PROVISIONAL ANSWER KEY

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Exam:KEAM 2025 ENGG-5

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1. Let $A = \{ x : x$ is a positive multiple of 2 less than 36$\}$,
$B = \{ x : x$ is a positive multiple of 3 greater than 16$\}$, and
$c = \{ x : x$ is a positive multiple of 4 less than 42$\}$,. Then $(A \cap B) \cap C =$

A) {12, 24, 36}

B) {12, 24}

C) {24}

D) {24, 36}

E) ϕ

Correct Answer : Option C

2. If $n(A) = 8$, then the number of subsets of A which contain 2 or 6 elements is

A) 24

B) 28

C) 48

D) 56

E) 216

Correct Answer : Option D

3. If $f(x) = [2x]$, where $[x]$ denotes the greatest integer function in x , then the image of {-2.3, 2.9} is

A) {-5, 3}

B) {-5, 5}

C) {-4, 5}

D) {-3, 2}

E) {-4, 6}

Correct Answer : Option B

4. If $f(x) = ax + bx^2$ then the co-efficient of x^3 in $f(f(x))$ is

A) 0

B) ab

C) a^3

D) ab^2

E) $2ab^2$

Correct Answer : Option E

5. If $z = 1 + \mathrm{i}\ tan\,\theta$, where $\pi < \theta < \frac{3\pi}{2}$, then $|z|$ is equal to

A) 1+tan θ

B) 2tan θ

C) sec θ

D) -sec θ

E) cosec θ

Correct Answer : Option D

6. If $z = \frac{3+i}{2-i}$ then z^{-1} is equal to

A) $1 + i$

B) $\frac{1+i}{2}$

C) $\frac{1-i}{2}$

D) $2(1 - i)$

E) $1 - i$

Correct Answer : Option C

7. If z is a complex number, then the minimum value of $|z - 2\ | + |z - 4|$ is

A) $\sqrt{20}$

B) 4

C) 6

D) $\sqrt{6}$

E) 2

Correct Answer : Option E

8. The point $z = \frac{1}{\sqrt{2}}(1 + i)$ in the complex plane is rotated about the origin through an angle $\frac{\pi}{4}$ in the clockwise direction, then the new position of z is

A) 2

B) 1

C) $\frac{1}{\sqrt{2}}(1 - i)$

D) $\frac{1}{2}(1 - i)$

E) $1 - i$

Correct Answer : Option B

9. If the numbers $x, 6, y, 54, 162$ are in geometric progression, then $\frac{y}{x}$ is equal to

A) 3
B) 6
C) 9
D) 12
E) 18

Correct Answer : Option C

10. If $1, a, b, c, 16$ are in geometric progression, then $\sqrt[3]{abc}$ is equal to

A) 1
B) 2
C) 6
D) 4
E) 8

Correct Answer : Option D

11. The sum of the geometric series $\sqrt{3} + \sqrt{12} + \sqrt{48} +$ ...up to 10 terms is

A) $1023\sqrt{3}$
B) $1024\sqrt{3}$
C) $511\sqrt{3}$
D) $512\sqrt{3}$
E) $215\sqrt{3}$

Correct Answer : Option A

12. The sum and difference of the arithmetic mean and the geometric mean of two positive integers are respectively, 18 and 8. Then the values of the two numbers are

A) 12 and 24
B) 2 and 24
C) 6 and 20
D) 8 and 18
E) 1 and 25

Correct Answer : Option E

13. The coefficient of x^5 in the binomial expansion of $\left(\sqrt{x}+\frac{1}{x}\right)^{10}$ is

A) 55
B) 10
C) 45
D) 135
E) 1

Correct Answer : Option E

14. Four digit numbers are formed using 0, 3, 4, 5, 9, 8 without repetitions. Then the number of such 4 digits numbers is

A) 270

B) 300

C) 320

D) 400

E) 450

Correct Answer : Option B

15. A bag contains 5 red balls, 4 black balls, and 3 white balls. Then the number of ways of selecting three balls at random that contains at least one white ball is

A) 220

B) 210

C) 180

D) 136

E) 74

Correct Answer : Option D

16. Four fair dices are rolled. Then the number of ways in which the sum of upper faces of four dices can be six, is

A) 4

B) 10

C) 15

D) 24

E) 36

Correct Answer : Option B

17. $2 + {}^{15}C_1 + {}^{15}C_2 + \ldots {}^{15}C_{14} =$

A) 2^{14}

B) 2^{15}

C) 2^{16}

D) 2^{10}

E) 2^{18}

Correct Answer : Option B

18. If $\begin{vmatrix} a & 1 & 1 \\ 1 & b & 1 \\ 1 & 1 & c \end{vmatrix} = 2$, where a, b and c are positive integers, then $a+b+c$ is equal to

A) 6

B) 8

C) 12

D) 18

E) 28

Correct Answer : Option A

19. Let $\Delta = \begin{vmatrix} x & y & 1 \\ x+y & y+1 & x+1 \\ 1 & x & y \end{vmatrix}$. If $x+y=-1$, then the value of Δ is equal to

A) 3

B) 2

C) 1

D) 0

E) -3

Correct Answer : Option D

20. If $A = \begin{bmatrix} 1 & 1 & 1 \\ 0 & 2 & 1 \\ 0 & 0 & -2 \end{bmatrix}$ then $|adj(adjA)|$ is equal to

A) 16

B) 256

C) 128

D) -256

E) -16

Correct Answer : Option B

If the following system of linear equations

21. $x - 2y + z = 5$
$2x - y + 2z = 7$
$x + 2y + \lambda\ z = 5$ has a unique solution, then $\lambda \neq$

A) 1

B) -1

C) 2

D) -2

E) 0

Correct Answer : Option A

22. If $\frac{x+1}{x-1} < 2$, then *x* lies in the interval

A) $(-\infty, -3) \cup (1, \infty)$

B) $(-\infty, -1) \cup (3, \infty)$

C) $(-\infty, 1) \cup (3, \infty)$

D) (-3,-1)

E) (1,3)

Correct Answer : Option C

23. The solution set of inequality $|x+2\,|\,<3$ is

A) $-1<x<5$

B) $-5<x<1$

C) $-1<x<3$

D) $1<x<3$

E) $-1<x<1$

Correct Answer : Option B

24. If $tan(x-y)=\frac{4}{5}, tan(x+y)=\frac{6}{5}$ and $0<x,y<\frac{\pi}{4}$, then $tan2x$ is

A) 62

B) 60

C) 54

D) 50

E) 55

Correct Answer : Option D

25. The value of $tan\frac{\pi}{12}+tan\frac{\pi}{6}+\left(tan\ \pi/12\ tan\ \pi/6\right)$ is equal to

A) 1

B) 2

C) $\sqrt{3}$

D) $-\sqrt{3}$

E) -1

Correct Answer : Option A

26. The period of the function $f(x)=2sin4x+3cos2x$ is

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

B) π

C) $\frac{3\pi}{2}$

D) 2π

E) 3π

Correct Answer : Option B

27. $\frac{1-cos2x}{1+cos2x}-sec^2x=$

A) 1

B) tan2x

C) sec2x

D) 0

E) -1

Correct Answer : Option E

28. If $\theta \in \left[\frac{\pi}{2}, \frac{3\pi}{2}\right]$, then $sin^{-1}(sin\,\theta)$ is equal to

A) θ

B) $\theta - \pi$

C) $\theta - \frac{\pi}{2}$

D) $\pi - \theta$

E) $\theta + \frac{\pi}{2}$

Correct Answer : Option D

29. If $cos^{-1}x + cos^{-1}y + cos^{-1}z = 3\pi$, then$(x + y + z)$ is equal to

A) 1

B) 3

C) 4

D) -3

E) $\frac{1}{8}$

Correct Answer : Option D

30. If $sin^{-1}x + sin^{-1}y = \frac{2\pi}{3}$,then $cos^{-1}x + cos^{-1}y$ is equal to

A) $-\frac{\pi}{2}$

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

C) π

D) $\frac{2\pi}{3}$

E) $\frac{\pi}{3}$

Correct Answer : Option E

31. If the line joining of two points (1, 0) and (4, 3) is rotated about the point (1, 0) in counter clockwise direction through an angle 15° , then the equation of the line in the new position is

A) $\sqrt{3}x - 2y - \sqrt{3} = 0$

B) $\sqrt{3}x - y - \sqrt{3} = 0$

C) $x + y - 1 = 0$

D) $x + \sqrt{3}y - 1 = 0$

E) $3x - y - 3 = 0$

Correct Answer : Option B

32. The point with integral coordinates on the line $x + y = 1$, that lie at a distance 2 units from the line $5x + 12y = 0$, is

A) (-7,8)

B) (-1,2)

C) (-12,13)

D) (-2,3)

E) (-3,4)

Correct Answer : Option D

33. If the normal form of the equation of a straight line $x + \sqrt{3}y = 2\sqrt{3}$ is $x\cos\alpha + y\sin\alpha = p$ then the values of α and p are respectively

A) $\frac{\pi}{6}$ and $\sqrt{6}$

B) $\frac{\pi}{3}$ and $\sqrt{6}$

C) $\frac{\pi}{3}$ and $\sqrt{3}$

D) $\frac{\pi}{6}$ and $\sqrt{3}$

E) $\frac{\pi}{4}$ and $\sqrt{6}$

Correct Answer : Option C

34. If the two circles $(x-2)^2 + (y-3)^2 = 9$ and $(x-2)^2 + (y+3)^2 = a^2$ intersect in two distinct points, then

A) $1 < a < 6$

B) $1 < a < 7$

C) $3 < a < 7$

D) $3 < a < 4$

E) $3 < a < 9$

Correct Answer : Option E

35. If one end of the latus rectum of the parabola $y^2 = 16x$ is (4,8), then the coordinates of the other end of the latus rectum, are

A) (4,-16)

B) (4,10)

C) (4,-10)

D) (4,16)

E) (4,-8)

Correct Answer : Option E

36. If the length of the latus rectum of an ellipse is one-fourth of the major axis, then the eccentricity of the ellipse is

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

B) $\frac{\sqrt{3}}{4}$

C) $\frac{\sqrt{5}}{4}$

D) $\frac{\sqrt{5}}{6}$

E) $\frac{2}{3}$

Correct Answer : Option A

37. The distance between the foci of the hyperbola $x^2 - 4y^2 = 16,$ is

A) $2\sqrt{5}$

B) $4\sqrt{5}$

C) $4\sqrt{3}$

D) $5\sqrt{3}$

E) $5\sqrt{2}$

Correct Answer : Option B

38. The unit vector that bisects the angle between two vectors $2i + j + 2k$ and $i + 2j - 2k$ is

A) $\frac{i+j-k}{\sqrt{3}}$

B) $\frac{i-j}{\sqrt{2}}$

C) $\frac{i+j+k}{\sqrt{3}}$

D) $\frac{i-j+k}{\sqrt{3}}$

E) $\frac{i+j}{\sqrt{2}}$

Correct Answer : Option E

39. Let $\vec{a}$ and $\vec{b}$ be two unit vectors, and θ be the angle between them.If $\vec{a}$-$\vec{b}$ is a unit vector,then θ is equal to

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

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

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

D) $\frac{2\pi}{3}$

E) $\frac{\pi}{6}$

Correct Answer : Option A

40. If $\vec{a} = i + 2j - 2k$ and $\vec{b} = 2i + j + 2k$ then a unit vector perpendicular to $\vec{a}$+$\vec{b}$ and $\vec{a}$-$\vec{b}$ is

A) $\frac{2i-2j+k}{3}$

B) $\frac{2i-2j-k}{3}$

C) $\frac{i+j+k}{\sqrt{3}}$

D) $\frac{i+2j+2k}{3}$

E) $\frac{i+j-k}{\sqrt{3}}$

Correct Answer : Option B

41. Let $\vec{a}, \vec{b}$ and $\vec{c}$ be the sides of a triangle ABC such that $\vec{BC} = \vec{a}, \vec{CA} = \vec{b}$ and $\vec{AB} = \vec{c}$.If BC=AC=3 and

