CUSAT 2022 : Shift 1

Solved Paper

Question 1

Force between two charges is given by

Options:

A. $\frac{Qq}{4\pi\varepsilon_0 r^2}$

B. $\frac{Qq}{4\pi\varepsilon_0 r^3}$

C. $\frac{Qq}{4\pi\varepsilon_0 r}$

D. Zero

Answer: A

Solution:

Solution:

Question 2

Which quantity is same when resistances are connected in parallel?

Options:

A. Current

B. Potential difference and Current

C. Potential difference

D. Capacitance

Answer: C

Solution:

Solution:

Question 3

How much power is dissipated when 2 A current passes through a wire

of 10 Ohm resistance?

Options:

A. 40 watt

B. 30 watt

C. 20 watt

D. 10 watt

Answer: A

Solution:

Solution:

Question 4

Magnetic field is produced by

Options:

A. rest charge alone

B. moving charge alone

C. moving charge with intrinsic magnetic moment

D. intrinsic magnetic moment alone

Answer: C

Solution:

Solution:

Question 5

Which magnetism shows Curie temperature?

Options:

A. Diamagnetism

B. Paramagnetism

C. Ferromagnetism

D. Ferrimagnetism

Answer: C

Solution:

Solution:

Question 6

Inconsistency of Ampere's circuit law is due to

Options:

A. standard current

B. flow of current

C. displacement current

D. zero current

Answer: C

Solution:

Solution:

Question 7

What are the components present in electromagnetic waves?

Options:

A. Electric field

B. Electric field and velocity

C. Magnetic field

D. Electric field and Magnetic field

Answer: D

Solution:

Solution:

Question 8

Which radiation is having higher energy in electromagnetic spectrum?

Options:

A. X-ray

B. Gamma ray

C. Microwave

D. Radio wave

Answer: B

Solution:

Solution:

Question 9

What is the frequency of LC circuit?

Options:

A. $\frac{1}{2\pi\sqrt{LC}}$

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

C. $2\pi\sqrt{LC}$

D. $2\pi LC$

Answer: A

Solution:

Solution:

Question 10

If the focal length of a lens is 2 cm, then its power is

Options:

A. 3 dioptre

B. 0.4 dioptre

C. 0.7 dioptre

D. 0.5 dioptre

Answer: D

Solution:

Solution:

Question 11

The angle of incidence at which reflected light is totally polarised for reflection from air to glass (refractive index n), is

Options:

A. $\tan^{-1}(1 / n)$

B. $\sin^{-1}(1 / n)$

C. $\sin^{-1}(n)$

D. $\tan^{-1}(n)$

Answer: D

Solution:

Solution:

Question 12

The number of electron in M shell is limited to

Options:

A. 2

B. 10

C. 18

D. 32

Answer: C

Solution:

Solution:

Question 13

Which of the following ray is emitted during the radioactive decay process?

Options:

A. Alpha ray

B. Gamma Ray

C. Beta ray

D. All the above

Answer: D

Solution:

Solution:

Question 14

Formation of shadows can be explained by

Options:

A. rectilinear propagation of light

B. curvilinear propagation of light

C. the total internal reflection

D. refraction

Answer: A

Solution:

Solution:

Question 15

When the temperature of the semiconductor is increased, its

Options:

A. resistivity increases

B. charge carrier reduces

C. conductivity increases

D. temperature coefficient becomes zero

Answer: C

Solution:

Solution:

Question 16

Which of the following is an active device?

Options:

A. Electric bulb

B. Transformer

C. Silicon controlled rectifier

D. Loud speaker

Answer: C

Solution:

Solution:

Question 17

The material suitable for making electromagnets should have

Options:

A. high retentivity and high coercivity

B. low retentivity and low coercivity

C. high retentivity and low coercivity

D. low retentivity and high coercivity

Answer: C

Solution:

Solution:

Question 18

A carbon resistor has color code as Brown, Black, Blue and Silver. The resistance and tolerance values are

Options:

A. 10MΩ ± 10%

B. 20MΩ ± 5%

C. 10MΩ ± 5%

D. 20kΩ ± 10%

Answer: A

Solution:

Solution:

Question 19

Which unit is appropriate for specifying magnetic induction?

Options:

A. Tesla

B. V / m

C. A / m^2

D. Henry

Answer: A

Solution:

Solution:

Question 20

Two particles A and B initially at rest move towards each other by mutual forces of attraction. At an instant when the speed of A is V and the speed for B is 2V , then the speed of centre of mass is

Options:

A. 1V

B. 2V

C. 3V

D. Zero

Answer: D

Solution:

Solution:

Question 21

The blue colour of the sky is due to

Options:

A. reflection of sunlight

B. polarization of sunlight

C. scattering of sunlight

D. refraction of sunlight

Answer: C

Solution:

Solution:

Question 22

Which of the following statements is wrong?

Options:

A. Sound travels in a straight line

B. Sound travels as waves

C. Sound is a form of energy

D. Sound travels faster in vacuum than that in air

Answer: D

Solution:

Solution:

Question 23

A proton and an electron are accelerated through the same accelerating potential. Which one of these two has the greater momentum?

Options:

A. Proton

B. Electron

C. Equal momentum

D. Zero momentum

Answer: A

Solution:

Solution:

Question 24

In a circuit containing inductor and resistor, as the frequency of the applied alternating current increases, the impedance

Options:

A. remain constant

B. decreases

C. first increases and then decreases

D. increases

Answer: D

Solution:

Solution:

Question 25

How many electron flow per second in 1 Ampere of current?

Options:

A. 6.25×10^{18}

B. 6×10^{18}

C. 1.6×10^{19}

D. 1.6×10^{23}

Answer: A

Solution:

Solution:

Question 26

If copper and silicon are heated, then their resistance will

Options:

A. increase and decrease respectively

B. increase and increase respectively

C. decrease and increase respectively

D. decrease and decrease respectively

Answer: A

Solution:

Solution:

Question 27

The unit of Universal Gravitational constant is

Options:

A. Nm^2 / kg^2

B. Nm / kg^2

C. Unit less

D. m / s^2

Answer: A

Solution:

Solution:

Question 28

Adiabatic expansion of a gas results in

Options:

A. heating

B. cooling

C. no change in temperature

D. initial cooling and then heating

Answer: B

Solution:

Solution:

Question 29

The function of the moderator in the nuclear reactor is to

Options:

A. decrease the speed of neutron

B. increase the speed of neutron

C. fuel the reactor

D. increase the temperature of the reactor

Answer: A

Solution:

Solution:

Question 30

$\int \frac{dx}{\sqrt{2ax - x^2}} = a^n \sin^{-1}\left(\frac{x}{a} - 1\right)$, then the value of n is

Options:

A. 0

B. -1

C. 1

D. -2

Answer: A

Solution:

Solution:

Question 31

A raindrop falls near the surface of the earth with almost uniform velocity because

Options:

A. its weight is negligible

B. the force of surface tension balances its weight

C. the force of viscosity of air balances its weight

D. the drops are charged and atmospheric electric field balances its weight

Answer: C

Solution:

Solution:

Question 32

The susceptibility of magnesium at 300K is 1.2×10^{-5}. At what temperature will the susceptibility increase to 1.8×10^{-5} ?

Options:

A. 400K

B. 300K

C. 600K

D. 200K

Answer: D

Solution:

Solution:

Question 33

A convex lens is placed 8 cm from a light source and it makes a sharp image on a screen, kept 8 cm from the lens. Now a glass block (refractive index 1.5) of 1.2 cm thickness is placed in contact with the light source. To get the sharp image again, the screen is shifted by a distance d . Then d is

Options:

A. 0.44 cm towards the lens

B. 1.6 cm away from the lens

C. 0.44 cm away from the lens

D. 0

Answer: C

Solution:

Solution:

Question 34

The resistance of 3Ω and 6Ω are joined in series are connected across a battery of emf 10V and internal resistance 1Ω. The power dissipated by the battery is

Options:

A. 3W

B. 8W

C. 9W

D. 10W

Answer: D

Solution:

Solution:

Question 35

Consider two light sources of wavelength λ_1 and $\lambda_2(\lambda_2 > \lambda_1)$ which are emitting n_1 and n_2 photons respectively, in a given time. Assume equal power for both sources, then

Options:

A. $n_1 > n_2$

B. $n_1 < n_2$

C. $n_1 = n_2$

D. None of the above

Answer: A

Solution:

Solution:

Question 36

As the orbit number increases, the distance between two consecutive orbits in an atom

Options:

A. increases

B. decreases

C. remains the same

D. first increases and then becomes constant

Answer: A

Solution:

Solution:

Question 37

For audible sound, the time interval between two words should be

Options:

A. 0.1 s

B. 3 s

C. 0.4 s

D. 2 s

Answer: A

Solution:

Solution:

Question 38

If S is stress and Y is Young's modulus of material of a wire, the energy stored in the wire per unit volume is

Options:

A. $2S^2Y$

B. S^2 / 2Y

C. 2Y / S^2

D. S / 2Y

Answer: B

Solution:

Solution:

Question 39

If a charge Q is to be divided into two parts q and (Q − q), such that the force between them is maximum at a certain distance, then the value of q must be

Options:

A. Q / 3

B. Q / 2

C. Q / 4

D. 3Q / 4

Answer: B

Solution:

Solution:

Question 40

If the electric field in a region of space is given by 5i + 4j + 9k. The electric flux through a surface of area 20 units lying in the y − z plane is

Options:

A. 100 units

B. 4 units

C. 500 units

D. 44 units

Answer: A

Solution:

Solution:

Question 41

A 25 Watt −220V bulb and 100W att-220 V bulb are connected in series across 220V line. Which bulb will glow more brightly?

Options:

A. 25 Watt bulb

B. 100W att bulb

C. Both will glow with equal brightness

D. Each bulb will glow bright alternatively

Answer: A

Solution:

Solution:

Question 42

A proton is projected horizontally eastward in a uniform magnetic field which is horizontal and southward in direction. The proton will be deflected

Options:

A. upward

B. downward

C. southward

D. northward

Answer: B

Solution:

Solution:

Question 43

Two long parallel wires separated by a distance ' r ' have equal current 'I' flowing in each. The magnetic field of one exerts a force ' F ' on the other. If the distance between them is doubled and the current in each wire is halved, the force between them will become

Options:

A. 4F

B. unchanged

C. F / 4

D. F / 8

Answer: D

Solution:

Solution:

Question 44

The magnetic field energy in an inductor changes from maximum value to minimum value in 2.5 ms, when connected to an AC source. The frequency of the source is

Options:

A. 100 Hz

B. 400 Hz

C. 50 Hz

D. 25 Hz

Answer: A

Solution:

Solution:

Question 45

Alternating current / e.m.f measuring instrument measures its

Options:

A. peak value

B. r.m.s value

C. average value

D. square of current and voltage

Answer: B

Solution:

Solution:

Question 46

In vacuum, the speed of electromagnetic waves depend up on

Options:

A. wavelength

B. frequency

C. electric and magnetic field

D. None of the above

Answer: D

Solution:

Solution:

Question 47

A convex mirror has a focal length ' f '. A real object placed at a distance ' f ' in front of it from the pole produces an image at

Options:

A. infinity

B. f

C. f / 2

D. 2f

Answer: C

Solution:

Solution:

Question 48

The refracting angle of a prism is A and refractive index of the material of the prism is cot A / 2. Then, the angle of minimum deviation is

Options:

A. $180 - 3A$

B. $180 + 2A$

C. $90 - A$

D. $180 - 2A$

Answer: D

Solution:

Solution:

Question 49

Which one of the following cannot be polarised?

Options:

A. Radio waves

B. Ultraviolet rays

C. Infrared rays

D. Ultrasonic waves

Answer: D

Solution:

Solution:

Question 50

Threshold wavelength for a metal having work function ϕ_0 is λ. What is the threshold wavelength for the metal having work function $\phi_0 / 2$?

Options:

A. 4λ

B. 2λ

C. λ

D. λ / 2

Answer: B

Solution:

Solution:

Question 51

Bohr's atomic model cannot explain

Options:

A. quantization of the angular momentum of the orbiting electrons

B. emission of photon due to the transition of electron from one orbit to other

C. intensity of spectral lines

D. spectral series of hydrogen like atom

Answer: C

Solution:

Solution:

Question 52

The process underlying β-decay is the

Options:

A. conversion of neutron to proton

B. conversion of proton to neutron

C. emission of gamma rays

D. emission of helium nucleus

Answer: A

Solution:

Solution:

Question 53

A sample of radioactive element has a mass of 10 gm at an instant t = 0. The approximate mass of the element in the sample after two mean lives is

Options:

A. 2.5 gm

B. 3.7 gm

C. 6.30 gm

D. 1.35 gm

Answer: D

Solution:

Solution:

Question 54

A potential difference of V is applied at the ends of a copper wire of length ' 1 ' and diameter 'd'. On doubling the 'd' value , the drift velocity

Options:

A. becomes two times

B. becomes half

C. becomes one fourth

D. does not change

Answer: D

Solution:

Solution:

Question 55

If a resistance is introduced in series with the cell in the secondary circuit of a potentiometer, the balancing length

Options:

A. increases

B. decreases

C. remains the same

D. cannot be found

Answer: C

Solution:

Solution:

Question 56

A vernier calliper has its main scale of 10 cm equally divided into 200 equal parts. Its vernier scale of 25 divisions coincides with 12 mm on the main scale. The least count of the instrument is

Options:

A. 0.020 cm

B. 0.002 cm

C. 0.010 cm

D. 0.001 cm

Answer: B

Solution:

Solution:

Question 57

A body starts from rest and with a uniform acceleration of $10ms^{-2}$ for 5 seconds. During the next 10 seconds, it moves with uniform velocity. The total distance traveled by the body is

Options:

A. 100m

B. 125m

C. 500m

D. 625m

Answer: D

Solution:

Solution:

Question 58

Two capacitors of equal capacity are first connected in parallel and then in series. The ratio of the total capacities in the two cases will be

Options:

A. 2 : 1

B. 1 : 2

C. 4 : 1

D. 1 : 4

Answer: C

Solution:

Solution:

Question 59

The strength of the magnetic field of a vibration magnetometer is increased to 4 times its original value. The frequency of oscillation of the magnet would then become

Options:

A. twice

B. four times

C. half

D. one-fourth

Answer: A

Solution:

Solution:

Question 60

An endoscope is employed by a physician to view the internal parts of a body organ. It is based on the principle of

Options:

A. refraction

B. reflection

C. total internal reflection

D. dispersion

Answer: C

Solution:

Solution:

Question 61

What will be the direction in the following reaction upon increasing pressure of the system?
$N_2O_4(g) \rightleftharpoons 2NO_2(g)$

Options:

A. Formation of N_2O_4 favored

B. Formation of NO_2 favored

C. No change in reaction

D. Increase in equilibrium constant

Answer: A

Solution:

Solution:

Question 62

When solid NH_4Cl is added to NH_4OH solution, the equilibrium shifts to the left, due to

Options:

A. common ion effect

B. buffer formation

C. neutralization

D. keep pH constant

Answer: A

Solution:

Solution:

Question 63

The obtained slope in the Arrhenius plot of $\log k$ Vs $\frac{1}{T}$ is equal to

Options:

A. $\frac{E_a}{R}$

B. $-\frac{E_a}{R}$

C. $\frac{E_a}{(2.303)R}$

D. $-\frac{E_a}{(2.303)R}$

Answer: D

Solution:

Solution:

Question 64

If the first order rate constant for a reaction is $6.93 \times 10^{-4}\ s^{-1}$, calculate the half life for the reaction.

Options:

A. 100 s

B. 200 s

C. 500 s

D. 1000 s

Answer: D

Solution:

Solution:

Question 65

The standard $E^0_{\text{red values of}}$ A, B and C are 0V, +0.68V and −0.50V, respectively. The order of their power as reducing agent is

Options:

A. B > A > C

B. A > B > C

C. C > A > B

D. C > B > A

Answer: C

Solution:

Solution:

Question 66

If the ratio of composition of oxidised and reduced species in an electrochemical cell is given as $\frac{[O]}{[R]} = e^2$, the correct potential difference will be

Options:

A. $E - E^0 = + \frac{2RT}{nF}$

B. $E - E^0 = - \frac{2RT}{nF}$

C. $E - E^0 = + \frac{RT}{nF}$

D. $E - E^0 = - \frac{RT}{nF}$

Answer: A

Solution:

Solution:

Question 67

If we pass 1 Coulomb of charge in an electrolytic cell, then 10 mg of substance will get deposited. Calculate the gram equivalent of the substance.

(1 Faraday = 96500C)

Options:

A. 9.65

B. 96.5

C. 965

D. 9650

Answer: C

Solution:

Solution:

Question 68

The packing fraction efficiency of a simple cubic lattice is close to

Options:

A. 34.0%

B. 52.4%

C. 68.0%

D. 74.0%

Answer: B

Solution:

Solution:

Question 69

How many NaCl are in the unit cell of sodium chloride crystal?

Options:

A. 1

B. 2

C. 3

D. 4

Answer: D

Solution:

Solution:

Question 70

Alkali halides do not show Frenkel defect because

Options:

A. cations and anions have high coordination number

B. cations and anions have low coordination number

C. anions cannot be accommodated in voids

D. cations and anions have almost equal size

Answer: D

Solution:

Solution:

Question 71

Coordination number for body centered cubic is

Options:

A. 2

B. 4

C. 6

D. 8

Answer: D

Solution:

Solution:

Question 72

Which one of the following is NOT applicable to chemisorption?

Options:

A. Its heat of adsorption is high

B. It takes place at high temperature

C. It is reversible

D. It forms mono-molecular layers

Answer: C

Solution:

Solution:

Question 73

Lyophilic colloids are stable due to

Options:

A. small size of the particle

B. large size of the particle

C. layer of dispersion medium on the particle

D. high Tyndall effect

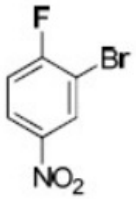
Answer: C

Solution:

Solution:

Question 74

IUPAC name for the following compound is



Options:

A. 2-bromo-1-fluoro-4-nitrobenzene

B. 3-bromo-4-fluoro-1-nitrobenzene

C. 2-fluoro-5-nitro-1-bromobenzene

D. 1-bromo-6-fluoro-3-nitrobenzene

Answer: A

Solution:

Solution:

Question 75

Dumas method is preferred over Kjeldahl's method for determining nitrogen quantitatively in

Options:

A. explosives such as trinitrotoluene

B. aminoacids

C. amides

D. compounds containing both sulfur and nitrogen

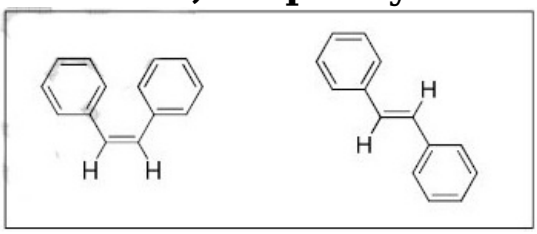
Answer: A

Solution:

Solution:

Question 76

Pick the statement that is NOT true for a pair of cis and trans isomers such as 1,2-diphenylethene (stilbene).



Options:

A. trans isomer has a higher melting point

B. trans isomer has higher heat of combustion

C. trans isomer has a higher retardation factor (R_f) in adsorption chromatography over silica gel

D. planarity is better maintained in the trans isomer

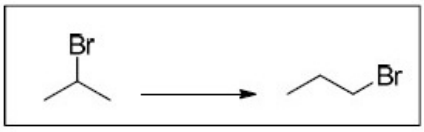
Answer: B

Solution:

Solution:

Question 77

How will you selectively convert 2-bromopropane to 1-bromopropane?



Options:

A. Treatment with alcoholic potassium chloride followed by reaction with HBr

B. Reaction with metallic sodium followed by reaction with bromine

C. Reaction with magnesium metal followed by treatment with HOBr

D. Reaction with alcoholic potassium hydroxide followed by heating with HBr in the presence of benzoyl peroxide.

Answer: D

Solution:

Solution:

Question 78

Pick the WRONG statement about propyne.

Options:

A. Addition of excess HBr to propyne gives 1,2-dibromopropane

B. It is less acidic than acetylene

C. Upon reaction with dilute sulfuric acid in the presence of mercuric sulfate, it gives acetone as the major product

D. It reacts with sodamide ($NaNH_2$) to give sodium propynide

Answer: A

Solution:

Solution:

Question 79

In aromatic electrophilic substitution reactions carried out under kinetically controlled conditions

Options:

A. all activating groups are meta orienting

B. all deactivating groups are ortho-para orienting

C. all deactivating groups are meta orienting

D. deactivating groups possessing unshared pair of electrons on atoms directly attached to aromatic ring are ortho-para orienting

Answer: D

Solution:

Solution:

Question 80

Compounds possessing certain distinct structural features give a yellow precipitate of iodoform on reacting with iodine in the presence of a base. This question is based on the ability of alcohols having no other functional groups to undergo iodoform reaction. Pick the WRONG statement.

Options:

A. Ethanol is the only primary alcohol that gives a positive iodoform test

B. Several secondary alcohols give positive iodoform test

C. All tertiary alcohols test negative for iodoform reaction

D. All alcohols test negative for iodoform reaction

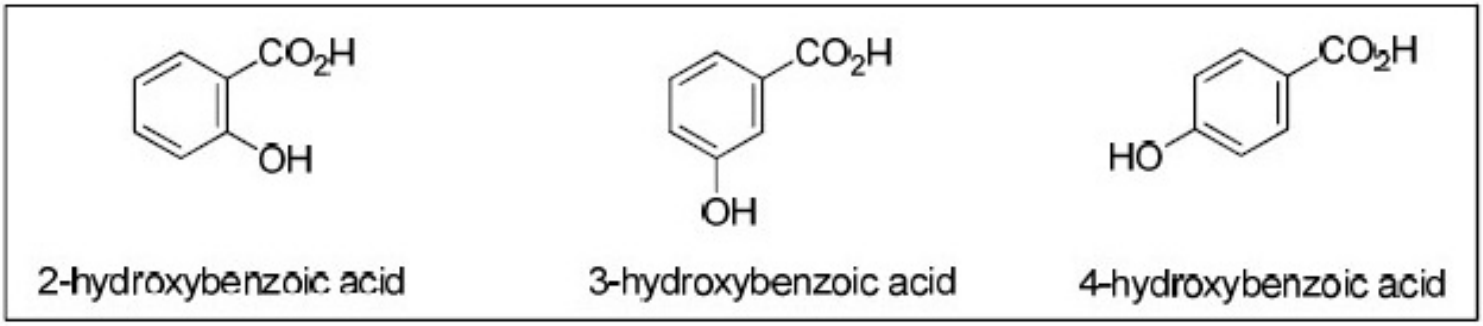
Answer: D

Solution:

Solution:

Question 81

Acidity of compounds is decided by several factors including electrometric effects, H -bonding, aromaticity etc. for acids and their conjugate bases. Pick the correct statement. pK_a of



Options:

A. 2-hydroxybenzoic acid > 3-hydroxybenzoic acid >4-hydroxybenzoic acid

B. 4-hydroxybenzoic acid > 3-hydrox ybenzoic acid > 2-hydroxybenzoic acid

C. 3-hydroxybenzoic acid > 2-hydroxybenzoic acid > 4-hydroxybenzoic acid

D. 4-hydroxybenzoic acid ≈ 2-hydroxybenzoic acid > 3-hydroxybenzoic acid

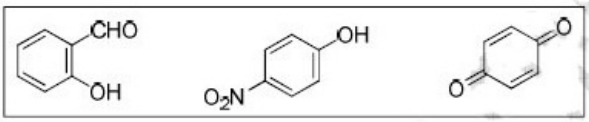
Answer: B

Solution:

Solution:

Question 82

The following statements are on the reactivity of phenols. Pick the WRONG statement.



Options:

A. Bubbling carbon dioxide through a solution of phenol in aqueous sodium hydroxide followed by acidification gives 2-hydroxybenzoic acid (salicylic acid)

B. Treatment of phenol with chloroform in the presence of sodium hydroxide followed by acidification of the reaction mixture gives 2-hydroxybenzaldehyde (salicylaldehyde)

C. Phenol on treatment with concentrated nitric acid gives 4-nitrophenol as the only product

D. Phenol on oxidation with sodium dichromate in the presence of concentrated sulfuric acid gives 1,4-benzoquinone

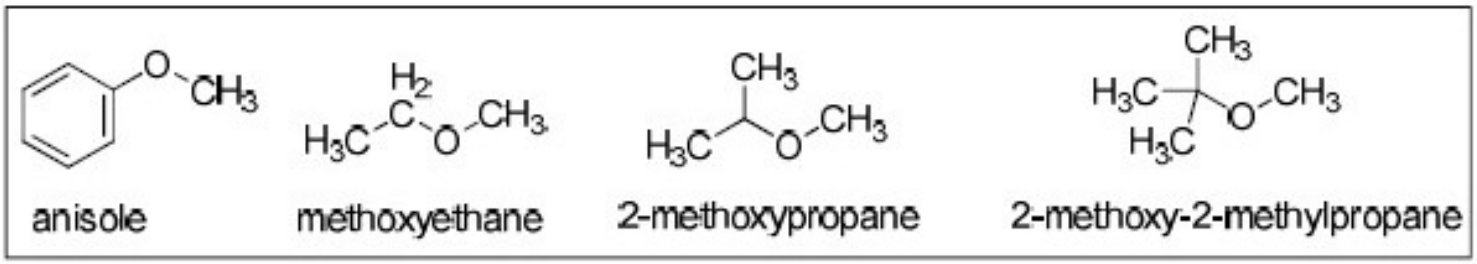
Answer: C

Solution:

Solution:

Question 83

On refluxing with constant boiling hydroiodic acid (57\% HI in water), most methyl ethers are cleaved to give methyl iodide and an alcohol as the products. Which among the following methyl ethers is most likely to give methanol instead of methyl iodide upon treatment with constant boiling HI ?



Options:

A. anisole

B. methoxyethane

C. 2-methoxypropane

D. 2-methoxy-2-methylpropane

Answer: D

Solution:

Solution:

Question 84

Carbonyl compounds can be separated from aliphatic hydrocarbons by

Options:

A. extraction with acid

B. extraction with base

C. as bisulfite addition compounds by treating with sodium bisulfite

D. as picrates by treating with picric acid

Answer: C

Solution:

Solution:

Question 85

Which among the following methods is NOT suitable for the preparation of hydrocarbons?

Options:

A. Meerwein-Verley-Ponndorf reduction of aldehydes

B. Clemmensen reduction of ketones

C. Wolff-Kishner reduction of aldehydes

D. Treatment of alkyl chlorides with metallic sodium in dry ether

Answer: A

Solution:

Solution:

Question 86

An organic compound gave positive tests with 2,4-DNP reagent, Tollens reagent and Fehling solution. Upon treatment with iodine in the presence of sodium hydroxide it gave iodoform and methanoic acid. The compound most probably is

Options:

A. methanal

B. ethanal

C. ethanoic acid

D. acetone

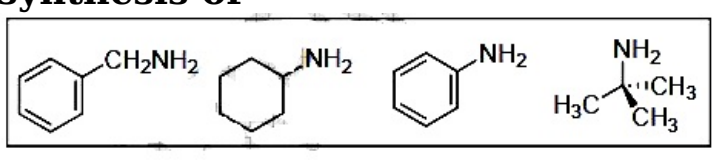
Answer: B

Solution:

Solution:

Question 87

Gabriel phthalimide synthesis is NOT a viable method for the direct synthesis of



Options:

A. benzylamine

B. cyclohexanamine

C. aniline

D. 2-methylpropan-2-amine

Answer: C

Solution:

Solution:

Question 88

While H_2S and H_2 Se are gases, H_2O is liquid due to

Options:

A. smaller size of oxygen

B. arrangement of molecules

C. presence of H-bonding

D. difference in bonding of their molecule

Answer: C

Solution:

Solution:

Question 89

Cd and Cu can be separated and analyzed using

Options:

A. KCN

B. H_2S

C. NH_4OH

D. H_2SO_4

Answer: A

Solution:

Solution:

Question 90

What will be the product of the reaction $_{26}Fe^{58}$ (d, p)?

Options:

A. $_{25}Mn^{59}$

B. $_{26}Fe^{60}$

C. $_{26}Fe^{59}$

D. $_{25}Mn^{60}$

Answer: C

Solution:

Solution:

Question 91

$[Cu(NH_3)_4]^{2+}$ ion has a structure.

Options:

A. square planar

B. trigonal

C. pyramidal

D. tetrahedral

Answer: A

Solution:

Solution:

Question 92

In Ellingham diagram, the slope obtained is equal to

Options:

A. ΔG

B. ΔH

C. ΔS

D. ΔE

Answer: C

Solution:

Solution:

Question 93

How many 2c-2e centered bonds are present in diborane?

Options:

A. 5

B. 6

C. 4

D. 7

Answer: C

Solution:

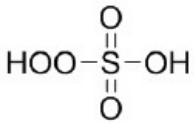
Solution:

Question 94

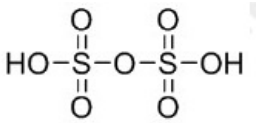
Choose the correct structure for Caro's acid.

Options:

A.



B.



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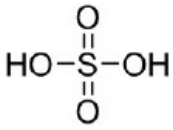
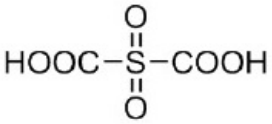


D.



Answer: A

Solution:

Solution:

Question 95

Balmer lines are observed in

Options:

A. UV region

B. IR region

C. microwave region

D. visible region

Answer: D

Solution:

Solution:

Question 96

Hybridization of Mn in $KMnO_4$ is

Options:

A. sp^2

B. sp^2d

C. dsp^2

D. sp^3

Answer: D

Solution:

Solution:

Question 97

The magnetic moment for the complex $[CoF_6]^{3-}$ is

Options:

A. 4.89 BM

B. 1.73 BM

C. 0 BM

D. 5.90 BM

Answer: A

Solution:

Solution:

Question 98

With respect to diamond and graphite, which of the following statement is CORRECT?

Options:

A. Graphite is lower thermal conductor than diamond

B. Graphite is harder than diamond

C. Graphite is lower bond order than diamond

D. Graphite has higher electrical conductivity than diamond

Answer: D

Solution:

Solution:

Question 99

The hybridisation and magnetic behavior of complexes $[Ni(CO)_4]$ and

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

Options:

A. dsp^2 and sp^3, both are paramagnetic

B. dsp^2 and sp^3, both are diamagnetic

C. sp^3 and dsp^2, paramagnetic and diamagnetic

D. sp^3 and dsp^2, both are diamagnetic

Answer: D

Solution:

Solution:

Question 100

Two electrons occupying the same orbital are distinguished by

Options:

A. Magnetic quantum number

B. Azimuthal quantum number

C. Spin quantum number

D. Principal quantum number

Answer: C

Solution:

Solution:

Question 101

The number of onto functions from {1, 2, ..., n} to itself is

Options:

A. n

B. $n - 1$

C. $(n - 1)$!

D. n !

Answer: D

Solution:

Solution:

Question 102

$\lim_{x \to \frac{\pi}{6}} \frac{2\sin^2 x + \sin x - 1}{2\sin^2 x - 3\sin x + 1}$ **is equal to**

Options:

A. 3

B. -3

C. 6

D. 0

Answer: B

Solution:

Solution:

Question 103

For any complex number z, the minimum value of |z|+ | z − 2i| is

Options:

A. 0

B. 1

C. 2

D. $\sqrt{3}$

Answer: C

Solution:

Solution:

Question 104

Let f (x) = a + bx | +cx|^2, where a, b and c are real constants. Then f ′(0)

exists if

Options:

A. b = 0

B. c = 0

C. a = 0

D. b = c

Answer: A

Solution:

Solution:

Question 105

The equation of the circle passing through (1, −3) and the points common to the two circles $x^2 + y^2 - 6x + 8y - 16 = 0$ and $x^2 + y^2 + 4x - 2y - 8 = 0$ is

Options:

A. $x^2 + y^2 - 4x + 6y + 24 = 0$

B. $2x^2 + 2y^2 + 3x + y - 20 = 0$

C. $3x^2 + 3y^2 - 5x + 7y - 19 = 0$

D. $x^2 + y^2 + 4x - 6y + 24 = 0$

Answer: B

Solution:

Solution:

Question 106

Let $f(x) = \int_1^x \sqrt{2-t^2}\, dt$. Then the roots of the equation $x^2 - f'(x) = 0$ are

Options:

(A) ± 1

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

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

(D) 0 and 1

Answer: A

Solution:

Question 107

If $\left(\vec{i}+\vec{j}-\vec{k}\right)\times\left(3\vec{i}+a\vec{j}+b\vec{k}\right)=0$, then the values of a and b are

Options:

A. a = 1, b = 3

B. a = −3, b = 3

C. a = 3, b = −3

D. a = $\frac{1}{3}$, b = $\frac{-1}{3}$

Answer: C

Solution:

Solution:

Question 108

The number of ways that a ring can be made out of 6 black and 4 white men standing on a ring, so that all the white men come together is

Options:

A. 8564

B. 8640

C. 8644

D. 8665

Answer: B

Solution:

Solution:

Question 109

In the interval 0 < x < 2, the function f (x) = x^2 has

Options:

A. maximum = 2 and minimum = 0

B. maximum = 4 and minimum = 0

C. no maximum and no minimum

D. some maximum but no minimum

Answer: C

Solution:

Solution:

Question 110

For the curve y = 5x − 2x^3, if x increases at the rate of 2 units/sec then at x = 3, the slope of the curve is changing at

Options:

A. 12 units/sec

B. -49 units/sec

C. -72 units/sec

D. 72 units/sec

Answer: C

Solution:

Solution:

Question 111

The LCM of smallest two digit composite number and the smallest composite number is

Options:

A. 12

B. 4

C. 20

D. 44

Answer: C

Solution:

Solution:

Question 112

The number of binary operations on a set {1, 2, 3} is

Options:

A. 3

B. 3^2

C. 3^3

D. 3^9

Answer: D

Solution:

Solution:

Question 113

The angle between two vectors $\vec{a}$ and $\vec{b}$ with respective magnitude 2 and 3 such that $\vec{a} \cdot \vec{b} = 3$ is

Options:

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

B. 0

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

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

Answer: D

Solution:

Solution:

Question 114

The mean of n observation is $\bar{x}$. If the first observation is increased by 1 , second by 2 , the third by 3 , and so on, then the new mean is

Options:

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

B. $\bar{x} + \frac{n+1}{2}$

C. $\bar{x} + (n + 1)$

D. $\bar{x} - \frac{n+1}{2}$

Answer: B

Solution:

Solution:

Question 115

The domain of the function f (t) = $\sqrt{t - \frac{t}{1-t}}$ is

Options:

A. $[1, \infty)$

B. $(-\infty, 1)$

C. $(-\infty, 1]$

D. $(1, \infty) \cup \{0\}$

Answer: D

Solution:

Solution:

Question 116

For every natural number n, $2^{3n} - 1$ is divisible by

Options:

A. 6

B. 16

C. 8

D. 7

Answer: D

Solution:

Solution:

Question 117

If x, y and z be greater than 1 , then the

Options:

A. $\log x \log y \log z$

B. $\log x + \log y + \log z$

C. 0

D. $1-(\log x \log y \log z)$

Answer: C

Solution:

Solution:

Question 118

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

Options:

A. -4

B. -12

C. 12

D. 4

Answer: B

Solution:

Solution:

Question 119

Let P be a 2 × 2 matrix.
Statement-1: adj(adj P) = P
Statement-2: |adj P| = | P|

Options:

A. Statement-1 is true, Statement-2 is false

B. Statement-1 is false, Statement-2 is true

C. Statement-1 is true, Statement-2 is true; Statement-2 is a correct explanation for Statement-1

D. Statement-1 is true, Statement-2 is true; Statement-2 is not a correct explanation for Statement-1

Answer: D

Solution:

Solution:

Question 120

If a line is equally inclined with the coordinate axes, then the angle of inclination is

Options:

A. $\cos^{-1}\left(\frac{1}{2}\right)$

B. $\cos^{-1}\left(\frac{1}{\sqrt{2}}\right)$

C. $\cos^{-1}\left(\frac{\sqrt{3}}{2}\right)$

D. $\cos^{-1}\left(\frac{1}{\sqrt{3}}\right)$

Answer: D

Solution:

Solution:

Question 121

Solution set of $|2x - 3| < |x + 2|$ is

Options:

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

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

C. $\left(\frac{1}{3}, 5\right)$

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

Answer: C

Solution:

Solution:

Question 122

If $\sin^x\alpha + \cos^x\alpha \geq 1$, $0 < \alpha < \frac{\pi}{2}$, then

Options:

A. $x \in [2, \infty)$

B. $x \in (-\infty, 2]$

C. $x \in [-1, 1]$

D. $x \in [0, 1]$

Answer: B

Solution:

Solution:

Question 123

The maximum value of $8\cos x + 6\sin x$ is

Options:

A. 1

B. 5

C. 10

D. 100

Answer: C

Solution:

Solution:

Question 124

If $\tan x + \tan\left(x + \frac{\pi}{3}\right) + \tan\left(x + \frac{2\pi}{3}\right) = 3$, which of the following values is equal to 1?

Options:

A. $\tan x$

B. $\tan 2x$

C. $\tan 3x$

D. $\tan 4x$

Answer: C

Solution:

Solution:

Question 125

The value of the expression $1-\frac{\sin^2 y}{1+\cos y}+\frac{1+\cos y}{\sin y}-\frac{\sin y}{1-\cos y}$ is equal to

Options:

A. 0

B. 1

C. sin y

D. cos y

E.

Answer: D

Solution:

Solution:

Question 126

The value of i^i is

Options:

A. $e^{\frac{\pi}{2}}$

B. $e^{\frac{i\pi}{2}}$

C. $e^{\frac{-i\pi}{2}}$

D. $e^{\frac{-\pi}{2}}$

Answer: D

Solution:

Solution:

Question 127

The complex number $\sqrt{2}i$ equals

Options:

A. $2 + i$

B. $1 + i$

C. $1 - i$

D. $2 - i$

Answer: B

Solution:

Solution:

Question 128

If a = p + q, b = pω + qω^2, c = pω^2 + qω, where ω is the cube root of unity, then the product of a, b and c is equal to

Options:

A. $(p + q)^3$

B. $p^3 + q^3$

C. $p^3 - q^3$

D. $(p + q)^3 + 3pq(p + q)$

Answer: B

Solution:

Solution:

Question 129

The equation $z\bar{z} + p\bar{z} + \bar{p}z + q = 0, q \in$ □ represents a circle, if

Options:

A. $|p|^2 = q$

B. $|p|^2 > q$

C. $|q|^2 = b$

D. $pq = 1$

Answer: B

Solution:

Solution:

Question 130

Let a, b, c be three distinct real numbers and they are in a Geometric Progression. If a + b + c = xb, then

Options:

A. $x \leq -1$ or $x \geq 3$

B. $x < -1$ or $x > 3$

C. $x < -3$ or $x > 2$

D. $x \leq -3$ or $x \geq 2$

Answer: A

Solution:

Solution:

Question 131

If the sum of the first n terms of a series be $5n^2 + 2n$, then its third term is

Options:

A. 11

B. 17

C. 23

D. 27

Answer: D

Solution:

Solution:

Question 132

Given that $\cos(x - y)$, $\cos x$, $\cos(x + y)$ are in HP. Then $\cos x \sec \frac{y}{2}$ is equal to

Options:

A. $\sqrt{2}$

B. $\pm\sqrt{2}$

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

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

Answer: B

Solution:

Solution:

Question 133

Let $x^2 + y^2 = t + \frac{1}{t}$ and $x^4 + y^4 = t^2 + \frac{1}{t^2}$. Then $\frac{dy}{dx}$ is equal to

Options:

A. $\frac{y}{x}$

B. $\frac{x}{y}$

C. $-\frac{y}{x}$

D. $-\frac{x}{y}$

Answer: C

Solution:

Solution:

Question 134

Let $f(x) = \sin x$, $g(x) = 2x$ and $h(x) = \cos x$. If $\varphi(x) = [g \circ f \circ h](x)$, then $\phi''\left(\frac{\pi}{4}\right)$ is equal to

Options:

A. -4

B. 4

C. 1

D. 0

Answer: A

Solution:

Solution:

Question 135

If $y = \cos^2 \frac{3x}{2} - \sin^2 \frac{3x}{2}$, then $\frac{d^2y}{dx^2}$ equals

Options:

A. $-3\sqrt{1-y^2}$

B. 9y

C. $-9y$

D. $3\sqrt{1-y^2}$

Answer: C

Solution:

Solution:

Question 136

A rectangle ABCD, where A = (0, 0), B = (4, 0), C = (4, 2), D = (0, 2), undergoes the following transformations successively.
(i) $f_1(x, y) \rightarrow (y, x)$
(ii) $f_2(x, y) \rightarrow (x + 3y, y)$
(iii) $f_3(x, y) \rightarrow \left(\frac{x-y}{2}, \frac{x+y}{2} \right)$
The final figure will be

Options:

A. a square

B. a rhombus

C. a rectangle

D. a parallelogram

Answer: D

Solution:

Solution:

Question 137

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

Options:

A. (2, 3)

B. $(2 + \sqrt{2}, 3 + \sqrt{2})$

C. $(2 - \sqrt{2}, 3 - \sqrt{2})$

D. (3, 2)

Answer: A

Solution:

Solution:

Question 138

If 5x − 12y + 10 = 0 and 12y − 5x + 16 = 0 are two tangents to a circle, then the radius of the circle is

Options:

A. 1

B. 2

C. 4

D. 6

Answer: A

Solution:

Solution:

Question 139

The equation of the tangents to the circle $x^2 + y^2 = 13$ at the points, whose absissa is 2 , are

Options:

A. 2x + 3y = 13 and 2x − 3y = 13

B. 3x + 2y = 13 and 2x − 3y = 13

C. 2x + 3y = 13 and 3x − 2y = 13

D. 3x + 2y = 13 and 3x − 2y = 13

Answer: A

Solution:

Solution:

Question 140

The equation of a common tangent to the circle $x^2 + y^2 = 2$ and the parabola $y^2 = 8x$ is

Options:

A. $y = x + 1$

B. $y = x + 2$

C. $y = x - 2$

D. $y = -x + 2$

Answer: B

Solution:

Solution:

Question 141

The latus rectum of an ellipse is equal to one-half of its minor axis. The eccentricity of the ellipse is

Options:

A. $\frac{1}{\sqrt{6}}$

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

C. $\frac{\sqrt{3}}{4}$

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

Answer: B

Solution:

Solution:

Question 142

The image of the interval [1, 3] under the mapping f : □→□, given by

$f(x) = 2x^3 - 24x + 107$ is

Options:

A. [0, 89]

B. [75, 89]

C. [85, 89]

D. [75, 0]

Answer: B

Solution:

Solution:

Question 143

The value of $\lim_{x \to 0} \left(\frac{1 + 5x^2}{1 + 3x^2} \right)^{\frac{1}{x^2}}$ is equal to

Options:

A. e^2

B. e

C. e^{-1}

D. e^{-2}

Answer: A

Solution:

Solution:

Question 144

$\lim_{n \to \infty} \left[\frac{1}{1 \cdot 2} + \frac{1}{2 \cdot 3} + \frac{1}{3 \cdot 4} + \ldots + \frac{1}{n \cdot (n + 1)} \right]$ is equal to

Options:

A. 1

B. -1

C. 0

D. 2

Answer: A

Solution:

Solution:

Question 145

If $\lim_{x \to \infty} \left(\frac{x^3+1}{x^2+1} - (ax+b) \right) = 2$, then

Options:

A. a = 1 and b = 1

B. a = 1 and b = −1

C. a = 1 and b = −2

D. a = 1 and b = 2

Answer: C

Solution:

Solution:

Question 146

If $f'(x) = \frac{1}{1+x^2}$ for all real x and f (0) = 0, then

Options:

A. f (2) < 0.4

B. f (2) > 2

C. 0.4 < f (2) < 2

D. f (2) = 2

Answer: C

Solution:

Solution:

Question 147

$\int \frac{x^4 + x^2 + 1}{x^2 - x + 1}$ dx is equal to

Options:

A. $\frac{x^3}{3} - \frac{x^2}{2} + x + c$

B. $\frac{x^3}{3} + \frac{x^2}{2} + x + c$

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

D. $\frac{x^3}{3} + \frac{x^2}{2} - x + c$

Answer: B

Solution:

Solution:

Question 148

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

Options:

A. $\log(\sin^{-1}x) + c$

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

C. $\log\left(\sqrt{1 - x^2}\right) + c$

D. $\sin(\cos^{-1}x) + c$

Answer: B

Solution:

Solution:

Question 149

The solution of the differential equation $\frac{d^2y}{dx^2} = e^{-2x}$ is $y = c_1e^{-2x} + c_2x + c_3$, where c_1 is

Options:

A. 1

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

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

D. 2

Answer: B

Solution:

Solution:

Question 150

The area of the triangle having vertices as $\hat{i} - 2\hat{j} + 3\hat{k}$, $-2\hat{i} + 3\hat{j} - \hat{k}$, $4\hat{i} - 7\hat{j} + 7\hat{k}$ is

Options:

A. 36 sq unit

B. 0 sq unit

C. 39 sq unit

D. 11 sq unit

Answer: B

Solution:

Solution:

Question 151

If the position vectors of A, B and C are respectively $2\hat{i} - \hat{j} + \hat{k}$, $\hat{i} - 3\hat{j} - 5\hat{k}$, and $3\hat{i} - 4\hat{j} - 4\hat{k}$, then $\cos^2 A$ is equal to

Options:

A. 0

B. $\frac{6}{41}$

C. $\frac{35}{41}$

D. 1

Answer: C

Solution:

Solution:

Question 152

Let * be the binary operation defined by a * b = a + b + a . b for a, b ∈ R where R be the set of all real numbers. Then

Options:

A. (R\{−1}, *) is an abelian group

B. (R\{−1}, *) is a group

C. (R\{0}, *) is an abelian group

D. (R\{0}, *) is a group

Answer: A

Solution:

Solution:

Question 153

Assume that $\begin{bmatrix} 0 & a \\ b & 0 \end{bmatrix}^4 = I$. Then

Options:

A. a = 1 = 2b

B. a = b

C. $a = b^2$

D. ab = 1

Answer: D

Solution:

Solution:

Question 154

If $\Delta = \begin{vmatrix} a_1 & b_1 & c_1 \\ a_2 & b_2 & c_2 \\ a_3 & b_3 & c_3 \end{vmatrix}$ and $A_1, B_1, C_1 \ldots$ are the cofactors of $a_1, b_1, c_1 \ldots\ldots$ then $a_1A_2 + b_1B_2 + c_1C_2$ is equal to

Options:

A. Δ

B. 0

C. $-\Delta$

D. Δ^2

Answer: B

Solution:

Solution:

Question 155

The value of $\sqrt{12 + \sqrt{12 + \sqrt{12 + \ldots\ldots\ldots}}}$ is

Options:

A. 3.9242

B. 3.4646

C. 2.0000

D. 4.0000

Answer: D

Solution:

Solution:

Question 156

If $\cos x$ is an integrating factor of the differential equation $\frac{dy}{dx} + Py = Q$, then P =

Options:

A. $-\cot x$

B. $\cot x$

C. $\tan x$

D. $-\tan x$

Answer: D

Solution:

Solution:

Question 157

The particular integral of $f(D)y = 2^x + 2^2$ is

Options:

A.

$\frac{1}{f(0)}x^2 + \frac{1}{f(1)}2^2$, where $f(0), f(1) \neq 0$

B.

$\frac{1}{f(\log 2)}2^x + \frac{1}{f(0)}2^2$, where $f(\log 2), f(0) \neq 0$

C.

$\frac{1}{f(0)}2^x + \frac{1}{f(\log 2)}2^2$, where $f(\log 2), f(0) \neq 0$

D.

$\frac{1}{f(\log 2)}(2^x + 2^2)$, where $f(\log 2) \neq 0$

Answer: B

Solution:

Solution:

Question 158

$\lim_{x \to \infty} \left(\frac{4 - x^2}{x^2 - 1} \right)$ **is equal to**

Options:

A. 1

B. 0

C. -4

D. -1

Answer: D

Solution:

Solution:

Question 159

$\int \frac{1}{x \ln x} dx$ is equal to

Options:

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

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

C. $\ln(x \ln x) + c$

D. $\ln(\ln x) + c$

Answer: D

Solution:

Solution:

Question 160

The maximum value of the function f (x) = $\frac{e^{\sin x}}{e^{-\cos x}}$ is

Options:

A. $\sin(e^2)$

B. e

C. 1

D. $e^{\sqrt{2}}$

Answer: D

Solution:

Solution:

Question 161

The solution of the equation $|z| - z = 1 + i$ is

Options:

A. i

B. $-i$

C. $1 + i$

D. $1 - i$

Answer: B

Solution:

Solution:

Question 162

Let A be the set of all z satisfying $\log_{\frac{1}{3}} \log_{\frac{1}{2}} (|z|^2 + 4z | + 3) < 0$. Then A is

Options:

A. an empty set

B. an infinite set

C. $\{z: | z | = 0\}$

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

Answer: A

Solution:

Solution:

Question 163

If

$$\sin^{-1}\left(x - \frac{x^2}{2} + \frac{x^3}{4} - \frac{x^4}{8} + \ldots\right) + \cos^{-1}\left(x^2 - \frac{x^4}{2} + \frac{x^6}{4} - \frac{x^4}{8} + \ldots\right) = \frac{\pi}{2}$$

for $0 < | x | < \sqrt{2}$, then x equals

Options:

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

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

C. 0

D. 1

Answer: D

Solution:

Solution:

Question 164

Which of the following functions is differentiable at x = 0 ?

Options:

A. $\cos(|x|) + |x|$

B. $\cos(|x|) - |x|$

C. $\sin(|x|) + |x|$

D. $\sin(|x|) - |x|$

Answer: D

Solution:

Solution:

Question 165

If P(A cup B) = P(A) + P(B) − P(A)P(B), then

Options:

A. $P\left(\frac{B}{A}\right) = P(B) - P(A)$

B. $P(A' \cup B') = P(B') - P(A')$

C. $P((A \cup B')) = P(B')$

D. $P\left(\frac{A}{B}\right) = P(A)$

Answer: D

Solution:

Solution:

Question 166

If A = $\begin{bmatrix} \cos x & \sin x \\ -\sin x & \cos x \end{bmatrix}$, 0 < x < $\frac{\pi}{2}$ and A + A′ = I , then the value of x is

Options:

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

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

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

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

Answer: A

Solution:

Solution:

Question 167

The maximum and minimum values of the function f (x) = | sin 2x + 3| are respectively

Options:

A. (4, 2)

B. (2, 4)

C. (2, −3)

D. (2, 1)

Answer: A

Solution:

Solution:

Question 168

The area of the region bounded by the curve |x| + y = 1 and the axis of x is given by

Options:

A. 2

B. 10

C. 1

D. 4

Answer: C

Solution:

Solution:

Question 169

The ratio in which the area bounded by the curves $y^2 = 12x$ and $x^2 = 12y$ is divided by the line x = 3, is

Options:

A. 19 : 49

B. 15 : 49

C. 12 : 37

D. 1 : 3

Answer: B

Solution:

Solution:

Question 170

The line y = mx bisects the area enclosed by the lines x = 0, y = 0, x = $\frac{3}{2}$ and the curve $y = 1 + 4x - x^2$. The value of m is

Options:

A. $\frac{13}{6}$

B. $\frac{13}{8}$

C. $\frac{8}{13}$

D. $\frac{6}{13}$

Answer: A

Solution:

Solution:

Question 171

The value of the integral $\int_1^3 \sqrt{(2x+3)(3x^2+4)}\,dx$ cannot exceed

Options:

A. $\sqrt{48}$

B. $\sqrt{66}$

C. $\sqrt{73}$

D. $\sqrt{6}$

Answer: B

Solution:

Solution:

Question 172

Let * be a binary operation, on the set of all non-zero real numbers, given by $a * b = \frac{ab}{5}$ for all $a, b \in R - \{0\}$. Then the value of ' x ' such that $2 * (x * 5) = 10$, is

Options:

A. 31

B. 22

C. 25

D. 43

Answer: C

Solution:

Solution:

Question 173

If the points $(au^2, 2au)$ and $(av^2, 2av)$ are the extremities of a focal chord of the parabola $y^2 = 4ax$, then

Options:

A. $uv - 1 = 0$

B. $uv + 1 = 0$

C. $u + v = 0$

D. $u - v = 0$

Answer: B

Solution:

Solution:

Question 174

For a constant a, the line $y = 2a^2$ meets the ellipse $\frac{x^2}{9} + \frac{y^2}{4} = 1$ at the real points if

Options:

A. $|a| \leq 1$

B. $|a| > 1$

C. $|a| < 3$

D. $-\infty < |a|$

Answer: A

Solution:

Solution:

Question 175

The mirror image of the directrix of the parabola $y^2 = 4(x + 1)$ in the line mirror $x + 2y = 3$ is

Options:

A. $x = -2$

B. $4y + 3x = 16$

C. $3x - 4y = -16$

D. $y = -1$

Answer: C

Solution:

Solution:

Question 176

The curve represented by $x = 3(\cos t + \sin t)$ and $y = 4(\cos t - \sin t)$ is

Options:

A. an ellipse

B. a parabola

C. a hyperbola

D. a circle

Answer: A

Solution:

Solution:

Question 177

Given $E(X + c) = 8$ and $E(X - c) = 12$ then the value of c is

Options:

A. -2

B. 4

C. -4

D. 2

Answer: A

Solution:

Solution:

Question 178

A random variable X has the following probability distribution:

X	0	1	2	3	4	5	6	7	8
$P(X = x)$	a	$3a$	$5a$	$7a$	$9a$	$11a$	$13a$	$15a$	$17a$

The value of ' a ' is

Options:

A. $\frac{7}{81}$

B. $\frac{5}{81}$

C. $\frac{1}{81}$

D. $\frac{2}{81}$

Answer: C

Solution:

Solution:

Question 179

If $\sin\left(\sin^{-1}\left(\frac{1}{5}\right) + \cos^{-1}x\right) = 1$, then the value of x is

Options:

A. $\frac{32}{31}$

B. $\frac{31}{32}$

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

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

Answer: D

Solution:

Solution:

Question 180

The equation of the normal to the curve $y = 1 - 2^{\frac{x}{2}}$ at the point of intersection with the y-axis is

Options:

A. $2y - x\log 2 = 0$

B. $2x - y\log 2 = 0$

C. $y - x\log 2 = 0$

D. $2y + x = 0$

Answer: B

Solution:

Solution:

Question 181

If $y = x^2 + ax + b$ attains the minimum value 5 at $x = 3$, then the values of a and b are

Options:

A. $a = 6, b = -14$

B. $a = -6, b = 14$

C. $a = 14, b = -6$

D. $a = -14, b = 6$

Answer: B

Solution:

Solution:

Question 182

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

Options:

A. 16

B. 32

C. 64

D. 0

Answer: C

Solution:

Solution:

Question 183

If the volume of a parallelepiped whose edges are represented by $-12\vec{i}+\lambda\vec{k}$, $3\vec{j}-\vec{k}$ and $2\vec{i}+\vec{j}-15\vec{k}$ is 546 , then the value of λ is

Options:

A. 3

B. -5

C. -179

D. 179

Answer: D

Solution:

Solution:

Question 184

If $3f(x)+5f\left(\frac{1}{x}\right)=\frac{1}{x}-3,\ \forall x(\neq 0)\in R$, then $f(x)=$

Options:

A. $\frac{1}{16}\left(\frac{3}{x}+5x-6\right)$

B. $\frac{1}{16}\left(-\frac{3}{x}+5x-6\right)$

C. $\frac{1}{16}\left(-\frac{3}{x}+5x+6\right)$

D. $\frac{1}{16}\left(-\frac{3}{x}-5x+6\right)$

Answer: B

Solution:

Solution:

Question 185

If 1, ω, ω^2 are the three cube roots of unity, then $(1-\omega+\omega^2)(1-\omega^2+\omega^4)(1-\omega^4+\omega^8)\ldots$ to 2n factors is equal to

Options:

A. 2^n

B. 2^{2n}

C. 2^{4n}

D. 2^{3n}

Answer: B

Solution:

Solution:

Question 186

For the equation $|x^2| + |x| - 6 = 0$, the roots are

Options:

A. real and equal

B. real with sum 0

C. real with sum 1

D. real with product 0

Answer: B

Solution:

Solution:

Question 187

If A = $\begin{bmatrix} 1 & 2 & -1 \\ -1 & 1 & 2 \\ 2 & -1 & 1 \end{bmatrix}$ **, then det[adj(adj A)] is**

Options:

A. 14^4

B. 14^3

C. 14^2

D. 14^1

Answer: A

Solution:

Solution:

Question 188

If Δ = $\begin{vmatrix} 1 & 3\cos\theta & 1 \\ \sin\theta & 1 & 3\cos\theta \\ 1 & \sin\theta & 1 \end{vmatrix}$ **, then the maximum value of Δ is**

Options:

A. 10

B. 11

C. 12

D. 14

Answer: A

Solution:

Solution:

Question 189

The value of the sum of the series
$14C_0 \cdot 15C_1 + 14C_1 \cdot 15C_2 + \ldots 14C_{14} \cdot 15C_{15}$ is

Options:

A. $29C_{12}$

B. $29C_{10}$

C. $29C_{14}$

D. $29C_{16}$

Answer: C

Solution:

Solution:

Question 190

Let a_n be the n^{th} term of the G.P of positive numbers. Let $\sum_{n=1}^{100} a_{2n} = \alpha$ and $\sum_{n=1}^{100} a_{2n-1} = \beta$, such that $\alpha \neq \beta$. Then the common ratio is

Options:

A. $\frac{\alpha}{\beta}$

B. $\frac{\beta}{\alpha}$

C. $\sqrt{\frac{\alpha}{\beta}}$

D. $\sqrt{\frac{\beta}{\alpha}}$

Answer: A

Solution:

Solution:

Question 191

$\lim_{x \to 0} \frac{e^x + e^{-x} + 2\cos x - 4}{x^4}$ **is equal to**

Options:

A. 0

B. 1

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

D. $-\frac{1}{6}$

Answer: C

Solution:

Solution:

Question 192

The value of k so that the equations $x^2 - x - 12 = 0$ and $kx^2 + 10x + 3 = 0$ may have one root in common, is

Options:

A. 5

B. -2

C. 3

D. 2

Answer: C

Solution:

Solution:

Question 193

If f and g be differentiable functions satisfying $g'(a) = 2$, $g(a) = b$ and $f \circ g = I$, then $f'(b)$ is equal to

Options:

A. 2

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

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

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

Answer: C

Solution:

Solution:

Question 194

$\int \frac{\sqrt{1+\sqrt{x}}}{x} dx$ is equal to

Options:

A. $2\sqrt{1+\sqrt{x}} - 2\log\left(\frac{\sqrt{1+\sqrt{x}}-1}{\sqrt{1+\sqrt{x}}+1}\right) + C$

B. $4\sqrt{1+\sqrt{x}} - 2\log\left(\frac{\sqrt{1+\sqrt{x}}-1}{\sqrt{1+\sqrt{x}}+1}\right) + C$

C. $4\sqrt{1+\sqrt{x}} + 2\log\left(\frac{\sqrt{1+\sqrt{x}}-1}{\sqrt{1+\sqrt{x}}+1}\right) + C$

D. $2\sqrt{1+\sqrt{x}} + 2\log\left(\frac{\sqrt{1+\sqrt{x}}-1}{\sqrt{1+\sqrt{x}}+1}\right) + C$

Answer: C

Solution:

Solution:

Question 195

A book contains 1,000 pages. A page is chosen at random. The probabilities that the sum of the digits of the marked number on the page is equal to 9 , is

Options:

A. $\frac{23}{500}$

B. $\frac{11}{200}$

C. $\frac{7}{100}$

D. $\frac{7}{500}$

Answer: B

Solution:

Solution:

Question 196

If $\left|\vec{a}\right| = 10, \left|\vec{b}\right| = 2$ and $\vec{a} \cdot \vec{b} = 12$, then the value of $\left|\vec{a} \times \vec{b}\right|$ is

Options:

A. 5

B. 10

C. 14

D. 16

Answer: D

Solution:

Solution:

Question 197

A plane meets the coordinate axes in points A, B and C and the centroid of the triangle ABC is (α, β, γ). Then the equation of the plane is

Options:

A. $\frac{x}{\alpha} + \frac{y}{\beta} + \frac{z}{\gamma} = 1$

B. $\frac{x}{\alpha} + \frac{y}{\beta} + \frac{z}{\gamma} = 3$

C. $\alpha x + \beta y + \gamma = 3$

D. $\alpha x + \beta y + \gamma = \frac{1}{3}$

Answer: B

Solution:

Solution:

Question 198

The reflection of the point (α, β, γ) in the XOY − plane is

Options:

A. (α, β, 0)

B. (0, 0, γ)

C. (−α, −β, γ)

D. (α, β, −γ)

Answer: D

Solution:

Solution:

Question 199

The mean and variance of a random variable X having binomial distribution are 3 and 2 respectively. Then the probability P(X = 2) is

Options:

A. $\frac{2^7}{3^7}$

B. $\frac{2^9}{3^7}$

C. $\frac{2^7}{3^9}$

D. $\frac{2^9}{3^9}$

Answer: B

Solution:

Solution:

Question 200

A flashlight has 8 batteries out of which 3 are dead. If 2 batteries are selected one after the other without replacement and tested, the probability that both are dead is

Options:

A. $\frac{33}{56}$

B. $\frac{9}{64}$

C. $\frac{1}{14}$

D. $\frac{3}{28}$

Answer: D

Solution:

Solution:
