PROVISIONAL ANSWER KEY

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1. The relation *R={(1,3),(2,3),(2,4),(3,1)(4,4)(4,1)}* on the set *X={1,2,3,4}* is

A) a1-1function

B) reflexive

C) transitive

D) not symmetric

E) an onto function

Correct Answer : Option D

2. If two sets A and B are having 11 elements in common, then the number of elements common to $A \times B$ and $B \times A$

A) 121

B) 22

C) 99

D) 11

E) 33

Correct Answer : Option A

3. The domain of the function $f(x) = \sqrt{x^2 + x - 2}$ is

A) $(-\infty, -2) \cup [1, \infty)$

B) $(-\infty, -2] \cup (1, \infty)$

C) $(-\infty, -2) \cup (1, \infty)$

D) $(-\infty, -2] \cup [1, \infty)$

E) $(-\infty, 1) \cup [0, \infty)$

Correct Answer : Option D

4. The range of the function $f(x) = \sqrt{x^2 + 4x + 4}$ is

A) $[0, \infty)$

B) $[1, \infty)$

C) $[3, \infty)$

D) $[2, \infty)$

E) $[4, \infty)$

Correct Answer : Option A

5. Let *s, t, r* be non-zero distinct positive real numbers. If the complex number $z = x + iy$ satisfies $sz + t\overline{z} + r = 0$, then z lies on

A) imaginary axis

B) real axis

C) $y = x$

D) $y = 2x$

E) $x + y = 0$

Correct Answer : Option B

6. Let $z = x + iy$ be a complex number, where $i = \sqrt{-1}$ is the complex unit. Then $|z - 1 + i| = 5$ is a circle with

A) centre at (-1,1) and radius 5

B) centre at (1,1) and radius $\sqrt{5}$

C) centre at (-1,-1) and radius $\sqrt{5}$

D) centre at (1,1) and radius 25

E) centre at (1,-1) and radius 5

Correct Answer : Option E

7. Let z be a complex number such that $z^3 + iz^2 - iz + 1 = 0$ where $i^2 = -1$. Then |z| =

A) 2

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

C) 1

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

E) 3

Correct Answer : Option C

8. Real part of $\frac{1+sin\frac{2\pi}{27}-icos\frac{2\pi}{27}}{1+sin\frac{2\pi}{27}+icos\frac{2\pi}{27}}$ is equal to

A) $cos\frac{2\pi}{27}$

B) $sin\frac{2\pi}{27}$

C) $1 + sin\frac{2\pi}{27}$

D) $1 + cos\frac{2\pi}{27}$

E) $sin\frac{2\pi}{27} + cos\frac{2\pi}{27}$

Correct Answer : Option B

9. The 25th term of 9,3,1,$\frac{1}{3}$,$\frac{1}{9}$,...is

A) $\frac{1}{3^{24}}$

B) $\frac{1}{3^{25}}$

C) $\frac{1}{3^{23}}$

D) $\frac{1}{3^{22}}$

E) $\frac{1}{3^{26}}$

Correct Answer : Option D

10. The first three terms in a G.P. are , a, b and c where $a \neq b$ Then the fifth term is

A) $\frac{c^2}{2a}$

B) $\frac{c}{2a}$

C) $\frac{c^2}{a}$

D) $\frac{c^2}{3a}$

E) $\frac{c}{3a}$

Correct Answer : Option C

11. The sum of first *n* terms of a G.P. is 1023. If the first term is 1 and the common ratio is 2, then the value of *n* is

A) 12

B) 11

C) 10

D) 9

E) 8

Correct Answer : Option C

12. Let G_1, G_2, G_3 be geometric means between l and n, where l and n are positive real numbers.Then the common ratio is

A) $\frac{n}{l}$

B) $\left(\frac{n}{l}\right)^{1/2}$

C) $\left(\frac{n}{l}\right)^{1/3}$

D) $\left(\frac{n}{l}\right)^{1/4}$

E) $\frac{n^2}{l^2}$

Correct Answer : Option D

13. 25 distinct objects are divided into 5 groups and each group consists of exactly 5 objects. Then the number of ways of forming such groups, is

A) $\frac{25!}{(5!)^5}$

B) $\frac{25!}{5!}$

C) $\frac{25!}{(5!)^6}$

D) $\frac{25!}{(5!)^4}$

E) $\frac{25!}{(5!)^3}$

Correct Answer : Option C

14. $1 + {}^{100}C_1 + {}^{100}C_2 + \ldots + {}^{100}C_{99} + 1 =$

A) 2^{99}

B) 2^{101}

C) 2^{98}

D) 2^{100}

E) 100^2

Correct Answer : Option D

15. The coefficient of x^{10} in $(1-x^2)(1-x^3)^9 is$

A) ${}^9C_4$

B) $-{}^9C_6$

C) $-{}^9C_4$

D) ${}^9C_6$

E) 0

Correct Answer : Option E

16. ${}^{21}C_1 + {}^{21}C_2 + \ldots + {}^{21}C_{10} =$

A) 2^{20}

B) 2^{21}

C) $2^{21} - 1$

D) $2^{21} - 2$

E) $2^{20}-1$

Correct Answer : Option E

17. The constant term in $\left(\frac{\sqrt{x}}{2}+\frac{1}{3x^2}\right)^{10}$ is

A) $\frac{5}{128}$

B) $\frac{9}{128}$

C) $\frac{5}{256}$

D) $\frac{9}{256}$

E) 0

Correct Answer : Option C

18. Let B be a matrix of order 3×2 and C be a matrix of order 3×3 . If A is a matrix such that $BA=C$, then the order of A is

A) 2×2

B) 2×3

C) 3×2

D) 3×4

E) 3×3

Correct Answer : Option B

19. Let $P=\begin{pmatrix}1&1&1\\0&2&2\\0&0&3\end{pmatrix}$ and $Q=\begin{pmatrix}2&1&2/3\\0&4&4/3\\0&0&6\end{pmatrix}$. Then the $\det\left(QPQ^{-1}\right)$ is equal to

A) 12

B) 8

C) 48

D) 24

E) 6

Correct Answer : Option E

20. Let $A=\begin{pmatrix}1&3&5\\-6&8&3\\-4&6&5\end{pmatrix}$ and $P=\frac{1}{2}\left(A+A^T\right)$. Then

A) $P^T=P$

B) $P^T=-P$

C) $P^T=2P$

D) $P^T=-2P$

E) $P^T = 3P$

Correct Answer : Option A

21. $sec^2x + cosec^2x - sec^2xcosec^2x =$

A) sec^2x

B) $cosec^2x$

C) cot^2x

D) 1

E) 0

Correct Answer : Option E

22. Let x be a real number such that $7x + 4 < 9x + 8$. Then the solution set of the inequality is

A) $(-\infty, -2)$

B) $(-\infty, -4)$

C) $(-2, \infty)$

D) $[-2, \infty)$

E) $[-1, \infty)$

Correct Answer : Option C

23. Let x be a real number such that $\frac{3(x+3)}{7} \leq \frac{6(x-1)}{5}$ Then the solution set of the inequality is

A) $\left(-\infty, \frac{29}{9}\right)$

B) $\left(\frac{29}{9}, \infty\right)$

C) $\left[\frac{29}{9}, \infty\right)$

D) $(-\infty, \infty)$

E) $\left(\frac{17}{9}, \infty\right)$

Correct Answer : Option C

24. $sin15^\circ sin45^\circ sin75^\circ =$

A) $\frac{1}{2\sqrt{2}}$

B) $\frac{1}{4\sqrt{2}}$

C) $\frac{1}{3\sqrt{2}}$

D) $\frac{1}{4\sqrt{3}}$

E) $\frac{1}{\sqrt{3}}$

Correct Answer : Option B

25. If $sin\,\theta = \frac{1}{5}$ and the angle θ is in the second quadrant, then sec θ is equal to

A) $\frac{5}{2\sqrt{6}}$

B) $\frac{-2\sqrt{6}}{5}$

C) $\frac{2\sqrt{6}}{5}$

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

E) $\frac{-5}{2\sqrt{6}}$

Correct Answer : Option E

26. $2^2 \sin\left(\frac{x}{2^2}\right)\cos\left(\frac{x}{2}\right)\cos\left(\frac{x}{2^2}\right) =$

A) $sin2x$

B) $sinx$

C) $cos2x$

D) cos^2x

E) $sin\frac{x}{2}$

Correct Answer : Option B

27. $\frac{cos75^\circ - cos1^\circ}{cos75^\circ + cos15^\circ}$

A) $\frac{-1}{\sqrt{3}}$

B) $\frac{1}{\sqrt{2}}$

C) $\frac{1}{\sqrt{3}}$

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

E) $\sqrt{3}$

Correct Answer : Option A

28. $\frac{(2sin\,\alpha)(1+sin\,\alpha)}{(1+sin\,\alpha+cos\,\alpha)(1+sin\,\alpha-cos\,\alpha)}$

A) $tan\,\alpha$

B) $\frac{sin\,\alpha+1}{sin\,\alpha-1}$

C) 1

D) 2

E) $\frac{cos\,\alpha+1}{cos\,\alpha-1}$

Correct Answer : Option C

29. If $\sin^{-1}\left(\frac{x}{1+x}\right)=\frac{\pi}{2}-\cos^{-1}\left(\frac{1}{2}\right)$, then x is equal to

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

B) 2

C) 3

D) 1

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

Correct Answer : Option D

30. If $tan^{-1}x = tan^{-1}(3) - \frac{\pi}{4}$, then x is equal to

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

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

C) 1

D) 3

E) 2

Correct Answer : Option A

31. If the distance of the line $4x - 3y + k = 0$ from the point (1, 2) is 5 units, then the values of k are

A) 27,-23

B) -27,23

C) 29,-24

D) -29,24

E) -28,-25

Correct Answer : Option A

32. Two sides of a parallelogram are along the lines $x + y = 5$ and $x - y =$ -5. If the diagonals of the parallelogram intersects at (3, 6) then one of its vertices, is at

A) (6,5)
B) (7,6)
C) (7,5)
D) (6,7)
E) (5,7)

Correct Answer : Option D

33. Let $ax + by + c = 0$ the equation of a straight line such that $3a + 2b + 4c = 0$. Which one of the following points, lies on the line?

A) $\left(\frac{3}{4}, \frac{1}{2}\right)$
B) $\left(\frac{1}{2}, \frac{3}{4}\right)$
C) $\left(\frac{1}{4}, \frac{3}{2}\right)$
D) $\left(\frac{3}{2}, \frac{1}{2}\right)$
E) (2,4)

Correct Answer : Option A

34. If two diameters of a circle are along the lines $2x - 3y = 5$ and $3x - 4y = 7$, then the centre is at

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

Correct Answer : Option D

35. Let $y^2 = 8x$ be the equation of a parabola. Which one of the following is an arbitrary point on the parabola?

A) $(2t, 4t^2), t \in \mathbb{R}$
B) $(2t^2, 4t^2), t \in \mathbb{R}$
C) $(2t^2, 2t^2), t \in \mathbb{R}$
D) $(2t, 2t^2), t \in \mathbb{R}$
E) $(2t^2, 4t), t \in \mathbb{R}$

Correct Answer : Option E

36. Let P be any point on the ellipse $4(x+2)^2 + 9(y-4)^2 = 144$. If F_1 and F_2 are the Foci of the ellipse, then $F_1P + F_2$ P=

A) 8

B) 12

C) 16

D) 6

E) 10

Correct Answer : Option B

37. The eccentricity of the hyperbola $\frac{(x-1)^2}{25}$ - $\frac{(y+2)^2}{11}$=1 is

A) $\frac{5}{3}$

B) $\frac{25}{11}$

C) $\frac{6}{5}$

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

E) $\frac{5}{11}$

Correct Answer : Option C

38. Let $\vec{a}, \vec{b}, \vec{c}$ be any three vectors and m, n be scalars. Which one of the following is not true?

A) $\left(\vec{a}+\vec{b}\right)+\vec{c}=\vec{a}+\left(\vec{b}+\vec{c}\right)$

B) $m\left(\vec{a}+\vec{b}+\vec{c}\right)=m\vec{a}+m\vec{b}+m\vec{c}$

C) $(m+n)\vec{a}=m\vec{a}+n\vec{a}$

D) $m\left(\vec{a}.\vec{b}=m\vec{a}.m\vec{b}\right)$

E) $m\left(\vec{a}\times\vec{b}=m\vec{a}\times\vec{b}\right)$

Correct Answer : Option D

39. If $\vec{a}.\vec{b}=12,$ then $(3\vec{a}).(3\vec{b})$is equal to

A) 36

B) 4

C) 108

D) 16

E) 144

Correct Answer : Option C

40. Let$\vec{a}=3\hat{\imath}+2\hat{\jmath}+2\hat{k}$, $\vec{b}=\hat{\imath}+2\hat{\jmath}-2\hat{k}$ .Then $(\vec{a}+\vec{b})$.$(\vec{a}-\vec{b})$ =

A) 6

B) 7

C) 8

D) 9

E) 10

Correct Answer : Option C

41. $\vec{a}, \vec{b}, \vec{c}, \vec{d}$ be non-zero vectors such that $\vec{a} \times \vec{b} = \vec{c} \times \vec{d}$ and $\vec{a} \times \vec{c} = \vec{b} \times \vec{d}$.Then

A) $\vec{a} - \vec{d}$ is parallel to $\vec{b} - \vec{c}$

B) $\vec{a} - \vec{b}$ is parallel to $\vec{b} - \vec{c}$

C) $\vec{b} - \vec{c}$ is parallel to $\vec{b} + \vec{c}$

D) $\vec{a} - \vec{c}$ is parallel to $\vec{b} - \vec{c}$

E) $\vec{a} + \vec{c}$ is parallel to $\vec{b} + \vec{d}$

Correct Answer : Option A

42. Let $\overrightarrow{OP} = 2\hat{j}$ be the position vector a point P. Let $\vec{r} = \hat{j} + \lambda\,(\hat{i} + \hat{j})$be a straight line. The distance of the point P from the line is

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

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

C) $\frac{\sqrt{6}}{3}$

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

E) $\frac{\sqrt{2}}{4}$

Correct Answer : Option A

43. The Cartesian equation of the line $\vec{r} = \left(2\hat{i} - 7\hat{j} + 11\hat{k}\right) + \lambda\left(3\hat{i} + 7\hat{j} - 13\hat{k}\right)$ is

A) $\frac{x-2}{3} = \frac{y+7}{7} = \frac{z-11}{-1}$

B) $\frac{x-2}{3} = \frac{y-7}{7} = \frac{z-11}{13}$

C) $\frac{x+2}{3} = \frac{y-7}{7} = \frac{z+11}{-1}$

D) $\frac{x+2}{3} = \frac{y+7}{7} = \frac{z-11}{-13}$

E) $\frac{x+2}{3} = \frac{y}{13} = \frac{z-11}{-7}$

Correct Answer : Option A

44. Which one of the following is a point on the straight line $\vec{r} = (13\hat{\imath} - 14\hat{\jmath} + 23\hat{k}) + \lambda\,(5\hat{\imath} - 7\hat{\jmath} - 9\hat{k})$,$\lambda \in \mathbb{R}$

A) (13,-14,-23)

B) (5,-7,-9)

C) (23,-28,7)

D) (23,-28,5)

E) (13,14,23)

Correct Answer : Option D

45. The point at which the line $\frac{x+3}{11} = \frac{y-2}{-1} = \frac{z+1}{3}$ meets the zx -plane is

A) (19,2,5)

B) (19,0,5)

C) (0,2,-1)

D) (-3,2,0)

E) (0,2,-1)

Correct Answer : Option B

46. The mean deviation about the mean from the data 400,410, 420,430,440 is

A) 14

B) 10

C) 20

D) 12

E) 16

Correct Answer : Option D

47. An unbiased die is thrown and B is an event showing an odd number on top. Then $P(B)$

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

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

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

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

E) $\frac{1}{5}$

Correct Answer : Option D

48. The standard deviation of 1,2,3,...,100 is

A) $\frac{1}{2}\sqrt{3333}$

B) $\frac{1}{4}\sqrt{3333}$

C) $\frac{1}{6}\sqrt{3333}$

D) $\frac{1}{8}\sqrt{3333}$

E) $\frac{1}{4}\sqrt{1111}$

Correct Answer : Option A

49. Consider the random experiment that an integer is chosen from the first 100 positive integers. Probability that the chosen number is a multiple of 11, is

A) $\frac{1}{10}$

B) $\frac{1}{11}$

C) $\frac{9}{100}$

D) $\frac{13}{100}$

E) $\frac{11}{100}$

Correct Answer : Option C

50. $\lim_{x\to 0}\frac{\sin x}{2\sqrt{2}\sin\frac{x}{\sqrt{2}}} =$

A) $\sqrt{2}$

B) $2\sqrt{2}$

C) $\frac{1}{\sqrt{2}}$

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

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

Correct Answer : Option E

51. $\lim_{\theta\to 0}\frac{\theta\ sin2\theta}{1-cos2\theta}$

A) 1

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

C) -1

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

E) 0

Correct Answer : Option A

52. The function $f(x) = x\left(\sqrt{x+2} + \sqrt{x+1}\right)$ is continuous on

A) $(-\infty, 1]$

B) $[4, \infty)$

C) [-3,∞)

D) [-1,∞)

E) (−∞,∞)

Correct Answer : Option D

53. $\lim_{x \to 2} \frac{sinxcos2 - cosxsin2}{x-2} =$

A) -1

B) 1

C) 4

D) 2

E) 0

Correct Answer : Option B

54. Let $f(x) = [x], x \in (0, 6),$ where[x] is the greatest integer function. Then the number of discontinuities of $f(x)$

A) 1

B) 2

C) 3

D) 4

E) 5

Correct Answer : Option E

55. Let $f(x) = 10 - \ |x - 5|\ , x \in \mathbb{R}$, Then $f(x)$ is not differentiable at

A) x=10

B) x=15

C) x=-5

D) x=5

E) x=-15

Correct Answer : Option D

56. For $x \in \mathbb{R}$,let $f(x) = log3 - sinx$ and $g(x) = f(f(x))$Then g'(0)=

A) $sin(log3)$

B) $-sin(log3)$

C) $-cos(log3)$

D) $2cos(log3)$

E) $cos(log3)$

Correct Answer : Option E

57. If $y = \cos x \cos y$, then $\frac{dy}{dx}$ at $\left(\frac{\pi}{3}, \frac{\pi}{6}\right)$ is

A) $\frac{-3}{5}$

B) $\frac{3}{5}$

C) $\frac{5}{3}$

D) $\frac{-5}{3}$

E) $\frac{-4}{3}$

Correct Answer : Option A

58. Let $f: \mathbb{R} \to \mathbb{R}$ be a function such that $f(x) = x^3 + x^2 f'(1) + xf"(2) + f'''(3)$, then $f'''(3)$=

A) 3

B) 6

C) 9

D) -2

E) $f"(2)$

Correct Answer : Option B

59. If $u = sec^{-1}(-sec2\theta)$ and $v = cos\,\theta$, then $\frac{du}{dv}$ at $\theta = \frac{\pi}{4}$,is equal to

A) $\sqrt{2}$

B) $2\sqrt{2}$

C) $\frac{1}{\sqrt{2}}$

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

E) $-\sqrt{2}$

Correct Answer : Option B

60. The function $f(x) = e^x - x$ is increasing in the interval

A) $(0, 4)$

B) $(-\infty, 0)$

C) $(-1, 1)$

D) $(-1, 0)$

E) $(0, \infty)$

Correct Answer : Option E

61. Let $f(x) = 10 - |x - 3|, x \in \mathbb{R}$ The maximum of $f(x)$ occurs at

A) x=0

B) x=3

C) x=-3

D) x=10

E) x=1

Correct Answer : Option B

62. The distance travelled by a moving particle is given by $s = \frac{t^2}{2} - 6t + 8$,where t denotes the time in seconds. The velocity becomes zero when t is equal to

A) 1

B) 4

C) 3

D) 6

E) 8

Correct Answer : Option D

63. If $a + b = 10$ and ab is maximum, then the value of a is

A) 5

B) 3

C) 6

D) 25

E) 10

Correct Answer : Option A

64. If $\int \frac{1}{x^7\left(\frac{1}{x^6}+1\right)^{2/3}}dx = -\frac{1}{2}\left(\frac{1}{\frac{1}{x^6}+1}\right)^p + c$, then $p =$

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

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

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

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

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

Correct Answer : Option C

65. $\int \frac{\sec x}{(\sec x+\tan x)^9}\,dx =$

A) $\frac{1}{9}(secx+tanx)^9+C$

B) $\frac{-1}{9}(secx+tanx)^9+C$

C) $\frac{-1}{9}(secx+tanx)^{-9}+C$

D) $\frac{1}{9}(secx+tanx)^{-9}+C$

E) $(secx+tanx)^{-9}+C$

Correct Answer : Option C

66. $\int\frac{\left(9e^{x}+4e^{-x}\right)}{\left(9e^{x}-4e^{-x}\right)}dx =$

A) $9e^{x}-4e^{-x}+C$

B) $\log|9e^{x}+4e^{-x}|+C$

C) $4e^{x}-9e^{-x}+C$

D) $\log|4e^{x}-9e^{-x}|+C$

E) $\log|9e^{x}-4e^{-x}|+C$

Correct Answer : Option E

67. $\int e^{2\theta}\left(2\cos^{2}\theta-\sin 2\theta\right)d\theta =$

A) $e^{2\theta}cos^{2}\theta+C$

B) $e^{2\theta}\sin 2\theta+C$

C) $2e^{2\theta}cos^{2}\theta+C$

D) $e^{2\theta}\sin\theta+C$

E) $e^{2\theta}cos2\theta+C$

Correct Answer : Option A

68. $\int e^{\left(x+\frac{1}{x}\right)}\left(\frac{x^{2}-1}{x^{2}}\right)dx =$

A) $xe^{\left(x+\frac{1}{x}\right)}+C$

B) $e^{\left(x+\frac{1}{x}\right)}+C$

C) $x+e^{\left(x+\frac{1}{x}\right)}+C$

D) $x^2e^{\left(x+\frac{1}{x}\right)}+C$

E) $e^{\left(x+\frac{1}{x}\right)}+x^2+C$

Correct Answer : Option B

69. The area bounded by $y=x-1, 1\le x\le 2, y=0$ (in sq.units) is

A) 2

B) 1

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

D) 4

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

Correct Answer : Option C

70. Given that $\int_0^1 \tan^{-1}(t)\,dt=\frac{\pi}{4}-\frac{1}{2}\log 2$. Then $\int_0^1 \tan^{-1}(1-t)\,dt=$

A) $\frac{\pi}{2}-\frac{1}{2}log2$

B) $\frac{\pi}{4}-\frac{1}{2}log3$

C) $\frac{\pi}{4}+\frac{1}{2}log2$

D) $\frac{\pi}{4}+\frac{1}{2}log2$

E) $\frac{\pi}{4}-\frac{1}{2}log2$

Correct Answer : Option E

71. $\int_0^{\frac{\pi}{2}} \frac{1}{1+\sin x}dx=$

A) 2

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

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

D) 1

E) 0

Correct Answer : Option D

72. $\int_{-2}^{2} |x+3|\,dx =$

A) 14

B) 16

C) 8

D) 10

E) 12

Correct Answer : Option E

73. If $\frac{dy}{dx} = \frac{1}{8\left(\sqrt{16+\sqrt{25+\sqrt{x}}}\right)\left(\sqrt{25+\sqrt{x}}\right)\sqrt{x}}$, then $y =$

A) $\sqrt{16+\sqrt{25+\sqrt{x}}} + C$

B) $\sqrt{16+\sqrt{25+\sqrt{x}}} + x + C$

C) $\sqrt{16+\sqrt{25+\sqrt{x}}} + x^2 + C$

D) $x\sqrt{16+\sqrt{25+\sqrt{x}}} + C$

E) $x^2\sqrt{16+\sqrt{25+\sqrt{x}}} + C$

Correct Answer : Option A

74. The elimination of arbitrary constants c_1, c_2, c_3 and c_4 from $y = (c_1 + c_2)$ sin $(x + c_3) - c_4 e^x$ gives a differential equation of order

A) 1

B) 2

C) 3

D) 4

E) 5

Correct Answer : Option C

75. The maximum value of the objective function $z = 2x + 3y$, when the corner points of the feasible region are (0, 0), (5, 0) , (4, 1) and (0, 2), is

A) 0

B) 6

C) 10

D) 11

E) 16

Correct Answer : Option D

76. The dimension of X in the equation, $F = 6\pi\eta\ X$ is
(F – Force; η -Coefficient of viscosity)

A) $M^0L^2T^{-1}$

B) ML^2T^{-2}

C) $M^0L^2T^{-2}$

D) $M^0L^3T^{-2}$

E) ML^2T^{-1}

Correct Answer : Option A

77. One torr is

A) 1 mm of Hg

B) 1 cm of Hg

C) 76 mm of Hg

D) 100 mm of Hg

E) 76 cm of Hg

Correct Answer : Option A

78. A particle moving with an initial velocity of 1 ms^{-1} has an uniform acceleration of 2 $m\ s^{-2}$. The distances travelled by the particle in the first two intervals of 5 s are respectively

A) 30 m and 110 m

B) 50 m and 110 m

C) 40 m and 80 m

D) 30 m and 80 m

E) 60 m and 160 m

Correct Answer : Option D

79. When a cricketer hits a ball at an angle of 45º with an initial velocity of 40 ms^{-1},the ball falls on the ground at a distance of 160 m. If he hits the ball at the same angle with an initial velocity of 50 ms^{-1} the ball will fall at a distance of

A) 480 m

B) 180 m

C) 280 m

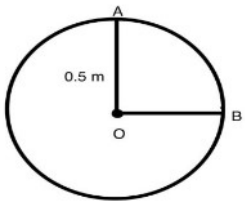
D) 300 m

E) 250 m

Correct Answer : Option E

A ball moves in a circle of radius 0.5 m from A to B in $\sqrt{2}$ s. The average velocity of the ball is (in ms^{-1})

80.



A) 0.25
B) 0.5
C) 0.75
D) 1.5
E) 1.25

Correct Answer : Option B

81. A block of mass m suspended from the ceiling of a lift by an inextensible string of negligible mass. When the lift moves in the upward direction with an acceleration of 0.2 ms^{-2}, the tension acting on the wire is 80 N. Then the mass of the block is

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

Correct Answer : Option C

82. The force to be applied to a body of mass 200 g to change its velocity by 25 ms^{-1} in 5 s is

A) 2.5 N
B) 50 N
C) 3 N
D) 30 N
E) 1 N

Correct Answer : Option E

83. Two bodies having masses in the ratio 1:3 have equal linear momentum. Their respective kinetic energies are in the ratio

A) 3:1
B) 1:2
C) 1:3

D) 4:1

E) 2:1

Correct Answer : Option A

84. A particle moving in a horizontal circle of radius 0.5 *m* completes half rotation. The work done by the centripetal force of 5 N on the particle (in J) is

A) 2

B) 5

C) 2.5

D) 3

E) 1

Correct Answer : Option B

85. The moment of inertia and rotational kinetic energy of a rigid body about an axis are respectively 4 kgm^2 and 50 J. The angular velocity of the body (in rad s^{-1}) is

A) 10

B) 20

C) 25

D) 5

E) 15

Correct Answer : Option D

86. If a torque of 1.25 Nm acts on a circular ring for a duration of 4 *s*, then its angular momentum changes by (kgm^2 s^{-1})

A) 25

B) 50

C) 15

D) 5

E) 10

Correct Answer : Option D

87. If the angular displacement made by a rotating wheel in 10 *s* is 150π radian, then the number of revolutions made by it is

A) 75

B) 100

C) 300

D) 150

E) 50

Correct Answer : Option A

88. Two satellites A and B are orbiting the earth at a height of 2.5R and 7.5R respectively from the centre of the earth. The ratio of time periods of A and B is

A) $\sqrt{3}:1$

B) $1:3\sqrt{3}$

C) $1:\sqrt{3}$

D) $1:2\sqrt{3}$

E) $3\sqrt{3}:1$

Correct Answer : Option B

89. The orbital velocity v_o of an artificial satellite revolving around the earth at a height R from the surface of the earth in terms of escape velocity v_e from the earth is (R - radius of the earth)

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

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

C) $\frac{v_e}{\sqrt{2}}$

D) v_e

E) $\sqrt{2}v_e$

Correct Answer : Option A

90. P_a is the atmospheric pressure and P is the absolute pressure at a depth h in an ocean. The gauge pressure at the depth h is

A) $P + P_a$

B) $\frac{P - P_a}{2}$

C) $2P - P_a$

D) $\frac{P + P_a}{2}$

E) $P - P_a$

Correct Answer : Option E

91. The principle behind the function of Bunsen burner is

A) Pascal's law

B) law of flotation

C) venturimeter

D) Toricelli's law

E) Archemedes' principle

Correct Answer : Option C

92. Bernoulli's principle is applicable to

A) non-viscous, incompressible fluids in streamline flow

B) viscous, compressible fluids in streamline flow
C) viscous, incompressible fluids in streamline flow
D) non-viscous, incompressible fluids in turbulent flow
E) non-viscous, compressible fluids in turbulent flow

Correct Answer : Option A

93. Specific heat capacity of a substance depends on the
A) material of the substance only
B) volume of the substance only
C) mass of the substance only
D) material and temperature of the substance
E) mass and volume of the substance

Correct Answer : Option D

94. Which one is INCORRECT statement?
A) In an isochoric process, volume remains constant
B) In an adiabatic process, there is a heat exchange with the surrounding
C) In an isobaric process, pressure remains constant
D) In an isothermal process, temperature remains constant
E) In a cyclic process, the change in internal energy is zero

Correct Answer : Option B

95. The number of molecules contained in the gas of mass *M* is (M_o - molar mass, N_A - Avogadro's number)
A) $\left(\frac{M}{M_o}\right)\frac{1}{N_A}$
B) $\left(\frac{M_o}{M}\right)N_A$
C) $(MM_o)N_A$
D) $(MM_o)\frac{1}{N_A}$
E) $\left(\frac{M}{M_o}\right)N_A$

Correct Answer : Option E

96. If the mean free path of a gas molecule at 27 ºC is 10 x 10^{-7} *m*. Its mean free path at 87 ºC is
A) 12 x10^{-7} m
B) 8 x10^{-7} m
C) 6 x10^{-7} m
D) 10 x10^{-7} m

E) 14×10^{-7} m

Correct Answer : Option A

97. If the speed of the transverse wave in a wire under certain tension T is v , then its speed under tension $2T$ (in ms^{-1}) is

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

B) $2v$

C) $\sqrt{2}v$

D) $\frac{3v}{\sqrt{2}}$

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

Correct Answer : Option C

98. A musician hits a drum 90 times in a minute. The time period of hit is

A) 1.34 s

B) 1.5 s

C) 0.33 s

D) 0.75 s

E) 0.67 s

Correct Answer : Option E

99. If the time period of a particle executing SHM is 8 s, then the time period of the potential energy of this particle is

A) 16 s

B) 4 s

C) 2 s

D) 8 s

E) 32 s

Correct Answer : Option B

100. Which one of the following pairs of charges separated by the same distance r will experience a maximum force?

A) 0.3 C and 0.7 C

B) 0.1 C and 0.9 C

C) 0.2 C and 0.8 C

D) 0.5 C and 0.5 C

E) 0.4 C and 0.6 C

Correct Answer : Option D

101. A charge of 5 C is moved from a point P to another point Q by doing a work of 10 J. If the potential at P is 0.5 V, then the potential at Q is

A) 1.0V
B) 2.0V
C) 2.5 V
D) 1.5V
E) 3.0V

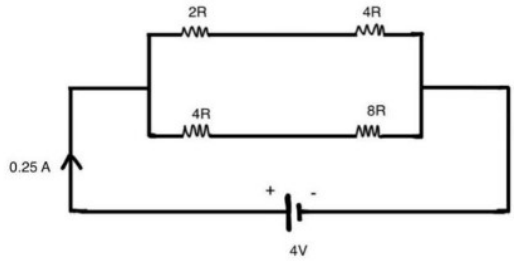
Correct Answer : Option C

102. The equivalent capacitance of n capacitors of equal capacitance when connected in series and parallel are respectively 0.4 μF and 10 μF. The capacitance of each capacitor is

A) 2μF
B) 4μF
C) 5 μF
D) 6 μF
E) 1μF

Correct Answer : Option A

103. The value of R in the given circuit is



A) 0.4 Ω
B) 8 Ω
C) 2 Ω
D) 0.8 Ω
E) 4 Ω

Correct Answer : Option E

104. The resistance of a wire at 30ºC and 40ºC are respectively 5 Ω and 6 Ω. The temperature coefficient of resistance of the material of the wire (in per degree Celcius) is

A) 0.04
B) 0.05
C) 0.02
D) 0.03
E) 0.01

Correct Answer : Option B

105. A wire of 25 Ω resistance is cut into n pieces of equal length. If these pieces of wires are connected in parallel, their equivalent resistance is 1 Ω , then the value of n is

A) 3
B) 6
C) 8
D) 5
E) 4

Correct Answer : Option D

106. A coil having 100 turns and an area of 0.02 m^2 is placed with its plane perpendicular to the magnetic field of 1 Wbm^{-2}. The magnetic flux linked with the coil is

A) zero
B) 1 Wb
C) 2 Wb
D) 3 Wb
E) 5 Wb

Correct Answer : Option C

107. Two charged particles of same mass but having charges in the ratio 1: 4 enter a uniform perpendicular magnetic field. The ratio of their time period in their respective circular path is

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

Correct Answer : Option D

108. Which one is not a ferromagnetic material?

A) cobalt
B) tungsten
C) nickel
D) gadolinium
E) iron

Correct Answer : Option B

109. If an inductor coil of self-inductance 2 H stores 25 J of magnetic energy, then the current I passing through it is

A) 25 A
B) 10A
C) 15A
D) 2 A

E) 5 A

Correct Answer : Option E

110. When a current passing through a coil changes at the rate of 30 As^{-1} , the emf induced in the coil is 12 V. The self-inductance of the coil is

A) 0.4 H
B) 0.2 H
C) 0.6 H
D) 0.3 H
E) 0.1 H

Correct Answer : Option A

111. An electromagnetic wave travelling in vacuum has its electric field component, E = 15 sin $[1.57y + 5.4t]\hat{j}$ The wavelength of the wave is

A) 4.0 m
B) 3.0 m
C) 2.5 m
D) 2.0 m
E) 1.0 m

Correct Answer : Option A

112. Chromatic aberration arises in thick lenses due to

A) scattering of light
B) refraction of light
C) interference of light
D) reflection of light
E) dispersion of light

Correct Answer : Option E

113. An unpolarized light incident on a plane glass surface gets totally polarized on reflection. If the refractive index of glass is tan 57°, then the angle of refraction is

A) 90º
B) 33º
C) 13º
D) 37º
E) 45º

Correct Answer : Option B

114. Light energy is redistributed in

A) diffraction and interference
B) reflection and diffraction

C) refraction and interference

D) reflection and polarisation

E) polarization and refraction

Correct Answer : Option A

115. Which one of the following statements is INCORRECT?

In photoelectric effect

A) Threshold frequency is different for different metals

B) The same metal gives same response to light of different wavelengths

C) The emission of photoelectrons is an instantaneous process

D) Above the threshold frequency the number of photoelectrons emitted per sec is directlyproportional to the intensity of incident radiation

E) The maximum K.E. of the photoelectrons is independent of the intensity of incident radiation

Correct Answer : Option B

116. When an electron is accelerated from rest by a potential of 480 V, the wavelength associated with it is λ. If the electron at rest is accelerated by a potential of 120 V, then the wavelength associated with it is

A) 5λ

B) 4λ

C) 2λ

D) 3λ

E) 6λ

Correct Answer : Option C

117. In hydrogen spectrum, the shortest wavelength of Bracket series is produced during the transition between the states

A) $n_2 = 5$ and $n_1 = 4$

B) $n_2 = 4$ and $n_1 = 1$

C) $n_2 = 4$ and $n_1 = 3$

D) $n_2 = \infty$ and $n_1 = 4$

E) $n_2 = 4$ and $n_1 = 2$

Correct Answer : Option D

118. A radioactive element having 6 x 10^5 atoms initially decays and is left with 0.75 x 10^5 undecayed atoms in 48 years. The half-life time of this radioactive element is

A) 16 years

B) 24 years

C) 12 years

D) 6 years

E) 18 years

Correct Answer : Option A

119. The possible number of energy states in a Ge crystal containing 5 x 10^3 atoms is

A) 2 x 10^4

B) 4 x 10^4

C) 4 x 10^4

D) 3 x 10^4

E) 5 x 10^4

Correct Answer : Option B

120. A pn junction diode without any voltage biasing acts as a

A) rectifier

B) resistor

C) ac generator

D) voltage regulator

E) transformer

Correct Answer : Option B

121. How many moles of methane are required to produce 11 g $CO_{2(g)}$ after combustion? (Molar mass of CO_2 = 44 g mol^{-1})

A) 0.25

B) 0.5

C) 1.5

D) 2.0

E) 2.5

Correct Answer : Option A

122. A sub-atomic particle of mass 6.63 × 10^{-31} kg is moving with a velocity of 1 × 10^6 ms $^{-1}$. What is the de Broglie wave length (in *nm*) associated with it (h = 6.63 × 10^{-34} Js)?

A) 10.0

B) 1.0

C) 0.10

D) 5.0

E) 0.50

Correct Answer : Option B

123. For hydrogen atom, the orbitals with the lowest energy among the given orbitals are (i) 4s (ii) $2p_x$ (iii) $3d_z2$ (iv) $2p_y$

A) (i) & (iii)

B) (ii) & (iv)

C) (ii) & (iii)
D) (ii) only
E) (i) only

Correct Answer : Option B

124. Which of the following species will have the largest and the smallest sizes respectively?

Na, Mg, Na^+, Mg^{2+}

A) Mg and Na^+
B) Mg and Mg^{2+}
C) Na and Mg^{2+}
D) Na and Mg
E) Na^+ and Mg

Correct Answer : Option C

125. Which of the following statement is INCORRECT?

A) The dipole moment of BF_3 is zero.
B) The bond order of CO molecule is the same as the bond order in NO^+ ion.
C) In ozone molecule, the two O-O bond lengths are equal.
D) The dipole moment of NF_3 is much greater than that in NH_3
E) Carbonate ion has three canonical forms.

Correct Answer : Option D

126. In which of following reactions entropy decreases?

(i) $2Pb(NO_3)_{2(s)} \rightarrow 2PbO_{(s)} + 4NO_{2(g)} + O_{2(g)}$
(ii) $H_2O_{(g)} \rightarrow H_2O_{(l)}$
(iii) $Br_{2(l)} \rightarrow 2Br_{(g)}$
(iv) $C_6H_{6(l)} \rightarrow C_6H_{6(s)}$

A) (ii), (iii) and (iv)
B) (i) and (iii)
C) (i) and (iii)
D) (i) and (iv)
E) (ii) and (iv)

Correct Answer : Option E

127. The enthalpy of combustion values of $C_2H_{4(g)}$, C(graphite,s) and $H_{2(g)}$ are respectively -1411kJ mol^{-1}, -394 kJ mol^{-1} and -286 kJ mo^{-1}. What is the value of enthalpy of formation of $C_2H_{4(g)}$ in kJ mol^{-1} ?

A) -102

B) -51

C) +102

D) +153

E) +51

Correct Answer : Option E

128. The following concentrations were obtained in the formation of $NH_{3(g)}$ from $N_{2(g)}$ and $H_{2(g)}$ at equilibrium at 500 K:
$[NH_3]$ =1.5 × 10^{-2} M, $[N_2]$ = 5 × 10^{-3} M and $[H_2]$ = 0.10 M
Calculate the equilibrium constant for the reaction (in dm^6 mol^{-3}) at 500 K.

$N_{2(g)} + 3H_{2(g)} \leftrightharpoons 2NH_{3(g)}$

A) 0.45

B) 4.5

C) 45.0

D) 4.5 × 10^{-2}

E) 4.5 × 10^{-3}

Correct Answer : Option C

129. Which of the following is a Lewis acid?

A) HCl

B) HO^-

C) H_2O

D) Co^{3+}

E) NH_3

Correct Answer : Option D

130. The EMF of the following cell at 298K is
$Mg_{(s)} \mid Mg^{2+}(aq)\ (0.10M) \mid\mid Ag^{+}(aq)(0.001M) \mid Ag_{(s)}$
(Given: E^0_{cell}=3.17V and 2.303RT/F = 0.06 V)

A) 3.32V

B) 2.96V

C) 3.02V

D) 3.17V

E) 3.47V

Correct Answer : Option C

131. The electrolyte used in lead storage battery is

A) 10% H_2SO_4 aqueous solution

B) 60% H_2SO_4 aqueous solution

C) 38% H_2SO_4 aqueous solution

D) 38% HCl aqueous solution

E) 60% HCl aqueous solution

Correct Answer : Option C

132. The binary liquid mixture that has positive deviation from Raoult's law is

A) Chloroform-Acetone

B) Chloroethane-Bromoethane

C) Phenol-Aniline

D) Benzene-Toluene

E) Ethanol-Acetone

Correct Answer : Option E

133. A first order reaction has a rate constant of 6.93×10^{-4} s^{-1} at 300 K. What is the half life period of the reaction in seconds at the same temperature?

A) 693

B) 6930

C) 10000

D) 1000

E) 500

Correct Answer : Option D

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

A) Plot of [Reactant] against time is a straight line with slope equal to k

B) Plot of [Reactant] against time is a straight line with slope equal to -k

C) Plot of [Reactant] against time is a straight line with slope equal to 2.303 k

D) Plot of [Reactant] against time is a straight line with slope equal to -2.303 k

E) Plot of [Reactant] against time is a straight line with slope equal to -k/2.303

Correct Answer : Option B

135. Which of the following 3d transition metal has +5 state as the more stable state?

A) Titanium

B) Vanadium

C) Manganese

D) Nickel

E) Silver

Correct Answer : Option B

In acidic medium, dichromate behaves as an oxidizing agent which can be represented as

136. $Cr2O_7^{2-} + xH^+ + ye^- \rightarrow 2Cr^{3+} + zH_2O$

The values of x, y and z are respectively

A) 6, 7 and 14

B) 7, 6 and 14

C) 14, 6 and 7

D) 14, 7 and 6

E) 6,12 and 7

Correct Answer : Option C

137. Which of the following is not an interstitial compound?

A) Sc_2O_3

B) TiC

C) Mn_4N

D) $TiH_{1.7}$

E) Fe_3H

Correct Answer : Option A

138. Which of the following transition metal has the highest magnetic moment?

A) Sc^{3+}

B) Ti^{3+}

C) Cr^{2+}

D) Fe^{2+}

E) Mn^{2+}

Correct Answer : Option E

139. Which of the following complex is optically active?

A) $trans - [CrCl_2(ox)_2]^{3-}$

B) $trans - [PtCl_2(en)_2]^{2+}$

C) $\text{cis} - [Pt(NH_3)_2]Cl_2$

D) $trans - [Pt(NH_3)_2]Cl_2$

E) $cis - [PtCl_2(en)_2]^{2+}$

Correct Answer : Option E

140. The number of bridging carbonyl groups in $[Mn_2(CO)_{10}]$ is

A) 2
B) 0
C) 4
D) 3
E) 1

Correct Answer : Option B

141. On complete combustion 0.12g of an organic compound gives 0.11g of CO_2. What is the percentage of carbon in the organic compound?

A) 15%
B) 20%
C) 25%
D) 17.5%
E) 21.5%

Correct Answer : Option C

142. One mole of an alkene reacts with acidic $KMnO_4$ to give two moles of ethanoic acid. What is the alkene?

A) 2-Methylpropene
B) 1-Butene
C) 2-Pentene
D) 2-Butene
E) 2-Methyl-2-butene

Correct Answer : Option D

143. Which of the following is a vicinal dihalide?

A) 1,1-Dibromopropane
B) 1,2-Dibromopropane
C) 1,3-Dibromopropane
D) Benzal dibromide
E) 1,3-Dibromobutane

Correct Answer : Option B

144. S_N1 reaction is most favoured by

A) Ethyl bromide
B) 2-methyl-2-bromopropane
C) 2-bromopropane
D) 1-bromopropane
E) 1-bromobutane

Correct Answer : Option B

145. Phenol is treated with Con.H_2SO_4 to gives a product 'X" which on treatment with Con.HNO_3 gives compound 'Y'. The compounds 'X' and 'Y' are respectively

A) Phenol-2- sulphonic acid and 2-nitrophenol
B) Phenol-2-sulphonic acid and 4-nitrophenol
C) Phenol-2-sulphonic acid, mixture of 2-nitrophenol and 4-nitrophenol
D) Phenol-2,4-disulphonic acid, mixture of 2-nitrophenol and 4-nitrophenol
E) Phenol-2,4-disulphonic acid and picric acid

Correct Answer : Option E

146. Denatured alcohol with colour and foul smell is made now a days by mixing ethanol with

A) Methanol
B) $ZnSO_4$ and thiophene
C) $CuSO_4$ and pyridine
D) $FeSO_4$ and furan
E) $Fe_2(SO_4)_3$ and hexane

Correct Answer : Option C

147. Benzoyl chloride is converted to benzaldehyde by

A) Etard reaction
B) Stephen reaction
C) Gatterman reaction
D) Gatterman – Koch reaction
E) Rosenmund reaction

Correct Answer : Option E

148. In which of the following liquid inter molecular hydrogen bonding does not exist?

A) CH_3COOH
B) C_2H_5OH
C) Phenol
D) Diethylether
E) Ethylamine

Correct Answer : Option D

149. The IUPAC name of allylamine is

A) But-2-en-1-amine
B) But-1-en-2-amine
C) Prop-2-en-1-amine
D) Prop-1-en-2-amine
E) 2-Amino 1-propene

Correct Answer : Option C

150. The carbohydrate found in yeast is

A) lactose
B) starch
C) cellulose
D) maltose
E) glycogen

Correct Answer : Option E