$\vec{b} . \vec{c} = -9$ then $\vec{a} . \vec{b}$ is equal to

A) 27

B) 9

C) $3\sqrt{3}$

D) 0

E) $-3\sqrt{3}$

Correct Answer : Option D

42. The equation of the straight line joining the points (1, 2,3) and (3, 4, k) is $\frac{x-3}{1} = \frac{y-4}{1} = \frac{z-k}{5}$. Then the value of k is

A) 4

B) 5

C) 7

D) 10

E) 13

Correct Answer : Option E

43. The projection of a line segment on the co-ordinate axes are 5, 6,8 . Then the length of the line segment is

A) 5

B) $5\sqrt{5}$

C) 6

D) $6\sqrt{6}$

E) $6\sqrt{5}$

Correct Answer : Option B

44. The shortest distance between the point (2, 3, 4) and the line $\frac{x-4}{-2} = \frac{y-4}{2} = \frac{z-6}{1}$ is

A) 12

B) 9

C) 3

D) $\sqrt{5}$

E) $\sqrt{3}$

Correct Answer : Option C

45. If a point *P* with x -coordinate 7 lies on the line joining the points *A* (1, 2, 3) and *B* (4, 6, 8) then the coordinates of the point *P* are

A) (7,10, -13)

B) (7,-10, 13)

C) (7,10, 12)

D) (7,10, 13)

E) (7,10, 15)

Correct Answer : Option D

46. If the point (3,6, k) lie on the line $\frac{x-1}{1} = \frac{y-2}{2} = \frac{z-3}{3}$, then the value of *k* is

A) 2

B) 3

C) 9

D) -2

E) -3

Correct Answer : Option C

47. The mean deviation from mean of the five numbers 2, 4, 6, 8, 10 is

A) 2.4

B) 3.6
C) 4.8
D) 6
E) 0

Correct Answer : Option A

48. If the standard deviation of six numbers $x_1, x_2, x_3, x_4, x_5, x_6$ is 4,then the variance of $2x_1 + 3, 2x_2 + 3, 2x_3 + 3, 2x_4 + 3, 2x_5 + 3, 2x_6 + 3$ is

A) 64
B) 67
C) 16
D) 19
E) 8

Correct Answer : Option A

49. A die is rolled once. If the die shows odd number, then the probability of getting other than 5 is

A) $\frac{1}{6}$
B) $\frac{5}{6}$
C) $\frac{1}{3}$
D) $\frac{2}{3}$
E) $\frac{1}{5}$

Correct Answer : Option D

50. If $P(A) = 0.4$, and $P(B/A) = 0.9$, then $P(\overline{A \cap B})$ is equal to

A) 0.36
B) 0.6
C) 0.64
D) 0.44
E) 0.24

Correct Answer : Option C

51. If $f(x) + 3f(1 - x) = x + 4$, then $f(x)$=

A) $\frac{19-4x}{8}$
B) $\frac{11-4x}{8}$
C) $\frac{11-2x}{8}$

D) $\frac{11-2x}{9}$

E) $\frac{11-4x}{9}$

Correct Answer : Option B

52. If $f(x)=\sqrt{10-x}$, then $\lim_{x\to 1}\frac{f(x)-f(1)}{x-1}$ is equal to

A) 3

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

C) $\frac{1}{6}$

D) $-\frac{1}{6}$

E) $\frac{3}{2}$

Correct Answer : Option D

53. The value of $\lim_{x\to 0}\frac{(x-sin2x)(2x-sinx)}{x^2}$ is equal to

A) 0

B) -2

C) 2

D) -1

E) $-\frac{3}{2}$

Correct Answer : Option D

54. The function $f(x)=\begin{cases}\frac{3x^2-12}{x-2}, & x\neq 2\\ \lambda, & x=2\end{cases}$ is continuous for $x\in\mathbb{R}$, then the value of λ is

A) 0

B) 4

C) 6

D) 8

E) 12

Correct Answer : Option E

55. The set of all points where the function $f(x)=\frac{x}{x^2-4}, x\in\mathbb{R}$, is discontinuous, is

A) {0,2}

B) {0,4}

C) {0,-2,2}

D) {2,4}

E) {-2,2}

Correct Answer : Option E

56. If $(xe)^y - e^x = 0$, then $\frac{dy}{dx}$ at $x = 1$ is

A) 0
B) 2
C) $\frac{1}{2}$
D) $\frac{1}{4}$
E) 4

Correct Answer : Option A

57. If $y = sinx\ sin2x$, and $t = cosx$, then $\frac{dy}{dt}$ is

A) $2(3t^2 - 1)$
B) $1 - 3t^2$
C) $\frac{1}{2}(1 - 3t^2)$
D) $(3t^2 - 1)$
E) $2(1 - 3t^2)$

Correct Answer : Option E

58. If $y = sin^{-1}\left(2x\sqrt{1 - x^2}\right)$,then $\frac{dy}{dx}$ at x=0 is

A) 0
B) 1
C) 2
D) $\frac{\sqrt{3}}{2}$
E) -1

Correct Answer : Option C

59. If $(f(x))^n = f(nx)$,then $\frac{f'(nx)}{f'(x)}$ is

A) $(f(x))^n$
B) $nf(nx)$
C) $\frac{f(nx)}{f(x)}$
D) $\frac{f((n-1)x)}{f(x)}$

E) $\frac{f(x)}{f(nx)}$

Correct Answer : Option C

60. If $x^3 = sin\theta, y^3 = cos\,\theta$,then $x\frac{dy}{dx}$ is

A) $\frac{y^5-1}{y^5}$

B) $\frac{y^6-1}{y^5}$

C) $\frac{y^6-1}{y^6}$

D) $\frac{y^3-1}{y^3}$

E) $\frac{y^2-1}{y^2}$

Correct Answer : Option B

61. If $y = (5x-2)e^x$, then $\frac{d^2y}{dx^2}$ is equal to

A) $e^x(5x+8)$

B) $e^x(5x-3)$

C) $e^x(5x+5)$

D) $e^x(5x+3)$

E) $e^x(5x-5)$

Correct Answer : Option A

62. If the function $f(x) = ax^3 - 9x^2 + 6ax + 6$ attains maximum at $x = 1$ and minimum at $x = 2$, then the value of a is

A) 6

B) 5

C) 4

D) 3

E) 2

Correct Answer : Option E

63. The function $f(x) = sin\,\theta + cos\,\theta\,, 0 \leq x \leq 2\pi$ is decreasing in the interval

A) $0 \leq x < \pi$

B) $0 \leq x \leq \frac{\pi}{4}$

C) $\frac{\pi}{4} \leq x \leq \frac{5\pi}{4}$

D) $\frac{5\pi}{4} \leq x \leq 2\pi$

E) $\frac{\pi}{2} \leq x \leq \frac{3\pi}{2}$

Correct Answer : Option C

64. If $x + y = 50$, then the maximum value of $\sqrt{4xy}$ is

A) 25

B) 50

C) 100

D) 625

E) 2500

Correct Answer : Option B

65. $\int cotx(1 - cosec\, x)e^x dx$ is

A) $e^x \cot x + C$

B) $-e^x cotx + C$

C) $e^x \operatorname{cosec}\, x + C$

D) $-e^x cose\, c\, x + C$

E) $e^x \operatorname{cosec}\, x \cot\, x + C$

Correct Answer : Option A

66. $\int \frac{dx}{cos^{2/3} x\, sin^{4/3} x}$ is

A) $3tan^3 x + C$

B) $3tan^{1/3} x + C$

C) $-3tan^{1/3} x + C$

D) $-3tan^{-1/3} x + C$

E) $3tan^{-1/3} x + C$

Correct Answer : Option D

67. $\int x(1-x)^{10} dx =$

A) $\frac{(1-x)^{12}}{12} - \frac{(1-x)^{11}}{11} + C$

B) $\frac{(1-x)^{12}}{12} + \frac{(1-x)^{11}}{11} + C$

C) $\frac{(1-x)^{11}}{11} - \frac{(1-x)^{10}}{10} + C$

D) $\frac{(1-x)^{12}}{12} + \frac{(1+x)^{11}}{11} + C$

E) $\frac{(1-x)^{12}}{12} - \frac{(1+x)^{11}}{11} + C$

Correct Answer : Option A

68. $\int\left(\frac{\sin 3x}{\sin x} - \frac{\cos 3x}{\cos x}\right)dx$ is equal to

A) $2cos2x + C$

B) $-2cos2x + C$

C) $2sin2x + C$

D) $2x + C$

E) $x + C$

Correct Answer : Option D

69. $\int_0^1 \frac{\sin x}{\sin x + \sin(1-x)}dx$ is equal to

A) 6

B) 4

C) 2

D) $\frac{1}{2}$

E) $\frac{1}{4}$

Correct Answer : Option D

70. $\int_0^{\pi/2} \sin 2x\, e^{\sin x}\, dx$ is equal to

A) 4

B) 3

C) 2

D) 1

E) 0

Correct Answer : Option C

71. The value of $\int_1^3 [x-1]dx$, where $[x]$ denotes the greatest integer function in x, is equal to

A) -2

B) -1

C) 0

D) 1

E) 2

Correct Answer : Option D

72. Area of the region bounded by the function $f(x) = \begin{cases} x & x \leq 3 \\ -x+6 & x > 3 \end{cases}$ with the $x-$axis (in square units) in the first quadrant is

A) 18
B) 9
C) 6
D) 3
E) 4.5

Correct Answer : Option B

73. The general solution of the differential equation $ydx - xdy = y^2(xdy + ydx)$ is

A) $\frac{y}{x} = xy + C$
B) $\frac{x}{y^2} = xy + C$
C) $\frac{y}{x^2} = xy + C$
D) $x + y = xy + C$
E) $\frac{x}{y} = xy + C$

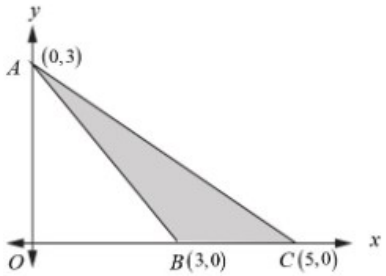
Correct Answer : Option E

74. The solution of the linear differential equation $\frac{dy}{dx} + y = e^{-x}$, when $x = 0, y = 1$,is

A) $ye^{-x} = x - 1$
B) $ye^{-x} = e^x - 1$
C) $ye^x = x + 1$
D) $ye^{-x} = e^x + 1$
E) $ye^x = x - 1$

Correct Answer : Option C

75. The shaded region ABC shown in the diagram is given by the inequalities



A) $x + y \leq 3, 3x + 5y \geq 15, x \geq 0, y \geq 0.$
B) $x + y \geq 3, 3x + 5y \leq 15, x \geq 0, y \geq 0.$

C) $x + y \leq 3, 3x + 5y \leq 15, x \geq 0, y \geq 0.$
D) $x + y \geq 3, 3x + 5y \geq 15, x \geq 0, y \geq 0.$
E) $x + y \leq 3, 3x + 5y = 15, x \geq 0, y \geq 0.$

Correct Answer : Option B

76. When a metallic sphere is heated, maximum percentage change will be observed in its

A) volume
B) radius
C) diameter
D) surface area
E) mass

Correct Answer : Option A

77. The dimensions of ratio of energy to Planck's constant are those of

A) time
B) velocity
C) frequency
D) linear momentum
E) angular momentum

Correct Answer : Option C

78. A garden roller of weight 100 kg is pulled with a force of 300 N acting at an angle of 30° with the ground. The effective pulling weight of the roller in (kg wt) is (g = 10 ms $^{-2}$)

A) 850
B) 725
C) 800
D) 820
E) 700

Correct Answer : Option A

79. When a body starts from rest and moves with uniform acceleration, then its instantaneous displacement s is related to time t as

A) $s \propto t^{-1}$
B) $s \propto t^{1/2}$
C) $s \propto t$
D) $s \propto t^{2}$
E) $s \propto t^{-2}$

Correct Answer : Option D

80. A particle moving in a circular path, covers equal distances in equal intervals of time. Then the quantity associated with the particle that remains constant with time is

A) displacement
B) velocity
C) speed
D) acceleration
E) linear momentum

Correct Answer : Option C

81. A body of mass 2 kg is moving with a velocity of 10 ms^{-1}. If a force of 50 N is applied on it for 10 s along its motion, the velocity of the body (in ms^{-1}) is

A) 220
B) 200
C) 150
D) 175
E) 260

Correct Answer : Option E

82. A body of mass 5 kg collides with a wall with a speed of 50 ms^{-1} and rebounds with the same speed. If the time of contact of the body with the wall is $\frac{1}{20}\ s$ the force exerted on the wall is

A) $0.5 \times 10^4 N$
B) $2.5 \times 10^4 N$
C) $2 \times 10^3 N$
D) $1 \times 10^4 N$
E) $4 \times 10^3 N$

Correct Answer : Option D

83. Power of an engine driving a vehicle of mass m with a speed v on a horizontal road is (μ is the coefficient of friction between the road and the tyre)

A) $\frac{mg}{\mu\ v}$
B) $\mu\ mgv$
C) $\mu\ mgv^2$
D) $\frac{\mu\ mg}{v}$
E) $\frac{\mu\ mv}{g}$

Correct Answer : Option B

84. In a perfectly inelastic head on collision

A) kinetic energy is conserved

B) total energy is not conserved

C) linear momentum is not conserved

D) two bodies move as one body after collision

E) two bodies move separately in different directions

Correct Answer : Option D

85. A rotating fly wheel with an initial angular speed of 4 rad s^{-1} has an angular acceleration of 2 rad s^{-2} . The angle (in radian) it will turn in a time of 4*s* from the start is

A) 32

B) 16

C) 8

D) 64

E) 24

Correct Answer : Option A

86. Radius of gyration of a uniform circular disc of radius R about its diameter is

A) $\frac{R}{8}$

B) 2R

C) R

D) $\frac{R}{4}$

E) $\frac{R}{2}$

Correct Answer : Option E

87. When two rigid bodies with moments of inertia I_1 and I_2 and angular velocities ω_1 and ω_2 respectively are coupled in such a way that their rotation axes coincide, the angular velocity of the combination is ω .Then

A) $(I_1\,\omega_1 + I_2\,\omega_2) = (I_1 + I_2)\omega$

B) $I_1\,\omega_1 - I_2\,\omega_2 = (I_1 + I_2)\omega$

C) $I_1 I_2\,\omega_1\omega_2 = I_1 I_2\,\omega$

D) $(I_1 + I_2)(\omega_1 + \omega_2) = (I_1 + I_2)\omega$

E) $\omega_1 + \omega_2 = \omega$

Correct Answer : Option A

88. If *K* is the kinetic energy of a satellite at a height *h* from the surface of earth, then its total energy is

A) -K

B) 2K

C) $\sqrt{K}$

D) $-\frac{K}{2}$

E) $-\frac{K}{4}$

Correct Answer : Option A

89. The force between two identical solid spheres each of radius *r* kept in contact is *F* . If the distance of their centres is made 4*r*, then the force between them is

A) $\frac{F}{2}$

B) $\frac{F}{4}$

C) $\frac{F}{8}$

D) $\frac{F}{16}$

E) $\frac{F}{24}$

Correct Answer : Option B

90. Global warming leads to

A) falling of sea level

B) lowering of the average temperature of earth

C) static weather pattern

D) melting of ice caps at slower rate

E) expansion of desert

Correct Answer : Option E

91. The specific heat capacity at constant volume Cv of a mole of an ideal gas is related to the gas constant R and the ratio of the specific heats Υ as

A) $\frac{R}{\Upsilon-1}$

B) $\frac{R\Upsilon}{1-\Upsilon}$

C) $\frac{R(1-\Upsilon)}{\Upsilon}$

D) $\frac{R}{(1-\Upsilon)}$

E) $\frac{R}{(1+\Upsilon)}$

Correct Answer : Option A

92. When a gas is compressed in an insulated vessel

A) its internal energy decreases

B) its temperature decreases

C) both its pressure and volume increase

D) both its temperature and volume increase

E) both its temperature and internal energy increase

Correct Answer : Option E

93. The statement, the total pressure of a mixture of ideal gases is the sum of partial pressures, is called as

A) Boyle's law

B) Charles' law

C) Dalton's law

D) Perfect gas law

E) Law of equipartition

Correct Answer : Option C

94. If the temperature of a gas is changed to 9 times the initial value, then the *rms* velocity of the gaseous molecule increases by

A) 9 times

B) 3 times

C) $\sqrt{3}$ times

D) 18 times

E) 12 times

Correct Answer : Option B

95. For an ideal gas at temperature *T* having the total number of molecules *N* , the product of the pressure and volume, *PV* is equal to (k_B is the Boltzmann constant)

A) $2NT$

B) $K_B NT$

C) $K_B T\sqrt{N}$

D) $K_B N\sqrt{T}$

E) NT

Correct Answer : Option B

96. If the mean kinetic energy of one mole of helium gas at 400 K temperature is 5000 J, then that for one mole of neon gas at 800 K is

A) 5000 J

B) 50000 J

C) 10000 J

D) 2500 J

E) 500 J

Correct Answer : Option C

97. If *T* and ρ represent the temperature and density of a gas ,then the velocity of sound in the gas is directly proportional to

A) $\sqrt{T}$

B) $\sqrt{\rho}$

C) T

D) ρ^2

E) T^2

Correct Answer : Option A

98. For smaller angular displacement, the period of a simple pendulum depends on

A) its amplitude

B) its phase constant

C) its energy

D) the mass of the bob

E) its length

Correct Answer : Option E

99. If the speed of transverse waves on a stretched wire of linear density 7 x 10^3 kg m^{-1} is 100 ms^{-1} , then the tension in the wire is

A) 60 N

B) 600 N

C) 700 N

D) 70 N

E) 80 N

Correct Answer : Option D

100. Force between two charges +8 μC and +2 μC is 16 N. If the charges are brought into contact and then separated by the same distance, the force between them is

A) 25 N

B) 20 N

C) 30 N

D) 15 N

E) 12 N

Correct Answer : Option A

101. If the work done in moving a charge of 3 C from A to B is 12 J, then the potential difference between A and B is

A) 5 V

B) 4 V

C) 36 V

D) 26 V

E) 10 V

Correct Answer : Option B

102. The magnitude of the torque experienced by an electric dipole of dipole moment **P** placed at an angle of 30º in a uniform electric field **E** is

A) PE

B) $\frac{\sqrt{3}}{2} PE$

C) $\frac{PE}{2}$

D) $\frac{PE}{\sqrt{2}}$

E) $\frac{PE}{\sqrt{3}}$

Correct Answer : Option C

103. The rms value of $a.c$ with peak value of 200 V is

A) $100V$

B) $\frac{200}{\sqrt{2}} V$

C) $300V$

D) $200\sqrt{2}V$

E) $\frac{200}{\sqrt{3}} V$

Correct Answer : Option B

104. Mobility is the drift velocity per unit

A) charge

B) volume

C) electric field

D) current

E) time

Correct Answer : Option C

105. The resistivity of a metallic wire is directly proportional to (T – temperature; τ average time of collisions of free electrons; n – number of free electrons per unit volume; *A* – area of cross-section)

A) n

B) τ

C) A

D) $\frac{1}{n}$

E) $\frac{1}{T}$

Correct Answer : Option D

106. Gyromagnetic ratio of an electron is the ratio between

A) charge and angular momentum

B) magnetic moment and angular acceleration

C) magnetic moment and angular momentum

D) charge and angular momentum

E) magnetic moment and angular velocity

Correct Answer : Option C

107. For a circular coil carrying current, the thumb in the right hand thumb rule gives the direction of

A) magnetic field

B) Current

C) induced emf

D) electric field

E) electric force

Correct Answer : Option A

108. In synchrotron, the required high magnetic fields are generated by

A) solenoid only

B) electromagnet only

C) toroid only

D) solenoid and electromagnet

E) solenoid and toroid

Correct Answer : Option E

109. The power required to push the arm of a rectangular conductor with a constant speed v in a motor is directly proportional to

A) v

B) v^2

C) $\sqrt{v}$

D) $\sqrt[3]{v}$

E) v^3

Correct Answer : Option B

110. A 1 kW bulb radiates light uniformly in all directions. The intensity at a point on the surface of the surrounding sphere of area 200 m^2 is (in Wm^{-2})

A) 2
B) 4
C) 5
D) 6
E) 8

Correct Answer : Option C

111. The transverse nature of electromagnetic waves is confirmed by the phenomenon of

A) diffraction
B) polarization
C) photoelectric effect
D) interference
E) total internal reflection

Correct Answer : Option B

112. If two waves of equal amplitude A and opposite phase interfere, the amplitude of the resultant wave is

A) A
B) 2A
C) A/2
D) 0
E) A^2

Correct Answer : Option D

113. At the lowest point of the plot of angle of deviation versus the angle of incidence of a triangular prism, the angle of incidence is equal to

A) the angle of refraction at the first face
B) the angle of refraction at the second face
C) the angle of emergence
D) the angle of prism
E) half of the angle of prism

Correct Answer : Option C

114. Plane polarized light can be produced by the phenomenon of

A) reflection
B) dispersion
C) diffraction
D) scattering
E) interference

Correct Answer : Option A

115. Above the threshold frequency, if the intensity of incident light falling on a photo sensitive material is increased, then the correct statement is:

A) The number of emitted electrons increases

B) The maximum kinetic energy of electrons increases

C) The stopping potential increases

D) The number of electrons emitted decreases

E) The stopping potential decreases

Correct Answer : Option A

116. The ratio between the wavelengths of the air column vibrating in the first two modes in an open organ pipe is

A) 2 : 1

B) 1 : 2

C) 1 : 1

D) 1 : 3

E) 6 : 1

Correct Answer : Option A

117. Light of wavelength $\frac{36}{5R}m$ is emitted by a hydrogen atom during the transition of electrons from the state

A) $n = 3$ to $n = 2$

B) $n = 4$ to $n = 1$

C) $n = 4$ to $n = 2$

D) $n = 4$ to $n = 3$

E) $n = 3$ to $n = 1$

Correct Answer : Option A

118. 75% of $^{234}_{90}\text{Th}$ decays in t years. Its half-life is (in years):

A) t

B) $\frac{t}{2}$

C) $2t$

D) $4t$

E) $\frac{t}{4}$

Correct Answer : Option B

119. The I-V characteristic of a semiconductor diode in forward bias is a/an:

A) straight line

B) parabolic curve
C) exponentially decreasing curve
D) exponentially increasing curve
E) sinusoidal curve

Correct Answer : Option D

120. The pn junction diode acts as a rectifier because:
A) it conducts in both directions
B) it blocks current in reverse bias
C) it allows ac to pass
D) it amplifies the signal
E) it offers a phase difference between voltage and current

Correct Answer : Option B

121. Which of the following has the highest molar mass?
(Atomic mass: N=14, O=16, Ag=108, Pb=208, Na=23, H=1, K=39)
A) Silver nitrate
B) Lead nitrate
C) Ammonium nitrate
D) Sodium nitrate
E) Potassium nitrate

Correct Answer : Option B

122. When the uncertainty in momentum is zero then the uncertainty in the position of a particle is
A) h/4π
B) 1
C) 2
D) ½
E) infinity

Correct Answer : Option E

123. Which of the following statement is NOT true with Bohr's model of atom?
A) It accounts the stability and line spectra of He^+
B) It fails to account for the finer details of the hydrogen atom spectrum by using sophisticated spectroscopic techniques.
C) It is unable to explain the spectrum of atom/ion which possess only two electrons.
D) It only explains about the splitting of spectral lines in the presence of electric field.
E) It is unable to explain the ability of atoms to form molecules by chemical bonds.

Correct Answer : Option D

124. Which of the following statement is INCORRECT with p-block elements?

A) p-Block elements comprise of Group 13 to Group 18.

B) The outer electronic configuration of p-block elements is $ns^2 p^{1-6}$.

C) Halogens belongs to Group 16.

D) Gallium and Bromine are liquids.

E) The zero group elements having general formula ns2p6 are inert, because their energy levels are completely filled.

Correct Answer : Option C

125. Which of the following molecule has zero dipole moment?

A) BF_3

B) CH_2Cl_2

C) NH_3

D) SO_2

E) NF_3

Correct Answer : Option A

126. Types of system and their definitions are given below:

System	Definition
(a) Closed system	(i) A system which can exchange both energy and matter with surrounding
(b) Open system	(ii) A system which cannot exchange matter or energy with surrounding
(c) Isolated system	(iii) A system consisting of single phase
(d) Homogeneous system	(iv) A system consisting of many phases
(e) Heterogeneous system	(v) A system which can exchange only energy with surrounding

Choose the correct match from the following codes:

A) (a)-(i), (b)-(ii), (c)-(iii), (d)-(iv), (e)-(v)

B) (a)-(ii), (b)-(i), (c)-(iii), (d)-(iv), (e)-(v)

C) (a)-(i), (b)-(ii), (c)-(iv), (d)-(iv), (e)-(iii)

D) (a)-(v), (b)-(i), (c)-(ii), (d)-(iii), (e)-(iv)

E) (a)-(v), (b)-(ii), (c)-(i), (d)-(iii), (e)-(iv)

Correct Answer : Option D

The $\Delta_r H^\circ$ for the following reaction at 25°C is

$$Ag^+(aq) + Cl^-(aq) \rightleftharpoons AgCl(s)$$

127. (Given: $\Delta_r H^\circ$ (Ag^+, aq) = 105.6 kJ mol^{-1},

$\Delta_r H^\circ$ (Cl^-, aq) = -167.2 kJ mol^{-1} and

$\Delta_r H^\circ$ (AgCl, s) = -127.1 kJ mol^{-1})

A) 6.0 kJ mol^{-1}

B) 65.5 kJ mol^{-1}

C) -65.5 kJ mol^{-1}

D) -6.0 kJ mol^{-1}

E) 100 kJ mol^{-1}

Correct Answer : Option B

128. The pH of a solution is 4 then it's OH^- ion concentration (in mol dm^{-3}) is

A) 10^{-4}

B) 10^{-10}

C) 10^{-2}

D) 10^{-12}

E) 10^{-6}

Correct Answer : Option B

129. 4 g of NaOH were dissolved in 1 litre of a solution containing 1 mole of CH_3COOH and 1 mole of CH_3COONa. The $[H^+]$ in the resultant solution is

(Given: Ka (CH_3COOH) = 1.1×10^{-5})

A) 1.47×10^{-5}M

B) 2×10^{-5}M

C) 2.5×10^{-5}M

D) 1.5×10^{-5}M

E) 0.9×10^{-5}M

Correct Answer : Option E

130. Which of the following statement is INCORRECT for the concept of oxidation?

A) Addition of oxygen

B) Removal of hydrogen

C) Decreases in number of positive charges

D) Decreases in number of negative charges

E) Removal of an electron

Correct Answer : Option C

131. Which of the following statement is true for the electrochemical, Daniel cell?

A) Electrons flow from copper electrode to zinc electrode.

B) Current flows from zinc electrode to copper electrode.

C) Cation moves toward copper electrode.

D) Cation moves toward zinc electrode

E) Reduction occurs at cathode.

Correct Answer : Option C

132. The osmotic pressure of 0.01 M aqueous solution of urea at 300 K is (R = 0.082 lit atm mol $^{-1}$)

A) 0.0082 atm

B) 0.082 atm

C) 2.46 atm

D) 24.6 atm

E) 0.246 atm

Correct Answer : Option E

133. The first order rate constant for the decomposition of N_2O_5 is 6.93×10^{-4} sec^{-1}. Its half-life period is

A) 1000 s

B) 100 s

C) 10 s

D) 1 s

E) 10000 s

Correct Answer : Option A

134. Which of the following is a zero order reaction?

A) Decomposition of H_2O_2 catalysed by iodide in alkaline medium.

B) Artificial radioactive decay of unstable nuclei.

C) Decomposition of N_2O_5

D) Decomposition of N_2O

E) Decomposition of gaseous ammonia on a hot platinum surface.

Correct Answer : Option E

135. Which of the following outermost electronic configuration of the element shows the highest oxidation state?

A) $3d^3 4s^2$

B) $3d^5 4s^1$

C) $3d^5 4s^2$

D) $3d^6 4s^2$

E) $3d^2 4s^2$

Correct Answer : Option C

136. CrO_3 is a/an

A) acidic oxide
B) basic oxide
C) neutral oxide
D) amphoteric oxide
E) reducing agent

Correct Answer : Option A

137. Which of the following statement is INCORRECT?

A) Transition metals and many of their compounds show paramagnetic behaviour.
B) The enthalpies of atomisation of the transition metals are high.
C) The transition metals generally form coloured compounds.
D) Transition metals and their many compounds act as good catalyst.
E) Zn, Cd and Hg are very hard and have very low volatility.

Correct Answer : Option E

138. The correct order of ionic radii of Ce, La, Pm and Yb in +3 oxidation state is

A) $La^{3+} < Pm^{3+} < Ce^{3+} < Yb^{3+}$
B) $La^{3+} < Ce^{3+} < Pm^{3+} < Yb^{3+}$
C) $Yb^{3+} < Ce^{3+} < Pm^{3+} < La^{3+}$
D) $Yb^{3+} < Pm^{3+} < Ce^{3+} < La^{3+}$
E) $La^{3+} > Pm^{3+} > Ce^{3+} > Yb^{3+}$

Correct Answer : Option D

139. The IUPAC name of $[Fe(CO)_5]$ is

A) Pentacarbonylferrate(0)
B) Pentacarbonylferrate(III)
C) Pentacarbonyliron(0)
D) Pentacarbonyl iron(II)
E) Pentacarbonylferrate(II)

Correct Answer : Option C

140. The isomerism exhibited by the octahedral complex $[Co(NH_3)_4Br_2]Cl$ is

A) Geometrical
B) Optical
C) Linkage
D) Coordination
E) Ionisation

Correct Answer : Option A

141. Which of the following is not a electron withdrawing group?

A) -CN

B) $-NO_2$

C) -COOH

D) -COOR

E) $-OCH_3$

Correct Answer : Option E

142. Which of the following statement is INCORRECT with Kolbe's electrolytic process?

A) Ethane can be prepared by this method.

B) Presence of alkyl groups in α -position decrease the yield of alkanes.

C) The reaction proceeds via methyl free radical.

D) At anode alkane and CO_2 gas is formed.

E) An alkane obtained at anode contains odd number of carbon atoms.

Correct Answer : Option E

143. Which of the following hydrocarbon pair have the highest boiling point and highest melting point respectively?

A) Eicosane and Methane

B) Eicosane and Decane

C) Eicosane and 2,2-Dimethylpropane

D) Eicosane and 2-Methylbutane

E) 2,2-Dimethylpropane and Eicosane

Correct Answer : Option C

144. The order of reactivity towards S_N2 reaction among the following is
(a)CH_3Cl (b)$CH_3CH(Cl)CH_3$ (c) $(CH_3)_3CCl$ (d) CH_3CH_2Cl

A) a > d > b > c

B) a > b > c > d

C) a > c > d > b

D) b > a > c > d

E) c > b > d > a

Correct Answer : Option A

145. The correct decreasing order of acidic strength is

A) C_6H_5OH >*p*-CH_3-C_6H_4OH>*m*-CH_3-C_6H_4OH > C_2H_5OH

B) C_2H_5OH >*m*-CH_3-C_6H_4OH >*p*-CH_3-C_6H_4OH>C_6H_5OH

C) *m*-CH_3-C_6H_4OH >C_6H_5OH >*p*-CH_3-C_6H_4OH> C_2H_5OH

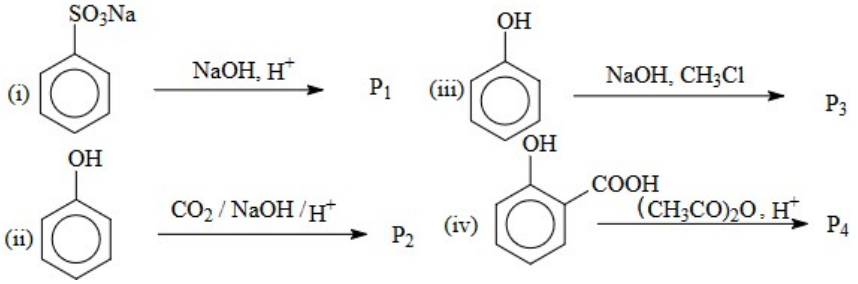
D) C_6H_5OH >*m*-CH_3-C_6H_4OH>*p*-CH_3-C_6H_4OH > C_2H_5OH

E) C_6H_5OH >*m*-CH_3-C_6H_4OH >C_2H_5OH >*p*-CH_3-C_6H_4OH

Correct Answer : Option D

The products P_1, P_2, P_3 and P_4 of the following reactions are

146.



A) P_1 = Phenol, P_2= Salicylaldehyde, P_3 = Cyclohexanol, P_4 = Phenyl acetate,

B) P_1 = Benzene, P_2 = Salicylic acid, P_3 = Cyclohexanol, P_4= Phenyl acetate,

C) P_1 = Phenol, P_2 = Salicylic acid, P_3 = Anisole, P_4 = Aspirin,

D) P_1 = Phenol, P_2 = Salicylic acid, P_3 = Anisole, P_4 = Phenyl acetate,

E) P_1 = Cyclohexanol, P_2 = Salicylic acid, P_3= Phenol, P_4 = Aspirin,

Correct Answer : Option C

147. Which one of the following compounds undergoes HVZ reaction?

A) C_6H_5COOH

B) CH_3CH_2COOH

C) Cl_3C-$COOH$

D) CH_3CH_2CHO

E) HCOOH

Correct Answer : Option B

148. Which of the following does not undergo Cannizarro reaction?

A) $(CH_3)_3CCHO$

B) C_6H_5CHO

C) $C_6H_5COC_6H_5$

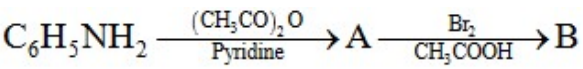
D) CH_3CHO

E) HCHO

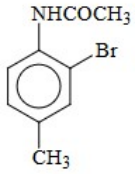
Correct Answer : Option D

In the following reaction, the final product B is

149.



A)



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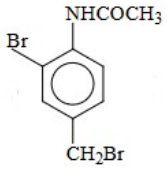
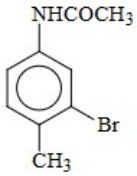
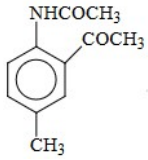


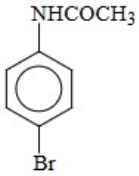
C)



D)



E)



Correct Answer : Option E

150. Match Column I with column II.

Column I (Vitamins)	**Column II (Sources)**
(a) Vitamin A	(i) Sunflower oil
(b) Vitamin B_1	(ii) Amla
(c) Vitamin C	(iii) Fish liver oil
(d) Vitamin E	(iv) Yeast

A) (a)-(iii), (b)-(i), (c)-(ii), (d)-(iv)

B) (a)-(iii), (b)-(ii), (c)-(i), (d)-(iv)

C) (a)-(iii), (b)-(ii), (c)-(iv), (d)-(i)

D) (a)-(iii), (b)-(iv), (c)-(i), (d)-(ii)

E) (a)-(iii), (b)-(iv), (c)-(ii), (d)-(i)

Correct Answer : Option E