CUSAT 2018

Solved Paper

Question 1

The relation R defined in the set {1, 2, 3, 4, 5, 6} as R = {(a, b); b = a + 1} is

Options:

A. reflexive

B. symmetric

C. transitive

D. neither reflexive nor symmetric

Answer: D

Solution:

Solution:

Question 2

Let $f:\mathrm{R}\to\mathrm{R}$ be defined by $f(x)=3x$. Then

Options:

(A) f is one-one and onto

(B) f is onto but not one-one

(C) f is one-one but not onto

(D) f is neither one-one nor onto

Answer: A

Solution:

Solution:

Question 3

Let f : [−1, 1] → R be a function defined as f (x) = $\frac{x}{x+2}$. The inverse of the

function f : [−1, 1]→ Range of f is

Options:

A. $f^{-1}(y) = \frac{2y}{1-y}, y \neq 1$

B. $f^{-1}(y) = \frac{y}{1-y}, y \neq 1$

C. $f^{-1}(y) = \frac{2y}{1+y}$

D. $f^{-1}(y) = \frac{y}{1+y}$

Answer: A

Solution:

Solution:

Question 4

The binary operation * on Z^+, defined by a * b = a − b, is

Options:

A. commutative

B. associative

C. commutative and associative

D. neither commutative nor associative

Answer: D

Solution:

Solution:

Question 5

Number of binary operations on the set {a, b}

Options:

A. 10

B. 16

C. 20

D. 8

Answer: D

Solution:

Solution:

Question 6

The principal value of $\tan^{-1}(-\sqrt{3})$ is

Options:

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

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

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

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

Answer: C

Solution:

Solution:

Question 7

The value of $\sin^{-1}\left(\sin\frac{3\pi}{5}\right)$ is

Options:

A. $\frac{6\pi}{5}$

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

C. $\frac{4\pi}{5}$

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

Answer: B

Solution:

Solution:

Question 8

If $x \in [-1, 1]$, then $\sin^{-1}x + \cos^{-1}x$ is

Options:

A. π

B. 0

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

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

Answer: C

Solution:

Solution:

Question 9

If $A = \begin{bmatrix} 2 & 1 \\ 3 & 4 \end{bmatrix}$, then $(\text{adj}\, A)A =$

Options:

A. $\begin{bmatrix} 1/5 & 0 \\ 0 & 1/5 \end{bmatrix}$

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

C. $\begin{bmatrix} 5 & 0 \\ 0 & -5 \end{bmatrix}$

D. $\begin{bmatrix} 5 & 0 \\ 0 & 5 \end{bmatrix}$

Answer: D

Solution:

Solution:

Question 10

Let A = $\begin{pmatrix} 1 & 2 & x \\ 3 & -1 & 2 \end{pmatrix}$ and B = $\begin{pmatrix} y \\ x \\ 1 \end{pmatrix}$ be such that AB = $\begin{pmatrix} 6 \\ 8 \end{pmatrix}$. Then

Options:

A. $y = 2x$

B. $y = -2x$

C. $y = x$

D. $y = -x$

Answer: A

Solution:

Solution:

Question 11

If the rank of the matrix $\begin{pmatrix} \lambda & -1 & 0 \\ 0 & \lambda & -1 \\ -1 & 0 & \lambda \end{pmatrix}$ is 2 , then λ is

Options:

A. $\lambda = 1$

B. $\lambda = -1$

C. $\lambda = 2$

D. $\lambda = -2$

Answer: A

Solution:

Solution:

Question 12

Matrices A and B will be inverse of each other only if

Options:

A. AB = BA ≠ I

B. AB = BA = 0

C. AB = 0, BA = I

D. AB = BA = I

Answer: D

Solution:

Solution:

Question 13

The system of equations αx + y + z = 0, x + βy + z = 0, x + y + γz = has a non trivial solution. Then $\frac{1}{1-\alpha} + \frac{1}{1-\beta} + \frac{1}{1-\gamma}$ =

Options:

A. 1

B. 2

C. -1

D. 0

Answer: A

Solution:

Solution:

Question 14

Force $\vec{F} = \vec{i} + \vec{j} + \vec{k}$ is acting on a particle. If the particle is displaced from A(3, 3, 3) to the point B(4, 4, 4), then work done is

Options:

A. 2 units

B. 4 units

C. 3 units

D. 7 units

Answer: C

Solution:

Solution:

Question 15

The area of the parallelogram having a diagonal $3\vec{i} + \vec{j} - \vec{k}$ and a side $\vec{i} - 3\vec{j} - \vec{k}$ is

Options:

A. $10\sqrt{3}$

B. $6\sqrt{30}$

C. $\left(\frac{3}{2}\right)\sqrt{30}$

D. $3\sqrt{30}$

Answer: D

Solution:

Solution:

Question 16

If $x^2 + y^2 = 1$, then the value of $\frac{1 + x + iy}{1 + x - iy}$ is

Options:

A. $x - iy$

B. $x + iy$

C. $2x$

D. $-2iy$

Answer: B

Solution:

Solution:

Question 17

If ω is the cube root of unity, then the value of $(1 - \omega)(1 - \omega^2)(1 - \omega^4)(1 - \omega^5)$ is

Options:

A. 9

B. -9

C. 16

D. 32

Answer: A

Solution:

Solution:

Question 18

The value of $\left[\frac{-1+i\sqrt{3}}{2}\right]^{100} + \left[\frac{-1-i\sqrt{3}}{2}\right]^{100}$ is

Options:

A. 2

B. 0

C. -1

D. 1

Answer: C

Solution:

Solution:

Question 19

Area of the region bounded by the curve $y^2 = 4x$, y axis and the line $y = 3$ is

Options:

A. 2

B. $\frac{9}{4}$

C. $\frac{9}{3}$

D. $\frac{9}{2}$

Answer: B

Solution:

Solution:

Question 20

If f (x) = $\int_0^x t\sin t\,dt$, then f′(x) is

Options:

A. $\cos x + x\sin x$

B. $x\sin x$

C. $x\cos x$

D. $\sin x + x\cos x$

Answer: B

Solution:

Solution:

Question 21

The integrating factor of $\frac{dy}{dx} + \frac{y}{(x\log x)} = \frac{2}{x^2}$ is

Options:

A. e^x

B. $\log x$

C. $1 / x$

D. e^{-x}

Answer: B

Solution:

Solution:

Question 22

The particular integral of the differential equation $f(D)y = e^{ax}$, where $f(D) = (D - a)g(D)$, $g(a) \neq 0$ is

Options:

A. me^{ax}

B. $\frac{xe^{ax}}{g(a)}$

C. $\frac{e^{ax}}{g(a)}$

D. $g(a)e^{ax}$

Answer: B

Solution:

Solution:

Question 23

The value of ' a ' so that the curves $y = 3e^{x}$ and $y = ae^{-x}$ intersect orthogonally, is

Options:

A. -1

B. 1

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

D. 3

Answer: C

Solution:

Solution:

Question 24

The line $y = x + 1$ is a tangent to the curve $y^2 = 4x$ at the point

Options:

A. (1, 2)

B. (2, 1)

C. $(1, -2)$

D. $(-1, 2)$

Answer: A

Solution:

Solution:

Question 25

The approximate change in the volume of a cube of side x metres caused by increasing the side by 3% is

Options:

A. $0.06x^3m^3$

B. $0.6x^3m^3$

C. $0.09x^3m^3$

D. $0.9x^3m^3$

Answer: C

Solution:

Solution:

Question 26

If the rate of increase of $x^3 - 2x^2 + 3x + 8$ is twice the rate of increase of x, then values of x are

Options:

A. $(-1 / 3, -3)$

B. $(1 / 3, 1)$

C. $(-1 / 3, 3)$

D. $(1 / 3, -3)$

Answer: B

Solution:

Solution:

Question 27

The point on the curve $x^2 = 2y$ which is nearest to the point (0, 5) is

Options:

A. (0, 0)

B. (2, 2)

C. $(2\sqrt{2}, 4)$

D. $(2\sqrt{2}, 0)$

Answer: C

Solution:

Solution:

Question 28

$\lim_{x \to 0} \frac{a^x - b^x}{c^x - d^x} =$

Options:

A. ∞

B. 0

C. $\log \frac{ab}{cd}$

D. $\log \frac{a / b}{c / d}$

Answer: D

Solution:

Solution:

Question 29

The value of ' p ', so that the lines $\frac{x-5}{7} = \frac{y+2}{-5} = \frac{z}{p}$ and $\frac{x}{p} = \frac{y}{2} = \frac{z}{3}$ are at right angles, is

Options:

A. 2

B. 1

C. 3

D. 5

Answer: B

Solution:

Solution:

Question 30

The point of intersection of the lines $\frac{x-6}{-6} = \frac{y+4}{4} = \frac{z-4}{-8}$ and $\frac{x+1}{2} = \frac{y+2}{4} = \frac{z+3}{-2}$ is

Options:

A. $(0, 0, -4)$

B. $(1, 0, 0)$

C. $(0, 2, 0)$

D. $(1, 2, 2)$

Answer: A

Solution:

Solution:

Question 31

The direction cosines of the line passing through the points $(-2, 4, -5)$ and $(1, 2, 3)$ are

Options:

A. $\frac{3}{\sqrt{87}}, \frac{-2}{\sqrt{87}}, \frac{8}{\sqrt{87}}$

B. $\frac{3}{\sqrt{87}}, \frac{2}{\sqrt{87}}, \frac{5}{\sqrt{87}}$

C. $\frac{3}{\sqrt{77}}, \frac{2}{\sqrt{77}}, \frac{5}{\sqrt{77}}$

D. $\frac{3}{\sqrt{77}}, \frac{-2}{\sqrt{77}}, \frac{8}{\sqrt{77}}$

Answer: D

Solution:

Solution:

Question 32

The distance to the plane $2x - 3y + 4z - 6 = 0$ from the origin is

Options:

A. $\frac{3}{\sqrt{29}}$

B. $\frac{4}{\sqrt{29}}$

C. $\frac{6}{\sqrt{29}}$

D. $\frac{2}{\sqrt{29}}$

Answer: C

Solution:

Solution:

Question 33

The planes $2x - y + 4z = 5$ and $5x - 2.5y + 10z = 6$ are

Options:

A. perpendicular

B. parallel

C. intersect on y-axis

D. passing through (0, 0, 5 / 4)

Answer: B

Solution:

Solution:

Question 34

If the standard deviation of the numbers 2, 3, a and 11 is 3.5 , then

Options:

A. $3a^2 - 26a + 55 = 0$

B. $3a^2 - 32a + 84 = 0$

C. $3a^2 - 34a + 91 = 0$

D. $3a^2 - 23a + 44 = 0$

Answer: B

Solution:

Solution:

Question 35

If the mean and variance of a binomial variate X are 2 and 1 respectively, then P(X ≥ 1) is

Options:

A. 1 / 16

B. 9 / 16

C. 3 / 4

D. 15 / 16

Answer: D

Solution:

Solution:

Question 36

A family has two children. Given that at least one of them is a boy, the probability of both the children are boys, is

Options:

A. 3 / 4

B. 1 / 3

C. 1 / 4

D. 1 / 2

Answer: B

Solution:

Solution:

Question 37

The probability of obtaining an even prime number on each die, when a pair of dice is rolled, is

Options:

A. 0

B. 1 / 3

C. 1 / 12

D. 1 / 36

Answer: D

Solution:

Solution:

Question 38

The probability that a student is not a swimmer is 1 / 5. Then the probability that out of five students, four are swimmers is

Options:

A. ${}^5C_4\left(\frac{4}{5}\right)^4\left(\frac{1}{5}\right)$

B. ${}^5C_4\left(\frac{1}{5}\right)^4\left(\frac{4}{5}\right)$

C. ${}^5C_1\left(\frac{4}{5}\right)^4\frac{1}{5}$

D. ${}^5C_2\left(\frac{4}{5}\right)^2\left(\frac{1}{5}\right)^3$

Answer: A

Solution:

Solution:

Question 39

Given E (X + c) = 8 and E (X − c) = 12. Then the value of c is

Options:

A. 2

B. -2

C. 4

D. -4

Answer: B

Solution:

Solution:

Question 40

The value of x for which $\frac{x-1}{x} \geq 2$ is

Options:

A. (0, 1)

B. $(-\infty, -1)$

C. $(-\infty, 0)$

D. $[-1, 0)$

Answer: D

Solution:

Solution:

Question 41

The value of x for which 12x − 6 < 0, 12 − 3x < 0 is

Options:

A. ϕ

B. R

C. R\{0}

D. set of all non-negative integers

Answer: A

Solution:

Solution:

Question 42

The value of x for which |x + 3|> | 2x − 1| is

Options:

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

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

C. (0, 1)

D. [0, 1]

Answer: A

Solution:

Solution:

Question 43

If $n^4 < 10^n$ for a fixed positive integer n ≥ 2, then

Options:

A. $(n + 1)^4 < 10^{n+1}$

B. $(n + 1)^4 > 10^{n+1}$

C. $(n + 1)^4 < 10^n$

D. $(n + 1)^4 > 10^n$

Answer: A

Solution:

Solution:

Question 44

If $x^2 + 6x − 27 > 0$ and $x^2 − 3x − 4 < 0$, then

Options:

A. $x > 3$

B. $x < 4$

C. $3 < x < 4$

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

Answer: C

Solution:

Solution:

Question 45

Solution of $2x - 1 - |x + 7|$ is

Options:

A. -2

B. 8

C. $-2, 8$

D. 4

Answer: B

Solution:

Solution:

Question 46

If $x \in I$ (set of all integers) such that $x^2 - 3x < 4$, then the number of possible values of x is

Options:

A. 3

B. 4

C. 6

D. 2

Answer: B

Solution:

Solution:

Question 47

If $3^{x+1} = 6^{\log_2 3}$, then x is

Options:

A. 3

B. 2

C. $\log_3 2$

D. $\log_2 3$

Answer: D

Solution:

Solution:

Question 48

The value of amp(iω) + amp(iω^2), where i = $\sqrt{-1}$ and ω = $\sqrt[3]{1}$ = non-real, is

Options:

A. 0

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

C. π

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

Answer: C

Solution:

Solution:

Question 49

If the fourth roots of unity are z_1, z_2, z_3, z_4, then $z_1^2 + z_2^2 + z_3^2 + z_4^2$ is equal to

Options:

A. 1

B. 0

C. i

D. $-i$

Answer: B

Solution:

Solution:

Question 50

If z is a complete number, then $z^2 + \omega z^2 = 2$ represents, where $\omega^3 = 1$,

Options:

A. a circle

B. a straight line

C. a hyperbola

D. an ellipse

Answer: C

Solution:

Solution:

Question 51

The value of $\left[i^{19} + \left(\frac{1}{i} \right)^{25} \right]^2$ is

Options:

A. 4

B. -4

C. 2

D. -2

Answer: B

Solution:

Solution:

Question 52

The value of $|\sqrt{2i} - \sqrt{-2i}|$ is

Options:

A. 2

B. $\sqrt{2}$

C. 0

D. $2\sqrt{2}$

Answer: A

Solution:

Solution:

Question 53

$\cos\left(i \log \frac{a - ib}{a + ib}\right)$ is equal to

Options:

A. ab

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

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

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

Answer: B

Solution:

Solution:

Question 54

Locus of the point z satisfying the equation $|iz - 1| + |z - i| = 2$ is

Options:

A. a straight line

B. a circle

C. an ellipse

D. a pair of straight lines

Answer: A

Solution:

Solution:

Question 55

If the cube root of unity is 1, ω, ω^2, then the roots of the equation $(x + 1)^3 + 8 = 0$ are

Options:

A. $-1, 1 + 2\omega, 1 + 2\omega^2$

B. $-3, -1 - 2\omega, -1 - 2\omega^2$

C. $-1, -1, -1$

D. .
$-2, -2\omega, -2\omega^2$

Answer: B

Solution:

Solution:

Question 56

If $x = a + b + c$, $y = a\alpha + b\beta + c$ and $z = a\beta + b\alpha + c$ where α, β are complex cube roots of unity and a, b, c are real, then xyz is equal to

Options:

A. $2(a^3 + b^3 + c^3)$

B. $2(a^3 - b^3 - c^3)$

C. $a^3 + b^3 + c^3 - 3abc$

D. $a^3 - b^3 - c^3$

Answer: C

Solution:

Solution:

Question 57

If z_1, z_2, z_3 are vertices of an equilateral triangle inscribed in the circle $|z| = 2$ and if $z_1 = 1 + 1\,sqrt\,3$, then

Options:

A. $z_2 = -2$ and $z_3 = 1 - i\sqrt{3}$

B. $z_2 = 2$ and $z_3 = 1 - i\sqrt{3}$

C. $z_2 = -2$ and $z_3 = -1 - i\sqrt{3}$

D. $z_2 = 1 - i\sqrt{3}$ and $z_3 = -1 - i\sqrt{3}$

Answer: C

Solution:

Solution:

Question 58

If $\frac{3}{2 + \cos\theta + i\sin\theta} = a + ib$, then $[(a-2)^2 + b^2]$ is equal to

Options:

A. 0

B. 1

C. -1

D. 2

Answer: B

Solution:

Solution:

Question 59

Let z_1 and z_2 be the roots of the equation $z^2 + pz + q = 0$ where p, q are real. The points represented by z_1, z, and the origin from an equilateral triangle, if

Options:

A. $p^2 = 3q$

B. $p^2 > 3q$

C. $p^2 < 3q$

D. $p^2 = 2q$

Answer: A

Solution:

Solution:

Question 60

The value of sum $\sum_{n=1}^{13} (i^n + i^{n+1})$, where $i = \sqrt{-1}$, equals

Options:

A. i

B. $i - 1$

C. $-i$

D. 0

Answer: B

Solution:

Solution:

Question 61

If $a^{\frac{1}{x}} = b^{\frac{1}{y}} = c^{\frac{1}{z}}$ where a, b, c are in geometrical progression, then x, y, z

are in

Options:

A. AP

B. GP

C. HP

D. None of the above

Answer: A

Solution:

Solution:

Question 62

The difference between two numbers is 48 and the difference between their arithmetic mean and their geometric mean is 18 . Then the greater of the two numbers is

Options:

A. 96

B. 60

C. 54

D. 49

Answer: D

Solution:

Solution:

Question 63

The first two terms of a geometric progression add up to 12. The sum of the third and the fourth terms is 48 . If the terms of the geometric progression are alternately positive and negative, then the first term is

Options:

A. -4

B. -12

C. 12

D. 1

Answer: B

Solution:

Solution:

Question 64

If the first, second and last term of an arithmetic series are a, b, c respectively, then the number of terms is

Options:

A. $\frac{b + c - 2a}{b - a}$

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

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

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

Answer: A

Solution:

Solution:

Question 65

Find the sum of the series $(1 + 2) + (1 + 2 + 2^2) + (1 + 2 + 2^2 + 2^3) + \ldots$ upto n terms

Options:

A. $2^{n+2} - n - 4$

B. $2(2^n - 1) - n$

C. $2^{n+1} - n$

D. $2^{n+1} - 1$

Answer: A

Solution:

Solution:

Question 66

If a, b, c are in arithmetic progression, then the value of $(a + 2b - c)(2b + c - a)(a + 2b + c)$ is

Options:

A. 16abc

B. 4abc

C. 8abc

D. 3abc

Answer: A

Solution:

Solution:

Question 67

The interior angles of a polygon are in AP. The smallest angle is 120˚ and the common difference is 50˚. The number of sides of the polygon is

Options:

A. 9

B. 10

C. 16

D. 5

Answer: A

Solution:

Solution:

Question 68

If $S_n = 1^3 + 2^3 + \ldots + n^3$ and $T_n = 1 + 2 + \ldots + n$, then

Options:

A. $S_n = T_{n^3}$

B. $S_n = T_{n^2}$

C. $S_n = T_n^2$

D. $S_n = T_n^3$

Answer: C

Solution:

Solution:

Question 69

The number of real solutions of $x - \frac{1}{x^2-4} = 2 - \frac{1}{x^2-4}$ is

Options:

A. 3

B. 1

C. 0

D. infinite

Answer: C

Solution:

Solution:

Question 70

If $x + \lambda y - 2$ and $x - \mu y + 1$ are factors of the expression $6x^2 - xy - y^2 - 6x + 8y - 12$, then

Options:

A. $\lambda = \frac{1}{3}, \mu = \frac{1}{2}$

B. $\lambda = 2, \mu = 3$

C. $\lambda = \frac{1}{3}, \mu = \frac{-1}{2}$

D. $\lambda = 2, \mu = -3$

Answer: C

Solution:

Solution:

Question 71

If $x + \frac{1}{x} = 5$, then $\left(x^3 + \frac{1}{x^3}\right) - 5\left(x^2 + \frac{1}{x^2}\right) + \left(x + \frac{1}{x}\right)$ is equal to

Options:

A. 0

B. 5

C. -5

D. 10

Answer: A

Solution:

Solution:

Question 72

If $\frac{6x^2 - 5x - 3}{x^2 - 2x + 6} < 4$, then the least and highest values of $4x^2$ are

Options:

A. 0,81

B. 0,36

C. $-10, 3$

D. $10, -3$

Answer: A

Solution:

Solution:

Question 73

For real a and b, the roots of the equation $(x - a)(x - b) = abx^2$ are always

Options:

A. real

B. purely imaginary

C. complex

D. one rational and other irrational

Answer: A

Solution:

Solution:

Question 74

If $f(x) = 2x^3 + mx^2 - 13x + n$ and 2,3 are roots of the equation $f(x) = 0$, then the values of m and n are

Options:

A. $-5, -30$

B. $-5, 30$

C. 5, 30

D. $5, -30$

Answer: B

Solution:

Solution:

Question 75

If $\log_{10}x + \log_{10}y \geq 2$, then the smallest possible value of $x + y$ is

Options:

A. 10

B. 30

C. 20

D. 5

Answer: C

Solution:

Solution:

Question 76

The number of real solutions of the equation $27^{\frac{1}{x}} + 12^{\frac{1}{x}} = 2 \times 8^{\frac{1}{x}}$

Options:

A. one

B. two

C. zero

D. infinite

Answer: C

Solution:

Solution:

Question 77

The roots of the equation $x^{\sqrt{x}} = \sqrt{x^x}$ are

Options:

A. 0 and 4

B. 0 and 1

C. 0.1 and 4

D. 1 and 4

Answer: D

Solution:

Solution:

Question 78

How many 10 digit numbers can be written by using the digits 1 and 2 ?

Options:

A. $^{10}C_1 + {}^{9}C_2$

B. 2^{10}

C. ${}^{10}C_2$

D. 10 !

Answer: B

Solution:

Solution:

Question 79

The total number of 9 digit numbers which have all different digit is

Options:

A. 10!

B. 9!

C. 9.9!

D. 10.10 !

Answer: C

Solution:

Solution:

Question 80

The number of possible outcomes in a throw of n ordinary dice in which at least one of the dice shows an odd number is

Options:

A. $6^n - 1$

B. $3^n - 1$

C. $6^n - 3^n$

D. 6^n

Answer: C

Solution:

Solution:

Question 81

The number of different garlands, that can be formed using 3 flowers of one kind and 3 flowers of other kind, is

Options:

A. 60

B. 20

C. 4

D. 5

Answer: D

Solution:

Solution:

Question 82

The number of divisors of the form 4n + 2(≥0) of the integer 240 is

Options:

A. 4

B. 8

C. 10

D. 3

Answer: A

Solution:

Solution:

Question 83

If a, b, c are three natural numbers in AP and a + b + c = 21, then the possible number of ordered triplet (a, b, c) is

Options:

A. 15

B. 14

C. 13

D. 12

Answer: C

Solution:

Solution:

Question 84

The number of different ways of distributions of 10 marks among 3 questions, each question carrying at least 1 mark, is

Options:

A. 72

B. 71

C. 36

D. 84

Answer: C

Solution:

Solution:

Question 85

Let A be the set of 4-digit numbers $a_1a_2a_3a_4$ where $a_1 < a_2 < a_3 < a_4$, then n(A) is equal to

Options:

A. 126

B. 84

C. 210

D. 96

Answer: A

Solution:

Solution:

Question 86

In the binomial expansion of (a − b)*, n ≥ 5 the sum of the 5^{th} and 6^{th} terms is zero. Then, $\frac{a}{b}$ equals

Options:

A. $\frac{n-5}{6}$

B. $\frac{n-4}{5}$

C. $\frac{5}{n-4}$

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

Answer: B

Solution:

Solution:

Question 87

The largest coefficient in the expression of $(1 + x)^{2n}$ is

Options:

A. ${}^{2n}C_{n}$

B. ${}^{2n}C_{n+1}$

C. ${}^{2n}C_{n-1}$

D. ${}^{2n}C_{2n-1}$

Answer: A

Solution:

Solution:

Question 88

The remainder when $3^{100} \times 2^{50}$ is divided by 5 is

Options:

A. 1

B. 2

C. 3

D. 4

Answer: D

Solution:

Solution:

Question 89

The digit at the unit place in the number $19^{2005} + 11^{2005} - 9^{2005}$ is

Options:

A. 2

B. 1

C. 0

D. 8

Answer: B

Solution:

Solution:

Question 90

If P(n) : 2 + 4 + 6 + ... + (2n), n ∈ ℕ, then P(k) = k(k + 1) + 2 implies p(k + 1) = (k + 1)(k + 2) + 2 is true for all k ∈ ℕ. So, the statement P(n) = n(n + 1) + 2 is true for

Options:

A. n ≥ 1

B. n ≥ 2

C. n ≥ 3

D. None of the above

Answer: D

Solution:

Solution:

Question 91

In the expression of $\left(x - \frac{1}{x}\right)^6$, the constant term is

Options:

A. -20

B. 20

C. 30

D. -30

Answer: A

Solution:

Solution:

Question 92

For |x| < 1, the constant term in the expansion of $\frac{1}{(x-1)^2(x-1)}$ is

Options:

A. 2

B. 1

C. 0

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

Answer: D

Solution:

Solution:

Question 93

Let A and B be two non-zero square matrices. If the product AB is a zero

matrix, then

Options:

A. A and B are non-singular

B. B is non-singular

C. A is non-singular

D. A and B are singular

Answer: D

Solution:

Solution:

Question 94

The solution set of the equation $\begin{vmatrix} 2 & 3 & x \\ 2 & 1 & x^2 \\ 6 & 7 & 3 \end{vmatrix}$ **= 0 is**

Options:

A. φ

B. $\{0, 1\}$

C. $\{-1, 1\}$

D. $\{1, -3\}$

Answer: D

Solution:

Solution:

Question 95

If ω is a complex cube root of unity, then the value of the determinant

$\begin{vmatrix} 1 & \omega & \omega+1 \\ \omega+1 & 1 & \omega \\ \omega & \omega+1 & 1 \end{vmatrix}$ **is**

Options:

A. 0

B. ω

C. 2

D. 4

Answer: D

Solution:

Solution:

Question 96

If A = $\begin{vmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ 1 & -1 & 0 \end{vmatrix}$, then $A^3 + A$ is equal to

Options:

A. $\begin{vmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{vmatrix}$

B. $\begin{vmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ 1 & 0 & 0 \end{vmatrix}$

C. $\begin{vmatrix} 0 & 0 & 1 \\ 0 & 0 & 1 \\ 1 & -1 & 0 \end{vmatrix}$

D. $\begin{vmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{vmatrix}$

Answer: D

Solution:

Solution:

Question 97

If A = $\begin{vmatrix} 1 & 0 & 0 \\ x & 1 & 0 \\ x & x & 1 \end{vmatrix}$ and I = $\begin{vmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{vmatrix}$ then $A^3 - 3A^2 + 3A + I$ is equal to

Options:

A. 31

B. I

C. $-I$

D. 2I

Answer: D

Solution:

Solution:

Question 98

If A = $\begin{bmatrix} 3 & 3 & 3 \\ 3 & 3 & 3 \\ 3 & 3 & 3 \end{bmatrix}$, then A^4 is equal to

Options:

A. 27A

B. 81A

C. 243A

D. 729A

Answer: D

Solution:

Solution:

Question 99

If $\begin{vmatrix} 2i & -3i & 1 \\ 3 & 3i & -1 \\ 4 & 3 & i \end{vmatrix}$ = x + iy, then

Options:

A. x = 3, y = 1

B. x = 2, y = 3

C. x = 0, y = 0

D. x = 1, y = 1

Answer: C

Solution:

Solution:

Question 100

If $\begin{vmatrix} a & b & a-b \\ b & c & b-c \\ 2 & 1 & 0 \end{vmatrix}$ **= 0, then a, b, c are in**

Options:

A. AP

B. H P

C. GP

D. None of the above

Answer: C

Solution:

Solution:

Question 101

If $2^x.3^{x+4} = 7x$, then x is equal to

Options:

A. $\frac{4\log_e 3}{\log_e 7 - \log_e 6}$

B. $\frac{4\log_e 3}{\log_e 6 - \log_e 7}$

C. $\frac{2\log_e 3}{\log_e 7 - \log_e 6}$

D. $\frac{3\log_{\varepsilon}3}{\log_{\varepsilon}6-\log_{\varepsilon}7}$

Answer: A

Solution:

Solution:

Question 102

If $x = 1 + 2 + \frac{4}{2!} + \frac{8}{3!} + \frac{16}{4!} + \ldots$, then x^{-1} is equal to

Options:

A. e^{-2}

B. e^{2}

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

D. e^{-1}

Answer: A

Solution:

Solution:

Question 103

Which of the following is not correct?

Options:

A. $A \subseteq A'$ if and only if $A = \varphi$

B. $A' \subseteq A$ if and only if $A = X$, where X is the universal set

C. If $A \cup B = A \cup C$, then $B = C$

D. $B = C$ if and only if $A \cup B = A \cup C$ and $A \cap B = A \cap C$

Answer: D

Solution:

Solution:

Question 104

A relation R is defined in the set Z of integers as follows (x, y) ∈ R if and only if $x^2 + y^2 = 9$. Which of the following is false?

Options:

A. R = {(0, 3), (0, −3), (3, 0), (−3, 0)}

B. Domain of R = {−3, 0, 3}

C. Range of R = {−3, 0, 3}

D. At least one of the above is false

Answer: D

Solution:

Solution:

Question 105

Two finite sets A and B have m and n elements respectively. If the total number of subsets of A is 112 more than the total number of subsets of B. then the value of m is

Options:

A. 7

B. 9

C. 10

D. 12

Answer: A

Solution:

Solution:

Question 106

A pack of cards contains 4 aces, 4 kings, 4 queens and 4 jacks. Two cards are drawn in random from this pack without replacement. The probability, that at least one of them will be an ace, is

Options:

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

B. $\frac{9}{20}$

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

D. $\frac{1}{9}$

Answer: B

Solution:

Solution:

Question 107

If P(A) = 0.65, P(B) = 0.80, then P(A cap B) lies in the interval

Options:

A. [0.30, 0.80]

B. [0.4, 0.70]

C. [0.4, 0.70]

D. [0.45, 0.65]

Answer: D

Solution:

Solution:

Question 108

One hundred identical coins, each with probability p, of showing up a head, are tossed. If 0 < p < 1, and if the probability of heads on exactly 50 coin is equal to that of heads on exactly 51 coins, then the value of p, is

Options:

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

B. $\frac{49}{101}$

C. $\frac{50}{101}$

D. $\frac{51}{101}$

Answer: D

Solution:

Solution:

Question 109

The probability density function of X is

f (x) = $\begin{cases} 3e^{-3x} & x > 0 \\ 0 & \text{elsewhere} \end{cases}$

The cumulative distribution function of X is

Options:

A. F (x) = $\begin{cases} 0 & x \geq 0 \\ 1 - e^{-3x} & x < 0 \end{cases}$

B. F (x) = $\begin{cases} 0 & x \leq 0 \\ 1 + e^{-3x} & x > 0 \end{cases}$

C. F (x) = $\begin{cases} 0 & x \leq 0 \\ 1 - e^{-3x} & x > 0 \end{cases}$

D. None of the above

Answer: C

Solution:

Solution:

Question 110

There are 12 white and 12 red balls in a bag. Balls are drawn one by one with replacement from the bag. The probability that 7^{th} drawn ball is $4^{m.}$ white is

Options:

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

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

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

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

Answer: C

Solution:

Solution:

Question 111

A determinant of second order is made with the elements 0,1 . What is the probability that the determinant is positive?

Options:

A. $\frac{7}{12}$

B. $\frac{11}{12}$

C. $\frac{3}{16}$

D. $\frac{15}{16}$

Answer: C

Solution:

Solution:

Question 112

A box contains 3 red and 5 blue balls. The probability, that two balls are drawn in which 2^{nd} ball drawn is blue without replacement, is

Options:

A. $\frac{5}{16}$

B. $\frac{5}{36}$

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

D. $\frac{20}{56}$

Answer: C

Solution:

Solution:

Question 113

If $\frac{\sin(x+y)}{\sin(x-y)} = \frac{a+b}{a-b}$, then $\frac{\tan x}{\tan y}$ is equal to

Options:

A. 0

B. ab

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

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

Answer: D

Solution:

Solution:

Question 114

If $x\sin^3\theta + y\cos^3\theta = \sin\theta\cos\theta$ and $x\sin\theta = y\cos\theta$, then $x^2 + y^2$ is

Options:

A. 2

B. 0

C. 3

D. 1

Answer: D

Solution:

Solution:

Question 115

If $\sin^{-1}x - \cos^{-1}x = \frac{\pi}{6}$, then x is

Options:

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

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

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

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

Answer: B

Solution:

Solution:

Question 116

If $\cos^{-1}\left(\frac{5}{13}\right) - \sin^{-1}\left(\frac{12}{13}\right) = \cos^{-1}x$, then x is equal to

Options:

A. 1

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

C. 0

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

Answer: A

Solution:

Solution:

Question 117

If $-\frac{x}{2} < \sin^{-1}x < \frac{x}{2}$, then $\tan(\sin^{-1}x)$ is equal to

Options:

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

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

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

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

Answer: C

Solution:

Solution:

Question 118

If $y = f(x^3)$, $z = g(x^5)$, $f'(x) = \tan x$ and $g'(x) = \sec x$, then the value of $\frac{dy}{dx}$ is

Options:

A. $\frac{3}{5x^2} \cdot \frac{\tan x^3}{\sec x^5}$

B. $\frac{5x^2}{3} \cdot \frac{\sec x^5}{\tan x^3}$

C. $\frac{3x^2}{5} \cdot \frac{\tan x^3}{\sec x^5}$

D. $\frac{5}{3x^2} \frac{\tan x^3}{\sec x^5}$

Answer: A

Solution:

Solution:

Question 119

If $\sqrt{x} + \sqrt{y} = 4$, then $\frac{dx}{dy}$ at $y = 1$ is

Options:

A. - 1

B. - 3

C. 3

D. 1

Answer: B

Solution:

Solution:

Question 120

The derivative of $\sin x^3$ with respect to $\cos x^3$ is equal to

Options:

A. $-\tan x^3$

B. $-\cot x^3$

C. $\cot x^3$

D. $\tan x^3$

Answer: B

Solution:

Solution:

Question 121

If $y = \sqrt{x + \sqrt{y + \sqrt{x + \sqrt{y + \ldots \infty}}}}$, then $\frac{dy}{dx}$ is equal to

Options:

A. $\frac{y + x}{y^2 - 2x}$

B. $\frac{y^2 - x}{2y^2 - 2xy - 1}$

C. $\frac{y^3 + x}{2y^2 - x}$

D. $\frac{y^2 - x}{y^3 - xy - 1}$

Answer: D

Solution:

Solution:

Question 122

$\lim_{n \to \infty} \left(\frac{3x^2 + 2x + 1}{x^2 + x + 2} \right)^{\frac{6x+1}{3x+2}}$ **is equal to**

Options:

A. 3

B. 9

C. 1

D. 5

Answer: B

Solution:

Solution:

Question 123

The values of constants a and b so that $\lim_{n \to \infty} \left(\frac{x^2 + 1}{x + 1} - ax - b \right) = 0$ **is**

Options:

A. $a = 0, b = 0$

B. $a = 1, b = -1$

C. $a = -1, b = 1$

D. $a = 2, b = -1$

Answer: B

Solution:

Solution:

Question 124

If [.] denotes the greatest integer function, then $\lim_{n \to \infty} \frac{[x] + [2x] + \ldots + [nx]}{n^2}$ **is**

Options:

A. 0

B. x

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

D. $\frac{x^2}{2}$

Answer: C

Solution:

Solution:

Question 125

The greatest value of $f(x) = (x + 1)^{\frac{1}{3}} - (x - 1)^{\frac{1}{3}}$ on [0, 1] is

Options:

A. 1

B. 2

C. 3

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

Answer: B

Solution:

Solution:

Question 126

A car starts from rest to cover a distance s. The coefficient of friction between the road and the tyres is μ. The minimum time in which the car can cover the distance is proportional to

Options:

A. μ

B. 1 / μ

C. $\sqrt{\mu}$

D. 1 / $\sqrt{\mu}$

Answer: D

Solution:

Solution:

Question 127

The diameter of a circle is 2.486m. Its area with due regard to significant figures is (Given π = 3.142)

Options:

A. $4.85454m^2$

B. $4.8545m^2$

C. $4.584m^2$

D. $4.855m^2$

Answer: D

Solution:

Solution:

Question 128

An athlete completes one round of a circular track of radius R in 40 s. What will be his displacement at the end of 2 minutes 20 seconds?

Options:

A. 7R

B. 2R

C. 2πR

D. 7πR

Answer: B

Solution:

Solution:

Question 129

Vectors A and B have same magnitude. In addition, the magnitude of their resultant is also equal to the magnitude of either of them. Then A and B are at an angle

Options:

A. 120˚

B. 60˚

C. 90˚

D. 45˚

Answer: A

Solution:

Solution:

Question 130

In a tug of war contest, two men pull on a horizontal rope from opposite sides. The winner will be the man who

Options:

A. exerts greater force on the rope

B. exerts greater force on the ground

C. exerts force on the rope which is greater than the tension in the rope

D. makes a smaller angle with the vertical

Answer: B

Solution:

Solution:

Question 131

Which one of the following is not a conservative force?

Options:

A. gravitational force

B. electromagnetic force between two charges

C. magnetic force between two magnetic dipoles

D. frictional force

Answer: D

Solution:

Solution:

Question 132

The center of mass of a system of particles does not depend on

Options:

A. mass of the particles

B. position of particles

C. forces on the particles

D. relative distance between the particles

Answer: C

Solution:

Solution:

Question 133

If the separation between carbon and oxygen in CO molecule is 0.12 nm, then the distance of the center of mass from the carbon atom is

Options:

A. 0.03 nm

B. 0.068 nm

C. 0.05 nm

D. 0.06 nm

Answer: B

Solution:

Solution:

Question 134

Which one of the following is an evidence to show that there must be a force acting on earth and directed towards sun?

Options:

A. deviation of the falling bodies towards east

B. revolution of the earth round the sun

C. phenomenon of day and night

D. expanding universe

Answer: B

Solution:

Solution:

Question 135

Kepler's second law regarding constancy of aerial velocity of a planet is a consequence of conservation of

Options:

A. energy

B. distance

C. linear momentum

D. angular momentum

Answer: D

Solution:

Solution:

Question 136

Glass is a

Options:

A. Crystalline solid

B. Amorphous solid

C. Liquid crystalline material

D. Polymeric material

Answer: B

Solution:

Solution:

Question 137

A certain planet is at a distance d from the sun. Then the temperature of the planet is

Options:

A. proportional to d

B. inversely proportional to d

C. inversely proportional to $\sqrt{d}$

D. inversely proportional to d^2

Answer: D

Solution:

Solution:

Question 138

The velocity of sound in air is independent of change in

Options:

A. temperature

B. density

C. pressure

D. humidity

Answer: C

Solution:

Solution:

Question 139

A parallel plate condenser is charged and isolated. When a sheet of glass is interposed between the plates

Options:

A. the charges on the plates will be reduced

B. the potential difference between the plates will be reduced

C. the potential difference between the plates will be increased

D. the charges on the plates will be increased

Answer: C

Solution:

Solution:

Question 140

Two wires carrying the same current in the same direction and placed 1 cm apart will experience

Options:

A. a mutually attractive force

B. a mutually repulsive force

C. no force at all

D. attractive as well as repulsive force

Answer: A

Solution:

Solution:

Question 141

Eddy currents developed on a conductor moving in a magnetic field will tend to

Options:

A. speed up the motion

B. slow down the motion

C. rotate the conductor

D. oscillate the conductor

Answer: B

Solution:

Solution:

Question 142

Two coils of inductances L_1 and L_2 are linked such that their mutual inductance is M. Then,

Options:

A. $M = L_1 - L_2$

B. $M = L_1 + L_2$

C. $M = (L_1 + L_2) / 2$

D. the maximum value of M is $\sqrt{(L_1 L_2)}$

Answer: D

Solution:

Solution:

Question 143

Two monochromatic light beams of intensities I and 4I are superposed. The maximum and minimum possible intensities in the resulting beam are

Options:

A. 5I and I

B. 5I and 3I

C. 9I and I

D. 9I and 3I

Answer: D

Solution:

Solution:

Question 144

The penetrating powers of a, b and g radiations, in decreasing order, are

Options:

A. α, β, γ

B. γ, α, β

C. β, γ, α

D. γ, β, α

Answer: D

Solution:

Solution:

Question 145

If orbits of n greater than 4 are not allowed, the maximum number of elements in nature would be

Options:

A. 78

B. 60

C. 106

D. 32

Answer: B

Solution:

Solution:

Question 146

Fermi level in the case of intrinsic semiconductor lies

Options:

A. close to the conduction band

B. close to the valence band

C. in the middle of the forbidden energy gap

D. above the conduction band

Answer: C

Solution:

Solution:

Question 147

A certain npn transistor has a forward current gain β of 99 . The current amplification factor α of the transistor is

Options:

A. 0.66

B. 0.99

C. 0.98

D. 9.9

Answer: B

Solution:

Solution:

Question 148

The truth table of a certain logic circuit is shown below.

A (input)	B (input)	Y (output)
0	0	0
0	1	1
1	0	1
1	1	0

The logic gate represented by the above truth table belongs to

Options:

A. NAND

B. OR

C. NOR

D. XOR

Answer: D

Solution:

Solution:

Question 149

Optical fibers transmit light signals from one place to another place by

Options:

A. internal conical refraction

B. double refraction

C. interference of light signals

D. total internal reflection

Answer: D

Solution:

Solution:

Question 150

Numerical aperture of an optical fiber is a measure of

Options:

A. attenuation of light signals in the fiber

B. difference between the refractive indices of core and the cladding

C. light gathering power of the fiber

D. signal distortion in the fiber

Answer: C

Solution:

Solution:

Question 151

In a sample of radioactive material, what percentage of initial number of active nuclei will decay during one mean life?

Options:

A. 37%

B. 63%

C. 50%

D. 69.3%

Answer: B

Solution:

Solution:

Question 152

The frequency of radio waves from a certain radio station is 600 KHz. Its wavelength is

Options:

A. 5m

B. 500m

C. 0.6m

D. 6m

Answer: B

Solution:

Solution:

Question 153

Blue colour of the sky is due to

Options:

A. Raman scattering

B. Tyndall scattering

C. Raleigh scattering

D. Mie scattering

Answer: C

Solution:

Solution:

Question 154

In a parallel LCR circuit, the current at resonance will be

Options:

A. maximum

B. zero

C. minimum

D. infinity

Answer: B

Solution:

Solution:

Question 155

The time period of an earth-satellite in circular orbit is independent of

Options:

A. mass of the satellite

B. radius of the orbit

C. both of them

D. none of them

Answer: A

Solution:

Solution:

Question 156

The kinetic energy of a body of moment of inertia I and angular momentum L is

Options:

A. L^2 / I

B. L^2 / 2I

C. L / 2I

D. $I L^2$

Answer: B

Solution:

Solution:

Question 157

The phase difference between the displacement and velocity of a particle executing simple harmonic motion is

Options:

A. π / 2

B. π

C. π / 4

D. zero

Answer: A

Solution:

Solution:

Question 158

Which physical phenomenon is responsible for spherical shape of the rain drop?

Options:

A. Viscosity

B. Buoyancy

C. Friction

D. Surface tension

Answer: D

Solution:

Solution:

Question 159

Bernoulli's principle is a consequence of

Options:

A. conservation of energy alone

B. conservation of energy and momentum

C. conservation of momentum alone

D. conservation of angular momentum

Answer: A

Solution:

Solution:

Question 160

At what temperature do the Fahrenheit and Celcius scales of temperature coincide?

Options:

A. $0^{\circ}C$

B. $-40^{\circ}C$

C. $-273^{\circ}C$

D. $32^{\circ}F$

Answer: B

Solution:

Solution:

Question 161

When the source and the listener move in the same direction with a speed equal to the half of the speed of sound, the change in frequency of the sound is

Options:

A. Zero

B. 25%

C. 50%

D. 75%

Answer: A

Solution:

Solution:

Question 162

In Young's double slit experiment, the fringe width is β. If the entire arrangement is now placed inside a liquid of refractive index μ, the fringe width will become

Options:

A. μβ

B. (μ + 1)β

C. β / μ

D. β / (μ + 1)

Answer: C

Solution:

Solution:

Question 163

Formation of rainbow involves

Options:

A. dispersion of sunlight

B. interference of sunlight

C. diffraction of sunlight

D. polarization of sunlight

Answer: A

Solution:

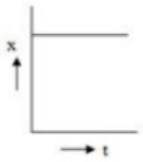
Solution:

Question 164

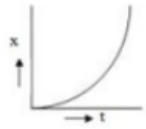
Which one of the following distance-time graphs represent one dimensional uniform motion?

Options:

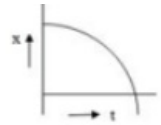
A.



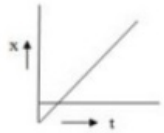
B.



C.



D.



Answer: D

Solution:

Solution:

Question 165

At the top of the trajectory of a projectile, the acceleration is

Options:

A. Zero

B. g

C. Maximum

D. Minimum

Answer: B

Solution:

Solution:

Question 166

In a uniform circular motion
$\vec{r}$, $\vec{v}$ and $\vec{\omega}$
stands for radius vector,
linear velocity and angular velocity respectively.
Then which of the following is true?

Options:

A. $\vec{v} = \vec{r} \times \vec{a}$

B. $\vec{v} = \vec{\omega} \times \vec{r}$

C. $\vec{v} = \vec{r} \cdot \vec{a}$

D. None of the above

Answer: B

Solution:

Solution:

Question 167

Two balls of masses 2g and 6g are moving with a kinetic energy in the ratio 3 : 1. What is the ratio of their linear momentum?

Options:

A. 1:1

B. 2 : 1

C. 1 : 2

D. None of the above

Answer: A

Solution:

Solution:

Question 168

Which of the following surfaces in contact has maximum coefficient of friction (u) ?

Options:

A. wood on wood

B. rubber tyre on dry concrete

C. steel on steel

D. rubber tyre on wet concrete

Answer: B

Solution:

Solution:

Question 169

If two electrons are forced to come closer to each other, the potential energy of the system of 2 electrons will

Options:

A. Becomes zero

B. Increases

C. Decreases

D. Becomes ∞

Answer: B

Solution:

Solution:

Question 170

If $\vec{P} \times \vec{Q} = \vec{Q} \times \vec{P}$, then the angle between $\vec{P}$ and $\vec{Q}$ is

Options:

A. π

B. π / 2

C. π / 4

D. None of the above

Answer: A

Solution:

Solution:

Question 171

The total energy of the particle executing Simple Harmonic Motion is

Options:

A. proportional to x

B. proportional to x^2

C. independent of x

D. proportional to x^3

Answer: C

Solution:

Solution:

Question 172

Young's modulus of a perfectly rigid body is

Options:

A. zero

B. unity

C. infinity

D. more than zero but less than infinity

Answer: C

Solution:

Solution:

Question 173

A wire fixed at the upper end stretches by length Δl by applying a force F . The work done in stretching is

Options:

A. F / 2 Δ l

B. F Δl

C. 2F Δ l

D. F Δ l / 2

Answer: D

Solution:

Solution:

Question 174

A hole is drilled along the diameter of the earth and a stone is dropped into it. Then the stone

Options:

A. reaches the centre of the earth and stops

B. reaches the opposite end and stops

C. executes simple harmonic motion about the centre of the earth

D. reaches the opposite side and escapes earth

Answer: C

Solution:

Solution:

Question 175

A car and a bus are moving with the same kinetic energy. They are brought to rest by applying brakes which provide equal retarding forces. The distances covered by them before coming to rest will be

Options:

A. Inversely proportional to the square of their masses

B. Inversely proportional to their masses

C. Directly proportional to their masses

D. Equal

Answer: D

Solution:

Solution:

Question 176

A ring of radius r and mass m rotates about its central axis. The kinetic energy is

Options:

A. $m\omega\omega^2$

B. $m^2\omega^2$

C. $\frac{1}{2}mr\omega^2$

D. $\frac{1}{2}mr^2\omega^2$

Answer: D

Solution:

Solution:

Question 177

Which waves are used in sonography?

Options:

A. Microwaves

B. Infra-red waves

C. Sound waves

D. Ultrasonic waves

Answer: D

Solution:

Solution:

Question 178

$[M^{-1}L^{-2}T^{2}Q^{2}]$ is dimensional formula of

Options:

A. capacitance

B. resistance

C. inductance

D. magnetic field

Answer: A

Solution:

Solution:

Question 179

The value of gravitational constant G depends upon

Options:

A. nature and size of bodies

B. the medium between two masses

C. the temperature of bodies

D. None of the above

Answer: D

Solution:

Solution:

Question 180

If 22g of CO_2 at 27˚C is mixed with 16g of O_2 at 37˚C, the temperature of the mixture is

Options:

A. 32˚C

B. 27˚C

C. 37˚C

D. 30.5˚C

Answer: A

Solution:

Solution:

Question 181

A black body at high temperature emits radiations of

Options:

A. longer wavelength

B. shorter wavelength

C. one fixed wavelength

D. all wavelength

Answer: D

Solution:

Solution:

Question 182

Cloudy nights are usually warmer than clear ones, because clouds

Options:

A. do not radiate heat

B. do not absorb heat

C. have low thermal conductivity

D. have high thermal conductivity

Answer: C

Solution:

Solution:

Question 183

In a container having water filled up to a height h, a hole is made in the bottom. The velocity of water flowing out of the hole is

Options:

A. proportional to h

B. proportional to h^2

C. proportional to $h^{1/2}$

D. independent of h

Answer: C

Solution:

Solution:

Question 184

If x = asin (ot + π / 6) and x = a cos o x, then the phase difference between the two waves is

Options:

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

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

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

D. π

Answer: A

Solution:

Solution:

Question 185

Two heater coils separately take 10 min and 5 min to boil a certain amount of water. If both the coils are connected in series, the time taken to boil water is

Options:

A. 2.5 min

B. 3.33 min

C. 7.5 min

D. 15 min

Answer: D

Solution:

Solution:

Question 186

If a star emitting orange light moves away from the earth, its colour

Options:

A. will appear red

B. will appear yellow

C. remain the same

D. turns gradually blue

Answer: A

Solution:

Solution:

Question 187

A stretched string fixed at both ends has n nodes then the length of the string in terms of wavelength is

Options:

A. $n\,\frac{\lambda}{2}$

B. $(n+1)\,\frac{\lambda}{2}$

C. $(n-1)\,\frac{\lambda}{2}$

D. $\left(n+\frac{1}{2}\right)\frac{\lambda}{2}$

Answer: C

Solution:

Solution:

Question 188

Which of the following properties has low value for ferrites?

Options:

A. Conductivity

B. Permeability

C. Magnetic susceptibility

D. None of the above

Answer: C

Solution:

Solution:

Question 189

In Carnot's engine at the end of the cycle, the temperature of the working substance is

Options:

A. less than initial temperature

B. greater than initial temperature

C. equal to initial temperature

D. None of the above

Answer: C

Solution:

Solution:

Question 190

Compressed air coming out of punctured football becomes cooler because of

Options:

A. adiabatic expansion

B. Joule Thomson effect

C. isothermal expansion

D. energy dissipation

Answer: A

Solution:

Solution:

Question 191

Two identical samples of gas are allowed to expand (i) isothermally and (ii) adiabatically. The amount of work done is then

Options:

A. equal in both the cases

B. more for adiabatic expansion

C. more for isothermal expansion

D. None of the above

Answer: C

Solution:

Solution:

Question 192

The thermodynamic process in which the pressure of the system remains constant is called

Options:

A. Isochoric

B. Adiabatic

C. Isothermal

D. Isobaric

Answer: D

Solution:

Solution:

Question 193

The internal energy of a perfect gas does not change during

Options:

A. adiabatic process

B. isothermal process

C. isobaric process

D. isochoric process

Answer: B

Solution:

Solution:

Question 194

The process of superimposing a signal frequency on the carrier wave is known as

Options:

A. transmission

B. reception

C. modulation

D. detection

Answer: B

Solution:

Solution:

Question 195

Which one of the following statements is wrong?

Options:

A. Ultra-violet rays have a wavelength longer than infra red rays

B. infra red rays travel with the same velocity as visible light

C. infra red ray can be focused by a lens and can be reflected by a mirror just as visible light

D. Infra red rays have more heating power than visible light rays

Answer: A

Solution:

Solution:

Question 196

When a diamagnetic substance is brought near the north or south pole of a bar magnet, it is

Options:

A. attracted by the poles

B. repelled by the poles

C. attracted by north pole and repelled by south pole

D. repelled by north pole and attracted by south pole

Answer: B

Solution:

Solution:

Question 197

How will an image produced by a lens change if half the lens is wrapped in black paper?

Options:

A. there will be no effect

B. the size of image will be reduced to one half

C. the image will disappear

D. the brightness of the image will be reduced

Answer: D

Solution:

Solution:

Question 198

The diode is used as

Options:

A. an amplifier

B. an oscillator

C. a rectifier

D. a modulator

Answer: C

Solution:

Solution:

Question 199

Which of the following interactions is the weakest?

Options:

A. Gravitational

B. Electrostatic

C. Nuclear

D. Electromagnetic

Answer: A

Solution:

Solution:

Question 200

In the following nuclear reaction $_{6}C^{11} \rightarrow {}^{11}B^{11} + B^{+} + X$, X stands for

Options:

A. a neutron

B. a neutrino

C. an electron

D. a proton

Answer: B

Solution:

Solution:

Question 201

Total number of electrons in sub shells is calculated by

Options:

A. $2(21 + 1)$

B. $2n^2$

C. $3(21 + 1)$

D. $2(2n + 1)$

Answer: A

Solution:

Solution:

Question 202

The order of ionization energy

Options:

A. $s < p < d < f$

B. $s > p > d > f$

C. $s > d > p > f$

D. $s < d < p < f$

Answer: B

Solution:

Solution:

Question 203

Sulphuric acid is

Options:

A. an oxidizing agent

B. a dehydrating agent

C. Both (A) and (B)

D. Neither (A) nor (B)

Answer: C

Solution:

Solution:

Question 204

Which is reduced in the following reaction (a) $2\,KI\ (aq)$ + (b) $Cl_2\ (aq) \rightarrow 2\,KCl + I_2\ (aq)$

Options:

A. (a) and (b)

B. (a)

C. (b)

D. None of the above

Answer: C

Solution:

Solution:

Question 205

The common isotopes of carbon are ^{12}C and ^{13}C. The average mass of carbon is $12.01115\,amu$. What is the abundance of the ^{13}C isotope?

Options:

A. 1.115%

B. 98.885%

C. 0.480%

D. 99.52%

Answer: A

Solution:

Solution:

Question 206

Which of the following sets of ions represent the collection of isoelectronic species?

Options:

A. K^+, Ca^{2+}, Sc^{3+}, Cl^-

B. Na^+, Mg^{2+}, Al^{3+}, Cl^-

C. K^+, Cl^-, Mg^{2+}, Sc^{3+}

D. Na^+, Ca^{2+}, Sc^{3+}, F^-

Answer: A

Solution:

Solution:

Question 207

Which of the following molecule does not have a net dipole moment?

Options:

A. H_2O

B. NH_3

C. BF_3

D. BrF_5

Answer: C

Solution:

Solution:

Question 208

Which of the following ions has a magnetic moment of 5.93 BM ? (At.no. V = 23, Cr = 24, Mn = 25, Fe = 26)

Options:

A. Mn^{2}

B. Fe^{2+}

C. Cr^{2+}

D. V^{3+}

Answer: A

Solution:

Solution:

Question 209

The purple colour of permanganate ion is due to

Options:

A. L to M charge transfer

B. M to L charge transfer

C. d-d transition

D. f-f transition

Answer: A

Solution:

Solution:

Question 210

Among the following, shortest bond length is found in

Options:

A. C_2

B. N_2

C. O_2

D. F_2

Answer: B

Solution:

Solution:

Question 211

The acid which has peroxy linkage is

Options:

A. Dithonic acid

B. Sulphurous acid

C. Caro's acid

D. Pyrosulphuric acid

Answer: C

Solution:

Solution:

Question 212

Bond angle of NH_3, PH_3, AsH_3 and SbH_3 is in the order

Options:

A. $PH_3 > AsH_3 > SbH_3 > NH_3$

B. $SbH_3 > AsH_3 > PH_3 > NH_3$

C. $SbH_3 > AsH_3 > NH_3 > PH_3$

D. $NH_3 > PH_3 > AsH_3 > SbH_3$

Answer: D

Solution:

Solution:

Question 213

Which one of the following octahedral complexes does not show geometrical isomerism? (A and B are monodentate ligands)

Options:

A. $[MA_2B_4]$

B. $[MA_3B_3]$

C. $[MA_4B_2]$

D. $[MA_5B]$

Answer: D

Solution:

Solution:

Question 214

Among the following which are ambidentate ligands

1) NO_2^-

2) $C_2O_4^{2-}$

3) EDTA $^{4-}$

4) SCN^-

Options:

A. (1) and (2)

B. (1) and (4)

C. (2) and (4)

D. (1) and (3)

Answer: B

Solution:

Solution:

Question 215

Among the noble gases, which is used for cancer treatment?

Options:

A. He

B. Ne

C. Ar

D. Rn

Answer: D

Solution:

Solution:

Question 216

Zone refining is used for the purification of

Options:

A. Au

B. Ge

C. Ag

D. Cu

Answer: B

Solution:

Solution:

Question 217

Sulphide ores are generally concentrated by

Options:

A. Froth flotation

B. Roasting

C. Magnetic separation

D. Carbon reduction

Answer: A

Solution:

Solution:

Question 218

0.177g of a monobasic acid required 30 ml of N / 10 NaOH solution for complete neutralization. Its molecular weight will be

Options:

A. 49

B. 59

C. 69

D. 79

Answer: B

Solution:

Solution:

Question 219

Which statement is true?

Options:

A. Resonance hybrids are inherently unstable

B. Resonance hybrids are more stable than any individual resonance form

C. Resonance hybrids are averages of all resonance forms resembling the less stable forms

D. Resonance hybrids are averages of all resonance forms resembling the more stable forms

Answer: D

Solution:

Solution:

Question 220

A meso compound

Options:

A. is an achiral molecule which contains chiral carbons

B. contains a plane of symmetry or a center of symmetry

C. is optically inactive

D. is characterized by all of the above

Answer: D

Solution:

Solution:

Question 221

Ethers are kept in brown bottles because

Options:

A. Brown bottles are cheaper than colorless clear bottles

B. Ethers absorb moisture

C. Ethers evaporate readily

D. Ethers are oxidized to explosive peroxides

Answer: D

Solution:

Solution:

Question 222

Acetone undergoes reduction with hydrazine in the presence of NaOH to form propane. This reaction is known as,

Options:

A. Clemmensen reduction

B. Wolf-Kishner reduction

C. Rosenmund reduction

D. Reformatsky reaction

Answer: B

Solution:

Solution:

Question 223

The self-condensation reaction of one molecule of 5-hydroxyhexanoic acid gives

Options:

A. an anhydride

B. a lactone

C. a ketone

D. a lactam

Answer: B

Solution:

Solution:

Question 224

The Zwitter ion structure is shown by

Options:

A. Sulphanilic acid

B. Acetanilide

C. Sulphanilamide

D. p-phenylene diamine

Answer: A

Solution:

Solution:

Question 225

The IUPAC name of $C_2(CN)_4$ is

Options:

A. 2,3-Dicyano butanedinitrile

B. 2,3-Dicyano-2-butenedinitrile

C. 1,1,2,2- Tetracyanoethane

D. 1,1,2,2-Tetracyanoethene

Answer: B

Solution:

Solution:

Question 226

Which effect best explains that o-nitrophenol is insoluble in water?

Options:

A. Inductive effect

B. Intermolecular H-bonding

C. Intramolecular H-bonding

D. Resonance effect

Answer: C

Solution:

Solution:

Question 227

Cannizzaro reaction involves migration of which species

Options:

A. Proton

B. Carbene

C. Hydride ion

D. Carbanion

Answer: C

Solution:

Solution:

Question 228

Bromination of 2-methyl propane gives preferentially

Options:

A. 2-Bromo-2-methyl propane

B. 1-Bromo-2-methyl propane

C. 2-Bromobutane

D. 1-Bromobutane

Answer: A

Solution:

Solution:

Question 229

Which of the following method may be used to distinguish between primary, secondary and tertiary alcohols?

Options:

A. Lucas test

B. Oxidation test

C. Victor-Meyer test

D. All of the above

Answer: D

Solution:

Solution:

Question 230

Reaction of benzaldehyde with acetic anhydride in the presence of base is known as. and the product is

Options:

A. Claisen reaction, Cinnamaldehyde

B. Perkin reaction, Cinnamaldehyde

C. Knovenagel reaction, Cinnamic acid

D. Perkin reaction, Cinnamic acid

Answer: D

Solution:

Solution:

Question 231

Which of the following is not a true aromatic compound?

Options:

A. Acetophenone

B. Hydroquinone

C. p-Benzoquinone

D. Phenyl acetaldehyde

Answer: C

Solution:

Solution:

Question 232

Which one of the following are called pseudo acids?

Options:

A. Alkyl nitrites

B. Primary nitro compounds

C. Tertiary nitro compounds

D. Alkyl sulphonic acids

Answer: B

Solution:

Solution:

Question 233

Rapid inter conversion of α-D-Glucose and β-D-Glucose in solution is known as

Options:

A. Racemization

B. Asymmetric induction

C. Fluxional isomerisation

D. Mutarotation

Answer: D

Solution:

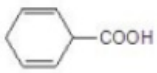
Solution:

Question 234

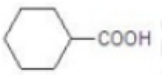
The Birch reduction of benzoic acid gives

Options:

A.



B.



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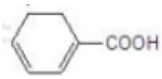
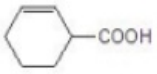


D.



Answer: A

Solution:

Solution:

Question 235

The hydrogen ion concentration of a solution with pH value 3.69 is given by

Options:

A. 2.042×10^{-4}M

B. 3.69×10^{-2}M

C. 4.31×10^{-4}M

D. 0.369M

Answer: A

Solution:

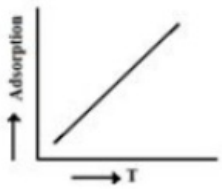
Solution:

Question 236

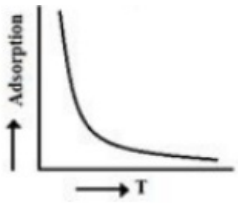
The variation of physical adsorption with temperature is shown by

Options:

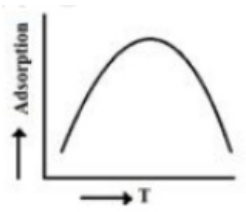
A.



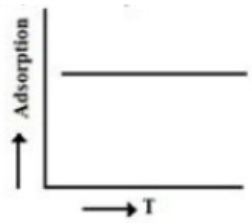
B.



C.



D.



Answer: B

Solution:

Solution:

Question 237

A molecule of SO_2 is two times heavier than a O_2 molecule. At 298K the average kinetic energy of SO_2 molecule is

Options:

A. two times that of O2 molecules

B. half that of O_2 molecules

C. four times that of O_2 molecules

D. same as that of O_2 molecules

Answer: D

Solution:

Solution:

Question 238

For the reaction, $N_2(g) + 3H_2(g) \rightarrow 2\,NH\,g(g)$; $\Delta H = -99.4\,kJ$ and $\Delta S = -1983 JK^{-1}$. The temperature at which the system is in equilibnum is

Options:

A. 500K

B. 279K

C. 198.8K

D. 99.4K

Answer: A

Solution:

Solution:

Question 239

The thermodynamic condition for the process of adsorption is

Options:

A. $\Delta G < 0; \Delta S > 0; \Delta H < 0$

B. $\Delta G < 0; \Delta S < 0; \Delta H < 0$

C. $\Delta G > 0; \Delta S > 0; \Delta H < 0$

D. $\Delta G < 0; \Delta S < 0; \Delta H > 0$

Answer: A

Solution:

Solution:

Question 240

For a linear plot of log(x / m) versus log p in a Freundlich adsorption isotherm, the correct statement is (k and n are constants)

Options:

A. Both k and 1 / n appear in the slope term

B. 1 / n appears as the intercept

C. Only 1 / n appears as the slope

D. log(1 / n) appears as the intercept

Answer: C

Solution:

Solution:

Question 241

In diamond, the coordination number of carbon is

Options:

A. 4 and its unit cell has 8 carbon atoms

B. 4 and its unit cell has 6 carbon atoms

C. 6 and its unit cell has 4 carbon atoms

D. 4 and its unit cell has 4 carbon atoms

Answer: A

Solution:

Solution:

Question 242

The Miller indices of a crystal plane which cuts through the crystal axes at (2a, 3b, c) are

Options:

A. 2, 3, 1

B. 4,6, 2

C. 3, 2, 6

D. 1 / 2, 1 / 3, 1

Answer: C

Solution:

Solution:

Question 243

If the radius of metal atom is 1.0Å and its crystal structure is simple cubic, the volume of the unit cell is

Options:

A. 8×10^{-28} cc

B. $4 \times 10^{-30} m^3$

C. $8 \times 10^{-30} m^3$

D. 2×10^{-24} cc

Answer: C

Solution:

Solution:

Question 244

0.5M glucose solution has density 1.21gcm^{-3}. The molality of the solution is

Options:

A. 0.246

B. 0.346

C. 0.446

D. 0.0546

Answer: C

Solution:

Solution:

Question 245

The boiling point of an azeotropic mixture of water-ethanol is less than that of both water and ethanol. This means that the mixture

Options:

A. shows negative deviation from Raoult's law

B. shows positive deviation from Raoult's law

C. shows no deviation from Raoult's law

D. is not a true solution

Answer: B

Solution:

Solution:

Question 246

The molar conductances at infinite dilution for sodium formate,

hydrochloric acid and sodium chloride are 91.0 , 426.2 and $126.5 S\,cm^2\,mol-1$ respectively at 298K. The molar conductance of acetic acid at infinite dilution would be

Options:

A. $335.2 cm^2 mol^{-1}$

B. $461.7 cm^2 mol^{-1}$

C. $217.5 cm^2 mol^{-1}$

D. $390.7 S cm^2 mol^{-1}$

Answer: D

Solution:

Solution:

Question 247

**The position of some metals in the electrochemical series in decreasing electropositive character is Mg > Al>
Zn > Cu > Ag. The change expected on stirring the solution of aluminium nitrate with copper spoon is**

Options:

A. the spoon gets coated with aluminium

B. any alloy of aluminium and copper is formed

C. the solution starts turning blue

D. no reaction occurs

Answer: D

Solution:

Solution:

Question 248

**The EMF of the following Daniell cell at 298K is
E_1 : Zn 1 $ZnSO_4$(0.01M) | $CuSO_4$(1.0M)r Cu
When the concentration of $ZnSO_4$ is 1.0M and that of $CuSO_4$ is 0.01M, the EMF changes to E_2. The relationship between E_1 and E_2 is**

Options:

A. $E_1 > E_2$

B. $E_1 < E_2$

C. $E_1 = E_2$

D. $E_1 = 0 \neq E_2$

Answer: A

Solution:

Solution:

Question 249

For a reaction 1\/A → 2B, rate of disappearance of A is related to rate of appearance of B by the expression

Options:

A. $\frac{-d[A]}{dt} = 4\frac{d[B]}{dt}$

B. $\frac{-d[A]}{dt} = \frac{1}{2}\frac{d[B]}{dt}$

C. $\frac{-d[A]}{dt} = \frac{1}{4}\frac{d[B]}{dt}$

D. $\frac{-d[A]}{dt} = \frac{d[B]}{dt}$

Answer: C

Solution:

Solution:

Question 250

The half life of a first order reaction is 12 min. Fraction of the reactant left behind after 1 hr from the beginning is

Options:

A. 1 / 8

B. 1 / 32

C. 1 / 64

D. 1 / 128

Answer: B

Solution:

Solution:
