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VITEEE 2022 Question Paper

Vellore Institute of Technology Engineering Entrance Examination

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Question 1**PART - I (PHYSICS)**

The root mean square speed of smoke particles of mass 5×10^{-17} kg in their Brownian motion in air at NTP is approximately.

[Given $k = 1.38 \times 10^{-23} \text{JK}^{-1}$]

Options:

- A. 60 mm s^{-1}
- B. 12 mm s^{-1}
- C. 15 mm s^{-1}
- D. 36 mm s^{-1}

Answer: C

Solution:

Solution:

Question 2

The equation of a particle executing simple harmonic motion is given by

$x = \sin \pi \left(t + \frac{1}{3} \right) \text{ m}$. At $t = 1 \text{ s}$, the speed of particle will be (Given : $\pi = 3.14$)

Options:

- A. 0 cm s^{-1}
- B. 157 cm s^{-1}
- C. 272 cm s^{-1}
- D. 314 cm s^{-1}

Answer: B

Solution:

Solution:

Question 3

Following are expressions for four plane simple harmonic waves

(i) $y_1 = A \cos 2\pi \left(n_1 t + \frac{x}{\lambda_1} \right)$

(ii) $y_2 = A \cos 2\pi \left(n_1 t + \frac{x}{\lambda_1} + \pi \right)$

(iii) $y_3 = A \cos 2\pi \left(n_2 t + \frac{x}{\lambda_2} \right)$

(iv) $y_4 = A \cos 2\pi \left(n_2 t - \frac{x}{\lambda_2} \right)$

The pairs of waves which will produce destructive interference and stationary waves respectively in a medium, are

Options:

A. (iii, iv), (i, ii)

B. (i, iii), (ii, iv)

C. (i, iv), (ii, iii)

D. (i, ii), (iii, iv)

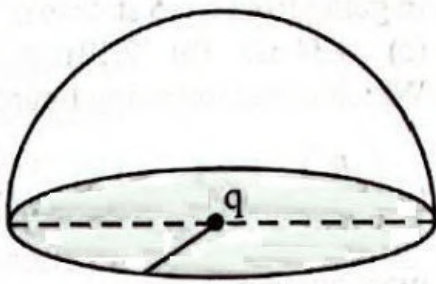
Answer: D

Solution:

Solution:

Question 4

If a charge q is placed at the centre of a closed hemispherical non-conducting surface, the total flux passing through the flat surface would be :



Options:

A. zero

B. $\frac{q}{2\epsilon_0}$

C. $\frac{q}{4\epsilon_0}$

D. $\frac{q}{2\pi\epsilon_0}$

Answer: A

Solution:

Solution:

Question 5

The electric potential $V(x)$ in a region around the origin is given by $V(x) = 4x^2$ volts. The electric charge enclosed in a cube of 1m side with its centre at the origin is (in coulomb)

Options:

A. $8\epsilon_0$

B. $-4\epsilon_0$

C. 0

D. $-8\epsilon_0$

Answer: D

Solution:

Solution:

Question 6

A heater coil is cut into two equal parts and only one part is now used in the heater. The heat generated will now be

Options:

A. four times

B. doubled

C. halved

D. one fourth

Answer: B

Solution:

Solution:

Question 7

In a region, steady and uniform electric and magnetic fields are present. These two fields are parallel to each other. A charged particle is released from rest in this region. The path of the particle will be a

Options:

- A. helix
- B. straight line
- C. ellipse
- D. circle

Answer: B

Solution:

Solution:

Question 8

An object is thrown vertically upwards. At its maximum height, which of the following quantity becomes zero ?

Options:

- A. Momentum
- B. Potential energy
- C. Acceleration
- D. Force

Answer: A

Solution:

Solution:

Question 9



The self induced emf of a coil is 25 volts. When the current in it is changed at uniform rate from 10A to 25 A in 1 s, the change in the

energy of the inductance is:

Options:

- A. 740J
- B. 437.5J
- C. 540J
- D. 637.5J

Answer: B

Solution:

Solution:

Question 10

Alternating current can not be measured by D.C. ammeter because

Options:

- A. Average value of current for complete cycle is zero
- B. A.C. Changes direction
- C. A.C. can not pass through D.C. Ammeter
- D. D.C. Ammeter will get damaged.

Answer: A

Solution:

Solution:

Question 11

The magnetic field of a plane electromagnetic wave is given by:

$$\vec{B} = 2 \times 10^{-8} \sin (0.5 \times 10^3 x + 1.5 \times 10^{11} t) \hat{j} \text{ T} .$$

The amplitude of the electric field would be:

Options:

- A. 6Vm^{-1} along x-axis
- B. 3Vm^{-1} along z-axis
- C. 6Vm^{-1} along z-axis
- D. $2 \times 10^{-8}\text{Vm}^{-1}$ along z-axis

Answer: A

Solution:

Solution:

Question 12

An ideal gas is expanding such that $PT^3 = \text{constant}$. The coefficient of volume expansion of the gas is :

Options:

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

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

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

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

Answer: C

Solution:

Solution:

Question 13

Two light beams of intensities in the ratio of 9 : 4 are allowed to interfere. The ratio of the intensity of maxima and minima will be :

Options:

A. 2 : 3

B. 16 : 81

C. 25 : 169

D. 25 : 1

Answer: B

Solution:

Solution:

Question 14

The deBroglie wavelength of a proton and α -particle are equal. The ratio of their velocities is :

Options:

- A. 4 : 3
- B. 4 : 1
- C. 4 : 2
- D. 1 : 4

Answer: B

Solution:

Solution:

Question 15

The recoil speed of a hydrogen atom after it e in going from $n = 5$ state to $n = 1$ state will be

Options:

- A. 4.34m / s
- B. 2.19m / s
- C. 4.17m / s
- D. 3.25m / s

Answer: C

Solution:

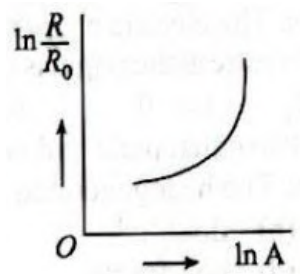
Solution:

Question 16

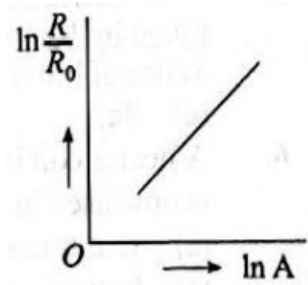
Which of the following figure represents the variation or $\ln \left(\frac{R}{R_0} \right)$ with $\ln A$ (If $R =$ radius of a nucleus and $A =$ its mass number)?

Options:

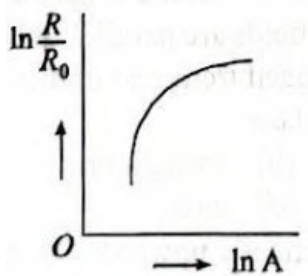
- A.



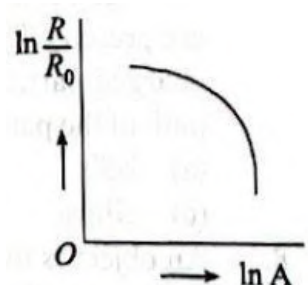
B.



C.



D.



Answer: B

Solution:

Solution:

Question 17

Zener breakdown occurs in a p – n junction having p and n both :

Options:

- A. lightly doped and have wide depletion layer
- B. heavily doped and have narrow depletion layer

C. lightly doped and have narrow depletion layer

D. heavily doped and have wide depletion layer

Answer: B

Solution:

Solution:

Question 18

If E and H represents the intensity of electric field and magnetising field respectively, then the unit of E / H will be :

Options:

A. ohm

B. mho

C. joule

D. newton

Answer: A

Solution:

Solution:

Question 19

A stone of mass m, tied to a string is being whirled in a vertical circle with a uniform speed. The tension in the string is :

Options:

A. the same throughout the motion

B. minimum at the highest position of the circular path

C. minimum at the lowest position of the circular path

D. minimum when the rope is in the horizontal position

Answer: B

Solution:

Solution:

Question 20

A particle is moving with a velocity $\vec{v} = K (\hat{y} + \hat{x})$, where K is a constant. The general equation for its path is:

Options:

- A. $y = x^2 + \text{constant}$
- B. $y^2 = x + \text{constant}$
- C. $y^2 = x^2 + \text{constant}$
- D. $xy = \text{constant}$

Answer: C

Solution:

Solution:

Question 21

A particle of mass M originally at rest is subjected to a force whose direction is constant but magnitude varies with time according to the relation

$$F = F_0 \left[1 - \left(\frac{t-T}{T} \right)^2 \right]$$

Where F_0 and T are constants. The force acts only for the time interval 2T. The velocity of the particle after time 2T is:

Options:

- A. $2F_0 T / M$
- B. $F_0 T / 2M$
- C. $4F_0 T / 3M$
- D. $F_0 T / 3M$

Answer: C

Solution:

Solution:

Question 22

The magnetic moment of an electron (e) revolving in an orbit around nucleus with an orbital angular momentum is given by:

Options:

A. $\vec{\mu}_L = \frac{e\vec{L}}{2m}$

B. $\vec{\mu}_L = -\frac{e\vec{L}}{2m}$

C. $\vec{\mu}_L = -\frac{e\vec{L}}{m}$

D. $\vec{\mu}_L = \frac{2e\vec{L}}{m}$

Answer: B

Solution:

Solution:

Question 23

Angular momentum of the particle rotating with a central force is constant due to

Options:

A. constant torque

B. constant force

C. constant linear momentum

D. zero torque

Answer: D

Solution:

Solution:

Question 24

The escape velocity of a body depends upon mass as

Options:

A. m^0

B. m^1

C. m^2

D. m^3

Answer: A

Solution:

Solution:

Question 25

Potential energy as a function of r is given by $U = \frac{A}{r^{10}} - \frac{B}{r^5}$, where r is the interatomic distance, A and B are positive constants. The equilibrium distance between the two atoms will be :

Options:

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

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

C. $\left(\frac{2A}{B}\right)^{\frac{1}{5}}$

D. $\left(\frac{B}{2A}\right)^{\frac{1}{5}}$

Answer: C

Solution:

Solution:

Question 26

If two soap bubbles of different radii are connected by a tube

Options:

A. air flows from the smaller bubble to the bigger

B. air flows from bigger bubble to the smaller bubble till the sizes are interchanged

C. air flows from the bigger bubble to the smaller bubble till the sizes become equal

D. there is no flow of air.

Answer: A

Solution:

Solution:

Question 27

The focal length f is related to the radius of curvature r of the spherical convex mirror by:

Options:

A. $f = +\frac{1}{2}r$

B. $f = -r$

C. $f = -\frac{1}{2}r$

D. $f = r$

Answer: A

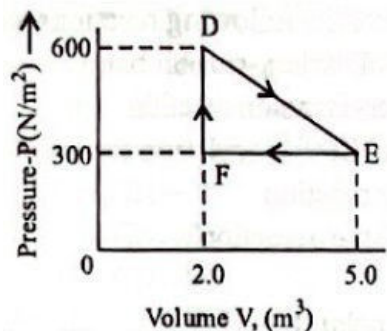
Solution:

Solution:

Question 28

A thermodynamic system is taken from an original state D to an intermediate state E by the linear process shown in the figure. Its volume is then reduced to the original volume from E to F by an isobaric process. The total work done by the gas from D to E to F will be

Volume V , (m^3)



Options:

A. -450J

- B. 450J
- C. 900J
- D. 1350J

Answer: B

Solution:

Solution:

Question 29

A vertical electric field of magnitude $4.9 \times 10^5 \text{ N / C}$ just prevents a water droplet of a mass 0.1g from falling. The value of charge on the droplet will be :

(Given $g = 9.8 \text{ m / s}^2$)

Options:

- A. $1.6 \times 10^{-9} \text{ C}$
- B. $2.0 \times 10^{-9} \text{ C}$
- C. $3.2 \times 10^{-9} \text{ C}$
- D. $0.5 \times 10^{-9} \text{ C}$

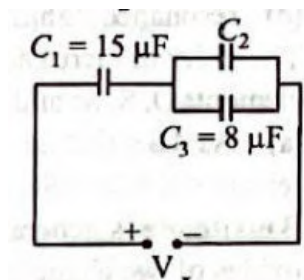
Answer: B

Solution:

Solution:

Question 30

In the circuit shown in the figure, the total charge is $750 \mu\text{C}$ and the voltage across capacitor C_2 is 20V. Then the charge on capacitor C_2 is :



Options:

- A. $450 \mu\text{C}$

B. $590\mu\text{C}$

C. $160\mu\text{C}$

D. $650\mu\text{C}$

Answer: B

Solution:

Solution:

Question 31

For a transistor α and β are given as $\alpha = \frac{I_C}{I_E}$ and $\beta = \frac{I_C}{I_B}$. Then the correct relation between α and β will be:

Options:

A. $\alpha = \frac{1 - \beta}{\beta}$

B. $\beta = \frac{\alpha}{1 - \alpha}$

C. $\alpha\beta = 1$

D. $\alpha = \frac{\beta}{1 - \beta}$

Answer: B

Solution:

Solution:

Question 32

A current I flows along the length of an infinitely long, straight, thin walled pipe. Then

Options:

A. the magnetic field at all points inside the pipe is the same, but not zero

B. the magnetic field is zero only on the axis of the pipe

C. the magnetic field is different at different points inside the pipe

D. the magnetic field at any point inside the pipe is zero

Answer: D

Solution:

Solution:

Question 33

A Carnot engine has efficiency of 50%. If the temperature of sink is reduced by 40°C , its efficiency increases by 30%. The temperature of the source will be :

Options:

- A. 166.7K
- B. 255.1K
- C. 266.7K
- D. 367.7K

Answer: C

Solution:

Solution:

Question 34

When you walk through a metal detector carrying a metal object in your pocket, it raises an alarm. This phenomenon works on

Options:

- A. Electromagnetic induction
- B. Resonance in ac circuits
- C. Mutual induction in ac circuits
- D. interference of electromagnetic waves

Answer: B

Solution:

Solution:

Question 35

An electron moving with speed v and a pno with speed c , have same D-Broglie wavelength. The ratio of kinetic energy of electron to that of photon is :

Options:

A. $\frac{3c}{v}$

B. $\frac{v}{3c}$

C. $\frac{v}{2c}$

D. $\frac{2c}{v}$

Answer: C

Solution:

Solution:

Chemistry

Question 36

PART-II (Chemistry)

Assuming fully decomposed, the volume of CO₂ released will be

Options:

A. 1.12L

B. 2.24L

C. 4.06L

D. 0.84L

Answer: A

Solution:

Solution:

Question 37

Among the following, the species having the smallest bond is

Options:

A. NO⁻

B. NO⁺

C. O_2

D. NO

Answer: B

Solution:

Solution:

Question 38

The oxidation number of phosphorus in $Ba(H_2PO_2)_2$ is

Options:

A. +3

B. +2

C. +1

D. -1

Answer: C

Solution:

Solution:

Question 39

The correct order of thermal stability of hydroxides is:

Options:

A. $Ba(OH)_2 < Ca(OH)_2 < Sr(OH)_2 < Mg(OH)_2$

B. $Mg(OH)_2 < Sr(OH)_2 < Ca(OH)_2 < Ba(OH)_2$

C. $Mg(OH)_2 < Ca(OH)_2 < Sr(OH)_2 < Ba(OH)_2$

D. $Ba(OH)_2 < Sr(OH)_2 < Ca(OH)_2 < Mg(OH)_2$

Answer: D

Solution:

Solution:

Question 40

Which of the following has correct increasing basic strength?

Options:

- A. $\text{MgO} < \text{BeO} < \text{CaO} < \text{BaO}$
- B. $\text{BeO} < \text{MgO} < \text{CaO} < \text{BaO}$
- C. $\text{BaO} < \text{CaO} < \text{MgO} < \text{BeO}$
- D. $\text{CaO} < \text{BaO} < \text{BeO} < \text{MgO}$

Answer: B

Solution:

Solution:

Question 41

Water sample is reported to be highly polluted if BOD (Biological Oxygen Demand) value of sample becomes

Options:

- A. more than 17 ppm.
- B. equal to 10 ppm.
- C. equal to 5 ppm.
- D. less than 5 ppm.

Answer: A

Solution:

Solution:

Question 42

200 mL of an aqueous solution of a protein contains its 1.26g. The osmotic pressure of this solution at 300K is found to be 2.57×10^{-3} bar. The molar mass of protein will be ($R = 0.083 \text{ L bar mol}^{-1} \text{ K}^{-1}$)

Options:

- A. 51022 g mol^{-1}

B. 122044g mol^{-1}

C. 31011g mol^{-1}

D. 61038g mol^{-1}

Answer: D

Solution:

Solution:

Question 43

Lyophilic sols are more stable than lyophobic sols because:

Options:

A. the colloidal particles have positive charge

B. the colloidal particles have negative charge

C. the colloidal particles are solvated

D. there is strong electrostatic repulsion between the colloidal particles

Answer: C

Solution:

Solution:

Question 44

Which of the following is not permissible arrangement of electrons in an atom?

Options:

A. $n = 5, l = 3, m = 0, s = +1/2$

B. $n = 3, l = 2, m = -3, s = -1/2$

C. $n = 3, l = 2, m = -2, s = -1/2$

D. $n = 4, l = 0, m = 0, s = -1/2$

Answer: B

Solution:

Solution:

Question 45

The value of van der Waals constant 'a' for gases O_2 , N_2 , NH_3 and CH_4 are 1.360, 1.390, 4.170 and 2.253 litre² atm mol⁻² respectively. The gas which can most easily be liquefied is :

Options:

A. O_2

B. N_2

C. NH_3

D. CH_4

Answer: C

Solution:

Solution:

Question 46

Which one of the following does not have a pyramidal shape?

Options:

A. $(CH_3)_3N$

B. $(SiH_3)_3N$

C. $P(CH_3)_3$

D. $P(SiH_3)_3$

Answer: B

Solution:

Solution:

Question 47

Boric acid is polymeric due to

Options:

- A. its acidic nature
- B. the presence of hydrogen bonds
- C. its monobasic nature
- D. its geometry

Answer: B

Solution:

Solution:

Question 48

Which of the following order is not correct?

Options:

- A. $\text{MeBr} > \text{Me}_2\text{CHBr} > \text{Me}_3\text{CBr} > \text{Et}_3\text{CBr}(\text{S}_{\text{N}}2)$
- B. $\text{PhCH}_2\text{Br} > \text{PhCHBrMe} > \text{PhCBrMe}_2 > \text{PhCBrMePh}(\text{S}_{\text{N}}1)$
- C. $\text{MeI} > \text{MeBr} > \text{MeCl} > \text{MeF}(\text{S}_{\text{N}}2)$
- D. All are correct

Answer: B

Solution:

Solution:

Question 49

A catalyst is a substance which :

Options:

- A. is always in the same phase as in the reaction
- B. alters the equilibrium in a reaction
- C. does not participate in the reaction but alters the rate of reaction
- D. participates in the reaction and provides an easier pathway for the same

Answer: A

Solution:

Solution:

Question 50

Which of the following is a non-reducing sugar?

Options:

- A. Lactose
- B. Fructose
- C. Sucrose
- D. Maltose

Answer: C

Solution:

Solution:

Question 51

An ideal gas expands against a constant external pressure of 2.0 atmosphere from 20 litre to 40 litre and absorbs 10 kJ of heat from surrounding. What is the change in internal energy of the system? (given: 1 atm-litre = 101.3J)

Options:

- A. 4052J
- B. 5948J
- C. 14052J
- D. 9940J

Answer: B

Solution:

Solution:

Question 52

The polymer used for optical lenses is :

Options:

- A. polypropylene
- B. polyvinyl chloride
- C. polythene
- D. polymethyl methacrylate

Answer: D

Solution:

Solution:

Question 53

Which of the following arrangements represents the increasing order (smallest to largest) of ionic radii of the given species O^{2-} , S^{2-} , N^{3-} , P^{3-} ?

Options:

- A. $O^{2-} < N^{3-} < S^{2-} < P^{3-}$
- B. $O^{2-} < P^{3-} < N^{3-} < S^{2-}$
- C. $N^{3-} < O^{2-} < P^{3-} < S^{2-}$
- D. $N^{3-} < S^{2-} < O^{2-} < P^{3-}$

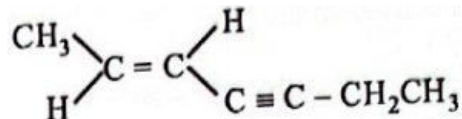
Answer: A

Solution:

Solution:

Question 54

The IUPAC name of the following compound is



Options:

- A. (E)-2-hepten-4-yne
- B. (Z)-5-hepten-3-yne
- C. (E)-5-hepten-3-yne
- D. (Z)-2-hepten-4-yne

Answer: A

Solution:

Solution:

Question 55

In CsCl type structure, the co-ordination number of Cs^+ and Cl^- respectively are

Options:

- A. 6,6
- B. 6,8
- C. 8,8
- D. 8,6

Answer: C

Solution:

Solution:

Question 56

Which one of the following reactions will not result in the formation of carbon-carbon bond?

Options:

- A. Reimer-Tiemann reaction
- B. Friedel Craft's acylation
- C. Wurtz reaction
- D. Cannizzaro reaction

Answer: D

Solution:

Solution:

Question 57

Water is :

Options:

- A. more polar than H_2S
- B. more or less identical in polarity with H_2S
- C. less polar than H_2S
- D. None of these

Answer: A

Solution:

Solution:

Question 58

Carboxylic acids are more acidic than phenol and alcohol because of

Options:

- A. intermolecular hydrogen bonding
- B. formation of dimers
- C. highly acidic hydrogen
- D. resonance stabilization of their conjugate base

Answer: D

Solution:

Solution:

Question 59

The order of increasing sizes of atomic radii among the elements O, S, Se and As is :

Options:

- A. $\text{As} < \text{S} < \text{O} < \text{Se}$
- B. $\text{Se} < \text{S} < \text{As} < \text{O}$
- C. $\text{O} < \text{S} < \text{As} < \text{Se}$
- D. $\text{O} < \text{S} < \text{Se} < \text{As}$

Answer: D

Solution:

Solution:

Question 60

Bauxite ore is generally contaminated with impurity of oxides of two elements X and Y. Which of the following statement is correct?

Options:

- A. X is a non-metal and belongs to the third period while Y is a metal and belongs to the fourth period.
- B. One of two oxides has three-dimensional polymeric structure.
- C. Both (a) and (b) are correct.
- D. None of the above.

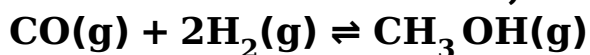
Answer: C

Solution:

Solution:

Question 61

The partial pressure of $\text{CH}_3\text{OH}(\text{g})$, $\text{CO}(\text{g})$ and $\text{H}_2(\text{g})$ in equilibrium mixture for the reaction,



are 2.0, 1.0 and 0.1 atm respectively at 427°C . The value of K_p for the decomposition of CH_3OH to CO and H_2 is

Options:

- A. 10^2 atm
- B. $2 \times 10^2 \text{ atm}^{-1}$
- C. 50 atm^2
- D. $5 \times 10^{-3} \text{ atm}^2$

Answer: D

Solution:

Solution:

Question 62

The conjugate base of $(\text{CH}_3)_2\text{NH}_2^+$ is

Options:

A. $(\text{CH}_3)_2\text{NH}$

B. $(\text{CH}_3)_2\text{N}^+$

C. $(\text{CH}_3)_3\text{N}^+$

D. $(\text{CH}_3)_2\text{N}^-$

Answer: A

Solution:

Solution:

Question 63

Which of the following is not present in a nucleotide?

Options:

A. Guanine

B. Cytosine

C. Adenine

D. Tyrosine

Answer: D

Solution:

Solution:

Question 64

The shape of $[\text{Cu}(\text{NH}_3)_4]^{2+}$ is

Options:

A. tetrahedral

- B. square planar
- C. pyramidal
- D. octahedral

Answer: B

Solution:

Solution:

Question 65

Heroin is a derivative of

Options:

- A. cocaine
- B. morphine
- C. caffeine
- D. nicotine

Answer: B

Solution:

Solution:

Question 66

The limiting equivalent conductivity of NaCl, KCl and KBr are 126.5, 150.0 and 151.5 $\text{Scm}^2 \text{eq}^{-1}$, respectively. The limiting equivalent ionic conductivity for Br is 78 $\text{Scm}^2 \text{eq}^{-1}$. The limiting equivalent ionic conductivity for Na^+ ions would be :

Options:

- A. 128
- B. 125
- C. 49
- D. 50

Answer: D

Solution:

Solution:

Question 67

Rate of dehydration of alcohols follows the order:

Options:

A. $2^\circ > 1^\circ > \text{CH}_3\text{OH} > 3^\circ$

B. $3^\circ > 2^\circ > 1^\circ > \text{CH}_3\text{OH}$

C. $2^\circ > 3^\circ > 1^\circ > \text{CH}_3\text{OH}$

D. $\text{CH}_3\text{OH} > 1^\circ > 2^\circ > 3^\circ$

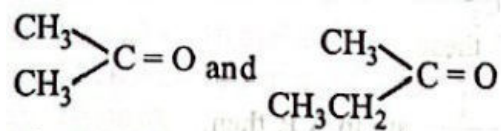
Answer: B

Solution:

Solution:

Question 68

An alkene having molecular formula C_7H_{14} was subjected to ozonolysis in the presence of zinc dust. An equimolar amount of the following two compounds was obtained



The IUPAC name of the alkene is

Options:

A. 3,4-dimethyl-3-pentene

B. 3,4-dimethyl-2-pentene

C. 2,3-dimethyl-3-pentene

D. 2,3-dimethyl-2-pentene

Answer: D

Solution:

Solution:

Question 69

Lanthanoid contraction can be observed in

Options:

- A. At
- B. Gd
- C. Ac
- D. Lw

Answer: B

Solution:

Solution:

Question 70

The form of iron obtained from blast furnace is:

Options:

- A. Steel
- B. Cast Iron
- C. Pig Iron
- D. Wrought Iron

Answer: B

Solution:

Solution:

Mathematics

Question 71

Mathematics

A class has 175 students. The following data shows the number of students opting one or more subjects. Maths-100, Physics-70, Chemistry-40, Maths and Physics-30, Maths and Chemistry-28, Physics and Chemistry-23, Maths, Physics and Chemistry-18. How many have offered Maths alone?

Options:

- A. 35
- B. 48
- C. 60
- D. 22

Answer: C

Question 72

Let R be a relation on the set N be defined by $\{(x, y) \mid x, y \in \mathbb{N}, 2x + y = 41\}$. Then, R is

Options:

- A. Reflexive
- B. Symmetric
- C. Transitive
- D. None of these

Answer: D

Question 73

The function $f : \mathbb{R} \rightarrow \mathbb{R}$ defined by $f(x) = x^2 + x$ is.

Options:

- A. one-one
- B. onto
- C. many-one
- D. None of these

Answer: C

Question 74

If $12\cot^2\theta - 31\operatorname{cosec}\theta + 32 = 0$, then the value of $\sin\theta$ is

Options:

- A. $\frac{3}{5}$ or 1
- B. $\frac{2}{3}$ or $-\frac{2}{3}$

C. $\frac{4}{5}$ or $\frac{3}{4}$

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

Answer: C

Question 75

The modulus of $\frac{(1 + i\sqrt{3})(2 + 2i)}{(\sqrt{3} - i)}$ is

Options:

A. 2

B. 4

C. $3\sqrt{2}$

D. $2\sqrt{2}$

Answer: D

Question 76

If α, β are the roots of the equation $ax^2 + bx + c = 0$, then $\frac{\alpha}{a\beta + b} + \frac{\beta}{a\alpha + b} =$

Options:

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

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

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

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

Answer: D

Question 77

The solution set of the inequality $37 - (3x + 5) \geq 9x - 8(x - 3)$ is

Options:

A. $(-\infty, 2)$

B. $(-\infty, -2)$

C. $(-\infty, 2]$

D. $(-\infty, -2]$

Answer: C

Question 78

If ${}^{n+2}C_8 : {}^{n-2}P_4 = 57 : 16$, then the value of n is:

Options:

- A. 20
- B. 19
- C. 18
- D. 17

Answer: B

Question 79

The middle term in the expansion of $\left(\frac{10}{x} + \frac{x}{10} \right)^{10}$ is

Options:

- A. ${}^{10}C_5$
- B. ${}^{10}C_6$
- C. ${}^{10}C_5 \frac{1}{x^{10}}$
- D. ${}^{10}C_5 x^{10}$

Answer: A

Question 80

The fourth, seventh and tenth terms of a G.P. are p, q, r respectively, then :

Options:

- A. $p^2 = q^2 + r^2$
- B. $q^2 = pr$
- C. $p^2 = qr$
- D. $pqr + pq + 1 = 0$

Answer: B

Question 81

The point $(t^2 + 2t + 5, 2t^2 + t - 2)$ lies on the line $x + y = 2$ for

Options:

- A. All real values of t
- B. Some real values of t
- C. $t = \frac{-3 \pm \sqrt{3}}{6}$
- D. None of these

Answer: D

Question 82

The equations of the lines which cuts off an intercept 1 from y-axis and equally inclined to the axes are

Options:

- A. $x - y + 1 = 0, x + y + 1 = 0$
- B. $x - y - 1 = 0, x + y - 1 = 0$
- C. $x - y - 1 = 0, x + y + 1 = 0$
- D. None of these

Answer: C

Question 83

The distance between the parallel lines $3x - 4y + 7 = 0$ and $3x - 4y + 5 = 0$ is $\frac{a}{b}$. Value of $a + b$ is

Options:

- A. 2
- B. 5
- C. 7
- D. 3

Answer: C

Question 84

For what value of k , does the equation

$9x^2 + y^2 = k(x^2 - y^2 - 2x)$
represent equation of a circle ?

Options:

- A. 1
- B. 2
- C. -1
- D. 4

Answer: D

Question 85

A parabola has the origin as its focus and the line $x = 2$ as the directrix. Then the vertex of the parabola is at

Options:

- A. (0, 2)
- B. (1, 0)
- C. (0, 1)
- D. (2, 0)

Answer: B

Question 86

Equation of the ellipse whose axes are the axes of coordinates and which passes through the point $(-3, 1)$ and has eccentricity $\sqrt{\frac{2}{5}}$ is

Options:

- A. $5x^2 + 3y^2 - 48 = 0$
- B. $3x^2 + 5y^2 - 15 = 0$
- C. $5x^2 + 3y^2 - 32 = 0$
- D. $3x^2 + 5y^2 - 32 = 0$

Answer: D

Question 87



The co-ordinates of the point which in the ratio 3; 4 internally are points $(2, -1, 3)$ and $(4, 3, 1)$ in the ratio 3 : 4 internally are given by :

Options:

A. $\left(\frac{2}{7}, \frac{20}{7}, \frac{10}{7} \right)$

B. $\left(\frac{10}{7}, \frac{15}{7}, \frac{2}{7} \right)$

C. $\left(\frac{20}{7}, \frac{5}{7}, \frac{15}{7} \right)$

D. $\left(\frac{15}{7}, \frac{20}{7}, \frac{3}{7} \right)$

Answer: C

Question 88

The relationship between a and b, so that the function f defined by

$$f(x) = \begin{cases} ax + 1 & \text{if } x \leq 3 \\ bx + 3 & \text{if } x > 3 \end{cases} \text{ is continuous at } x = 3, \text{ is}$$

Options:

A. $a = b + \frac{2}{3}$

B. $a - b = \frac{3}{2}$

C. $a + b = \frac{2}{3}$

D. $a + b = 2$

Answer: A

Question 89

$$f(x) = \begin{cases} x \sin \frac{1}{x} & x \neq 0 \\ 0 & x = 0 \end{cases} \text{ at } x = 0 \text{ is}$$

Options:

A. continuous as well as differentiable

B. differentiable but not continuous

C. continuous but not differentiable

D. neither continuous nor differentiable

Answer: C

Question 90

The variance of the data 2, 4, 6, 8, 10 is

Options:

- A. 8
- B. 7
- C. 6
- D. None of these

Answer: A

Question 91

Find the probability of getting the sum as a perfect square number when two dice are thrown together.

Options:

- A. $5 / 12$
- B. $7 / 18$
- C. $7 / 36$
- D. None of these

Answer: C

Question 92

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

Options:

- A. $-\frac{5\pi}{3}$
- B. $\frac{5\pi}{3}$
- C. $-\frac{\pi}{3}$
- D. $\frac{4\pi}{3}$

Answer: C

Question 93

If the system of linear equations

$$x + ky + 3z = 0$$

$$3x + ky - 2z = 0$$

$$2x + 4y - 3z = 0$$

has a non-zero solution (x, y, z), then $\frac{xz}{y^2}$ is equal to :

Options:

- A. 10
- B. -30
- C. 30
- D. -10

Answer: A

Question 94

The value of definite integral $\int_0^{\frac{\pi}{2}} \log(\tan x) dx$ is

Options:

- A. 0
- B. $\frac{\pi}{4}$
- C. $\frac{\pi}{2}$
- D. p

Answer: A

Question 95

The area enclosed between the graph of $y = x^3$ and the lines $x = 0, y = 1, y = 8$ is

Options:

- A. $\frac{45}{4}$
- B. 14
- C. 7
- D. None of these

Answer: A

Question 96

The total number of 3-digit numbers, the sum of whose digits is even, is equal to

Options:

- A. 450
- B. 350
- C. 250
- D. 325

Answer: A

Question 97

To fill 12 vacancies, there are 25 candidates of which five are from scheduled caste. If 3 of the vacancies are reserved for scheduled caste candidates while the rest are open to all, then the number of ways in which the selection can be made

Options:

- A. ${}^5C_3 \times {}^{22}C_9$
- B. ${}^{22}C_9 - {}^5C_3$
- C. ${}^{22}C_3 + {}^5C_3$
- D. None of these

Answer: A

Question 98

$\frac{1}{q+r}, \frac{1}{r+p}, \frac{1}{p+q}$ are in A.P. then,

Options:

- A. p, q, r are in A.P
- B. p^2, q^2, r^2 are in A.P
- C. $\frac{1}{p}, \frac{1}{q}, \frac{1}{r}$ are in A.P
- D. $p + q + r$ are in A.P

Answer: B

Question 99

The sum of the first n terms of the series

$$1^2 + 2.2^2 + 3^2 + 2.4^2 + 5^2 + 2.6^2 + \dots$$

is $\frac{n(n+1)^2}{2}$ when n is even. When n is odd the sum is

Options:

A. $\left[\frac{n(n+1)}{2} \right]^2$

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

C. $\frac{n(n+1)^2}{4}$

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

Answer: B

Question 100

The locus of a point that is equidistant from the lines $x + y - 2\sqrt{2} = 0$ and $x + y - \sqrt{2} = 0$ is

Options:

A. $x + y - 5\sqrt{2} = 0$

B. $x + y - 3\sqrt{2} = 0$

C. $2x + 2y - 3\sqrt{2} = 0$

D. $2x + 2y - 5\sqrt{2} = 0$

Answer: C

Question 101

The point diametrically opposite to the point $P(1, 0)$ on the circle $x^2 + y^2 + 2x + 4y - 3 = 0$ is

Options:

A. $(3, -4)$

B. $(-3, 4)$

C. $(-3, -4)$

D. $(3, 4)$

Answer: C

Question 102

For the parabola $y^2 = -12x$, equation of directrix is $x = a$. The value of 'a' is

Options:

- A. 3
- B. 4
- C. 2
- D. 6

Answer: A

Question 103

The eccentricity of the curve $2x^2 + y^2 - 8x - 2y + 1 = 0$ is:

Options:

- A. $\frac{1}{2}$
- B. $\frac{1}{\sqrt{2}}$
- C. $\frac{2}{3}$
- D. $\frac{3}{4}$

Answer: B

Question 104

The equation of the hyperbola with vertices at $(0, \pm 6)$ and $e = \frac{5}{3}$ is

Options:

- A. $\frac{x^2}{36} - \frac{y^2}{64} = 1$
- B. $\frac{y^2}{36} - \frac{x^2}{64} = 1$
- C. $\frac{x^2}{64} - \frac{y^2}{36} = 1$
- D. $\frac{y^2}{64} - \frac{x^2}{36} = 1$

Answer: B

Question 105

$$\begin{vmatrix} \sin^2 x & \cos^2 x & 1 \\ \cos^2 x & \sin^2 x & 1 \\ -10 & 12 & 2 \end{vmatrix} \text{ is equal to:}$$

Options:

- A. 0
- B. $12\cos^2 x - 10\sin^2 x$
- C. $12\cos^2 x - 10\sin^2 x - 2$
- D. $10\sin 2x$

Answer: A

Question 106

$$\text{The function } f(x) = \begin{cases} x[x] & \text{if } 0 \leq x < 2 \\ (x-1)x & \text{if } 2 \leq x < 3 \end{cases}.$$

Options:

- A. differentiable at $x = 2$
- B. not differentiable at $x = 2$
- C. continuous at $x = 2$
- D. None of these

Answer: B

Question 107

The local minimum value of the function f given by $f(x) = 3 + |x|$, $x \in \mathbb{R}$ is

Options:

- A. 1
- B. 2
- C. 3
- D. 0

Answer: C

Question 108

Value of $\int_0^{\pi/2} \frac{\sqrt{\sin x}}{\sqrt{\sin x} + \sqrt{\cos x}} dx$ is

Options:

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

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

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

D. None of these

Answer: C

Question 109

The equation of the plane which bisects the angle between the planes $3x - 6y + 2z + 5 = 0$ and $4x - 12y + 3z - 3 = 0$ which contains the origin is

Options:

A. $33x - 13y + 32z + 45 = 0$

B. $x - 3y + z - 5 = 0$

C. $33x + 13y + 32z + 45 = 0$

D. None of these

Answer: D

Question 110

An urn contains five balls. Two balls are drawn and found to be white. The probability that all the balls are white is

Options:

A. $\frac{1}{10}$

B. $\frac{3}{10}$

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

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

Answer: D

Question 111

PART - IV (APTITUDE TEST)

What is the total marks obtained by Meera in all the subject?

Options:

- A. 448
- B. 580
- C. 470
- D. 74.67

Answer: C

Question 112

What is the average marks obtained by these seven students in History? (rounded off to two digits)

Options:

- A. 72.86
- B. 27.32
- C. 24.86
- D. 29.14

Answer: A

Question 113

How many students have got 60% or more marks in all the subjects?

Options:

- A. One
- B. Two
- C. Three
- D. Four

Answer: B

Question 114

A series is given, with one term missing. Choose the correct alternative from the given ones that will complete the series. 5, 11, 24, 51, 106, _?

Options:

- A. 122
- B. 217
- C. 120
- D. 153

Answer: B

Question 115

In a certain code BANKER is written as LFSCBO. How will CONFER be written in that code?

Options:

- A. GFSDPO
- B. GFSEPO
- C. FGSDOP
- D. FHSDPO

Answer: A

Question 116

Kailash faces towards north. Turnings to his right, he walks 25 metres. He then turns to his left and walks 30 metres. Next, he moves 25 metres to his right. He then turns to the right again and walks 55 metres. Finally, he turns to the right and moves 40 metres. In which direction is he now from his starting point ?

Options:

- A. South-West
- B. North-West
- C. South
- D. South-East

Answer: D

Question 117

An accurate clock shows 8 O'clock in the morning. Through how many degrees will the hour hand rotate when the clock shows 20' clock in the afternoon?

Options:

- A. 144°
- B. 150°
- C. 168°
- D. 180°

Answer: D

Question 118

Two statements are given followed by three conclusions numbered I, II and III. Assuming the statements to be true, even if they seem to be at variance with commonly known facts, decide which of the conclusions logically follow(s) from the statements.

Statements:

All utensils are spoons.

All bowls are spoons.

Conclusions:

I. No utensil is a bowls.

II. Some utensils are bowls

III. No spoon is a utensil.

Options:

- A. Only conclusions I follows
- B. Conclusions I and III follow
- C. Either conclusion I or II follows
- D. Only conclusion III follows

Answer: C

Question 119

What was the ratio between the ages of P and Q four years ago?

I The ratio between the present ages of P and Q is 3 : 4.

II. The ratio between the present ages of Q and R is 4:5.

Options:

- A. if the data in statement I alone are sufficient to answer the question, while the data in

statement II alone are not sufficient to answer the question.

B. if the data in statement II alone are sufficient to answer the question, while the data in statement I alone are not sufficient to answer the question.

C. if the data in both the statements I and II together are not sufficient to answer the question.

D. if the data in both the statements I and II together are necessary to answer the question.

Answer: C

Question 120

What was the cost price of the suitcase purchased by Samir?

I Samir got 25 percent concession on the labelled price.

II. Samir sold the suitcase for ₹2000 with 25 percent profit on the labelled price:

Options:

A. if the data in statement I alone are sufficient to answer the question, while the data in statement II alone are not sufficient to answer the question.

B. if the data in statement II alone are sufficient to answer the question, while the data in statement I alone are not sufficient to answer the question.

C. if the data in both the statements I and II together are not sufficient to answer the question.

D. if the data in both the statements I and II together are necessary to answer the question.

Answer: D

English

Question 121

Read the following passage and answer the question that follows.

Choose the correct answer.

His instrument struck against something hard, dangerously near the kidney.... "It is not quite at the kidney, my friend," Sadao murmured.... "My friend," he always called his patients and so he did now, forgetting that this was his enemy.

To whom does Sadao attend to in the lines above?

Options:

A. A relative

B. His friend

C. His enemy

D. A patient

Answer: C

Solution:

Solution:

Question 122

Choose the correct pronunciation for the word 'sorbet' from the following options:

Options:

- A. sore-bet
- B. sore-bay
- C. sore-bye
- D. shore- bay

Answer: B

Solution:

Solution:

Question 123

What is the correct syllable division of the word 'indomitable'?

Options:

- A. in - do - mit - able
- B. in - dom- i - ta - ble
- C. in - do - mi - ta - ble
- D. in - dom - i - table

Answer: B

Solution:

Solution:

Question 124

Read the following passage and the question below. Choose the correct answer.

Gandhi never contented himself with large political or economic solutions. He saw the cultural and social backwardness in the Champaran villages and wanted to do something about it immediately. He appealed to teachers.

Which of the following statements is true about the passage?

Options:

- A. Gandhi was dissatisfied with political or economic solutions
- B. Gandhi was interested in the welfare of teachers of Champaran villages
- C. Gandhi was happy about the cultural and social backwardness of Champaran villages
- D. Gandhi was hopeful that teachers could save villages from cultural and social backwardness

Answer: D

Solution:

Solution:

Question 125

Choose the correct meaning of the idiom 'a bolt out of the blue' from the given options:

Options:

- A. Something totally unexpected
- B. Lightning and thunderstorm
- C. To do something kind
- D. To mourn after someone

Answer: A

Solution:

Solution:
