's capsule                   |       |
| IV. JGA          | –     | Rise in glomerular blood pressure activates it to release rennin |       |
| A) III           | B) II | C) I   | D) IV |

162. The diurnal rhythms are regulated by\_\_\_\_\_

|              |              |              |                |
|--------------|--------------|--------------|----------------|
| A) Adrenalin | B) Melatonin | C) Serotonin | D) Vasopressin |
|--------------|--------------|--------------|----------------|

163. In DNA fingerprinting technique, \_\_\_\_\_ probe is used for hybridization of DNA fragments.

|                                     |   |
|-------------------------------------|---|
| A) Double stranded RNA              | B) Double stranded non-radio active DNA |
| C) Single stranded radio active DNA | D) Single stranded radio active RNA     |

164. Find the Odd one out :

|                   |                   |                    |                         |
|-------------------|-------------------|--------------------|-------------------------|
| A) <i>Adamsia</i> | B) <i>Astraea</i> | C) <i>Physalia</i> | D) <i>Pleurobrachia</i> |
|-------------------|-------------------|--------------------|-------------------------|

165. The totipotent cell can form a \_\_\_\_\_

|                   |                          |
|-------------------|--------------------------|
| A) Bud            | B) Cell membrane         |
| C) Cell organelle | D) Complete new organism |

166. The salivary amylase shows maximum digestive action at pH\_\_\_\_\_

|        |        |        |        |
|--------|--------|--------|--------|
| A) 3.6 | B) 6.8 | C) 7.5 | D) 8.5 |
|--------|--------|--------|--------|

167. The central hollow portion of the vertebra is called\_\_\_\_\_

|                   |                            |
|-------------------|----------------------------|
| A) Neural canal   | B) Central canal           |
| C) Auditory canal | D) Vertebro-arterial canal |

168. The depolarization of nerve membrane takes place through influx of \_\_\_\_\_ ions.

|            |              |           |              |
|------------|--------------|-----------|--------------|
| A) Calcium | B) Potassium | C) Sodium | D) Magnesium |
|------------|--------------|-----------|--------------|

169. Which of the following is used to promote growth of new blood vessels, thus helping in wound healing ?

|            |                             |
|------------|-----------------------------|
| A) HUMULIN | B) TPA                      |
| C) TGF – B | D) $\alpha$ – 1 antitrypsin |



170. Select the correct statement regarding the Schwann cells
- A) Surround axon of myelinated nerve fibre
  - B) Support muscle fibres
  - C) Found in Haversian system of bones
  - D) Form basement membrane of epithelium
171. The structural unit of bone is\_\_\_\_\_
- A) chondrin
  - B) cyton
  - C) osteon
  - D) ossein
172. The stato-acoustic receptor responds to changes in the\_\_\_\_\_
- A) Light and pressure
  - B) Pressure and touch
  - C) Pain and pressure
  - D) Sound and equilibrium
173. The chromosome with centromere near the end is called\_\_\_\_\_
- A) Acrocentric
  - B) Metacentric
  - C) Sub-metacentric
  - D) Telocentric
174. One of the following is NOT a possible reason for use of CNG in automobiles
- A) It can be adulterated
  - B) It is cheaper than petrol
  - C) It burns more efficiently
  - D) It reduces pollution
175. Oviparous mammal is\_\_\_\_\_
- A) *Equus*
  - B) *Macropus*
  - C) *Ornithorhynchus*
  - D) *Pteropus*
176. The nodal tissue located in the lower left corner of the right atrium is \_\_\_\_\_
- A) SA node
  - B) AV node
  - C) AV bundle
  - D) Purkinje fibres
177. Which of the following hormones initiate the parturition ?
- A) ACTH, HCG, Oxytocin
  - B) ACTH, Corticosteroid, Oxytocin
  - C) Corticosteroid, ACTH, Prostaglandin
  - D) ACTH, Progesteron, HCG
178. The primary lymphoid organ is\_\_\_\_\_
- A) Tonsils
  - B) Payer's patches
  - C) Lymph nodes
  - D) Thymus
179. Synapse is\_\_\_\_\_
- A) Crossing over between non-homologous chromosomes
  - B) Pairing of homologous chromosomes
  - C) Junction between axon and dendrites of two different neurons
  - D) Zig zag junctions in cardiac muscle fibres
180. Which of the following animal has enucleated erythrocytes ?
- A) Earthworm
  - B) Sepia
  - C) Frog
  - D) Rat



---

SPACE FOR ROUGH WORK



## 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 |



## ANTILOGARITHMS

|      | 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 |