CUSAT 2021 : Shift 3

Solved Paper

Question 1

A certain screw gauge has a pitch of 0.5 mm. If there are 50 divisions on the head scale, the dimension of the object can then be determined to an accuracy of

Options:

A. 0.05 cm

B. 0.01 cm

C. 0.001 cm

D. 0.0001 cm

Answer: C

Solution:

Solution:

Question 2

The refractive index of glass measured by a given method by four independent measurements is found to have values of 1.54, 1.58, 1.52 and 1.56 respectively. The mean value of refractive index with percentage error is

Options:

A. 1.55 ± 1.29%

B. 1.55 ± 0%

C. 1.56 ± 6%

D. 1.56 ± 0%

Answer: A

Solution:

Solution:

Question 3

A particle moves for 20 seconds with velocity 3m / s and then with velocity 4m / s for another 20 seconds and finally moves with velocity 5m / s for next 20 seconds. Then the average velocity of the particle is

Options:

A. 3m / s

B. 4m / s

C. 5m / s

D. Zero

Answer: B

Solution:

Solution:

Question 4

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 40 seconds?

Options:

A. 8R

B. 8πR

C. 2R

D. Zero

Answer: D

Solution:

Solution:

Question 5

A wheel having 1m diameter makes 60 revolutions per minute. The linear speed of a point on its circumference is

Options:

A. π / 2m / s

B. πm / s

C. 2πm / s

D. 60πm / s

Answer: B

Solution:

Solution:

Question 6

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

Options:

A. μ

B. $\sqrt{\mu}$

C. 1 / μ

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

Answer: D

Solution:

Solution:

Question 7

A diesel engine pumps 40 kg of water in 1 second. The water comes out vertically upwards with a velocity of 3m / s. What is the power of the engine in kilo Watt?

Options:

A. 12 kW

B. 1.2 kW

C. 120 kW

D. 1200 kW

Answer: B

Solution:

Solution:

Question 8

Which one of the following is the S.I. unit of electric field strength?

Options:

A. Am^{-1}

B. Nm^{-1}

C. Vm^{-1}

D. Coulomb s cm^{-1}

Answer: C

Solution:

Solution:

Question 9

If the distance between the two charged particles is reduced to half the original distance, then the force between them becomes

Options:

A. doubled

B. one-forth

C. one-half

D. four times

Answer: D

Solution:

Solution:

Question 10

A metal sheet is placed between two charges separated by a distance. Then the force between them will

Options:

A. increase

B. decrease

C. remains the same

D. be reduced to half the initial value

Answer: A

Solution:

Solution:

Question 11

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

Options:

A. 0.03 nm

B. 0.068 nm

C. 0.05 nm

D. 0.06 nm

Answer: B

Solution:

Solution:

Question 12

A hole is drilled along the earth's diameter and a stone is dropped into it. When the stone is at the center of the earth, it has

Options:

A. mass

B. weight

C. potential energy

D. zero mass

Answer: A

Solution:

Solution:

Question 13

Two wires of the same radius and material have lengths in the ratio 1 : 2. If these are stretched by the same force, the strain produced in the two cases will be in the ratio

Options:

A. 1 : 2

B. 2 : 1

C. 1 : 1

D. 4 : 1

Answer: C

Solution:

Solution:

Question 14

Two wires of the same radius and material have lengths in the ratio 1 : 2. If these are stretched by the same force, the strain produced in the two cases will be in the ratio

Options:

A. 1 : 2

B. 2 : 1

C. 1 : 1

D. 4 : 1

Answer: C

Solution:

Solution:

Question 15

Standing waves are produced in a 10m long stretched string. If the

string vibrates in 5 segments and the wave velocity is 20m / sec, the frequency is

Options:

A. 2 Hz

B. 4 Hz

C. 5 Hz

D. 10 Hz

Answer: C

Solution:

Solution:

Question 16

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

Options:

A. the charges on the plates will be reduced

B. the potential difference between the plates will be reduced

C. the potential difference between the plates will be increased

D. the charges on the plates will be increased

Answer: C

Solution:

Solution:

Question 17

If a capacitor of Capacitance 10 micro Farad (μF) is charged to a potential difference of 100V, the energy stored in it is

Options:

A. 0.5J

B. 0.05 ergs

C. 10J

D. 0.05J

Answer: D

Solution:

Solution:

Question 18

With increase in altitude, the conductivity of the atmosphere

Options:

A. first increases and then decreases

B. increases

C. decreases

D. remains constant

Answer: B

Solution:

Solution:

Question 19

An electric iron box has a heater coil of resistance 50Ω. If it is connected to 230V AC mains, the current flowing through the heater coil will be

Options:

A. 4.6 mA

B. 5A

C. 4.6A

D. 15A

Answer: C

Solution:

Solution:

Question 20

Glass has a resistivity of the order of

Options:

A. $10^{-8}\Omega m$

B. $10^{-5}\Omega m$

C. $10^{8}\Omega m$

D. $10^{12}\Omega m$

Answer: D

Solution:

Solution:

Question 21

A long solenoid of n turns has a self inductance L and area of cross section a. When a current flows through the solenoid, it produces a magnetic field B. The current flowing through the solenoid is

Options:

A. Ban / L

B. BanL

C. Bn / aL

D. B / anL

Answer: A

Solution:

Solution:

Question 22

A conductor of length r moves in a uniform magnetic field of induction B with a velocity boldsymbol v. The emf induced across the conductor is

Options:

A. $(v \times B) \cdot r$

B. $v . (r \times B)$

C. B. (r × v)

D. r × (v × B)

Answer: A

Solution:

Solution:

Question 23

The penetrating powers of α, β and γ radiation, in decreasing order are

Options:

A. α, β, γ

B. γ, α, β

C. β, γ, α

D. γ, β, α

Answer: D

Solution:

Solution:

Question 24

A half-wave rectifier is being used to rectify an alternating voltage of frequency 50 Hz. The number of pulses of rectified current obtained in one second is

Options:

A. 50

B. 25

C. 100

D. 6

Answer: B

Solution:

Solution:

Question 25

The voltage V and the current I flowing through an A.C circuit are given by V = 2cos100πt and I = 4sin 100πt, where t represents time. The power dissipated in the circuit is

Options:

A. zero Watt

B. 8 Watt

C. 4 Watt

D. 2 Watt

Answer: A

Solution:

Solution:

Question 26

An alternating e.m.f. is given by V = 100sin 314t. Its frequency is

Options:

A. 100 Hz

B. 50 Hz

C. 314 Hz

D. 60 Hz

Answer: B

Solution:

Solution:

Question 27

In a purely inductive circuit, the current

Options:

A. is in phase with voltage

B. is out of phase with voltage

C. leads the voltage by 90˚

D. lags behind the voltage by 90˚

Answer: D

Solution:

Solution:

Question 28

The current and voltage in an A.C. circuit are given by $I = I_o \sin\left(\omega t - \frac{\pi}{2}\right)$ and $E = E_o \sin \omega t$. Then the average power consumption P in the circuit is

Options:

A. $P = \frac{E_o I_o}{\sqrt{2}}$

B. $P = \frac{E I}{\sqrt{2}}$

C. $P = \frac{E_o I_o}{2}$

D. zero

Answer: D

Solution:

Solution:

Question 29

Two electric bulbs whose resistances are in the ratio 1 : 2, are connected in parallel to a constant voltage source. The power dissipated in them is in the ratio

Options:

A. 1 : 2

B. 2 : 1

C. 1:1

D. 1 : 4

Answer: B

Solution:

Solution:

Question 30

The neutral temperature for a thermocouple is 270˚C. If the temperature of the cold junction is 15˚C, then the inversion temperature is

Options:

A. 255˚C

B. 285˚C

C. 570˚C

D. 525˚C

Answer: D

Solution:

Solution:

Question 31

A source emits a sound of frequency 400 Hz but the listener hears it to be 390 Hz. Then

Options:

A. the listener is moving towards the source

B. the source is moving toward the listener

C. the listener is moving away from the source

D. the listener has a defective ear

Answer: C

Solution:

Solution:

Question 32

The binding energy of the electron in a hydrogen atom is 13.6 eV, the energy required to remove the electron from the first excited state of Li^{++} is

Options:

A. 122.4 eV

B. 30.6 eV

C. 13.6 eV

D. 3.4 eV

Answer: B

Solution:

Solution:

Question 33

Which of the following nuclei has lowest value of the binding energy per nucleon?

Options:

A. $2He^{4}$

B. $24Cr^{52}$

C. $62Sm^{152}$

D. $80Hg^{100}$

Answer: A

Solution:

Solution:

Question 34

The average number of neutrons emitted during the fission of U^{235} is

Options:

A. 3

B. 2

C. 1.5

D. 2.5

Answer: D

Solution:

Solution:

Question 35

The radioactive decay of uranium into thorium is represented by the equation $92U^{238} \rightarrow 90Th^{234} + X$, then X is

Options:

A. an electron

B. a neutron

C. a proton

D. an alpha particle

Answer: D

Solution:

Solution:

Question 36

The same radioactive nucleus may emit

Options:

A. all the three α, β and γ simultaneously

B. either α or β or γ at a time

C. all the three α, β and γ at a time

D. only α and β

Answer: B

Solution:

Solution:

Question 37

The radius of a nucleus of mass number A is proportional to

Options:

A. A

B. $A^{1/2}$

C. $A^{1/3}$

D. A^{3}

Answer: C

Solution:

Solution:

Question 38

Which one of the statements about nuclear forces is INCORRECT?

Options:

A. Nuclear forces are short range forces

B. Nuclear forces are charge independent forces

C. Nuclear forces are exchange forces

D. Nuclear forces are central forces

Answer: D

Solution:

Solution:

Question 39

Which one of the statements about neutron is INCORRECT?

Options:

A. Neutron is a fundamental particle

B. Neutron has no charge

C. Nuclei of all elements in nature contain neutron

D. Neutron has a spin

Answer: C

Solution:

Solution:

Question 40

The ground state energy of the hydrogen atom is

Options:

A. $13.6\,\text{eV}$

B. $0\,\text{eV}$

C. $-3.4\,\text{eV}$

D. $-13.6\,\text{eV}$

Answer: D

Solution:

Solution:

Question 41

Which one of the statements about matter waves is INCORRECT?

Options:

A. Matter waves are not electromagnetic waves

B. Matter waves are also called probability waves

C. de Broglie waves are pilot waves i.e., these waves guide the particle

D. The phase velocity of the matter waves in vacuum is independent of wavelength

Answer: D

Solution:

Solution:

Question 42

Kinetic energy of the cathode rays (electrons) depend on

Options:

A. voltage applied to the electrode

B. depend on work function

C. depend on both (A) and (B)

D. does not depend on any physical quantity

Answer: C

Solution:

Solution:

Question 43

A man cannot see objects clearly at a distance greater than 2m. He is then suffering from

Options:

A. short sight

B. long sight

C. astigmatism

D. presbyopia

Answer: A

Solution:

Solution:

Question 44

The magnifying power of a simple microscope can be increased by if we use eyepiece of

Options:

A. higher focal length

B. smaller focal length

C. higher diameter

D. smaller diameter

Answer: B

Solution:

Solution:

Question 45

If the focal length of the objective and eyepiece lens of an astronomical telescope are f_o and f_e respectively, then its magnifying power is

Options:

A. $\frac{f_o}{f_e}$

B. $\frac{f_e}{f_o}$

C. $\frac{2f_o}{f_e}$

D. $2f_e$

Answer: A

Solution:

Solution:

Question 46

If f_r and f_v stand for focal length of the lens for red colour and violet colour respectively, then the longitudinal chromatic aberration of the lens for parallel rays is given by

Options:

A. $f_r - f_v$

B. $f_v - f_r$

C. $f_r f_v$

D. $f_v + f_r$

Answer: A

Solution:

Solution:

Question 47

The deviation produced by a flint glass prism for violet and red light rays are 3.25˚ and 3.10˚ respectively. Then the angular dispersion is

Options:

A. 6.35˚

B. 3.175˚

C. 0.15˚

D. 6.35 radians

Answer: C

Solution:

Solution:

Question 48

Total internal reflection is NOT possible in the case when light travels from

Options:

A. glass to air

B. glass to water

C. water to glass

D. water to air

Answer: C

Solution:

Solution:

Question 49

When the angle of incidence on a certain material is 60˚, the reflected light is completely polarized. The angle of refraction is then

Options:

A. 60˚

B. 90˚

C. 30˚

D. 45˚

Answer: C

Solution:

Solution:

Question 50

A sugar solution of length 15 cm has specific rotation of 65˚ and produces a optical rotation of 7˚. Then the concentration of the solution is

Options:

A. 0.7g / cc

B. 13.9g / cc

C. 0.0717g / cc

D. 0.01g / cc

Answer: C

Solution:

Solution:

Question 51

To observe diffraction, the size of an obstacle

Options:

A. should be of the order of wavelength

B. should be much larger than the wavelength

C. has no relation to wavelength

D. should be exactly / / 2.

Answer: A

Solution:

Solution:

Question 52

If the distance between the screen and the slit is doubled in Young's double slit experiment, the fringe width will become

Options:

A. four times

B. two times

C. one-half

D. one-fourth

Answer: B

Solution:

Solution:

Question 53

When light waves suffer reflection at the interface between air and glass, the change of phase of the reflected wave is

Options:

A. zero

B. π

C. 2π

D. π / 2

Answer: B

Solution:

Solution:

Question 54

If a string of string constant k is stretched by a length x under tension T , the energy stored is

Options:

A. $\frac{2k}{T^2}$

B. $\frac{2T^2}{k^2}$

C. $\frac{T^2}{2k}$

D. $\frac{2T}{k^2}$

Answer: C

Solution:

Solution:

Question 55

The Young's modulus of a perfectly rigid body is

Options:

A. zero

B. unity

C. infinite

D. may be any finite non-zero value

Answer: C

Solution:

Solution:

Question 56

A wire elongates by l mm when a load W is hanged at from it. If the wire goes over a pulley and the two weights W each are hung at the two ends, the elongation of the wire (in mm) will be

Options:

A. 1 / 2

B. l

C. 2l

D. zero

Answer: B

Solution:

Solution:

Question 57

If two liquids of same masses but densities ρ_1 and ρ_2 respectively are mixed, then the density of the mixture is

Options:

A. $\rho_1 + \rho_2$

B. $\frac{\rho_1 + \rho_2}{2}$

C. $\frac{\rho_1\rho_2}{\rho_1 + \rho_2}$

D. $\frac{2\rho_1\rho_2}{\rho_1 + \rho_2}$

Answer: D

Solution:

Solution:

Question 58

A boy carries on his head an airtight box containing a bird resting on the floor of the box. When the bird starts flying inside the box, he will feel that the box is now

Options:

A. lighter

B. heavier

C. same in weight as before

D. lighter in the beginning and heavier later

Answer: C

Solution:

Solution:

Question 59

A cork ball is floating on the surface of water in a beaker. The beaker is covered with a bell jar and the air is evacuated. What will happen to the ball?

Options:

A. Sink a little

B. Rise a little

C. Remain unchanged

D. Sink completely

Answer: A

Solution:

Solution:

Question 60

The thermometer used as a reference standard is

Options:

A. mercury thermometer

B. platinum resistance thermometer

C. gas thermometer

D. thermocouple thermometer

Answer: C

Solution:

Solution:

Question 61

If α is coefficient of linear expansion, β is coefficient of superficial expansion and γ is the coefficient of cubical expansion, then for the same rise in temperature, the percentage changes in α, β and γ are in the ratio

Options:

A. 1 : 2 : 3

B. 3 : 2 : 1

C. 1 : 1 : 1

D. 1 : 2 : 4

Answer: A

Solution:

Solution:

Question 62

If K and σ respectively are the thermal and electrical conductivities of a metal at absolute temperature T , then

Options:

A. $\frac{K}{\sigma T}$ = constant

B. $\frac{K}{\sigma}$ = constant

C. $\frac{K}{T}$ = constant

D. $\frac{\sigma}{K T}$ = constant

Answer: A

Solution:

Solution:

Question 63

The velocity V of thermal radiation is (C = velocity of light in vacuum)

Options:

A. V < C

B. V > C

C. V = C

D. dependent on the medium

Answer: C

Solution:

Solution:

Question 64

Which one of the following statements about electromagnetic waves is INCORRECT?

Options:

A. They do not require material medium for propagation

B. They are not deflected in electric an magnetic fields

C. The waves are transverse in nature

D. They cannot be diffracted

Answer: D

Solution:

Solution:

Question 65

If $\vec{E}$ and $\vec{B}$ represent electric and magnetic field vectors of the electromagnetic waves, then the direction of propagation of the waves will be along

Options:

A. $\vec{B} \times \vec{E}$

B. $\vec{E}$

C. $\vec{B}$

D. $\vec{E} \times \vec{B}$

Answer: D

Solution:

Solution:

Question 66

The area of $B - H$ hysteresis loop in a ferromagnetic material is a measure of the

Options:

A. net energy dissipated per unit volume per cycle of magnetization of the material

B. permeability of the material

C. susceptibility of the material

D. retentivity of the material

Answer: A

Solution:

Solution:

Question 67

The unit cubic cell of Al has an edge length equal to 4.5×10^{-10}m. The number of unit cells in an aluminium foil of volume 91×10^{-6}m^3 is

Options:

A. 10^{24}

B. 10^{-24}

C. 10^{8}

D. 10^{23}

Answer: A

Solution:

Solution:

Question 68

The gate with the Boolean expression $Y = \overline{A \cdot B}$ for its output is

Options:

A. AND

B. NAND

C. XOR

D. XNOR

Answer: B

Solution:

Solution:

Question 69

The Boolean expression for NOR gate is

Options:

A. $Y = A + \overline{B}$

B. $Y = \overline{A + B}$

C. $Y = \overline{A} + B$

D. $Y = \overline{A} + \overline{B}$

Answer: B

Solution:

Solution:

Question 70

What gate has the truth table given below?

A	B	Y
0	0	0
0	1	0
1	0	0
1	1	1

Options:

A. NOT

B. AND

C. NAND

D. NOR

Answer: B

Solution:

Solution:

Question 71

A transistor amplifier is operated in common emitter configuration at constant collector voltage of V_C = 1.5V, such that the change in the base current from 100μA to 150μA produces a change in the collector current from 5 mA to 10 mA. The current gain β of the circuit is then

Options:

A. 50

B. 67

C. 75

D. 100

Answer: D

Solution:

Solution:

Question 72

A two stage transistor amplifier has a gain of 10 for the first stage and a gain of 20 for the second stage. The overall gain of the cascade amplifier will be

Options:

A. 30

B. 10

C. 200

D. 2

Answer: C

Solution:

Solution:

Question 73

Long range radio transmission is possible when the radio waves are reflected from the ionosphere. For this to happen, the frequency of the radio waves must be in the range

Options:

A. $80 - 150\,\text{MHz}$

B. $8 - 25\,\text{MHz}$

C. $1 - 3\,\text{MHz}$

D. $150 - 1500\,\text{kHz}$

Answer: B

Solution:

Solution:

Question 74

The colour of a star is dependent on its

Options:

A. radius

B. distance from the earth

C. temperature

D. structure

Answer: C

Solution:

Solution:

Question 75

Hubble constant H has the dimensions of

Options:

A. mass

B. length

C. $(\ \text{time}\ )^{-1}$

D. temperature

Answer: C

Solution:

Solution:

Question 76

mole of water converted to steam at 373K is

Options:

A. $109.1 \mathrm{JK}^{-1} \mathrm{mol}^{-1}$

B. $40.7\,\mathrm{kJ\,mol}^{-1}$

C. $81.4\,\mathrm{kJ\,mol}^{-1}$

D. $218.2 \mathrm{JK}^{-1} \mathrm{mol}^{-1}$

Answer: A

Solution:

Solution:

Question 77

For a non-linear triatomic gas the value of the ratio of C_p and C_V at laboratory temperature is (assuming no vibrational contribution)

Options:

A. 7 / 5

B. 9 / 7

C. 8 / 3

D. 4 / 3

Answer: D

Solution:

Solution:

Question 78

6 moles of SO_2 and 6 moles of O_2 are allowed to form SO_3 in a closed vessel. At the equilibrium stage, 60% of SO_2 is used up. The total number moles of the mixture at equilibrium is

Options:

A. 10.2

B. 9.8

C. 7.2

D. 11.2

Answer: A

Solution:

Solution:

Question 79

pH of a solution obtained by mixing equal volumes of the solutions with pH 3 and pH 5 is

Options:

A. 4.0

B. 3.5

C. 3.3

D. 2.0

Answer: C

Solution:

Solution:

Question 80

The K_{sp} of AgCl is 1×10^{-10}, its solubility in pure water in 0.01M NaCl is

Options:

A. 2×10^{-10}

B. 1×10^{-8}

C. 2×10^{-8}

D. 1×10^{-10}

Answer: B

Solution:

Solution:

Question 81

The edge length of fcc unit cell is 508 pm. The radius of the atom is pm.

Options:

A. 180

B. 200

C. 618

D. 288

Answer: A

Solution:

Solution:

Question 82

Crystalline solids having the least enthalpy of fusion is

Options:

A. Molecular solid

B. Metallic solid

C. Ionic solid

D. Covalent solid

Answer: A

Solution:

Solution:

Question 83

Vapour pressure of water at 298K is 19.8 mm of Hg. 0.1 mole of glucose is dissolved in 172.8g of water. The vapour pressure 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 84

Osmotic pressure of blood is 8.21 atm at 37°C. Amount of glucose that should be used per litre of intravenous injection that is at the same osmotic pressure of blood is

Options:

A. 58.4g

B. 29.2g

C. 5.84g

D. 2.92g

Answer: A

Solution:

Solution:

Question 85

The equitant conductance of 1M benzoic acid is $12.8 Scm^2 eq^{-1}$ and if the limiting equivalent conductance of benzoate ion and H^+ ion are 42 and $288.42 Scm^2 eq^{-1}$, respectively, its degree of dissociation is

Options:

A. 39%

B. 3.9%

C. 0.35%

D. 0.039%

Answer: B

Solution:

Solution:

Question 86

Two half-cells of electrode potentials of E_1 and E_2 are combined to form a cell of potential E_3, (n_1, n_2. and n_3 are number of electrons involved in first electrode, second electrode and the cell) E_3 is

Options:

A. $E_3 = E_2 - E_1$

B. $E_3 = (E_1n_1 + E_2n_2) / n_3$

C. $E_3 = (E_1n_1 - E_2n_2) / n_3^2$

D. $E_3 = E_1 + E_2$

Answer: A

Solution:

Solution:

Question 87

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. $-0.8221V$

B. $-0.704V$

C. $-0.881V$

D. $-0.645V$

Answer: A

Solution:

Solution:

Question 88

A dilute aqueous solution of $CuSO_4$ is electrolyzed using Pt electrodes. The products at the anode and cathode are

Options:

A. O_2, H_2

B. H_2, O_2

C. O_2, Cu

D. $S_2O_8^{2-}$, H_2

Answer: C

Solution:

Solution:

Question 89

The half-life for radioactive decay of C^{14} is 5730 years. An archaeological artefact containing wood had only 80% of the C^{14} found in living tree. The age of the sample is

Options:

A. 1845 years

B. 2865 years

C. 4584 years

D. 1146 years

Answer: A

Solution:

Solution:

Question 90

If the volume of the reaction vessel is halved, for the reaction, $2SO_2(g) + O_2(g) \rightarrow 2SO_3(g)$, then the rate is

Options:

A. 1 / 6 th of its initial value

B. 1 / 4 th of its initial value

C. 8 times of its initial value

D. 4 times of its initial value

Answer: C

Solution:

Solution:

Question 91

The rate equation for a reaction: A → B is $r = k[A]^0$. If the initial concentration of the reactant is ' a ' mol dm^{-3}, then half-life period of reaction is

Options:

A. a / k

B. 2a / k

C. a / 2k

D. k / a

Answer: C

Solution:

Solution:

Question 92

The number of unit cells present in 39g of potassium that crystallizes as body centered cubic structure is N_A = Avogadro number)

Options:

A. N_A

B. $0.25NA_A$

C. $0.5N_A$

D. $0.75N_A$

Answer: C

Solution:

Solution:

Question 93

Which one of the following is not correctly matched?

Options:

A. $[Ni(CN)_4]^{2-}$ – dsp^2 hybridization, dia-magnetic

B. $[Cu(NH_3)_4]^{2+}$ – sp^3 hybridization, para-magnetic

C. $[NiCl_4]^{2-}$ – sp^3 hybridization, tetrahedral

D. $[CuCl_4]^{2-}$ – sp^3 hybridization, para-magnetic

Answer: B

Solution:

Solution:

Question 94

Which one of the following statements is not true according to Werner's theory of coordination compounds?

Options:

A. Both primary and secondary valencies can be satisfied by anions

B. Secondary valency is non-directional

C. Primary valency is ionic valency

D. Metal ions exhibit two types of valencies

Answer: B

Solution:

Solution:

Question 95

Which one of the following is true regarding the energies of d-orbitals of tetragonally distorted octahedral geometry?

Options:

A. $d_{yz} > d_{xz} > d_{xy}$

B. $d_{x^2-y^2} = d_{z^2}$

C. $d_{xz} > d_{yz}$

D. $d_{z^2} > d_{x^2-y^2}$

Answer: D

Solution:

Solution:

Question 96

In the estimation of Ca (II) ions, in the presence of ammonia-ammonium chloride buffer solution, EDTA acts as a ligand.

Options:

A. flexidentate

B. pi-donor

C. hexadentate

D. tetradentate

Answer: C

Solution:

Solution:

Question 97

How much amount of oxalic acid dihydrate crystals are required to prepare 1L of a decinormal solution of it?

Options:

A. 6.3g

B. 12.6g

C. 3.15g

D. 9g

Answer: A

Solution:

Solution:

Question 98

What is correct order of increasing acidic strength of oxides of nitrogen?

Options:

A. $NO < N_2O_3 < N_2O_4 < N_2O_5$

B. $NO = N_2O_3 < N_2O_4 = N_2O_5$

C. $NO > N_2O_3 < N_2O_4 > N_2O_5$

D. $NO > N_2O_3 > N_2O_4 > N_2O_5$

Answer: A

Solution:

Solution:

Question 99

Regarding compounds of sulfur, which one of the following statements in not true?

Options:

A. SF_6 does not undergo hydrolysis

B. SF_4 undergoes hydrolysis

C. SF_6 is thermally stable and chemically inert

D. SF4 acts as Lewis acid

Answer: D

Solution:

Solution:

Question 100

Fluorine does not act as the central atom in interhalogen compounds, because

Options:

A. it is highly electronegative

B. of absence of d-orbitals

C. of its small size

D. of its gaseous nature

Answer: B

Solution:

Solution:

Question 101

A hydrometallurgical process involves the following steps.

$$Ag_2S + 4\,NaCN \rightarrow 2\,Na[Ag(CN)_2] + Na_2S$$

$$2\,Na[Ag(CN)_2] + Zn \rightarrow Na_2[Zn(CN)_4] + 2\,Ag\downarrow$$

Which one of the following statements is true?

Options:

A. In the second step Zn (II) is reduced to Zn(0)

B. Dicyanoargentum(I) complex is insoluble in water

C. In the first step Ag(I) is reduced to Ag(0)

D. Tetracyanozinc(II) complex is soluble in water

Answer: D

Solution:

Solution:

Question 102

Transition metals exhibit variable oxidation states. This is because

Options:

A. the outermost shell is empty

B. they are all metals

C. the energies of (n − 1)d and ns orbitals are almost equal

D. the ionization energy to remove electron from ns orbital is very low

Answer: C

Solution:

Solution:

Question 103

The general electronic configuration of inner-transition elements is

Options:

A. $(n-2)f^{1-14}(n-1)d^{0,1}$

B. $(n-2)f^{1-14}(n-1)d^{0-1}n\ s^2$

C. $(n-1)f^{1-14}(n-1)d^{0-1}n\ s^2$

D. $(n-2)f^{1-14}n\ s^2$

Answer: B

Solution:

Solution:

Question 104

Which of the following species would be diamagnetic?

Options:

A. Cr^{3+}

B. Co^{3+}

C. Br

D. Zn^{2+}

Answer: D

Solution:

Solution:

Question 105

Which orbital is designated by the quantum numbers: $n = 5, l = 1, m_l = 0$?

Options:

A. 5 s

B. 5p

C. 5d

D. 5f

Answer: B

Solution:

Solution:

Question 106

If travelling at equal speeds, which of the following matter waves have the longest wavelength?

Options:

A. Electron

B. Proton

C. Neutron

D. α particle

Answer: A

Solution:

Solution:

Question 107

Number of angular nodes for 4d orbital is

Options:

A. 4

B. 3

C. 2

D. 1

Answer: C

Solution:

Solution:

Question 108

Which of the following will not show deflection from the path on passing through electric field?

Options:

A. Electron

B. Neutron

C. Cathode rays

D. Proton

Answer: B

Solution:

Solution:

Question 109

Complete the following nuclear equation:

$$_{27}^{59}\mathrm{Co} + {}_{0}^{1}\mathrm{n} \rightarrow {}_{25}^{56}\mathrm{Mn} + \ ?$$

Options:

A. $4{}_{1}^{1}\mathrm{H}$

B. $4{}_{1}^{1}\mathrm{n}$

C. ${}_{2}^{4}\mathrm{He}$

D. $2_1{}^1H$

Answer: C

Solution:

Solution:

Question 110

Which among the following sequence is best suited for selective transformation on 2-methylbutane to 2-methylbutan-2-ol?

Options:

A. Treatment with Cl_2 in the presence of UV light followed by hydrolysis with potassium hydroxide in water

B. Treatment with Cl_2 in the presence of UV light followed by hydrolysis with potassium hydroxide in ethanol

C. Treatment with Br_2 in the presence of UV light followed by hydrolysis with potassium hydroxide in water

D. Treatment with I_2 in the presence of UV light followed by hydrolysis with potassium hydroxide in a 1:1 mixture of water and ethanol

Answer: D

Solution:

Solution:

Question 111

Ozone depletion in Antartica is due to

Options:

A. sulphur containing gases

B. peroxy acetyl nitrate

C. chlorine nitrate

D. fluorine

Answer: C

Solution:

Solution:

Question 112

When an organic compound ' A ' was treated sequentially with ammonia and Br_2 / KOH, methanamine was obtained. Then ' A ' is an

Options:

A. ethanol

B. ethyl acetate

C. acetonitrile

D. acetic acid

Answer: B

Solution:

Solution:

Question 113

How many structural isomers are possible for C_3H_9N ?

Options:

A. 3

B. 4

C. 5

D. 6

Answer: B

Solution:

Solution:

Question 114

Which is a non-reducing sugar?

Options:

A. Glucose

B. Sucrose

C. Maltose

D. Fructose

Answer: B

Solution:

Solution:

Question 115

0.200g of an organic compound contains 71% carbon. What is the mass of CO_2 produced when it is subjected to complete combustion?

Options:

A. 0.142

B. 0.039

C. 0.521

D. 0.733

Answer: C

Solution:

Solution:

Question 116

Consider the following compounds:
(i) hydrazine
(ii) paracetamol
(iii) chlorophyll
(iv) saccharin
How many among them will test negative for nitrogen in Lassaigne's test ?

Options:

A. 1

B. 2

C. 3

D. 4

Answer: A

Solution:

Solution:

Question 117

Which among the following is more reactive towards nitration using nitrating mixture?

Options:

A. tertiary-Butylbenzene

B. Toluene

C. Benzene

D. Chlorobenzene

Answer: B

Solution:

Solution:

Question 118

Which among the following is antiaromatic?

Options:

A.

B.

C.

D.

Answer: A

Solution:

Solution:

Question 119

Hydrogenation of acetyl chloride in the presence of $Pd - BaSO_4$ as catalyst to obtain ethanal is

Options:

A. Clemmensen reduction

B. Rosenmund reduction

C. Schmidt reaction

D. Dakin reaction

Answer: B

Solution:

Solution:

Question 120

Which among the following compounds will selectively give the same addition product with HBr under both Markonikkoff's and anti-Markonikkoff's addition conditions?

Options:

A. $CH_3 - CH = CH - CH_2 - CH_3$

B. $CH_3 - CH = CH - C(CH_3)_2$

C. $CH_3 - CH = CH - CH(CH_3)_2$

D. $C_6H_5 - CH = CH_2$

Answer: C

Solution:

Solution:

Question 121

Among the following, the organic compound that gives propyne on treatment with sodamide with minimal side products is

Options:

A. $CH_3CH_2CHCl_2$

B. $CH_3CCl = CH_2$

C. $CH_3CCl = CH_2Cl$

D. $CH_3CCl_2 - CH_3$

Answer: A

Solution:

Solution:

Question 122

Which among the following tests is useful to differentiate between styrene and phenol?

Options:

A. Lucas test

B. Test with bromine water

C. Test with bromine in dry chloroform

D. Test with $KMnO_4$

Answer: C

Solution:

Solution:

Question 123

Identify the incorrect statement about natural rubber.

Options:

A. Double bonds are located between C_2 and C_3 of each isoprene unit

B. Has mostly trans double bonds

C. Intermolecular forces are quite weak

D. Has a randomly coiled structure

Answer: B

Solution:

Solution:

Question 124

The monomer unit/units in cellulose is/are

Options:

A. α-D-glucose

B. β-D-glucose

C. Alternating α-D-glucose and D-fructose units

D. Alternating β-D-fructose and D-fructose units

Answer: B

Solution:

Solution:

Question 125

Which among the following vitamins is the most efficient antioxidant?

Options:

A. Vitamin D

B. Vitamin C

C. Vitamin B

D. Vitamin A

Answer: B

Solution:

Solution:

Question 126

Suppose $\sqrt{\frac{1+\cos A}{1-\cos A}} = 2$. Then $\tan A =$

Options:

A. $\tan A < 1$

B. $\tan A > 2$

C. $\tan A > 1$

D. $\tan A = \infty$

Answer: C

Solution:

Solution:

Question 127

Let a and b be non zero real numbers such that $a^2 + b^2 = 1$. Then

Options:

A. $a + b = 1$

B. $a + b \leq \sqrt{2}$

C. $a + b \geq \sqrt{2}$

D. $a + b = 2$

Answer: B

Solution:

Solution:

Question 128

Let $\tan^2 x = 2\tan^2 y + 1$. Then $\sin^2 y =$

Options:

A. $\sin 2x$

B. $-\cos 2x$

C. $\cos 2x$

D. $-\sin 2x$

Answer: B

Solution:

Solution:

Question 129

Let $\tan\alpha = \frac{x}{x+1}$ and $\tan\beta = \frac{x+1}{x}$. Then $\alpha + \beta =$

Options:

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

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

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

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

Answer: C

Solution:

Solution:

Question 130

Let $a = \sin x$, $b = \operatorname{cosec} x$ and $a + b = 3$. Then $a^2 + b^2 =$

Options:

A. 3

B. 5

C. 7

D. 9

Answer: C

Solution:

Solution:

Question 131

Suppose $\frac{1+\sin 2\theta}{1-\sin 2\theta} = \cot^2(x+\theta)$, then x is equal to

Options:

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

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

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

D. $\frac{3\pi}{4}$

Answer: D

Solution:

Solution:

Question 132

The maximum value of $5\sin^2 x + 4\cos^2 x + \sin\frac{x}{2} + \cos\frac{x}{2}$ is

Options:

A. $5 + 2\sqrt{2}$

B. $5 - 2\sqrt{2}$

C. $5 + \sqrt{2}$

D. $5 - \sqrt{2}$

Answer: C

Solution:

Solution:

Question 133

The chances to fail in Mathematics is 20% and the chances to fail in Chemistry is 25%. The chance to fail in at least one subject is

Options:

A. $\frac{11}{13}$

B. $\frac{14}{15}$

C. $\frac{2}{5}$

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

Answer: C

Solution:

Solution:

Question 134

An urn contains 4 red and 6 blue balls. The probability that two balls are drawn in which second ball drawn is blue without replacements, is

Options:

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

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

C. $\frac{2}{5}$

D. $\frac{7}{15}$

Answer: A

Solution:

Solution:

Question 135

The third moment about the mean for normal distribution is

Options:

A. 5σ

B. $3\sigma^2$

C. $7\sigma^2$

D. 0

Answer: D

Solution:

Solution:

Question 136

A box contains 24 identical balls of which 12 are white and remaining black. The balls are drawn at random from the box one at a time with replacement. The probability that a white ball is drawn for the 4^{th} time on the 7^{th} draw is

Options:

A. $\frac{6}{32}$

B. $\frac{5}{32}$

C. $\frac{7}{32}$

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

Answer: B

Solution:

Solution:

Question 137

5 gentlemen and 5 ladies take seats at random round a table. The probability that they are sitting alternatively is

Options:

A. $\frac{3}{126}$

B. $\frac{1}{252}$

C. $\frac{1}{126}$

D. $\frac{3}{252}$

Answer: C

Solution:

Solution:

Question 138

Let A and B be two non-empty subsets of a set X such that A is not a subset of B. Then

Options:

A. A and B are disjoint

B. $B \subseteq A$

C. A is the complement of B

D. A and B may be disjoint

Answer: D

Solution:

Solution:

Question 139

Let $f : R \to R$ be defined by $f(x) = \cos 2x$. Then f is

Options:

A. a one-to-one function

B. an onto function

C. both one-to-one and onto function

D. neither one-to-one nor onto function

Answer: D

Solution:

Solution:

Question 140

Let $f\left(z + \frac{1}{z}\right) = z^2 + \frac{1}{z^2}$ for all real $z \in R$backslash{0}. Then $f(z) =$

Options:

A. z^2

B. $z^2 - 1$

C. $z^2 - 2$ for all $|z| \geq 2$

D. $z^2 + 2$ for all $|z| \geq 2$

Answer: C

Solution:

Solution:

Question 141

Define f (x) = | x − 1| for all real numbers x. Then

Options:

A. $f(x^2) = (f(x))^2$ for all x

B. f (x + y) = f (x) + f (y) for all x, y

C. f (|x|) = | f (x)| for all x

D. All (A) to (C) above are not true

Answer: D

Solution:

Solution:

Question 142

The sum $\sum_{i=1}^{\infty} \frac{1}{i!} \left(\sum_{k=1^i 2}^{k-1} \right)$ is equal to

Options:

A. $e^2 - e$

B. $e^2 + e$

C. $e^2 + 1 / e$

D. e + 1 / e

Answer: A

Solution:

Solution:

Question 143

If S = $\sum_{n=0}^{\infty} \frac{(\log x)^{2n}}{(2n)!}$, then S =

Options:

A. $x + x^{-1}$

B. $x - x^{-1}$

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

D. 0

Answer: C

Solution:

Solution:

Question 144

The sum of the series $\frac{2^2}{2!} + \frac{3^2}{3!} + \ldots + \infty$ is

Options:

A. 2e

B. $2e^2$

C. e / 2

D. −e / 2

Answer: A

Solution:

Solution:

Question 145

If $y = -\left(x^3 + \frac{x^6}{2} + \frac{x^9}{3} + \ldots + \infty\right)$

Options:

A. $x = 1 - e^{y}$

B. $x = 1 + e^{y}$

C. $x^{3} = 1 - e^{y}$

D. $x^{3} = 1 + e^{-y}$

Answer: C

Solution:

Solution:

Question 146

Sum of the series $\frac{2}{1!} + \frac{4}{3!} + \frac{6}{5!} + \ldots + \infty$

Options:

A. e

B. e^{2}

C. $-e$

D. $-e^{2}$

Answer: A

Solution:

Solution:

Question 147

The value of f (θ) = $\begin{vmatrix} \cos^{2}\theta & \cos\theta\sin\theta & \sin\theta \\ \cos\theta\sin\theta & \sin^{2}\theta & -\cos\theta \\ \sin\theta & -\cos\theta & 0 \end{vmatrix}$

Options:

A. 0

B. 1

C. -1

D. 2

Answer: C

Solution:

Solution:

Question 148

If A is a skew-symmetric matrix of order n, then the trace of A is

Options:

A. n^2

B. n

C. 0

D. 1

Answer: C

Solution:

Solution:

Question 149

Suppose A = $\begin{vmatrix} y-1 & 0 & 7 \\ y^2-1 & y-1 & 8 \\ 2y & 3y & 0 \end{vmatrix}$ **$= ay^3 + by^2 + cy + d$. Then**

Options:

A. $c = -17, d = 0$

B. $b = 38, d = 0$

C. $a = -21, b = 38$

D. $a = 21, d = 0$

Answer: D

Solution:

Solution:

Question 150

Let A = $\begin{bmatrix} 4x-7 & 2 & 2 \\ 2 & 4x-7 & 2 \\ 2 & 2 & 4x-7 \end{bmatrix}$. One of the root of the equation |A| = 0 is

Options:

A. 3 / 4

B. −3 / 4

C. 4 / 3

D. −4 / 3

Answer: A

Solution:

Solution:

Question 151

Let A be the matrix $\begin{bmatrix} -2 & 0 & 0 \\ 0 & -2 & 0 \\ 0 & 0 & -2 \end{bmatrix}$. Then the value of | adj A| is equal to

Options:

A. 8

B. 64

C. 16

D. 32

Answer: B

Solution:

Solution:

Question 152

Given that the matrix $\begin{bmatrix} 1/36 & 0 \\ x & 1/36 \end{bmatrix} = \begin{bmatrix} 6 & 0 \\ -a & 6 \end{bmatrix}^{-2}$. Then the value of x is

Options:

A. $\frac{a}{108}$

B. $\frac{5a}{108}$

C. $\frac{3a}{118}$

D. $\frac{a}{118}$

Answer: A

Solution:

Solution:

Question 153

For a positive integer n, the third term in the expansion of $\left(\sqrt[4]{a} + \frac{a}{\sqrt{a^{-1}}}\right)^n$ is $15a^4$. Then the value of n is

Options:

A. 6

B. -5

C. 3

D. 15

Answer: A

Solution:

Solution:

Question 154

$\sum_{i=0}^{k} \frac{i^k C_i}{^k C_{i-1}}$ is equal to

Options:

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

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

C. $\frac{k(2k-1)}{2}$

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

Answer: B

Solution:

Solution:

Question 155

The coefficient of x^8 in the expansion of $[(1+x)^7 + (1+x)^8 + \ldots + (1+x)^{14}]$

Options:

A. ${}^{15}C_8$

B. ${}^{15}C_6$

C. ${}^{15}C_4$

D. ${}^{15}C_5$

Answer: B

Solution:

Solution:

Question 156

Given that the coefficient of x^7 and x^8 in the expansion of $\left(2+\frac{x}{4}\right)^n$ are equal. Then $n =$

Options:

A. 91

B. 8.7!

C. 71

D. 7.8!

Answer: C

Solution:

Solution:

Question 157

Number of terms in the expansion of $\left(y^2+\sqrt{y^2-1}\right)^4+\left(y^2-\sqrt{y^2-1}\right)^4$ is

Options:

A. 10

B. 8

C. 6

D. 5

Answer: D

Solution:

Solution:

Question 158

There are 5 letters and 5 different envelopes. The number of ways in which all the letters can be put in wrong envelope is

Options:

A. 119

B. 44

C. 59

D. 40

Answer: B

Solution:

Solution:

Question 159

The number of diagonals in an octagon will be

Options:

A. 12

B. 16

C. 18

D. 20

Answer: D

Solution:

Solution:

Question 160

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

Options:

A. 3

B. 4

C. 12

D. 15

Answer: B

Solution:

Solution:

Question 161

There are three coplanar parallel lines. If any p points are taken on each of the lines, the maximum number of triangles with vertices at these points is

Options:

A. $p^2(p + 3)$

B. $p^2(p - 3)$

C. $p^2(4p + 3)$

D. $p^2(4p - 3)$

Answer: D

Solution:

Solution:

Question 162

In class of 18 students, every student has to hand shake with every other student. The total number of handshakes was

Options:

A. 17

B. 18

C. 153

D. 306

Answer: C

Solution:

Solution:

Question 163

Total number of numbers that are less than 4.10^6 and can be formed using the digits 1, 2, 3 is equal to

Options:

A. $\frac{9.3^8 + 3}{2}$

B. $\frac{9.3^8 - 2}{3}$

C. $\frac{9.3^8 + 3}{3}$

D. $\frac{9.3^8 - 3}{2}$

Answer: D

Solution:

Solution:

Question 164

A variable name in certain computer language must be either an alphabet or an alphabet followed by a decimal digit. Total number of different variable names that can exist in that language is equal to

Options:

A. 280

B. 286

C. 290

D. 296

Answer: B

Solution:

Solution:

Question 165

Let X = { a | a is a prime number and a < 30 }. The number of different rational numbers whose numerator and denominator belong to X is

Options:

A. 90

B. 91

C. 180

D. 181

Answer: B

Solution:

Solution:

Question 166

Let $z^2 - z + 1 = 0$ and z be a complex number. Then the value of $z^n - z^{-n}$, where n is a multiple of 3 is

Options:

A. $2(-1)^n$

B. 2^n

C. $(-1)^{n+1}$

D. 0

Answer: D

Solution:

Solution:

Question 167

Assume that $(1 + i)(1 + 2i)(1 + 3i)\ldots(1 + xi) = \alpha + i\beta$. Then $2.5.10\ldots(1 + x^2)$ is equal to

Options:

A. $\alpha^2 - \beta^2$

B. $\alpha^2 + \beta^2$

C. $\alpha - i\beta$

D. $\alpha \cdot \beta$

Answer: B

Solution:

Solution:

Question 168

If ω is a cube root of unity, then $(3 + 5\omega + 3\omega^2)^2 + (3 + 3\omega + 5\omega^2)^2$ is equal to

Options:

A. -2

B. 2

C. 4

D. -4

Answer: D

Solution:

Solution:

Question 169

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

Options:

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

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

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

D. $\frac{2xy}{x^2+y^2}$

Answer: A

Solution:

Solution:

Question 170

Let z be a complex number satisfying the relation $|z-36|^2 = 36z-1|^2$. Then |z| is equal to

Options:

A. 5

B. 6

C. 7

D. 8

Answer: B

Solution:

Solution:

Question 171

If z is a complex number such that $\left|\frac{z-1}{z+1}\right| = 0$ is purely real. Then

Options:

A. z is purely imaginary

B. z is purely real

C. |z| = 1

D. Re(z) ≠ 0 and Im(z) ≠ 0

Answer: B

Solution:

Solution:

Question 172

The product of all values of $(\cos x + i\sin x)^{\frac{3}{4}}$ is

Options:

A. $(\cos 4x + i\sin 4x)$

B. $(\cos 4x - i\sin 4x)$

C. $(\cos 3x - i\sin 3x)$

D. $(\cos 3x + i\sin 3x)$

Answer: D

Solution:

Solution:

Question 173

Let z be a complex number such that |z + 4| ≤ 3. Then

Options:

A. |z + 1| = 6

B. $0 \leq |z+1| \leq 6$

C. |z + 1| = 0

D. $3 \leq |z+1| \leq 6$

Answer: B

Solution:

Solution:

Question 174

Let a, b, c > 0. Then a(1 − b) > $\frac{1}{4}$, b(1 − c) > $\frac{1}{4}$, c(1 − a) > $\frac{1}{4}$

Options:

A. are never possible

B. are always possible

C. are sometimes possible

D. cannot be discussed

Answer: A

Solution:

Solution:

Question 175

The inequality $\frac{2}{x}$ < 3 is true, when x belongs to

Options:

A. [2 / 3, ∞)

B. (−∞, 2 / 3]

C. (2 / 3, ∞) ∪ (−∞, 0)

D. (−∞, 0)

Answer: C

Solution:

Solution:

Question 176

Let $\alpha \in \left(0, \frac{\pi}{2}\right)$. The value of the expression $\sqrt{x^2+x} + \frac{\sin^2\alpha}{\sqrt{x^2+x}}$ is always greater than or equal to

Options:

A. 1

B. 2

C. $2\sin\alpha$

D. $2\,\mathrm{cosec}\,\alpha$

Answer: C

Solution:

Solution:

Question 177

Solutions of $2y - 3 = |y + 6|$ are

Options:

A. $-1, -1$

B. $1, -1$

C. $-1, 9$

D. 9

Answer: D

Solution:

Solution:

Question 178

If $a \in R$ and $m = \frac{a^2}{1+a^4}$ is real, then

Options:

A. $0 \leq m \leq \frac{1}{2}$

B. $0 \leq m \leq 1$

C. $0 \leq m \leq 2$

D. $0 \leq m \leq \infty$

Answer: A

Solution:

Solution:

Question 179

Let a, b, c be three distinct numbers which are in a Geometric Progression. Also the numbers a, 2b, 3c are in an Arithmetic Progression. Then the common ratio of the Geometric Progression is

Options:

A. 3

B. 1

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

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

Answer: D

Solution:

Solution:

Question 180

Three positive real numbers x, y, z are in Arithmetic Progression and xyz = 4. The the minimum value of y is

Options:

A. $\sqrt{2}$

B. $\sqrt[3]{2}$

C. $2^{1/3}$

D. $2^{2/3}$

Answer: D

Solution:

Solution:

Question 181

The maximum possible integer value of sum $15 + 14\frac{1}{7} + 13\frac{2}{7} + \ldots$ is

Options:

A. 134

B. 136

C. 138

D. 140

Answer: C

Solution:

Solution:

Question 182

Let S_n denotes the sum of n terms of an Arithmetic Progression. Then the value of $S_{n+3} - 5S_{n+2} + 7S_{n+1} - 3S_n$ is

Options:

A. 0

B. 3

C. 6

D. 9

Answer: A

Solution:

Solution:

Question 183

The sum of 10 terms of the series $\sqrt{3} + \sqrt{12} + \sqrt{48} + \ldots$

Options:

A. $S = 1023\sqrt{3}$

B. $S = 1023\sqrt{2}$

C. $S = 1025\sqrt{2}$

D. $S = 1025\sqrt{3}$

Answer: A

Solution:

Solution:

Question 184

The harmonic mean of two numbers is 8 . Also their arithmetic mean is A and geometric mean is G. If G satisfies $2A + G^2 = 90$, then the numbers are

Options:

A. $2, -2$

B. $6, -12$

C. 2,12

D. 6,12

Answer: D

Solution:

Solution:

Question 185

The harmonic mean of two numbers is 8 . Also their arithmetic mean is A and geometric mean is G. If G satisfies $2A + G^2 = 90$, then the numbers are

Options:

A. $2, -2$

B. $6, -12$

C. 2,12

D. 6,12

Answer: B

Solution:

Solution:

Question 186

The equation $\sqrt{y+2-4\sqrt{y-2}} + \sqrt{y+7-6\sqrt{y-2}} = 1$ has

Options:

A. no solution

B. one solution

C. two solutions

D. more than two solutions

Answer: D

Solution:

Solution:

Question 187

Let α and β be the roots of the equation $my^2 - ny - p = 0$. Then the root of the equation $(m + px)^2 = n^2x$ are

Options:

A. $\alpha + \beta, \alpha - \beta$

B. $\frac{1}{\alpha^2}, \frac{1}{\beta^2}$

C. $\frac{1}{\alpha^2}, -\frac{1}{\beta^2}$

D. α^2, β^2

Answer: B

Solution:

Solution:

Question 188

If the roots of the equation $y^2 - 2my + m^2 + m - 3 = 0$ are real and less than 3 , then

Options:

A. $m = 1$

B. $m < -1$

C. $m = 2$

D. $m < 2$

Answer: D

Solution:

Solution:

Question 189

Let β, β^2 be the roots of the equation $y^2 + 4y + 1 = 0$. Then β^{46}, β^{62} are roots of the equation

Options:

A. $y^2 + 4y + 1 = 0$

B. $y^2 - 4y + 1 = 0$

C. $y^2 - 4y - 1 = 0$

D. $y^2 + 4y - 1 = 0$

Answer: A

Solution:

Solution:

Question 190

The number of real solutions of the equation $\left(\frac{7}{13}\right)^x = -13 + x - x^2$ is

Options:

A. 3

B. 2

C. 1

D. 0

Answer: D

Solution:

Solution:

Question 191

Given that the sum of the squares of the roots of the equation $y^2 - (k-3)y - k - 2 = 0$ is 13 . Then number of values of k lying in the interval [1, 4] is

Options:

A. 0

B. 1

C. 2

D. 3

Answer: B

Solution:

Solution:

Question 192

Let $8^{\sin^2 x} + 8^{\cos^2 x} = 6$. Then

Options:

A. $\sin^2 x = \frac{2}{3}$

B. $\sin x = -\frac{1}{3}$

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

D. $\cos x = -\frac{1}{2}$

Answer: A

Solution:

Solution:

Question 193

The equation $|\sin x| = 2\cos x$ has

Options:

A. infinitely many solutions

B. finitely many solutions

C. has no solutions in integers

D. has no solutions

Answer: D

Solution:

Solution:

Question 194

The value of x satisfying $1 + \cos x + \cos^2 x + \ldots = 4 + 2\sqrt{3}$ in the interval $\left[\frac{\pi}{2}, \pi\right]$ is

Options:

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

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

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

D. $\frac{3\pi}{4}$

Answer: A

Solution:

Solution:

Question 195

In a triangle ABC, let $\frac{2\cos A}{a} + \frac{\cos B}{b} + \frac{2\cos C}{c} = \frac{a}{bc} + \frac{b}{ac}$. Then $b^2 + c^2$ is equal to

Options:

A. a^2

B. ac

C. bc

D. a + b

Answer: A

Solution:

Solution:

Question 196

In a triangle ABC, let $\frac{2\cos A}{a} + \frac{\cos B}{b} + \frac{2\cos C}{c} = \frac{a}{bc} + \frac{b}{ac}$. Then $b^2 + c^2$ is equal to

Options:

A. a^2

B. ac

C. bc

D. a + b

Answer: B

Solution:

Solution:

Question 197

If the sides of a triangle are proportional to the cosines of the opposite angles, then

Options:

A. the triangle is right angled

B. the triangle is isosceles

C. the triangle is equilateral

D. one of the angle is obtuse

Answer: C

Solution:

Solution:

Question 198

Let a = 7, b = 4, c = 9a in a △ABC. Then the values of sin $\frac{A}{2}$ and cos A are equal to respectively

Options:

A. $\sqrt{\frac{4}{13}}$ and $\frac{9}{13}$

B. $\sqrt{\frac{5}{13}}$ and $\frac{8}{13}$

C. $\sqrt{\frac{7}{13}}$ and $\frac{6}{13}$

D. $\sqrt{\frac{6}{13}}$ and $\frac{7}{13}$

Answer: D

Solution:

Solution:

Question 199

Given that the lengths of the sides p, q, r of a △PQR are in an Arithmetic Progression. Then the ration $\frac{q}{r}$ lies in the interval

Options:

A. $\left(\frac{1}{3}, \frac{2}{3}\right)$

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

C. $\left(\frac{2}{3}, 1\right)$

D. $\left(\frac{1}{3}, \frac{4}{3}\right)$

Answer: B

Solution:

Solution:

Question 200

The two adjacent sides AB and BC of a cyclic quadrilateral ABCD are 2 and 5 units respectively and the angle between them is 60˚. Then the area of circle circumscribing the quadrilateral ABCD is

Options:

A. $\frac{9\pi}{2}$

B. $\frac{19\pi}{2}$

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

D. $\frac{19\pi}{3}$

Answer: D

Solution:

Solution:

Question 201

In a $\triangle ABC$, $2a^2 + 9b^2 + c^2 = 6ab + 2ac$, then $\cos C$ is equal to

Options:

A. 1 / 2

B. 1 / 3

C. 1 / 4

D. 1 / 6

Answer: D

Solution:

Solution:

Question 202

In the $\triangle ABC$, $(a+b+c)\left(\tan\frac{A}{2}+\tan\frac{B}{2}\right)$ is equal to

Options:

A. $2c\cot\frac{C}{2}$

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

C. $2b\cot\frac{B}{2}$

D. $\tan\frac{C}{2}$

Answer: A

Solution:

Solution:

Question 203

$\sin\left[\frac{\pi}{6}-\sin^{-1}\left(-\frac{1}{2}\right)\right]$ is equal to

Options:

A. 0

B. ∞

C. 1

D. -1

Answer: C

Solution:

Solution:

Question 204

If $\sin A+\cos B=a$ and $\sin B+\cos A=b$, $\sin(A+B)$ is equal to

Options:

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

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

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

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

Answer: A

Solution:

Solution:

Question 205

The first and last terms of an Arithmetic Progression are 1 and 56. If the sum of its terms is 290 , then the number of terms will be

Options:

A. 4

B. 6

C. 8

D. 10

Answer: D

Solution:

Solution:

Question 206

Suppose A is a point which is at equidistant from X (1, 3), Y (−3, 5) and Z (5, −1). Then the point A is

Options:

A. (−8, −10)

B. (8, −10)

C. (−8, 10)

D. (8, 10)

Answer: A

Solution:

Solution:

Question 207

The midpoint of the line joining $(-6, 4)$ and $(8, -6)$ divides the line joining $(3, 6)$ and $(-6, -3)$ in the ratio

Options:

A. 2:7 externally

B. 2:7 internally

C. 3:7 internally

D. 3:7 externally

Answer: B

Solution:

Solution:

Question 208

The sum of the distances from a point to the two perpendicular lines is 2 . The locus of the point is

Options:

A. a square

B. a pair of straight lines

C. an ellipse

D. a parabola

Answer: A

Solution:

Solution:

Question 209

If a point P(2, 1) is shifted by a distance $\sqrt{2}$ units parallel to the line x + y = 0, then the new position of P is

Options:

A. $(-1, 2)$

B. $(-1, -2)$

C. $(1, -2)$

D. $(1, 2)$

Answer: D

Solution:

Solution:

Question 210

The length of the common chord of intersection of the circles $x^2 + y^2 - 2x + 4y - 4 = 0$ and $x^2 + y^2 - 2x - 6y + 6 = 0$ is

Options:

A. 0

B. 1

C. 2

D. 3

Answer: A

Solution:

Solution:

Question 211

The equation of the tangents to the circle $x^2 + y^2 = 25$ with 3 as x coordinate are

Options:

A. $3x \pm 5y = 25$

B. $3x \pm 4y = 5$

C. $3x \pm 4y = 25$

D. $3x \pm 5y = 5$

Answer: C

Solution:

Solution:

Question 212

The equation of the circumcircle of the triangle formed by the lines x = 2, y = 0 and x + y − 6 = 0 is

Options:

A. $x^2 + y^2 + 8x - 4y - 12 = 0$

B. $x^2 + y^2 - 8x - 4y - 12 = 0$

C. $x^2 + y^2 - 8x - 4y + 12 = 0$

D. $x^2 + y^2 + 8x - 4y + 12 = 0$

Answer: C

Solution:

Solution:

Question 213

The equation of a parabola is $y^2 = 4x$. P(1, 3) and Q(1, 1) are two points in the xy-plane. Then, for the parabola

Options:

A. P and Q are exterior points

B. P is an interior point while Q is an exterior point

C. P and Q are interior points

D. P is an exterior point while Q is an interior point

Answer: D

Solution:

Solution:

Question 214

A circle having its center at (2, 3) is cut orthogonally by the parabola $y^2 = 4x$. The possible intersection point of these curves can be

Options:

A. (1, 2) or (3, $3\sqrt{3}$)

B. (9, 6) or (2, $2\sqrt{2}$)

C. (1, 2) or (4, 4)

D. (1, 3) or (2, $2\sqrt{2}$)

Answer: C

Solution:

Solution:

Question 215

If the polar of $y^2 = 4ax$ is always touching the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$, then the locus of the pole is

Options:

A. $4a^2x^2 + b^2y^2 = 4a^4$

B. $4a^2x^2 - b^2y^2 = 4a^4$

C. $4a^2x^2 - b^2y^2 = 4b^4$

D. $4a^2x^2 - b^2y^2 = 4b^4$

Answer: B

Solution:

Solution:

Question 216

The radius of the circle passing through the foci of the ellipse $\frac{x^2}{16} + \frac{y^2}{9} = 1$ and having its center (0, 3) is

Options:

A. 4

B. 3

C. $\sqrt{12}$

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

Answer: A

Solution:

Solution:

Question 217

The equation to the hyperbola having its eccentricity 2 and the distance between foci as 8 , is

Options:

A. $\frac{x^2}{4} - \frac{y^2}{12} = 1$

B. $\frac{x^2}{12} - \frac{y^2}{4} = 1$

C. $\frac{x^2}{2} - \frac{y^2}{4} = 1$

D. $\frac{x^2}{4} - \frac{y^2}{2} = 1$

Answer: A

Solution:

Solution:

Question 218

The equation of the hyperbola whose vertices are at (5, 0) and (−5, 0) and x = $\frac{25}{7}$ as one of its directrices, is

Options:

A. $\frac{x^2}{25} - \frac{y^2}{24} = 1$

B. $\frac{x^2}{24} - \frac{y^2}{25} = 1$

C. $\frac{x^2}{16} - \frac{y^2}{25} = 1$

D. $\frac{x^2}{25} - \frac{y^2}{16} = 1$

Answer: A

Solution:

Solution:

Question 219

$\frac{d}{dx}\left\{\tan^{-1}\left(\frac{3x-x^3}{1-3x^2}\right)\right\}$ **is equal to**

Options:

A. $\frac{3}{1+9x^2}\ \forall|x|<\frac{1}{\sqrt{3}}$

B. $\frac{9}{1+x^2}\ \forall|x|<\frac{1}{\sqrt{3}}$

C. $\frac{3}{1+x^2}\ \forall|x|<\frac{1}{\sqrt{3}}$

D. $\frac{1}{9+x^2}\ \forall|x|<\frac{1}{\sqrt{3}}$

Answer: C

Solution:

Solution:

Question 220

Let x = $\sec\theta-\cos\theta$ and y = $\sec^2\theta-\cos^2\theta$. Then $\left(\frac{dy}{dx}\right)^2$ =

Options:

A. $\frac{4(y^2-4)}{x^2+4}$

B. $\frac{4(y^2+4)}{x^2+4}$

C. $\frac{4(y^2-4)}{x^2-4}$

D. $\frac{4(y^2+4)}{x^2-4}$

Answer: B

Solution:

Solution:

Question 221

Given that the line y = 3x + c touches the curve $\frac{x^2}{4} + \frac{y^2}{9} = 1$. The value of c is

Options:

A. an integer

B. always a rational number

C. always an irrational number

D. sometimes a rational number

Answer: C

Solution:

Solution:

Question 222

Let f (x) = $|\cos x| + |\sin x|$. Then $f'(2\pi / 3)$ =

Options:

A. $\frac{1-\sqrt{3}}{2}$

B. $\frac{\sqrt{3}-1}{2}$

C. 0

D. $\frac{\sqrt{3}+1}{2}$

Answer: B

Solution:

Solution:

Question 223

If $x = a\left\{\cos\theta + \log\tan\left(\frac{\theta}{2}\right)\right\}$ and $y = a\sin\theta$, then $\frac{dy}{dx}$ is

Options:

A. $\cot\theta$

B. $\tan\theta$

C. $\sin\theta$

D. $\cos\theta$

Answer: B

Solution:

Solution:

Question 224

If f (x) = $|x-1|$ g(x) = f (f (x)), then, for all x ≥ 2, $g'(x)$ =

Options:

A. 1

B. 2

C. -1

D. 0

Answer: A

Solution:

Solution:

Question 225

If y = sin [$\cos^{-1}${sin ($\cos^{-1}$x)}], then $\frac{dy}{dx}$ at x = $\frac{1}{2}$ is equal to

Options:

A. 0

B. 1

C. 2 / $\sqrt{3}$

D. -1

Answer: B

Solution:

Solution:

Question 226

The function f (x) = $\sqrt{\log_{10}\left(\frac{5x - x^2}{4}\right)}$ exists for

Options:

A. [1, 4]

B. [1, 0]

C. [0, 5]

D. [5, 0]

Answer: A

Solution:

Solution:

Question 227

The range of the function f (x) = $\frac{x + 3}{|x + 3|}$, x ≠ −3 is

Options:

A. {0}

B. {0, 1}

C. {−3, 3}

D. {−1, 1}

Answer: D

Solution:

Solution:

Question 228

The period of the function f (x) = cos $\frac{2x}{7}$ + sin $\frac{x}{2}$ is

Options:

A. 7π

B. 4π

C. 14π

D. 28π

Answer: D

Solution:

Solution:

Question 229

Let $f : R \to R$ **be defined as** $f(x) = \begin{cases} 0, & x \text{ is irrational} \\ \sin|x|, & x \text{ is rational} \end{cases}$.

Then which of the following is true?

Options:

(A) f is discontinuous for all x
(B) f is continuous for all x
(C) f is discontinuous at $x = k\pi$, where k is an integer
(D) f is continuous at $x = k\pi$, where k is an integer

Answer: D

Solution:

Solution:

Question 230

The period of the function f (x) = $\text{cosec}^3 3x + \cot 4x$ is

Options:

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

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

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

D. π

Answer: D

Solution:

Solution:

Question 231

$\lim_{x \to \infty} \left(\frac{x+7}{x+3} \right)^{x+2}$ **is equal to**

Options:

A. e^2

B. e^4

C. e^{-4}

D. e^{-2}

Answer: B

Solution:

Solution:

Question 232

Let m, n be natural numbers with n > m . $\lim_{x \to 0} \frac{\sin x^n}{(\sin x)^m}$ is equal to

Options:

A. 2

B. -2

C. -1

D. 0

Answer: D

Solution:

Solution:

Question 233

$\lim_{x \to \frac{\pi}{2}} \frac{\sin x - (\sin x)^{\sin x}}{1 - \sin x + \log \sin x}$

Options:

A. 1

B. 2

C. 3

D. 4

Answer: B

Solution:

Solution:

Question 234

If the curve $y = x^2 + bx + c$ touches the line $y = x$ at the point (1, 1), then the values of x for which the curve has a negative gradient are

Options:

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

B. $x < \frac{3}{2}$

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

D. $x < \frac{1}{2}$

Answer: D

Solution:

Solution:

Question 235

The sub tangent, ordinate and sub normal to the parabola $y^2 = 4ax$ at a point (different from the origin) are

Options:

A. in Harmonic Progression

B. in Geometric Progression

C. in Arithmetic Progression

D. equal

Answer: B

Solution:

Solution:

Question 236

If $0 < x < \frac{\pi}{2}$, then

Options:

A. $\cos(\sin x) < \sin(\cos x)$

B. $\sin(\cos x) > \cos x$

C. $\cos(\sin x) > \sin(\cos x)$

D. $\cos(\sin x) \leq \cos x$

Answer: C

Solution:

Solution:

Question 237

The minimum value of $e^{(2x^2 + 2x + 1)\sin^2 x}$ is

Options:

A. 0

B. 1

C. 2

D. 3

Answer: B

Solution:

Solution:

Question 238

$\int \frac{dx}{x^2 + 4x + 5}$ is equal to

Options:

A. $\frac{1}{2}\left\{ \tan^{-1}(x + 2) + \frac{x + 2}{x^2 + 4x + 5} \right\} + c$

B. $\frac{1}{2}\left\{\tan^{-1}(x+2)+\frac{x}{x^2+4x+5}\right\}+c$

C. $\frac{1}{2}\left\{\tan^{-1}(x+2)+\frac{x-2}{x^2+4x+5}\right\}+c$

D. $\frac{1}{2}\left\{\tan^{-1}(x-2)+\frac{x}{x^2+4x+5}\right\}+c$

Answer: A

Solution:

Solution:

Question 239

$\int\left(\frac{x+2}{x+4}\right)^2 e^x dx$ is equal to

Options:

A. $e^x\left(\frac{x}{x+4}\right)+c$

B. $e^x\left(\frac{x+2}{x+4}\right)+c$

C. $e^x\left(\frac{x-2}{x+4}\right)+c$

D. $e^x\left(\frac{2xe^x}{x+4}\right)+c$

Answer: A

Solution:

Solution:

Question 240

The value of $I=\int_0^1 x\left|x-\frac{1}{2}\right| dx$ is equal to

Options:

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

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

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

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

Answer: D

Solution:

Solution:

Question 241

Consider the group $\left(\mathbb{R}\backslash\left\{\frac{1}{2}\right\}, *\right)$ where $a * b = a + b - 2ab$ for all $a, b \in \mathbb{R}\backslash\left\{\frac{1}{2}\right\}$. Then the inverse of arbitrary element a is

Options:

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

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

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

D. $\frac{a}{a+1}$

Answer: C

Solution:

Solution:

Question 242

The area bounded by $y = 2x - x^2$ and y-axis is

Options:

A. 3 sq. units

B. 2 sq. units

C. 1 sq. units

D. 0 sq. units

Answer: D

Solution:

Solution:

Question 243

If the position vector of three points are $\vec{a} - 2\vec{b} + 3\vec{c}$, $3\vec{a} + 4\vec{b} - 5\vec{c}$, $-\vec{a} - 8\vec{b} + 11\vec{c}$, then the three points are

Options:

A. non-coplanar

B. non-collinear

C. collinear

D. unit vectors

Answer: C

Solution:

Solution:

Question 244

The sides of a parallelogram are $\vec{a} = \vec{i} + 2\vec{j} - 3\vec{k}$, $\vec{b} = \vec{i} + \vec{j} + 2\vec{k}$. Then the unit vector parallel to one of the diagonals is

Options:

A. $\frac{1}{\sqrt{14}}\left(2\vec{i} + 3\vec{j} + \vec{k}\right)$

B. $\frac{1}{\sqrt{14}}\left(2\vec{i} + 3\vec{j} - \vec{k}\right)$

C. $\frac{1}{\sqrt{26}}\left(\vec{j} + 5\vec{k}\right)$

D. $\frac{1}{26}\left(-\vec{j} - 5\vec{k}\right)$

Answer: B

Solution:

Solution:

Question 245

In a three dimensional space, the equation 8x + 7y = 0 represents

Options:

A. the z-axis

B. the z-plane

C. the x-axis

D. the plane y = 0

Answer: A

Solution:

Solution:

Question 246

The plane $x - 2y + z = 6$ and the line $\frac{x}{1} = \frac{y}{2} = \frac{z}{3}$ are related as

Options:

A. parallel to the plane

B. at right angles to a plane

C. lies in the plane

D. meets the plane obliquely

Answer: A

Solution:

Solution:

Question 247

If the position vectors of A, B and C are respectively $\hat{i} + \hat{j} + \hat{k}$, $\hat{i} - 2\hat{j} - 4\hat{k}$ and $2\hat{i} - 3\hat{j} - 3\hat{k}$, then $\cos^2 B$ is equal to

Options:

A. $\frac{1}{63}$

B. $\frac{4}{63}$

C. $\frac{6}{63}$

D. $\frac{11}{63}$

Answer: B

Solution:

Solution:

Question 248

The number of solutions at x = 5 for the equation $\left|\frac{dy}{dx}\right| + |x| + 7 = 0$ is

Options:

A. 0

B. 1

C. 5

D. ∞

Answer: A

Solution:

Solution:

Question 249

A solution of the differential equation $(x + y)^2 \frac{dy}{dx} = 4$ is

Options:

A. $y = 2\tan^{-1}\left(\frac{x-y}{2}\right) + c$

B. $y = 2\tan^{-1}\left(\frac{x+y}{2}\right) + c$

C. $y = \tan^{-1}\left(\frac{x-y}{2}\right) + c$

D. $y = \tan^{-1}\left(\frac{x+y}{2}\right) + c$

Answer: B

Solution:

Solution:

Question 250

$I = \int_{-3}^{2} (|x+1| + |x+2|)\,dx =$

Options:

A. 10

B. 12

C. 15

D. 18

Answer: C

Solution:

Solution:
