

RB IIT Academy EAMCET ENG MOCK TEST 1

1) The circles $x^2 + y^2 = 25$ and $x^2 + y^2 - 18x + 24y + 125 = 0$

- A) Touch internally B) Touch externally C) Cut orthogonally D) Intersect each other

2) Range of $\sqrt{x-2} + \sqrt{3-x}$

- A) $[1, \sqrt{3}]$ B) $[1, \sqrt{2}]$ C) $[1, 2]$ D) $[2, 3]$

3) \vec{a} and \vec{b} are unit vectors along OA and OB. OC bisects the angle AOB. The unit vector along OC is

- A) $\frac{\vec{a}+\vec{b}}{|\vec{a}+\vec{b}|}$ B) $\frac{\vec{a}-\vec{b}}{|\vec{a}-\vec{b}|}$ C) $\frac{\vec{a}+\vec{b}}{2|\vec{a}+\vec{b}|}$ D) $\frac{\vec{a}-\vec{b}}{2|\vec{a}-\vec{b}|}$

4) $\vec{v} = 2\vec{i} + \vec{j} - \vec{k}$ and $\vec{w} = \vec{i} + 3\vec{k}$. If \vec{u} is a unit vector then the maximum value of the scalar triple product $[\vec{u} \vec{v} \vec{w}]$ is

- A) -1 B) $\sqrt{10} + \sqrt{6}$ C) $\sqrt{59}$ D) $\sqrt{60}$

5) $(\vec{a} \times \vec{b}) \cdot \vec{c} = |\vec{a}| |\vec{b}| |\vec{c}| \Rightarrow$

- A) $\vec{a} \cdot \vec{b} = \vec{b} \cdot \vec{c} = \vec{c} \cdot \vec{a}$ B) $\vec{a} \cdot \vec{b} = \vec{b} \cdot \vec{c} = \vec{c} \cdot \vec{a} = 0$ C) $\vec{a} \perp \vec{b}, \vec{b} = \vec{c}$ D) $\vec{a} \cdot \vec{b} = 1$

6) If $\vec{a}, \vec{b}, \vec{c}$ are three vectors of which every pair is non-collinear. If the vectors $\vec{a} + 2\vec{b}, \vec{b} + 3\vec{c}$ collinear with \vec{c} and \vec{a} respectively, then $\vec{a} + 2\vec{b} + 6\vec{c} =$

- A) \vec{a} B) \vec{b} C) \vec{c} D) $\vec{0}$

7) If $\vec{r} = 3\vec{p} + 4\vec{q}$ and $2\vec{r} = \vec{p} - 3\vec{q}$ then

- A) \vec{r}, \vec{q} are having same direction and $|\vec{r}| < 2|\vec{q}|$
 B) \vec{r}, \vec{q} are having opposite direction and $|\vec{r}| > 2|\vec{q}|$
 C) \vec{r}, \vec{q} are having opposite direction and $|\vec{r}| < 2|\vec{q}|$
 D) \vec{r}, \vec{q} are having same direction and $|\vec{r}| > 2|\vec{q}|$

8) $a^2x^2 + 2xy + 9y^2 = 0$ represent a pair of distinct lines than 'a' lies in

- A) $[-\frac{1}{3}, \frac{1}{3}]$ B) $(-\frac{1}{3}, \frac{1}{3})$ C) $[-\frac{1}{2}, \frac{1}{2}]$ D) $(-\frac{1}{2}, \frac{1}{2})$

9) The approximate value of $\frac{1}{\sqrt[3]{8.08}} =$

- A) 0.49 B) 0.4983 C) 0.048 D) 0.483

10) If $A^2 = A$ then $(I + A)^4$

- A) $I + 15A$ B) $I + 7A$ C) $I + 8A$ D) $I + 11A$

11)
$$\begin{vmatrix} 2 & a+b+c+d & ab+cd \\ a+b+c+d & 2(a+b)(c+d) & ab(c+d)+cd(a+b) \\ ab+cd & ab(c+d)+cd(a+b) & 2abcd \end{vmatrix}$$

- A) abcd B) 0 C) 1 D) $a+b+c+d$

12) The velocity v of a particle moving along a straight line when it is at a distance X from the point of start is given by $a + bv^2 = x^2$, then the acceleration is

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

13) If the curves $\frac{x^2}{a^2} + \frac{y^2}{4} = 1$, $y^3 = 16x$ cut orthogonally then the value of a^2 is

- A) $\frac{4}{3}$ B) $\frac{2}{\sqrt{3}}$ C) 1 D) $\frac{1}{3}$

14) $f(x) = 3 + 12x - 19x^2 + 2x^3$ is strictly increasing in the interval

- A) $(\frac{1}{3}, 6)$ B) $(-\infty, 1) \cup (6, \infty)$ C) $(1, 3)$ D) $(-\infty, \frac{1}{3}) \cup (6, \infty)$

15) If the projection of the line segment \overline{PQ} on the axes are 3, 4, 12 then the length of $PQ =$

- A) 12 B) 13 C) $\sqrt{50}$ D) $2\sqrt{5}$

16) If A, B, C are acute angles such that $\tan A = \frac{1}{2}$, $\tan B = \frac{1}{5}$ and $\tan C = \frac{1}{8}$ then $A + B + C =$

