MATHS

BOOKS - SAI MATHS (TELUGU ENGLISH)

MOCK TEST 2

Maths

1. If $f: R \to R, S: R \to R$ are defined by f(x) = 3x-4, g(x) = 5x-1 then, $\left(fog^{-1}\right)(2)$ =

A. $\frac{11}{5}$

B. $-\frac{11}{5}$

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

D. $-\frac{1}{5}$

Answer: B

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2. The range of $y = 2x^2 + x + \dfrac{2}{2x^2 + x + 1}$ is

A. $\left(11 - \dfrac{\sqrt{2}}{7}, 11 + \dfrac{\sqrt{2}}{7}\right)$

B. $\left[11 - \dfrac{\sqrt{2}}{7}, 11 + \dfrac{\sqrt{2}}{7}\right]$

C. $\left(-11 + \dfrac{\sqrt{2}}{7}, -11 - \dfrac{\sqrt{2}}{7}\right)$

D. $\left[-11 + \dfrac{\sqrt{2}}{7}, -11 + \dfrac{\sqrt{2}}{7}\right]$

Answer: B

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3. $\sum\left(\dfrac{1^2 + 2^2 + 3^2 + \ldots. + n^2}{1 + 2 + 3 + \ldots. + n}\right)$

A. $n^2 + \dfrac{11}{12}n$

B. $n^2 - 2\dfrac{n}{6}$

C. $\frac{n^2+2n}{3}$

D. None

Answer: C

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4. If A = $\begin{bmatrix} 1 & 1 & 0 \\ 0 & 1 & 0 \\ 1 & 0 & 1 \end{bmatrix}$ then A^3 =

A. $\begin{bmatrix} 1 & 3 & 0 \\ 0 & 1 & 0 \\ 3 & 3 & 1 \end{bmatrix}$

B. $\begin{bmatrix} 1 & 0 & 3 \\ 3 & 1 & 3 \\ 0 & 0 & 1 \end{bmatrix}$

C. $\begin{bmatrix} 3 & 3 & 1 \\ 1 & 3 & 0 \\ 0 & 1 & 0 \end{bmatrix}$

D. $\begin{bmatrix} 3 & 1 & 0 \\ 3 & 3 & 1 \\ 1 & 0 & 0 \end{bmatrix}$

Answer: A

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5. If $\frac{1}{a}+\frac{1}{b}+\frac{1}{c}=0$ then $\begin{vmatrix} 1+a & 1 & 1 \\ 1 & 1+b & 1 \\ 1 & 1 & 1+c \end{vmatrix} =$

A. $-abc$

B. 0

C. abc

D. None

Answer: C

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6. If the system of equations $\lambda x+3y+z=0, 4x+\lambda y+3z=0, 2x+3y+\lambda z=0$ has non-trival solution, then $\lambda =$

A. 6

B. 3

C. 2

D. None

Answer: D

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7. If z_1, z_2, z_3 are collinear and $z_3 - \frac{z_1}{z_2 - z_1}$ is purely real, then $arg\left(z_3 - \frac{z_1}{z_2 - z_1}\right)$

A. 0

B. 1

C. 2

D. 3

Answer: A

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8. If ω, ω^2 are cube root of unity then, $\frac{\omega}{1} + \omega^2 + \frac{\omega}{1} + \omega =$

A. $-2\omega^2$

B. -2ω

C. 2

D. -2

Answer: D

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9. If z = 3 + 3i then, $z^2 + z + 15 =$

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10. If the area of the triangle on the complex plane formed by the points z ,iz and z+iz is 50 sq. units then |z| is

A. 15

B. 10

C. 5

D. None

Answer: B

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11. If A,B and C are the angles of a triangle such that cosA+cosB+cosC=0=sinA+sinB+sinC, then sin3A+sin3B+sin3C =

A. 1

B. 2

C. 0

D. 3

Answer: C

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12. If $x^2 + 3x + 2 = 0, x^2 + 6x + k = 0$ have a common root then p=

A. 10 (or) 16

B. 11 (or) 15

C. 8 (or) 4

D. 5 (or) 8

Answer: D

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13. If x is real , then the maximum value of $\frac{x^2 + 14x + 9}{x^2 + 2x + 3}$ is

A. 6

B. 8

C. 4

D. 2

Answer: C

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14. The condition that the roots of $x^3 + 3px^2 + 3qx + r = 0$ may be in A.P is

A. $2q^3 + r^2 = 3pqr$

B. $2p^3 + r = 3pq$

C. $p^3 r = q^3$

D. None

Answer: B

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15. The roots of $2x^5 + x^4 - 12x^3 - 12x^2 + x + 2 = 0$ are

A. $-1, \ -2, \ -\frac{1}{2}, 3 \pm \frac{\sqrt{5}}{2}$

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

C. $2, \frac{1}{2}, 3, \frac{1}{3}, 1$

D. $1, 2, \frac{1}{2}, 5 \pm \sqrt{11}\frac{i}{6}$

Answer: A

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16. How many numbers can be made with digit 3,4,5,6,7,8 lying between 3000 and 4000 which are divisible by 5 without repetition

A. 120

B. 60

C. 24

D. 12

Answer: D

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17. If $n_{p_r} = 840, n_{c_r} = 35$, then n is equal to

A. 1

B. 7

C. 4

D. 10

Answer: B

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18. The co-efficient of x^{11} in the expansion of $\left(1 + 3x + 2x^2\right)^6$ is

A. 216

B. 144

C. 576

D. 288

Answer: C

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19. $1+\frac{1}{3}x+\frac{1.4}{3.6}x^2+\frac{1.4.7}{3.6.9}x^3+\ldots.=$

A. $(1+x)^{\frac{1}{3}}$

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

C. $(1-x)^{-\frac{1}{3}}$

D. x

Answer: C

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20. The partial fractions of $\frac{1}{x^3(x+2)} =$

A. $\frac{1}{8}x + \frac{1}{4}x^2 + \frac{1}{2}x^3 - \frac{1}{8(x+2)}$

B. $\frac{1}{8}x - \frac{1}{4}x^2 + \frac{1}{2}x^3 - \frac{1}{8(x+2)}$

C. $\frac{1}{8}x + \frac{1}{4}x^2 + \frac{1}{2}x^3 + \frac{1}{8(x+2)}$

D. $\frac{1}{8}x - \frac{1}{4}x^2 - \frac{1}{2}x^3 + \frac{1}{8(x+2)}$

Answer: B

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21. If $70\sin^2\theta + 3\cos^2\theta = 4$, then $\tan\theta$

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

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

C. $\pm\sqrt{3}$

D. ± 1

Answer: A

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22. If $\begin{vmatrix} 1+\sin^2\theta & \cos^2\theta & 4\sin 4\theta \\ \sin^2\theta & 1+\cos^2\theta & 4\sin 4\theta \\ \sin^2\theta & \cos^2\theta & 1+4\sin 4\theta \end{vmatrix} = 0$, then the value of θ is

A. $7\frac{\pi}{24}$ or $11\frac{\pi}{24}$

B. $\frac{\pi}{24}$

C. $5\frac{\pi}{24}$

D. None

Answer: A

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23. $\tan\left[\frac{1}{2}\sin^{-1}\frac{2a}{1+a^2} + \frac{1}{2}\cos^{-1}\frac{1-a^2}{1+a^2}\right] =$

A. $1-\frac{a^2}{1+a^2}$

B. $2\frac{a}{1+a^2}$

C. $\frac{1+a^2}{1-a^2}$

D. $2\frac{a}{1}-a^2$

Answer: D

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24. If sin x cosh $y=\cos\theta,$ cos x sinh $y=\sin\theta$ then $\sinh^2$ y =

A. $\cosh^2 y$

B. $\cos^2 x$

C. $\sec^2 x$

D. $\cosh^2 x$

Answer: B

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25. If $m \cdot \tan(\theta - 30^\circ) = n \cdot \tan(\theta + 120^\circ)$, then $\cos 2\theta =$

A. $\sin 2\theta$

B. $\cos 2\theta$

C. $2\sin 2\theta$

D. $2\cos 2\theta$

Answer: D

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26. If $\tan\left(B - \frac{C}{2}\right) = x\frac{\cot A}{2}$, then x =

A. $a - \frac{b}{a+b}$

B. $b - \frac{c}{b+c}$

C. $c - \frac{a}{c+a}$

D. None

Answer: B

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27. If P_1, P_2, P_3 are altitudes of ΔABC from the vertices A,B,C and Δ is the area of triangle then, $\frac{1}{P_1^2} + \frac{1}{P_2^2} + \frac{1}{P_3^2} =$

A. $a^2 + b^2 + \frac{c^2}{4}\Delta^2$

B. $a^2 - b^2 - \frac{c^2}{\Delta^2}$

C. $a + b + \frac{c}{\Delta}$

D. $a^2 + b^2 + \frac{c^2}{\Delta^2}$

Answer: A

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28. From the top of a mast of 60 m height, the angle of depression of an object is 45°.The distance of the object from the ship is

A. 45 m

B. 80 m

C. 60 m

D. 90 m

Answer: C

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29. If the position vector of A,B,C are $2i + 3j + 4k, i + 2j, j + 2k$and $\overrightarrow{AB} = P\overrightarrow{AC}$ then P=

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

B. $\frac{1}{4}$

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

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

Answer: C

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30. If the position vectors of A, B are 2a - 3b, 3a + 2b respectively then the position of vector of C in AB produced such that AC = 2 AB is

A. 4a+7b

B. 5b-2a

C. 3a+2b

D. 3b-2a

Answer: A

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31. The vector equation of the linepassing through the point i+j-k and parallel to the vector 2i+3j-k is

A. r=(i+j-k)+t(2i+3j-k)

B. r=(i-j+k)+t(2i-3j-k)

C. r=(i-j-k)+t(2i-3j-k)

D. r=(-i-j+k)+t(-2i+3j+k)

Answer: A

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32. The length of projection of i+2j+3k in the direction of 3i-4j+5k is

A. $\sqrt{2}$

B. $\sqrt{3}$

C. 1

D. 2

Answer: A

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33. A unit vector perpendicular to each of the vector 3i+2j+4k and 2i+j-k is,

A. $\pm 6i + 8j + \frac{k}{\sqrt{101}}$

B. $\pm 6i - 8j + \frac{k}{\sqrt{104}}$

C. $\pm 6i - 8j - \frac{k}{\sqrt{101}}$

D. $\pm 6i - 8j - 4\frac{k}{\sqrt{101}}$

Answer: A

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34. The vector i+j+k,i+2j+3k,2i+3j+k are

A. Collinear

B. Non-coplanar

C. Coplanar

D. None

Answer: B

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35. The variance of 6,5,8,10,3,4,9,11 is

A. 8

B. 9

C. 7.5

D. 10

Answer: C

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36. If 6 cards are drawn at random, from a pack of cards, then the probability to get 3 red and 3 black cards is

A. $\frac{{}^{28}C_3 \times {}^{28}C_3}{{}^{56}C_6}$

B. None

C. $\frac{{}^{16}C_3 \times {}^{16}C_3}{{}^{32}C_6}$

D. $\frac{{}^{26}C_3 \times {}^{26}C_3}{{}^{52}C_6}$

Answer: D

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37. Let A,B,C are three events such that $P(A) = 0.2, P(B) = 0.5, P(C) = 0.6, P(A \cap B) = 0.15, P(A \cap C) = 0.2$,then,

A. $0.05 \leq P(B \cap C) \leq 0.5$

B. $0.03 \leq P(B \cap C) \leq 0.38$

C. $0.06 \leq P(B \cap C) \leq 0.24$

D. $0.04 \leq P(B \cap C) \leq 0.22$

Answer: C

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38. In a class, 40% students study botany, 25% Zoology and 15% bith Botany and Zoology.A student from the class is selected at random. The probability that he studies Botany,if it is known that he studies Zoology is

A. $\frac{1}{8}$

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

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

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

Answer: D

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39. There are 2 red, 4 green balls in bag A, bag B, there are 5 red and 7 green balls.If one ball is randomly replaced from A into B and a ball is drawn from B then the probability for the ball to be red is

A. $\frac{17}{40}$

B. $\frac{14}{40}$

C. $\frac{19}{45}$

D. $\frac{16}{39}$

Answer: D

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40. If X is random variable with distribution given below

x:1 2 3 4

P(X=x):k k 2k 3k

The value of k and its mean are

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41. If X is a poisson distribution such that P(X=1)=P(X=2)then,P(X=4)=

A. $\frac{1}{3}e^2$

B. $\frac{2}{3}e^2$

C. $\frac{4}{3}e^2$

D. none

Answer: B

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42. A(2, 1) and B(2, 3) are two points.If Pis a point such that PA + PB - 2, then the locus of P is

A. $4x^2 - 12y^2 - 16x + 124y - 69 = 0$

B. $4x^2 + 12y^2 - 16x - 124y + 69 = 0$

C. $4x^2 + 12y^2 + 16x - 124y + 69 = 0$

D. $4x^2 + 12y^2 + 16x + 124y - 69 = 0$

Answer: A

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43. The transformed equation of xy + 2x -5y - 11 = 0 when the origin is shifted to the point (2, 3) is,

A. xy-5x-3y + 16 = 0

B. xy+5x+3y - 16 = 0

C. xy+5x-3y - 16 = 0

D. xy-5x+3y + 16 = 0

Answer: C

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44. The area of the triangle formed by the line $\frac{x}{5}+\frac{y}{4}=1$ with the coordinate axes is

A. 20 sq.units

B. 15 sq.units

C. 5 sq.units

D. 10 sq.units

Answer: D

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45. The perpendicular distance of the straight line 3x + 4y- 8 = 0 from the point of intersection of the lines 3x + 2y + 4 = 0, 2x + 5y -1=0 is

A. $\frac{11}{5}$units

B. $\frac{12}{5}$units

C. $\frac{8}{5}$units

D. 2units

Answer: D

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46. The diagonal of a square is 8x- 15y =0 and one vertex of the square is (1, 2). The equations to the sides of the square passing through this vertex are

A. 23x+7y = 9, 7x-23y= 52

B. 23x+7y = 9, 7x-23y= 53

C. 22x + 8y=9, 22x- 8y =52

D. None

Answer: B

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47. The area of the triangle formed by the pair of lines $3x^2 + 8xy - 3y^2 = 0$ and the line 3x + 4y - 5 =0 is,

A. $\frac{3}{5} sq.\ units$

B. $\frac{5}{3} sq.\ units$

C. $\frac{4}{5} sq.\ units$

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

Answer: B

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48. If $x^2 - 10xy + 4y^2 + 6x + 2y + k = 0$ represents a pair of straight lines then, k=

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

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

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

D. None

Answer: A

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49. The equation of the circle concentric with $x^2 + y^2 - 2x + 8y - 23 = 0$ and passing through (2, 3) is

A. $x^2 + y^2 - 2x - 8y - 33 = 0$

B. $x^2 + y^2 + 6x - 4y - 12 = 0$

C. $x^2 + y^2 + x + 8y + 33 = 0$

D. $x^2 + y^2 - 6x + 4y - 12 = 0$

Answer: A

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50. If the tangent to the circle $x^2 + y^2 = 5$ at (1,-2) also touches the circle $x^2 + y^2 - 8x + 6y + 20 = 0$ then the point of contac tis

A. (-1, 0)

B. (1, 0)

C. (3,-1)

D. (5, 2).

Answer: C

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51. If the circles $x^2 + y^2 - 6x - 8y + c = 0$ and $x^2 + y^2 = 9$ have three common tangent then c=

A. 17

B. 19

C. 21

D. 20

Answer: C

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52. The equation of the circle which cuts orthogonally the circle $x^2 + y^2 - 4x + 2y - 7 = 0$ and having centre at (2, 3) is,

A. $3x^2 - 3y^2 + 2x - 12y + 2 = 0$

B. $x^2 + y^2 + 6x + 4y + 19 = 0$

C. $x^2 + y^2 - 2x + 4y + 2 = 0$

D. $x^2 + y^2 - 4x - 6y + 9 = 0$

Answer: D

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53. If (2, 1) is limiting point of coaxial system of which $x^2 + y^2 - 6x - 4y - 3 = 0$ is a member, then the other limiting point is

A. (-5,-6)

B. (-2,-3)

C. (3,2)

D. (5,6)

Answer: A

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54. The locus of the point of intersection of tangents to parabola $y^2 = 4(x + 1)$ and $y^2 = 8(x + 2)$ which are perpendicular to each other is

A. x-3=0

B. x+3=0

C. y-3=0

D. y+3=0

Answer: B

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55. If the normals at the points t_1 and t_2 on $y^2 = 4ax$ at the point t_3 on the parabola, the t_1t_2=

A. 4

B. 3

C. 2

D. $2t_3$

Answer: C

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56. The eccentricity of the ellipse $9x^2 + 16y^2 = 144$ is

A. $\frac{7}{4}$

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

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

D. $\frac{\sqrt{7}}{4}$

Answer: D

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57. The condition that the line $x\cos\alpha + y\sin\alpha = P$ may be a normal to the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ is

A. $\frac{a^2}{\cos^2\alpha} - \frac{b^2}{\sin^2\alpha} = \left(a^2 - \frac{b^2}{P^2}\right)^2$

B. $\frac{a^2}{\cos^2\alpha} - \frac{b^2}{\sin^2\alpha} = \left(a^2 + \frac{b^2}{P^2}\right)^2$

C. $\frac{a^2}{\cos^2\alpha} + \frac{b^2}{\sin^2\alpha} = \left(a^2 - \frac{b^2}{P^2}\right)^2$

D. $\frac{a^2}{\cos^2\alpha} + \frac{b^2}{\sin^2\alpha} = \left(a^2 + \frac{b^2}{P^2}\right)^2$

Answer: C

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58. The distance between the foci is $4\sqrt{13}$ and the length of conjugate axis is 8 then, the eccentricity of the hyperbola is

A. $\frac{\sqrt{15}}{4}$

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

C. $\frac{\sqrt{13}}{3}$

D. $\frac{\sqrt{13}}{2}$

Answer: C

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59. If the d.c.'s (l, m, n) of two lines are connected by the relations $l+m+n=0$ and $2mn+3\ln-5lm=0$ then the angle between

the lines is

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

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

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

D. None

Answer: A

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60. The plane 2x + 3y + kz - 7 = 0 is parallel to the line whose d.r's are (2,-3,1) then k=

A. 5

B. 10

C. 15

D. 20

Answer: A

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61. The centroid of the triangle formed by the points (1, 2,3), (2, 3, 1), (3, 1, 2) is

A. (1,1,1)

B. (2,2,2)

C. (1,2,2)

D. (3,1,3)

Answer: B

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62. $Lt_{x \to 0}\left(\frac{1-2\cos x+\cos 2x}{x^2}\right)$

A. 2

B. 3

C. -1

D. 0

Answer: C

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63. $Lt\left(x \to 2^{-}\right)\left\{x + (x - [x])^{2}\right\}=$

A. 3

B. 1

C. 2

D. None

Answer: A

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64. If

$$f(x) = \left\{\left(-2\sin x, f \text{ or } x \leq -\frac{\pi}{2}\right)\left(a\sin x + b, f \text{ or } -\frac{\pi}{2} < x < \frac{\pi}{2}\right)\right.$$

everywhere then the ordered pair(a,b) is

A. (-1,1)

B. (1,1)

C. (0,0)

D. None

Answer: A

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65. If $y = x\log\left|x + \sqrt{1+x^2}\right| - \sqrt{1+x^2}$ then $\frac{dy}{dx} =$

A. $\cos^{-1} hx$

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

C. $\cos ec^{-1} hx$

D. $\sin^{-1} hx$

Answer: D

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66. The derivative of $e^{\sin^{-1} x}$ w.r.t logx is

A. $\frac{e^{\sin^{-1} x}}{\sqrt{1+x^2}}$

B. $x\frac{e^{\sin^{-1} x}}{\sqrt{1+x^2}}$

C. $\frac{e^{\sin^{-1} x}}{\sqrt{1+x^2}}$

D. $x\frac{e^{\sin^{-1} x}}{\sqrt{1-x^2}}$

Answer: D

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67. If $y = ae^{nx} + be^{-nx}$ then $y_2 =$

A. $-n^2y$

B. ny

C. n^2y

D. $-ny$

Answer: C

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68. Equation of the tangent to the curve$y^2 = 4ax$ at $\left(at^2, 2at\right)$ is

A. $xt + y - 2at - at^3 = 0$

B. $x + yt = at^2$

C. $x - yt + at^2 = 0$

D. $xt - y - 2at - at^3 = 0$

Answer: C

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69. the side of a square is equal to the diameter of a circle. Ifthe side and radius change at the same rate then the ratio of the change of their areas is

A. $2:\pi$

B. $1:1$

C. $\pi:2$

D. $1:\pi$

Answer: A

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70. Verify Rolle's theorem for the function $f(x)=x(x+3)e^{-\frac{x}{2}}$ in [-3,0].

A. -2

B. 1

C. -1

D. 0

Answer: A

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71. Show that when the curved surface of a is right circular cylinder inscribed in a sphere of radius R is maximum , then the height of the cylinder is $\sqrt{2R}$.

A. $\sqrt{3}R$

B. $\sqrt{2}R$

C. 2R

D. R

Answer: B

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72. $\int\left(\sin 2\frac{x}{a\cos^2 x}+b\sin^2 x\right)dx =$

A. $\frac{1}{b}-a\log\left|a\cos^2 x-b\sin^2 x\right|+c$

B. $\frac{1}{b}-a\log\left|a\cos^2 x+b\sin^2 x\right|+c$

C. $\frac{1}{b}+a\log\left|a\cos^2 x+b\sin^2 x\right|+c$

D. $\frac{1}{b}+a\log\left|a\cos^2 x-b\sin^2 x\right|+c$

Answer: B

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73. $\int\frac{3x-4}{\sqrt{2x^2+4x+5}}dx =$

A. $\frac{3}{2}\sqrt{2x^2+4x+5}-\frac{7}{\sqrt{2}}\sin^{-1}\left(\sqrt{2}\frac{x-1}{\sqrt{3}}\right)+c$

B. $\frac{3}{2}\sqrt{2x^2+4x+5}+\frac{7}{\sqrt{2}}\sin^{-1}h\left(\sqrt{2}\frac{x+1}{\sqrt{3}}\right)+c$

C. $\frac{3}{2}\sqrt{2x^2+4x+5}-\frac{7}{\sqrt{2}}\sin^{-1}h\left(\sqrt{2}\frac{x+1}{\sqrt{3}}\right)+c$

D. $\frac{3}{2}\sqrt{2x^2+4x+5}+\frac{7}{\sqrt{2}}\sin^{-1}h\left(\sqrt{2}\frac{x-1}{\sqrt{3}}\right)+c$

Answer: C

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74. $\int\frac{1}{2\cos x+3\sin x+4}dx=$

A. $\frac{2}{\sqrt{3}}\tan^{-1}\left[\frac{1}{\sqrt{3}}\left(2\frac{\tan x}{2}+3\right)\right]+c$

B. $\frac{2}{\sqrt{3}}\tan^{-1}\left[\frac{1}{\sqrt{3}}\left(2\frac{\tan x}{2}-3\right)\right]+c$

C. $\frac{1}{\sqrt{3}}\tan^{-1}\left[\frac{1}{\sqrt{3}}\left(2\frac{\tan x}{2}+3\right)\right]+c$

D. None

Answer: A

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75. $\int e^x \left(\frac{2 + \sin 2x}{1 + \cos 2x} dx = \right.$

A. $e^x \cos 2x + c$

B. $e^x \cot x + c$

C. $2e^x \sec^2 x + c$

D. $e^x \tan x + c$

Answer: D

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76. $\int_0^{\pi} \sin^3 x \cos^4 x dx =$

A. $\frac{2}{35}$

B. $\frac{4}{35}$

C. $\frac{4}{30}$

D. $\frac{2}{30}$

Answer: B

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77. $Lt_{n\to\infty}\left[\frac{1}{3n+1}+\frac{1}{3n+2}+\ldots\ldots\ldots+\frac{1}{3n+n}\right]=$

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

B. $\log\left(\frac{1}{3}\right)$

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

D. 0

Answer: A

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78. The area of the region bounded by the curves $y=|x-1|$ and $y=3-|x|$ is

A. 1

B. 2

C. 3

D. 4

Answer: D

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79. The degree of the differential equation $\left[5+\frac{d^2y}{dx^2}\right]^{\frac{3}{2}}=\frac{dy}{dx}$

A. 1

B. 2

C. 3

D. None

Answer: C

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80. The solution of $\frac{dy}{dx} = \frac{x - 2y + 3}{2x - y + 5}$ is

A. $x^2 + 4xy - y^2 - 6x + 10y = c$

B. $x^2 + 4xy + y^2 - 6x - 10y = c$

C. $x^2 - 4xy - y^2 - 6x + 10y = c$

D. $x^2 - 4xy + y^2 + 6x - 10y = c$

Answer: D

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81. If $f: R \to R, S: R \to R$ are defined by f(x) = 3x-4, g(x) = 5x-1 then, $\left(fog^{-1}\right)(2)$ =

A. $\frac{11}{5}$

B. $-\frac{11}{5}$

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

D. $-\frac{1}{5}$

Answer: B

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82. The range of $y = 2x^2 + x + \frac{2}{2x^2 + x + 1}$ is

A. $\left(11 - \frac{\sqrt{2}}{7}, 11 + \frac{\sqrt{2}}{7}\right)$

B. $\left[11 - \frac{\sqrt{2}}{7}, 11 + \frac{\sqrt{2}}{7}\right]$

C. $\left(-11 + \frac{\sqrt{2}}{7}, -11 - \frac{\sqrt{2}}{7}\right)$

D. $\left[-11 + \frac{\sqrt{2}}{7}, -11 + \frac{\sqrt{2}}{7}\right]$

Answer: B

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83. $\sum\left(\frac{1^2+2^2+3^2+\ldots.+n^2}{1+2+3+\ldots.+n}\right)$

A. $n^2+\frac{11}{12}n$

B. $n^2-2\frac{n}{6}$

C. $n^2+2\frac{n}{3}$

D. None

Answer: C

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84. If A = $\begin{bmatrix}1&1&0\\0&1&0\\1&0&1\end{bmatrix}$ then A^3 =

A. $\begin{bmatrix}1&3&0\\0&1&0\\3&3&1\end{bmatrix}$

B. $\begin{bmatrix}1&0&3\\3&1&3\\0&0&1\end{bmatrix}$

C. $\begin{bmatrix}3&3&1\\1&3&0\\0&1&0\end{bmatrix}$

D. $\begin{bmatrix} 3 & 1 & 0 \\ 3 & 3 & 1 \\ 1 & 0 & 0 \end{bmatrix}$

Answer: A

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85. If $\frac{1}{a}+\frac{1}{b}+\frac{1}{c}=0$ then $\begin{vmatrix} 1+a & 1 & 1 \\ 1 & 1+b & 1 \\ 1 & 1 & 1+c \end{vmatrix} =$

A. $-abc$

B. 0

C. abc

D. None

Answer: C

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86. If the system of equations $\lambda x + 3y + z = 0, 4x + \lambda y + 3z = 0, 2x + 3y + \lambda z = 0$ has non-trival solution, then $\lambda =$

A. 6

B. 3

C. 2

D. None

Answer: D

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87. If z_1, z_2, z_3 are collinear and $z_3 - \frac{z_1}{z_2 - z_1}$ is purely real, then $arg\left(z_3 - \frac{z_1}{z_2 - z_1}\right)$

A. 0

B. 1

C. 2

D. 3

Answer: A

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88. If ω, ω^2 are cube root of unity then, $\frac{\omega}{1} + \omega^2 + \frac{\omega}{1} + \omega =$

A. $-2\omega^2$

B. -2ω

C. 2

D. -2

Answer: D

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89. If z = 3 + 3i then, $z^2 + z + 15 =$

A. 12+3i

B. 12-3i

C. $-12 - 3i$

D. $-12 + 3i$

Answer: A

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90. If the area of the triangle on the complex plane formed by the points z ,iz and z+iz is 50 sq. units then |z| is

A. 15

B. 10

C. 5

D. None

Answer: B

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91. If A,B and C are the angles of a triangle such that cosA+cosB+cosC=0=sinA+sinB+sinC, then sin3A+sin3B+sin3C =

A. 1

B. 2

C. 0

D. 3

Answer: C

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92. If $x^2 + 3x - 2 = 0, x^2 + 6x + k = 0$ have a common root then p=

A. 10 (or) 16

B. 11 (or) 15

C. 8 (or) 4

D. 5 (or) 8

Answer: D

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93. If x is real , then the maximum value of $\frac{x^2+14x+9}{x^2+2x+3}$ is

A. 6

B. 8

C. 4

D. 2

Answer: C

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94. The condition that the roots of $x^3 + 3px^2 + 3qx + r = 0$ may be in A.P is

A. $2q^3 + r^2 = 3pqr$

B. $2p^3 + r = 3pq$

C. $p^3 r = q^3$

D. None

Answer: B

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95. The roots of $2x^5 + x^4 - 12x^3 - 12x^2 + x + 2 = 0$ are

A. $-1, \ -2, \ -\frac{1}{2}, 3 \pm \frac{\sqrt{5}}{2}$

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

C. $2, \frac{1}{2}, 3, \frac{1}{3}, 1$

D. $1, 2, \frac{1}{2}, 5 \pm \sqrt{11}\frac{i}{6}$

Answer: A

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96. How many numbers can be made with digit 3,4,5,6,7,8 lying between 3000 and 4000 which are divisible by 5 without repetition

A. 120

B. 60

C. 24

D. 12

Answer: D

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97. IF ${}^{n}P_{r} = 840, {}^{n}C_{r} = 35$ then n=

A. 1

B. 7

C. 4

D. 10

Answer: B

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98. The co-efficient of x^{11} in the expansion of $\left(1 + 3x + 2x^{2}\right)^{6}$ is

A. 216

B. 144

C. 576

D. 288

Answer: C

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99. $1+\frac{1}{3}x+\frac{1.4}{3.6}x^2+\frac{1.4.7}{3.6.9}x^3+\ldots.=$

A. $(1+x)^{\frac{1}{3}}$

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

C. $(1-x)^{-\frac{1}{3}}$

D. x

Answer: C

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100. The partial fractions of $\frac{1}{x^3(x+2)}=$

A. $\frac{1}{8}x+\frac{1}{4}x^2+\frac{1}{2}x^3-\frac{1}{8(x+2)}$

B. $\frac{1}{8}x - \frac{1}{4}x^2 + \frac{1}{2}x^3 - \frac{1}{8(x+2)}$

C. $\frac{1}{8}x + \frac{1}{4}x^2 + \frac{1}{2}x^3 + \frac{1}{8(x+2)}$

D. $\frac{1}{8}x - \frac{1}{4}x^2 - \frac{1}{2}x^3 + \frac{1}{8(x+2)}$

Answer: B

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101. If $7\sin^2\theta + 3\cos^2\theta = 4$, then $\tan\theta$

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

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

C. $\pm\sqrt{3}$

D. ± 1

Answer: A

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102. If $\begin{vmatrix} 1+\sin^2\theta & \cos^2\theta & 4\sin 4\theta \\ \sin^2\theta & 1+\cos^2\theta & 4\sin 4\theta \\ \sin^2\theta & \cos^2\theta & 1+4\sin 4\theta \end{vmatrix} = 0$, then the value of θ is

A. $7\frac{\pi}{24}$ or $11\frac{\pi}{24}$

B. $\frac{\pi}{24}$

C. $5\frac{\pi}{24}$

D. None

Answer: A

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103. $\tan\left[\frac{1}{2}\sin^{-1}\frac{2a}{1+a^2} + \frac{1}{2}\cos^{-1}\frac{1-a^2}{1+a^2}\right] =$

A. $1 - \frac{a^2}{1+a^2}$

B. $2\frac{a}{1+a^2}$

C. $\frac{1+a^2}{1-a^2}$

D. $2\frac{a}{1} - a^2$

Answer: D

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104. If sin x cosh $y = \cos\theta,$ cos x sinh $y = \sin\theta$ then $\sinh^2$ y =

A. $\cosh^2 y$

B. $\cos^2 x$

C. $\sec^2 x$

D. $\cosh^2 x$

Answer: B

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105. $m.\ (\tan\theta - 30) = n(\tan\theta + 120)$ then, $m + \frac{n}{m} - n =$

A. $\sin 2\theta$

B. $\cos 2\theta$

C. $2\sin 2\theta$

D. $2\cos 2\theta$

Answer: D

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106. If $\tan\left(B - \frac{C}{2}\right) = x\frac{\cot A}{2}$,then x =

A. $a - \frac{b}{a+b}$

B. $b - \frac{c}{b+c}$

C. $c - \frac{a}{c+a}$

D. None

Answer: B

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107. If P_1, P_2, P_3 are altitudes of ΔABC from the vertices A,B,C and Δ is the area of triangle then, $\frac{1}{P_1^2} + \frac{1}{P_2^2} + \frac{1}{P_3^2} =$

A. $a^2 + b^2 + \frac{c^2}{4}\Delta^2$

B. $a^2 - b^2 - \frac{c^2}{\Delta^2}$

C. $a + b + \frac{c}{\Delta}$

D. $a^2 + b^2 + \frac{c^2}{\Delta^2}$

Answer: A

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108. From the top of a mast of 60 m height, the angle of depression of an object is 45°.The distance of the object from the ship is

A. 45 m

B. 80 m

C. 60 m

D. 90 m

Answer: C

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109. If the position vector of A,B,C are $2i + 3j + 4k, i + 2j, j + 2k$and $\overrightarrow{AB} = P\overrightarrow{AC}$ then P=

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

B. $\frac{1}{4}$

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

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

Answer: C

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110. If the position vectors of A, B are 2a - 3b, 3a + 2b respectively then the position of vector of C in AB produced such that AC = 2 AB is

A. 4a+7b

B. 5b-2a

C. 3a+2b

D. 3b-2a

Answer: A

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111. The vector equation of the linepassing through the point i+j-k and parallel to the vector 2i+3j-k is

A. r=(i+j-k)+t(2i+3j-k)

B. r=(i-j+k)+t(2i-3j-k)

C. r=(i-j-k)+t(2i-3j-k)

D. r=(-i-j+k)+t(-2i+3j+k)

Answer: A

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112. The length of projection of i+2j+3k in the direction of 3i-4j+5k is

A. $\sqrt{2}$

B. $\sqrt{3}$

C. 1

D. 2

Answer: A

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113. A unit vector perpendicular to each of the vector 3i+2j+4k and 2i+j-k is,

A. $\pm\frac{-6i+11j-k}{\sqrt{158}}$

B. $\pm 6i-8j+\frac{k}{\sqrt{104}}$

C. $\pm 6i-8j-\frac{k}{\sqrt{101}}$

D. $\pm 6i-8j-4\frac{k}{\sqrt{101}}$

Answer: A

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114. The vector i+j+k,i+2j+3k,2i+3j+k are

A. Collinear

B. Non-coplanar

C. Coplanar

D. None

Answer: B

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115. The variance of 6,5,8,10,3,4,9,11 is

A. 8

B. 9

C. 7.5

D. 10

Answer: C

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116. If 6 cards are drawn at random, from a pack of cards, then the probability to get 3 red and 3 black cards is

A. $\frac{{}^{28}C_3 \times {}^{28}C_3}{{}^{56}C_6}$

B. None

C. $\frac{{}^{16}C_3 \times {}^{16}C_3}{{}^{32}C_6}$

D. $\frac{{}^{26}C_3 \times {}^{26}C_3}{{}^{52}C_6}$

Answer: D

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117. Let A,B,C are three events such that $P(A) = 0.2, P(B) = 0.5, P(C) = 0.6, P(A \cap B) = 0.15, P(A \cap C) = 0.2$,then,

A. $0.05 \leq P(B \cap C) \leq 0.5$

B. $0.03 \leq P(B \cap C) \leq 0.38$

C. $0.06 \leq P(B \cap C) \leq 0.24$

D. $0.04 \leq P(B \cap C) \leq 0.22$

Answer: C

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118. In a class, 40% students study botany, 25% Zoology and 15% bith Botany and Zoology.A student from the class is selected at random. The probability that he studies Botany,if it is known that he studies Zoology is

A. $\frac{1}{8}$

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

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

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

Answer: D

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119. There are 2 white , 4 black balls in urn A, In urn B, there are 5 white and 7 black balls. If one ball is randomly replaced from A and B , and a ball is drawn from B then the probability for the ball to be white one is

A. $\frac{17}{40}$

B. $\frac{14}{40}$

C. $\frac{19}{45}$

D. $\frac{16}{39}$

Answer: D

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120. If X is random variable with distribution given below

x:1 2 3 4

P(X=x):k k 2k 3k

The value of k and its mean are

A. $\frac{3}{19}, \frac{8}{19}$

B. $\frac{1}{19}, \frac{21}{19}$

C. $\frac{4}{19}, \frac{18}{19}$

D. $\frac{5}{19}, \frac{15}{19}$

Answer: B

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121. If X is a poisson distribution such that P(X=1)=P(X=2)then,P(X=4)=

A. $\frac{1}{3}e^2$

B. $\frac{2}{3}e^2$

C. $\frac{4}{3}e^2$

D. none

Answer: B

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122. A(2, 1) and B(2, 3) are two points.If Pis a point such that PA + PB - 2, then the locus of P is

A. $4x^2 - 12y^2 - 16x + 124y - 69 = 0$

B. $4x^2 + 12y^2 - 16x - 124y + 69 = 0$

C. $4x^2 + 12y^2 + 16x - 124y + 69 = 0$

D. $4x^2 + 12y^2 + 16x + 124y - 69 = 0$

Answer: A

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123. The transformed equation of xy + 2x -5y - 11 = 0 when the origin is shifted to the point (2, 3) is,

A. xy-5x-3y + 16 = 0

B. xy+5x+3y - 16 = 0

C. xy+5x-3y - 16 = 0

D. xy-5x+3y + 16 = 0

Answer: C

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124. The area of the triangle formed by the line $\frac{x}{5}+\frac{y}{4}=1$ with the coordinate axes is

A. 20 sq.units

B. 15 sq.units

C. 5 sq.units

D. 10 sq.units

Answer: D

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125. The perpendicular distance of the straight line 3x + 4y- 8 = 0 from the point of intersection of the lines 3x + 2y + 4 = 0, 2x + 5y -1=0 is

A. $\frac{11}{5}$units

B. $\frac{12}{5}$units

C. $\frac{8}{5}$units

D. $\frac{9}{5}$units

Answer: D

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126. The diagonal of a square is 8x- 15y =0 and one vertex of the square is (1, 2). The equations to the sides of the square passing through this vertex are

A. 23x+7y = 9, 7x-23y= 52

B. 23x+7y = 9, 7x-23y= 53

C. 22x + 8y=9, 22x- 8y =52

D. None

Answer: B

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127. The area of the triangle formed by the pair of lines $3x^2 + 8xy - 3y^2 = 0$ and the line 3x + 4y - 5 =0 is,

A. $\frac{3}{5} sq.\ units$

B. $\frac{5}{3} sq.\ units$

C. $\frac{4}{5} sq.\ units$

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

Answer: B

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128. If $x^2 - 10xy + 4y^2 + 6x + 2y + k = 0$ represents a pair of straight lines then, k=

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

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

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

D. None

Answer: A

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129. The equation of the circle concentric with $x^2 + y^2 - 2x + 8y - 23 = 0$ and passing through (2, 3) is

A. $x^2 + y^2 - 2x - 8y - 33 = 0$

B. $x^2 + y^2 + 6x - 4y - 12 = 0$

C. $x^2 + y^2 + x + 8y + 33 = 0$

D. $x^2 + y^2 - 6x + 4y - 12 = 0$

Answer: A

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130. If the tangent to the circle $x^2 + y^2 = 5$ at (1,-2) also touches the circle $x^2 + y^2 - 8x + 6y + 20 = 0$ then the point of contac tis

A. (-1, 0)

B. (1, 0)

C. (3,-1)

D. (5, 2).

Answer: C

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131. If the circles $x^2 + y^2 - 6x - 8y + c = 0$ and $x^2 + y^2 = 9$ have three common tangent then c=

A. 17

B. 19

C. 21

D. 20

Answer: C

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132. The equation of the circle which cuts orthogonally the circle $x^2 + y^2 - 4x + 2y - 7 = 0$ and having centre at (2, 3) is,

A. $3x^2 - 3y^2 + 2x - 12y + 2 = 0$

B. $x^2 + y^2 + 6x + 4y + 19 = 0$

C. $x^2 + y^2 - 2x + 4y + 2 = 0$

D. $x^2 + y^2 - 4x - 6y + 9 = 0$

Answer: D

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133. If (2, 1) is limiting point of coaxial system of which $x^2 + y^2 - 6x - 4y - 3 = 0$ is a member, then the other limiting point is

A. (-5,-6)

B. (-2,-3)

C. (3,2)

D. (5,6)

Answer: A

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134. The locus of the point of intersection of tangents to parabola $y^2 = 4(x+1)$ and $y^2 = 8(x+2)$ which are perpendicular to each other is

A. x-3=0

B. x+3=0

C. y-3=0

D. y+3=0

Answer: B

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135. If the normals at the points t_1 and t_2 on $y^2 = 4ax$ at the point t_3 on the parabola, the $t_1 t_2$=

A. 4

B. 3

C. 2

D. $2t_3$

Answer: C

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136. The eccentricity of the ellipse $9x^2 + 16y^2 = 144$ is

A. $\frac{7}{4}$

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

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

D. $\frac{\sqrt{7}}{4}$

Answer: D

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137. The condition that the line $x\cos\alpha + y\sin\alpha = P$ may be a normal to the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ is

A. $\frac{a^2}{\cos^2\alpha} - \frac{b^2}{\sin^2\alpha} = \left(a^2 - \frac{b^2}{P^2}\right)^2$

B. $\frac{a^2}{\cos^2\alpha} - \frac{b^2}{\sin^2\alpha} = \left(a^2 + \frac{b^2}{P^2}\right)^2$

C. $\frac{a^2}{\cos^2\alpha} + \frac{b^2}{\sin^2\alpha} = \left(a^2 - \frac{b^2}{P^2}\right)^2$

D. $\frac{a^2}{\cos^2\alpha} + \frac{b^2}{\sin^2\alpha} = \left(a^2 + \frac{b^2}{P^2}\right)^2$

Answer: C

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138. The distance between the foci is $4\sqrt{13}$ and the length of conjugate axis is 8 then, the eccentricity of the hyperbola is

A. $\frac{\sqrt{15}}{4}$

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

C. $\frac{\sqrt{13}}{3}$

D. $\frac{\sqrt{13}}{2}$

Answer: C

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139. If the d.c.'s (l, m, n) of two lines are connected by the relations $l+m+n=0$ and $2mn+3\ln-5lm=0$ then the angle between the lines is

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

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

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

D. None

Answer: A

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140. The plane 2x + 3y + kz - 7 = 0 is parallel to the line whose d.r's are (2,3,-1) then k=

A. 5

B. 10

C. 15

D. 20

Answer: B

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141. The centroid of the triangle formed by the points $(1, 2, 3), (2, 3, 1), (3, 1, 2)$ is

A. (1,1,1)

B. (2,2,2)

C. (1,2,2)

D. (3,1,3)

Answer: B

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142. $Lt_{x \to 0}\left(\frac{1-2\cos x+\cos 2x}{x^2}\right)$

A. 2

B. 3

C. -1

D. 0

Answer: C

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143. $Lt(x \to 2^-)\left\{x+(x-[x])^2\right\}=$

A. 3

B. 1

C. 2

D. None

Answer: A

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144. If

$$f(x) = \left\{\left(-2\sin x, f \text{ or } x \leq -\frac{\pi}{2}\right)\left(a\sin x + b, f \text{ or } -\frac{\pi}{2} < x < \frac{\pi}{2}\right)\right.$$

everywhere then the ordered pair(a,b) is

A. (-1,1)

B. (1,1)

C. (0,0)

D. None

Answer: A

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145. If $y = x\log\left|x + \sqrt{1+x^2}\right| - \sqrt{1+x^2}$ then $\frac{dy}{dx} =$

A. $\cos^{-1} hx$

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

C. $\cos ec^{-1} hx$

D. $\sin^{-1} hx$

Answer: D

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146. The derivative of $e^{\sin^{-1} x}$ w.r.t logx is

A. $\frac{e^{\sin^{-1} x}}{\sqrt{1+x^2}}$

B. $x\frac{e^{\sin^{-1}x}}{\sqrt{1+x^2}}$

C. $\frac{e^{\sin^{-1}x}}{\sqrt{1+x^2}}$

D. $x\frac{e^{\sin^{-1}x}}{\sqrt{1-x^2}}$

Answer: D

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147. If $y = ae^{nx} + be^{-nx}$ then $y_2 =$

A. $-n^2y$

B. ny

C. n^2y

D. $-ny$

Answer: C

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148. The equation of the tangent to the curve $y^2 = 4ax$ at $\left(at^2, 2at\right)$ is

A. $xt + y - 2at - at^3 = 0$

B. $x + yt = at^2$

C. $x - yt + at^2 = 0$

D. $xt - y - 2at - at^3 = 0$

Answer: C

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149. The side of a square is equal to the diametre of a circle. If the side and radius change at the same rate then the ratio of the change of their areas is

A. $2 : \pi$

B. $1 : 1$

C. $\pi : 2$

D. $1:\pi$

Answer: A

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150. Verify Rolle's theorem for the function $f(x) = x(x+3)e^{-\frac{x}{2}}$ in [-3,0].

A. -2

B. 1

C. -1

D. 0

Answer: A

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151. Show that when the curved surface of a is right circular cylinder inscribed in a sphere of radius R is maximum , then the height of the cylinder is $\sqrt{2R}$.

A. $\sqrt{3}R$

B. $\sqrt{2}R$

C. 2R

D. R

Answer: B

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152. $\int\left(\sin 2\frac{x}{a\cos^2 x}+b\sin^2 x\right)$dx =

A. $\frac{1}{b}-a\log\left|a\cos^2 x-b\sin^2 x\right|+c$

B. $\frac{1}{b}-a\log\left|a\cos^2 x+b\sin^2 x\right|+c$

C. $\frac{1}{b}+a\log\left|a\cos^2 x+b\sin^2 x\right|+c$

D. $\frac{1}{b} + a \log \left| a \cos^2 x - b \sin^2 x \right| + c$

Answer: B

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153. $\int \frac{3x - 4}{\sqrt{2x^2 + 4x + 5}} dx =$

A. $\frac{3}{2}\sqrt{2x^2 + 4x + 5} - \frac{7}{\sqrt{2}} \sin^{-1}\left(\sqrt{2}\frac{x - 1}{\sqrt{3}}\right) + c$

B. $\frac{3}{2}\sqrt{2x^2 + 4x + 5} + \frac{7}{\sqrt{2}} \sin^{-1} h\left(\sqrt{2}\frac{x + 1}{\sqrt{3}}\right) + c$

C. $\frac{3}{2}\sqrt{2x^2 + 4x + 5} - \frac{7}{\sqrt{2}} \sin^{-1} h\left(\sqrt{2}\frac{x + 1}{\sqrt{3}}\right) + c$

D. $\frac{3}{2}\sqrt{2x^2 + 4x + 5} + \frac{7}{\sqrt{2}} \sin^{-1} h\left(\sqrt{2}\frac{x - 1}{\sqrt{3}}\right) + c$

Answer: C

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154. $\int \frac{1}{2\cos x + 3\sin x + 4} dx =$

A. $\frac{2}{\sqrt{3}}\tan^{-1}\left[\frac{1}{\sqrt{3}}\left(2\frac{\tan x}{2}+3\right)\right]+c$

B. $\frac{2}{\sqrt{3}}\tan^{-1}\left[\frac{1}{\sqrt{3}}\left(2\frac{\tan x}{2}-3\right)\right]+c$

C. $\frac{1}{\sqrt{3}}\tan^{-1}\left[\frac{1}{\sqrt{3}}\left(2\frac{\tan x}{2}+3\right)\right]+c$

D. None

Answer: A

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155. $\int e^x\left(\frac{2+\sin 2x}{1+\cos 2x}dx=\right.$

A. $e^x\cos 2x+c$

B. $e^x\cot x+c$

C. $2e^x\sec^2 x+c$

D. $e^x\tan x+c$

Answer: D

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156. $\int_0^{\pi} \sin^3 x \cos^4 x dx =$

A. $\frac{2}{35}$

B. $\frac{4}{35}$

C. $\frac{4}{30}$

D. $\frac{2}{30}$

Answer: B

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157. $Lt_{n \to \infty} \left[\frac{1}{3n+1} + \frac{1}{3n+2} + \ldots\ldots\ldots + \frac{1}{3n+n} \right] =$

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

B. $\log\left(\frac{1}{3}\right)$

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

D. 0

Answer: A

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158. The area of the region bounded by the curves $y = |x - 1|$ and $y = 3 - |x|$ is

A. 1

B. 2

C. 3

D. 4

Answer: D

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159. The degree of the differential equation $\left[5+\frac{d^2y}{dx^2}\right]^{\frac{3}{2}}=\frac{dy}{dx}$

A. 1

B. 2

C. 3

D. None

Answer: C

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160. The solution of $\frac{dy}{dx}=\frac{x-2y+3}{2x-y+5}$ is

A. $x^2+4xy-y^2-6x+10y=c$

B. $x^2+4xy+y^2-6x-10y=c$

C. $x^2-4xy-y^2-6x+10y=c$

D. $x^2-4xy+y^2+6x-10y=c$

Answer: D

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Physics

1. When a big drop of water is formed from n small drops of water, the energy loss is 3E, where, E is the energy of the bigger drop. If the radius of the bigger drop is R and r is the radius of the smaller drop, then number of smaller drops (n) is

A. $4\frac{R}{r^2}$

B. $4\frac{R}{r}$

C. $2\frac{R^2}{r}$

D. $4\frac{R^2}{r^2}$

Answer: C

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2. Two litre glass flask contains some mercury. k is found that at all temperatures the volume of the air inside the flask remains the same. The volume of mercury inside the flask is $\left(a_g = 9 \times 10^{-6} \hat{} (\circ) C^{-1} \gamma_{Hg} = 1.8 \times 10^{-4} \hat{} (\circ) C^{-1}\right)$

A. 1500 CC

B. 150 CC

C. 300 CC

D. 3000 CC

Answer: B

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3. Two photons of energies twice and thrice the work function of a metal are incident on the metal surface .Then, the ratio of maximum velocities of the photoelectrons emitted in the two cases respectively ,is

A. $\sqrt{2}:1$

B. $\sqrt{3}:3$

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

D. $1:\sqrt{2}$

Answer: D

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4. A gas is compressed at a constant pressure of $50N/m^2$, from a volume $10m^3$ to a volume of $4m^3$. 100 J of heat is added to the gas then its internal energy.

A. Increases by 400 J

B. Increases by 200 J

C. Decreases by 400 J

D. Decreases by 200 J

Answer: A

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5. An ammeter whose resistance is 180Ω shows full scale deflection when the current is 2 mA. The shunt required to convert into an ammeter reading 20mA is (in ohm)

A. 18

B. 20

C. 0.1

D. 10

Answer: D

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6. Two bodies of mass 4 kg and 5 kg are moving along East and North directions with velocities 5 m//s and 3 m//s respectively. Magnitude of the velocity of centre of mass of the system is

A. $\frac{25}{9} m/s$

B. $\frac{9}{25} m/s$

C. $\frac{41}{9} m/s$

D. $\frac{16}{9} m/s$

Answer: A

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7. The frequency of vibration in a vibration magnetometer of the combination of two bar magnets of magnetic moments M_1 and M_2 is 6 Hz when like poles are tied and it is 2 Hz when the unlike poles are tied together, then the ratio $M_1 : M_2$ is

A. $4:5$

B. $5:4$

C. $1:3$

D. $3:1$

Answer: B

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8. A short magnetic needle is pivoted in a uniform magnetic field of induction IT. Now, simultaneously another magnetic field of induction sqrt3 T is applied at right angles to the first field , the needle defects through an angle theta whose value is

A. 30°

B. 45°

C. 90°

D. 60°

Answer: A

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9. Two litre glass flask contains some mercury. k is found that at all temperatures the volume of the air inside the flask remains the same. The volume of mercury inside the flask is $\left(a_g = 9 \times 10^{-6} \hat{} (\circ) C^{-1} \gamma_{Hg} = 1.8 \times 10^{-4} \hat{} (\circ) C^{-1}\right)$

A. 1500 CC

B. 150 CC

C. 300 CC

D. 3000 CC

Answer: B

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10. A mass kg is suspended by a weightless string. The horizontal force required to hold the mass at 60° with the vertical is

A. Mg

B. $Mg\sqrt{3}$

C. $Mg\left(\sqrt{3}+1\right)$

D. $M\frac{g}{\sqrt{3}}$

Answer: B

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11. If the equation of motion of a projectile is $y = 3x - \frac{1}{8}x^2$, the range and maximum height are respectively (y and x are in metres).

A. 18 m and 24 m

B. 24 m and 18 m

C. 24 m and 6 m

D. 12 m and 9 m

Answer: A

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12. If n_e and n_h are electron and hole concentrations in an extrinsic semiconductor and n_i is electron concentration in an intrinsic semiconductor then.

A. $\left(\frac{n_e}{n_h}\right) = n_i$

B. $(n_e + n_h) = n_i$

C. $(n_e - n_h) = n_i^2$

D. $(n_e n_h) = n_i^2$

Answer: A

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13. A radioactive nucleus can decay by two different processes. The half lives of the first and second decay processes are 5×10^3 and 10^5 years respectively, Then, the effective half-life of the nucleus is,

A. 105×10^5

B. 4762 yrs

C. 104 yrs

D. 47.6 yrs

Answer: A

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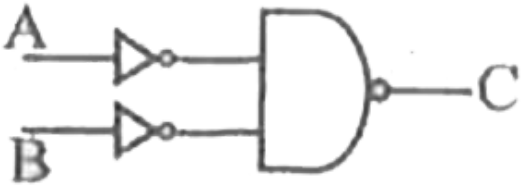
14. Which logic gate is represented by the following combination of logic gates



A. OR

B. NAND

C. AND

D. NOR

Answer: A

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15. The FM radio broadcasting band is,

A. 5 MHz to 30 MHz

B. 88 MHz to 108 MHz

C. 30 KHz to 300 KHz

D. 3 GHz to 30 GHz

Answer: B

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Chemistry

1. A metallic carbide on treatment with water gives a colourless gas which burns readily in air and gives a precipitate with ammoniacal silver nitrate solution. The gas evolved

A. CH_4

B. C_2H_6

C. C_2H_4

D. C_2H_2

Answer: A

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2. Chlorination of toluene in presence of light and heat followed by treatment with aqueous NAOH gives

A. o-Cresol

B. p-Cresol

C. 2: 4 dihydroxy toluene

D. Benzoic acid

Answer: B

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3. Molar ionic conductivities of a bivalent electrolyte are 57 and 73. The molar conductivity of the solution will be

A. $130 Scm^2 mol^{-1}$

B. $65 Scm^2 mol^{-1}$

C. $260 Scm^2 mol^{-1}$

D. $187 Scm^2 mol^{-1}$

Answer: C

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4. The forces operating between the adsorbate and the adsorbent in physical adsorption are

A. Van der Waals forces

B. Chemical forces

C. Covalent forces

D. All the three

Answer: A

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5. Horn silver is

A. Carbonate mineral

B. Chloride mineral

C. Sulphate mineral

D. Phosphate mineral

Answer: B

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6. Stainless steel does not rust because

A. Chromium and nickel combine with iron

B. Chromium forms an oxide layer and protects iron form rusting

C. Nickel present in it does not rust.

D. Iron forms a hard chemical compound with chromium present in it

Answer: B

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7. A polymer which is commonly used as a packaging material is

A. Polythene

B. Polypropylene

C. PVC

D. Bakelite

Answer: D

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8. Which compound/set of compounds is used in the manufacture of Nylon-6,6?

A. $HOOC(CH_2)_4COOH + H_2N(CH)_6NH_2$

B. $CH_3 = CH - C(CH_3) = CH_2$

C. $CH_2 = CH_2$

D. $HOOCCOOH + HOCH_2 - CH_2OH$

Answer: D

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9. The pH value of a solution in which a polar amino acid does not migrate under the influence of electric field is called

A. Isoelectronic point

B. Iso-electric point

C. Neutralisation point

D. None

Answer: B

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10. The substances which affect the central nervous system and induce sleep are called

A. Antipyretics

B. Tranquilizers

C. Analgesics

D. Antibiotics

Answer: A

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11. Which is detected by carbylamine test?

A. H_2NCONH_2

B. CH_3CONH_2

C. $C_5H_5NH_2$

D. All of these

Answer: B

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12. Acid catalyzed hydration of alkenes except ethane leads to the formation of

A. Primary alcohol

B. Secondary or tertiary alcohol

C. Mixture of primary and secondary alcohols

D. Mixture of secondary and tertiary alcohols

Answer: D

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13. 2, 2-dichloro propane treated with aq.KOH gives an unstable product. It is

A. CH_3COCH_3

B. $CH_3CH(OH)CH_3$

C. $CH_3C(OH)_2CH_3$

D. $CH_3CH(OH)CH_2CHO$

Answer: B

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14. The process that does not yield an amine is

A. Action of ammonia on RX

B. Reduction of aldoxime with Na/alcohol

C. Acid hydrolysis of alkyl cyanide

D. Reduction of amide with LiA/H_4

Answer: D

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15. Which one of the following compounds would undergo nitration with greatest ease?

A. Benzene

B. Phenol

C. Nitrobenzene

D. Benzoic acid

Answer: B

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16. In the chemical reaction, $CH_3CH_2NH_2 + CHCl_3 + 3KOH \rightarrow (A) + (B) + 3H_2O$ the compounds (A) and (B) are respectively

A. C_2H_5NC and $3KCI$

B. C_2H_5CN and $3KCI$

C. $CH_3CH_2CONH_2$ and $3KCI$

D. C_2H_5NC and K_2CO_3

Answer: B

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17. X' grams of calcium carbonate was completely burnt in air. The weight of the solid residue formed is 28 g. What is the value of "X'(in grams)?

A. 50

B. 150

C. 300

D. 200

Answer: D

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18. 4 g of a hydrocarbon on complete combustion gave 12.571 g of Co, and 5.143 g of water. What is the empirical formula of the hydrocarbon?

A. CH_2

B. C_3H_3

C. C_2H_3

D. C_2H_4

Answer: B

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19. 10 grams of $CaCO_3$ is completely decomposed to x and CaO. 'x' is passed into an aqueous solution containing 0.1mole of sodium carbonate. What is the number of moles of sodium bicarbonate formed? (mol. wts: $CaCO_3 = 100$, $NaCO_3 = 106$, $NaHCO_3 = 84$)

A. 0.2

B. 10

C. 0.3

D. 5

Answer: A

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20. 50 grams of calcium carbonate was completely burnt in air. What is the weight (in grams) of the residue? Atomic weights of Ca, C and O are

40,12 and 16 respectively)

A. 2.8

B. 28

C. 22

D. 4.4

Answer: B

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21. 4 g of a hydrocarbon on complete combustion gave 12.571 g of Co, and 5.143 g of water. What is the empirical formula of the hydrocarbon?

A. CH_2

B. C_3H_3

C. C_2H_3

D. C_2H_4

Answer: B

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