CUSAT 2021 : Shift 1

Solved Paper

Question 1

The density of a material in the form of a cube is measured using its dimensions and mass. If the error in measurement of length and mass is 0.6% and 1.2% respectively, the maximum error in calculation of density is

Options:

A. 3.0%

B. 4.0%

C. 4.5%

D. 6.0%

Answer: A

Solution:

Solution:

Question 2

If m is the mass of a body and E its kinetic energy, then its linear momentum is

Options:

A. $m\sqrt{E}$

B. $2\sqrt{mE}$

C. $\sqrt{mE}$

D. $\sqrt{2\,mE}$

Answer: D

Solution:

Solution:

Question 3

The separation between carbon and oxygen in CO molecule is 0.12 nm. What is the distance of the center of mass from the carbon atom?

Options:

A. 0.03 nm

B. 0.068 nm

C. 0.05 nm

D. 0.06 nm

Answer: B

Solution:

Solution:

Question 4

In a Young's double slit experiment, let S_1 and S_2 be two slits and C be the center of the screen. If angle $\angle S_1CS_2 = \theta$, and λ is the wavelength, the fringe width will be

Options:

A. $\frac{\lambda}{\theta}$

B. $\lambda\theta$

C. $\frac{2\lambda}{\theta}$

D. $\frac{\lambda}{2\theta}$

Answer: A

Solution:

Solution:

Question 5

For a series RLC circuit driven with voltage of amplitude V_m and frequency $\omega_0 = \frac{1}{\sqrt{LC}}$, the current exhibits resonance. The quality factor, Q of the circuit is given by

Options:

A. $\omega_0 L / R$

B. $\omega_0 R / L$

C. $R / (\omega_0 L)$

D. CR / ω_o

Answer: A

Solution:

Solution:

Question 6

The half-life of ^{215}At is 100μ s. The time taken for the radioactivity decay of a sample of ^{215}At to 1 / 16 th of its initial value is

Options:

A. 400μ s

B. 6.3μ s

C. 40μ s

D. 300μ s

Answer: A

Solution:

Solution:

Question 7

The shortest wavelength of X-rays emitted from an X-ray tube depends on

Options:

A. the current in the tube

B. the voltage applied to the tube

C. the nature of the gas in the tube

D. the atomic number of the target material

Answer: B

Solution:

Solution:

Question 8

The electromagnetic waves detected using a thermopile and used in physiotherapy are

Options:

A. X - rays

B. ɣ - rays

C. ultraviolet radiations

D. infrared radiations

Answer: D

Solution:

Solution:

Question 9

If the wavelength of an electromagnetic wave is about the diameter of an apple, the region of radiation is

Options:

A. X-ray

B. UV

C. infrared

D. microwave

Answer: D

Solution:

Solution:

Question 10

In an AC circuit containing a pure resistor and an inductor in series, the

phase lag between current and voltage is

Options:

A. dependent on the AC frequency

B. independent of AC frequency

C. always zero

D. always 90˚

Answer: A

Solution:

Solution:

Question 11

Kirchhoff's junction rule is a reflection of

Options:

A. conservation of energy

B. conservation of charges

C. conservation of momentum

D. conservation of current density

Answer: B

Solution:

Solution:

Question 12

If the carrier power of a 100% modulated AM wave is suppressed, the percentage saving in power will be

Options:

A. 50%

B. 100%

C. 66.66%

D. 75%

Answer: C

Solution:

Solution:

Question 13

White X-rays are called "white" because

Options:

A. they are produced most abundantly in X-ray tubes

B. they have a nature similar to visible white light

C. they have a continuous range of frequencies

D. they can be converted into visible light coated screens

Answer: C

Solution:

Solution:

Question 14

An antenna uses electromagnetic waves of frequency 5 MHz. For proper working, the size of the antenna should be

Options:

A. 15m

B. 3 km

C. 60m

D. 300m

Answer: A

Solution:

Solution:

Question 15

The rectangular Cartesian components of grad ϕ are

Options:

A. $\frac{\partial\varphi}{\partial x}, \frac{\partial\varphi}{\partial y}, \frac{\partial\varphi}{\partial z}$

B. $\frac{\partial\varphi}{\partial x^2}, \frac{\partial\varphi}{\partial y^2}, \frac{\partial\varphi}{\partial z^2}$

C. $\frac{\partial^2\varphi}{\partial x^2}, \frac{\partial^2\varphi}{\partial y^2}, \frac{\partial^2\varphi}{\partial z^2}$

D. ϕ, ϕ^2, ϕ^3

Answer: A

Solution:

Solution:

Question 16

An ideal gas undergoes a thermodynamic process such that $dW = 0$ and $dQ < 0$. Then for the gas

Options:

A. the temperature will decrease

B. the temperature will increase

C. the volume will increase

D. there is no change in temperature

Answer: A

Solution:

Solution:

Question 17

Optical fibres 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 18

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 19

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: B

Solution:

Solution:

Question 20

Two protons are kept at a separation of 10 nm. If F_e and F_n represent the electromagnetic force and nuclear force, then

Options:

A. $F_e \gg F_n$

B. F_e and F_n differ only slightly

C. $F_e = F_n$

D. $Fe_e \ll F_n$

Answer: A

Solution:

Solution:

Question 21

An inductor of inductance L and a resistor R are joined in series and connected to a source of frequency ω. The power dissipated in the circuit is

Options:

A. $\frac{V^2R}{R^2 + \omega^2L^2}$

B. $\frac{V^2R}{\sqrt{R^2 + \omega^2L^2}}$

C. $\frac{R^2 + \omega^2L^2}{V}$

D. $\frac{V^2}{R^2 + \omega^2L^2}$

Answer: A

Solution:

Solution:

Question 22

Find the odd one out

Options:

A. silicon

B. gallium arsenide

C. barium titanate

D. Cadmium sulphide

Answer: C

Solution:

Solution:

Question 23

The two nearest harmonics of a tube closed at one end and open at other end are 220 Hz and 260 Hz. What is the fundamental frequency of the system?

Options:

A. 10 Hz

B. 20 Hz

C. 30 Hz

D. 40 Hz

Answer: B

Solution:

Solution:

Question 24

If a stone and a pencil are dropped simultaneously in vacuum from the top of a tower, which of the two will reach the ground first?

Options:

A. Pencil

B. Stone

C. Both will reach the ground simultaneously

D. Either stone or pencil depending on which is heavier

Answer: C

Solution:

Solution:

Question 25

A conductor AB = r carries a current i in a magnetic field B. The force on the conductor F is

Options:

A. $F = r \times B$

B. $F = i(r \times B)$

C. $F = i(B \times r)$

D. $|F| = i(r . B)$

Answer: B

Solution:

Solution:

Question 26

Three small identical spheres having charges -8.4×10^{-16}C, -7.2×10^{-16}C and 0.6×10^{-16}C are brought in contact and then separated. Now the number of electrons on each ball is

Options:

A. 3375

B. 3125

C. 2925

D. 2775

Answer: B

Solution:

Solution:

Question 27

Nichrome wire has been used as heating element because of its

Options:

A. low melting point

B. high conductivity

C. low specific resistance

D. high specific resistance

Answer: D

Solution:

Solution:

Question 28

The torque on a rectangular coil placed in an uniform magnetic field is large, when the

Options:

A. number of turns is large

B. number of turns is less

C. plane of the coil is perpendicular to the field

D. area of the coil is small

Answer: A

Solution:

Solution:

Question 29

When a moving coil galvanometer is shunted with a resistance of 30 Ohms, then its deflection is reduced to half. The actual resistance of the galvanometer is

Options:

A. 10 Ohms

B. 15 Ohms

C. 20 Ohms

D. 30 Ohms

Answer: D

Solution:

Solution:

Question 30

Canal rays were discovered by

Options:

A. Neil Bohr

B. J.J. Thomson

C. Millikan

D. Eugen Goldstein

Answer: D

Solution:

Solution:

Question 31

Which of the following transition produces the spectral line of maximum wavelength in hydrogen atom?

Options:

A. 4 → 3

B. 3 → 2

C. 5 → 4

D. 6 → 5

Answer: D

Solution:

Solution:

Question 32

The bandwidth of the amplitude modulation is

Options:

A. equal to the signal frequency

B. twice the signal frequency

C. thrice the signal frequency

D. four times the signal frequency

Answer: B

Solution:

Solution:

Question 33

Which one of the following of carrier wave remains constant in amplitude modulation?

Options:

A. amplitude and phase

B. frequency and phase

C. amplitude and frequency

D. phase and time

Answer: B

Solution:

Solution:

Question 34

What will be the input current when a step up transformer has a power input of 23 kW at 230 volts?

Options:

A. 1A

B. 10A

C. 52.9A

D. 100A

Answer: D

Solution:

Solution:

Question 35

In an AC generator, the current from the coil is transferred to the external circuit through

Options:

A. split rings

B. slip rings

C. O-rings

D. field magnet

Answer: B

Solution:

Solution:

Question 36

A long solenoid having N turns, length (l), area of cross section A, carrying a current I is placed in a magnetic field of inductance B. The total magnetic flux is

Options:

A. $\phi = \mu_o NI$

B. $\phi = \mu_o N\ I / 1$

C. $\phi = \mu_0\ N\ I\ A /l$

D. $\phi = \mu_0 N^2 IA / l$

Answer: C

Solution:

Solution:

Question 37

In Raman spectrum, the intensity of Stokes lines will be the intensity of corresponding anti Stokes lines.

Options:

A. greater than

B. less than

C. equal to

D. greater or less than

Answer: A

Solution:

Solution:

Question 38

In an X-ray tube, when 35 kV is applied, the minimum wavelength of the emitted radiation is

Options:

A. 3.0Å

B. 1.5Å

C. 0.821Å

D. 0.333Å

Answer: D

Solution:

Solution:

Question 39

The half-life period of a particle is 624 s. Its mean life is

Options:

A. 11.3 s

B. 22.6 s

C. 90 s

D. 900 s

Answer: D

Solution:

Solution:

Question 40

What will be the energy of the thermal neutrons?

Options:

A. few MeV

B. few keV

C. few eV

D. 0.025 eV

Answer: D

Solution:

Solution:

Question 41

Which one of the following is not purely an electrostatic accelerator?

Options:

A. Betatron

B. Linear accelerator

C. Van de Graff generator

D. Cockcroft-Walton accelerator

Answer: A

Solution:

Solution:

Question 42

The moment of inertia of a disc of mass M and radius R about its diameter as axis is

Options:

A. $M R^2 / 2$

B. $M R^2 / 4$

C. $M R^2$

D. $(3 / 4) M R^2$

Answer: B

Solution:

Solution:

Question 43

An electron beam is moving horizontally towards east. If this beam is passed through a uniform magnetic field directed vertically upwards, then the direction of the deflected beam is

Options:

A. east

B. west

C. north

D. south

Answer: C

Solution:

Solution:

Question 44

A pn-junction diode works as insulator if it is connected

Options:

A. in forward bias

B. in reverse bias

C. to a.c.

D. to d.c.

Answer: B

Solution:

Solution:

Question 45

A passenger is sitting in a fast moving car. The car blows horn with a frequency of f Hz. If the apparent frequency of the sound heard by the passenger is f′ Hz, then

Options:

A. $f' = f$

B. $f' < f$

C. $f' > f$

D. $f' = 1 / f$

Answer: A

Solution:

Solution:

Question 46

Let v_{max} and a_{max} are the maximum velocity and maximum acceleration of a simple harmonic oscillator respectively, then its time period in terms of v_{max} and a_{max} is

Options:

A. zero

B. 2π

C. $[2\pi v_{max}] / \alpha_{max}$

D. $[2\pi\alpha_{max}] / v_{max}$

Answer: C

Solution:

Solution:

Question 47

A red paper illuminated by green light appears

Options:

A. black

B. blue

C. green

D. yellow

Answer: A

Solution:

Solution:

Question 48

A thermodynamics system goes from state (i) P_1, V to $2P_1$, V (ii) P_1, V to P_1, 2V. Then the work done in the two cases will be

Options:

A. zero and P_1V

B. P_1V and zero

C. P_1V and P_1V

D. zero and zero

Answer: A

Solution:

Solution:

Question 49

Which one of the following pair of physical quantities do not have same dimension?

Options:

A. Planck's constant and Angular momentum

B. Impulse and moment of force

C. Force and rate of change of linear momentum

D. Pressure and Young's modules

Answer: B

Solution:

Solution:

Question 50

The exponential law of radioactive decay is

Options:

A. $\frac{N}{N_0} e^{-\lambda / t} = 1$

B. $\frac{N_0}{N} e^{-\lambda / t} = 1$

C. $\frac{N_0}{N} e^{z / t} = 1$

D. $\frac{N}{N_0} e^{\lambda t} = 1$

Answer: D

Solution:

Solution:

Question 51

Which of the following is the universal gate?

Options:

A. NOT

B. OR

C. AND

D. NAND

Answer: D

Solution:

Solution:

Question 52

When metals combine with non-metals, then

Options:

A. electrons of the outer shells are shared

B. electrons in the outer shells of non-metals are transferred to metals

C. electrons in the outer shells of metals are transferred to the non-metals atoms

D. hydrogen gas is given off

Answer: C

Solution:

Solution:

Question 53

The Compton shift is maximum for scattering angle of

Options:

A. 0°

B. 45°

C. 90°

D. 180°

Answer: D

Solution:

Solution:

Question 54

A stone released with zero velocity from the top of a tower, reaches the ground in 4 s. The height of the tower is (g = 10m / $s^{2.}$)

Options:

A. 20m

B. 40m

C. 80m

D. 120m

Answer: C

Solution:

Solution:

Question 55

Swimming is possible on account of

Options:

A. first law of motion

B. second law of motion

C. third law of motion

D. Newton's law of gravitation

Answer: C

Solution:

Solution:

Question 56

A steel wire is stretched to double its length, then its Young's modulus

Options:

A. becomes half

B. becomes double

C. remains same

D. becomes one-fourth

Answer: C

Solution:

Solution:

Question 57

Thermoelectric thermometer is based on

Options:

A. Photoelectric effect

B. Seebeck effect

C. Compton effect

D. Joule effect

Answer: B

Solution:

Solution:

Question 58

The number of degrees of freedom for each atom of a monatomic gas is

Options:

A. 3

B. 5

C. 6

D. 1

Answer: A

Solution:

Solution:

Question 59

The capacity of parallel plate capacitor depends on

Options:

A. metal used to make plates

B. thickness of plate

C. potential applied across the plate

D. area of plate

Answer: A

Solution:

Solution:

Question 60

A hydrogen atom is paramagnetic. A hydrogen molecule is

Options:

A. diamagnetic

B. paramagnetic

C. ferromagnetic

D. ferrimagnetic

Answer: A

Solution:

Solution:

Question 61

10 cm is a wavelength corresponding to the spectrum of

Options:

A. infrared rays

B. ultraviolet rays

C. microwaves

D. X-rays

Answer: C

Solution:

Solution:

Question 62

In a semiconductor, the forbidden energy gap between the valance band

and conduction band is of the order of

Options:

A. 1 MeV

B. 0.1 MeV

C. 1 eV

D. 5 eV

Answer: C

Solution:

Solution:

Question 63

The mass of a ship is 2×10^7 kg. On applying a force of 25×10^5N, it is displaced through 25m. After the displacement, the velocity acquired by the ship will be

Options:

A. 12.5m / s

B. 5m / s

C. 3.7m / s

D. 2.5m / s

Answer: D

Solution:

Solution:

Question 64

A system consists of 3 particles each of mass m located at points (1, 1), (2, 2) and (3, 3). The coordinates of the centre of mass are

Options:

A. (6, 6)

B. (3, 3)

C. (1, 1)

D. (2, 2)

Answer: D

Solution:

Solution:

Question 65

If a spring extends by ' x ' on loading, then the energy stored by the spring is (if T is tension in the spring and k is spring constant)

Options:

A. T^2 / 2x

B. T^2 / 2k

C. 2x / T^2

D. $2T^2$ / k

Answer: B

Solution:

Solution:

Question 66

A simple pendulum is executing simple harmonic motion with a time period T . If the length of the pendulum is increased by 21%, the percentage increase in the time period of the pendulum of increased length is

Options:

A. 10%

B. 21%

C. 30%

D. 50%

Answer: A

Solution:

Solution:

Question 67

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

Options:

A. attracted by the poles

B. repelled by the poles

C. repelled by the north pole and attracted by the south pole

D. attracted by north pole and repelled by south pole

Answer: B

Solution:

Solution:

Question 68

The inductive reactance of an inductor of 1 / π Henry at 50 Hz frequency is

Options:

A. 50 / π Ohm

B. π / 50 Ohm

C. 100 Ohm

D. 50 Ohm

Answer: C

Solution:

Solution:

Question 69

How fast a person should drive his car so that the red signal of light appears green (λ_{red} = 6200Å, λ_{green} = 5400Å)

Options:

A. 1.5×10^8m / s

B. $7 \times 10^7 \mathrm{m} / \mathrm{s}$

C. $3.9 \times 10^7 \mathrm{m} / \mathrm{s}$

D. $2 \times 10^8 \mathrm{m} / \mathrm{s}$

Answer: C

Solution:

Solution:

Question 70

The position of a particle is given by $x = a\sin\omega t$, $y = a\cos 2\omega t$. The trajectory is

Options:

A. parabola

B. hyperbola

C. straight line

D. cycloid

Answer: D

Solution:

Solution:

Question 71

If an annular disc of radii r_1 and r_2 is heated, then

Options:

A. r_1 increases, r_2 decreases

B. r_2 increases, r_1 decreases

C. both r_1 and r_2 increase

D. r_1 increases, r_2 remains unchanged

Answer: C

Solution:

Solution:

Question 72

Velocity of sound in air is 332m / s. Its velocity in vacuum is

Options:

A. >332m / s

B. 3×10^{8}m / s

C. 332m / s

D. zero

Answer: D

Solution:

Solution:

Question 73

A steady current flows in a metallic conductor of non-uniform cross-section. The quantity/quantities constant along the length of the conductor is/are

Options:

A. current, electric field and drift velocity

B. drift speed only

C. current and drift speed

D. current only

Answer: D

Solution:

Solution:

Question 74

A convex lens is dipped in a liquid whose refractive index is equal to refractive index of the lens. Then its focal length will

Options:

A. remain unchanged

B. be 0

C. be infinity

D. be small but non zero

Answer: C

Solution:

Solution:

Question 75

AND gate can be produced using two gates of

Options:

A. NOT

B. NOR

C. XOR

D. NAND

Answer: D

Solution:

Solution:

Question 76

Iodine crystals are

Options:

A. electrical conductors

B. insulators

C. semiconductors

D. high melting

Answer: B

Solution:

Solution:

Question 77

In an ionic solid with the larger anions and smaller cations, the ions that form close packed structure are

Options:

A. anions

B. cations

C. half of total anions

D. half of total cations

Answer: A

Solution:

Solution:

Question 78

When a piece of copper is added to concentrated hydrochloric acid,

Options:

A. it remains insoluble

B. it readily dissolves

C. it slowly dissolves

D. it dissolves with the release of hydrogen

Answer: A

Solution:

Solution:

Question 79

The electrode potential of a half cell

Options:

A. does not vary with concentration of the solution

B. depends on the concentration of the solution

C. depends on the rate of diffusion of the cation

D. depends on the rate of diffusion of the anion

Answer: B

Solution:

Solution:

Question 80

A catalyst

Options:

A. decreases the ΔG of a reaction

B. increases the ΔG of a reaction

C. does not alter the ΔG of a reaction

D. shifts the equilibrium of the reaction

Answer: C

Solution:

Solution:

Question 81

As per the Freundlich's adsorption isotherm, the amount adsorbed per gram of the adsorbent is independent of pressure, when

Options:

A. n = 0

B. n > 1

C. n = 1

D. 1 / n = 0

Answer: D

Solution:

Solution:

Question 82

When an ideal solution is formed from pure n-hexane and n-heptane, the wrong statement is

Options:

A. no heat is evolved

B. no volume change occurs

C. large quantity of heat is evolved

D. it obeys Raoult's law

Answer: C

Solution:

Solution:

Question 83

If cells placed in sodium chloride solution shrink, the solution is called

Options:

(A) hypertonic
(B) hypotonic
(C) isotonic
(D) azeotropic

Answer: A

Solution:

Solution:

Question 84

The van't Hoff's factor for ethanoic acid in benzene is equal to

Options:

A. zero

B. close to 0.5

C. unity

D. two

Answer: B

Solution:

Solution:

Question 85

When a dilute solution of KI is added to a dilute solution of $AgNO_3$,

Options:

A. a positively charged sol results

B. a negatively charged sol results

C. a neutral sol results

D. both the positive and negative sol particles result

Answer: B

Solution:

Solution:

Question 86

Hardy - Schulze rule states that the ease of coagulation of a negatively charged colloid with the cations varies in the order

Options:

A. $Fe^{3+} > Mg^{2+} > K^+$

B. $K^+ > Mg^{2+} > Fe^{3+}$

C. $Mg^{2+} > Fe^{3+} > K^+$

D. $Fe^{3+} > K^+ > Mg^{2+}$

Answer: A

Solution:

Solution:

Question 87

For the following reaction, the initial concentration of HI($0.005\,mol\,L^{-1}$) becomes half of it after 25 min. The rate of decomposition of HI is equal to

$2HI_{(g)} \rightarrow H_{2(g)} + I_{2(g)}$

Options:

A. $-0.0005\,mol\,L^{-1}\,min^{-1}$

B. $0.00005\,mol\,L^{-1}\,min^{-1}$

C. $-0.0001\,mol\,L^{-1}\,min^{-1}$

D. $+0.000.2\,mol\,L^{-1}\,min^{-1}$

Answer: C

Solution:

Solution:

Question 88

When acetone is added to ethanol, the solution shows

Options:

A. positive deviation from Raoult's law

B. negative deviation from Raoult's law

C. no deviation from Raoult's law

D. ideal behavior

Answer: B

Solution:

Solution:

Question 89

For the Daniel cell of emf 1.1V, if an external emf of 1.5V is applied,

Options:

A. the copper electrode will dissolve

B. the zinc electrode will dissolve

C. the electrode reactions will be ceased

D. copper will be deposited

Answer: A

Solution:

Solution:

Question 90

The material that shows increase in conductivity with increase in temperature is

Options:

A. copper

B. silver

C. alumina

D. titania

Answer: D

Solution:

Solution:

Question 91

One mole of a gas expands from $6m^3$ to $8m^3$ in a container against a constant external pressure of $3\,Pa$ at 300K. The work done on the gas, w, is

Options:

A. $-2J$

B. $-6J$

C. $+575J$

D. $-575J$

Answer: B

Solution:

Solution:

Question 92

The latent heat of phase change from ice to water is 80 cal per gram at 0˚C. Then change in entropy (in eu) for the surrounding, when 1 mole water freezes at 0˚C

Options:

A. ≈ -5.3 eu

B. ≈ 5.3 eu

C. ≈ 0.3 eu

D. zero

Answer: B

Solution:

Solution:

Question 93

At 25˚C, p Kw is 14 . The degree of dissociation of water is nearly

Options:

A. 10^{-4}

B. 1.8×10^{-9}

C. 10^{-7}

D. 5.6×10^{-6}

Answer: B

Solution:

Solution:

Question 94

Which one of the following uranium isotopes is used as atomic fuel?

Options:

A. $^{233}U_{92}$

B. $^{235}U_{92}$

C. $^{236}U_{92}$

D. $^{238}U_{92}$

Answer: B

Solution:

Solution:

Question 95

Most abundant element in the earth crust is

Options:

A. O

B. Al

C. Fe

D. Si

Answer: A

Solution:

Solution:

Question 96

Soda acid type fire extinguishers contain H_2SO_4 and

Options:

A. $NaHCO_3 + Na_2CO_3$

B. $NaHCO_3$ solution

C. Na_2CO_3

D. $CaCO_3$

Answer: A

Solution:

Solution:

Question 97

The correct order of electronegativity of N, O, F and P is

Options:

A. F > O > N > P

B. F > N > P > O

C. F > O > P > N

D. N> O > P > F

Answer: A

Solution:

Solution:

Question 98

Find the correct order of electron affinity on the following elements. S, O and Se

Options:

A. S > O > Se

B. O > S > Se

C. S > Se > O

D. Se > O > S

Answer: C

Solution:

Solution:

Question 99

The solution of sodium metal in liquid ammonia acts as a strong reducing agent due to the presence of

Options:

A. Sodium atoms

B. Solvated electrons

C. Sodium hydroxide

D. Sodium azide

Answer: B

Solution:

Solution:

Question 100

The isostructural group with I_3^-ion is

Options:

A. NO_2^-, XeF_2, N_3^-

B. ICl_2^-, XeF_2, N_3^-

C. NH_2^-, NO_2^-, ICl_2^-

D. BH_3, CO_2, ICl_2^-

Answer: B

Solution:

Solution:

Question 101

The diamagnetic metal complex ion is

Options:

A. $[NiCl_4]^{2-}$

B. $[CoCl_4]^{2-}$

C. $[CoF_6]^{3-}$

D. $[Ni(CN)_4]^{2-}$

Answer: D

Solution:

Solution:

Question 102

The CFSE of cobalt(II) in complex ion $[CoCl_4]^{2-}$ is

Options:

A. 0.6 Δ t

B. 1.2 Δ t

C. 1.8 Δ t

D. 2.4 Δ t

Answer: B

Solution:

Solution:

Question 103

The species in which the colour is not due to d-d transitions is

Options:

A. $[Ti(H_2O)_6]^{3+}$

B. $[CoF_6]^{3-}$

C. $[Cu(NH_3)_4]^{2+}$

D. $[CrO_4]^{2-}$

Answer: D

Solution:

Solution:

Question 104

Per ton of the material consumed, which is expected to produce the greatest quantity of $SO_2(g)$?

Options:

A. Burning coal

B. Burning natural gas

C. Smelting zinc sulphide

D. Smelting lead sulphide

Answer: C

Solution:

Solution:

Question 105

The acceptable value for the missing quantum number in the following set of quantum numbers is:
n = 3, l = ?, m_l = 2, m_s = +1 / 2

Options:

A. l = 3

B. l = 1

C. l = 2

D. l = 0

Answer: C

Solution:

Solution:

Question 106

Which must possess greater velocity to produce matter waves of same wavelength?

Options:

A. protons

B. neutrons

C. electrons

D. α-particles

Answer: C

Solution:

Solution:

Question 107

Which of the following ions has a trigonal planar shape?

Options:

A. SO_3^{2-}

B. PO_4^{3-}

C. PF_6^{-}

D. CO_3^{2-}

Answer: D

Solution:

Solution:

Question 108

Number of angular nodes for 4d orbital is

Options:

A. 4

B. 3

C. 2

D. 1

Answer: C

Solution:

Solution:

Question 109

What type of radioactive decay causes the atomic number of a nucleus to increase by one unit?

Options:

A. Electron capture

B. α-emission

C. β-emission

D. γ-ray emission

Answer: C

Solution:

Solution:

Question 110

The type of hybridization of each carbon in the compound, $H_3C - CH = C = CH - CH_3$ is

Options:

A. sp^3, sp^2, sp^2, sp^2, sp^3

B. sp^3, sp^2, sp, sp^2, sp^3

C. sp^3, sp, sp, sp, sp^3

D. sp^3, sp, sp^2, sp, sp^3

Answer: B

Solution:

Solution:

Question 111

If the sodium fusion extract of an organic compound gives violet colour upon treatment with sodium nitroprusside, then which of the following statement is correct?

Options:

A. Nitrogen is present in the compound and the violet colour is due to the formation of $[Fe(CN)_6]^{4-}$

B. Both nitrogen and bromine are present in the compound and the violet colour is due to the formation of $(NH_4)_2MoO_4$

C. Sulfur is present in the compound and the violet colour is due to the formation of

$[Fe(CN)_5 NOS]^4$

D. Both nitrogen and sulfur are present in the compound and the violet colour is due to the formation of $[Fe(SCN)]^{2+}$

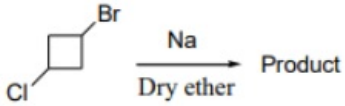
Answer: C

Solution:

Solution:

Question 112

Major product of the following reaction is



Options:

A.

B.

C.

D.

Answer: B

Solution:

Solution:

Question 113

When propyne is treated with mercuric sulphate and dilute sulfuric acid at 60˚C, it forms

Options:

A. acetone through anti-Markovnikov addition of water

B. propionaldehyde through Markovnikov addition of water

C. acetone through Markovnikov addition of water

D. propionaldehyde through anti-Markovnikov addition of water

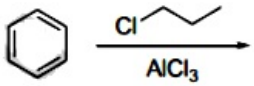
Answer: C

Solution:

Solution:

Question 114

Major product formed in the following reaction is



Options:

A. n-propylbenzene

B. isopropylbenzene (cumene)

C. 1-phenylpropene

D. 1,3-di-(n-propyl)benzene

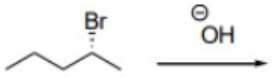
Answer: B

Solution:

Solution:

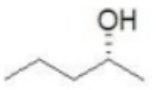
Question 115

The product(s) of the following bimolecular nucleophilic substitution reaction is (are)

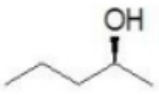


Options:

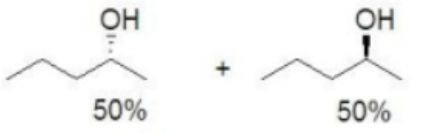
A.



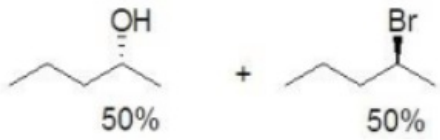
B.



C.



D.



Answer: B

Solution:

Solution:

Question 116

A compound P with molecular formula C_9H_{12} upon air oxidation gives compound Q, which upon treatment with dilute acid gives compounds R and S. R gives violet colour when treated with neutral $FeCl_3$. S gives an yellow precipitate on reaction with iodine in the presence of NaOH. The compounds P and S are

Options:

A. P = n-propylbenzene and S = acetone

B. P = n-propylbenzene and S = phenol

C. P = isopropylbenzene (cumene) and S = acetone

D. P = 1, 2, 4-trimethylbenzene and S = phenol

Answer: C

Solution:

Solution:

Question 117

The major product formed in the nitration of anisole (methoxybenzene) i

Options:

A. o-nitroanisole

B. p-nitroanisole

C. m-nitroanisole

D. 3,4-dinitroanisole

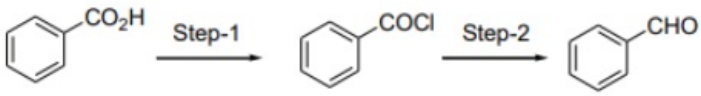
Answer: B

Solution:

Solution:

Question 118

Suitable reagents to perform the following transformations are



Options:

A. For step-1: $SOCl_2$ and for step-2: H_2, $Pd - BaSO_4$

B. For step-1: $SOCl_2$ and for step-2: $NaBH_4$

C. For step-1: Cl_2 and for step-2: H_2, $Pd - BaSO_4$

D. For step-1: PCl_5 and for step-2: $LiAlH_4$

Answer: A

Solution:

Solution:

Question 119

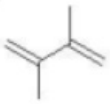
A compound P with molecular formula C_6H_{10} decolorizes bromine water and undergoes oxidation with acidified $KMnO_4$ to give a dicarboxylic acid with the same number of carbon atoms. The dicarboxylic acid serves as an important precursor in the manufacture of nylon- 6,6 . The compound P is

Options:

A.

B.

C.



D.

Answer: B

Solution:

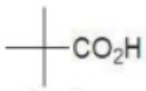
Solution:

Question 120

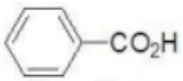
Which one of the following carboxylic acids would undergo Hell-Volhard-Zelinsky reaction?

Options:

A.



B.



C.

D. CF_3CO_2H

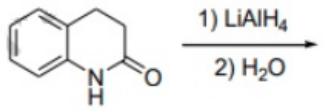
Answer: C

Solution:

Solution:

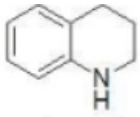
Question 121

Major product formed in the following reaction is

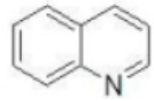


Options:

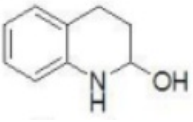
A.



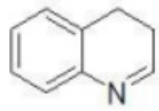
B.



C.



D.



Answer: A

Solution:

Solution:

Question 122

Gabriel phthalimide synthesis cannot be used for introducing the NH_2 group in

Options:

A. n-butylamine

B. benzylamine

C. aniline

D. 2-aminopropanoic acid

Answer: C

Solution:

Solution:

Question 123

In amylose,

Options:

A. α-D-(+)-glucose units are linked through C1-C4 glycosidic linkage

B. α-D-(+)-glucose units are linked to β-D-(-)-fructose through C1-C2 glycosidic linkage

C. α-D-(+)-glucose units are linked through C1-C2 glycosidic linkage

D. β-D-(+)-glucose units are linked through C1-C4 glycosidic linkage

Answer: A

Solution:

Solution:

Question 124

The Ziegler-Natta catalyst is

Options:

A. Et_2Zn and $TiCl_4$

B. Et_3Al and $SnCl_4$

C. Et_2Zn and $SnCl_4$

D. Et_3Al and $TiCl_4$

Answer: B

Solution:

Solution:

Question 125

Which one of the following is not a tranquilizer?

Options:

A. Meprobamate

B. Ranitidine

C. Valium

D. Serotonin

Answer: B

Solution:

Solution:

Question 126

The value of x with $\log_{\frac{1}{2}} x \geq \log_{\frac{1}{3}} x$ lies in

Options:

A. (0, 1]

B. (0, 1)

C. [0, 1)

D. [0, 1]

Answer: A

Solution:

Solution:

Question 127

If $\alpha \in \left(0, \frac{\pi}{2}\right)$, then the expression $\sqrt{x^2 + x} + \frac{\tan^2\alpha}{\sqrt{x^2 + x}}$ is always greater than or equal to

Options:

A. $2 \tan \alpha$

B. 2

C. 1

D. $\sec^2\alpha$

Answer: A

Solution:

Solution:

Question 128

If $\left|z - \frac{4}{z}\right| = 2$, then the maximum value of |z| is

Options:

A. $\sqrt{3} + 1$

B. $\sqrt{5} + 1$

C. 2

D. $2 + \sqrt{2}$

Answer: B

Solution:

Solution:

Question 129

If α, β are roots of the equation $x^2 - 2x + 4 = 0$, then $\alpha^n + \beta^n$ is equal to

Options:

A. $2^n \cos\left(\frac{n\pi}{3}\right)$

B. $2^n \sin\left(\frac{n\pi}{3}\right)$

C. $2^{n+1} \cos\left(\frac{n\pi}{3}\right)$

D. $2^{n+1} \sin\left(\frac{n\pi}{3}\right)$

Answer: C

Solution:

Solution:

Question 130

If $\log_{\cos x} \tan x + \log_{\sin x} \cot x = 0$, then the most general solutions of x are

Options:

A. $n\pi + \frac{\pi}{4}, n \in I$

B. $2n\pi + \frac{\pi}{4}, n \in I$

C. $2n\pi - \frac{3\pi}{4}, n \in I$

D. $2n\pi - \frac{\pi}{2}, n \in I$

Answer: B

Solution:

Solution:

Question 131

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 132

$\int_{-\frac{\pi}{2}}^{\frac{\pi}{2}} \frac{\cos x}{1 + e^x} dx$ is equal to

Options:

A. -1

B. 0

C. 1

D. None of these

Answer: C

Solution:

Solution:

Question 133

The centre of the circle passing through the point (0, 1) and touching the curve $y = x^2$ at (2, 4) is

Options:

A. $\left(-\frac{16}{5}, \frac{27}{10}\right)$

B. $\left(-\frac{16}{7}, \frac{53}{10}\right)$

C. $\left(-\frac{16}{5}, \frac{53}{10}\right)$

D. $\left(-\frac{16}{7}, -\frac{53}{10}\right)$

Answer: C

Solution:

Solution:

Question 134

If $z_1 = 8 + 4i$, $z_2 = 6 + 4i$ and $\arg\left(\frac{z - z_1}{z - z_2}\right) = \frac{\pi}{4}$, then z satisfies

Options:

A. $|z - 7 - 4i| = 1$

B. $|z - 4i| = 8$

C. $|z - 7 - 5i| = \sqrt{2}$

D. $|z - 4i| = \sqrt{18}$

Answer: C

Solution:

Solution:

Question 135

Which of the following is a non-abelian group?

Options:

A. Cube roots of unity under multiplication

B. $(Z, +)$

C. $(Z_n, +_n)$

D. 2×2 non-singular matrices under matrix multiplication

Answer: D

Solution:

Solution:

Question 136

The equation of the parabola with its focus at (3, 4) and vertex at the focus of the parabola $y^2 - 12x - 4y + 4 = 0$ is

Options:

A. $x^2 - 6x - 8y - 25 = 0$

B. $x^2 - 6x + 8y - 25 = 0$

C. $x^2 - 6x - 8y + 25 = 0$

D. $x^2 + 6x - 8y - 25 = 0$

Answer: C

Solution:

Solution:

Question 137

The locus of z satisfying $Im(z^2) = 4$ is

Options:

A. a circle

B. a rectangular hyperbola

C. a pair of straight lines

D. an ellipse

Answer: B

Solution:

Solution:

Question 138

The solution of the differential equation $\left(x\sin\left(\frac{y}{x}\right)\right)dy - \left(y\sin\left(\frac{y}{x}\right) - x\right)dx = 0$ is

Options:

A. $\cos\left(\frac{y}{x}\right) = 0$

B. $\sin\left(\frac{y}{x}\right) = 0$

C. $\cos\left(\frac{y}{x}\right) - \log x = c$

D. $\sin\left(\frac{y}{x}\right) - \log x = c$

Answer: C

Solution:

Solution:

Question 139

If a, b, c are in A.P. and a^2, b^2, c^2 are in H.P., then

Options:

A. a = b = c

B. $2b = 3a + c$

C. $b^2 = \sqrt{ac / 8}$

D. $2b = a$

Answer: A

Solution:

Solution:

Question 140

If x, y, z are three positive real numbers, then the value of $(x + y)(y + z)(z + x)$ is

Options:

A. $\geq 8xyz$

B. $< 8xyz$

C. $= 8xyz$

D. $\leq xyz$

Answer: A

Solution:

Solution:

Question 141

The product $(32)(32)^{1/6}(32)^{1/36} \ldots \infty$ is equal to

Options:

A. 16

B. 64

C. 32

D. 0

Answer: B

Solution:

Solution:

Question 142

The harmonic mean of the roots of the equation $(5 + \sqrt{2})x^2 - (4 + \sqrt{5})x + 8 + 2\sqrt{5} = 0$ is

Options:

A. 2

B. 4

C. 6

D. 8

Answer: B

Solution:

Solution:

Question 143

If $ax^2 + bx + c = 0$ and $2x^2 + 3x + 4 = 0$ have a common root where $a, b, c \in$ square (set of natural numbers), the least value of $a + b + c$ is

Options:

A. 13

B. 11

C. 7

D. 9

Answer: D

Solution:

Solution:

Question 144

If $x = \sqrt{7 + 4\sqrt{3}}$, then $x + \frac{1}{x}$ is equal to

Options:

A. 4

B. 6

C. 3

D. 2

Answer: A

Solution:

Solution:

Question 145

If α, β, γ are the roots of $x^3 + 64 = 0$, then the equation whose roots are $\left(\frac{\alpha}{\beta}\right)^2$ and $\left(\frac{\alpha}{\gamma}\right)^2$ is

Options:

A. $x^2 - 4x + 16 = 0$

B. $x^2 + x + 1 = 0$

C. $x^2 + 4x + 16 = 0$

D. $x^2 - x + 1 = 0$

Answer: B

Solution:

Solution:

Question 146

The roots of the equation $(x - a)(x - b) = abx^2$ are always

Options:

A. real

B. imaginary

C. rationals

D. irrationals

Answer: A

Solution:

Solution:

Question 147

Which of the following functions is nonperiodic?

Options:

A. $f(x) = x - [x]$

B. $f(x) = \begin{cases} 1 & \text{if } x \text{ is a rational number} \\ 0 & \text{if } x \text{ is an irrational number} \end{cases}$.

C. $f(x) = \sqrt{\frac{8}{1+\cos x} + \frac{8}{1-\cos x}}$

D. $\log(1 + |x|)$

Answer: D

Solution:

Solution:

Question 148

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. 40

Answer: C

Solution:

Solution:

Question 149

The only value of x satisfying the equation $6\sqrt{\frac{x}{x+4}} - 2\sqrt{\frac{x+4}{x}} = 11$ where $x \in R$ is

Options:

A. 16 / 3

B. −16 / 3

C. 4 / 35

D. −4 / 35

Answer: B

Solution:

Solution:

Question 150

The number of real values of a for which the system of equations x + ay − z = 0, 2x − y + az = 0, ax + y + 2z = 0 has a non-trivial solution is

Options:

A. 0

B. 1

C. 2

D. 3

Answer: D

Solution:

Solution:

Question 151

In the binomial expansion of $(a - b)^n$, 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 152

The coefficient of t^{24} in the expansion of $(1 + t^2)^{12}(1 + t^{12})(1 + t^{24})$ is

Options:

A. ${}^{12}C_6 + 2$

B. ${}^{12}C_5$

C. ${}^{12}C_6$

D. ${}^{12}C_7$

Answer: A

Solution:

Solution:

Question 153

The equation $z^2 + \bar{z}^2 - 2z|^2 + z + \bar{z} = 0$, where z is a complex number, represents

Options:

A. a straight line

B. a circle

C. an ellipse

D. a parabola

Answer: D

Solution:

Solution:

Question 154

Let A = $\begin{bmatrix} 1 & -1 & 1 \\ 2 & 1 & -3 \\ 1 & 1 & 1 \end{bmatrix}$ and 10B = $\begin{bmatrix} 4 & 2 & 2 \\ -5 & 0 & \alpha \\ 1 & -2 & 3 \end{bmatrix}$. If B is the inverse of A, then α is

Options:

A. -2

B. 1

C. 2

D. 5

Answer: D

Solution:

Solution:

Question 155

If [ ] denotes the greatest integer function, then $[(\sqrt{2}+1)^6]$ is equal to

Options:

A. 196

B. 197

C. 198

D. 199

Answer: B

Solution:

Solution:

Question 156

$\tan\theta \sin\left(\frac{\pi}{2}+\theta\right)\cos\left(\frac{\pi}{2}-\theta\right) =$

Options:

A. 1

B. -1

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

D. None of the above

Answer: D

Solution:

Solution:

Question 157

If sin (A + B)sin (A − B) is equal to

Options:

A. $\sin^2 A - \cos^2 B$

B. $\sin (A^2 - B^2)$

C. $\sin^2 A - \sin^2 B$

D. $\cos^2 A - \cos^2 B$

Answer: C

Solution:

Solution:

Question 158

If $\cos\theta + \sqrt{3}\sin\theta = 2$, then the minimum value of θ is

Options:

A. π / 3

B. 2π / 3

C. 4π / 3

D. 5π / 3

Answer: A

Solution:

Solution:

Question 159

$\lim_{x \to \pi/3} \frac{2\sin\left(x - \frac{\pi}{3}\right)}{1 - 2\cos x}$ **is**

Options:

A. $1 / \sqrt{2}$

B. $2 / \sqrt{3}$

C. 2 / 3

D. 1 / 3

Answer: B

Solution:

Solution:

Question 160

The value of $\tan^{-1}\frac{1}{2} + \tan^{-1}\frac{1}{3}$ is

Options:

A. 0

B. π / 3

C. π / 6

D. π / 4

Answer: D

Solution:

Solution:

Question 161

If $\binom{2n}{3} : \binom{n}{2} = 44 : 3$, then the value of n is

Options:

A. 3

B. 4

C. 5

D. 6

Answer: D

Solution:

Solution:

Question 162

If $\sin\left\{\frac{1}{5}\cos^{-1}x\right\} = 1$, then x =

Options:

A. 0

B. 1

C. -1

D. ∞

Answer: A

Solution:

Solution:

Question 163

In a $\triangle ABC$, $b = \sqrt{3} + 1$, $c = \sqrt{3} - 1$, $\angle A = 60^\circ$, then the value of $\tan\frac{1}{2}(B - C)$ is

Options:

A. 2

B. 1 / 2

C. 1

D. 3

Answer: C

Solution:

Solution:

Question 164

If $\begin{vmatrix} x^n & x^{n+2} & x^{n+3} \\ y^n & y^{n+2} & y^{n+3} \\ z^n & z^{n+2} & z^{n+3} \end{vmatrix} = (y-z)(z-x)(x-y)\left(\frac{1}{x}+\frac{1}{y}+\frac{1}{z}\right)$, **then n is equal to**

Options:

A. 2

B. -2

C. -1

D. 1

Answer: C

Solution:

Solution:

Question 165

If f (x) = $|\log_{10} x|$ then at x = 1,

Options:

A. f is not continuous

B. f is continuous but not differentiable

C. f is differentiable

D. the derivative is 1

Answer: B

Solution:

Solution:

Question 166

If the ratio of the roots of $ax^2 + bx + c = 0$, $a \neq 0$ is 4 : 5, then $\frac{b^2}{ac}$ is equal

to

Options:

A. $\frac{20}{49}$

B. $\frac{49}{20}$

C. $\frac{81}{20}$

D. $\frac{20}{81}$

Answer: C

Solution:

Solution:

Question 167

The locus represented by $|Z - 1| = |Z + i|$ is

Options:

A. a circle of radius 1

B. an ellipse with foci at (1, 0) and (0, −1)

C. a straight line through the origin

D. a circle on the line joining (1, 0), (0, 1) as diameter

Answer: C

Solution:

Solution:

Question 168

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 169

A square root of 3 + 4i is

Options:

A. $\sqrt{3} + 1$

B. $2 + i$

C. $-2 + i$

D. None of the above

Answer: B

Solution:

Solution:

Question 170

The sum of the series $1 + \frac{5}{2!} + \frac{9}{3!} + \frac{17}{4!} + \infty$ is

Options:

A. $e(e + 1)$

B. $e(1 - e)$

C. $e(e - 1)$

D. $e^2 + e - 4$

Answer: D

Solution:

Solution:

Question 171

If (1 + 3p) / 3, (1 − p) / 4 and (1 − 2p) / 2 are the probabilities of three mutually exclusive events, then the set of all values of p is

Options:

A. $-1 \leq p \leq 1 / 5$

B. $-2 \leq p \leq 1 / 3$

C. $1 / 3 \leq p \leq 1 / 2$

D. $1 / 4 \leq P \leq 1 / 3$

Answer: C

Solution:

Solution:

Question 172

If 2α + 3β + γ = 0, then the line αx + 5βy + 2γ = 0 passes through the fixed point

Options:

A. $\left(4, \frac{6}{5}\right)$

B. $\left(\frac{6}{5}, 4\right)$

C. $\left(-4, -\frac{6}{5}\right)$

D. $\left(-\frac{6}{5}, -4\right)$

Answer: A

Solution:

Solution:

Question 173

If $f(x) = \cos(\log x)$, then $f(x^2)f(y^2) - \frac{1}{2}[f(x^2 / y^2) + f(x^2y^2)]$, has the value of

Options:

A. -2

B. -1

C. 1 / 2

D. 0

Answer: D

Solution:

Solution:

Question 174

A and B are two independent events. Then probability that both A and B occur, is 1 / 6 and the probability that none of them occurs, is 1 / 3. The minimum value of probability of occurrence of A, is

Options:

A. 1 / 2

B. 1 / 3

C. 1 / 4

D. 1 / 5

Answer: B

Solution:

Solution:

Question 175

The equation of the directrix of the parabola $(x - \alpha)^2 = 4a(y - \beta)$ is

Options:

A. $x + a = \alpha$

B. $x + a = \beta$

C. $y + a = \beta$

D. $y + a = \alpha$

Answer: C

Solution:

Solution:

Question 176

The minimum value of $27\tan^2\theta + 3\cot^2\theta$ is

Options:

A. 9

B. 18

C. 27

D. 30

Answer: B

Solution:

Solution:

Question 177

The interval in which the function $y = \frac{x-1}{x^2-3x+3}$ transforms the real line is

Options:

A. $(0, \infty)$

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

C. $[0, 1]$

D. $\left[-\frac{1}{3}, 1\right]$

Answer: D

Solution:

Solution:

Question 178

The rank of the matrix $\begin{pmatrix} 2 & 3 & 4 \\ 2a & 3a & 4a \\ 2a^2 & 3a^2 & 4a^2 \end{pmatrix}$ **is**

Options:

A. 3

B. 2

C. 1

D. 0

Answer: C

Solution:

Solution:

Question 179

Twelve tickets are numbered from 1 to 12 . One ticket is drawn at random, then the probability of the number to be divisible by 2 or 3 , is

Options:

A. 2 / 3

B. 7 / 12

C. 5 / 6

D. 3 / 4

Answer: A

Solution:

Solution:

Question 180

$\lim_{x \to 0} \{\sin x - x / x^3\}$ equals

Options:

A. 1 / 3

B. -1 / 3

C. 1 / 6

D. −1 / 6

Answer: D

Solution:

Solution:

Question 181

If f (x) = $\log_3 x$ and g(x) = x^2, then the composite function f (g(x)) is equal to

Options:

A. 2f (x)

B. $(f(x))^2$

C. g(x)

D. 2g(x)

Answer: A

Solution:

Solution:

Question 182

The projection of the vector $2\hat{i} + \hat{j} - 3\hat{k}$ on the vector $\hat{i} - 2\hat{j} + \hat{k}$ is

Options:

A. $\frac{-3}{\sqrt{14}}$

B. $\frac{3}{\sqrt{14}}$

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

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

Answer: C

Solution:

Solution:

Question 183

The smallest positive x satisfying the equation $\log_{\cos x}\sin x + \log_{\sin x}\cos x = 2$ is

Options:

A. π / 2

B. π / 3

C. π / 4

D. π / 6

Answer: C

Solution:

Solution:

Question 184

The median of a set of 9 distinct observation is 20.5 . If each of the largest 4 observations of the set is increased by 2 , then the median of the new set

Options:

A. is increased by 2

B. is decreased by 2

C. is two times the original median

D. remains the same as that of the original set

Answer: D

Solution:

Solution:

Question 185

The position vector of the points A, B, C are $2\hat{i} + \hat{j} - \hat{k}$, $3\hat{i} - 2\hat{j} + \hat{k}$ and $\hat{i} + 4\hat{j} - 3\hat{k}$ respectively. These points

Options:

A. form an isosceles triangle

B. form a right angled triangle

C. are collinear

D. for a scalene triangle

Answer: C

Solution:

Solution:

Question 186

The statement p → (q → p) is equivalent to

Options:

A. p → (p ↔ q)

B. p → (p → q)

C. p → (p ∨ q)

D. p → (p ∧ q)

Answer: C

Solution:

Solution:

Question 187

If y = log(log(log x)), then $\frac{dy}{dx}$ is equal to

Options:

A. $\log(\log x)$

B. $\log x \cdot \log(\log x)$

C. $\frac{1}{x \cdot \log x \cdot \log(\log x)}$

D. $\frac{1}{\log x \cdot \log(\log x)}$

Answer: C

Solution:

Solution:

Question 188

Slope of the tangent to the curve $xy - 3x + 2y = 6$ at the point (2, 3) is

Options:

A. 1

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

C. ∞

D. 0

Answer: D

Solution:

Solution:

Question 189

If $z = x^2\tan^{-1}\left(\frac{y}{x}\right) - y^2\tan^{-1}\left(\frac{x}{y}\right)$, then $\partial^2 z / \partial x \partial y =$

Options:

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

B. $\frac{x^2 - y^2}{(x^2 + y^2)^2}$

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

D. $\frac{(x^2 - y^2)}{x^2 + y^2}$

Answer: D

Solution:

Solution:

Question 190

The argument of the complex number -5 is

Options:

A. 0

B. $-\pi$

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

D. π

Answer: D

Solution:

Solution:

Question 191

One function is selected from all the function F : S → S, where S = {1, 2, 3, 4, 5, 6}. The probability that it is onto function is

Options:

A. 5 / 81

B. 5 / 162

C. 5 / 324

D. 7 / 324

Answer: C

Solution:

Solution:

Question 192

The equation of the tangent to the curve $y = 4 + \sin^2 x$ at $x = 0$ is $y =$

Options:

A. 2

B. 3

C. 4

D. 6

Answer: C

Solution:

Solution:

Question 193

The non-zero vectors $\vec{a}$, $\vec{b}$ and $\vec{c}$ are related by $\vec{a} = 8\vec{b}$ and $\vec{c} = -7\vec{b}$. Then, the angle between $\vec{a}$ and $\vec{c}$

Options:

A. 0

B. π / 4

C. π / 2

D. π

Answer: D

Solution:

Solution:

Question 194

The point P is equidistant from A(1, 3), B(−3, 5) and C(5, −1). Then PA is equal to

Options:

A. 5

B. $5\sqrt{5}$

C. 25

D. $5\sqrt{10}$

Answer: D

Solution:

Solution:

Question 195

The area bounded by the curves x + 2y | = 1 and x = 0 is

Options:

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

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

C. 2

D. 3

Answer: B

Solution:

Solution:

Question 196

If a > 1, then the roots of the equation $(1 - a)x^2 + 3ax - 1 = 0$ are

Options:

A. both positive

B. both negative

C. opposite in sign

D. imaginary conjugate

Answer: A

Solution:

Solution:

Question 197

The tangent from the origin to the parabola $y^2 + 4 = 4x$ are inclined at an angle

Options:

A. π / 6

B. π / 4

C. π / 3

D. π / 2

Answer: D

Solution:

Solution:

Question 198

If the points $(-2, 0)$, $\left(-1, \frac{1}{\sqrt{3}}\right)$ and $(\cos\theta, \sin\theta)$ are collinear, then the number of values of $\theta = [0, 2\pi]$ is

Options:

A. 0

B. 1

C. 2

D. infinite

Answer: B

Solution:

Solution:

Question 199

The contrapositive of the statement "I go to school if it does not rain" is

Options:

A. if it rains, I do not go to school

B. if I do not go to school, it rains

C. if it rains, I go to school

D. if I go to school, it rains

Answer: B

Solution:

Solution:

Question 200

The function $f(x) = [x(x-3)]^2$ increases for all values of x lying in the interval

Options:

A. $0 < x < 3/2$

B. $0 < x < \infty$

C. $-\infty < x < 0$

D. $1 < x < 3$

Answer: A

Solution:

Solution:

Question 201

Let $f : \square \to \square$ be a positive valued increasing function with $\lim_{x \to \infty} \frac{f(3x)}{f(x)} = 1$. Then $\lim_{x \to \infty} \frac{f(2x)}{f(x)}$ is

Options:

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

B. 3

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

D. 1

Answer: D

Solution:

Solution:

Question 202

If one of the lines of $my^2 + (1-m^2)xy - mx^2 = 0$ is a bisector of the angle between the lines $xy = 0$, then m is

Options:

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

B. -2

C. ± 1

D. 2

Answer: C

Solution:

Solution:

Question 203

The number of points on the line x + y = 4 which are unit distance apart from the line 2x + 2y = 5 is

Options:

A. 0

B. 1

C. 2

D. ∞

Answer: A

Solution:

Solution:

Question 204

$\int \frac{\sin x - \cos x}{\sqrt{1 + \sin 2x}}$ dx is equal to

Options:

A. $\log(\sin x + \cos x) + c$

B. $-\log(\sin x + \cos x) + c$

C. $\log \left| \sec\left(x - \frac{\pi}{4}\right) \right| + c$

D. $-\log \left| \sec\left(x - \frac{\pi}{4}\right) \right| + c$

Answer: B

Solution:

Solution:

Question 205

The range of λ for which the circles $x^2 + y^2 = 4$ and $x^2 + y^2 - 4\lambda x + 9 = 0$ have two common tangents, is

Options:

A. $\lambda \in \left(-\frac{13}{8}, \frac{13}{8}\right)$

B. $\lambda > \frac{13}{8}$ or $\lambda < -\frac{13}{8}$

C. $1 < \lambda < \frac{13}{8}$

D. $\lambda \in \left[-\frac{13}{8}, \frac{13}{8}\right]$

Answer: B

Solution:

Solution:

Question 206

If $I_n = \int_0^1 [(n+1)x^n + nx^{n-1} + \ldots + 2x + 1]\,dx$, then the value of I_n is

Options:

A. $n - 1$

B. n

C. $n + 1$

D. $n + 2$

Answer: C

Solution:

Solution:

Question 207

The area of the region bounded by the lines y = $|x-2|$, x = 1, x = 3 and the x-axis is

Options:

A. 1

B. 2

C. 3

D. 4

Answer: A

Solution:

Solution:

Question 208

The value of a for which the difference of the roots of the equation $ax^2 + (a-1)x + 2 = 0$ is min, is given by

Options:

A. 1 / 5

B. 5

C. -1 / 5

D. None of the above

Answer: A

Solution:

Solution:

Question 209

The line x − 1 = 0 is the directrix of the parabola $y^2 - kx + 8 = 0$. Then, one of the value of k is

Options:

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

B. 8

C. 4

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

Answer: C

Solution:

Solution:

Question 210

Area between the curve $y = 4 + 3x - x^2$ and x-axis is

Options:

A. $\left(\frac{125}{3}\right)$ sq. unit

B. $\left(\frac{125}{4}\right)$ sq. unit

C. $\left(\frac{125}{6}\right)$ sq. unit

D. None of the above

Answer: C

Solution:

Solution:

Question 211

The focus of the parabola $y = 2x^2 + x$ is

Options:

A. (0, 0)

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

C. $\left(-\frac{1}{4}, 0\right)$

D. $\left(-\frac{1}{4}, \frac{1}{8}\right)$

Answer: C

Solution:

Solution:

Question 212

The order and degree of the differential equation $y + \left(\frac{d^3y}{dx^3}\right)^2 = \sqrt[3]{1 + \frac{dx}{dy}}$ are respectively

Options:

A. 3,5

B. 3,6

C. 3, 2

D. 5, 4

Answer: B

Solution:

Solution:

Question 213

The area bounded by the straight lines x = 0, x = 2 and the curve $y = 2^x$, $y = 2x - x^2$ is

Options:

A. $\frac{4}{3} - \frac{1}{\log 2}$

B. $\frac{3}{\log 2} + \frac{4}{3}$

C. $\frac{4}{\log 2} - 1$

D. $\frac{3}{\log 2} - \frac{4}{3}$

Answer: D

Solution:

Solution:

Question 214

The number of solutions of the equation $z^2 = \bar{z}$, where z is a complex number, is

Options:

A. 2

B. 3

C. 4

D. 6

Answer: C

Solution:

Solution:

Question 215

The differential equation of all circles passing through the origin and having their centres on the x-axis is

Options:

A. $x^2 = y^2 + xy\frac{dy}{dx}$

B. $x^2 = y^2 + 3xy\frac{dy}{dx}$

C. $y^2 = x^2 + 2xy\frac{dy}{dx}$

D. $y^2 = x^2 - 2xy\frac{dy}{dx}$

Answer: C

Solution:

Solution:

Question 216

Which one of the following function is not periodic?

Options:

A. $e^{\sin x}$

B. $\frac{1}{10 + \sin x + \cos x}$

C. $\log_e(\cos x)$

D. $\sin(e^x)$

Answer: D

Solution:

Solution:

Question 217

Differential coefficient of $\log_{10}x$ with respect to $\log_x 10$ is

Options:

A. $-\frac{(\log 10)^2}{(\log x)^2}$

B. $\frac{(\log_x 10)^2}{(\log 10)^2}$

C. $\frac{(\log_{10} x)^2}{(\log 10)^2}$

D. $-\frac{(\log x)^2}{(\log 10)^2}$

Answer: D

Solution:

Solution:

Question 218

The derivative of $\sin^{-1}\left(\frac{2x}{1+x^2}\right)$ with respect to $\cos^{-1}\left(\frac{1-x^2}{1+x^2}\right)$ is

Options:

A. 11

B. 1

C. 2

D. 4

Answer: B

Solution:

Solution:

Question 219

$\lim_{n \to \infty} \left[\frac{n!}{n^n} \right]^{1/n}$ **equals**

Options:

A. e

B. 1 / e

C. π / 4

D. 4 / π

Answer: B

Solution:

Solution:

Question 220

If $\frac{1}{a} = \frac{1}{b} = \frac{1}{c} = \frac{1}{a+b+c}$ **then** $\frac{1}{a^5} = \frac{1}{b^5} = \frac{1}{c^5} =$

Options:

A. 0

B. 1

C. $1 / (a^5 + b^5 + c^5)$

D. None of the above

Answer: C

Solution:

Solution:

Question 221

If $x = y\sqrt{1 - y^2}$**, then** $\frac{dy}{dx}$ **is equal to**

Options:

A. x

B. $\frac{\sqrt{1-y^2}}{1+2y^2}$

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

D. 0

Answer: C

Solution:

Solution:

Question 222

The solution of $\sec^2 x \tan^2 y\, dx + \sec^2 y \tan^2 x\, dy = 0$ is

Options:

A. $\frac{\tan x - \tan y}{\tan x \tan y} = c$

B. $\frac{\tan x + \tan y}{\tan x} = c$

C. $\frac{\tan x + \tan y}{\tan x \tan y} = c$

D. $\frac{\tan x + \tan y}{\tan y} = c$

Answer: C

Solution:

Solution:

Question 223

A differentiable function f (x) is defined for all x > 0 and satisfies $f(x^3) = 4x^4$ for all x > 0. The value of $f'(8)$ is

Options:

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

B. $\frac{32}{3}$

C. $\frac{16\sqrt{2}}{3}$

D. $\frac{32\sqrt{2}}{3}$

Answer: B

Solution:

Solution:

Question 224

If $\Delta(n) = \begin{vmatrix} x^n & \sin x & \cos x \\ n! & \sin\frac{n\pi}{2} & \cos\frac{n\pi}{2} \\ \alpha & \alpha^2 & \alpha^3 \end{vmatrix}$, then the value of $\frac{d^n}{dx^n}[\Delta(x)]$ at x = 0 is

Options:

A. -1

B. 0

C. 1

D. 2

Answer: B

Solution:

Solution:

Question 225

The vector in the direction of 3i − 4j that has magnitude 7 unit is

Options:

A. $\frac{21}{5}i - \frac{28}{5}j$

B. $\frac{3}{5}i - \frac{4}{5}j$

C. $21i - 28j$

D. $\frac{21}{5}i + \frac{28}{5}j$

Answer: A

Solution:

Solution:

Question 226

If f (x) = ax + b and g(x) = cx + d , then f {g(x)} = g{f (x)} is equivalent to

Options:

A. f (a) = g(c)

B. f (b) = g(b)

C. f (d) = g(b)

D. f (c) = g(a)

Answer: C

Solution:

Solution:

Question 227

In a △ABC, tan A and tan B are the roots of $pq(x^2 + 1) = r^2x$. Then △ABC is

Options:

A. a right angled triangle

B. an equilateral triangle

C. an acute angled triangle

D. an obtuse angled triangle

Answer: A

Solution:

Solution:

Question 228

The number of ways in which we can choose a committee from four men and six women so that the committee includes at least two men and at least twice as many women as men is

Options:

A. 94

B. 126

C. 136

D. 156

Answer: C

Solution:

Solution:

Question 229

If f (x) = $\begin{cases} \frac{1-\cos x}{x} & x \neq 0 \\ k & x = 0 \end{cases}$. is continuous at x = 0, then the value of k is

Options:

A. 0

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

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

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

Answer: A

Solution:

Solution:

Question 230

If f (2) = 4 and f ′(2) = 1, then the value of $\lim_{x \to 2} \frac{xf(2) - 2f(x)}{x - 2}$ is

Options:

A. -3

B. 1

C. 3

D. 2

Answer: D

Solution:

Solution:

Question 231

The value of $\lim_{x \to \frac{\pi}{2}} \frac{2x - \pi}{\cos x}$ is equal to

Options:

A. -1

B. -2

C. 2

D. 1

Answer: B

Solution:

Solution:

Question 232

The function $f(x) = xe^{1-x}$

Options:

A. strictly increases in the interval $\left(\frac{1}{2}, 2 \right)$

B. increases in the interval $(0, \infty)$

C. decreases in the interval $(0, 2)$

D. strictly decreases in the interval $(1, \infty)$

Answer: D

Solution:

Solution:

Question 233

If three positive real numbers a, b, c are in A.P. and abc = 4 then minimum possible value of b is

Options:

A. $2^{3/2}$

B. $2^{2/3}$

C. $2^{1/3}$

D. 1

Answer: B

Solution:

Solution:

Question 234

Let f : N → Y be a function defined as f(x) = 4x + 3 where Y = { y ∈ N : y = 4x + 3 for some x ∈ N }. Then the inverse of f is

Options:

A. $g(y) = \frac{3y+4}{3}$

B. $g(y) = 4 + \frac{y+3}{4}$

C. $g(y) = \frac{y+3}{4}$

D. $g(y) = \frac{y-3}{4}$

Answer: D

Solution:

Solution:

Question 235

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. 4

Answer: B

Solution:

Solution:

Question 236

If ω is a cube root of unity, then a root of the equation

$$\begin{vmatrix} x+1 & \omega & \omega^2 \\ \omega & x+\omega^2 & 1 \\ \omega^2 & 1 & 1+\omega \end{vmatrix} = 0 \text{ is}$$

Options:

A. x = 1

B. x = ω

C. $x = \omega^2$

D. x = 0

Answer: D

Solution:

Solution:

Question 237

Let α and β be two real numbers and the matrix $A = \begin{bmatrix} 0 & \alpha \\ \beta & 0 \end{bmatrix}$ be such that $A^3 + A = 0$. Then

Options:

A. αβ = 2

B. αβ = 0

C. αβ = 1

D. $\alpha\beta = -1$

Answer: D

Solution:

Solution:

Question 238

The number of surjection's from A = {1, 2, . . . n}, n ≥ 2, onto B = {a, b} is

Options:

A. nP_2

B. $2^n - 2$

C. $2^n - 1$

D. None of the above

Answer: B

Solution:

Solution:

Question 239

For real numbers x and y, we define xRy if and only if $x - y + \sqrt{2}$ is an irrational number. Then the relation R is

Options:

A. Reflexive

B. Symmetric

C. Transitive

D. None of the above

Answer: A

Solution:

Solution:

Question 240

The set of all values of x for which log(1 + x) < x is

Options:

A. $x > 0$

B. $0 < x < 1$

C. $x \geq 0$

D. $x = 1$

Answer: C

Solution:

Solution:

Question 241

A house has multi-storey's. The lowest storey is 20 ft. high. A stone which is dropped from the top of the house passes the lowest story in 1 / 4 second. The height of the house is

Options:

A. 100 ft.

B. 110 ft.

C. 110.25 ft.

D. None of the above

Answer: C

Solution:

Solution:

Question 242

A particle is projected with a velocity of 39.2m / sec at an angle of 30˚ to the horizontal. It will move at right angles to the direction of projection after the time.

Options:

A. 8 sec

B. 5 sec

C. 6 sec

D. 10 sec

Answer: B

Solution:

Solution:

Question 243

The value of $\int_{\frac{1}{\pi}}^{\frac{2}{\pi}} \frac{1}{x^2}\sin\frac{1}{x}\,dx$ is equal to

Options:

A. 0

B. 1

C. 2

D. -1

Answer: B

Solution:

Solution:

Question 244

Three houses are available in a locality. Three persons apply for the houses. Each applies for one house without consulting others. The probability that all the three apply for the same house is

Options:

A. $\frac{8}{9}$

B. $\frac{7}{9}$

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

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

Answer: D

Solution:

Solution:

Question 245

Last two digits of the natural number 19^{9^4} is

Options:

A. 29

B. 39

C. 90

D. 19

Answer: D

Solution:

Solution:

Question 246

The number of solutions of $1/x + 1/y = 1/6$, where $x, y \in$ □ is

Options:

A. 9

B. 18

C. 21

D. 28

Answer: A

Solution:

Solution:

Question 247

If (3, 2, 5) is one end of a diameter of the sphere

$x^2 + y^2 + z^2 - 6x - 12y - 2z + 20 = 0$, then co-ordinates of the other end of the diameter are

Options:

A. (4, 3, 5)

B. (4, 3, −3)

C. (4, 9, −3)

D. None of the above

Answer: C

Solution:

Solution:

Question 248

The weighted mean of first n natural numbers whose weights are equal to the squares of corresponding number is

Options:

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

B. $\frac{3n(n+1)}{2(2n+1)}$

C. $\frac{(n+1)(2n+1)}{6}$

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

Answer: B

Solution:

Solution:

Question 249

$\int 5^{5^{5^x}} \cdot 5^{5^x} \cdot 5^x dx$ equal to

Options:

A. $\frac{5^{5^2}}{(\log 5)^3} + c$

B. $5^{5^{5}}(\log 5)^3 + c$

C. $\frac{5^{5^{5^x}}}{(\log 5)^3} + c$

D. None of these

Answer: C

Solution:

Solution:

Question 250

The sum of the coefficients of all those term with integral power of x in the expansion of $(1 + \sqrt{x})^9$ is

Options:

A. 128

B. 225

C. 312

D. 256

Answer: D

Solution:

Solution:
