

# EAMCET - ENGINEERING

## Model Grand Test 2017

INSTRUCTIONS : (Read the Instructions Carefully Before Answering)

1. Candidates will be permitted into the Examination Hall at 9.00AM for Engineering Entrance Test .
2. Candidates will not be admitted into the Examination Hall once the test commences and will not be allowed to leave the Examination Hall till the END of the Examination.
3. Hall ticket shall be produced at the Entrance of the Test Centre and also in the Examination Hall, failing which the candidates will not be allowed to write the test.
4. Question paper consists of 160 questions. Each question carries 1 mark. No Negative marks for wrong answers
5. Candidates shall carry into the Examination hall only (i) Black / Blue Ball Point Pen (ii) Filled in Online Application form along with attested copy of Caste Certificate (in case of SC/ST category only) and (iii) EAMCET-2014 Hall Ticket.
6. Carrying of Calculators, Mathematical / Log Tables, Pagers, Cell Phones, any other electronic gadgets and loose sheets of paper into the Examination Hall is strictly prohibited.
7. Hall Ticket must be preserved till the time of admission into the College.
8. Candidates should return the OMR Answer sheet, Filled in Online Application Form along with attested copy of Caste Certificate (in case of SC/ST category only) before leaving the Examination Hall to the invigilator. Failure to do so, He / She is liable for criminal action as per the law.
9. Serious criminal action will be taken against the candidates as per the law if they are found indulging in any sort of malpractice and impersonation
10. Candidates have to verify before marking the OMR Answer sheet that they have got the correct Booklet code as printed in their OMR Answer sheet.
11. Read the Instructions carefully given on Question Paper Booklet and OMR Answer sheet before marking on the OMR Answer Sheet.
12. Candidates not complying with the instructions given in the Instruction Booklet and Website shall be summarily disqualified.
13. Changing an answer is NOT ALLOWED
15. Use Black / Blue ball point pen to darken the circles. Ink pens, gel pens and pens with any other colours are prohibited

# MATHEMATICS

1. If  $(1 + 2x + 3x^2)^{10} = a_0 + a_1x + a_2x^2 + \dots + a_{20}x^{20} \Rightarrow \frac{a_2}{a_1} =$   
1) 10.5                      2) 21                      3) 10                      4) 5.5
2. If  $x^2 + x + 1, 2x + 1$  and  $x^2 - 1$  are the sides of a triangle then the greatest angle of that triangle is  
1)  $\frac{\pi}{3}$                       2)  $\frac{\pi}{2}$                       3)  $\frac{2\pi}{3}$                       4)  $\frac{5\pi}{6}$
3. If  $\frac{1}{2.4} + \frac{1}{4.6} + \frac{1}{6.8} + \dots n$  terms  $= \frac{Kn}{n+1}$  then  $K =$   
1)  $\frac{1}{4}$                       2)  $\frac{1}{2}$                       3) 1                      4)  $\frac{1}{8}$
4. If one root of  $x^2 + px + q = 0$  is  $3 + 4i$  then  $p + q =$   
1) 16                      2) 25                      3) 19                      4) 31
5. If  $\tan A, \tan B$  are roots of  $x^2 - 2x + 2 = 0$  then  $\sin^2(A + B) =$   
1)  $\frac{4}{5}$                       2)  $\frac{1}{2}$                       3)  $\frac{3}{5}$                       4)  $\frac{1}{4}$
6. If  $\alpha \neq \beta$  and  $\alpha^2 - 3\alpha = 5, \beta^2 - 3\beta = 5$  then  $\frac{\alpha^2 + \beta^2}{\alpha^{-2} + \beta^{-2}} =$   
1) 1                      2) 3                      3) 5                      4) 25
7. If  $\alpha, \beta, \gamma$  are the roots of  $x^3 - px^2 + qx - r = 0$  then  $\alpha^2 + \beta^2 + \gamma^2 =$   
1)  $p^2 + 2q$                       2)  $p^2 - 2q$                       3)  $q^2 - 2r$                       4)  $r^2 - 2p$
8. Number of positive integer  $x$  for which  $f(x) = x^3 - 8x^2 + 20x - 13$  is a prime number is  
1) 2                      2) 5                      3) 6                      4) 3
9. The numbers of non-trivial solutions of the system  $x - y + z = 0, x + 2y - z = 0, 2x + y + 3z = 0$  is  
1) 1                      2) 0                      3) 2                      4) infinitely many
10. If  $A = \begin{bmatrix} 0 & 1 & 0 \\ 1 & 0 & 0 \\ 0 & 0 & 1 \end{bmatrix}$  then  $A^{-1} =$   
1)  $2A$                       2)  $A$                       3)  $-A$                       4)  $I$
11. If  $f(x) = x^2 + 4x - 5$  and  $A = \begin{bmatrix} 1 & 2 \\ 4 & -3 \end{bmatrix}$  then  $f(A)$  is equal to  
1)  $\begin{bmatrix} 0 & -4 \\ 8 & 8 \end{bmatrix}$                       2)  $\begin{bmatrix} 2 & 1 \\ 2 & 0 \end{bmatrix}$                       3)  $\begin{bmatrix} 1 & 1 \\ 1 & 0 \end{bmatrix}$                       4)  $\begin{bmatrix} 8 & 4 \\ 8 & 0 \end{bmatrix}$
12. The least value of  $n$  so that  ${}^{n-1}C_3 + {}^{n-1}C_4 > {}^n C_3$  is  
1) 7                      2) 8                      3) 9                      4) 10

13. A class room has 8 doors. The numbers of ways can a man enters the room by a door and exit by a different door is
- 1) 64                      2) 56                      3) 49                      4) 45
14. Let  $n=1!+4!+7!+10!+\dots+400!$  Then the tens digit of  $n$  is
- 1) 1                      2) 6                      3) 2                      4) 7
15.  $1 + \frac{2}{4} + \frac{2.5}{4.8} + \frac{2.5.8}{4.8.12} + \dots =$
- 1)  $4^{-\frac{2}{3}}$                       2)  $\sqrt[3]{16}$                       3)  $\sqrt[3]{4}$                       4)  $4^{\frac{3}{2}}$
16. If  $f(x) = x^2 - 3x + 4$ , then the values of  $x$  satisfying the equation  $f(x) = f(2x+1)$  are
- 1)  $-1, \frac{2}{3}$                       2)  $1, -\frac{2}{3}$                       3)  $1, \frac{2}{3}$                       4)  $-1, -\frac{2}{3}$
17. If the coefficient of  $r$ th and  $(r+1)^{th}$  terms in the expansion of  $(3+7x)^{29}$  are equal, then  $r=$
- 1) 14                      2) 15                      3) 18                      4) 21
18. The remainder when  $x^{64} + x^{27} + 1$  is divided by  $x+1$  is
- 1) 1                      2) -1                      3) 0                      4) 2
19.  $\sqrt{1 - \sin^2 100^\circ} \cdot \sec 100^\circ =$
- 1) 0                      2)  $\pm 1$                       3) 1                      4) -1
20.  $\cos \theta = a \cos \phi$  and  $\sin \theta = b \sin \phi$  then  $(a^2 - b^2) \sin^2 \phi =$
- 1)  $a^2 - 1$                       2)  $a^2$                       3)  $a^2 + 1$                       4)  $-(a^2 + 1)$
21. If  $\cos x + \cos y + \cos z = 0 = \sin x + \sin y + \sin z$ , then possible value of  $\cos^2 \frac{(x-y)}{2}$  is
- 1)  $\frac{-1}{2}$                       2)  $\frac{-1}{\sqrt{2}}$                       3)  $\frac{1}{4}$                       4)  $\frac{1}{\sqrt{2}}$
22. The number of solutions of the pair of equations  $2 \sin^2 \theta - \cos 2\theta = 0$  and  $2 \cos^2 \theta - 3 \sin \theta = 0$  in the interval  $[0, 2\pi]$  is
- 1) 1                      2) 2                      3) 3                      4) 4
23. If  $x = \cot^{-1} \sqrt{\tan \alpha} - \tan^{-1} \sqrt{\tan \alpha}$  then  $\tan \left( \frac{\pi}{4} - \frac{x}{2} \right) =$
- 1)  $\sqrt{\tan \alpha}$                       2)  $\sqrt{\cot \alpha}$                       3)  $\cot \alpha$                       4)  $\tan \alpha$
24. In a  $\Delta ABC$ , If  $b+c=3a$  then  $\cot \frac{B}{2} \cot \frac{C}{2} =$
- 1) 1                      2) 2                      3) 3                      4) 4



38. Twenty persons are to sit at a round table. That probability that two persons A and B with four persons in between them can sit is
- 1)  $\frac{10}{19}$                       2)  $\frac{2}{19}$                       3)  $\frac{9}{19}$                       4)  $\frac{17}{19}$
39. If the odds in favour of an event that will occur are 3:2 then the probability of the event to occur is
- 1)  $\frac{3}{5}$                       2)  $\frac{2}{5}$                       3)  $\frac{1}{5}$                       4)  $\frac{4}{5}$
40. The mean and variance of a Binomial distribution are 4 and 2 respectively. Then the probability of 2 successes is
- 1)  $\frac{128}{256}$                       2)  $\frac{219}{256}$                       3)  $\frac{37}{256}$                       4)  $\frac{28}{256}$
41. Locus of centroid of the triangle whose vertices are  $(a \cos t, a \sin t)$ ,  $(b \sin t, -b \cos t)$  and  $(1,0)$ , where  $t$  is a parameter is
- 1)  $(3x-1)^2 + (3y)^2 = a^2 - b^2$                       2)  $(3x-1)^2 + (3y)^2 = a^2 + b^2$   
3)  $(3x+1)^2 + (3y)^2 = a^2 + b^2$                       4)  $(3x+1)^2 + (3y)^2 = a^2 - b^2$
42. If the origin is shifted to the point  $(3,-3)$  and the coordinates of P,Q,R are  $(5,5)$ ,  $(-2,4)$ ,  $(7,-7)$  in the new system, then the area of the triangle formed by coordinates in old system is
- 1) 43                      2) 23                      3) 45                      4) 50
43. The algebraic sum of the perpendicular distances from  $(2,0)$   $(0,2)$ ,  $(1,1)$  to a variable line is zero. The line passes through a fixed point given by
- 1)  $(1,2)$                       2)  $(2,1)$                       3)  $(1,1)$                       4)  $(2,2)$
44. Equation to the base of an equilateral triangle is  $3x - 4y + 15 = 0$  and one vertex is  $(1,2)$ , then the length of the side is
- 1)  $\frac{\sqrt{3}}{4}$                       2)  $\sqrt{\frac{3}{4}}$                       3)  $\frac{4}{\sqrt{3}}$                       4)  $\sqrt{\frac{4}{3}}$
45. If  $2x + 3y = 5$  is the perpendicular bisector of the line segment joining the points  $A\left(1, \frac{1}{3}\right)$  and B, then B=
- 1)  $\left(\frac{21}{13}, \frac{49}{39}\right)$                       2)  $\left(\frac{17}{13}, \frac{31}{39}\right)$                       3)  $\left(\frac{7}{13}, \frac{49}{39}\right)$                       4)  $\left(\frac{21}{13}, \frac{31}{39}\right)$
46. The angle between the pair of straight lines formed by joining the points of intersection of  $x^2 + y^2 = 4$  and  $y = 3x + c$  to the origin is a right angle. Then  $c^2$  is
- 1) 20                      2) 13                      3) 1/5                      4) 5
47. If the pair of lines  $ax^2 + 2hxy + by^2 + 2gx + 2fy + c = 0$  intersect on y-axis, then  $2fgh =$
- 1)  $af^2 + bg^2$                       2)  $bg^2 + ch^2$                       3)  $af^2 + ch^2$                       4)  $af^2 + bg^2 + ch^2$



61. If the circle  $x^2 + y^2 = a^2$  intersects the hyperbola  $xy = c^2$  in four points  $(x_i, y_i), i = 1, 2, 3, 4$  then  $y_1 + y_2 + y_3 + y_4 =$
- 1) 0                      2) c                      3) a                      4)  $c^4$
62.  $\lim_{x \rightarrow 0} \frac{\sin(\pi \cos^2 x)}{x^2} =$
- 1)  $-\pi$                       2)  $\pi$                       3)  $\frac{\pi}{2}$                       4) 1
63. If  $f : R \rightarrow R$  defined by  $f(x) = \begin{cases} a^2 \cos^2 x + b^2 \sin^2 x, & x \leq 0 \\ e^{ax+b}, & x > 0 \end{cases}$  is a continuous function, then
- 1)  $b = 2 \log|a|$               2)  $2b = \log|a|$               3)  $b = \log|2a|$               4)  $b^2 = \log|a|$
64. Suppose f is differentiable at  $x = 1$  and  $\lim_{h \rightarrow 0} \frac{f(1+h) - f(1)}{h} = 5$ , then
- 1)  $f(1) = 0$               2)  $f'(1) \neq 5$               3)  $f'(1) = -5$               4)  $f'(1) = 0$
65. An integrating factor of the linear equation  $(1-x^2) \frac{dy}{dx} + 2xy = \sin^{-1} x$  is
- 1)  $1-x^2$               2)  $\frac{1}{1-x^2}$               3)  $e^{1-x^2}$               4)  $e^{\frac{1}{1-x^2}}$
66. If  $x = a(1 + \cos \theta), y = a(\theta + \sin \theta)$ , then  $\frac{d^2y}{dx^2}$  at  $\theta = \frac{\pi}{2}$  is
- 1)  $-\frac{1}{a}$                       2)  $\frac{1}{a}$                       3) -1                      4)  $-\frac{2}{a}$
67. According to Boyle's law of pressure (P) is related to volume (V), with the equation  $PV^{\frac{1}{4}} =$  constant. If the percentage of decrease in volume is  $\frac{1}{2}$ , then the percentage of increase in pressure is
- 1)  $\frac{1}{2}$                       2)  $\frac{1}{4}$                       3)  $\frac{1}{8}$                       4)  $\frac{1}{16}$
68. If  $\Delta$  is the area of the triangle formed by the positive x-axis the normal and tangent to the circle  $x^2 + y^2 = 4$  at  $(1, \sqrt{3})$  then  $\Delta =$
- 1)  $\frac{\sqrt{3}}{2}$                       2)  $\sqrt{3}$                       3)  $2\sqrt{3}$                       4) 6
69. If any point (except the origin) on the curve  $y^2 = 4ax$ , the length of the subtangent, ordinate and length of the subnormal are in
- 1) AP                      2) HP                      3) GP                      4) AGP

70. The of the largest rectangle of maximum area that can be inscribed in a circle of radius  $a$  is

- 1)  $\pi a^{3/2}$                       2)  $a^2$                       3)  $\pi a^{1/4}$                       4)  $2a^2$

71. General solution of the equation  $\frac{dy}{dx} = \frac{x(2 \log x + 1)}{\sin y + y \cos y}$  is

- 1)  $y \sin y = x^2 + c$                       2)  $y + \sin y = x^2 + \log x + c$   
3)  $y = \sin y + x^2 + c$                       4)  $y \sin y = x^2 \log x + c$

72.  $\int \frac{\sec x}{(\sec x + \tan x)^n} dx, (n \in \mathbb{Z}^+) =$

- 1)  $\frac{1}{n(\sec x + \tan x)^n} + c$                       2)  $\frac{1}{(n-1)(\sec x + \tan x)^{n-1}} + c$   
3)  $\frac{-1}{n(\sec x + \tan x)^n} + c$                       4)  $\frac{-1}{(n-1)(\sec x + \tan x)^{n-1}} + c$

73. If  $\int \frac{dx}{4 + 5 \tan x} = Ax + B \log |4 \cos x + 5 \sin x| + c$  then  $A+B =$

- 1)  $\frac{4}{41}$                       2)  $\frac{5}{41}$                       3)  $\frac{9}{41}$                       4)  $\frac{1}{41}$

74. If  $I_n = \int_0^{\pi/4} \tan^n x dx$ , then  $\lim_{n \rightarrow \infty} n(I_n + I_{n+2}) =$

- 1) 0                      2)  $\infty$                       3)  $\frac{n}{n-1}$                       4) 1

75.  $\int_0^{\pi/2} \frac{a \tan x + b \cot x}{\tan x + \cot x} dx =$

- 1)  $\frac{\pi}{4}$                       2)  $(a+b) \frac{\pi}{2}$                       3)  $(a+b) \frac{\pi}{4}$                       4)  $\frac{\pi}{2}$

76. If  $\int_0^{2\pi} x f(\cos x) dx = k \int_0^{\pi} f(\cos x) dx$ , then  $k =$

- 1)  $\pi$                       2)  $2\pi$                       3)  $\frac{\pi}{2}$                       4) 0

77. The are enclosed between the curves  $y^2 = x$  and  $y = |x|$  is

- 1)  $\frac{1}{3}$                       2)  $\frac{2}{3}$                       3) 1                      4)  $\frac{1}{6}$

78. If the order and degree of  $\left( \frac{d^4 y}{dx^4} + \frac{d^2 y}{dx^2} \right)^{5/3} = a \frac{d^2 y}{dx^2}$  are  $p, q$  respectively then  $p+q =$

- 1) 9                      2) 6                      3) 7                      4) 10



79.  $\int e^x \left( \frac{1 + \sin x}{1 + \cos x} \right) dx =$

1)  $\frac{e^x}{2} \sec^2 \left( \frac{x}{2} \right) + c$

2)  $e^x \log(1 + \cos x) + c$

3)  $\frac{e^x}{(1 + \cos x)^2} + c$

4)  $e^x \tan \left( \frac{x}{2} \right) + c$

80. If  $x\sqrt{1+y} + y\sqrt{1+x} = 0$ , then  $\frac{dy}{dx} =$

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

2)  $\frac{-1}{(1+x)^2}$

3)  $\frac{1}{1+x^2}$

4)  $\frac{1}{1-x^2}$

## PHYSICS

81. Two stars, each of mass  $m$  and radius  $R$  are approaching each other for a head-on collision. They start approaching each other when their separation is  $r \gg R$ . If their speeds at this separation are negligible, the speed with which they collide would be

1)  $v = \sqrt{GM \left( \frac{1}{R} - \frac{1}{r} \right)}$

2)  $v = \sqrt{GM \left( \frac{1}{2R} - \frac{1}{r} \right)}$

3)  $v = \sqrt{GM \left( \frac{1}{R} + \frac{1}{r} \right)}$

4)  $v = \sqrt{GM \left( \frac{1}{2R} + \frac{1}{r} \right)}$

82. A uniform rope AB of mass  $2\text{kg}$  and length  $1\text{m}$  is pulled at ends A and B with forces  $F_1 = 4\text{N}$  and  $F_2 = 3\text{N}$  respectively. Find the tension at a point P at a distance  $20\text{cm}$  from end A.

1)  $3.8\text{N}$

2)  $4.1\text{N}$

3)  $5.2\text{N}$

4)  $6.4\text{N}$

83. A shell of mass  $2m$  fired with a speed  $u$  at an angle  $\theta$  to the horizontal explodes at the highest point of its trajectory into two fragments of a mass  $m$  each. If one fragment falls vertically, the distance at which the other fragment falls from the gun is given by

1)  $\frac{u^2 \sin 2\theta}{g}$

2)  $\frac{3u^2 \sin 2\theta}{2g}$

3)  $\frac{2u^2 \sin 2\theta}{g}$

4)  $\frac{3u^2 \sin 2\theta}{g}$

84. An aero plane of mass  $M$  requires a speed  $V$  for takeoff. The length of the runway is  $S$  and the coefficient of friction between the tyres and the ground is  $\mu$ . Assuming that the plane accelerates uniformly during the take off, the minimum force required by the engine of the plane for takeoff is given by

1)  $M \left( \frac{V^2}{2S} + \mu g \right)$

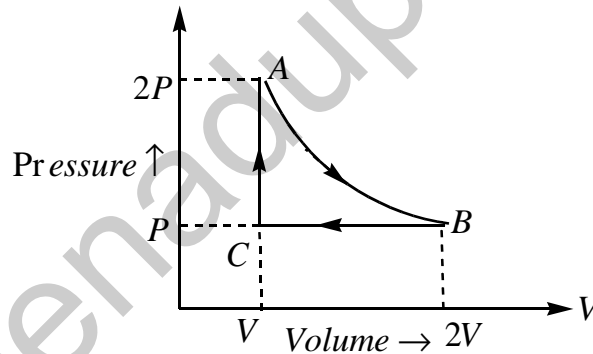
2)  $M \left( \frac{V^2}{2S} - \mu g \right)$

3)  $M \left( \frac{2V^2}{S} + 2\mu g \right)$

4)  $M \left( \frac{2V^2}{S} - 2\mu g \right)$

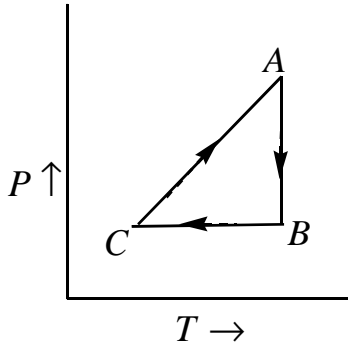
85. A train has to negotiate a curve of radius 200m. By how much should the outer rails be raised with respect to the inner rails for a speed of 36kmph. The distance between the rails is 1.5m. Take  $g = 10ms^{-2}$
- 1) 7.5cm                      2) 10cm                      3) 12.5cm                      4) 15cm
86. A body is thrown vertically up with a velocity  $u$ . It passes three points A,B, and C in its upward journey with velocities  $\frac{u}{2}$ ,  $\frac{u}{3}$  and  $\frac{u}{4}$  respectively. The ratio  $\frac{AB}{BC}$  is
- 1)  $\frac{20}{7}$                       2) 2                      3)  $\frac{10}{7}$                       4) 1
87. A solid sphere rolls down from the top of an inclined plane. Its velocity on reaching the bottom of the plane is  $v$ . When the same sphere slides down from the top of the plane, its velocity on reaching the bottom is  $v'$ . The ratio  $v'/v$  is
- 1)  $\sqrt{\frac{3}{5}}$                       2) 1                      3)  $\sqrt{\frac{7}{5}}$                       4)  $\frac{3}{\sqrt{5}}$
88. Moment of inertia of uniform horizontal solid cylinder of mass  $M$  about an axis passing through its edge and perpendicular to the axis of the cylinder if its length is 6 times its radius  $R$  is
- 1)  $\frac{39MR^2}{4}$                       2)  $\frac{39MR^2}{8}$                       3)  $\frac{49MR^2}{8}$                       4)  $\frac{49MR^2}{4}$
89. The dimensions of pressure gradient
- 1)  $ML^{-1}T^{-1}$                       2)  $ML^{-2}T^{-2}$                       3)  $ML^{-1}T^{-2}$                       4)  $ML^{-2}T^{-1}$
90. Water stands at a depth  $H$  in a tank whose side walls are vertical. A hole is made in one of the walls at a height  $h$  below the water surface. The stream of water emerging from the hole strikes the floor at a distance  $R$  from the tank, where  $R$  is given by
- 1)  $R = \sqrt{h(H-h)}$     2)  $R = \sqrt{h(H+h)}$     3)  $R = 2\sqrt{h(H-h)}$     4)  $R = 2\sqrt{h(H+h)}$
91. A stone of mass  $m$  is attached to one end of a wire of cross-sectional area  $A$  and Young's modulus  $Y$ . The stone is revolved in a horizontal circle at a speed such that the wire makes an angle  $\theta$  with the vertical. The strain produced in the wire will be
- 1)  $\frac{mg \cos \theta}{AY}$                       2)  $\frac{mg}{AY \cos \theta}$                       3)  $\frac{mg \sin \theta}{AY}$                       4)  $\frac{mg}{AY \sin \theta}$

92. 300g of water at  $25^{\circ}C$  is added to 100g of ice at  $0^{\circ}C$ . The final temperature of the mixture is
- 1)  $-\frac{5}{3}^{\circ}C$       2)  $-\frac{5}{2}^{\circ}C$       3)  $5^{\circ}C$       4)  $0^{\circ}C$
93. A cylinder of radius  $R$  made of material of thermal conductivity  $k_1$ , is surrounded by a cylindrical shell of inner radius  $R$  and outer radius  $2R$  made of a material of thermal conductivity  $k_2$ . The two ends of the combined system are maintained at two different temperatures. There is no loss of heat across the cylindrical surface and the system is in steady state. The effective thermal conductivity of the system is
- 1)  $k_1 + k_2$       2)  $\frac{k_1 k_2}{k_1 + k_2}$       3)  $\frac{k_1 + 3k_2}{4}$       4)  $\frac{3k_1 + k_2}{4}$
94. A body cools from  $75^{\circ}C$  to  $65^{\circ}C$  in 5 minutes in a room where the temperature is  $25^{\circ}C$ . The temperature of the body at the end of next 5 minutes will be
- 1)  $55^{\circ}C$       2)  $56^{\circ}C$       3)  $57^{\circ}C$       4)  $58^{\circ}C$
95. An ideal gas ( $\gamma = 1.4$ ) expands from  $5 \times 10^{-3} m^3$  to  $25 \times 10^{-3} m^3$  at a constant pressure of  $1 \times 10^5 Pa$ . The heat energy supplied to the gas in this process is
- 1) 7J      2) 70J      3) 700J      4) 7000J
96. Figure shows the P-V diagram for a fixed mass of an ideal gas undergoing cyclic process ABCA. AB represents isothermal process.

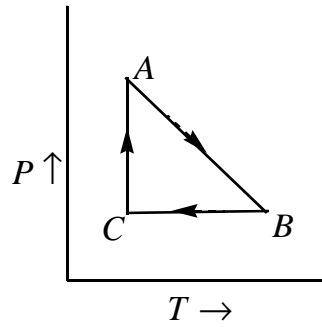


Which of the graphs shown in fig. represents the P-T diagram of the cyclic process

- 1)
- 2)



3)



4)

97. Choose the correct statement. When the temperature of an ideal gas is increased

- 1) the kinetic energy of its molecules increases
- 2) the potential energy of its molecules decreases
- 3) the potential energy decreases and the kinetic energy increases; the total energy remaining unchanged
- 4) the potential energy increases and the kinetic energy decreases; the total energy remaining unchanged

98. The displacement  $x$  (in centimeters) of an oscillating particle varies with time  $t$  (in seconds) as

$$x = 2 \cos\left(0.5\pi t + \frac{\pi}{3}\right)$$

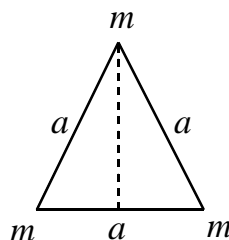
The magnitude of the maximum acceleration of the particle is

- 1)  $\frac{\pi}{2} \text{ cms}^{-2}$
- 2)  $\frac{\pi}{4} \text{ cms}^{-2}$
- 3)  $\frac{\pi^2}{2} \text{ cms}^{-2}$
- 4)  $\frac{\pi^2}{4} \text{ cms}^{-2}$

99. Eight spherical droplets each of radius  $r$  of a liquid of density  $\rho$  and surface tension  $\sigma$  coalesce to form one big drop. If  $S$  is the specific heat capacity of the liquid, find the rise in temperature of the liquid in this process.

- 1)  $\frac{3\sigma}{2r\rho S}$
- 2)  $\frac{4\sigma}{3r\rho S}$
- 3)  $\frac{\sigma}{r\rho S}$
- 4)  $\frac{2\sigma}{5r\rho S}$

100. Three particles each of mass  $m$ , are placed at the corners of an equilateral triangle of side  $a$ , as shown in Fig. The position vector of the centre of mass is

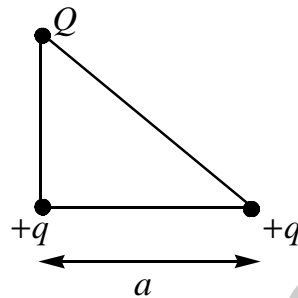


- 1)  $\frac{a}{2} \left( \mathbf{i} + \frac{\mathbf{j}}{\sqrt{3}} \right)$
- 2)  $\frac{a}{2} (3\mathbf{i} + \mathbf{j})$
- 3)  $\frac{a}{2} (3\mathbf{i} + \sqrt{3}\mathbf{j})$
- 4)  $\frac{a}{2} \left( \frac{3\mathbf{i} + \mathbf{j}}{\sqrt{3}} \right)$

101. Two organ pipes, each closed at one end, give 5beats per second when emitting their fundamental notes. If their lengths are in the ratio of 50:51, their fundamental frequencies (in Hz) are
- 1) 250, 255                      2) 255,260                      3) 260, 265                      4) 265, 270
102. A sonometer wire, with a suspended mass of  $M=1\text{kg}$ . is in resonance with a given tuning fork. The apparatus is taken to the moon where the acceleration due to gravity is  $1/6$  that on earth. To obtain resonance on the moon, the value of  $M$  should be

- 1) 1kg                      2)  $\sqrt{6}\text{kg}$                       3) 6kg                      4) 36kg

103. Three charges  $Q$ ,  $+q$  and  $+q$  are placed at the vertices of a right-angled isosceles triangle as shown in Fig. The net electrostatic energy of the configuration is zero if  $Q$  is equal to



- 1)  $\frac{-q}{1+\sqrt{2}}$                       2)  $\frac{-2q}{2+\sqrt{2}}$                       3)  $-2q$                       4)  $+q$

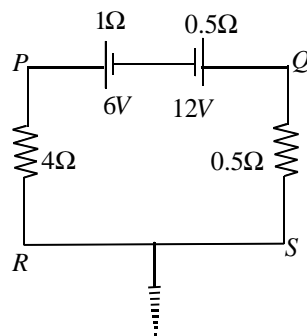
104. In pure silicon at 300K the electron and hole concentration is equal to  $1.5 \times 10^{16} \text{m}^{-3}$ . When doped with indium, the hole concentration increases to  $4.5 \times 10^{22} \text{m}^{-3}$ . What is the electron concentration in doped silicon

- 1)  $3 \times 10^9 \text{m}^{-3}$                       2)  $4 \times 10^9 \text{m}^{-3}$                       3)  $5 \times 10^9 \text{m}^{-3}$                       4)  $6 \times 10^9 \text{m}^{-3}$

105. Two point charges  $-q$  and  $+q$  are located at points  $(0,0,-a)$  and  $(0,0,a)$  respectively. What is the electric potential at point  $(0,0,z)$

- 1)  $\frac{4\epsilon_0 A}{d}$                       2)  $\frac{q}{4\pi\epsilon_0 a}$                       3)  $\frac{2qa}{4\pi\epsilon_0(z^2 - a^2)}$                       4)  $\frac{2qa}{4\pi\epsilon_0(z^2 + a^2)}$

106. Which of the following statements is correct about the circuit shown in fig. where  $1\Omega$  and  $0.5\Omega$  are the internal resistances of the 6V and 12V batteries respectively .



- 1) the potential at point P is 6V
- 2) the potential at point Q is +0.5V

3) if a voltmeter is connected across the 6V battery, it will read 7V

4) if a voltmeter is connected across the 6V batter, it will read 5V

107. If a wire is stretched to make it 0.1% longer, its resistance will

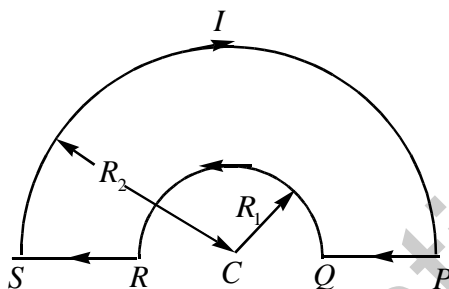
1) increase by 0.05%

2) increase by 0.2%

3) decrease by 0.2%

4) remain unchanged

108. The wire loop PQRSP formed by joining two semicircular wires to radii  $R_1$  and  $R_2$  carries a current  $I$  as shown in fig. The magnitude of the magnetic field at centre  $C$  is



- 1)  $\frac{\mu_0 I}{4} \left( \frac{1}{R_1} - \frac{1}{R_2} \right)$     2)  $\frac{\mu_0 I}{4} \left( \frac{1}{R_1} + \frac{1}{R_2} \right)$     3)  $\frac{\mu_0 I}{2} \left( \frac{1}{R_1} - \frac{1}{R_2} \right)$     4)  $\frac{\mu_0 I}{2} \left( \frac{1}{R_1} + \frac{1}{R_2} \right)$

109. A wire of length  $l$  metres carrying a current  $I$  amperes is bent in the form of a circle. The magnitude of the magnetic moment is

- 1)  $\frac{II^2}{2\pi}$     2)  $\frac{II^2}{4\pi}$     3)  $\frac{l^2 I}{2\pi}$     4)  $\frac{II^2}{4\pi}$

110. Current in a circuit falls from 5ampere to 0 in 0.1 second . If an average e.m.f of two hundred volt is induced. The self inductance of the circuit in Henry

- 1) 2    2) 4    3) 8    4) 16

111. An ac series circuit contains  $4\Omega$  resistance and  $3\Omega$  inductive reactance. What is the impedance of the circuit

- 1)  $1\Omega$     2)  $5\Omega$     3)  $7\Omega$     4)  $\frac{7}{\sqrt{2}}\Omega$

112. Which of the following statements is correct about npn and pnp transistors

- 1) The majority current carriers in an npn transistor are electrons and in a pnp transistor holes  
2) the majority current carriers in an npn transistor are holes and in a pnp transistor electrons are the majority current carriers.  
3) the emitter-base junction and the base collector junction are both forward biased in both types of transistors.  
4) the emitter-base junction is reverse biased and the base collector junction is forward biased in both types of transistors

113. In a compound microscope, the intermediate image is

- 1) real, inverted and magnified  
2) real, erect and magnified

3) virtual, erect and magnified

4) virtual, erect and reduced

114. In Young's double slit experiment the slits are 0.5mm apart and interference is observed on a screen placed at a distance of 100cm from the slits. It is found that the 9<sup>th</sup> bright fringe is at a distance of 9.0 mm from the second dark fringe from the centre of the fringe pattern. The wavelength of light used is .

- 1)  $2000\text{\AA}$       2)  $4000\text{\AA}$       3)  $6000\text{\AA}$       4)  $8000\text{\AA}$

115. In a double slit experiment, instead of taking slits of equal widths, one slit is made twice as wide as the other, then, in the interference pattern

- 1) the intensities of both maxima and minima increase  
2) the intensity of the maxima increases and the minima have zero intensity  
3) the intensity of maxima decreases and that of the minima increases  
4) the intensity of the maxima decreases and the minima have zero intensity

116. Monochromatic light of frequency  $\nu_1$  irradiates a photocell and the stopping potential is found to be  $V_1$ . What is the new stopping potential of the cell if it is radiated by monochromatic light of frequency  $\nu_2$

- 1)  $V_1 + \frac{h}{e}(\nu_2 - \nu_1)$     2)  $V_1 - \frac{h}{e}(\nu_2 - \nu_1)$     3)  $V_1 + \frac{h}{e}(\nu_2 + \nu_1)$     4)  $V_1 - \frac{h}{e}(\nu_2 + \nu_1)$

117. The ratio of the wavelengths of the longest wavelength lines in the Lyman and Balmer series of hydrogen spectrum is

- 1)  $\frac{3}{23}$       2)  $\frac{5}{27}$       3)  $\frac{7}{29}$       4)  $\frac{9}{31}$

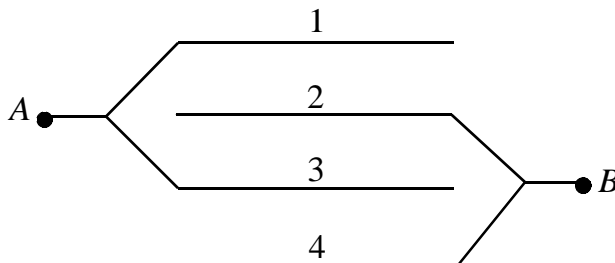
118. For certain radioactive substance, it is observed that after 4 hours, only 6.25% of the original sample is left undecayed. Choose the only wrong statement from the following

- 1) the half life time of radioactive substance is 1 hour  
2) the half life time of radioactive substance is 2hours

3) the mean life time is 1.44 hour

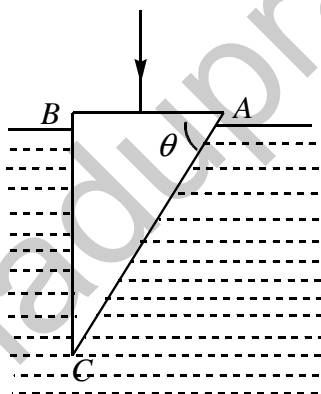
4) decay constant is  $0.696h^{-1}$

119. For metal plates numbered 1,2,3 and 4 are arranged as shown in Fig. The area of each plate is A and the separation between adjacent plates is d. The capacitance of the arrangement is



- 1)  $\frac{\epsilon_0 A}{d}$       2)  $\frac{2\epsilon_0 A}{d}$       3)  $\frac{3\epsilon_0 A}{d}$       4)  $\frac{4\epsilon_0 A}{d}$

120. A glass prism ABC of refractive index 1.5 is immersed in water of refractive index  $\frac{4}{3}$  as shown in fig. A ray of light incident normally on face AB is totally reflected at face AC if



- 1)  $\sin \theta \geq \frac{8}{9}$       2)  $\sin \theta \geq \frac{2}{3}$       3)  $\sin \theta = \frac{\sqrt{3}}{2}$       4)  $\frac{2}{3} < \sin \theta < \frac{8}{9}$

## CHEMISTRY

121. Tajmahal gets deteriorated by acid rain. The chemical reaction related is

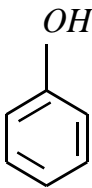
- 1)  $Na_2CO_3 + H_2SO_4 \rightarrow Na_2SO_4 + CO_2 + H_2O$   
2)  $CaCO_3 + H_2SO_4 \rightarrow CaSO_4 + CO_2 + H_2O$   
3)  $NaCO_3 + CaCl_2 \rightarrow CaCO_3 + 2HCl$   
4)  $CaCO_3 + 2HCl \rightarrow CaCl_2 + CO_2 + H_2O$

122. Assertion (A) : First ionisation energy of  $Li^+$  ion is greater than that of He

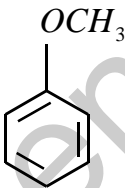
Reason (R) : Effective nuclear charge of  $Li^+$  ion is more than that of He

- 1) A and R are true, R explains A      2) A and R are true, R cannot explain A  
3) A is true, R is false      4) A is false, R is true

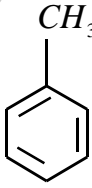


123. Magnetic moment of the autocatalyst involved in the oxidation of acidified oxalic acid with  $KMnO_4$  is
- 1) 2.8BM                      2) 3.8BM                      3) 4.8BM                      4) 5.8BM
124. Retardation factor ( $R_f$ ) values of four components A,B,C and D of a mixture are 0.3, 0.8, 0.5 and 0.7 respectively. Then the order of extent of adsorption of the components on the stationary phase is
- 1) A<D<C<B                      2) B<D<A<C                      3) B<D<C<A                      4) A<B<C<D
125. Repeating structural unit in silicones is
- 1)  $SiO_2$                       2)  $-R_2SiO-$                       3)  $SiO_4^{4-}$                       4)  $R_2SiH_2$
126. Ethyne can be prepared from limestone and coke in different series of reactions. Then the amount of 80% pure limestone required to prepare 2 mole of acetylene is
- 1) 160g                      2) 200g                      3) 250g                      4) 300g
127.  $(C_6H_5CH_2)_2Cd + 2CH_3COCl \rightarrow A$   
 $CH_3-CH_2-CN \xrightarrow[(ii)H_3O^+]{(i)C_6H_5MgBr\text{ ether}} B$
- Here A and B are
- 1) Homologues                      2) Functional isomers  
 3) Metamers                      4) Chain isomers
128. Arrange the following in the order of decreasing reactivity towards electrophilic substitution reaction
- 

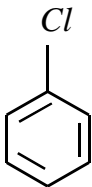
I



II



III



IV
- 1) IV>III>II>I                      2) I>II>III>IV                      3) I>II>IV>III                      4) III>II>IV>I
129. Incorrect match with respect to the reagent used for lab test
- 1)  $1^0, 2^0$  &  $3^0$  amines: Hinsberg's reagent  
 2) Formic acid: Tollen's reagent  
 3) Phenol: Lucas reagent  
 4) Benzoic acid:  $NaHCO_3$
130.  $\alpha$ -Helix structure of protein is stabilized by
- 1) peptide bond                      2) vanderwall force                      3) hydrogen bonding                      4) dipole-dipole interaction
131. Number of coloured spectral lines formed during the de-excitation of electron from  $6^{th}$  energy level to ground state in H-atom is
- 1) 4                      2) 5                      3) 10                      4) 15
132. Which of the following is an optically active polymer

- 1) Nylon-6,6                      2) Natural rubber                      3) Teflon                      4) PVC

133. Salvarsan is arsenic containing drug which was first used for the treatment of

- 1) Syphilis                      2) typhoid                      3) meningitis                      4) dysentery

134. Cationic detergent among the following is

- 1) sodium lauryl sulphate                      2) sodium dodecyl benzene sulphate  
3) cetyl trimethyl ammonium bromide                      4) penta ethyl monosterate

135. When one mole of  $NO_3^-$  is converted one mole of  $NO_2$  and 0.5 mole of  $N_2O$  it accepts  $x$  and  $y$  moles of electrons respectively

- 1)  $x = 1$  &  $y = 4$                       2)  $x = 1$  &  $y = 3$                       3)  $x = 2$  &  $y = 3$                       4)  $x = 2$  &  $y = 4$

136. Mole fraction of toluene in the vapour phase which is in equilibrium with a solution of benzene ( $P = 120\text{torr}$ ) and toluene ( $P = 80\text{torr}$ ) having 2 mole of each is

- 1) 0.25                      2) 0.4                      3) 0.5                      4) 0.6

137. Acetic acid dimerises in benzene as follows  $2CH_3COOH \rightleftharpoons (CH_3COOH)_2$ . If 60% of  $CH_3COOH$  goes in dimer formation and the remaining is monomer then the average molecular weight of  $CH_3COOH$  is

- 1) 90.1                      2) 60.3                      3) 98.5                      4) 85.7

138. Number of moles of sulphuric acid is to be dissolved to produce 250ml of an aqueous solution of  $pH=3.52$

- 1)  $3.75 \times 10^{-5}$                       2)  $7.5 \times 10^{-4}$                       3)  $3.75 \times 10^{-4}$                       4)  $7.5 \times 10^{-5}$

139. Starting from 'a' moles of hydrogen and 'b' moles of iodine equilibrium is established as

$H_2 + I_2 \rightleftharpoons 2HI$  with  $2X$  moles of HI equilibrium constant will be

- 1)  $\frac{4X^2}{a-b}$                       2)  $\frac{4X^2}{(a-X)(b-X)}$                       3)  $\frac{2X^2}{(a-X)(b-X)}$                       4)  $\frac{2X^2}{(a-2X)(b-2X)}$

140. Most unsymmetrical crystal system among the following is

- 1) Cubic                      2) Hexagonal                      3) Triclinic                      4) Orthorhombic

141. Of the following complex ions, which is diamagnetic in nature

- 1)  $[NiCl_4]^{2-}$                       2)  $[CuCl_4]^{2-}$                       3)  $[CoF_6]^{3-}$                       4)  $[Ni(CN)_4]^{2-}$

142. Among the following, number of correct statements

- A) Entropy change for adsorption of gases over solid is positive  
B) Gelatin has low value of gold number and is effective protective colloid  
C) Like charge on dispersed phase particles is responsible for stability of lyophobic sol

D) Greater the valence of the coagulating ion, greater is its coagulating power

- 1) 4                      2) 3                      3) 2                      4) 1

143. Lanthanide with greater atomic radius is

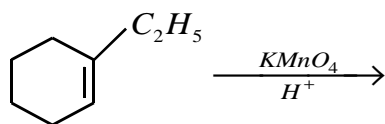
- 1) Ce                      2) Eu                      3) Er                      4) Lu

144. Borax is represented as

- 1)  $Na_2[B_4O_5(OH)_4]$                       2)  $Na_2[B_4O_5(OH)_2] \cdot 8H_2O$   
 3)  $Na_2[B_4O_5(OH)_4] \cdot 8H_2O$                       4)  $Na_2[B_4O_5(OH)_2] \cdot 6H_2O$

145. For the reaction  $A \rightarrow B + C$ , the initial concentration of A is 0.01M and after 100sec the concentration of A becomes 0.001M. If the rate constant of the reaction is  $9 \times 10^{-5}$  then the unit of rate constant 'K' is

- 1)  $M^{-1}s^{-1}$                       2)  $M s^{-1}$                       3)  $s^{-1}$                       4)  $M^{-1.5}s^{-1}$



Identify the product of reaction

- 1)  $CH_3 - \overset{\overset{O}{\parallel}}{C} - (CH_2)_4 - COOH$                       2)  $CH_3 - CH_2 - \overset{\overset{O}{\parallel}}{C} - (CH_2)_4 - COOH$   
 3)  $CH_3 - CH_2 - \overset{\overset{O}{\parallel}}{C} - (CH_2)_4 - CH_3$                       4)  $CH_3 - CH_2 - \overset{\overset{O}{\parallel}}{C} - (CH_2)_3 - CHO$

147. The voltage of the following cell is increased by  $Cu_{(s)} + 2Ag_{(aq)}^+ \rightarrow Cu_{(aq)}^{+2} + 2Ag_{(s)}$

- 1) increase in the concentration of  $Ag^+$  ions  
 2) increase in the concentration of  $Cu^{+2}$  ions  
 3) increase in the dimension of Ag electrode  
 4) decrease in the concentration of  $Ag^+$  ions

148. Hybridisation and number of lone pairs in  $XeOF_4$  molecule

- 1)  $sp^3d$ , two                      2)  $sp^3d^2$  two                      3)  $sp^3d^2$ , one                      4)  $sp^3d$ , one



Incorrect statement about the final organic product 'L'

- 1) it has  $5\pi$  bonds                      2) it contains 5 lone pairs  
 3) starting compound in Hoffmann Bromamide degradation  
 4) anion of its salt acts as nucleophile in Gabriel phthalimide synthesis

150. Correct match for freezing of water

List I

- A) water at  $-10^0C$   
 B) water at  $0^0C$

List II

- I)  $\Delta G = 0$   
 II)  $\Delta G = +ve$

C) water at  $+10^0C$

A B C

1) II I III

3) I II III

III)  $\Delta G = -ve$

A B C

2) III I II

4) III II I

151. Hydration enthalpy is greater than its lattice enthalpy in

1)  $BaSO_4$                       2)  $SrSO_4$                       3)  $CaSO_4$                       4)  $BeSO_4$

152. Higher  $P^{kb}$  value for

1)  $NH_3$                       2)  $C_6H_5 - NH_2$                       3)  $(C_2H_5)_2NH$                       4)  $C_2H_5NH_2$

153. Chlorine gas is obtained by various reactions but not by

1)  $KMnO_4 + conc.HCl \xrightarrow{\Delta}$                       2)  $KCl + F_2 \rightarrow$   
3)  $KCl + K_2Cr_2O_7 + conc.H_2SO_4 \xrightarrow{\Delta}$                       4)  $MnO_2 + conc.HCl \xrightarrow{\Delta}$

154. Isoelectronic pair having bond order 3 and acts as strong field ligands

1)  $CN^+ & CO$                       2)  $O_2^- & CN^-$                       3)  $CO & CN^-$                       4)  $CN^- & NO^-$

155. The following does not give cannizzaro reaction but gives positive test with iodoform

1)  $CCl_3CHO$                       2)  $CH_3CHO$                       3)  $HCHO$                       4)  $C_6H_5CHO$

156. In the metallurgy of iron, the upper layer obtained at the bottom of blast furnace mainly contains

1)  $CaSiO_3$                       2)  $FeSiO_3$                       3)  $Fe_3C$                       4) Pig iron

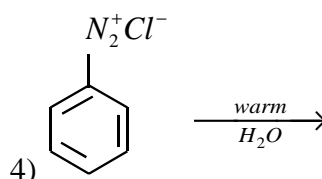
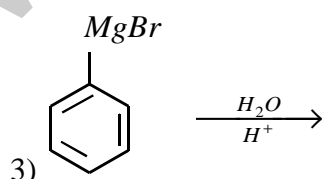
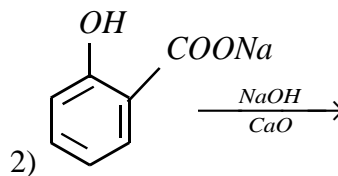
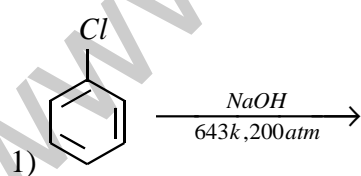
157. Bleaching property of  $H_2O_2$  is due to its

1) reducing property    2) acidic nature  
3) oxidizing property    4) unstable nature

158. If the molar solubility of zirconium phosphate is 'S' then its  $K_{sp}$  is

1)  $6912(S)^7$                       2)  $6912(S)^6$                       3)  $6912(S)^5$                       4)  $6912(S)^4$

159. Phenol is not prepared from



160. Ratio of  $p\pi - d\pi$  bonds in sulphurous anhydride and sulphuric anhydride is

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

# KEY SHEET

## MATHEMATICS

1) 1	2) 3	3) 1	4) 3	5) 1	6) 4	7) 2	8) 4	9) 2	10) 2
11) 4	12) 2	13) 2	14) 2	15) 2	16) 1	17) 4	18) 1	19) 4	20) 1
21) 3	22) 2	23) 1	24) 2	25) 2	26) 3	27) 1	28) 1	29) 3	30) 1
31) 2	32) 3	33) 3	34) 2	35) 3	36) 3	37) 2	38) 2	39) 1	40) 4
41) 2	42) 1	43) 3	44) 3	45) 1	46) 1	47) 2	48) 4	49) 1	50) 3
51) 4	52) 3	53) 4	54) 1	55) 1	56) 2	57) 3	58) 4	59) 2	60) 3
61) 1	62) 2	63) 1	64) 1	65) 2	66) 1	67) 3	68) 3	69) 3	70) 4
71) 4	72) 3	73) 3	74) 4	75) 3	76) 2	77) 4	78) 1	79) 4	80) 2

## PHYSICS

81) 2	82) 1	83) 2	84) 1	85) 1	86) 1	87) 3	88) 4	89) 2	90) 3
91) 2	92) 4	93) 3	94) 3	95) 4	96) 3	97) 1	98) 3	99) 1	100) 1
101) 1	102) 3	103) 2	104) 3	105) 3	106) 3	107) 2	108) 1	109) 4	110) 2
111) 2	112) 1	113) 1	114) 3	115) 1	116) 1	117) 2	118) 2	119) 3	120) 1

## CHEMISTRY

121) 2	122) 1	123) 4	124) 3	125) 2	126) 3	127) 3	128) 2	129) 3	130) 3
131) 1	132) 4	133) 1	134) 3	135) 1	136) 2	137) 4	138) 1	139) 2	140) 3
141) 4	142) 2	143) 2	144) 3	145) 2	146) 2	147) 1	148) 3	149) 3	150) 2
151) 4	152) 2	153) 3	154) 3	155) 2	156) 1	157) 3	158) 1	159) 3	160) 2

**VARSITY EDUCATION MANAGEMENT LTD.**

Mumbai, Hyderabad, Vijayawada, Bangalore