CUSAT 2021 : Shift 2

Solved Paper

Question 1

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 min 20 seconds?

Options:

A. 7R

B. 2R

C. 2πR

D. 7πR

Answer: B

Solution:

Solution:

Question 2

The phase difference between the displacement and velocity of a particle executing SHM is

Options:

A. π / 2

B. π

C. π / 4

D. 0

Answer: A

Solution:

Solution:

Question 3

The work done per unit volume in stretching a wire is

Options:

A. $\frac{\text{force} \times \text{extension}}{2}$

B. $\frac{\text{stress} \times \text{strain}}{2}$

C. force × extension

D. stress × strain

Answer: B

Solution:

Solution:

Question 4

A capacitor connected to a cell of emf E is fully charged. If V is the potential difference across the capacitor, then which one of the following is correct?

Options:

A. $V > E$

B. $V = E = 0$

C. $V = E$

D. $V < E$

Answer: C

Solution:

Solution:

Question 5

In a common emitter amplifier circuit using an n − p − n transistor, the phase difference between the input and the output voltage will be

Options:

A. 135°

B. 180°

C. 45°

D. 90°

Answer: B

Solution:

Solution:

Question 6

If λ is the decay constant, $T_{1/2}$ is the half life and T is the mean life of a radioactive element, then which of the following is true

Options:

A. $T_{1/2} = \frac{1}{\lambda}, T = \frac{\ln 2}{\lambda}$

B. $T_{1/2} = \frac{\ln 2}{\lambda}, T = \frac{1}{\lambda}$

C. $T_{1/2} = \lambda \ln 2, T = \frac{1}{\lambda}$

D. $T_{1/2} = \frac{\lambda}{\ln 2}, T = \frac{\ln 2}{\lambda}$

Answer: B

Solution:

Solution:

Question 7

Ozone layer in the atmosphere absorbs

Options:

A. radio waves

B. infrared

C. ultra violet rays

D. X-rays

Answer: C

Solution:

Solution:

Question 8

In a Rutherford experiment, for head-on collision of α - particles with a gold nucleus, the impact parameter is

Options:

A. of the order of 10^{-14}m

B. of the order of 10^{-10}m

C. of the order of 10^{-6}m

D. zero

Answer: D

Solution:

Solution:

Question 9

The speed of electromagnetic waves in free space is $3 \times 10^{8} ms^{-1}$. The frequency of a radio wave of wavelength 150m is

Options:

A. 45 MHz

B. 2 MHz

C. 20 kHz

D. 2 kHz

Answer: B

Solution:

Solution:

Question 10

In a series resonant circuit, the AC voltages across R, L and C are respectively 5V, 10V and 10V. The AC voltage applied to the circuit is

Options:

A. 25V

B. 15V

C. 5V

D. 20V

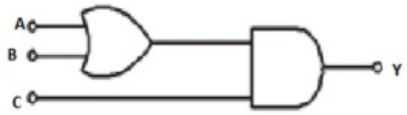
Answer: A

Solution:

Solution:

Question 11

To get output 1 for the following circuit, the correct choice for the input is



Options:

A. A = 0, B = 1, C = 0

B. A = 1, B = 0, C = 0

C. A = 1, B = 1, C = 0

D. A = 1, B = 0, C = 1

Answer: D

Solution:

Solution:

Question 12

For a transistor amplifier, the voltage gain

Options:

A. is high at high and low frequencies and constant at middle frequency range

B. constant at high frequencies and low at low frequencies

C. remains constant at all frequencies

D. is low at high and low frequencies and constant at mid frequencies

Answer: D

Solution:

Solution:

Question 13

Frequency of revolution of an electron revolving in the n^{th} orbit of H - atom is proportional to

Options:

A. n

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

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

D. n^2

Answer: B

Solution:

Solution:

Question 14

In which of the following devices, the eddy current effect is not used?

Options:

A. Induction furnace

B. Magnetic braking in train

C. Electromagnet

D. Electric heater

Answer: D

Solution:

Solution:

Question 15

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

Options:

A. mass of the particles

B. position of the particles

C. forces on the particles

D. relative distance between particles

Answer: C

Solution:

Solution:

Question 16

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 17

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 18

In a compound microscope, maximum magnification is obtained when the image

Options:

A. is formed at infinity

B. is formed at the least distance of distinct vision

C. coincides with objective lens

D. is at any finite distance

Answer: B

Solution:

Solution:

Question 19

If P, Q and R are physical quantities having different dimensions, which one of the following combinations can never be a meaningful quantity?

Options:

A. $PQ - R$

B. $\frac{PR - Q^2}{R}$

C. $\frac{P - Q}{R}$

D. $\frac{PQ}{R}$

Answer: C

Solution:

Solution:

Question 20

Light of a certain frequency and intensity is incident on a photosensitive material causing photoelectric effect. If both the frequency and intensity are doubled, the photoelectric saturation current becomes

Options:

A. unchanged

B. doubled

C. halved

D. quadrupled

Answer: B

Solution:

Solution:

Question 21

The phenomenon involved in the reflection of radio waves by ionosphere is similar to

Options:

A. scattering of light by air particles

B. total internal reflection of light in air during a mirage

C. reflection of light by plane mirror

D. dispersion of light by water molecules during the formation of a rainbow

Answer: B

Solution:

Solution:

Question 22

Gyromagnetic ratio of a nucleus is

Options:

A. a vector

B. a scalar

C. a tensor

D. zero

Answer: B

Solution:

Solution:

Question 23

The following four wires of length L and radius r are made of the same material. Which of these wires will have the largest extension, when the same tension is applied?

Options:

A. L = 50 cm, r = 0.25 mm

B. L = 100 cm, r = 0.5 mm

C. L = 200 cm, r = 1 mm

D. L = 300 cm, r = 1.5 mm

Answer: A

Solution:

Solution:

Question 24

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

Options:

A. energy

B. mass

C. linear momentum

D. angular momentum

Answer: D

Solution:

Solution:

Question 25

A hollow metal sphere carrying electric charge produces no electric field at the points

Options:

A. outside the sphere

B. inside the sphere

C. on its surface

D. at a distance more than its radius

Answer: B

Solution:

Solution:

Question 26

When the force between two charges in vacuum is 0.6N, then what will be the force if vacuum is replaced by a medium whose permittivity is five times greater than that of in vacuum?

Options:

A. 0.30N

B. 0.12N

C. 8.33N

D. 4.165N

Answer: B

Solution:

Solution:

Question 27

In a thermocouple at one of the junction, the Peltier coefficient depends on

Options:

A. the temperature of the junction

B. the current in the junction

C. the time for which the current flows

D. the heat absorbed or evolved

Answer: A

Solution:

Solution:

Question 28

An ideal voltmeter has

Options:

A. zero resistance

B. finite resistance

C. infinite resistance

D. resistance depends on the load

Answer: C

Solution:

Solution:

Question 29

The intensity of the X-rays emitted in an X-ray tube can be increased by

Options:

A. increasing the target potential

B. increasing the filament current

C. increasing the target resistance

D. increasing the filament resistance

Answer: B

Solution:

Solution:

Question 30

A photon having energy 15.2 eV will have the frequency

Options:

A. 3.67×10^{15} Hz

B. 2.29×10^{15} Hz

C. 3.67×10^{22} Hz

D. 2.29×10^{22} Hz

Answer: A

Solution:

Solution:

Question 31

The wave number of the sodium vapour lamp having spectral line of wavelength 5890Å is,

Options:

A. $1.6978 \times 10^{6} \mathrm{m}^{-1}$

B. $1.6978 \times 10^{8} \mathrm{m}^{-1}$

C. $5.0933 \times 10^{6} \mathrm{m}^{-1}$

D. $5.0933 \times 10^{8} \mathrm{m}^{-1}$

Answer: A

Solution:

Solution:

Question 32

Which part of the electromagnetic wave is used for the communication purpose?

Options:

A. Radio waves only

B. Microwaves only

C. Infrared waves only

D. Both radio waves and microwaves

Answer: D

Solution:

Solution:

Question 33

If E_c and E_s are the amplitudes of the carrier and signal waves, then the magnitude of the upper side band and lower side band is

Options:

A. $mEE_c / 2$

B. $mE_s / 2$

C. $m(E_c + E_s) / 2$

D. $m(E_c - E_s) / 2$

Answer: A

Solution:

Solution:

Question 34

A rectangular coil having 100 turns of size $5\,cm \times 2\,cm$ is placed perpendicularly in a magnetic field of induction $0.10\,Wb / m^2$. When the magnetic field of induction is changed to $0.01\,Wb / m^2$ in 0.1 second, then the emf induced is

Options:

A. 0.09V

B. 0.06V

C. 0.03V

D. 0.003V

Answer: A

Solution:

Solution:

Question 35

A rectangular coil having 100 turns of size $5\,cm \times 2\,cm$ is placed perpendicularly in a magnetic field of induction $0.10\,Wb / m^2$. When the magnetic field of induction is changed to $0.01\,Wb / m^2$ in 0.1 second, then the emf induced is

Options:

A. 0.09V

B. 0.06V

C. 0.03V

D. 0.003V

Answer: B

Solution:

Solution:

Question 36

Herapathite (iodoquinine sulphate) is a

Options:

A. polarizer

B. uniaxial crystal

C. biaxial crystal

D. reflector

Answer: A

Solution:

Solution:

Question 37

Tyndall effect is due to the of light.

Options:

A. reflection

B. refraction

C. polarization

D. scattering

Answer: D

Solution:

Solution:

Question 38

From the Laue pattern, one can get information about the material

Options:

A. crystal system

B. Bravais lattice

C. lattice constants

D. crystal symmetry

Answer: D

Solution:

Solution:

Question 39

A nuclear reactor is producing energy of 1000 MW. When the energy per fission is 200 MeV, then the number of fission per second is

Options:

A. 3.125×10^{19}

B. 5.000×10^{19}

C. 6.250×10^{19}

D. 9.375×10^{19}

Answer: A

Solution:

Solution:

Question 40

The coolant materials used in the nuclear reactors have the characteristic of specific heat capacity and boiling point.

Options:

A. high, high

B. high, low

C. low, high

D. low, low

Answer: A

Solution:

Solution:

Question 41

One Curie is equal to disintegrations per second.

Options:

A. 3.7×10^{8}

B. 3.7×10^{9}

C. 3.7×10^{10}

D. 3.7×10^{12}

Answer: C

Solution:

Solution:

Question 42

The average binding energy per nucleon in the mass number region 20 to 80 is

Options:

A. 8.7 MeV

B. 5.8 MeV

C. 6.9 MeV

D. 7.8 MeV

Answer: D

Solution:

Solution:

Question 43

Three resistances each of 1Ω are connected to form a triangle. The resistance between any two terminals is

Options:

A. 2Ω

B. 2 / 3Ω

C. 3 / 2Ω

D. 1 / 3Ω

Answer: B

Solution:

Solution:

Question 44

When a piece of copper and another of germanium are cooled from room temperature to 89K then the resistance of

Options:

A. copper decreases and germanium increases

B. copper increases and germanium decreases

C. each of them decreases

D. each of them increases

Answer: A

Solution:

Solution:

Question 45

A sonometer wire vibrates with a frequency f Hz. It is replaced by another wire of thrice the diameter. The frequency of vibration of the wire, when the tension and other parameters remain constant, is

Options:

A. 3f Hz

B. f 13 Hz

C. f 19 Hz

D. 9f Hz

Answer: B

Solution:

Solution:

Question 46

Sound waves are travelling in a medium whose adiabatic elasticity is E and isothermal elasticity is E′. Then the velocity of sound waves is proportional to

Options:

A. E'

B. $\sqrt{E'}$

C. E

D. $\sqrt{E}$

Answer: D

Solution:

Solution:

Question 47

A converging lens is used to form an image on a screen. When the upper half of the lens is covered by an opaque screen

Options:

A. half the image will disappear

B. intensity of the image will increase

C. complete image will be formed

D. intensity of the image will remain same

Answer: C

Solution:

Solution:

Question 48

The motion of the molecules of a monoatomic gas is

Options:

A. vibratory

B. rotatory

C. translatory

D. constant

Answer: C

Solution:

Solution:

Question 49

When a charged particle absorbs radiant energy ε in the time 2π / ω, then the linear momentum transferred to the particle in the same time is

Options:

A. ε / c

B. c / ε

C. c + ε

D. $c - \varepsilon$

Answer: A

Solution:

Solution:

Question 50

Which of the following is correct in terms of the relative strength of the four fundamental forces of nature in their decreasing order?

Options:

A. Gravitational, electromagnetic, electroweak and strong

B. Strong, electroweak, electromagnetic and gravitational

C. Strong, electroweak, gravitational and electromagnetic

D. Strong, electromagnetic, electroweak and gravitational

Answer: D

Solution:

Solution:

Question 51

The principle involved when we squeeze one end of a tube to get toothpaste out from the other end is

Options:

A. Archimedes principle

B. Pascal's principle

C. principle of reflection

D. principle of superposition for forces

Answer: B

Solution:

Solution:

Question 52

Of the following radiations, which one penetrates less through matter?

Options:

A. Gamma

B. Beta

C. Alpha

D. X-rays

Answer: C

Solution:

Solution:

Question 53

The electric field intensity at the surface of charged conductor is

Options:

A. perpendicular to the surface

B. at 45˚ to the surface

C. zero

D. tangential to the surface

Answer: A

Solution:

Solution:

Question 54

When milk is churned, cream gets separated due to

Options:

A. centripetal force

B. centrifugal force

C. frictional force

D. gravitational force

Answer: B

Solution:

Solution:

Question 55

Two bodies of masses m and 4m are moving with equal kinetic energies. The ratio of their linear momenta will be

Options:

A. 1 : 4

B. 4 : 1

C. 1 : 2

D. 2 : 1

Answer: C

Solution:

Solution:

Question 56

At which temperature, Centigrade and Fahrenheit scales are equal?

Options:

A. 40 degrees

B. -40 degrees

C. 37 degrees

D. -80 degrees

Answer: B

Solution:

Solution:

Question 57

During melting of ice, its entropy

Options:

A. increases

B. decreases

C. remains same

D. cannot change

Answer: A

Solution:

Solution:

Question 58

The average acceleration in one time period in simple harmonic motion is

Options:

A. $A\omega^2$

B. $A\omega^2$ / 2

C. $A\omega^2$ / $\sqrt{2}$

D. zero

Answer: D

Solution:

Solution:

Question 59

Below the superconducting transition temperature, the material exhibits

Options:

A. ferromagnetism

B. super fluidity

C. super capacitance

D. diamagnetism

Answer: D

Solution:

Solution:

Question 60

A 100 millihenry coil carries a current of 1 A. Energy stored in its magnetic field is

Options:

A. 0.5J

B. 1J

C. 0.05J

D. 0.1J

Answer: C

Solution:

Solution:

Question 61

When a drop of oil spread on a water surface, it displays beautiful colours in daylight because of

Options:

A. dispersion of light

B. reflection of light

C. polarization of light

D. interference of light

Answer: D

Solution:

Solution:

Question 62

The resistance R = V / I where V = 100 ± 5 volts and I = 10 ± 0.2 amperes. What is the total error in R ?

Options:

A. 5%

B. 7%

C. 5.2%

D. 5 / 2%

Answer: B

Solution:

Solution:

Question 63

A shell of mass 10 kg is moving with a velocity of $10ms^{-1}$. Then it blasts and forms two parts of mass 9 kg and 1 kg respectively. If the 1^{st} mass is stationary, the velocity of the 2^{nd} is

Options:

A. 1m / s

B. 10m / s

C. 100m / s

D. 1000m / s

Answer: C

Solution:

Solution:

Question 64

If the distance between two masses is doubled, the gravitational attraction between them

Options:

A. is doubled

B. become four times

C. is reduced to half

D. is reduced to quarter

Answer: D

Solution:

Solution:

Question 65

In a Carnot engine, when $T_2 = 0^\circ C$ and $T_1 = 200^\circ C$, its efficiency is η1, and when $T_1 = 0^\circ C$ and $T_2 = -200^\circ C$ its efficiency is η_2. Then η_1 / η_2, is given by

Options:

A. 0.577

B. 0.733

C. 0.638

D. 1.577

Answer: A

Solution:

Solution:

Question 66

Eight drops of mercury of equal radii combine to form a big drop. Then the radius of bigger drop compared to each individual small drop is

Options:

A. 8 times

B. 4 times

C. 2 times

D. 32 times

Answer: C

Solution:

Solution:

Question 67

The self inductance of a coil is 5 Henry. A current of 1 Amp changes to 2 Amp within 5 second through the coil. The value of induced e.m.f. will be

Options:

A. 10 volt

B. 0.10 volt

C. 1.0 volt

D. 100 volt

Answer: C

Solution:

Solution:

Question 68

Relation between critical angles of water and glass is

Options:

A. $C_w > C_g$

B. $C_W < C_g$

C. $C_W = C_g$

D. $C_W = C_g = 0$

Answer: A

Solution:

Solution:

Question 69

If the potential difference applied across X-ray tube is V volts, then approximately minimum wavelength of the emitted X-rays will be

Options:

A. 1227 / √VÅ

B. 1240 / VÅ

C. 2400 / VÅ

D. 12400 / VÅ

Answer: D

Solution:

Solution:

Question 70

A satellite is launched into a circular orbit of radius R around the earth. A second satellite is launched into an orbit of radius (1.01)R. The period of the second satellite is larger than the first one by approximately

Options:

A. 0.7%

B. 1%

C. 1.5%

D. 3%

Answer: C

Solution:

Solution:

Question 71

The potential energy of a simple harmonic oscillator when the particle is half way to its end point is

Options:

A. E / 2

B. 2E / 3

C. E / 8

D. E / 4

Answer: D

Solution:

Solution:

Question 72

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

Options:

A. maximum

B. minimum

C. zero

D. g

Answer: C

Solution:

Solution:

Question 73

A potential of $V = 200\sqrt{2}\cos\omega t$ is passed through a dc voltmeter. Its reading will be

Options:

A. $200\sqrt{2}$V

B. 200V

C. 100V

D. zero

Answer: D

Solution:

Solution:

Question 74

Which of the following properties show light is a transverse wave?

Options:

A. Interference

B. Reflection

C. Diffraction

D. Polarization

Answer: D

Solution:

Solution:

Question 75

The energy released when 1 / 12 carbon atom of $_{6}^{12}C$ (or 1 amu) is converted into energy is

Options:

A. 931 MeV

B. 939 MeV

C. 935 MeV

D. 938 MeV

Answer: A

Solution:

Solution:

Question 76

The packing efficiency of simple cubic unit cell is

Options:

A. higher than that of cep

B. higher than that of bcc

C. lower than that of both ccp and bec

D. equal to that of ccp and bcc

Answer: C

Solution:

Solution:

Question 77

The density of a unit cell is

Options:

A. higher than that of its crystal

B. lower than that of its crystal

C. same as that of its crystal

D. None of the above

Answer: C

Solution:

Solution:

Question 78

The conductivity of 0.001028M acetic acid is $4.95 \times 10^{-5} Scm^{-1}$ and its limiting molar conductivity is $390.5 Scm^{2} mol^{-1}$. It is degree of dissociation is equal to

Options:

A. 0.0012

B. 0.1233

C. 0.2233

D. 0.0123

Answer: B

Solution:

Solution:

Question 79

If a current of 500 ampere is passing for one second, it is equal to

Options:

A. 0.000518F per sec

B. 0.518F per sec

C. 0.0518F per sec

D. 0.00518F per sec

Answer: D

Solution:

Solution:

Question 80

Freundlich adsorption isotherm of a gas on a solid surface is

Options:

A. applicable only at high pressures

B. applicable only at low pressures

C. applicable only at moderate pressures

D. applicable at low and moderate pressures

Answer: D

Solution:

Solution:

Question 81

Zeolites are

Options:

A. microporous crystalline alumino silicates

B. non-porous crystalline alumino silicates

C. amorphous alumino silicates

D. microporous crystalline magnesium silicates

Answer: A

Solution:

Solution:

Question 82

An azeotropic mixture at its boiling point

Options:

A. can be separated into its components

B. has different composition for the liquid and vapour

C. cannot be separated into its components

D. has different components for the liquid and vapour

Answer: C

Solution:

Solution:

Question 83

The wrong statement of chemisorption is

Options:

A. it is highly specific

B. it is very exothermic

C. it is reversible

D. it involves formation of a strong bond

Answer: C

Solution:

Solution:

Question 84

The unit cell edge of an element with the bec structure is 288×10^{-10} cm. Its density is 7.2g / cm^3. The number of unit cells in 208g of the element is equal to

Options:

A. 10.01×10^{23}

B. 12.08×10^{23}

C. 14.04×10^{23}

D. 16.03×10^{23}

Answer: B

Solution:

Solution:

Question 85

The semiconductors are

Options:

A. alkalimetal oxides

B. alkaline earth metal oxides

C. most of the transition metal oxides

D. oxides of group IV elements

Answer: C

Solution:

Solution:

Question 86

According to Le Chatelier's principle, high temperature favours the formation of more products at equilibrium, if the forward reaction

Options:

A. Accompanied by decrease in number of gas molecules

B. Accompanied by increase in number of gas molecules

C. Is endothermic

D. Is exothermic

Answer: C

Solution:

Solution:

Question 87

The coordination of each particle in simple cubic, body centred cubic, face centred and hexagonal cubic packing are

Options:

A. 6, 8, 12, 12

B. 6, 8, 12, 14

C. 4, 8, 12, 12

D. 6, 6, 6, 6

Answer: A

Solution:

Solution:

Question 88

Vapour pressure of water at 296K is 19.8 mm of Hg .0 .1 mole of glucose is dissolved in 172.8g of water. The vapour of the solution is

Options:

A. 19.6 mm

B. 16.9 mm

C. 19.0 mm

D. 18.9 mm

Answer: A

Solution:

Solution:

Question 89

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

Options:

A. Shows negative deviation from Rauolt's law

B. Shows positive deviation from Rauolt's law

C. Shows no deviation from Rauolt's law

D. Is an ideal solution

Answer: B

Solution:

Solution:

Question 90

A calculator batter provides a current of 10^{-5}A. The number of coulombs required to operate 1000 hours is

Options:

A. 1.0

B. 10

C. 0.010

D. 36

Answer: D

Solution:

Solution:

Question 91

The potential of half-cell consisting of zinc electrode in 0.01M$ZnSO_4$ solution at 25˚C is ($E^{\circ} = -0.763V$)

Options:

A. $-0.704V$

B. $-0.822V$

C. $-0.382V$

D. $+0.704V$

Answer: A

Solution:

Solution:

Question 92

The rate constant for a first order reaction is 60 s^{-1}. The time taken to reduce the initial concentration of the reactant to its 1 / 16 th value will be

Options:

A. 0.00462 s

B. 0.462 s

C. 0.0462 s

D. 4.63 s

Answer: C

Solution:

Solution:

Question 93

-8.2 for $H_2O(I)$, $CO_2(g)$, and pentane (g), respectively. The value of E° cell for the pentane-oxygen fuel cell is

Options:

A. 1.968V

B. 2.0968V

C. 0.0968V

D. 1.0968V

Answer: D

Solution:

Solution:

Question 94

In what way the ionization energy varies in the 1 st group elements?

Options:

A. Increases down the group

B. Decreases down the group

C. Remains unchanged

D. Variation is not regular

Answer: B

Solution:

Solution:

Question 95

The set containing only amphoteric oxides is

Options:

A. ZnO, K_2O and SO_3

B. SnO_2, Al_2O_3 and ZnO

C. ZnO, P_2O_5 and Cl_2O_7

D. PbO_2, SnO_2 and SO_3

Answer: B

Solution:

Solution:

Question 96

Which of the following has more than one unshared pair of electrons on the central atom?

Options:

A. BrF_5

B. ClF_3

C. NF_3

D. IF_7

Answer: B

Solution:

Solution:

Question 97

In metallurgical processes, aluminium acts as

Options:

A. a reducing agent

B. an oxidizing agent

C. a flux

D. a solder

Answer: A

Solution:

Solution:

Question 98

Which of the following imparts violet colouration to the Bunsen burner non-luminous flame?

Options:

A. NaCl

B. $BaCl_2$

C. $CaCl_2$

D. KCl

Answer: D

Solution:

Solution:

Question 99

The complex, which exhibit optical isomerism, is

Options:

A. trans- $[Co(en)_2Cl_2]Cl$

B. $[PtCl_2(NH_3)_2]$

C. $[Co(en)_3]Cl_3$

D. $[Fe(n^5 - C_5H_5)_2]$

Answer: C

Solution:

Solution:

Question 100

Which of the following is n-acid ligand?

Options:

A. NH_3

B. CO

C. F^-

D. ethylenediammine

Answer: B

Solution:

Solution:

Question 101

The magnetic moment of the complex ion, $[MnF_6]^{3-}$, is

Options:

A. 1.73 BM

B. 3.90 BM

C. 4.90 BM

D. 2.73 BM

Answer: C

Solution:

Solution:

Question 102

Which of the following nuclides is most radioactive?

Options:

A. $^{31}P_{15}$

B. $^{66}Zn_{30}$

C. $^{37}Cl_{17}$

D. $^{108}Ag_{47}$

Answer: D

Solution:

Solution:

Question 103

Which of the following is a not a green house gas?

Options:

A. CO

B. CO_2

C. Water vapour

D. CH_4

Answer: A

Solution:

Solution:

Question 104

What type of orbital is designated for the set of quantum numbers:

n = 4, l = 2, $m_l = -2$?

Options:

A. 4p

B. 4f

C. 4d

D. 4 s

Answer: C

Solution:

Solution:

Question 105

Which of the following sets of quantum numbers is not allowed?

Options:

A. n = 3, l = 2, $m_l = -1$

B. n = 6, l = 2, $m_l = -1$

C. n = 4, l = 3, $m_l = -1$

D. n = 3, l = 0, $m_l = +1$

Answer: D

Solution:

Solution:

Question 106

Ionic size decreases in the order

Options:

A. $N^{3-} > O^{2-} > F^- > Na^+ > Mg^{2+}$

B. $N^{3-} > O^{2-} > F^- > Mg^{2+} > Na^+$

C. $N^{3-} > F^- > O^{2-} > Na^+ > Mg^{2+}$

D. $O^{2-} > N^{3-} > F^- > Na^+ > Mg^{2+}$

Answer: A

Solution:

Solution:

Question 107

The $t_{1/2}$ of a radioisotope is 15 min. What percent of radioactivity of that isotope will remain after 45 min ?

Options:

A. 10%

B. 12.5%

C. 15%

D. 17.5%

Answer: B

Solution:

Solution:

Question 108

Water gas is a mixture of

Options:

A. H_2O + air

B. CO + H_2

C. CO + CO_2

D. H_2 + CO_2

Answer: B

Solution:

Solution:

Question 109

Which category of synthetic detergents is used in toothpaste?

Options:

A. Zwitterionic detergent

B. Anionic detergent

C. Cationic detergent

D. Non-ionic detergent

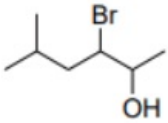
Answer: B

Solution:

Solution:

Question 110

The IUPAC name of the following compound is



Options:

A. CC(Br)C(C)O

B. 4-bromo-5-hydroxy-2-methylhexane

C. 1,4,4-trimethyl-2-bromobutanol
(C) 2-bromo-2-isobutyl-1-methylethanol

D. 3-bromo-5-methylhexan-2-ol

Answer: D

Solution:

Solution:

Question 111

On complete combustion, 0.25g of an organic compound gave 0.30g of carbon dioxide and 0.10g of water. The percentage compositions of carbon and hydrogen in the compound are

Options:

A. C = 32.73 and H = 4.44

B. C = 30.73 and H = 5.33

C. C = 34.36 and H = 5.33

D. C = 36.36 and H = 4.44

Answer: A

Solution:

Solution:

Question 112

The reagents P and Q in the following transformations are

Options:

A. P = H_2, Pd − $CaCO_3$, $Pb(OAc)_2$, quinoline & Q = Li, $NH_3(\ell)$

B. P = H_2, Ni&Q = Na, $NH_3(\ell)$

C. P = H_2, Pd − $CaCO_3$, $Pb(OAc)_2$, quinoline & Q = H_2, Ni

D. P = $NaBH_4$&Q = H_2, Pd − $CaCO_3$, $Pb(OAc)_2$, quinoline

Answer: A

Solution:

Solution:

Question 113

Which of the following alkenes forms acetone as the only product upon ozonolysis?

Options:

A. 2-Methylpropene

B. But-2-ene

C. 2,3-Dimethylbut-2-ene

D. 2-Methylbut-1-ene

Answer: C

Solution:

Solution:

Question 114

When the nucleophile is changed from H_2O to ^-OH($-OH$ is more powerful nucleophile than H_2O) in the nucleophilic substitution reaction of tert-butylbromide, to give tert-butanol

Options:

A. the rate of the reaction remains nearly unaffected

B. the rate of the reaction increases substantially

C. the rate of the reaction decreases

D. mechanism of substitution changes from S_N1 to S_N2

Answer: A

Solution:

Solution:

Question 115

Which among the following compounds undergoes fastest S_N1 reaction?

Options:

A. P

B. Q

C. R

D. S

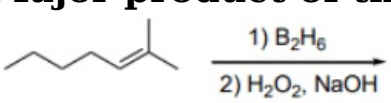
Answer: A

Solution:

Solution:

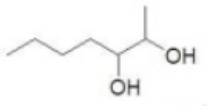
Question 116

Major product of the following reaction is



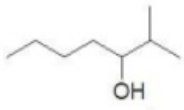
Options:

A.

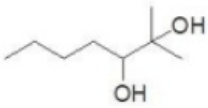


B.

C.



D.



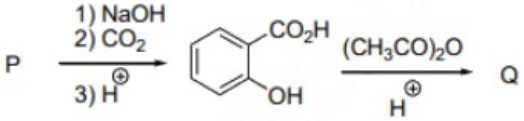
Answer: C

Solution:

Solution:

Question 117

The starting material P and product Q in the following reaction are:



Options:

A. P = phenol and Q = aspirin

B. P = benzoic acid and Q = aspirin

C. P = phenol and Q = methyl salicylate

D. P = benzoic acid and Q = methyl salicylate

Answer: A

Solution:

Solution:

Question 118

An organic compound P with molecular formula C_8H_8O forms an orange-red precipitate with 2,4-dinitrophenylhydrazine and yellow precipitate on heating with iodine in the presence of NaOH. It does not reduce Tollens' or Fehling's reagent and it does not decolorize bromine water. When treated with zinc-amalgam and con. HCl, it gives a compound Q with molecular formula C_8H_{10}. The compounds P and Q are

Options:

A. P = acetophenone and Q = 1,2-dimethylbenzene (o-xylene)

B. P = 2-phenylacetaldehyde and Q = ethylbenzene

C. P = 4-methylbenzaldehyde and Q = 1,4-dimethylbenzene (p-xylene)

D. P = acetophenone and Q = ethylbenzene

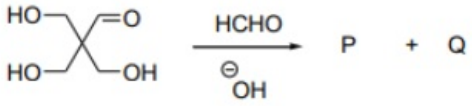
Answer: D

Solution:

Solution:

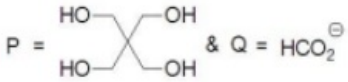
Question 119

The products mathrm P and mathrm Q in the following reaction are

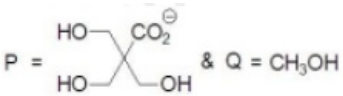


Options:

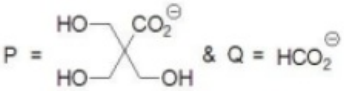
A.



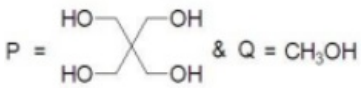
B.



C.



D.



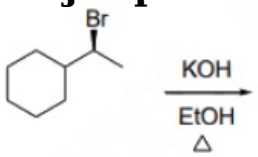
Answer: A

Solution:

Solution:

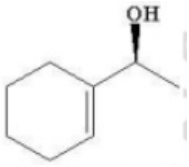
Question 120

Major product formed in the following reaction is

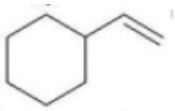


Options:

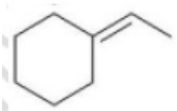
A.



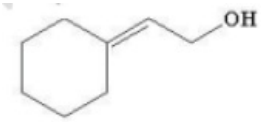
B.



C.



D.



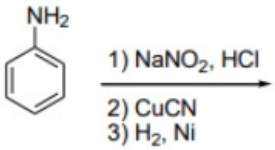
Answer: C

Solution:

Solution:

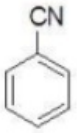
Question 121

Major product formed in the following reaction sequence is

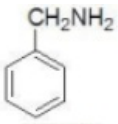


Options:

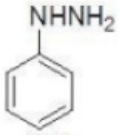
A.



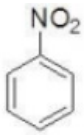
B.



C.



D.



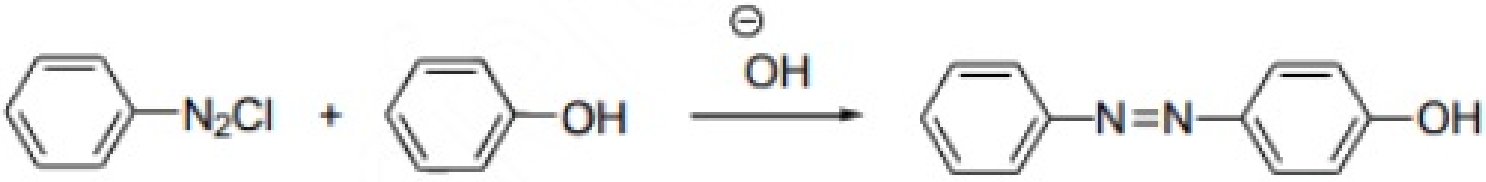
Answer: B

Solution:

Solution:

Question 122

Consider the following reaction.



Here, benzene diazonium chloride acts as

Options:

A. nucleophile

B. electrophile

C. Lewis base

D. Bronsted base

Answer: B

Solution:

Solution:

Question 123

The maximum number of dipeptides that could be made from the three different amino acids is

Options:

A. 4

B. 6

C. 9

D. 8

Answer: C

Solution:

Solution:

Question 124

Which one of the following is an example for biodegradable polymers?

Options:

A. Nylon 6

B. Nylon 6,6

C. Glyptal

D. Nylon 2-nylon 6

Answer: D

Solution:

Solution:

Question 125

Which among the following is not a detergent?

Options:

A. Sodium laurylsulphate

B. Sodium dodecylbenzenesulphonate

C. cetyltrimethylammonium bromide

D. calcium stearate

Answer: D

Solution:

Solution:

Question 126

The value of x, for which $\log_e(x - 3) < 1$ lies in

Options:

A. (0, 3)

B. (0, e)

C. (0, e + 3)

D. (3, 3 + e)

Answer: D

Solution:

Solution:

Question 127

The area bounded by the curve $y = \cos x$ between $x = \frac{-\pi}{2}$ and $x = \frac{3\pi}{2}$ is

Options:

A. 1

B. 2

C. 3

D. 4

Answer: D

Solution:

Solution:

Question 128

The number of values of x satisfying is $(\sqrt{12})^x + (\sqrt{3})^x = (\sqrt{13})^{x/2}$

Options:

A. 1

B. 2

C. 3

D. 4

Answer: D

Solution:

Solution:

Question 129

If $f(x) = x(x+3)e^{-\left(\frac{1}{2}\right)x}$ satisfies Rolle's Theorem in $[-3, 0]$, then the value of c is

Options:

A. -3

B. -1

C. 0

D. -2

Answer: D

Solution:

Solution:

Question 130

Let $f(x) = ax^2 + bx + c$ and $a \neq 0$. Suppose $f(-1) < 1$, $f(1) > -1$ and $f(3) < -4$. Then

Options:

A. b is an integer

B. $b + 1 > 0$

C. $b + 1 < 0$

D. b is positive real

Answer: B

Solution:

Solution:

Question 131

If $z = x + iy$ and x, y are real, then $|x| + |y| \leq kz|$, where k is equal to

Options:

A. 1

B. $\sqrt{2}$

C. $\sqrt{3}$

D. 2

Answer: B

Solution:

Solution:

Question 132

For any complex number z, the minimum value of $|z| + |z - 1| \geq$

Options:

A. 1

B. 0

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

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

Answer: A

Solution:

Solution:

Question 133

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 134

The value of $\left(\frac{1+i}{\sqrt{2}}\right)^8 + \left(\frac{1-i}{\sqrt{2}}\right)^8$ is equal to

Options:

A. 4

B. 6

C. 8

D. 2

Answer: D

Solution:

Solution:

Question 135

Number of elements of order 4 in the group $(Z_5 - \{[0]\}, .5)$ is

Options:

A. 1

B. 2

C. 3

D. 4

Answer: B

Solution:

Solution:

Question 136

The equation of the ellipse whose axes are coincident with the coordinate axes and which touches the straight lines $3x - 2y - 20 = 0$ and $x + 6y - 20 = 0$ is

Options:

A. $\frac{x^2}{5} + \frac{y^2}{8} = 1$

B. $\frac{x^2}{8} + \frac{y^2}{5} = 1$

C. $\frac{x^2}{40} + \frac{y^2}{10} = 1$

D. $\frac{x^2}{10} + \frac{y^2}{40} = 1$

Answer: C

Solution:

Solution:

Question 137

$\lim_{x \to 0} \frac{\sin 2x + 2\sin^2 x - 2\sin x}{\cos x - \cos^2 x}$ **is equal to**

Options:

A. -4

B. -2

C. 2

D. 4

Answer: D

Solution:

Solution:

Question 138

Sum of n terms of the series $\sqrt{2} + \sqrt{8} + \sqrt{18} + \sqrt{32} + \ldots$ is equal

Options:

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

B. $2n(n+1)$

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

D. 1

Answer: C

Solution:

Solution:

Question 139

If f (x) is a function satisfying f (x + y) = f (x) . f (y) for all x, y ∈ ▯ such that f (1) = 3 and $\sum_{x=1}^{n} f(x) = 120$, then the value of n is

Options:

A. 4

B. 5

C. 6

D. 7

Answer: A

Solution:

Solution:

Question 140

The sum of the series $1 + 2x + 3x^2 + 4x^3 + \ldots$ up to infinity when x lies between 0 and 1 (i.e., $0 < x < 1$) is

Options:

A. $\frac{1}{1+x}$

B. $\frac{1}{1-x}$

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

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

Answer: D

Solution:

Solution:

Question 141

The positive integer n for which
$2 \times 2^2 + 3 \times 2^3 + 4 \times 2^4 + \ldots + n \times 2^n = 2^{n+10}$ is

Options:

A. 510

B. 511

C. 512

D. 513

Answer: D

Solution:

Solution:

Question 142

If $\sin\alpha, \cos\alpha$ are the roots of the equation $ax^2 + bx + c = 0 (c \neq 0)$, then

Options:

A. $a^2 - b^2 + 2ac = 0$

B. $(a + c)^2 = b^2 - c^2$

C. $a^2 + b^2 - ac = 0$

D. $(a - c)^2 = b^2 + c^2$

Answer: A

Solution:

Solution:

Question 143

The positive value of $\sqrt{6 + \sqrt{6 + \sqrt{6 + \ldots \infty}}}$ is

Options:

A. 3

B. 6

C. -2

D. -4

Answer: A

Solution:

Solution:

Question 144

If $\int_a^b f(x)\,dx = 5a + 3b$, then $\int_a^b (f(x) + 10)\,dx$ is equal to

Options:

A. 13b + 15a

B. 15a − 7b

C. −5a − 5b

D. 13b − 5a

Answer: D

Solution:

Solution:

Question 145

The functions f and g are given by f(x) = (x), where (x) denotes the fractional part of x and g(x) = $\frac{1}{2}$sin [x]π, where [x] denotes the integral part of x. Then the range of g ∘ f is

Options:

A. $[-1, 1]$

B. $\{0\}$

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

D. [0, 1]

Answer: B

Solution:

Solution:

Question 146

If $(a^2 - 1)x^2 + (a - 1)x + a^2 - 4a + 3 = 0$ is an identity in x, then the value of a is

Options:

A. 1

B. 3

C. -1

D. -3

Answer: A

Solution:

Solution:

Question 147

The inequality |z − i|< | z + i| represents the region

Options:

A. Im(z) > 0

B. Im(z) < 0

C. Re(z) > 0

D. Re(z) < 0

Answer: A

Solution:

Solution:

Question 148

The total number of 9 digit numbers with different digits is

Options:

A. 10!

B. 9!

C. 9.9 !

D. 10.10 !

Answer: C

Solution:

Solution:

Question 149

The sum of all the values of x satisfying the equation $\log_{17}\log_{11}(\sqrt{x+11}+\sqrt{x})=0$ is

Options:

A. 25

B. 36

C. 171

D. 0

Answer: A

Solution:

Solution:

Question 150

The number of five-digit telephone numbers having at least one of their digits repeated is

Options:

A. 90000

B. 100000

C. 30240

D. 69760

Answer: D

Solution:

Solution:

Question 151

In a group of 8 girls, two of them are sisters. The number of ways in which the girls can sit so that two sisters are not sitting together is

Options:

A. 34820

B. 31410

C. 30830

D. 30240

Answer: D

Solution:

Solution:

Question 152

The function f : □→□ defined by f (n) = $\begin{cases} \frac{n-1}{2} & \text{when n is odd} \\ \frac{n}{2} & \text{when n is even end cases} \end{cases}$

Options:

A. is onto but not one-one

B. is one-one and onto both

C. is neither one-one nor onto

D. is one-one but not onto

Answer: C

Solution:

Solution:

Question 153

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

Options:

A. 20

B. -20

C. 30

D. -30

Answer: B

Solution:

Solution:

Question 154

The sum of all three digit numbers which are even is

Options:

A. 247050

B. 247052

C. 247048

D. 247060

Answer: A

Solution:

Solution:

Question 155

The value of n for which the determinant

$$\begin{vmatrix} \binom{8}{3} & \binom{9}{5} & \binom{10}{7} \\ \binom{8}{4} & \binom{9}{6} & \binom{10}{8} \\ \binom{9}{n} & \binom{10}{n+2} & \binom{11}{n+4} \end{vmatrix}$$

becomes zero is

Options:

A. 2

B. 3

C. 4

D. 5

Answer: C

Solution:

Solution:

Question 156

If $\sin\theta + \operatorname{cosec}\theta = 2$, then $\sin^2\theta + \operatorname{cosec}^2\theta$ is equal to

Options:

A. 1

B. 4

C. 2

D. 0

Answer: C

Solution:

Solution:

Question 157

If x > 0, and $\log_2 x + \log_2(\sqrt{x}) + \log_2(\sqrt[4]{x}) + \log_2(\sqrt[8]{x}) + \ldots = 4$, then x equals

Options:

A. 2

B. 3

C. 4

D. 5

Answer: C

Solution:

Solution:

Question 158

If z and w are two non-zero complex number such that $|z| = |w|$ and $\arg z + \arg w = \pi$, then z equals

Options:

A. $\overline{w}$

B. $-\overline{w}$

C. w

D. $-w$

Answer: B

Solution:

Solution:

Question 159

The number of different positive divisors of 2160 is

Options:

A. 30

B. 40

C. 50

D. 60

Answer: B

Solution:

Solution:

Question 160

The maximum value of f (x) = $4x^3 - 15x^2 + 12x - 2$ is

Options:

A. $\frac{3}{4}$

B. $-\frac{3}{4}$

C. -6

D. 6

Answer: A

Solution:

Solution:

Question 161

If $\lim_{x \to 0}(1 + ax)^{b/x} = e^4$, where a and b are natural numbers, then

Options:

A. a = 4, b = 2

B. a = 8, b = 4

C. a = 16, b = 8

D. ab = 4

Answer: D

Solution:

Solution:

Question 162

In a △ABC, if $\frac{\cos A}{a} = \frac{\cos B}{b} = \frac{\cos C}{c}$ and the side a = 2, then area of the triangle is

Options:

A. 1

B. 2

C. $\sqrt{3}$ / 2

D. $\sqrt{3}$

Answer: D

Solution:

Solution:

Question 163

$\lim_{x \to 0} \left(\frac{1 + \tan x}{1 + \sin x} \right)^{\operatorname{cosec} x}$ **is equal to**

Options:

A. 1

B. e

C. e^{-1}

D. e^{2}

Answer: A

Solution:

Solution:

Question 164

The coefficient of x in f (x) = $\begin{vmatrix} x & 1+\sin x & \cos x \\ 1 & \log(1+x) & 2 \\ x^2 & 1+x^2 & 0 \end{vmatrix}$ **, $-1 < x \leq 1$, is**

Options:

A. 1

B. -2

C. -1

D. 0

Answer: B

Solution:

Solution:

Question 165

If cos A + cos B + cos C = 3 / 2, then the triangle is

Options:

A. equilateral

B. right angled

C. isosceles

D. with an angle 45˚

Answer: A

Solution:

Solution:

Question 166

The value of $1000\left[\frac{1}{1\times 2}+\frac{1}{2\times 3}+\ldots+\frac{1}{999\times 1000}\right]$ **is equal to**

Options:

A. 1000

B. 999

C. 1001

D. $\frac{1}{999}$

Answer: B

Solution:

Solution:

Question 167

The line y = 3x bisects the angle between the lines $ax^2 + 2axy + y^2 = 0$ if a =

Options:

A. 3

B. 11

C. 3 / 11

D. 11 / 3

Answer: C

Solution:

Solution:

Question 168

If the locus of a point which moves so that the line joining the points of contacts of the tangents drawn from it to the circle $x^2 + y^2 = b^2$ touches the circle $x^2 + y^2 = a^2$, is the circle $x^2 + y^2 = c^2$, then a, b, c are in

Options:

A. A.P.

B. G.P.

C. H.P.

D. a = b = c

Answer: B

Solution:

Solution:

Question 169

If x satisfies the equation $x^2 - 2x\cos\theta + 1 = 0$, then the value of $x^n + 1 / x^n$ is equal to

Options:

A. $2^n \cos n\theta$

B. $2^n \cos^n \theta$

C. $2\cos n\theta$

D. $2\cos^n \theta$

Answer: C

Solution:

Solution:

Question 170

The sum of the series $\cos x - \frac{1}{2}\cos^2 x + \frac{1}{3}\cos^3 x - \frac{1}{4}\cos^4 x + \ldots$ is equal to

Options:

A. $\log 2 + 2\log\left|\cos\left(\frac{x}{2}\right)\right|$

B. $\log 2 - 2\log\left|\cos\left(\frac{x}{2}\right)\right|$

C. $\log 2 + \log\left|\cos\left(\frac{x}{2}\right)\right|$

D. $\log 2 - \log\left|\cos\left(\frac{x}{2}\right)\right|$

Answer: A

Solution:

Solution:

Question 171

In a class of 100 students, there are 70 boys whose average marks in a subject is 75 . If the average marks of the complete class is 72 , then the average marks of the girls is

Options:

A. 73

B. 74

C. 68

D. 65

Answer: D

Solution:

Solution:

Question 172

Whatever be the value of θ, the locus of the point of intersection of the lines $x\cos\theta + y\sin\theta = a$ and $x\sin\theta - y\cos\theta = b$ is

Options:

A. an ellipse

B. a straight line

C. a circle

D. a pair of straight lines

Answer: C

Solution:

Solution:

Question 173

Let $f(x) = bx^2 + cx + d$. The values of b and c for which the identity $f(x + 1) - f(x) = 8x + 3$ is satisfied, are

Options:

A. b = c, c = 1

B. b = 4, c = −1

C. b = −1, c = 4

D. b = −1, c = 1

Answer: B

Solution:

Solution:

Question 174

For a party 8 guests are invited by a husband and his wife. They sit around a circular table for dinner. The probability that the husband and his wife sit together is

Options:

A. 2 / 7

B. 2 / 9

C. 1 / 9

D. 4 / 9

Answer: B

Solution:

Solution:

Question 175

The domain of real valued function f (x) = $\sqrt{(\log_{16} x^2)}$ of the real variable x is

Options:

A. x > 0

B. |x| ≥ 1

C. |x| ≥ 4

D. x ≥ 4

Answer: B

Solution:

Solution:

Question 176

The straight line 3x + y = 9 divides the line segment joining the points (1, 3) and (2, 7) in the ratio

Options:

A. 3 : 4 internally

B. 3 : 4 externally

C. 4 : 5 internally

D. 5 : 6 externally

Answer: A

Solution:

Solution:

Question 177

The value of f (0) so that f (x) = $\frac{(4^x - 1)^3}{\sin\left(\frac{x}{4}\right)\log\left(1 + \frac{x^2}{3}\right)}$ is continuous everywhere, is equal to

Options:

A. $3(\log 4)^3$

B. $(\log 4)^3$

C. $12(\log 4)^3$

D. $15(\log 4)^3$

Answer: C

Solution:

Solution:

Question 178

If $\log_{0.2}(x-2) < \log_{0.04}(x-2)$, then x lies in the interval

Options:

A. (3, ∞)

B. (2, 3)

C. (1, 2)

D. (0, ∞)

Answer: A

Solution:

Solution:

Question 179

A function y = f (x) has a second order derivatives $f''(x) = 6(x-1)$. If its graph passes through the point (2, 1) and at that point the tangent to the graph is y = 3x − 5, then the function is

Options:

A. $(x-1)^3$

B. $(x+1)^3$

C. $(x-1)^2$

D. $(x+1)^2$

Answer: A

Solution:

Solution:

Question 180

If f (x) = sin $\frac{e^{x-2}-1}{\log(x-1)}$, then $\lim_{x \to 2} f(x)$ is given by

Options:

A. -2

B. -1

C. 0

D. 1

Answer: D

Solution:

Solution:

Question 181

If a function f has the property that f(x) + f(y) = f(x + y) for all real x and y, then f(−x) is equal to

Options:

A. 0

B. 1

C. f(x)

D. −f(x)

Answer: D

Solution:

Solution:

Question 182

If $\vec{a} + \vec{b} + \vec{c} = \vec{0}$ and $|\vec{a}| = 3, |\vec{b}| = 4$ and $|\vec{c}| = \sqrt{37}$, then the angle between $\vec{a}$ and $\vec{b}$ is

Options:

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

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

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

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

Answer: D

Solution:

Solution:

Question 183

For two data sets, each of size 5 , the variances are given to be 4 and 5 and the corresponding means are given to be 2 and 4 , respectively. The variance of the combined data set is

Options:

A. 5 / 2

B. 11 / 2

C. 6

D. 13 / 2

Answer: B

Solution:

Solution:

Question 184

If a function is defined by f (x) = $\begin{cases} x & \text{when } x \text{ is rational} \\ -x & \text{when } x \text{ is irrational} \end{cases}$ **.. Then**

Options:

A. f is continuous at every x, except x = 0

B. f is discontinuous at every x, except x = 0

C. f is continuous at everywhere

D. f is discontinuous at everywhere

Answer: B

Solution:

Solution:

Question 185

Let f (x) = (x − x_0)g(x) where g(x) is continuous at x_0, then f ′(x_0) is equal to

Options:

A. 0

B. x_0

C. $g(x_0)$

D. $\dot{g}(x_0)$

Answer: C

Solution:

Solution:

Question 186

If $u = \sin^{-1}\left(\frac{x^2+y^2}{x+y}\right)$, then $\left[x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y}\right]$ =

Options:

A. u

B. sin u

C. tan u

D. 1

Answer: C

Solution:

Solution:

Question 187

If SD of variate x is σ, then the SD of $\frac{ax+b}{p}$, ∀a, b, p ∈ R is

Options:

A. $\left|\frac{a}{p}\right|\sigma_x$

B. $\left|\frac{p}{a}\right|\sigma_x$

C. $\frac{p}{a}\sigma_x$

D. σ_x

Answer: A

Solution:

Solution:

Question 188

If $z = xyf(x / y)$, then $\left[x \frac{\partial z}{\partial x} + y \frac{\partial z}{\partial y} \right] =$

Options:

A. z

B. 0

C. 1 / z

D. 2z

Answer: D

Solution:

Solution:

Question 189

If $f(x, y) = \ln(x\tan^{-1}y)$, then $f_{xy} =$

Options:

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

B. 0

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

D. y

Answer: B

Solution:

Solution:

Question 190

The ratio in which $\hat{i} + 2\hat{j} + 3\hat{k}$ divides the join of $-2\hat{i} + 3\hat{j} + 5\hat{k}$ and $7\hat{i} - \hat{k}$ is

Options:

A. 1 : 2

B. 2 : 3

C. 3 : 4

D. 1 : 4

Answer: A

Solution:

Solution:

Question 191

In a binomial distribution B(n, p = 1 / 4) if the probability of at least one success is greater than or equal to 9 / 10, then n is greater than

Options:

A. $\frac{1}{\log_{10}4 - \log_{10}3}$

B. $\frac{1}{\log_{10}4 + \log_{10}3}$

C. $\frac{9}{\log_{10}4 - \log_{10}3}$

D. $\frac{4}{\log_{10}4 - \log_{10}3}$

Answer: A

Solution:

Solution:

Question 192

The angle of intersection of the curves $y = x^2$ and $6y = 7 - x^3$ at (1, 1) is

Options:

A. π / 4

B. π / 3

C. π / 2

D. π

Answer: C

Solution:

Solution:

Question 193

The transformed equation of $3x^2 + 3y^2 + 2xy = 2$, when the coordinate axes are rotated through an angle of 45˚, is

Options:

A. $x^2 + 2y^2 = 1$

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

C. $x^2 + y^2 = 1$

D. $x^2 + 3y^2 = 1$

Answer: B

Solution:

Solution:

Question 194

If orthocenter and circumcentre of a triangle are respectively (1, 1) and (3, 2), then the coordinates of its centroid are

Options:

A. $\left(\frac{7}{3}, \frac{5}{3}\right)$

B. $\left(\frac{5}{3}, \frac{7}{3}\right)$

C. (7, 5)

D. (5, 7)

Answer: A

Solution:

Solution:

Question 195

If the curves $y^2 = 16x$ and $9x^2 + by^2 = 16$ cut each other at right angles, then the value of b is

Options:

A. 2

B. 4

C. 9 / 2

D. 0

Answer: C

Solution:

Solution:

Question 196

The term independent of x in the expansion of $(1 + x)^3 \left(x - \frac{1}{x} \right)^6$ is

Options:

A. 25

B. -25

C. 65

D. -65

Answer: A

Solution:

Solution:

Question 197

The area of the triangle formed by the tangent and the normal to the parabola $y^2 = 4ax$, both drawn at the same end of the latuscrectum and the axis of the parabola is

Options:

A. $2\sqrt{2}a^2$

B. $2a^2$

C. $4a^2$

D. 4a

Answer: C

Solution:

Solution:

Question 198

If the straight lines $ax^2 + 2hxy + by^2 + 2gx + 2fy + c = 0$ intersect on the x-axis, then

Options:

A. ag = f h

B. ah = f g

C. af = gh

D. a = ghf

Answer: C

Solution:

Solution:

Question 199

The median of a set of 9 distinct observations 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 decreased by 2

B. is two times the original median

C. remains the same as that of the original set

D. is increased by 2

Answer: C

Solution:

Solution:

Question 200

The function f : R → R be defined by f (x) = 2x − 7 for all x ∈ R. Then f is

Options:

A. injective but not surjective

B. surjective but not injective

C. neither injective nor surjective

D. bijective

Answer: D

Solution:

Solution:

Question 201

If f (x) = $\begin{cases} x & \text{when x is rational} \\ 1-x & \text{when x is irrational} \end{cases}$ **., then**

Options:

A. f is differentiable for all real x

B. f is continuous for all real x

C. f is continuous only at x = $\frac{1}{2}$

D. f is discontinuous for all real x

Answer: C

Solution:

Solution:

Question 202

A square is inscribed in the circle $x^2 + y^2 - 2x + 4y + 3 = 0$. Its sides are equal to the coordinate axes. Then one vertex of the square is

Options:

A. (0, 2)

B. (0, −3)

C. (2, 0)

D. (2, −1)

Answer: D

Solution:

Solution:

Question 203

The centre of the circle which circumscribes the square formed by $x^2 - 8x + 12 = 0$ and $y^2 - 14y + 45 = 0$ is

Options:

A. (3, 7)

B. (4, 7)

C. (2, 5)

D. (6, 9)

Answer: B

Solution:

Solution:

Question 204

The radius of the circle touching the straight lines $x - 2y - 1 = 0$ and $3x - 6y + 7 = 0$, is

Options:

A. $\frac{3}{\sqrt{5}}$

B. $\frac{\sqrt{5}}{3}$

C. $\sqrt{5}$

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

Answer: B

Solution:

Solution:

Question 205

ABC is an isosceles triangle and the coordinates of the base are B(1, 3) and C(−2, 7). Then the coordinates of vertex A can be

Options:

A. (1, 6)

B. (1 / 2, 5)

C. (5 / 6, 6)

D. (−8, 1 / 8)

Answer: C

Solution:

Solution:

Question 206

The function $f(x) = (3 - x)e^{2x} - 4xe^{x} - x$ has

Options:

A. a maximum at x = 0

B. a minimum at x = 0

C. neither a maximum nor a minimum at x = 0

D. f (x) is not differentiable at x = 0

Answer: C

Solution:

Solution:

Question 207

In an arranged discrete series in which total number of observations ' n ' is even, then the median is

Options:

A. $\frac{n^{th}}{2}$ item

B. $\left(\frac{n}{2}+1\right)^{th}$ item

C. The mean of $\frac{n^{th}}{2}$ and $\left(\frac{n}{2}+1\right)^{th}$ item

D. n

Answer: C

Solution:

Solution:

Question 208

The number of solutions of $\tan^{-1}\sqrt{x(x+1)} + \sin^{-1}\sqrt{x^2+x+1} = \pi/2$ is

Options:

A. 0

B. 1

C. 2

D. infinite

Answer: B

Solution:

Solution:

Question 209

A ladder rest against a wall at an angle α to the horizontal. Its foot is pulled away from the wall through a distance a so that it slides a distance b down wall making an angle β with the horizontal, then tan(α + β) is equal to

Options:

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

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

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

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

Answer: D

Solution:

Solution:

Question 210

Area bounded by the curve y = log x, y = 0 and x = e is given by

Options:

A. e

B. e / 2

C. 1

D. ∞

Answer: C

Solution:

Solution:

Question 211

The line $y = 2t^2$ intersects the ellipse $\frac{x^2}{9} + \frac{y^2}{4} = 1$ in real points, if

Options:

A. $|t| \leq 1$

B. $|t| < 1$

C. $|t| > 1$

D. $|t| \geq 1$

Answer: A

Solution:

Solution:

Question 212

A man standing on level plane observer the angle of elevation of top of a pole to be α. He walks, a distance equal to double the height of the pole and finds that elevation is 2α. Then α is equal to

Options:

A. π / 12

B. π / 6

C. π / 4

D. π / 3

Answer: A

Solution:

Solution:

Question 213

The number of values of c such that the line y = 4x + c touches the curve $\frac{x^2}{4} + y^2 = 1$, is

Options:

A. 1

B. 2

C. ∞

D. 0

Answer: B

Solution:

Solution:

Question 214

The domain of f (x) = $\cos^{-1}(2x)$ is

Options:

A. $(-1, 1)$

B. $\left(-\frac{1}{2}, \frac{1}{2}\right]$

C. $\left[-1, \frac{1}{2}\right]$

D. $\left[-\frac{1}{2}, \frac{1}{2}\right]$

Answer: D

Solution:

Solution:

Question 215

If y = $\sqrt{x\log_x x}$, then $\frac{dy}{dx}$ at x = e is

Options:

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

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

C. $\sqrt{e}$

D. e

Answer: B

Solution:

Solution:

Question 216

The area enclosed between the curves $y^2 = x$ and y = | x| is

Options:

A. 2 / 3 sq unit

B. 1 sq unit

C. 1 / 6 sq unit

D. 1/3 sq unit

Answer: C

Solution:

Solution:

Question 217

If y is a function of x and log(x + y) − 2xy = 0, then the value of $y'(0)$ is equal to

Options:

A. 1

B. -1

C. 2

D. 0

Answer: A

Solution:

Solution:

Question 218

If $x^2 + y^2 = t - \frac{1}{t}$ and $x^4 + y^4 = t^2 + \frac{1}{t^2}$, then $\frac{dy}{dx}$ is equal to

Options:

A. $\frac{1}{x^2y^3}$

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

C. $\frac{1}{x^2y^2}$

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

Answer: D

Solution:

Solution:

Question 219

The set of points where $f(x) = \frac{x}{1+|x|}$ is differentiable are in

Options:

A. $(0, \infty)$

B. $(-\infty, 0) \cup (0, \infty)$

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

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

Answer: D

Solution:

Solution:

Question 220

If $f(x+y) = 2f(x)f(y)$, $f'(5) = 1024(\log 2)$ and $f(2) = 8$, then the value of $f'(3)$ is equal to

Options:

A. $64(\log 2)$

B. $128(\log 2)$

C. $256(\log 2)$

D. $1024(\log 2)$

Answer: A

Solution:

Solution:

Question 221

General solution of the equation $\sin x - 3\sin 2x + \sin 3x = \cos x - 3\cos 2x + \cos 3x$ is

Options:

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

B. $(-1)^n \frac{n\pi}{2} + \frac{\pi}{8}$

C. $2n\pi + \cos^{-1}\frac{2}{3}$

D. $\frac{n\pi}{2} + \frac{\pi}{8}$

Answer: D

Solution:

Solution:

Question 222

Domain of the function f (x) = $\sqrt{\log_{10}\left(\frac{5x - x^2}{4}\right)}$ is

Options:

A. $0 \leq x \leq 5$

B. $1 \leq x \leq 4$

C. $1 \leq x \leq 5$

D. $0 \leq x \leq 4$

Answer: B

Solution:

Solution:

Question 223

The domain of the function f (x) = $x^{\frac{1}{\log x}}$ is

Options:

A. $(0, \infty) - \{1\}$

B. $(0, \infty)$

C. $[0, \infty)$

D. $[0, \infty) - \{1\}$

Answer: A

Solution:

Solution:

Question 224

The function f (x) = $\frac{\sec^{-1}x}{\sqrt{x-[x]}}$, where [x] denotes the greatest integer less than or equal to x is defined for all x belonging to

Options:

A. $\mathbb{R}$

B. $\mathbb{R}^{+}-(0, 1)$

C. $\mathbb{R}^{+}-\{ n \mid n \text{ is an integer } \}$

D. $\mathbb{R}-\{ (-1, 1) \cup \{ n \mid n \text{ is an integer } \} \}$

Answer: D

Solution:

Solution:

Question 225

For the function f (x) = $e^{\cos x}$, Rolle's Theorem is

Options:

A. applicable when $0 \leq x \leq \frac{\pi}{2}$

B. applicable when $\frac{\pi}{2} \leq x \leq \frac{3\pi}{2}$

C. applicable when $\frac{\pi}{4} \leq x \leq \frac{\pi}{2}$

D. applicable when $0 \leq x \leq \pi$

Answer: B

Solution:

Solution:

Question 226

If f (x) = $-x \tan x$, then the function f (x) is

Options:

A. monotonically increasing in $\left(0, \frac{\pi}{2}\right)$

B. monotonically decreasing in $\left(0, \frac{\pi}{2}\right]$

C. strictly decreasing in $\left(0, \frac{\pi}{2}\right)$

D. not monotonic in $\left(0, \frac{\pi}{2}\right)$

Answer: C

Solution:

Solution:

Question 227

Ram is visiting a friend. Ram knows that his friend has 2 children and 1 of them is a boy. Assuming that a child is equally likely to be a boy or a girl, then the probability that the other child is a girl, is

Options:

A. 1 / 3

B. 1 / 2

C. 2 / 9

D. 2

Answer: B

Solution:

Solution:

Question 228

Let $f(x) = 2x^2 + 5x + 1$. If we write $f(x)$ as $f(x) = a(x + 1)(x - 2) + b(x - 2)(x - 1) + c(x - 1)(x + 1)$ for real numbers a, b, c, then

Options:

A. there are infinite number of choices for a, b, c

B. only one choice for a but infinite number of choices for b and c

C. exactly one choice for each of a, b, c

D. more than one but finite number of choices for a, b, c

Answer: C

Solution:

Solution:

Question 229

If the function f : ℝ→ℝ is defined by f (x) = $(x^2 + 1)^{10}$, for all x ∈ ℝ, then f is

Options:

A. one-one but not onto

B. onto but not one-one

C. neither one-one nor onto

D. both one-one and onto

Answer: C

Solution:

Solution:

Question 230

$\lim_{x \to 1} \left(\frac{1+x}{2+x} \right)^{\frac{1-\sqrt{x}}{1-x}}$ **is**

Options:

A. 1

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

C. does not exist

D. 2

Answer: B

Solution:

Solution:

Question 231

A function f (x) is defined as follows for real f (x) = $\begin{cases} 1 - x^2 & \text{for } x < 1 \\ 0 & \text{for } x = 1 \\ 1 + x^2 & \text{for } x > 1 \end{cases}$

The

Options:

A. f (x) is not continuous at x = 1

B. f (x) is continuous but not differentiable at x = 1

C. f (x) is both continuous and differentiable x = 1

D. f is a constant function

Answer: A

Solution:

Solution:

Question 232

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

Options:

A. 0

B. 1

C. 2

D. -1

Answer: C

Solution:

Solution:

Question 233

$\int \left(\frac{(\log x - 1)}{1 + (\log x)^2} \right)^2 dx$ is equal to

Options:

A. $\frac{x}{(\log x)^2 + 1} + c$

B. $\frac{xe^x}{(1 + x^2)} + c$

C. $\frac{x}{x^2 + 1} + c$

D. $\frac{\log x}{(\log x)^2 + 1} + c$

Answer: A

Solution:

Solution:

Question 234

The value of $\int x(x^x)^x(2\log x + 1)\,dx$ is

Options:

A. $(x^x)^x + c$

B. $x^x + c$

C. $x^{\log x} + c$

D. $(x^{\log x})^x + c$

Answer: A

Solution:

Solution:

Question 235

The value of $\int_{-\pi/2}^{\pi/2} \log\left(\frac{2 - \sin\theta}{2 + \sin\theta}\right) d\theta$ is

Options:

A. 0

B. 1

C. 2

D. 3

Answer: A

Solution:

Solution:

Question 236

If a, b, c are different and $\begin{vmatrix} a & a^2 & a^3-1 \\ b & b^2 & b^3-1 \\ c & c^2 & c^3-1 \end{vmatrix}$ **= 0, then**

Options:

A. a + b + c = 0

B. abc = 1

C. a + b + c = 1

D. ab + bc + ca = 0

Answer: B

Solution:

Solution:

Question 237

If f (x) = $\begin{vmatrix} \cos x & 1 & 0 \\ 1 & 2\cos x & 1 \\ 0 & 1 & 2\cos x \end{vmatrix}$ **, then** $\int_0^{\pi/2} f(x)\,dx =$

Options:

A. 1 / 3

B. 1 / 4

C. 1 / 2

D. 0

Answer: A

Solution:

Solution:

Question 238

Set A has 3 elements and set B has 4 elements. The number of injections that can be defined from A to B is

Options:

A. 144

B. 12

C. 24

D. 64

Answer: C

Solution:

Solution:

Question 239

The value of $\int_0^a \sqrt{\frac{a-x}{x}}\,dx$ is

Options:

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

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

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

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

Answer: D

Solution:

Solution:

Question 240

Which of the following is an even function?

Options:

A. $f(x) = \frac{a^x + a^{-x}}{a^x - a^{-x}}$

B. $f(x) = \frac{a^x + 1}{a^x - 1}$

C. $f(x) = x\left(\frac{a^x - 1}{a^x + 1}\right)$

D. $f(x) = \log_2\left(x + \sqrt{x^2 + 1}\right)$

Answer: C

Solution:

Solution:

Question 241

From 6 different novels and 3 different dictionaries, 4 novels and 1 dictionary are to be selected and arranged in a row on a shelf so that the dictionary is always in the middle. Then the number of such arrangements is

Options:

A. at least 750 but less than 1000

B. at least 1000

C. at least 500 but less than 750

D. less than 500

Answer: B

Solution:

Solution:

Question 242

A ball weighting 0.01 kg hits a head surface vertically with a speed of 5m / sec and rebounds with the same speed. The ball remains in contact with the surface for 0.01 sec. The average force exerted by the surface on the ball in Newton is

Options:

A. 0.1

B. 1.0

C. 5.0

D. 10.0

Answer: D

Solution:

Solution:

Question 243

If the constant term in the expansion of $\left(\sqrt{x}-\frac{k}{x^2}\right)^{10}$ is 405 , then k is

Options:

A. ± 2

B. $\pm \sqrt[4]{3}$

C. ± 3

D. $\pm \sqrt[3]{4}$

Answer: C

Solution:

Solution:

Question 244

$\log_7\log_7\sqrt{7\sqrt{7\sqrt{7}}}$ is equal to

Options:

A. $3\log_2 7$

B. $\log_7 2$

C. $1-3\log_7 2$

D. $1-3\log_2 7$

Answer: C

Solution:

Solution:

Question 245

The equation of the sphere with centre at (2, 3, −4) and touching the plane 2x + 6y − 3z + 15 = 0 is

Options:

A. $x^2 + y^2 + z^2 - 4x - 6y + 8z - 20 = 0$

B. $x^2 + y^2 + z^2 + 4x - 6y - 8z - 20 = 0$

C. $x^2 + y^2 + z^2 - 4x - 6y + 8z + 20 = 0$

D. $x^2 + y^2 + z^2 + 4x + 6y + 8z + 20 = 0$

Answer: A

Solution:

Solution:

Question 246

If $y = \tan^{-1}\left(\frac{\sqrt{a} - \sqrt{x}}{1 + \sqrt{ax}}\right)$, then $\frac{dy}{dx}$ =

Options:

A. $\frac{1}{2(1+x)\sqrt{x}}$

B. $\frac{1}{(1+x)\sqrt{x}}$

C. $-\frac{1}{2(1+x)\sqrt{x}}$

D. $-\frac{1}{(1+x)\sqrt{x}}$

Answer: C

Solution:

Solution:

Question 247

The distance x covered by a particle moving in a straight line in time t is

given by the relation $2x^2 + 3x = t$. If v is the velocity of the particle in time t, then its acceleration at time t is

Options:

A. $-2v^3$

B. $-4v^3$

C. $-2v^2$

D. $-3v^3$

Answer: B

Solution:

Solution:

Question 248

If the difference between mean and mode is 63 , the difference between mean and median is:

Options:

A. 189

B. 21

C. 31.5

D. 485

Answer: B

Solution:

Solution:

Question 249

A function f : □→□ is given by f (x) = $\begin{cases} px + q & \text{when } x > 2 \\ 2px - 3q + 1 & \text{when } x < 2 \end{cases}$

If $\lim_{x \to 2} f(x)$ **exists, then the relation between p and q is**

Options:

A. $2p - 2q = 1$

B. $2p - 3q = 1$

C. 3q − 2p = 1

D. 4q − 2p = 1

Answer: D

Solution:

Solution:

Question 250

Let f : ℝ→ℝ, g : ℝ→ℝ, be continuous functions. Then the value of the integral $\int_{-\pi/2}^{\pi/2} \{f(x) + f(-x)\}\{g(x) - g(-x)\}\,dx$ is

Options:

A. π

B. 1

C. -1

D. 0

Answer: D

Solution:

Solution:
