

National Testing Agency

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COMPUTATIONAL AND INTEGRATIVE SCIENCES Track 1

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Part A

Section Id : 128206299
Section Number : 1
Section type : Online
Mandatory or Optional: Mandatory
Number of Questions: 15
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Section Marks: 30
Display Number Panel: Yes
Group All Questions: No

Sub-Section Number: 1
Sub-Section Id: 128206482
Question Shuffling Allowed : Yes

Question Number : 1 Question Id : 12820610559 Question Type : MCQ Option Shuffling : No Display Question Number : Yes
Single Line Question Option : No Option Orientation : Vertical
Correct Marks : 2 Wrong Marks : 0

A planet in a distant solar system is 10 times more massive than the earth and its radius is 10 times smaller. Given that the escape velocity from the earth is 11 kms^{-1} , the escape velocity from the surface of the planet would be

- (a) 1.1 kms^{-1}
- (b) 11 kms^{-1}
- (c) 110 kms^{-1}
- (d) 0.11 kms^{-1}

Options :

- 12820641739. A
- 12820641740. B
- 12820641741. C
- 12820641742. D

Question Number : 2 Question Id : 12820610560 Question Type : MCQ Option Shuffling : No Display Question Number : Yes
Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 2 Wrong Marks : 0

Consider a uniform square plate of side 'a' and mass 'm'. The moment of inertia of this plate about an axis perpendicular to its plane and passing through one of its corners is

- (a) $4/6 \text{ ma}^2$
- (b) $3/4 \text{ ma}^2$
- (c) $2/3 \text{ ma}^2$
- (d) $1/5 \text{ ma}^2$

Options :

- 12820641743. A
- 12820641744. B
- 12820641745. C
- 12820641746. D

Question Number : 3 Question Id : 12820610561 Question Type : MCQ Option Shuffling : No Display Question Number : Yes
Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 2 Wrong Marks : 0

A body of mass $m = 3.513 \text{ kg}$ is moving along the x-axis with a speed of 5.00 ms^{-1} . The magnitude of its momentum is recorded as

- (a) 17.6 kg ms^{-1}
- (b) $17.565 \text{ kg ms}^{-1}$
- (c) 17.56 kg ms^{-1}
- (d) 17.57 kg ms^{-1}

Options :

- 12820641747. A
- 12820641748. B
- 12820641749. C
- 12820641750. D

Question Number : 4 Question Id : 12820610562 Question Type : MCQ Option Shuffling : No Display Question Number : Yes
Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 2 Wrong Marks : 0

A block of mass 0.50 kg is moving with a speed of 2.00 m/s on a smooth surface. It strikes another mass of 1.00 kg and then they move together as a single body. The energy loss during the collision is

- (a) 0.16 J
- (b) 1.00 J
- (c) 0.67 J
- (d) 0.34 J

Options :

- 12820641751. A
- 12820641752. B
- 12820641753. C
- 12820641754. D

Question Number : 5 Question Id : 12820610563 Question Type : MCQ Option Shuffling : No Display Question Number : Yes
Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 2 Wrong Marks : 0

An experiment is performed to find the refractive index of glass using a travelling microscope. In this experiment distance are measured by

- (a) a vernier scale provided on the microscope
- (b) a standard laboratory scale
- (c) a meter scale provided on the microscope
- (d) a screw gauge provided on the microscope

Options :

- 12820641755. A
- 12820641756. B
- 12820641757. C
- 12820641758. D

Question Number : 6 Question Id : 12820610564 Question Type : MCQ Option Shuffling : No Display Question Number : Yes
Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 2 Wrong Marks : 0

Write the dimension of energy in [M L T] system.

- (a) $[M L^{-1} T^{-2}]$
- (b) $[M L^2 T^{-2}]$
- (c) $[M T^{-2}]$
- (d) $[M L T^{-2}]$

Options :

- 12820641759. A
- 12820641760. B
- 12820641761. C
- 12820641762. D

Question Number : 7 Question Id : 12820610565 Question Type : MCQ Option Shuffling : No Display Question Number : Yes
Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 2 Wrong Marks : 0

Calculate the molarity of a solution containing 5 g of NaOH in 450 mL solution.

- (a) 0.177
- (b) 0.017
- (c) 0.028
- (d) 0.278

Options :

- 12820641763. A
- 12820641764. B
- 12820641765. C
- 12820641766. D

Question Number : 8 Question Id : 12820610566 Question Type : MCQ Option Shuffling : No Display Question Number : Yes
Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 2 Wrong Marks : 0

What are the units for rate constant in second order reactions?

- (a) $\text{mol L}^{-1} \text{s}^{-1}$
- (b) $\text{mol}^{-1} \text{L}^{-1} \text{s}^{-1}$
- (c) $\text{mol}^{-1} \text{L s}^{-1}$
- (d) $\text{mol}^{-2} \text{L}^{-1} \text{s}^{-1}$

Options :

- 12820641767. A
- 12820641768. B
- 12820641769. C
- 12820641770. D

Question Number : 9 Question Id : 12820610567 Question Type : MCQ Option Shuffling : No Display Question Number : Yes
Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 2 Wrong Marks : 0

Which of the following changes involve oxidation?

- (a) The conversion of Cl_2 to NaCl
- (b) The conversion of H_2S to S
- (c) The conversion of ZnSO_4 to Zn
- (d) conversion of HCl to H_2

Options :

- 12820641771. A
- 12820641772. B
- 12820641773. C
- 12820641774. D

Question Number : 10 Question Id : 12820610568 Question Type : MCQ Option Shuffling : No Display Question Number : Yes
Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 2 Wrong Marks : 0

Which of the following has highest second ionization enthalpy?

- a) O
- b) F
- c) Mg
- d) Be

Options :

- 12820641775. A
- 12820641776. B
- 12820641777. C
- 12820641778. D

Question Number : 11 Question Id : 12820610569 Question Type : MCQ Option Shuffling : No Display Question Number : Yes
Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 2 Wrong Marks : 0

If $x = \log t$ and $y = t^2 - 1$, then the value of y'' at $t = -2$ is:

- A. 4
- B. -16
- C. 16
- D. -4

Options :

- 12820641779. A
- 12820641780. B
- 12820641781. C
- 12820641782. D

Question Number : 12 Question Id : 12820610570 Question Type : MCQ Option Shuffling : No Display Question Number : Yes
Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 2 Wrong Marks : 0

The number of ways in which 7 distinct toys can be distributed among 3 children is:

- a. 7P_3
- b. 7C_3
- c. 7^3
- d. 3^7

Options :

- 12820641783. A
- 12820641784. B
- 12820641785. C
- 12820641786. D

Question Number : 13 Question Id : 12820610571 Question Type : MCQ Option Shuffling : No Display Question Number : Yes
Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 2 Wrong Marks : 0

The coefficient of x^5 in the expansion of $(1+x^2)(1+x)^4$ is:

- a. 50
- b. -60
- c. 60
- d. -50

Options :

- 12820641787. A
- 12820641788. B
- 12820641789. C
- 12820641790. D

Question Number : 14 Question Id : 12820610572 Question Type : MCQ Option Shuffling : No Display Question Number : Yes
Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 2 Wrong Marks : 0

A and B play a game where each is asked to select a number from 1 to 25. If the two numbers match, both of them win a prize. The probability that they will not win a prize in a single trial is:

- a. $24/25$
- b. $1/25$
- c. $2/25$
- d. $1/5$

Options :

12820641791. A

12820641792. B

12820641793. C

12820641794. D

Question Number : 15 Question Id : 12820610573 Question Type : MCQ Option Shuffling : No Display Question Number : Yes
Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 2 Wrong Marks : 0

The image of the point (3,8) in the line $x + 3y = 7$ is:

- A. (1,4)
- B. (1,-4)
- C. (-1,4)
- D. (-1, -4)

Options :

12820641795. A

12820641796. B

12820641797. C

12820641798. D

Part B Section I (Physics)

Section Id :	128206300
Section Number :	2
Section type :	Online
Mandatory or Optional:	Optional
Number of Questions:	35
Number of Questions to be attempted:	35
Section Marks:	70
Display Number Panel:	Yes
Group All Questions:	No

Sub-Section Number:	1
Sub-Section Id:	128206483
Question Shuffling Allowed :	Yes

Question Number : 16 Question Id : 12820610574 Question Type : MCQ Option Shuffling : No Display Question Number : Yes
Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 2 Wrong Marks : 0

A current I is flowing through the sides of an equilateral triangle of side a . The magnitude of the magnetic field at the centroid of the triangle is

(a) $9\mu_0 I / 2\pi a$

(b) $\mu_0 I / \pi a$

(c) $3\mu_0 I / 2\pi a$

(d) $3\mu_0 I / \pi a$

Options :

12820641799. A

12820641800. B

12820641801. C

12820641802. D

Question Number : 17 Question Id : 12820610575 Question Type : MCQ Option Shuffling : No Display Question Number : Yes
Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 2 Wrong Marks : 0

Two boxes A and B contain an equal number of molecules of the same gas. If the volumes are V_A and V_B , and λ_A and λ_B denote respective mean free paths, then

(a) $\lambda_A = \lambda_B$

(b) $\lambda_A / V_A = \lambda_B / V_B$

(c) $\lambda_A / V_A^{1/3} = \lambda_B / V_B^{1/3}$

(d) $\lambda_A V_A = \lambda_B V_B$

Options :

12820641803. A

12820641804. B

12820641805. C

12820641806. D

Question Number : 18 Question Id : 12820610576 Question Type : MCQ Option Shuffling : No Display Question Number : Yes
Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 2 Wrong Marks : 0

Let T_g and T_e be the kinetic energies of the electron in the ground and the third excited states of a hydrogen atom, respectively. According to the Bohr model, the ratio T_g/T_e is

(a) 3

(b) 4

(c) 9

(d) 16

Options :

- 12820641807. A
- 12820641808. B
- 12820641809. C
- 12820641810. D

Question Number : 19 Question Id : 12820610577 Question Type : MCQ Option Shuffling : No Display Question Number : Yes
Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 2 Wrong Marks : 0

The plane of polarisation of a plane polarized light rotates by 60° after passing through a wave plate. The pass-axis of the wave plate is at an angle α with respect to the plane of polarisation of the incident light. The wave plate and α are

- (a) $\lambda/4, 60^\circ$
- (b) $\lambda/2, 30^\circ$
- (c) $\lambda/2, 120^\circ$
- (d) $\lambda/4, 30^\circ$

Options :

- 12820641811. A
- 12820641812. B
- 12820641813. C
- 12820641814. D

Question Number : 20 Question Id : 12820610578 Question Type : MCQ Option Shuffling : No Display Question Number : Yes
Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 2 Wrong Marks : 0

An ideal gas consists of three dimensional polyatomic molecules. The temperature is such that only one vibrational mode is excited. If R denotes the gas constant, then the specific heat at constant volume of one mole of the gas at this temperature is

- (a) $3R$
- (b) $7/2R$
- (c) $4R$
- (d) $9/2R$

Options :

- 12820641815. A
- 12820641816. B
- 12820641817. C
- 12820641818. D

Question Number : 21 Question Id : 12820610579 Question Type : MCQ Option Shuffling : No Display Question Number : Yes
Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 2 Wrong Marks : 0

A raindrop falls under gravity and captures water molecules from atmosphere. Its mass changes at the rate $\lambda m(t)$, where λ is a positive constant and $m(t)$ is the instantaneous mass. Assume that acceleration due to gravity is constant and water molecules are at rest with respect to earth before capture. Which of the following statements is correct?

- (a) The speed of the raindrop increases linearly with time.
- (b) The speed of the raindrop increases exponentially with time.
- (c) The speed of the raindrop approaches a constant value when $\lambda t \gg 1$.
- (d) The speed of the raindrop approaches a constant value when $\lambda t \ll 1$.

Options :

12820641819. A

12820641820. B

12820641821. C

12820641822. D

Question Number : 22 Question Id : 12820610580 Question Type : MCQ Option Shuffling : No Display Question Number : Yes
Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 2 Wrong Marks : 0

Let the electric field in some region R be given by $\vec{E} = e^{-y^2} \hat{i} + e^{-x^2} \hat{j}$. From this we may conclude that

- (a) R has a non-uniform charge distribution.
- (b) R has no charge distribution.
- (c) R has a time dependent magnetic field.
- (d) The energy flux in R is zero everywhere.

Options :

12820641823. A

12820641824. B

12820641825. C

12820641826. D

Question Number : 23 Question Id : 12820610581 Question Type : MCQ Option Shuffling : No Display Question Number : Yes
Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 2 Wrong Marks : 0

Which of the combinations of crystal structure and their coordination number is (are) correct?

- (a) body centered cubic – 8
- (b) diamond – 4
- (c) hexagonal closed packed – 12
- (d) all of the above

Options :

12820641827. A
 12820641828. B
 12820641829. C
 12820641830. D

Question Number : 24 Question Id : 12820610582 Question Type : MCQ Option Shuffling : No Display Question Number : Yes
 Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 2 Wrong Marks : 0

Consider a convex lens of focal length f . A point object moves towards the lens along its axis between $2f$ and f . If the speed of the object is V_O , then its image would move with speed V_I . Which of the following is correct?

- (a) $V_I = V_O$; the image moves away from the lens.
 (b) $V_I = -V_O$; the image moves towards the lens.
 (c) $V_I > V_O$; the image moves away from the lens.
 (d) $V_I < V_O$; the image moves away from the lens.

Options :

12820641831. A
 12820641832. B
 12820641833. C
 12820641834. D

Question Number : 25 Question Id : 12820610583 Question Type : MCQ Option Shuffling : No Display Question Number : Yes
 Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 2 Wrong Marks : 0

$$\text{The function } f(x) = \begin{cases} x, & -\pi < x < 0 \\ -x, & 0 < x < \pi \end{cases}$$

is expanded as a Fourier series of the form $a_0 + \sum_{n=1}^{\infty} \left(a_n \cos \frac{n\pi x}{L} + b_n \sin \frac{n\pi x}{L} \right)$

Which of the following is true?

- (a) $a_0 \neq 0, b_n = 0$
 (b) $a_0 \neq 0, b_n \neq 0$
 (c) $a_0 = 0, b_n = 0$
 (d) $a_0 = 0, b_n \neq 0$

Options :

12820641835. A
 12820641836. B
 12820641837. C
 12820641838. D

Question Number : 26 Question Id : 12820610584 Question Type : MCQ Option Shuffling : No Display Question Number : Yes
 Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 2 Wrong Marks : 0

There are three planets in circular orbits around a star at distances a , $4a$ and $9a$, respectively. At time $t = t_0$, the star and the three planets are in a straight line. The period of revolution of the closest planet is T . How long after t_0 will they again be in the same straight line?

- (a) $8T$
- (b) $27T$
- (c) $216T$
- (d) $512T$

Options :

- 12820641839. A
- 12820641840. B
- 12820641841. C
- 12820641842. D

Question Number : 27 Question Id : 12820610585 Question Type : MCQ Option Shuffling : No Display Question Number : Yes
Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 2 Wrong Marks : 0

For the given set of equations:

$$x + y = 1$$

$$y + z = 1$$

$$x + z = 1,$$

Which one of the following statements is correct?

- (a) Equations are inconsistent.
- (b) Equations are consistent and a single non-trivial solution exists.
- (c) Equations are consistent and many solutions exist.
- (d) Equations are consistent and only a trivial solution exists.

Options :

- 12820641843. A
- 12820641844. B
- 12820641845. C
- 12820641846. D

Question Number : 28 Question Id : 12820610586 Question Type : MCQ Option Shuffling : No Display Question Number : Yes
Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 2 Wrong Marks : 0

Light travelling between two points takes a path for which

- (a) time of flight is always minimum.
- (b) distance is always minimum.
- (c) time of flight is extremum.
- (d) distance is extremum.

