MATHS

BOOKS - SAI MATHS (TELUGU ENGLISH)

EAMCET -2016 (AP)

Mathematics

1. The domain of the function $f(x) = \sqrt{\log_{0.5} X!}$

A. $\{0, 1, 2, 3, \ldots\ldots\}$

B. $\{1, 2, 3, \ldots\ldots\ldots\}$

C. $\{0, \propto\}$

D. $\{0, 1\}$.

Answer: D

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2. If $f(x) = |x-1| + |x-2| + |x-3|, 2 < x < 3$, then f is

A. an onto function but not one-one

B. one -one function but not onto

C. a bijection

D. neither one-one nor onto

Answer: C

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3. The greatest positive integer which divides $(n+16)(n+17)(n+18)(n+19)$, for all positive integers n , is

A. 6

B. 24

C. 28

D. 20

Answer: B

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4. If a, b,c are distinct positive real numbers, then the vlaue of the determinant , $\begin{vmatrix} a & b & c \\ b & c & a \\ c & a & b \end{vmatrix}$.

A. < 0

B. > 0

C. 0

D. ≥ 0

Answer: A

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5. If x_1, x_2, x_3 as well as y_1, y_2, y_3 are in geometric progression with same common ratio thent he points $(x_1, y_1), (x_2, y_2), (x_3, y_3)$ are

A. vertices of an equilateral triangle

B. vertices of a right angled triangle

C. vertices of a right angled isosceles triangle

D. collinear

Answer: D

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6. The equations $x - y + 2z = 4$

$3x + y + 4z = 6$

$x + y + z = 1$ have

A. unique solution

B. infinitely many solutions

C. no solution

D. two solutions

Answer: B

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7. The locus of the point representing the complex number z for which $|z+3|^2 - |z-3|^2 = 15$ is

A. a circle

B. a parabola

C. a straight line

D. an ellipse

Answer: C

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8. $\frac{(1+i)^{2016}}{(1-i)^{2014}} =$

A. $-2i$

B. $2i$

C. 2

D. -2

Answer: A

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9. If $|z,| = 1, |z_2| = 2, |z_3| = 3$ and $|9z_1z_2 + 4z_1z_3 + z_2z_3| = 12$, then the value of $|z_1 + z_2 + z_3|$ is

A. 3

B. 4

C. 8

D. 2

Answer: D

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10. If $1, z_1 z_2, \ldots\ldots z_{n-1}$ are the $n^t h$ roots of unity, then $(1-z_1)(1-z_2)\ldots\ldots(1-z_{n-1}) = .$

A. 0

B. n

C. 8

D. 1

Answer: C

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11. If $12^{4+2x^2} = \left(24\sqrt{3}\right)^{3x^2-2}$, then x=

A. $\pm\sqrt{\frac{13}{12}}$

B. $\pm\sqrt{\frac{14}{5}}$

C. $\pm\sqrt{\frac{12}{13}}$

D. $\pm\sqrt{\frac{5}{14}}$.

Answer: B

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12. The product and sum of the roots of the equaiton $\left|x^2\right| - 5|x| - 24 = 0$ are respectively.

A. $-64, 0$

B. $-24, 5$

C. $5, \ -24$

D. $0, 72$

Answer: A

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13. The number of real roots of the equation $x^5 + 3x^3 + 4x + 30 = 0$ is

A. 1

B. 2

C. 3

D. 5

Answer: A

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14. If the coefficients of the equation whose roots are k times the roots of the equation $x^3 + \frac{1}{4}x^2 - \frac{1}{16}x + \frac{1}{144} = 0$, are integers then a possible value of k is

A. 3

B. 12

C. 9

D. 4

Answer: B

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15. The sum of all 40digits numbers that can be formed using the digits 2,3,4,5,6 without repetition, is

A. 533820

B. 532280

C. 533280

D. 532380

Answer: C

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16. If a set A has 5 elements , then the number of ways of selecting two subsets P and Q from A such that P and Q are mutually disjoint is

A. 64

B. 128

C. 243

D. 729

Answer: C

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17. The coefficient of x^4 in the expansion of $\left(1 - x + x^2 - x^3\right)^4$. Is

A. 31

B. 30

C. 25

D. -14

Answer: A

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18. If the middle term in the expansion of $(1+x)^{2n}$ is the greatest term, then x lies in the interval

A. $\left(\frac{n}{n+1}, \frac{n+1}{n}\right)$

B. $\left(\frac{n+1}{n}, \frac{n}{n+1}\right)$

C. $(n-2, n)$

D. $(n-1, n)$

Answer: A

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19. To find the coefficient of x^4 in the expansion of $\frac{3x}{(x-2)(x-1)}$, the interval in which the expansion is valid, is

A. $-2 < x < \propto$

B. $-\frac{1}{2} < x < \frac{1}{2}$

C. $-1 < x < 1$

D. $-\propto < x < \propto$

Answer: C

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20. If $(1+\tan\alpha)(1+\tan 4\alpha) = 2, \alpha\varepsilon\left(0, \frac{\pi}{6}\right)$, then $\alpha =$.

A. $\frac{\pi}{20}$

B. $\frac{\pi}{30}$

C. $\frac{\pi}{40}$

D. $\frac{\pi}{60}$

Answer: A

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21. If $\cos\theta = \frac{\cos\alpha - \cos\beta}{1 - \cos\alpha\cos\beta}$, then one of the vlaues of $\tan\left(\frac{\theta}{2}\right)$ is

A. $\cot.\frac{\beta}{2}\tan.\frac{\alpha}{2}$

B. $\tan\alpha\tan.\frac{\beta}{2}$

C. $\tan.\frac{\beta}{2}\cot.\frac{\alpha}{2}$

D. $\tan^2.\frac{\alpha}{2}\tan^2.\frac{\beta}{2}$

Answer: A

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22. The value of the expression $\frac{1+\sin 2\alpha}{\cos(2\alpha-2\pi)\tan\left(\alpha-\frac{3\pi}{4}\right)}-\frac{1}{4}\sin 2\alpha\left(\cot\frac{\alpha}{2}+\cot\left(\frac{3\pi}{2}+\frac{\alpha}{2}\right)\right)$ is

A. 0

B. 1

C. $\sin^2.\frac{\alpha}{2}$

D. $\sin^2\alpha.$

Answer: D

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23. If $\frac{1}{6}\sin\theta, \cos\theta$ and $\tan\theta$ are in geometric progression, then the solution set of θ is

A. $2n\pi\pm(\pi/6)$

B. $2n\pi\pm(\pi/3)$

C. $n\pi + (-1)^0(\pi \times 3)$

D. $n\pi + (\pi/3)$

Answer: B

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24. If $x = \sin(2\tan^{-1}2)$ and $y = \sin\left(\frac{1}{2}\tan^{-1}\frac{4}{3}\right)$ then

A. $x > y$

B. $x = y$

C. $x = 0 = y$

D. $x < y$

Answer: A

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25. If $\cos h(x) = \frac{5}{4}$, then $\cos h(3x) =$

A. $\frac{61}{16}$

B. $\frac{63}{16}$

C. $\frac{65}{16}$

D. $\frac{61}{63}$

Answer: C

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26. In ΔABC, if $x = \tan\left(\frac{B-C}{2}\right)\tan.\frac{A}{2}, y = \tan\left(\frac{C-A}{2}\right)\tan.\frac{B}{2}$ and $z = \tan\left(\frac{A-$

then $(x+y+z) =$.

A. xyz

B. $-xyz$

C. $2xyz$

D. $\frac{1}{2}xyz$

Answer: B

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27. In ΔABC, if the sides a,b,c are in geometric progression and the largest angle exceeds the smallest angle by 60°, then $\cos B$.

A. $\frac{\sqrt{13}+1}{4}$

B. $\frac{1-\sqrt{13}}{4}$

C. 1

D. $\frac{\sqrt{13}-1}{4}$

Answer: D

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28. In a ΔABC if $\angle A = 90^\circ$, then $\cos^{-1}\left(\frac{R}{r_2 + r_3}\right)$ is equal

A. 90°

B. 30°

C. 60°

D. 45°.

Answer: C

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29. The cartesian equation of the plane whose vector equation is

A. $2x + y = 5$

B. $2x - y = 5$

C. $2x - z = 5$

D. $2x + z = 5$.

Answer: D

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30. For three vectors $\bar{p}, \bar{q}$ and $\bar{r}$, if $\bar{r} = 3\bar{p} + 4\bar{q}$ and $2\bar{r} = \bar{p} - 3\bar{q}$ then

A. $|\bar{r}| < 2|\bar{q}|$ and $\bar{r}, \bar{q}$ have the same direction

B. $|\bar{r}| > 2|\bar{q}|$ and $\bar{r}, \bar{q}$ have opposite directions

C. $|\bar{r}| < 2|\bar{q}|$ and $\bar{r}, \bar{q}$ have opposite directions

D. $|\bar{r}| > 2|\bar{q}|$ and $\bar{r}, \bar{q}$ have same direction

Answer: B

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31. If $\bar{a} = 2\bar{i} + 3\bar{j} - 5\bar{k}, \bar{b} = m\bar{i} + n\bar{j} + 12\bar{k}$ and $\bar{a} \times \bar{b} = \bar{0}$ then $(m, n) =$.

A. $\left(\frac{-24}{5}, \frac{-36}{5}\right)$

B. $\left(\frac{-24}{5}, \frac{36}{5}\right)$

C. $\left(\frac{24}{5}, \frac{-36}{5}\right)$

D. $\left(\frac{24}{5}, \frac{36}{5}\right)$.

Answer: A

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32. If $|\bar{a}| = 3, |\bar{b}| = 4$ and the angle between $\bar{a}$ and $\bar{b}$ is 120°, then $|4\bar{a} + 3\bar{b}|$ is equal to

A. 25

B. 7

C. 13

D. 12

Answer: D

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33. If $\bar{a}, \bar{b}, \bar{c}$ are non-zero vectors such that $(\bar{a} \times \bar{b}) \times \bar{c} = \frac{1}{3}|\bar{b}||\bar{c}|\bar{a}, \bar{c} \perp$ and θ is the angle between the vectors $\bar{b}, \bar{c}$ then $\sin\theta =$.

A. $\frac{2\sqrt{2}}{3}$

B. $\frac{1}{3}$

C. $\frac{\sqrt{2}}{3}$

D. $\frac{2}{3}$

Answer: A

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34. If $a(\bar{\alpha} \times \bar{\beta}) + b(\bar{\beta} \times \bar{\gamma}) + c(\bar{\gamma} \times \bar{\alpha}) = 0$ and atleast one of the scalars a, b, c is non-zero, then the vectors $\bar{\alpha}, \bar{\beta}, \bar{\gamma}$ are

A. parallel

B. non coplanar

C. coplanar

D. mutually perpendicular

Answer: C

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35. If the mean of 10 observations is 50 and the sum of the squares of the deviations of the observations from the mean is 250 , such the coefficient of variation of those observations is

A. 25

B. 50

C. 10

D. 5

Answer: C

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36. The variance of the first 50 even natural numbers is

A. $\frac{833}{4}$

B. 833

C. 437

D. $\frac{437}{4}$

Answer: B

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37. 3 out of 6 vertices of a regular hexagon are chosen at a time at random. The probability that the triangle formed with these three vertices is an equilateral triangle , is

A. $\frac{1}{2}$

B. $\frac{1}{5}$

C. $\frac{1}{10}$

D. $\frac{1}{20}$

Answer: C

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38. A speaks truth in 75% of the cases and B in 80% of the cases. Then the probability that their statements about an incident do not match , is

A. $\frac{7}{20}$

B. $\frac{3}{20}$

C. $\frac{2}{7}$

D. $\frac{5}{7}$.

Answer: A

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39. If the mean and variance of a binomial distribution are 4 and 2 respectively , then the probability of 2 successes of that binomial variate X , is

A. $\frac{1}{2}$

B. $\frac{219}{256}$

C. $\frac{37}{256}$

D. $\frac{7}{64}$

Answer: D

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40. In a city 10 accidents take place in a span of 50 days. Assuming that the number of accidents follow the posion distribution, the probability that three or more accidents occur in a day, is

A. $\sum_{k=3}^{\infty} \frac{e^{-\lambda}\lambda^k}{k!}, \lambda = 0.2$

B. $\sum_{k=3}^{\infty} \frac{e^{-\lambda}\lambda^k}{k}, \lambda = 0.2$

C. $1 - \sum_{k=0}^{3} \frac{e^{-\lambda}\lambda_k}{k!}, \lambda = 0.2$

D. $\sum_{k=0}^{3} \frac{e^{-\lambda}\lambda_k}{k!}, \lambda = 0.2.$

Answer: A

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41. Equation of the locus of the centroid of the triangle whose vertices are $(a\cos k, a\sin k), (b\sin k, -b\cos k)$ and $(1, 0)$, where k is a perameter, is

A. $(1-3x)^2 + 9y^2 = a^2 + b^2$

B. $(3x-1)^2 + 9y^2 = 2a^2 + b^2$

C. $(3x+1)^2 + (3y)^2 = a^2 + b^2.$

D. $(3x+1)^2 + (3y)^2 = 3a^2 3b^2.$

Answer: A

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42. If the coordinate axes are rotated through an angle $\frac{\pi}{6}$ about the origin, then transformed equation of $\sqrt{3}x^2 - 4xy + \sqrt{3}y^2 = 0$ is

A. $\sqrt{3}y^2 + xy = 0$

B. $x^2 - y^2 = 0$

C. $\sqrt{3}y^2 - xy = 0$

D. $\sqrt{3}y^2 - 2xy = 0$

Answer: C

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43. If the lines $x + 3y - 9 = 0, 4x + by - 2 = 0,$ and $2x - y - 4 = 0$ are concurrent, then the equation of the line passing through the point

(b,0) and concurrent with the given lines, is

A. $2x + y + 10 = 0$

B. $4x - 7y + 20 = 0$

C. $x - y + 5 = 0$

D. $x - 4y + 5 = 0$

Answer: D

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44. The midpoint of the line segment joining the centroid and the orthocentre of the triangle whose vertices are $(a, b), (a, c)$ and (d, c) is

A. $\left(\frac{5a + d}{6}, \frac{b + 5c}{6}\right)$

B. $\left(\frac{a + 5d}{6}, \frac{5b + c}{6}\right)$

C. (a, c)

D. $(0, 0)$

Answer: A

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45. The distance from the orgin to the image of (1,1) with respect to the line $x + y + 5 = 0$ is

A. $7\sqrt{2}$

B. $3\sqrt{2}$

C. $6\sqrt{2}$

D. $4\sqrt{2}$.

Answer: C

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46. The equation of the pair of lines joining the origin to the points of intersection of $x^2 + y^2 = 9$ and $x + y = 3$, is

A. $x^2 + (3 - y)^2 = 9$

B. $(3 + y)^2 + y^2 = 9$

C. $x^2 - y^2 = 9$

D. $xy = 0$

Answer: D

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47. The orthocentre of the triangle formed by the lines $x + y =$ and $2y^2 - xy - 6x^2 = 0$ is

A. $\left(\frac{4}{3}, \frac{4}{3}\right)$

B. $\frac{2}{3}, \frac{2}{3}\Big)$

C. $\left(\frac{2}{3}, \frac{-2}{3}\right)$

D. $\left(\frac{4}{3}, \frac{-4}{3}\right)$

Answer: A

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48. Let L be the line joing the origin to the point of interesection of the lines represecnted by $2x^2 - 3xy - 2y^2 + 10x + 5y = 0$. If L is perpendicular to the line kx+y+3=0, then k=

A. $\frac{1}{2}$

B. $\frac{-1}{2}$

C. -1

D. $\frac{1}{3}$

Answer: B

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49. A circle S=0 with radius $\sqrt{2}$ touches the line x+y-2=0 at (1,1). Then the length of the tangent drawn from the point (1,2) to S=0 is

A. 1

B. $\sqrt{2}$

C. $\sqrt{3}$

D. 2

Answer: C

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50. The normal drawn at $P(-1, 2)$ on the circle $x^2 + y^2 - 2x - 2y - 3 = 0$ meets the circle at another point Q. Then the coordinates of Q are

A. (3,0)

B. $(-3, 0)$

C. $(2, 0)$

D. $(-2, 0)$

Answer: A

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51. If the lines $kx + 2y - 4 = 0$ and $5x - 2y - 4 = 0$ are conjugate with respect to the circle $x^2 + y^2 - 2x - 2y + 1 = 0$, then $k =$.

A. 0

B. 1

C. 2

D. 3

Answer: B

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52. The anlge between the tangents drawn from the origin to the circle $x^2 + y^2 + 4x - 6y + 4 = 0$ is

A. $\tan^{-1}\left(\frac{5}{13}\right)$

B. $\tan^{-1}\left(\frac{5}{12}\right)$

C. $\tan^{-1}\left(\frac{12}{5}\right)$

D. $\tan^{-2}\left(\frac{13}{5}\right)$

Answer: C

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53. If the angle between the circle $x^2 + y^2 - 2x - 4y + c = 0$ and $x^2 + y^2 - 4x - 2y + 4 = 0$ is 60°, then C is equal to

A. $\frac{3 \pm \sqrt{5}}{2}$

B. $\frac{6 \pm \sqrt{5}}{2}$

C. $\frac{9 \pm \sqrt{5}}{2}$

D. $\frac{7 \pm \sqrt{5}}{2}$

Answer: D

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54. A circle S cuts three circles $x^2 + y^2 - 4x - 2y + 4 = 0$

$x^2 + y^2 - 2x - 4y + 1 = 0$

and $x^2 + y^2 + 4x + 2y + 1 = 0$ orthogonally. Then the radius of S is

A. $\sqrt{\frac{29}{8}}$

B. $\sqrt{\frac{28}{11}}$

C. $\sqrt{\frac{29}{7}}$

D. $\sqrt{\frac{29}{5}}$.

Answer: A

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55. The distance between the vertex and the focus of the parabola $x^2 - 2x + 3y - 2 = 0$ is

A. $\frac{4}{5}$

B. $\frac{3}{4}$

C. $\frac{1}{2}$

D. $\frac{5}{6}$

Answer: B

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56. If (x_1, y_1) and (x_2, y_2) are the end points of a focal chord of the parabola $y^2 = 5x$, then $4x_1x_2 + y_1y_2 =$

A. 25

B. 5

C. 0

D. $\frac{5}{4}$

Answer: C

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57. The distance between the focii of the ellipse $x = 3\cos\theta, y = 4\sin\theta$ is

A. $2\sqrt{7}$

B. $7\sqrt{2}$

C. $\sqrt{7}$

D. $3\sqrt{7}$

Answer: A

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58. The equations of the latus recta of the ellipse $9x^2 + 25y^2 - 36x + 50y - 164 = 0$ are

A. $x - 4 = 0, x + 2 = 0$

B. $x - 6 = 0, x + 2 = 0$

C. $x + 6 = 0, x - 2 = 0$

D. $x + 4 = 0, x + 5 = 0.$

Answer: B

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59. The values of m for which the line $y = mx + 2$ becomes a tangent to the hyperbola $4x^2 - 9y^2 - 36$ is .

A. $\pm \frac{2}{3}$

B. $\pm \frac{2\sqrt{2}}{3}$

C. $\pm \frac{8}{9}$

D. $\pm \frac{4\sqrt{2}}{3}$

Answer: B

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60. The harmonic conjugate of (2,3,4) with respect to the points $(3, -2, 2), (6, -17, -4)$ is

A. $\left(\frac{1}{2}, \frac{1}{3}, \frac{1}{4}\right)$

B. $\left(\frac{18}{5}, -5, \frac{4}{5}\right)$

C. $\left(\frac{-18}{5}, \frac{5}{4}, \frac{4}{5}\right)$

D. $\left(\frac{18}{5}, -5\frac{-4}{5}\right)$.

Answer: B

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61. If a line makes angles $\alpha, \beta, \lambda, \delta$ with the 4 diagonals of a cube then $\sin^2\alpha + \sin^2\beta + \sin^2\lambda + \sin^2\delta$

A. $\frac{4}{3}$

B. $\frac{8}{3}$

C. $\frac{7}{3}$

D. $\frac{5}{3}$

Answer: B

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62. If the plane $56x + 4y + 9z = 2016$ meets the coordinate axes in A,B,C then the centroid of the triangle ABC is

A. $(12, 168, 224)$

B. $(12, 168, 112)$

C. $\left(12, 168, \frac{224}{3}\right)$

D. $\left(12, -168, \frac{224}{3}\right)$.

Answer: C

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63. The value (s) of x for which the function

$$f(x) = \begin{cases} 1-x & , \quad x < 1 \\ (1-x)(2-x) & : \quad 1 \leq x \leq 2 \\ x-3 & , \quad x > 2 \end{cases}$$ fails to be continuous is (are)

A. 1

B. 2

C. 3

D. All real numbers

Answer: B

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64. $Lt_{x \to 0} \frac{6^x - 3^x - 2^x + 1}{x^2} =$

A. $(\log_e 2)\log_e 3$

B. $\log_e 5$

C. $\log_e 6$

D. 0

Answer: A

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65. Define $f(x) = \begin{cases} x^2 + bx + c & ,x < 1 \\ x & ,x \geq 1 \end{cases}$. If f(x) is differentiable at $x = 1$, then $(b - c) =$

A. -2

B. 0

C. 1

D. 2

Answer: A

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66. If $x = a$ is a root of multiplicity two of a polynomial eqution $f(x) = 0$, then

A. $f'(a) = f(a) = 0$

B. $f(a) = f(a) = 0$

C. $f'(a) \neq 0 \neq f(a)$

D. $f(a) = f'(a) = 0, f(a) \neq 0$

Answer: D

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67. If $y = \log_2(\log_2 x)$, then $\frac{dy}{dx} =$

A. $\frac{\log_e 2}{x \log_e x}$

B. $\frac{1}{\log_e (2x)^2}$

C. $\frac{1}{(x \log_e x)\log_e 2}$

D. $\frac{1}{x(\log_2 x)^2}$.

Answer: C

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68. The angle of intersection between the curves $y^2 + x^a = a^2\sqrt{2}$ and $x^2 - y^2 = a^2$, is

A. $\frac{\pi}{3}$

B. $\frac{\pi}{4}$

C. $\frac{\pi}{6}$

D. $\frac{\pi}{12}$

Answer: B

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69. If $A > 0, B > 0$ and $A + B = \frac{\pi}{3}$, then the maximum value of $\tan A \tan B$ is

A. $\frac{1}{\sqrt{3}}$

B. $\frac{1}{3}$

C. $\frac{1}{2}$

D. $\sqrt{3}$

Answer: B

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70. The equation of the common tangent drawn to the curves $y^2 = 8x$ and $xy = -1$ is .

A. $y = 2x + 1$

B. $2y = x + 6$

C. $y = x + 2$

D. $3y = 8x + 2$

Answer: C

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71. Suppose $f(x) = x(x+3)(x-2), x \in [-1, 4]$. Then a value of c in $(-1, 4)$ satisfying $f'(c) = 10$ is .

A. 2

B. $\frac{5}{2}$

C. 3

D. $\frac{7}{2}$

Answer: A

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72. If $\int x^3 e^{5x} dx = \frac{e^{5x}}{5^4}(f(x)) + c$, then f(x)=

A. $\frac{x^3}{5} - \frac{3x^2}{5^2} + \frac{6x}{5^3} - \frac{6}{5^4}$

B. $5x^3 - 5^2x^2 + 5^3x - 6$

C. $5^2x^3 - 15x^2 + 30x - 6$

D. $5^3x^3 - 75x^2 + 30x - 6$

Answer: D

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73. $\int \frac{x}{(x^2 + 2x + 2)^2} dx =$

A. $\frac{x^2 + 2}{x^2 + 2x + 2} - \frac{1}{2}\tan^{-1}(x + 1) + c$

B. $\frac{x^2 + 2}{2(x^2 + 2x + 2)} - \frac{1}{2}\tan^{-1}(x - 1) + c$

C. $\frac{x^2 - 2}{4(x^2 + 2x + 2)} \frac{1}{2}\tan^{-1}(x + 1) + c$

D. $\frac{2(x - 1)}{(x^2 + 2x + 2)} + \frac{1}{2}\tan^{-1}(x + 1) + c$

Answer: C

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74. If $\int \log(a^2 + x^2)dx = h(x) + c$, then $h(x) =$

A. $x\log(a^2 + x^2) + 2\tan^{-1}\left(\frac{x}{a}\right)$.

B. $x^2\log(a^2 + x^2) + x + a\tan^{-1}\left(\frac{x}{a}\right)$

C. $x\log(a^2 + x^2) - 2x + 2a\tan^{-1}\left(\frac{x}{a}\right)$

D. $x^2\log(a^2 + x^2) + 2x - a^2\tan^{-1}\left(\frac{x}{a}\right)$.

Answer: C

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75. For $x > 0$, if $\int (\log x)^5 dx = x\left[A(\log x)^5 + B(\log x)^4 + C(\log x)^3 + D(\log x)^2 + E(\log x$ constant , then $A + B + C + D + E + F =$.

A. -44

B. -42

C. -40

D. 36

Answer: A

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76. The area included between the parabola $y = \frac{x^2}{4a}$ and the curve $y = \frac{8a^3}{(x^2 + 4a^2)}$ is

A. $a^2\left(2\pi + \frac{2}{3}\right)$

B. $a^2\left(2\pi - \frac{8}{3}\right)$

C. $a^2\left(\pi + \frac{4}{3}\right)$

D. $a^2\left(2\pi - \frac{4}{3}\right)$

Answer: D

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77. By the definition of the definite integral, the value of $\lim_{n \to \infty} \frac{1}{\sqrt{n^2-1}} + \ldots + \frac{1}{\sqrt{n^2-(n-1)^2}}$ is equal to

A. π

B. $\frac{\pi}{2}$

C. $\frac{\pi}{4}$

D. $\frac{\pi}{6}$

Answer: B

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78. $\int_{-\pi/4}^{\pi/4} \left(\frac{x + \frac{\pi}{4}}{2 - \cos 2x} \right) dx =$

A. $\frac{8\pi\sqrt{3}}{5}$

B. $\frac{2\pi\sqrt{3}}{9}$

C. $\frac{4\pi^2\sqrt{3}}{9}$

D. $\frac{\pi^2}{6\sqrt{3}}$.

Answer: D

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79. The solution of the differential equation $\left(1+y^2\right)+\left(x-e^{\tan^{-1}y}\right)\frac{dy}{dx}=0$, is

A. $xe^{(\tan^{-1})y}=\tan^{-1}y+c$

B. $xe^{2\tan^{-1}}y=e^{-\tan^{-1}y}+c$

C. $2xe^{\tan^{-1}y}=e^{2\tan^{-1}y}+c$

D. $x^2e^{\tan^{-1}y}=4e^{2\tan^{-1}y}+c$

Answer: C

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80. The solution of the differential equation $(2x-4y+3)\frac{dy}{dx}+(x-2y+1)=0$ is

A. $\log((2x-4y)+)=x-2y+c$

B. $\log[2(2x-4y)+]=2(x-2)+c$

C. $\log[2(x-2y+5]=2(x+y)+c$

D. $\log[4(x-2y)+5]=4(x+2y)+c.$

Answer: D

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Physics

1. Two trains, which are moving along different tracks in opposite directions are put on the same track by mistake: On noticing the mistake, when the trains are 300 m apart the drivers start slowing down the

trains. The graphs given below show decrease in their velocities as function of time. The separation between the trains when both have stopped is .

A. 120m

B. 20m

C. 60m

D. 280m

Answer: B

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2. A point object moves along an arc of a circle of radius 'R'. Its velocity depends upon the distance covered 'S' as V = $K\sqrt{S}$ where 'K' is a constant. If ' theta' is the angle between the total acceleration and tangential acceleration, then

A. $\tan\theta = \sqrt{\frac{S}{R}}$

B. $\tan\theta = \sqrt{\frac{S}{2R}}$

C. $\tan\theta = \frac{S}{2R}$

D. $\tan\theta = \frac{2S}{R}$.

Answer: D

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3. A body projected from the ground reaches a point 'X' in its path after 3 seconds and from there it reaches the ground after further 6 seconds. The vertical distance of the point 'X' from the ground is (acceleration due to gravity =$10ms^{-2}$)

A. 30m

B. 60m

C. 80m

D. 90m

Answer: D

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4. A particle of mass 'm' is suspended from a ceiling through a string of length 'L'. If the particle moes in a horizontal circle of radius 'r' as shown in the figure , then the speed of the particle is

A. $r\sqrt{\frac{g}{\sqrt{L^2-r^2}}}$

B. $r\sqrt{\frac{r}{\sqrt{L^2-r^2}}}$

C. $r\sqrt{\frac{g}{L^2-r^2}}$.

D. $g\sqrt{\frac{r}{L^2-r^2}}$.

Answer: A

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5. A particle is placed at rest inside a hollow hemisphere of radius 'R'. The co-efficient of friction between the particle and the hemisphere is $\mu = \frac{1}{\sqrt{3}}$ The maximum height upto which the particle can remain stationary is .

A. $\frac{R}{2}$

B. $\left(1 - \frac{\sqrt{3}}{2}\right)R$

C. $\frac{\sqrt{3}}{2}R$

D. $\frac{3R}{8}$.

Answer: B

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6. A 1 kg ball moving with a speed of $6ms^{-1}$ collides head on with a 0.5 kg ball moving in the opposite direction with a speed of $9ms^{-1}$. If the co-efficient of restitution is $\frac{1}{3}$, the energy lost in the collision is

A. $303.4J$

B. $66.7J$

C. $33.3J$

D. $67.8J$

Answer: C

View Text Solution

7. A ball is thrown vertically down from a height of 40m from the ground with an initial velocity .v.. The ball hits the ground, loses one-third of its total mechanical energy and rebounds back to the same height. If the acceleration due to gravity is $10ms^{-2}$, the value of .v. is

A. $5ms^{-1}$

B. $10ms^{-1}$

C. $15ms^{-1}$

D. $20ms^{-1}$.

Answer: D

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8. Three identical uniform thin metal rods from the three sides of an equilateral triangle. If the moment of interia of the system of these three rods about an axis passing through the centroid of the triangle and perpendicular to the plane of the triangle is 'n' times the moment of inertia of one rod separately about an axis passing through the centre of the rod and perpendicular to its length, the value of 'n' is

A. 3

B. 6

C. 9

D. 12

Answer: B

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9. Two smooth and similar right angled prisms are arranged on a smooth horizontal plane as shown in the figure. The lower prism has a mass '3' times upper prism. The prisms are held in an intial position as shown and are then released. As the upper prism touches the horizontal plane, the distance moved by the lower prism is

A. $a - b$

B. $\frac{a - b}{2}$

C. $\frac{b - a}{2}$

D. $\frac{a - b}{4}$

Answer: D

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10.

A. $2s, 2\sqrt{3}ms^{-1}$

B. $\frac{7}{22}s, 4\sqrt{3}ms^{-1}$

C. $\frac{22}{7}s, 2\sqrt{3}ms^{-1}$

D. $\frac{44}{7}s, 4\sqrt{3}ms^{-1}$.

Answer: C

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11. Two bodies of masses .m. and .9m. are placed at a distance .r.. The gravitational potential at a point on the line joining them, where gravitational field is zero, is (G is universal gravitational constant)

A. $\frac{-14Gm}{r}$

B. $\frac{-16Gm}{r}$

C. $\frac{-12Gm}{r}$

D. $\frac{-8Gm}{r}$

Answer: B

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12. When a load of 80N is suspended from a string, its length is 101mm. If a load of 100N is suspended , its length is 102mm. If a load of 160N is suspended from it, then length of the string is (Assume the area of cross-section unchanged)

A. 15.5cm

B. 13.5cm

C. 16.5cm

D. 10.5cm

Answer: D

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13. A sphere of material of relative density 8 has a concentric spherical cavity and just sinks in water. If the radius of the sphere is 2cm, then the volume of the cavity is

A. $\frac{76}{3}cm^3$

B. $\frac{79}{3}cm^3$

C. $\frac{82}{3}cm^3$

D. $\frac{88}{3}cm^3$.

Answer: D

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14. A hunter fired a metallic bullet of mass 'm' kg from a gun towards an obstacle and it just melts when it is stopped by the obstacle. The initial temperature of the bullet is $300K$. If $\frac{1^{th}}{4}$ of heat is absorbed by the obstacle, then the minimum velocity of the bullet is

[Melting point of bullet =600K,

Specific heat of bullet $= 0.3\text{cal g}^{-1}.^{0}C^{-1}$,

Latent heat of fusion of bullet $= 6calg^{-1}$].

A. $410ms^{-1}$

B. $260ms^{-1}$

C. $460ms^{-1}$

D. $310ms^{-1}$

Answer: A

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15. M' kg of water at 't' $.^{0}C$ is divided into two parts so that one part of mass 'm' kg when converted into ice at $0^{\circ}C$ would release enough heat to vapourise the other part, then $\frac{m}{M}$ is equal to

[Specific heat of water $= 1calg^{-1}.^{0}C^{-1}$,

Latent heat of fusion of ice $= 80calg^{-1}$,

Latent heat of steam $= 540calg^{-1}$].

A. $640 - t$

B. $\frac{720 - t}{640}$

C. $\frac{640 + t}{720}$

D. $\frac{640 - t}{720}$.

Answer: D

View Text Solution

16. A diatomic gas (γ = 1.4) does 300J work when it is expanded isobarically. The heat given to the gas in this process is

A. 1050 J

B. 950 J

C. 600 J

D. 550 J

Answer: A

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17. When the absolute temperature of the source of a Carnot heat engine is increased by 25%, its efficiency increases by 80%. The new efficiency of the engine is

A. $12\ \%$

B. $24\ \%$

C. $48\ \%$

D. $36\ \%$

Answer: D

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18. A cylinder of fixed capacity 67.2 litres contains helium gas at STP. The amount of heat needed to rise the temperature of the gas in the cylinder by $20^\circ C$ is (R = 8.31 $\mathrm{Jmol}^{-1}K^{-1}$)

A. 748 J

B. 374 J

C. 1000 J

D. 500 J

Answer: A

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19. For a certain organ pipe, three successive resonance frequencies are observed at 425, 595 and 765 Hz, respecitvely. The length of the pipe is

A. 0.5 m

B. 1m

C. 1.5m

D. 2m

Answer: B

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20. A student hlods a tuning fork oscillating at 170 Hz. He walks towards a wall at a constant speed of $2ms^{-1}$.The beat frequency observed by the student between the tuning fork and its echo is (Velocity of sound $= 342ms^{-1}$).

A. 2.5 Hz

B. 3Hz

C. 1Hz

D. 2Hz

Answer: D

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21. An infinitely long rod lies along the axis of a concave mirror of focal length 'f'. The nearer end of the rod is at a distance u, $(u > f)$ from the

mirror. It's image will have a length.

A. $\frac{uf}{u+f}$

B. $\frac{uf}{u-f}$

C. $\frac{f^2}{u+f}$

D. $\frac{f^2}{u-f}$

Answer: D

View Text Solution

22. In Young's double slit experiment red light of wavelength 6000Å is used and the n^th bright fringe is obtained at a point 'P' on the screen. Keeping the same setting , the source of light is replaced by green light of wavelength 5000Å and now $(n+1)^{th}$ bright fringe is obtained at the point P on the screen. The value of 'n' is .

A. 4

B. 5

C. 6

D. 3

Answer: B

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23. Two charges each of charge $+10\mu c$ are kept on Y-axis at y=-a and y=+ a respecitvely. Another point charge $-20\mu c$ is placed at the origin and given a small displacement $x(x << a0$ along X-axis. The force acting on the point charge is (x and a are in metres , $\frac{1}{4\pi\varepsilon_0} = 9 \times 10^9 Nm^2C^{-1}$).

A. $\frac{3.6x}{a^2}N$

B. $\frac{2.4x^2}{a}N$

C. $\frac{3.6x}{a^3}N$

D. $\frac{4.8x}{a^2}N.$

Answer: C

View Text Solution

24. Three identical charges, each $2\mu C$ lie at the vertices of a right angled triangle as shown in the figure. Forces on the charges at B due to the charges at A and C respectively are F_1 and F_2. The angle between their resultant force and F_2 is .

A. $\tan^{-1}\left(\frac{9}{16}\right)$

B. $\tan^{-1}\left(\frac{9}{7}\right)$

C. $\tan^{-1}\left(\frac{16}{9}\right)$

D. $\tan^{-1}\left(\frac{7}{9}\right)$.

Answer: C

View Text Solution

25. The figure shows equipotential surfaces concentric at 'O'. The magnitude of electric field at a distance 'r' meters from 'O' is

 .

A. $\frac{9}{r^2} Vm^{-1}$

B. $\frac{16}{r^2} Vm^{-1}$

C. $\frac{2}{r^2} Vm^{-1}$

D. $\frac{6}{r^2} Vm^{-1}$.

Answer: D

View Text Solution

26. A region contains a uniform electric field $\vec{E} = \left(10\hat{i} + 30\hat{j}\right) Vm^{-1}$. A and B are two points in the field at (1,2,0)m and (2,1,3)m respectively . The work done when a charge of 0.8 C moves from A to B in a parabolic path is

A. 8J

B. 80J

C. 40J

D. 16J

Answer: D

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27. When a long straight uniform rod is connected across an ideal cell, the drift velocity of electrons in it is v. If a uniform hole is made along the axis of the rod and the same battery is used, then the drift velocity of electrons becomes .

A. v

B. $> v$

C. $< v$

D. Zero

Answer: A

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28. In a meter bridge experiment , when a nichrome wire is in the right gap, the balancing length is 60 cm. When the nichrome wire is uniformaly stretched to increase its length by 20% and again connected in the right gap, the new balancing length is neraly.

A. 61cm

B. 31cm

C. 51cm

D. 41cm

Answer: C

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29. A loop of flexible conducting wire lies in a magnetic field of 2.0 T with its plane perpendicular to the field. The length of the wire is 1m. When a current of 1.1 A is passed through the loop, it opens into a circle, then the tension developed in the wire is

A. 0.15N

B. 0.25N

C. 0.35N

D. 0.45N

Answer: C

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30. A charge q is spread uniformly over an isolated ring of radius ' R'. The ring is rotated about its natural axis with an angular velocity $'\Omega'$. Magnetic dipole moment of the ring is

A. $\frac{q\omega R^2}{2}$

B. $\frac{q\omega R}{2}$

C. $q\omega R^2$

D. $\frac{q\omega}{2R}$.

Answer: A

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31. A magnetic dipole of moment $2.5Am^2$ is frcc to rotate about a vertical axis passing through its centre . It is released from East- West direction . Its kinetic energy at the moment it takes North - South position is $\left(B_H = 3 \times 10^{-5}T\right)$.

A. $50\mu J$

B. $100\mu J$

C. $175\mu J$

D. $75\mu J$.

Answer: D

View Text Solution

32. A branch of a circuit is shown in the figure. If current is decreasing at the rate of $10^3 As^{-1}$, the potential difference between A nad B is

 .

A. 1V

B. 5V

C. 10V

D. 2V

Answer: A

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33. The natural frequency of an LC circuits is 125 kHz. When the capacitor is totally filled with a dielectric material , the natural frequency decreases by 25 kHz. Dielectric constant of the material is nearly.

A. 3.33

B. 2.12

C. 1.56

D. 1.91

Answer: C

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34. Choose the correct sequence of the radiation source in increasing order of the wavelength of electromagneitc waves produced by them.

A. X-ray tube, Magnetron valve, Radio active source , Sodium lamp

B. Radio active source, X-ray tube, Sodium lamp Magnetron valve

C. X-ray tube, Magnetron valve, Sodium lamp, Radio active source

D. Magnetic valve, Sodium lamp, X-ray tube, Radio , active source.

Answer: B

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35. A photo sensitive metallic surface emits electrons when X-rays of wavelength 'λ' fall on it. The de Broglie wavelength of the emitted electrons is (Neglect the work function of the surface , m is mass of the electron. H-plank's constant , c-velocity of light).

A. $\sqrt{\frac{2mc}{h\lambda}}$

B. $\sqrt{\frac{h\lambda}{2mc}}$

C. $\sqrt{\frac{mc}{h\lambda}}$

D. $\sqrt{\frac{h\lambda}{me}}$.

Answer: B

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36. An electron in a hydrogen atom undergoes a transition from a higher energy level to a lower energy level. The incorrect statement of the following is .

A. Kinetic energy of the electron increases

B. Velocity of the electron increases

C. Angular momentum of the electron remains constant

D. Wavelength of de - Broglie wave associated with the motion of electron decreases.

Answer: C

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37. The radius of germanium (Ge) nuclide is measured to be twice the radius of ${}_{4}^{9}Be$. The number of nucleons in Ge will be

A. 72

B. 73

C. 74

D. 75

Answer: A

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38. For a common - emitter transistor amplifier, the current gain is 60. If the emitter current is 6.6 m A then its base current is

A. 6.492 m A

B. 0.108 m A

C. 4.208 m A

D. 0.343 m A

Answer: B

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39. If a transmitting antenna of height 105 m is placed on a hill, then its coverage area is

A. $4224km^2$

B. $3264km^2$

C. $6400km^2$

D. $4864km^2$.

Answer: A

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Chemistry

1. In which of the following the product of uncertainity in velocity and uncertaninity in position of a micro particle of mass 'm' is not less than

A. $h \times \frac{3\pi}{m}$

B. $\frac{h}{3\pi} \times m$

C. $\frac{h}{4\pi} \times \frac{1}{m}$

D. $\frac{h}{4\pi} \times m.$

Answer: C

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2. 

A. Wurtz- Fitting reaction

B. Wurtz reaction

C. Fitting reaction

D. Friedel-crafts reaction .

Answer: A

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3. Identify the name of the following reaction

A. Gatterman-Koch reaction

B. Gatterman reaction

C. Stephen reaction

D. Etard reaction

Answer: D

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