- A) 0 B) $\frac{\pi}{6}$ C) $\frac{\pi}{4}$ D) $\frac{\pi}{2}$

17) Point $A(2, 1)$, $B(3, 7)$. C is any point on the line $3x - 2y = 1$, then locus of point D such that ABCD is a parallelogram is $3x - 2y = K$ then $K =$

- A) 20 B) 18 C) -20 D) -18

18) If the sum of two of the roots of $x^3 + px^2 + qx + r = 0$ is zero then $pq =$

- A) -r B) r C) 2r D) -2r

19) The slope of the tangent to the curve $y = \frac{8}{4+x^2}$ at $x = 2$ on it is

- A) -2 B) -0.5 C) 0.5 D) 2

20) If $\tan 40^\circ + 2\tan 10^\circ = \cot x$ then $x =$

- A) 75° B) 85° C) 30° D) 40°

21) If $\sinh x = \frac{3}{4}$, then $\sinh(2x) =$

- A) $\frac{5}{8}$ B) $\frac{15}{8}$ C) $\frac{7}{8}$ D) $\frac{17}{8}$

22) In a triangle ABC, if $C = 60^\circ$ then $\frac{a}{b+c} + \frac{b}{c+a} =$

- A) 2 B) 4 C) 3 D) 1

23) In a ΔABC $r_1 > r_2 > r_3$, then its sides are related as

- A) $a < b < c$ B) $a < b > c$ C) $a > b < c$ D) $a > b > c$

24) The area of the triangle formed by the tangent, normal at $(1, \sqrt{3})$ to the circle $x^2 + y^2 = 4$ and the X- axes is

- A) $4\sqrt{3}$ B) $\frac{7}{2}\sqrt{3}$ C) $2\sqrt{3}$ D) $\frac{1}{2}\sqrt{3}$

25) The number of ways of mixed doubles tennis game be arranged from a group of 10 players consisting of 6 men and 4 women is

- A) 48 B) 90 C) 120 D) 180

26) The expression $2x^2 + 4x + 7$ has minimum value "m" at $x = \alpha$, then $(\alpha, m) =$

- A) (5, -1) B) (5, 1) C) (-1, -5) D) (-1, 5)

27) α, β are the roots of the equation $x^2 - px + q = 0$ and α, β, γ are the roots of the equation $x^3 - ax^2 + bx - c = 0$

- A) $p + \gamma = a$ B) $p\gamma + q = b$ C) $q\gamma = c$ D) 1, 2, 3 are true

28) The vertices of a triangle are $(ab, \frac{1}{ab})$ $(bc, \frac{1}{bc})$ $(ca, \frac{1}{ca})$ where a, b, c are the roots of the equation $x^3 - 3x^2 + 6x + 1 = 0$ then its centroid is

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

29) The numerically greatest term in the expansion of $(5x - 6y)^{14}$ when $x = \frac{2}{5}, y = \frac{1}{2}$ is

- A) ${}^{14}C_6 \cdot 2^8 \cdot 3^6$ B) ${}^{14}C_6 \cdot 2^6 \cdot 3^8$ C) ${}^{14}C_5 \cdot 2^6 \cdot 3^8$ D) ${}^{14}C_7 \cdot 2^8 \cdot 3^6$

30) The number of rational terms in the expansion of $(\sqrt{2} + \sqrt[4]{3})^{100}$ is

- A) 25 B) 26 C) 27 D) 28

31) The locus of the point of intersection of the lines $x = \frac{1-t^2}{1+t^2}$ $y = \frac{2t}{1+t^2}$ where t is a parameter is a circle whose radius is

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

32) The equation to the locus of the point of intersection of any two perpendicular tangents to $x^2 + y^2 = 4$ is

- A) $x^2 + y^2 = 8$ B) $x^2 + y^2 = 12$ C) $x^2 + y^2 = 16$ D) $x^2 + y^2 = 4\sqrt{3}$

33) Nine toys are to be packed in 9 boxes. If 5 of them are too big for 3 boxes, then the number of ways in which they can be packed is

- A) ${}^6P_5 \cdot 4!$ B) ${}^6P_5 \cdot 3!$ C) $6!3!2!$ D) $5!3!$

34) The number of 3×3 symmetric matrices using $-1, -1, -1, 1, 1, 1, 2, 2, 2$ is

- A) 24 B) 36 C) 48 D) 52

35) The number of ways of selections 2 squares on a chess board so as to have a side in common is

- A) 110 B) 111 C) 112 D) 114

36) $P(A \cup B) = \frac{1}{2}$; $P(\bar{A}) = \frac{2}{3} \Rightarrow P(\bar{A} \cap B) =$

- A) $\frac{1}{3}$ B) $\frac{1}{4}$ C) $\frac{1}{5}$ D) $\frac{1}{6}$

37) An unbiased coin is tossed n times. The probability that head will present itself, odd number of times is

- A) $\frac{1}{4}$ B) $\frac{1}{3}$ C) $\frac{1}{2}$ D) $\frac{1}{5}$

38) A linear function that map the set $\{-2, 2\}$ onto the set $\{0, 4\}$

- A) $(x - 2)$ B) $(2 - x)$ C) $2 + x$ D) both B and C

$$39) \int \{1 + \tan x \cdot \tan(x + \alpha)\} dx =$$

- A) $\cot \alpha \log |\cot(x + \alpha)| + c$ B) $\cot \alpha \log \left| \frac{\cot(x+\alpha)}{\cos x} \right| + c$ C) $\cot \alpha \log \left| \frac{\cos x}{\cos(x+\alpha)} \right| + c$
 D) $\cot \alpha \log \left| \frac{\sin x}{\cot(x+\alpha)} \right| + c$

$$40) \int \tan^7 x dx + \int \tan^9 x dx =$$

- A) $\frac{\tan^7 x}{7} + c$ B) $\tan^7 x + c$ C) $\frac{\tan^{10} x}{10} + c$ D) $\frac{\tan^8 x}{8} + c$

$$41) \text{ The value at } \int_0^{\frac{\pi}{2}} \frac{e^{\sin x}}{e^{\sin x} + e^{\cos x}} dx \text{ is}$$

- A) 2π B) $\frac{\pi}{2}$ C) π D) $\frac{\pi}{4}$

$$42) \int_{-\frac{\pi}{2}}^{\frac{\pi}{2}} \log \left(\frac{2 - \sin \theta}{2 + \sin \theta} \right) d\theta =$$

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

43) The area of the region bounded by $y = x$ and $y = x^3$ in square units is

- A) 4 B) 3 C) 2 D) $\frac{1}{2}$

44) The order and degree of the differential equation of all tangent lines to the parabola $x^2 = 4y$ are

- A) 1,2 B) 2,2 C) 3,1 D) 4,1

45) The Differential equation whose solution is $y = ce^{-2x}$ where c is an arbitrary constant is

- A) $\frac{dy}{dx} - y = 0$ B) $\frac{dy}{dx} + y = 0$ C) $\frac{dy}{dx} + 2y = 0$ D) $\frac{dy}{dx} - 2y = 0$

$$46) \sum_{m=1}^n \tan^{-1} \left(\frac{2m}{m^4+m^2+2} \right) =$$

- A) $\tan^{-1} \left(\frac{n^2+n}{n^2+n+2} \right)$ B) $\tan^{-1} \left(\frac{n^2-n}{n^2-n+2} \right)$ C) $\tan^{-1} \left(\frac{n^2+n+2}{n^2+n} \right)$ D) $\frac{\pi}{4}$

47) The area of the triangle inscribed in the parabola $y^2 = 4x$ with the vertices, whose ordinates are 1, 2, 4 is

- A) $\frac{7}{2}$ sq. units B) $\frac{5}{2}$ sq. units C) $\frac{3}{2}$ sq. units D) $\frac{3}{4}$ sq. units

48) If the angle between the lines joining the foci to an extremity of minor axis of an ellipse is 90° its eccentricity is

- A) $\frac{1}{2}$ B) $\frac{\sqrt{3}}{2}$ C) $\frac{1}{\sqrt{3}}$ D) $\frac{1}{\sqrt{2}}$

49)

The product of focal distances of the point (4,3) on the hyperbola $x^2 - y^2 = 7$ is

- A) 25 B) 12 C) 9 D) 16

50) The upper $\frac{3}{4}$ th portion of a vertical pole subtends an angle $\tan^{-1} \left(\frac{3}{5} \right)$ at point in the horizontal plane through its foot and at a distance 40m from the foot. A possible height of the vertical pole is

- A) 20 B) 30 C) 40 D) 60

51) The angle of elevation of the Sun, when the length of the shadow of a pole is $\sqrt{3}$ times the height of the pole is

- A) 30° B) 45° C) 60° D) 90°

$$52) \lim_{x \rightarrow 0} \frac{a^{\tan x} - a^{\sin x}}{\tan x - \sin x} = (a > 0)$$

- A) 1 B) 0 C) $\log a$ D) -1

53) By translating the axes, the equation $xy - x + 2y = 6$ has changed to $XY = k$, then $k =$

- A) 5 B) 4 C) 3 D) 7

54) If $\sin(x + y) = \log(x + y)$ then $\frac{dy}{dx} =$

- A) 1 B) -1 C) -2 D) 2

55) If $f(x) = \begin{cases} [x] & \text{if } -3 < x \leq -1 \\ |x| & \text{if } -1 < x < 1 \\ |[x]| & \text{if } 1 \leq x < 3 \end{cases}$ then f is continuous on

- A) (-3,3) B) [-1,1] C) (-3,1) D) (-1,1]

56) If X is a binomial variate with $n = 6$ and $P(X = 2) = 4P(X = 4)$, then the parameter p of X is :

- A) $\frac{1}{2}$ B) $\frac{1}{3}$ C) $\frac{2}{3}$ D) $\frac{3}{4}$

57) The minimum value of $f(x) = |3 - x| + |2 + x| + |5 - x|$ is

- A) 0 B) 7 C) 8 D) 10

58) If $x = e^y + e^{y+\dots\text{to } \infty}$, $x > 0$ then $\frac{dy}{dx} =$

- A) $\frac{x}{1+x}$ B) $\frac{1+x}{x}$ C) $\frac{1-x}{x}$ D) $\frac{1}{x}$

59) The mean weight of 150 students in a certain class is 60 kilograms. The mean weight of boys in the class is 70 kilograms and that of the girls is 55 kilograms, then the number of boys and girls are

- A) 100,50 B) 50,100 C) 75,75 D) 60,90

60) If $y = \log_2(\log_2^x)$ then $\frac{dy}{dx}$

A) $\frac{1}{x(\log_e^2)^2}$ B) $\frac{1}{\log_e(2x)^x}$ C) $\frac{(\log_2^e)^2}{x \log_2^x}$ D) $\frac{(\log_2^e)^2}{x \log_2^x}$

61) $A = \begin{pmatrix} 1 & 2 & 1 \\ 3 & 2 & 3 \\ 1 & 1 & 2 \end{pmatrix}$, $adj A = \begin{pmatrix} 1 & -3 & 4 \\ -3 & 1 & 0 \\ 1 & 1 & k \end{pmatrix}$

A) 1 B) 2 C) -4 D) -8

62) $\begin{vmatrix} x & x+y & x+y+z \\ 2x & 3x+2y & 4x+3y+2z \\ 3x & 6x+3y & 10x+6y+3z \end{vmatrix} = 64$ then $x =$

A) 2 B) 4 C) 6 D) 8

63) $f(x) = \sqrt{25 - 9x^2}$ is strictly decreasing in

A) $(-\frac{5}{3}, 0)$ B) $(0, \frac{5}{3})$ C) $(-\frac{5}{3}, \frac{5}{3})$ D) None

64) Stationary point of $y = x^2 + \frac{250}{x}$ is

A) (1, 5) B) (5, 1) C) (5, 25) D) (5, 75)

65) The eccentricity of a rectangular hyperbola is

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

66) If it rains a dealer in rain coats can earn Rs. 500/- a day. If it is fair, he can loose Rs. 40/- per day. What is his mean profit if the probability of a fair day is 0.6?

A) 170 B) 172 C) 274 D) 176

67) If $f : R \rightarrow R$ defined by $f(x) = x^2 - 10x + 21$ then $f^{-1}(-3) =$

A) {-4, 6} B) {2,4} C) {-4, 4, 6} D) {4, 6}

68) If there is an error 0.01 cm in the diameter of a sphere when its radius is 5 cm. the percentage error in its surface area =

- A) 0.2 B) 0.6 C) 0.5 D) $\frac{\pi}{10}$

69) $\int_0^1 \log\left(\frac{1}{x}-1\right) dx =$

- A) $\frac{1}{2} \log \frac{1}{2}$ B) $\frac{1}{2} \log 2$ C) 0 D) $\log \frac{1}{2}$

70) The number of rational terms in the expansion of $(\sqrt{2} + \sqrt[4]{3})^{100}$ is

- A) 28 B) 26 C) 27 D) 28

71) The locus of a point represented by equations $x = \frac{a}{2}\left(t + \frac{1}{t}\right)$, $y = \frac{a}{2}\left(t - \frac{1}{t}\right)$

- A) $x^2 + y^2 = a^2$ B) $x^2 - y^2 = a^2$ C) $2x^2 - y^2 = a^2$ D) $x^2 - 2y^2 = a^2$

72) The number of partial fractions of $\frac{2}{x^4+x^2+1}$ is

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

73) In the expansion of $(1+x)^{43}$ if the coefficients of the $(2r+1)^{th}$ and $(r+2)^{th}$ terms are equal the value of 'r' is

- A) 12 B) 13 C) 14 D) 15

74) $\frac{\cos 11^\circ + \sin 11^\circ}{\cos 11^\circ - \sin 11^\circ} =$

- A) $\tan 62^\circ$ B) $\tan 79^\circ$ C) $\tan 56^\circ$ D) $\tan 9^\circ$

75) If the projections of the line segment AB on the yz-plane, zx-plane, xy-plane are $\sqrt{160}$, $\sqrt{153}$, 5 respectively then the projection of AB on the z-axis is

A) 10 B) 11 C) 12 D) 15

76) The area of the parallelogram formed by the lines

$$4y - 3x - a = 0, 3y - 4x + a = 0, 4y - 3x - 3a = 0, 3y - 4x + 2a = 0$$

A) $\frac{a^2}{5}$ B) $\frac{a^2}{7}$ C) $\frac{2a^2}{7}$ D) $\frac{2a^2}{9}$

77) The number $a^n = 6^n - 5n$ for $n = 1, 2, 3, \dots$ when divided by 25 leave the remainder is

A) 9 B) 7 C) 3 D) 1

78)

If the period of $\sin(x + 8x + 27x + \dots + n^3x)$ is $\frac{k\pi}{n^2(n+1)^2}$

then k =

A) 1 B) 2 C) 6 D) 8

79)

If $\cos x + \cos y = \frac{1}{3}$, $\sin x + \sin y = \frac{1}{4}$ then $\sin(x + y) =$

A) $\frac{7}{25}$ B) $\frac{24}{25}$ C) $\frac{25}{24}$ D) $\frac{25}{7}$

80) The vector component of \vec{b} perpendicular to \vec{a} is

A) $(\vec{b} \cdot \vec{c})\vec{a}$ B) $\frac{\vec{a} \times (\vec{b} \times \vec{a})}{|\vec{a}|^2}$ C) $\vec{a} \times (\vec{b} \times \vec{a})$ D) $(\vec{b} \times \vec{a})$

81) When a ball is thrown up vertically with velocity V_0 , it reaches a maximum height of 'h'. If one wishes to triple the maximum height then the ball should be thrown with velocity

A) $\sqrt{3}V_0$ B) $3V_0$ C) $9V_0$ D) $\frac{3}{2}V_0$

82) From the top of a building 9.8 m high, a ball is thrown horizontally which hits the ground at a distance. The line joining the top of a building to the point where the ball hits the ground makes an angle of 45° with the ground, the initial velocity of projection of the ball is

- A) 4.9 m s^{-1} B) $4.9 \sqrt{2} \text{ m s}^{-1}$ C) 9.8 m s^{-1} D) $9.8 \sqrt{2} \text{ m s}^{-1}$

83) A force acts for 0.5s on a body of mass 1.5kg initially at rest. When the force ceases to act, the body is found to cover a distance of 5m in 2s. The magnitude of the applied force is

- A) 5.0 N B) 10 N C) 12.5 N D) 7.5 N

84) An electric pump is used to fill an overhead tank of capacity 9 m^3 kept at a height 10 m above the ground. If the pump takes 5 minutes to fill the tank by consuming 10 kW power, the efficiency of the pump should be where $g = 10 \text{ m s}^{-2}$

- A) 60% B) 40% C) 20% D) 30%

85) A ball is dropped from a height 'h' on a floor of the coefficient of restitution 'e'. The total time covered by the ball just before the second hit is

- A) $e^2 \sqrt{\frac{2h}{g}}$ B) $(1 + 2e) \sqrt{\frac{2h}{g}}$ C) $2e \sqrt{\frac{2h}{g}}$ D) $\frac{e}{2} \sqrt{h}$

86) Three bodies of masses 1kg, 2kg, 3kg are acted upon by forces $(i + 2j)$, $(2j + 3k)$ and $(i - k)$ newton respectively. The magnitude of acceleration of centre of mass is

- A) $\sqrt{3}$ B) $2\sqrt{3}$ C) $\sqrt{\frac{2}{3}}$ D) $\frac{2}{\sqrt{3}}$

87) A block released from rest from the top of a smooth inclined plane of inclination 45° takes t seconds to reach the bottom. The same block released from rest from the top of a rough inclined plane of the same inclination of 45° takes $2t$ seconds to reach the bottom. The coefficient of friction is

- A) $\sqrt{0.5}$ B) $\sqrt{0.75}$ C) 0.5 D) 0.75

88) If the earth were suddenly shrunk to $\frac{1}{n}$ of its present radius without any change in its mass, the duration of the new day will be

- A) $\frac{24}{n} \text{ hrs}$ B) $\frac{24}{n^2} \text{ hrs}$ C) $24 n^2 \text{ hrs}$ D) $\frac{24}{\sqrt{n}} \text{ hrs}$

89) Two identical hollow spheres roll down two inclined planes of the same height but of different angles of inclination. Then they reach the bottom.

- A) With same speed and in same time B) With different speeds and in different time
C) With same speed but in different times D) With different speeds in same time

90) A stretched wire of some length under tension is vibrating with its fundamental frequency. Its length is decreased by 45% and tension is increased by 21%. Now its fundamental frequency.

- A) Increases by 50% B) Increases by 100% C) Decreases by 50% D) Decreases by 25%

91) A prism is made up of material of refractive index $\sqrt{3}$. The angle of the prism is A. If the angle of minimum deviation is equal to the angle of the prism, then the value of A is

- A) 30° B) 45° C) 60° D) 75°

92) In Young's experiment with one source and two slits, one of the slits is covered with black paper. Then

- A) The fringes will be darker B) the fringes will be narrower C) the fringes will be broader
D) No fringes will be obtained and the screen will have uniform illumination

93) A magnetic wire bent into an arc of a circle subtends 60° at the centre of curvature and has a magnetic moment of $24 A - m^2$, If it is made straight, the magnetic moment becomes

- A) $4\pi A - m^2$ B) $8\pi A - m^2$ C) $24\pi A - m^2$ D) $12\pi A - m^2$

94) A charge 'q' is placed at the centre of the open end of a cylindrical vessel. The flux of electric field through the surface of vessel is

- A) $\frac{q}{\epsilon_0}$ B) $\frac{q}{2\epsilon_0}$ C) $\frac{q}{3\epsilon_0}$ D) $\frac{q}{4\epsilon_0}$

95) Three charged particles are initially in position 1. They are free to move and they come in position 2 after some time. Let U_1 and U_2 be the electrostatic potential energies in position 1 and 2. Then

- A) $U_1 > U_2$ B) $U_2 > U_1$ C) $U_1 = U_2$ D) $U_2 \geq U_1$

96) The emf of a cell is $2V$ and its internal resistance is 2Ω . A resistance of 8Ω is joined to the battery in parallel. This is connected to the secondary circuit of a potentiometer. If $1V$ standard cell balances for 100 cm of potentiometer wire, the balance point of the above cell is

- A) 120 m B) 240 cm C) 160 cm D) 116 cm

97) If the displacement (x) and velocity (v) of a particle executing simple harmonic motion are related through the expression $4v^2 = 25 - x^2$, then its time period is

- A) π B) 2π C) 4π D) 6π

98) A wire is stretched by 5 mm when it is pulled by a certain force. If the wire of same material but of double the length and double the diameter be stretched by the same force, the elongation in wire will be

- A) 2.5 mm B) 5 mm C) 10 mm D) 40 mm

99) When a capillary tube of inner radius ' r ' is dipped vertically in a liquid having surface tension T and density ' ρ '. The heat evolved is where angle of contact = 0°

- A) $\frac{2\pi T}{\rho g}$ B) $\frac{\pi T^2}{\rho g}$ C) $\frac{2\pi T^2}{\rho g}$ D) $\frac{4\pi T^2}{\rho g}$

100) A tank of height 20m is full of water. There is a hole of a cross-sectional area 2 cm^2 in its bottom. The volume of water that will come out from this hole per second is ($g = 10\text{ m/sec}^2$)

- A) $4 \times 10^{-3}\text{ m}^3\text{ sec}^{-1}$ B) $2 \times 10^{-3}\text{ m}^3\text{ sec}^{-1}$ C) $0.5 \times 10^{-3}\text{ m}^3\text{ sec}^{-1}$
D) $10^{-3}\text{ m}^3\text{ sec}^{-1}$

101) The coefficient of real expansion of a liquid is found to be three times the coefficient of apparent expansion of the same liquid in a container. Then the ratio of the coefficient of linear expansion of the container to the coefficient of real expansion of the liquid is

- A) 2:9 B) 2:3 C) 1:3 D) 1:9

102) An air bubble doubles in radius on rising from the bottom of a lake to its surface. Assuming that the bubble rises slowly and the atmospheric pressure to be equal to the column of water of height H , the depth of the lake is

- A) $4H$ B) $5H$ C) $7H$ D) $14H$

103) A tap supplies water at $10^{\circ}C$ and another tap at $100^{\circ}C$. How much hot water in kilograms, must be taken so that we get $20kg$ water at $35^{\circ}C$?

- A) 7.2 B) 10 C) 5.6 D) 14.4

104) A vessel contains 15gm of a gas at a pressure P and temperature $327^{\circ}C$ the gas leaks through a small hole. The mass of the gas leaked out when the pressure is $\frac{P}{3}$ and the temperature is $300K$ is —

- A) 10 gm B) 5 gm C) 2.5 gm D) 9 gm

105) If the temperature of the sun were to increase from T to $2T$ and its radius from R to $2R$, then the ratio of the radiant energy received on earth to what it was previously will be

- A) 4 B) 16 C) 32 D) 64

106) In a particular system, the units of length, mass, and time are chosen to be 10 cm, 10 gm, and 0.1sec respectively. The unit of force in this system will be

- A) 0.1 N B) 1 N C) 10 N D) 100 N

107) The range of voltmeter of resistance 300Ω is $5V$. The resistance to be connected to convert it into an ammeter of range $5A$ is

- A) 1Ω in series B) 1Ω in parallel C) 0.1Ω in series D) 0.1Ω in parallel

108) In a series LCR circuit $R = 10\sqrt{3}\Omega$ and the impedance $Z = 20\Omega$. Then the phase difference between the current and the voltage is

- A) 60° B) 30° C) 45° D) 90°

109) If λ_0 is the de-Broglie wavelength for a proton accelerated through a potential difference of $100V$. The de-Broglie wavelength for α – particle accelerated through the same potential difference is

- A) $2\sqrt{2}\lambda_0$ B) $\frac{\lambda_0}{2}$ C) $\frac{\lambda_0}{2\sqrt{2}}$ D) $\frac{\lambda_0}{\sqrt{2}}$

110) The de - Broglie wavelength of a particle moving with a velocity $225 \times 10^8 \text{ m/s}$ is equal to the wavelength of a photon. The ratio of kinetic energy of the particle to the energy of the photon is

- A) $\frac{1}{8}$ B) $\frac{3}{8}$ C) $\frac{5}{8}$ D) $\frac{7}{8}$

111) The width of forbidden gap in silicon crystal is 1.1eV. When the crystal is converted into P-type semiconductor, then the distance of fermi energy level from valance band is

- A) equal to 0.55eV B) equal to 1.1eV C) less than 0.55eV D) greater than 0.55eV

112) If the height of the transmitting tower increases by 44% then the area to be covered increases by

- A) 22 % B) 44 % C) 66% D) 88%

113) If ${}_{92}\text{U}^{238}$ changes to ${}_{85}\text{At}^{210}$ by a series of α and β decays, the number of α and β decays undergone is

- A) 7 & 5 B) 7 & 7 C) 5 & 7 D) 7 & 9

114) The potential barrier in the depletion layer is due to

- A) ions B) holes C) electrons D) both 2 and 3

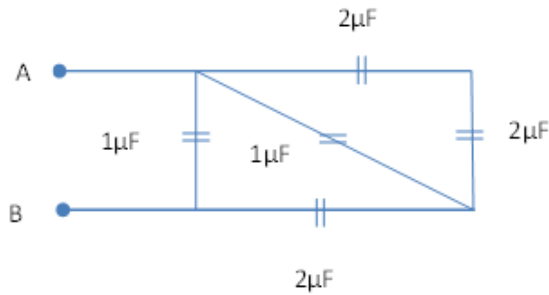
115) Four point charges 2C, -3C, -4C & 5C respectively are placed at the corner of a square. If \vec{E} & V represent the electric field strength & potential at the centre of square then

- A) $\vec{E} = 0, V = 0$ B) $|\vec{E}| = 0, V \neq 0$ C) $|\vec{E}| \neq 0, V = 0$ D) $|\vec{E}| \neq 0, V \neq 0$

116) A transverse wave is described by the equation $y = y_0 \sin 2\pi(ft - \frac{x}{\lambda})$. The maximum particle velocity is equal to four times the wave velocity if

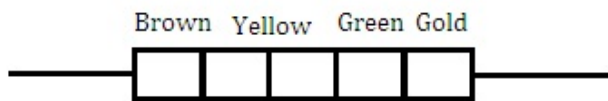
- A) $\lambda = \frac{\pi y_0}{4}$ B) $\lambda = \frac{\pi y_0}{2}$ C) $\lambda = \pi y_0$ D) $\lambda = 2\pi y_0$

117) The total capacity of the system in the figure between A and B is



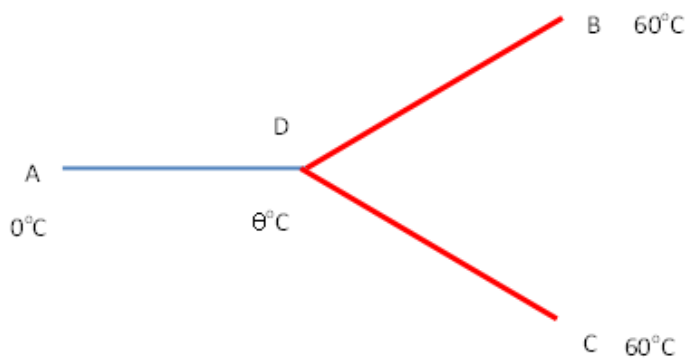
- A) $1\mu F$ B) $2\mu F$ C) $3\mu F$ D) $4\mu F$

118) Suppose the colors on the resistor as shown in the figure are brown, yellow, green, and gold as read from left to right. Find the resistance of the resistor.



- A) $(1.4 \pm 0.07) M\Omega$ B) $(1.4 \pm 0.07) K\Omega$ C) $(1.5 \pm 0.05) M\Omega$ D) $(1.4 \pm 0.05) G\Omega$

119) Three rods made of the same material and the same length and cross-sectional areas are joined as shown in the figure. The temperature of the junction D of three rods is



- A) $40^{\circ}C$ B) $50^{\circ}C$ C) $60^{\circ}C$ D) $80^{\circ}C$

120) A parallel plate condenser has conducting plates of radius 12cm separated by a distance of 5mm. It is charged with a constant charging current of 0.16 A, the rate at which the potential difference between the plates change is

- A) $1 \times 10^9 V s^{-1}$ B) $2 \times 10^{10} V s^{-1}$ C) $3 \times 10^{12} V s^{-1}$ D) $2 \times 10^9 V s^{-1}$

121) The atomic radius of elements of which of the following series would be nearly the same

- A) Na, K, Rb, Cs B) Li, Be, B, C C) Fe, Co, Ni, Cu D) F, Cl, Br, I

122) An example for AB_3E_2 representation is

- A) SO_3 B) XeO_3 C) ClF_3 D) BrF_5

123) Non polar molecule among the following compounds is

- A) CCl_4 B) SF_4 C) H_2S D) NCl_3

124) If the wave length of electron and its velocity is numerically same then

- A) $\lambda = \frac{h}{m}$ B) $\lambda = \sqrt{\frac{h}{m}}$ C) $\lambda = \sqrt{\frac{h}{p}}$ D) $\lambda = \frac{h}{m^2}$

125) Which of the following is optically active?

- A) 2-chloro butane B) 1- chloro butane C) 1- chloro propane D) tert. butyl chloride

126) The compound with a lower boiling point is

- A) n - pentane B) neopentane C) Isopentane D) n-hexane

127) Which of the following has acidic hydrogen and liberates H_2 gas with sodium

- A) $CH_3HC = CH_2$ B) $CH \equiv CH$ C) $CH_3 - C \equiv C - CH_3$ D) $CH_2 = CH_2$

128) The volume of H_2 at STP required to convert 14 gm of N_2 completely into NH_3 is

- A) 11.2 lit B) 22.4 lit C) 33.6 lit D) 44.8 lit

129) Fluorine is passed into cold dilute $NaOH$ solution. What are the oxidation numbers of fluorine in the products formed ?

- A) + 1, + 3 B) + 1, + 5 C) -1, + 3 D) -1, -1

130) The following relationship is correct between critical pressure (P_c), critical temperature, (T_c) and critical volume (V_c)

- A) $P_c V_c = \frac{3}{2} RT_c$ B) $P_c V_c = RT_c$ C) $P_c V_c = \frac{3}{8} RT_c$ D) $P_c V_c = \frac{8}{3} RT_c$

131) Which of the following artificial sweetener is a chloro derivative of sucrose

- A) Alitame B) Aspartame C) Saccharine D) Sucralose

132) The hybridisation of chlorine in $HClO_3$ molecule is

- A) sp B) sp^2 C) sp^3 D) $sp^3 d$

133) Assertion(A): Nitrogen cannot form NCl_5 but phosphorus gives PCl_5

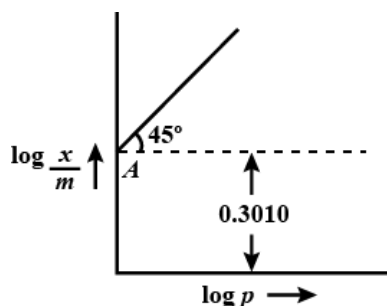
Reason(R): Nitrogen has no vacant 'd' orbitals but phosphorus has vacant d orbitals

- A) A, R are true and R is a correct explanation of A
 B) A, R are true but R is not correct explanation of A C) A is true, R is false
 D) A is false, R is true

134) The hydrogen electrode is dipped in a solution of $p^H = 3$ at $25^\circ C$. The potential of the cell would be

- A) 0.277 V B) 0.087 V C) -0.177 V D) 0.059 V

135) Graph between $\log(x/m)$ and $\log p$ is a straight line at angle 45° with intercept OA as shown in figure. Then (x/m) at a pressure of 2 atm is



- A) 2 B) 4 C) 8 D) 1

136) In the dissociation of $CaCO_3$ in a closed vessel, the forward reaction is favoured by

- A) adding some more $CaCO_3$ B) adding CaO C) increasing the pressure
D) removing CO_2

137) The most unsymmetric crystal system is

- A) Hexagonal B) Triclinic C) Monoclinic D) Orthorhombic

138) Which of the following is a nonreducing sugar?

- A) Glucose B) Sucrose C) Fructose D) Maltose

139) In the complex $K_2[Ni(CN)_4]$, oxidation state of nickel is

- A) +2 B) +4 C) +1 D) 0

140) Molar conductance of $Al_2(SO_4)_3$ is $x \text{ ohm}^{-1} \text{ cm}^2 \text{ mol}^{-1}$. Its equivalent conductance is

- A) $\frac{x}{6}$ B) $6x$ C) $\frac{x}{3}$ D) $3x$

141) The compound which can exchange more hydrogens with D_2O is

- A) H_3PO_3 B) H_3PO_2 C) CH_3COOH D) H_3PO_4

142) $SiO_2 + HF(\text{excess}) \rightarrow X + H_2O$

The product 'X' and covalency of the central atom in X are respectively

- A) Orthosilicic acid, 4 B) Silicon tetrafluoride, 6 C) Hydrofluorosilicic acid, 6
D) Pyrosilicic acid, 6

143) The most abundant inert gas in atmosphere and most reactive inert gas are respectively

- A) Ar, He B) Ar, Xe C) Xe, Ar D) Xe, He

144) A salt 'X' gives a white precipitate with $NaOH$ & the precipitate dissolves in excess $NaOH$. The salt 'X' is

- A) $FeSO_4$ B) $FeCl_3$ C) $ZnCl_2$ D) $MnSO_4$

145) The biodegradable polymer used in making capsules is

- A) PHBV B) Poly glycolic acid C) Dextran D) Silicone elastomer

146) In the reaction $Na_2S_2O_3 + Cl_2 + H_2O \rightarrow Na_2SO_4 + S + 2HCl$, the equivalent weight of hypo is (molecular wt = 248)

- A) 158 B) 79 C) 248 D) 124

147) White bauxite is purified by

- A) Bayer's process B) Hall's process C) Serpeck's process D) Hoopes process

148) The work done on the surroundings is 9 joules. 45J heat is supplied to the system. The change in internal energy is

- A) -36J B) -54J C) +36J D) +54 J

149) The mole fraction of urea in 2 molal aqueous solutions is

- A) 0.0348 B) 0.9652 C) 0.2000 D) 0.8000

150) Which of the following solutions can exactly neutralize 2 gms. of $NaOH$?

- A) 25ml of 0.1 N acid B) 250ml of 0.2N acid C) 100ml of 2.5 N acid D) all the above

151) The solubility of calcium phosphate in water is $x' \text{ mol } L^{-1}$ at $25^\circ C$. Its solubility product is equal to

- A) $108x^2$ B) $36x^3$ C) $36x^5$ D) $108x^5$

152) $C_6H_5 - OH + CHCl_3 + 3NaOH \xrightarrow{65^\circ C} X + 3NaCl + 2H_2O$ The compound 'X'

- A) has intramolecular hydrogen bond B) can be purified by steam distillation C) is salicylaldehyde
D) all the above

153) $C_2H_5OH \xrightarrow{Na} A :$

$C_2H_5OH \xrightarrow[\text{Pyridine}]{SOCl_2} B :$

$A + B \rightarrow C.$

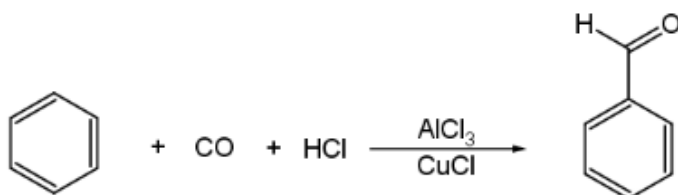
The final product 'C' forms an oxonium salt with strong mineral acids at low temperatures. The valency of Oxygen in the salt is

- A) 1 B) 2 C) 3 D) 4

154) Which of the following has zwitter ion structure

- A) p - cresol B) salicylic acid C) picric acid D) Sulphanilic acid

155)



- A) Cannizzaro's reaction B) Cross aldol condensation C) Gattermann – Koch reaction
D) Wacker's process

156) What percentage of acetic acid is used for cooking purposes & known as vinegar

- A) 6 to 10% B) 20% C) 98% D) 1%

157) A 0.1 g/cc Organic solution is placed in 2 decimeters long polarimeter tube showed an observed rotation $+6^\circ$. Specific rotation will be

- A) $+3^\circ$ B) $+30^\circ$ C) $+0.3^\circ$ D) $+60^\circ$

158) Rectified spirit is a mixture of

- A) 50% ethyl alcohol and 50% water B) 98% Ethyl alcohol and 2 % water
C) 95.6 % ethyl alcohol and 4.4% water D) 95.6 % water and 4.4% ethyl alcohol

159) For an ionic crystal of general formula AX and co-ordination number 6, the value of radius ratio will be

- A) Greater than 0.73 B) In between 0.732 and 0.414 C) In between 0.41 and 0.22
D) Less than 0.22

160) An explosive compound (A) reacts with water to produce NH_4OH and $HOCl$. Then, the compound (A), is

- A) TNG B) NCl_3 C) PCl_3 D) HNO_3