**PAPER-1 PCM**

<table>
<thead>
<tr>
<th>Question Booklet Sr. No.</th>
<th>AC</th>
</tr>
</thead>
</table>

**Instruction to Candidate**

1. **Instructions to the Candidate :**
   - **1. Use** BLUE or BLACK BALL POINT PEN only for all entries and for filling the bubbles in the OMR Answer Sheet.
   - **2. Before opening the SECURITY SEAL of the question booklet, write your Name, Roll Number (In figures), OMR Answer-sheet Number in the space provided at the top of the Question Booklet.**
   - **Non-compliance of these instructions would mean that the Answer Sheet can not be evaluated leading the disqualification of the candidate.**
   - **3. Each question carries FOUR marks. No marks will be awarded for unattempted questions. There is no negative marking on wrong answer.**
   - **4. Each multiple choice questions has only one correct answer and marks shall be awarded for correct answer.**
   - **5. Use of calculator, log table, mobile phones, any electronic gadget and slide rule etc. is strictly prohibited.**
   - **6. Candidate will be allowed to leave the examination hall at the end of examination time period only.**
   - **7. If a candidate is found in possession of books or any other printed or written material from which he/she might derive assistance, he/she is liable to be treated at disqualified. Similarly, if a candidate is found giving or obtaining (or attempting to give or obtain) assistance from any source, he/she is liable to be disqualified.**
   - **8. English version of questions paper is to be considered as authentic and final to resolve any ambiguity.**
   - **9. OMR sheet is placed within this paper and can be taken out from this paper but seal of paper must be opened only at the start of paper.**
001. The energy levels of a hypothetical one electron atom system are given by \( E_n = -\frac{16}{n^2} \text{eV} \), where \( n = 1, 2, 3, \ldots \). The wavelength of emitted photon corresponding to transition from first excited level to ground level is about:

(A) 1220 Å  
(B) 3650 Å  
(C) 690 Å  
(D) 1035 Å

002. What is the voltage across an ideal PN junction diode for shown circuit?

(A) 1 V  
(B) 2 V  
(C) 0 V  
(D) 0.7 V
003. Power emitted by a black body at temperature 50°C is P. Now temperature is doubled i.e. temperature of black body becomes 100°C. Now power emitted is:
(A) greater than 16P
(B) P
(C) 16P
(D) greater than P but less than 16P

004. An experimenter needs to heat a small sample to temperature 900K, but the only available large object has maximum temperature of 600K. Could the experimenter heat the sample to 900K by using a large lens to concentrate the radiation from the large object onto the sample as shown below?

(A) Yes, if the sample is placed at the focal point of the lens.
(B) It is not possible
(C) Yes, if the volume of the large object is at least 1.5 times the volume of the sample.
(D) Yes, if the front area of the large object is at least 1.5 times the area of the front of the sample.

005. Consider a small electric dipole with magnitude of dipole moment p which is placed far away from point A as shown. The electric potential at the point A is:

(A) \(-\frac{kp}{r}\)
(B) \(\frac{kp}{r}\)
(C) exactly zero
(D) \(\frac{kp}{r^2}\)
006. A conducting loop (as shown) has total resistance $R$. A uniform magnetic field $B = \gamma t$ is applied perpendicular to plane of the loop where $\gamma$ is a constant and $t$ is time. The induced current flowing through loop is:

\[ \begin{align*}
(A) & \quad \frac{(b^2 - a^2)\gamma}{R} \\
(B) & \quad \frac{(b^2 - a^2)\gamma t}{R} \\
(C) & \quad \frac{(b^2 + a^2)\gamma}{R} \\
(D) & \quad \frac{(b^2 + a^2)\gamma t}{R}
\end{align*} \]

007. A uniform disc of mass $M$ and radius $R$ is hinged at its centre $C$. A force $F$ is applied on the disc as shown. At this instant, angular acceleration of the disc is:

\[ \begin{align*}
(A) & \quad \frac{F}{MR} \\
(B) & \quad \frac{2}{\sqrt{3}} \frac{F}{MR} \\
(C) & \quad \frac{F}{2MR} \\
(D) & \quad \frac{1}{\sqrt{3}} \frac{F}{MR}
\end{align*} \]

008. The velocity of a particle is zero at time $t=2$, then

(A) acceleration may be zero at $t=2$
(B) velocity must be zero for $t>2$
(C) acceleration must be zero at $t=2$
(D) displacement must be zero in the interval $t=0$ to $t=2$.

009. A ball moving in $xy$ plane, has velocity $(4i - 4j) \text{m/s}$ just before the collision with ground. Coefficient of restitution for collision is $e = \frac{1}{2}$. What will be velocity of the ball just after the collision with ground?

\[ \begin{align*}
(A) & \quad (4i + 2j) \text{m/s} \\
(B) & \quad (2i + 4j) \text{m/s} \\
(C) & \quad (4i + 4j) \text{m/s} \\
(D) & \quad (2i + 2j) \text{m/s}
\end{align*} \]
010. A light ray moving in medium-1 (of refractive index $n_1$) is incident on interface of two media and it is totally internally reflected at the interface. Now refractive index $n_2$ of medium-II is decreased, then

(A) ray will be still totally internally reflected at interface.
(B) ray will be totally transmitted into medium-II only if angle of incidence is increased.
(C) ray will be totally transmitted in medium-II.
(D) ray will move completely parallel to the interface.

011. A light beam consists of two types of photons. In one type each photon has energy $2eV$ and in other type each photon has energy $3eV$. The light beam is incident on a photoelectric material of work function $1eV$. The maximum kinetic energy of emitted photoelectron is:

(A) $3eV$
(B) $4eV$
(C) $1eV$
(D) $2eV$

012. A light beam parallel to axis is incident on the system of four convex lenses A, B, C and D. Focal lengths of A, B, C and D are 30cm, 10cm, 30cm and 10cm respectively as shown. Here fixed distance $BC = 20cm$. What should be the distance between the lens A and lens D so that after refractions, rays will be parallel to axis in regions I, III and V?

(A) 100 cm
(B) 80 cm
(C) 20 cm
(D) 40 cm

013. A long silver tea spoon is placed in a cup filled with hot tea. After some time, the exposed end (the end which is not dipped in tea) of the spoon becomes hot even without a direct contact with the tea. This phenomenon can be explained mainly by:

(A) reflection
(B) radiation
(C) thermal expansion
(D) conduction
014. Figure shows a nonconducting semicircular rod in xy plane. Top half (quarter circle) has uniform linear charge density \(-\lambda\) whereas remaining half has uniform linear charge density \(+\lambda\). What is the direction of the net electric field at point P?

\[
\begin{align*}
-\lambda & \quad P \quad x \\
+\lambda & 
\end{align*}
\]

(A) electric field is zero at point P, so direction cannot be determined.
(B) along the bisector of x axis and y axis.
(C) along +x axis
(D) along +y axis

015. A bead of mass m can slide without friction on a fixed circular horizontal ring of radius 3R having centre at the point C. The bead is attached to one of the ends of spring of spring constant k. Natural length of spring is R and the other end of the spring is fixed at point O as shown in figure. Bead is released from position A, what will be kinetic energy of the bead when it reaches at point B?

\[
OC = 4R
\]

\[
\begin{align*}
(A) & \quad \frac{9}{2} kR^2 \\
(B) & \quad 8kR^2 \\
(C) & \quad 12 kR^2 \\
(D) & \quad \frac{25}{2} kR^2
\end{align*}
\]

016. The total electrostatic energy stored in both the capacitors is:

\[
-3V \quad 3\mu F \quad 6\mu F
\]

\[
\begin{align*}
(A) & \quad 40.5 \mu J \\
(B) & \quad 13.5 \mu J \\
(C) & \quad 18 \mu J \\
(D) & \quad 9 \mu J
\end{align*}
\]
017. Gravitational force acts on a particle due to fixed uniform solid sphere. Neglect other forces. Then particle:
(A) always moves in the radial direction only.
(B) always moves in circular orbit.
(C) experiences a force directed along the radial direction only.
(D) always moves normal to the radial direction.

018. A block performs simple harmonic motion with equilibrium point $x = 0$. Graph of acceleration of the block as a function of time is shown. Which of the following statement is correct about the block?
(A) speed is maximum at $t = 4s$.
(B) speed is minimum at $t = 2s$.
(C) speed is maximum at $t = 3s$.
(D) displacement from equilibrium is maximum at $t = 4s$.

019. There are two identical springs each of spring constant $k$. Here springs, pulley and rods are massless and block has mass $m$. What is the extension of each spring at equilibrium?
(A) $\frac{mg}{2k}$
(B) $\frac{3mg}{4k}$
(C) $\frac{mg}{k}$
(D) $\frac{2mg}{k}$

020. Two tuning forks A and B produce 4 beats/sec. Forks B and C produce 5 beats/sec. Forks A and C may produce ……. beats/sec.
(A) 9  (B) 20
(C) 2  (D) 5
021. A 10 gm bullet moving directly upward at 1000 m/s strikes and passes through the center of mass of a 10 kg block initially at rest. The bullet emerges from the block moving directly upward at 400 m/s. What will be velocity of the block just after the bullet comes out of it?

(A) 0.4 m/s  
(B) 1.4 m/s  
(C) 0.6 m/s  
(D) 1 m/s

022. Two identical balls P and Q are projected with same speeds in vertical plane from same point O with making projection angles with horizontal 30° and 60° respectively and they fall directly on plane AB at points P' and Q' respectively. Which of the following statement is true about distances as given in options?

(A) AP' < AQ'  
(B) AP' ≤ AQ'  
(C) AP' = AQ' as there are complimentary projection angles.  
(D) AP' > AQ'

023. A string has a length of 5m between fixed points and has fundamental frequency of 20 Hz. What is the frequency of the second overtone?

(A) 50 Hz  
(B) 60 Hz  
(C) 30 Hz  
(D) 40 Hz

024. Displacement \( x \) versus \( t^2 \) graph is shown for a particle. The acceleration of the particle is:

(A) 8 m/s\(^2\)  
(B) zero  
(C) 2 m/s\(^2\)  
(D) 4 m/s\(^2\)
025. For given LR circuit, growth of current as function of time \( t \) is shown in graph. Which of the following option represents value of time constant most closely for the circuit?

(A) 1 s  \hspace{1cm} (B) 2.4 s  \hspace{1cm} (C) 0.4 s  \hspace{1cm} (D) 0.7 s

026. Radii of two conducting circular loops are \( b \) and \( a \) respectively where \( b > > a \). Centers of both loops coincide but planes of both loops are perpendicular to each other. The value of mutual inductance for these loops :

(A) zero  \hspace{1cm} (B) \( \frac{\mu_0 \pi ab}{2(a+b)} \)  \hspace{1cm} (C) \( \frac{\mu_0 \pi a^2}{2b} \)  \hspace{1cm} (D) \( \frac{\mu_0 \pi b^2}{2a} \)

027. A block of mass of 1kg is moving on the \( x \) axis. A force \( F \) acting on the block is shown. Velocity of the block at time \( t=2s \) is \(-3m/s\). What is the speed of the block at time \( t=4s \) ?

(A) 2 m/s  \hspace{1cm} (B) 3 m/s  \hspace{1cm} (C) 5 m/s  \hspace{1cm} (D) 8 m/s

028. Two particles P and Q are moving on a circle. At a certain instant of time both the particles are diametrically opposite and P has tangential acceleration \( 8m/s^2 \) and centripetal acceleration \( 5m/s^2 \) whereas Q has only centripetal acceleration of \( 1m/s^2 \). At that instant acceleration (in m/s\(^2\)) of P with respect to Q is :

(A) \( \sqrt{80} \)  \hspace{1cm} (B) 10  \hspace{1cm} (C) 12  \hspace{1cm} (D) 14
029. In the given figure, atmospheric pressure \( P_0 = 1 \text{ atm} \) and mercury column length is 9cm. Pressure \( P \) of the gas enclosed in the tube is:

![Diagram of gas enclosure]

(A) pressure of 90cm of Hg  
(B) pressure of 78cm of Hg  
(C) pressure of 85cm of Hg  
(D) pressure of 67cm of Hg

030. PV diagram of an ideal gas is shown. The gas undergoes from initial state A to final state B such that initial and final volumes are same. Select the correct alternative for given process AB.

![PV diagram]

(A) work done by gas is negative  
(B) temperature of gas increases continuously  
(C) process is isochoric  
(D) work done by gas is positive

031. A small object of mass of 100gm moves in a circular path. At a given instant velocity of the object is \( 10i \text{ m/s} \) and acceleration is \( (20i + 10j) \text{ m/s}^2 \). At this instant of time, rate of change of kinetic energy of the object is:

(A) 300 \( \text{kgm}^2\text{s}^{-3} \)  
(B) 10000 \( \text{kgm}^2\text{s}^{-3} \)  
(C) 20 \( \text{kgm}^2\text{s}^{-3} \)  
(D) 200 \( \text{kgm}^2\text{s}^{-3} \)

032. A time varying horizontal force (in Newton) \( F = 8|\sin (4\pi t)| \) is acting on a stationary block of mass 2kg as shown. Friction coefficient between the block and ground is \( \mu = 0.5 \) and \( g = 10\text{m/s}^2 \). Then resulting motion of the block will be:

![Block and force diagram]

(A) It remains stationary  
(B) It moves towards left  
(C) It moves towards right  
(D) It will oscillate
033. Take Bulk modulus of water $B = 2100MPa$. What increase in pressure is required to decrease the volume of 200 liters of water by 0.004 percent?

(A) 840 kPa  
(B) 8400 kPa  
(C) 84 kPa  
(D) 210 kPa

034. Thin semicircular part ABC has mass $m_1$ and diameter AOC has mass $m_2$. Here axis passes through mid point of diameter and the axis is perpendicular to plane ABC. Here AO=OC=R. The moment of inertia of this composite system about the axis is:

(A) $m_1 R^2 + m_2 R^2$  
(B) $m_1 R^2 + \frac{m_2 R^2}{6}$  
(C) $m_1 R^2 + \frac{m_2 R^2}{2}$  
(D) $m_1 R^2 + \frac{m_2 R^2}{12}$

035. In Young’s double slit experiment, the path difference between two interfering waves at a point on screen is 13.5 times the wavelength. The point is:

(A) neither bright nor dark  
(B) central bright  
(C) dark  
(D) bright but not central bright

036. A ball having velocity $v$ towards right and having angular velocity clockwise approaches the wall. It collides elastically with wall and moves towards left. Ground and wall are frictionless. Select the correct statement about angular velocity of the ball after collision.

(A) It becomes zero  
(B) Angular speed decreases  
(C) It will be clockwise  
(D) It will be anticlockwise
037. Which of the following particle will describe the smallest circle when projected with same velocity perpendicular to magnetic field?
(A) He⁺  (B) Li⁺
(C) electron  (D) proton

038. A loop PQR carries a current of 2A as shown. A uniform magnetic field \(B=2\,\text{T}\) is parallel to plane of the loop. The magnetic torque on the loop is:
(A) 8 Nm  (B) zero
(C) 4 Nm  (D) 16 Nm

039. The sides of a rectangle are 7.01 m and 12 m. Taking the significant figures into account, the area of the rectangle is:
(A) 84.00 \(\text{m}^2\)  (B) 84.12 \(\text{m}^2\)
(C) 84 \(\text{m}^2\)  (D) 84.1 \(\text{m}^2\)

040. In steady state, charge on \(3\mu\text{F}\) capacitor is:
(A) 27 \(\mu\text{C}\)  (B) 18 \(\mu\text{C}\)
(C) 54 \(\mu\text{C}\)  (D) 36 \(\mu\text{C}\)

041. Consider one dimensional motion of a particle. Velocity \(v\) versus time \(t\) graph is shown. Which graph is most appropriate for displacement \(x\) versus time \(t\)?

(A)  
(B)  
(C)  
(D)  

037. निम्न कणों में से किन्सा कण सबसे छोटी त्रिज्या का बुत बनाएगा जब वह चुम्बकीय क्षेत्र के लम्बवत समान ब्लेंड से प्रश्वेचित किया जाता है?
(A) He⁺  (B) Li⁺
(C) इलेक्ट्रॉन  (D) प्रोटॉन

038. चित्रानुसार एक लूप PQR में धारा 2A है। एक समान चुम्बकीय क्षेत्र \(B=2\,\text{T}\) लूप के तल के समानार है। लूप पर चुम्बकीय आक्षरण है:
(A) 8 Nm  (B) शून्य
(C) 4 Nm  (D) 16 Nm

039. एक आयत की भुजाएँ 7.01 m तथा 12 m है। सार्थक अंको को लेंगे हुए आयत का क्षेत्रफल होगा:
(A) 84.00 \(\text{m}^2\)  (B) 84.12 \(\text{m}^2\)
(C) 84 \(\text{m}^2\)  (D) 84.1 \(\text{m}^2\)

040. स्थायी अवस्था में \(3\mu\text{F}\) संधारित पर आवेश होगा:
(A) 27 \(\mu\text{C}\)  (B) 18 \(\mu\text{C}\)
(C) 54 \(\mu\text{C}\)  (D) 36 \(\mu\text{C}\)

041. एक कण के लिए एक विश्वसनीय गति लीजिए। यहाँ \(v\) तथा समय \(t\) के मध्य ग्राफ़ दर्शाया गया है। किन्सा ग्राफ़ समय \(t\) के सापेक्ष विश्वासपत्र \(x\) की सबसे उपयुक्त रूप से दर्शाता है?
042. An object of mass 26 kg floats in air and it is in equilibrium state. Air density is 1.3 kg/m$^3$. The volume of the object is:
(A) 20 m$^3$  
(B) 13 m$^3$  
(C) 26 m$^3$  
(D) 10 m$^3$

043. In the given circuit cell E has internal resistance of $r = 2\Omega$. What is the value of resistance R so that power delivered to resistor R is maximum?

(A) 3 $\Omega$  
(B) 5 $\Omega$  
(C) 1 $\Omega$  
(D) 2 $\Omega$

044. Two cylindrical rods A and B have same resistivities and same lengths. Diameter of rod A is twice the diameter of the rod B. Ratio of voltage drop across rod A to rod B is:

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

045. Which of the following material is not ferromagnetic in nature?

(A) Co  
(B) Ni  
(C) Al  
(D) Fe

046. Three small balls of masses 1 kg, 2 kg and 3 kg are moving in a plane and their velocities are 1 m/s, 2 m/s and 3 m/s respectively as shown. The total angular momentum of the system of the three balls about point P at given instant of time is:

(A) 9 kgm$^2$s$^{-1}$  
(B) 36 kgm$^2$s$^{-1}$  
(C) 7 kgm$^2$s$^{-1}$  
(D) 8 kgm$^2$s$^{-1}$
047. Three identical resistors each of resistance R are connected to an ideal cell of voltage V as shown. Total power dissipated in all three resistors is:

\[
\begin{align*}
(A) \quad & \frac{3V^2}{R} \\
(B) \quad & \frac{V^2}{3R} \\
(C) \quad & \frac{2V^2}{3R} \\
(D) \quad & \frac{3V^2}{2R}
\end{align*}
\]

048. For given logic diagram, output F=1, then inputs are:

\[
\begin{align*}
(A) \quad & A = 0, B = 1, C = 0 \\
(B) \quad & A = 1, B = 1, C = 1 \\
(C) \quad & A = 0, B = 0, C = 1 \\
(D) \quad & A = 0, B = 0, C = 0
\end{align*}
\]

049. Consider two polaroids A and B as shown. Unpolarized light is incident on polaroid A. Now both the polaroids are rotated simultaneously by 180° in same sense of rotation such that at every instant, their pass(transmission) axes always remain parallel to each other. During the rotation, intensity of transmitted light through polaroid B:

\[
\begin{align*}
(A) \quad & \text{first increases then decreases} \\
(B) \quad & \text{remains same} \\
(C) \quad & \text{decreases continuously} \\
(D) \quad & \text{increases continuously}
\end{align*}
\]

050. Activity of a radioactive substance becomes from 8000Bq to 1000Bq in 12 Days. What is the half life of the radioactive substance?

\[
\begin{align*}
(A) \quad & 6 \text{ days} \\
(B) \quad & 2 \text{ days} \\
(C) \quad & 3 \text{ days} \\
(D) \quad & 4 \text{ days}
\end{align*}
\]
051. Which of the following is Reimer-Tieman reaction?

\[
\begin{align*}
(A) & \quad \text{OCH}_3 + \text{CH}_3\text{COCl} \quad \text{anhy. AlCl}_3 \\
(B) & \quad \text{OC}_2\text{H}_5 + \text{Conc. H}_2\text{SO}_4 \quad \text{Conc. HNO}_3 \\
(C) & \quad \text{OH} + \text{CHCl}_3 + \text{aq. NaOH} \\
(D) & \quad \text{OH} + \text{CHCl}_3 + \text{alcoh. NaOH}
\end{align*}
\]

052. The increasing order of the first ionization enthalpies of the elements B, P, S and F is:

\[
\begin{align*}
(A) & \quad \text{F} < \text{S} < \text{P} < \text{B} \\
(B) & \quad \text{P} < \text{S} < \text{B} < \text{F} \\
(C) & \quad \text{B} < \text{P} < \text{S} < \text{F} \\
(D) & \quad \text{B} < \text{S} < \text{P} < \text{F}
\end{align*}
\]

053. Some pairs of ions are given below. In which pair, first ion is more stable than second ion?

\[
\begin{align*}
(A) & \quad \text{CH}_2\text{CH}_3^- + \text{CH}_2\text{CH}_3^- \\
(B) & \quad \text{H}_2\text{C}-\text{C}^- + \text{H}_3\text{C}-\text{N}^- \quad \text{CH}_3 \\
(C) & \quad \text{H}_2\text{C}-\text{C}^- + \text{H}_3\text{C}-\text{N}^- \quad \text{CH}_3 \\
(D) & \quad \text{H}_2\text{C}-\text{C}^- + \text{H}_3\text{C}-\text{N}^- \quad \text{CH}_3 \\
\end{align*}
\]

054. Which alkaline earth metal compound is volatile?

\[
\begin{align*}
(A) & \quad \text{Ca}_3\text{N}_2 \\
(B) & \quad \text{None of the options} \\
(C) & \quad \text{Be}_3\text{N}_2 \\
(D) & \quad \text{Mg}_3\text{N}_2
\end{align*}
\]

055. What is the name of the following reaction?

\[
\begin{align*}
\text{HCHO} + \text{HCHO} \quad \text{NaOH} & \quad \Delta \quad \text{CH}_3\text{OH} + \text{HCOONa} \\
(A) & \quad \text{Cannizzaro reaction} \\
(B) & \quad \text{None of the options} \\
(C) & \quad \text{Hell-Volhard reaction} \\
(D) & \quad \text{Clemmensen reaction}
\end{align*}
\]
056. Inorganic graphite is:
(A) BN  (B) BF$_3$
(C) B$_2$N$_3$H$_6$  (D) B$_2$H$_6$

057. Rank the following in decreasing order of basic strength:
(i) CH$_3$ - CH$_2$ - C = C$^-$
(ii) CH$_3$ - CH$_2$ - S$^-$
(iii) CH$_3$ - CH$_2$ - CO$_2^-$
(iv) CH$_3$ - CH$_2$ - O$^-$
(A) i > iv > ii > iii  (B) i > iv > iii > ii
(C) ii > i > iv > iii  (D) iv > i > ii > iii

058. Among the given compound choose the two that yield same carbocation on ionization.

\[
\begin{align*}
\text{(i)} & \quad \text{Br} & \quad \text{Br} & \quad \text{Br} \\
\text{(ii)} & \quad \text{Br} & \quad \text{Br} & \quad \text{Br} \\
\text{(iii)} & \quad \text{Br} & \quad \text{Br} & \quad \text{Br} \\
\text{(iv)} & \quad \text{Br} & \quad \text{Br} & \quad \text{Br}
\end{align*}
\]

(A) (i),(ii)  (B) (ii),(iii)
(C) (i),(iii)  (D) (ii),(iv)

059. Increasing order of acidic strength of given compounds is :

\[
\begin{align*}
\text{(i)} & \quad \text{OH} & \quad \text{OH} & \quad \text{OH} \\
\text{(ii)} & \quad \text{OH} & \quad \text{CN} & \quad \text{OCH}_3 \\
\text{(iii)} & \quad \text{OH} & \quad \text{Cl} & \quad \text{Cl}
\end{align*}
\]

(A) i < iii < iv < ii  (B) i < iii < ii < iv
(C) iii < i < iv < ii  (D) ii < i < iv < iii

060. Which of the following effects of –NO$_2$ group operates on –NH$_2$ group in this molecule ?

\[
\begin{align*}
\text{NH}_2 & \quad \text{Me} \\
\text{Me} & \quad \text{NO}_2
\end{align*}
\]

(A) Only –M effect  (B) Both –I and –M effect
(C) Only –I effect  (D) Only +M effect
061. Which of the following material is known as lunar caustic?
(A) AgNO₃  (B) NaOH  (C) NaNO₃  (D) AgCl

062. Provide an acceptable name for the alkane shown below:

\[
\begin{align*}
&\text{H} & & \text{CH}_2\text{CH}_2\text{CH}(\text{CH}_3)\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_3 \\
&\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_3 & - & \text{C} - & \text{CH}_2\text{CH}_2\text{CH}_3 \\
&\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_3 & - & \text{C} - & \text{CH}_2\text{CH}_2\text{CH}_3 \\
& & & \text{CH}_2\text{CH}_3 & \text{H} \\
\end{align*}
\]

(A) 2-ethyl-6-methyl-2-propyldecane  
(B) 2-ethyl-6-methyl-5-propyldecane  
(C) 6-ethyl-2-methyl-5-propyldecane  
(D) 5-ethyl-6-methyl-2-propyldecane

063. D – Mannose $\xrightarrow{\text{HO}^-}$ D – glucose $\xrightarrow{\text{HO}^-}$ (A)
Product (A) of above reaction is:
(A) D–Talose  
(B) D–Idose  
(C) D–glucose  
(D) D–fructose

064. What is the product in the following reaction?

\[
\begin{align*}
&\text{OH} & - & (\text{NH}_4)_2\text{Cr}_2\text{O}_7 & \xrightarrow{\text{H}_2\text{SO}_4} & \text{Cyclohexane-1-one} \\
\end{align*}
\]

(A) Cyclohexane-1-one  
(B) Benzoic sulphate  
(C) Benzoic Acid  
(D) Benzoquinone

065. How many bonds are there in:

(A) 19σ, 4π  
(B) 14σ, 2π  
(C) 14σ, 8π  
(D) 18σ, 8π
066. Which of the following molecules is optically active?

- [I] \( \text{Br} \)
- [II] \( \text{NO}_2 \)
- [III] \( \text{NO}_2 \)

(A) (ii) and (iii)  (B) (i), (ii) and (iii)  
(C) (i) and (ii)  (D) (i) and (iii)

067. Which of the following statement is correct?

- (A) \( \text{BCl}_3 \) and \( \text{AlCl}_3 \) are both equally strong Lewis acid
- (B) Both \( \text{BCl}_3 \) and \( \text{AlCl}_3 \) are not Lewis acids
- (C) \( \text{BCl}_3 \) and \( \text{AlCl}_3 \) are both Lewis acids and \( \text{BCl}_3 \) is stronger than \( \text{AlCl}_3 \)
- (D) \( \text{BCl}_3 \) and \( \text{AlCl}_3 \) are both Lewis acids and \( \text{AlCl}_3 \) is stronger than \( \text{BCl}_3 \)

068. Consider the following compounds.

- [I] \( \text{O} - \text{C} - \text{CH}_3 \)
- [II] \( \text{O} - \text{C} - \text{CH}_3 \)
- [III] \( \text{O} - \text{C} - \text{CH}_3 \)
- [IV] \( \text{O} - \text{C} - \text{CH}_3 \)

Friedel–Crafts acylation can be used to obtain:

(A) I, II, IV  (B) I, II, III  
(C) I, III, IV  (D) II, III, IV

069. Provide the systematic name of the compound shown:

- (A) 1 - butyl - 4 - ethyl - 3 - methylecycloheptane
- (B) 2 - butyl - 4 - ethyl - 1 - methylecycloheptane
- (C) 4 - butyl - 1 - ethyl - 2 - methylecycloheptane
- (D) 4 - butyl - 2 - ethyl - 1 - methylecycloheptane
070. Give the IUPAC name for the following structure:

(A) 1 - chloro - 4 - methylcyclohexanol
(B) 5 - chloro - 2 - methylcyclohexanol
(C) 3 - chloro - 2 - methylcyclohexanol
(D) 2 - methyl - 5 - chlorocyclohexanol

071. In aldol addition reaction product is always:
(A) $\alpha$, $\beta$ - unsaturated aldehyde
(B) $\alpha$, $\beta$ - unsaturated ketone
(C) $\beta$ - hydroxyaldehyde
(D) $\beta$ - hydroxyketone

072. Which one of the following compounds will have the highest dipole moment?

(A) ![Image of compound A]
(B) ![Image of compound B]
(C) ![Image of compound C]
(D) ![Image of compound D]

073. The number of moles of Grignard reagent consumed per mole of the compound:

- HO\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\rightarrow\]\[\right
075. Which one of the following has the highest Nucleophilicity?
(A) CH$_3^-$ (B) NH$_2^-$ (C) F$^-$ (D) OH$^-$

076. In view of $\Delta G^0$ for the following reactions:
PbO$_2$ + Pb $\rightarrow$ 2PbO, $\Delta G^0 < 0$
SnO$_2$ + Sn $\rightarrow$ 2SnO, $\Delta G^0 > 0$
Which oxidation state is more characteristic for lead and tin?
(A) For lead +4, for tin +4
(B) For lead +2, for tin +4
(C) For lead +4, for tin +2
(C) For lead +2, for tin +2

077. Which of the following compounds will exhibit geometrical isomerism?
(A) 2-Phenyl-1-butene (B) 1,1-Diphenyl-1-propene
(C) 1-Phenyl-2-butene (D) 3-Phenyl-1-butene

078. At Critical Micell Concentration (CMC), the surfactant molecules:
(A) associate (B) become completely soluble
(C) decompose (D) dissociate

079. Which one of the following will be reactive for Perkin condensation?
(A) CH$_3$–CHO (B) O$_2$N–CHO
(C) C$_6$H$_5$–CHO (D) CH$_3$–O–CHO

080. The pair of metal carbonyl complexes that are isoelectronic is:
(A) [Cr(CO)$_6$] and V(CO)$_6$
(B) [Fe(CO)$_4$]$^-$ and Cr(CO)$_6$
(C) [Co(CO)$_4$]$^-$ and Ni(CO)$_4$
(D) Ni(CO)$_4$ and V(CO)$_6$

081. Which one of the following has (have) octahedral geometry?
(i) SbCl$_6^-$ (ii) SnCl$_6^-$
(iii) XeF$_6$ (iv) IO$_6^-$
(A) (i), (ii), (iii) & (iv) (B) All of these
(C) (i), (ii) & (iii) (D) (i), (ii) & (iv)
082. In terms of polar character which one of the following orders is correct?
(A) $\text{H}_2\text{O} < \text{NH}_3 < \text{H}_2\text{S} < \text{HF}$
(B) $\text{HF} < \text{H}_2\text{O} < \text{NH}_3 < \text{H}_2\text{S}$
(C) $\text{NH}_3 < \text{H}_2\text{O} < \text{HF} < \text{H}_2\text{S}$
(D) $\text{H}_2\text{S} < \text{NH}_3 < \text{H}_2\text{O} < \text{HF}$

083. Among the following compounds of Boron, the species which also forms $\pi$–bond in addition to $\sigma$–bonds is:
(A) $\text{B}_2\text{H}_6$  
(B) $\text{BF}_3$
(C) $\text{BF}_4^-$  
(D) $\text{BH}_3$

084. Identify the Brønsted acid in the following equation:
$$\text{PO}_4^{3-} + \text{H}_2\text{O}(l) \rightarrow \text{HPO}_4^{2-} (aq) + \text{OH}^-(aq)$$
(A) $\text{HPO}_4^4$
(B) $\text{H}_2\text{O}$
(C) $\text{OH}^-$
(D) $\text{PO}_4^{3-}$

085. The number of grams/weight of $\text{NH}_4\text{Cl}$ required to be added to 3 liters of 0.01M $\text{NH}_3$ to prepare the buffer of pH=9.45 at temperature 298K ($K_b$ for $\text{NH}_3$ is $1.85\times10^{-5}$)
(A) 4.55 gm  
(B) 0.455gm  
(C) 3.53 gm  
(D) 0.354 gm

086. For the reaction $2\text{HI}(g) \rightarrow \text{H}_2(g) + \text{I}_2(g)$ the degree of dissociation ($\alpha$) of $\text{HI}(g)$ is related to equilibrium constant $K_p$ by the expression:
(A) $\frac{\sqrt{2K_p}}{1 + 2K_p}$  
(B) $\frac{2\sqrt{K_p}}{1 + 2\sqrt{K_p}}$
(C) $\frac{1 + 2\sqrt{K_p}}{2}$  
(D) $\sqrt{\frac{1 + 2K_p}{2}}$

087. A 6% solution of sucrose $\text{C}_{22}\text{H}_{22}\text{O}_{11}$ is isotonic with 3% solution of an unknown organic substance. The molecular weight of unknown organic substance will be:
(A) 171  
(B) 100  
(C) 342  
(D) 684

088. The enthalpy of the formation of $\text{CO}_2$ and $\text{H}_2\text{O}$ are $-395$ kJ and $-285$ kJ respectively and the enthalpy of combustion of acetic acid is $869$ kJ. The enthalpy of formation of acetic acid is:
(A) 420 kJ  
(B) 491 kJ  
(C) 235 kJ  
(D) 340 kJ
089. Which of the following is a lyophobic colloid:
   (A) Starch  (B) Gum Arabica
   (C) Gelatin  (D) Sulphur

090. For car battery which one is correct statement?
   (A) Cathode is Copper (Cu) and anode is Lead dioxide (PbO₂)
   (B) Cathode is Copper (Cu) and anode is Lead (Pb)
   (C) Cathode is Lead dioxide (PbO₂) and anode is Lead (Pb)
   (D) Cathode is Lead dioxide (PbO₂) and anode is Copper (Cu)

091. Considering entropy(s) as a thermodynamic parameter, the criterion for the spontaneity of any process the change in entropy is:
   (A) ∆S_{surrounding} > 0 only
   (B) (∆S_{system} + ∆S_{surrounding}) > 0
   (C) (∆S_{system} - ∆S_{surrounding}) > 0
   (D) ∆S_{system} > 0 only

092. At low pressure and high temperature, the Vander Waal’s equation is finally reduced (simplified) to:
   (A) P(V_m - b) = RT
   (B) \( P + \frac{a}{V_m^2} \) \( V_m = RT \)
   (C) PV_m = RT
   (D) \( P + \frac{a}{V_m^2} \)(V_m - b) = RT

093. Which graph represents the zero order reaction \([A(g) \rightarrow B(g)]\)

094. Which of the following compounds is insoluble even in hot concentrated H₂SO₄?
   (A) Hexane  (B) Aniline
   (C) Ethylene  (D) Benzene
095. The half life of Th$^{232}$ is $1.4 \times 10^{10}$ years and that of its daughter element Ra$^{238}$ is 7 years. What amount (most nearly) weight of Ra$^{238}$ will be in equilibrium with 1gm of Th$^{232}$?
(A) $1.95 \times 10^{-9}$ gm (B) $2 \times 10^{-10}$ gm
(C) $5 \times 10^{-10}$gm (D) 5.0 gm

096. Which of the following electron has minimum energy?
(A) $n = 4, l = 1, m = +1, s = +\frac{1}{2}$
(B) $n = 5, l = 0, m = 0, s = +\frac{1}{2}$
(C) $n = 3, l = 2, m = -2, s = +\frac{1}{2}$
(D) $n = 4, l = 0, m = 0, s = +\frac{1}{2}$

097. Total number of stereoisomers of the following compounds are respectively :

![Chemical structures](image)

(i) (ii)
(A) 6, 6 (B) 8, 8 (C) 4, 6 (D) 8, 0

098. Which of the following is a monomer of Dacron:
(A) COOH \(\rightleftharpoons\) COOH
(B) HOH$_2$C – CH$_2$OH
(C) CH$_2$ \(\rightleftharpoons\) CH – CH \(\rightleftharpoons\) CH$_2$
Cl
(D) H$_2$C \(\rightleftharpoons\) C – CH \(\rightleftharpoons\) CH$_2$

099. Which of the following is a meso compound ?
(A) trans–1, 3–dimethylcyclohexane
(B) cis–1, 4–dimethylcyclohexane
(C) trans–1, 4–dimethylcyclohexane
(D) cis–1, 3–dimethylcyclohexane

100. IUPAC name of the following is :
CH$_3$ CH$_2$ CH \(\rightleftharpoons\) CHCH$_2$CH$_3$
CH$_3$ CHO
(A) 2 ethyl–3 methyl pentanal
(B) 8 methyl–2 ethyl pentanal
(C) 2,5 butyl butenal
(D) 2,3 di ethyl butenal

100. Th$^{232}$ की अर्थ आयु का मान $1.4 \times 10^{10}$ वर्ष है और इससे उत्पन्न पुत्री तथा Ra$^{238}$ की अर्थ आयु 7 वर्ष है। Ra$^{238}$ की कितनी (समस्त समीपतम) मात्रा Th$^{232}$ की 1gm मात्रा के साथ सम्भव होगी?
(A) $1.95 \times 10^{-9}$gm (B) $2 \times 10^{-10}$ gm
(C) $5 \times 10^{-10}$ gm (D) 5.0 gm

096. निम्नलिखित में से कौनसा इलेक्ट्रॉन न्युनतम ऊर्जा रखता है?
(A) $n = 4, l = 1, m = +1, s = +\frac{1}{2}$
(B) $n = 5, l = 0, m = 0, s = +\frac{1}{2}$
(C) $n = 3, l = 2, m = -2, s = +\frac{1}{2}$
(D) $n = 4, l = 0, m = 0, s = +\frac{1}{2}$

097. निम्न यौगिकों के निम्न विभूषण वर्गों की संख्या क्रमशः हैं:

![Chemical structures](image)

(i) (ii)
(A) 6, 6 (B) 8, 8 (C) 4, 6 (D) 8, 0

098. निम्न में से कौनसा डेंक्रोन का एकलक है?
(A) COOH \(\rightleftharpoons\) COOH
(B) HOH$_2$C – CH$_2$OH
(C) CH$_2$ \(\rightleftharpoons\) CH – CH \(\rightleftharpoons\) CH$_2$
Cl
(D) H$_2$C \(\rightleftharpoons\) C – CH \(\rightleftharpoons\) CH$_2$

099. निम्न में से कौनसा पिसो यौगिक है?
(A) ट्रांज़−1, 3− डाइमेथिलसाइक्लोहेक्सेन
(B) सिस−1, 4− डाइमेथिलसाइक्लोहेक्सेन
(C) ट्रांज़−1, 4− डाइमेथिलसाइक्लोहेक्सेन
(D) सिस−1, 3− डाइमेथिलसाइक्लोहेक्सेन

100. निम्न का IUPAC नाम है :
CH$_3$ CH$_2$ CH \(\rightleftharpoons\) CHCH$_2$CH$_3$
CH$_3$ CHO
(A) 2 एथिल, 3 मेथिल प्रेंटेनल
(B) 8 मेथिल, 2 एथिल प्रेंटेनल
(C) 2, 5 ब्यूटिल ब्यूटेनल
(D) 2, 3 डाइ एथिल ब्यूटेनल
101. The angle at which the curve 
\[ y = x^2 \] and the curve 
\[ x = \frac{5}{3} \cos t, \quad y = \frac{5}{4} \sin t \] intersect is:
(A) \( \tan^{-1} \frac{41}{2} \)
(B) \( -\tan^{-1} \frac{2}{41} \)
(C) \( 2 \tan^{-1} \frac{41}{2} \)
(D) \( \tan^{-1} \frac{2}{41} \)

102. The maximum value of the function 
\[ y = 2 \tan x - \tan^2 x \] over \([0, \frac{\pi}{2}]\) is:
(A) 1
(B) 3
(C) 2
(D) \( \infty \)

103. Let \( O = (0, 0) \), \( A = (a, 11) \) and \( B = (b, 37) \) are the vertices of an equilateral triangle \( OAB \), then \( a \) and \( b \) satisfy the relation:
(A) \( (a^2 + b^2) - ab = 124 \)
(B) \( (a^2 + b^2) + 3ab = 130 \)
(C) \( (a^2 + b^2) - 3ab = 138 \)
(D) \( (a^2 + b^2) - 4ab = 138 \)

104. Let \( f \) be an odd function defined on the real numbers such that \( f(x) = 3 \sin x + 4 \cos x \), for \( x \geq 0 \), then \( f(x) \) for \( x < 0 \) is:
(A) \(-3 \sin x - 4 \cos x \)
(B) \(3 \sin x + 4 \cos x \)
(C) \(3 \sin x - 4 \cos x \)
(D) \(-3 \sin x + 4 \cos x \)

105. The function \( f(x) = x \tan^{-1} \frac{1}{x} \) for \( x \neq 0 \), \( f(0) = 0 \) is:
(A) Neither continuous at \( x = 0 \) nor differentiable at \( x = 0 \)
(B) Not continuous at \( x = 0 \)
(C) continuous at \( x = 0 \) but not differentiable at \( x = 0 \)
(D) Differentiable at \( x = 0 \)
106. Let \( \alpha \) and \( \beta \) be two numbers where \( \alpha < \beta \). The geometric mean of these numbers exceeds the smaller number \( \alpha \) by 12 and the arithmetic mean of the same number is smaller by 24 than the larger number \( \beta \), then the value of \( |\beta - \alpha| \) is:

(A) 45  (B) 44  (C) 27  (D) 48

107. The values of \( a \) and \( b \) for which the function \( y = a \log_e x + bx^2 + x \), has extremum at the points \( x_1 = 1 \) and \( x_2 = 2 \) are:

(A) \( a = -\frac{2}{3}, b = -\frac{1}{6} \)  (B) \( a = -\frac{2}{3}, b = \frac{1}{6} \)

(C) \( a = -\frac{1}{3}, b = -\frac{1}{6} \)  (D) \( a = \frac{2}{3}, b = -\frac{1}{6} \)

108. A point \( p \) is selected randomly from the interior of the circle, then the probability that it is closer to the center of the circle rather than its boundary is:

(A) \( \frac{1}{4} \)  (B) \( \frac{3}{4} \)

(C) \( \frac{1}{3} \)  (D) \( \frac{2}{3} \)

109. If the letters of the word ASHOKA are written down at randomly, then the chance that all A’s are consecutive is:

(A) \( \frac{1}{4} \)  (B) \( \frac{2}{3} \)

(C) \( \frac{1}{2} \)  (D) \( \frac{1}{3} \)

110. In a triangle \( \triangle ABC \):

\[ 3 \sin A + 4 \cos B = 6 \] \[ 4 \sin B + 3 \cos A = 1 \]

then the angle C is:

(A) \( 45 \)  (B) \( 60 \)

(C) \( 30 \)  (D) \( 150 \)

111. The value of the integral \( \int \frac{dx}{x^2 - a^2} \) is equal to:

(A) \( \frac{1}{a} \cos^{-1} \frac{a}{|x|} \)

(B) \( \frac{1}{a} \sin^{-1} \frac{a}{|x|} + c \)

(C) \( \frac{1}{a} \sin^{-1} \frac{a}{|x|} + c \)

(D) \( \frac{1}{a} \sin^{-1} \frac{a}{|x|} \)
112. The function $y$ specified implicitly by the relation
\[ \int_0^x e^t \, dt + \int_0^t \cos \, dt = 0 \] satisfies the differential equation:
(A) $e^y \left( \frac{d^2 y}{dx^2} + \left( \frac{dy}{dx} \right)^2 \right) = \sin 2x$
(B) $e^y \left( 2 \frac{d^2 y}{dx^2} + \left( \frac{dy}{dx} \right)^2 \right) = \sin x$
(C) $e^y \left( \frac{d^2 y}{dx^2} + \left( \frac{dy}{dx} \right)^2 \right) = \sin x$
(D) $e^y \left( \frac{d^2 y}{dx^2} + \left( \frac{dy}{dx} \right)^2 \right) = \sin x$

113. Let $a$ and $b$ be real numbers such that $\sin a + \sin b = \frac{1}{\sqrt{2}}$ and $\cos a + \cos b = \frac{\sqrt{6}}{2}$ then the value of $\sin(a + b)$ is:
(A) $\frac{\sqrt{3}}{2}$
(B) $\frac{2}{\sqrt{3}}$
(C) $\frac{1}{2\sqrt{2}}$
(D) $\frac{1}{\sqrt{3}}$

114. The tangent to the graph of a continuous function $y = f(x)$ at the point with abscissa $x = a$ forms with the $x$ axis an angle of $\frac{\pi}{4}$ and at the point with abscissa $x = b$ an angle of $\frac{\pi}{4}$, then what is the value of the integral $\int_a^b e^x \{ f'(x) + f''(x) \} \, dx$?
where $f'(x)$ the derivative of $f$ w.r.to $x$ which is assumed to be continuous and similarly $f''(x)$ the double derivative of $f$ w.r.to $x$)
(A) $e^b - \sqrt{3} e^a$
(B) $e^b + \sqrt{3} e^a$
(C) $- e^b + \sqrt{3} e^a$
(D) $e^b + \sqrt{3} e^a$
115. The system \[
\begin{pmatrix}
1 & -1 & 2 \\
3 & 5 & -3 \\
2 & 6 & a
\end{pmatrix}
\begin{pmatrix}
x \\
y \\
z
\end{pmatrix} = \begin{pmatrix}
3 \\
b \\
2
\end{pmatrix}
\] has no solution if
(A) \( a = -5, b = 5 \)  
(B) \( a \neq -5, b = 5 \)  
(C) \( a \neq -5, b \neq 5 \)  
(D) \( a = -5, b \neq 5 \)

116. Let \( \alpha, \beta \) be the roots of \( x^2 + 3x + 5 = 0 \) then the equation whose roots are \( -\frac{1}{\alpha} \) and \( -\frac{1}{\beta} \) is :
(A) \( 5x^2 - 3x + 4 = 0 \)  
(B) \( 5x^2 + 3x - 1 = 0 \)  
(C) \( 5x^2 - 3x + 1 = 0 \)  
(D) \( 5x^2 + 3x - 4 = 0 \)

117. A closed figure \( S \) is bounded by the hyperbola \( x^2 - y^2 = a^2 \) and the straight line \( x = a + h; (h > 0, a > 0) \). This closed figure is rotated about the \( x \)-axis. Then the volume of the solid of revolution is :
(A) \( \frac{\pi h^2}{6}(3a + h) \)  
(B) \( \frac{\pi h^2}{3}(3a + h) \)  
(C) \( \frac{\pi h^2}{2}(3a + h) \)  
(D) \( \pi h^2(3a + h) \)

118. The general solution of the equation \[
\frac{dy}{dx} = \frac{y^2 - x}{2y(x + 1)}
\] is :
(A) \( y^2 = (1 + x) \log \frac{c}{(1 - x)} - 1 \)  
(B) \( y^2 = (1 - x) \log \frac{c}{(1 + x)} - 1 \)  
(C) \( y^2 = (1 + x) \log \frac{c}{1 + x} - 1 \)  
(D) \( y^2 = (1 + x) \log (1 + x) - c \)

119. The equation of displacement of a particle is \( x(t) = 5t^2 - 7t + 3 \). The acceleration at the moment when its velocity becomes \( 5m/sec \) is :
(A) \( 7m/sec^2 \)  
(B) \( 10m/sec^2 \)  
(C) \( 8m/sec^2 \)  
(D) \( 3m/sec^2 \)
120. If $5p^2 - 7p - 3 = 0$ and $5q^2 - 7q - 3 = 0$, $p \neq q$, then the equation whose roots are $5p - 4q$ and $5q - 4p$ is:

(A) $5x^2 - 7x - 439 = 0$

(B) $5x^2 + 7x + 439 = 0$

(C) $5x^2 + x - 439 = 0$

(D) $5x^2 + 7x - 439 = 0$

121. The range of $x$ for which the formula $3 \sin^{-1} x = \sin^{-1} [x(3 - 4x^2)]$ hold is:

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

(B) $-\frac{1}{3} \leq x \leq 1$

(C) $-\frac{2}{3} \leq x \leq \frac{2}{3}$

(D) $-\frac{1}{2} \leq x \leq \frac{1}{2}$

122. The equation of the ellipse, whose focus is the point $(-1, 1)$, whose directrix is the straight line $x - y + 3 = 0$ and whose eccentricity is $1/2$ is:

(A) $(x + 1)^2 + (y - 1)^2 = \frac{1}{8}(x - y + 1)^2$

(B) $(x + 1)^2 + (y - 1)^2 = \frac{1}{6}(x - y + 3)^2$

(C) $(x + 1)^2 + (y - 1)^2 = \frac{1}{2}(x - y + 3)^2$

(D) $(x + 1)^2 + (y - 1)^2 = \frac{1}{8}(x - y + 3)^2$

123. The mean value of the function $f(x) = \frac{2}{e^x + 1}$ on the interval $[0, 2]$ is:

(A) $2 + \log_e \left( \frac{2}{e^2 + 1} \right)$

(B) $2 + \log_e \left( \frac{2}{e^2 - 1} \right)$

(C) $-2 + \log_e \left( \frac{2}{e^2 - 1} \right)$

(D) $2 - \log_e \left( \frac{2}{e^2 - 1} \right)$

124. The general solution of the differential equation $\frac{dy}{dx} + \sin \frac{x + y}{2} = \sin \frac{x - y}{2}$ is:

(A) $\log_e \left| \tan \frac{y}{4} \right| = 2 \sin \frac{x}{2} + c$

(B) $\log_e \left| \tan \frac{y}{4} \right| = -\sin \frac{x}{2} + c$

(C) $\log_e \left| \tan \frac{y}{4} \right| = -2 \sin \frac{x}{2} + c$

(D) $\log_e \left| \tan \frac{y}{4} \right| = -2 \sin \frac{x}{2} + c$
125. If \( \frac{7}{2} \) and 1 are the roots of the equation
\[
\begin{vmatrix}
2x & 3 & 7 \\
2x & 2 & 2 \\
7 & 6 & 2x
\end{vmatrix} = 0
\]
then the third root is:
(A) \(- \frac{9}{2}\)  
(B) \(- \frac{3}{2}\)  
(C) \(- \frac{5}{2}\)  
(D) \(- \frac{7}{2}\)

126. If \( \cos (\log i^b) = a + i b \), then
(A) \( a = -1, b = 1 \)  
(B) \( a = 1, b = 0 \)  
(C) \( a = 1, b = 2 \)  
(D) \( a = 1, b = -1 \)

127. The function \( y = \sqrt{2x - x^2} \)
(A) Decreases in \( (0, 2) \)  
(B) Increases in \( (1, 2) \) but decreases in \( (0, 1) \)  
(C) Increases in \( (0, 2) \)  
(D) Increases in \( (0, 1) \) but decreases in \( (1, 2) \)

128. If the point \((a, a)\) lies between the lines \(2x + y = 5\) then select one of the most appropriate option:
(A) \( |a| < \frac{7}{2} \)  
(B) \( |a| < \frac{11}{3} \)  
(C) \( |a| < \frac{5}{2} \)  
(D) \( |a| < \frac{5}{3} \)

129. If \( \log_{\sin \frac{\pi}{2}} \left\{ \frac{|z-2|+3}{\sqrt{3}|z-2|+1} \right\} > 1 \), then
(A) \( |z-2| < 3 \)  
(B) \( |z-2| < 6 \)  
(C) \( |z-2| > 7 \)  
(D) \( |z-2| < 7 \)

130. The \( n \)th term of the series
\( 1 + 4 + 13 + 40 + 121 + 364 + \ldots \), is:
(A) \( \frac{1}{2} (3^n - 1) \)  
(B) \( \left( \frac{2^n + 1}{2} \right) \)  
(C) \( 3^n - 1 \)  
(D) \( \frac{1}{2} (3^n + 1) \)

131. The interval in which the function \( y = x - 2 \sin x; \) \( 0 \leq x \leq 2\pi \) increases throughout is:
(A) \( \left( 0, \frac{\pi}{2} \right) \)  
(B) \( \left( \frac{\pi}{2}, \frac{5\pi}{6} \right) \)  
(C) \( \left( 0, \frac{\pi}{4} \right) \)  
(D) \( \left( \frac{5\pi}{3}, 2\pi \right) \)

125. यदि समीकरण \( \begin{vmatrix} 2x & 3 & 7 \\ 2x & 2 & 2 \\ 7 & 6 & 2x \end{vmatrix} = 0 \) के मूल \( \frac{7}{2} \) तथा 1 है तो तीसरा मूल होगा:
(A) \(- \frac{9}{2}\)  
(B) \(- \frac{3}{2}\)  
(C) \(- \frac{5}{2}\)  
(D) \(- \frac{7}{2}\)

126. यदि \( \cos (\log i^b) = a + i b \) हो तब
(A) \( a = -1, b = 1 \)  
(B) \( a = 1, b = 0 \)  
(C) \( a = 1, b = 2 \)  
(D) \( a = 1, b = -1 \)

127. \( y = \sqrt{2x - x^2} \)
(A) \( 0, 2 \) में घटता है  
(B) \( 1, 2 \) में बढ़ता है पर्यन्त \( 0, 1 \) में घटता है  
(C) \( 0, 2 \) में बढ़ता है  
(D) \( 0, 1 \) में बढ़ता है पर्यन्त \( 1, 2 \) में घटता है

128. \( \cos (\alpha, a) \) रेखाओ \( 2x + y = 5 \) के मध्य स्थित है तब सबसे उपयुक्त एक बिकर्ण हल करो:
(A) \( |a| < \frac{7}{2} \)  
(B) \( |a| < \frac{11}{3} \)  
(C) \( |a| < \frac{5}{2} \)  
(D) \( |a| < \frac{5}{3} \)

129. \( \log_{\sin \frac{\pi}{2}} \left\{ \frac{|z-2|+3}{\sqrt{3}|z-2|+1} \right\} > 1 \) हो तो
(A) \( |z-2| < 3 \)  
(B) \( |z-2| < 6 \)  
(C) \( |z-2| > 7 \)  
(D) \( |z-2| < 7 \)

130. दी गई श्रेणी का \( n \)व शब्द होगा:
\( 1 + 4 + 13 + 40 + 121 + 364 + \ldots \)
(A) \( \frac{1}{2} (3^n - 1) \)  
(B) \( \left( \frac{2^n + 1}{2} \right) \)  
(C) \( 3^n - 1 \)  
(D) \( \frac{1}{2} (3^n + 1) \)

131. वह अंतराल क्या होगा जिसमें फलन \( y = x - 2 \sin x; \) \( 0 \leq x \leq 2\pi \) शुरू से अन्त तक बढ़ता है:
(A) \( \left( 0, \frac{\pi}{2} \right) \)  
(B) \( \left( \frac{\pi}{2}, \frac{5\pi}{3} \right) \)  
(C) \( \left( 0, \frac{\pi}{4} \right) \)  
(D) \( \left( \frac{5\pi}{3}, 2\pi \right) \)
132. If the ratio of the seventh term from the beginning of the binomial expansion of \( \left( 2^{\frac{1}{3}} + \frac{1}{3^{\frac{1}{3}}} \right)^{x} \) to the seventh term from its end is 1/6, then the value of \( x \) is:
(A) 11
(B) 9
(C) 7
(D) 5

133. Let \( A = \{ u, v, w, z \} \) and \( B = \{ 3, 5 \} \), then the number of relations from \( A \) to \( B \) is:
(A) 1024
(B) 512
(C) 64
(D) 256

134. Given \( y = x^{2} \). As \( x \to 2, y \to 4 \), what must the value of \( \delta \) be for which from \( |x - 2| < \delta \) and \( |y - 4| < \epsilon \) it follows that \( \epsilon = 0.001 \)?
(A) \( 0.2 < \delta < 0.25 \)
(B) \( 0.4 < \delta < 0.5 \)
(C) \( 0 < \delta < 0.00025 \)
(D) \( 0.03 < \delta < 0.05 \)

135. Given that \( f(0) = 0 \) and \( \lim_{x \to 0} \frac{f(x)}{x} \) exists, say L. Here \( f'(0) \) denotes the derivative of \( f \) w.r.t. \( x \) at \( x = 0 \). Then \( L \) is:
(A) \( 2f'(0) - 5 \)
(B) \( f'(0) \)
(C) 0
(D) \( 2f'(0) - 6 \)

136. The inverse of the function \( y = \frac{2^{x}}{1 + 2^{x}} \) is:
(A) \( x = \log_{2} \left( 1 - \frac{1}{y} \right) \)
(B) \( x = \log_{2} \left( 1 - y \right) \)
(C) \( x = \log_{2} \frac{y}{1 - y} \)
(D) \( x = \log_{2} \frac{1}{1 - 2y} \)

137. The domain of the definition of the function \( y = \frac{1}{\log_{10}(1 - x)} + \sqrt{x + 2} \) is:
(A) \(-3 < x \leq -2 \)
(B) \(-2 \leq x < 0 \)
(C) \(-2 \leq x < 1 \)
(D) \( x \geq -2 \)

135. If the ratio of the seventh term from the beginning of the binomial expansion of \( \left( 2^{\frac{1}{3}} + \frac{1}{3^{\frac{1}{3}}} \right)^{x} \) to the seventh term from its end is 1/6, then the value of \( x \) is:
(A) 11
(B) 9
(C) 7
(D) 5

133. Let \( A = \{ u, v, w, z \} \) and \( B = \{ 3, 5 \} \), then the number of relations from \( A \) to \( B \) is:
(A) 1024
(B) 512
(C) 64
(D) 256

134. Given \( y = x^{2} \). As \( x \to 2, y \to 4 \), what must the value of \( \delta \) be for which from \( |x - 2| < \delta \) and \( |y - 4| < \epsilon \) it follows that \( \epsilon = 0.001 \)?
(A) \( 0.2 < \delta < 0.25 \)
(B) \( 0.4 < \delta < 0.5 \)
(C) \( 0 < \delta < 0.00025 \)
(D) \( 0.03 < \delta < 0.05 \)

135. Given that \( f(0) = 0 \) and \( \lim_{x \to 0} \frac{f(x)}{x} \) exists, say L. Here \( f'(0) \) denotes the derivative of \( f \) w.r.t. \( x \) at \( x = 0 \). Then \( L \) is:
(A) \( 2f'(0) - 5 \)
(B) \( f'(0) \)
(C) 0
(D) \( 2f'(0) - 6 \)

136. The inverse of the function \( y = \frac{2^{x}}{1 + 2^{x}} \) is:
(A) \( x = \log_{2} \left( 1 - \frac{1}{y} \right) \)
(B) \( x = \log_{2} \left( 1 - y \right) \)
(C) \( x = \log_{2} \frac{y}{1 - y} \)
(D) \( x = \log_{2} \frac{1}{1 - 2y} \)

137. The domain of the definition of the function \( y = \frac{1}{\log_{10}(1 - x)} + \sqrt{x + 2} \) is:
(A) \(-3 < x \leq -2 \)
(B) \(-2 \leq x < 0 \)
(C) \(-2 \leq x < 1 \)
(D) \( x \geq -2 \)
138. Let \( f(x) = \begin{cases} \sin x & \text{if } x \leq -\frac{\pi}{2} \\ A \sin x + B & \text{if } -\frac{\pi}{2} < x < \frac{\pi}{2} \\ \cos x & \text{if } x \geq \frac{\pi}{2} \end{cases} \)

For what values of A and B, the function \( f(x) \) is continuous throughout the real line?

(A) \( A = -1, B = -1 \)  
(B) \( A = 1, B = -1 \)  
(C) \( A = 1, B = 1 \)  
(D) \( A = -1, B = 1 \)

139. Let \( f(x) = \alpha(x) \sin \frac{\pi x}{2} \) for \( x \neq 0 \); 
\( f(x) = 1 \) for \( x = 0 \) 
where \( \alpha(x) \) is such that \( \lim_{x \to 0} |\alpha(x)| = \infty \)

Then the function \( f(x) \) is continuous at \( x = 0 \) if \( \alpha(x) \) is chosen as:

(A) \( \frac{1}{x^2} \)  
(B) \( \frac{2}{\pi x} \)  
(C) \( \frac{1}{x} \)  
(D) \( \frac{2}{\pi x} \)

140. The \( \lim_{y \to a} \{ (\sin \frac{y-a}{2}) \cdot (\tan \frac{\pi y}{2a}) \} \) is:

(A) \( \frac{a}{\pi} \)  
(B) \( -\frac{a}{\pi} \)  
(C) \( \frac{a}{2\pi} \)  
(D) \( 2\frac{a}{\pi} \)

141. Let \( \ell_n = \frac{2^n + (-2)^n}{2^n} \) and \( L_n = \frac{2^n + (-2)^n}{3^n} \) then as \( n \to \infty \)

(A) \( \lim_{n \to \infty} \ell_n \) does not exist but \( \lim_{n \to \infty} L_n \) exists  
(B) Both the sequences do not have limits.  
(C) Both the sequences have limits 
(D) \( \lim_{n \to \infty} \ell_n \) exists but \( \lim_{n \to \infty} L_n \) does not exist
142. For what interval of variation of \( x \), the identity
\[
\arccos \left( \frac{1-x^2}{1+x^2} \right) = -2 \arctan x
\]
is true?
(A) \( 1 < x < \infty \)  
(B) \( 0 \leq x \leq 1 \)  
(C) \( 0 \leq x < \infty \)  
(D) \( -\infty < x \leq 0 \)

143. The points of the curve \( y = x^3 + x - 2 \) at which its tangents are parallel to the straight line \( y = 4x - 1 \) are:
(A) \( (0, -2), (2\frac{1}{2}, 2\frac{1}{2}) \)
(B) \( (-2\frac{1}{2}, -2\frac{1}{2}), (0, -4) \)
(C) \( (1, 0), (-1, -4) \)
(D) \( (2, 7), (-2, -11) \)

144. If \( \vec{a}, \vec{b}, \vec{c} \) are three vectors such that \( [\vec{a} \cdot \vec{b} \cdot \vec{c}] = 5 \), then the value of \( [\vec{a} \times \vec{b}, \vec{b} \times \vec{c}, \vec{c} \times \vec{a}] \) is:
(A) 25  
(B) 20  
(C) 10  
(D) 15

145. A chord of the parabola \( y = x^2 - 2x + 5 \) joins the point with the abscissas \( x_1 = 1, x_2 = 3 \). Then the equation of the tangent to the parabola parallel to the chord is:
(A) \( 2x - y + 1 = 0 \)  
(B) \( 2x + y + 1 = 0 \)  
(C) \( 2x - y + \frac{5}{4} = 0 \)  
(D) \( 2x - y + 2 = 0 \)

146. The point of inflection of the function
\[
y = \int_0^x (t^3 - 3t + 2) \, dt
\]
is:
(A) \( \left(-\frac{3}{2}, -\frac{3}{4}\right) \)  
(B) \( \left(-\frac{1}{2}, -\frac{3}{2}\right) \)  
(C) \( \left(\frac{1}{2}, \frac{3}{2}\right) \)  
(D) \( \left(\frac{3}{2}, \frac{3}{4}\right) \)
147. The \( \lim_{x \to \frac{\pi}{2}} \left\{ 2x \tan x - \frac{\pi}{\cos x} \right\} \) is:

(A) -2  
(B) 0  
(C) -1  
(D) -3

148. The equation of the normal to the curve \( y = -\sqrt{x} + 2 \) at the point of its intersection with the bisector of the first quadrant is:

(A) 4x - y = 16  
(B) 2x - y - 1 = 0  
(C) 2x - y + 1 = 0  
(D) 4x - y + 16 = 0

149. Let the equation of a curve is given in implicit form as \( y = \tan(x + y) \). Then \( \frac{d^2y}{dx^2} \) in terms of \( y \) is:

(A) \( \frac{-2(1 + y^2)}{y^6} \)  
(B) \( \frac{-2(1 + y^2)}{y^3} \)  
(C) \( \frac{2(1 + y^2)^2}{y^6} \)  
(D) \( \frac{2(1 + y^2)}{y^6} \)

150. Suppose the area of the \( \Delta ABC \) is \( 10\sqrt{3} \). Length of segments AC and AB be 5 and 8 respectively. Then the angle A is (are):

(A) 90°  
(B) 60° or 120°  
(C) 45° or 135°  
(D) 30° or 150°
SPACE FOR ROUGH WORK / कच्चे काम के लिये जगह