Options :

12820641847. A

12820641848. B

12820641849. C

12820641850. D

Question Number : 29 Question Id : 12820610587 Question Type : MCQ Option Shuffling : No Display Question Number : Yes
Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 2 Wrong Marks : 0

Consider a free electron (e) and a photon (ph) both having 10 eV of energy. If λ and P represent wavelength and momentum respectively, then (mass of electron = 9.1×10^{-31} kg; speed of light = 3×10^8 m/s)

- (A) $\lambda_e = \lambda_{ph}$ and $P_e = P_{ph}$
- (B) $\lambda_e < \lambda_{ph}$ and $P_e > P_{ph}$
- (C) $\lambda_e > \lambda_{ph}$ and $P_e < P_{ph}$
- (d) $\lambda_e < \lambda_{ph}$ and $P_e < P_{ph}$

Options :

12820641851. A

12820641852. B

12820641853. C

12820641854. D

Question Number : 30 Question Id : 12820610588 Question Type : MCQ Option Shuffling : No Display Question Number : Yes
Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 2 Wrong Marks : 0

If U , F , H , and G represent internal energy, Helmholtz free energy, enthalpy, and Gibbs free energy respectively, then which one of the following is a correct thermodynamic relation?

- (a) $dU = PdV - TdS$
- (b) $dH = VdP + TdS$
- (c) $dF = -PdV + SdT$
- (d) $dG = VdP + SdT$

Options :

12820641855. A

12820641856. B

12820641857. C

12820641858. D

Question Number : 31 Question Id : 12820610589 Question Type : MCQ Option Shuffling : No Display Question Number : Yes
Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 2 Wrong Marks : 0

A train passes through a station with a constant speed. A stationary observer at the station platform measures the tone of the train whistle as 484 Hz when it approaches the station and 442 Hz when it leaves the station. If the sound velocity in air is 330 m/s, then the tone of the whistle and the speed of the train are

- (a) 462 Hz, 54 km/h.
- (b) 463 Hz, 52 km/h.
- (c) 463 Hz, 56 km/h.
- (d) 464 Hz, 52 km/h.

Options :

12820641859. A

12820641860. B

12820641861. C

12820641862. D

Question Number : 32 Question Id : 12820610590 Question Type : MCQ Option Shuffling : No Display Question Number : Yes
Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 2 Wrong Marks : 0

The minimum length of a plane mirror to see the entire full-length image of an object is half of the object's height. Suppose δ is the distance between eye and top of the head of a person of height h . The person will be able to see his entire full-length image with a mirror of height $h/2$ fixed on the wall

- (a) when the bottom edge of mirror is kept $h/2$ above the floor.
- (b) when the bottom edge of mirror is kept $(h + \delta)/2$ above the floor.
- (c) when the bottom edge of mirror is kept $(h - \delta)/2$ above the floor.
- (d) when the centre of the mirror is at the same height as centre of the person.

Options :

12820641863. A

12820641864. B

12820641865. C

12820641866. D

Question Number : 33 Question Id : 12820610591 Question Type : MCQ Option Shuffling : No Display Question Number : Yes
Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 2 Wrong Marks : 0

A particle is moving in a plane with a constant radial velocity of 12 m/s and constant angular velocity of 2 rad/s. When the particle is at a distance $r = 8$ m from the origin, the magnitude of the instantaneous velocity of the particle in m/s is

- (a) $8\sqrt{15}$.
- (b) 20.
- (c) $2\sqrt{37}$.
- (d) 10.

Options :

- 12820641867. A
- 12820641868. B
- 12820641869. C
- 12820641870. D

Question Number : 34 Question Id : 12820610592 Question Type : MCQ Option Shuffling : No Display Question Number : Yes
Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 2 Wrong Marks : 0

A cylindrical rod of length L has a mass density distribution given by $(x) = \rho_0 (1+x/L)$ where x is measured from one end of the rod and ρ_0 is a constant of appropriate dimensions. The center of mass of the rod is

- (a) $5/9 L$.
- (b) $4/9 L$.
- (c) $1/9 L$.
- (d) $1/2 L$.

Options :

- 12820641871. A
- 12820641872. B
- 12820641873. C
- 12820641874. D

Question Number : 35 Question Id : 12820610593 Question Type : MCQ Option Shuffling : No Display Question Number : Yes
Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 2 Wrong Marks : 0

A lightly damped harmonic oscillator with natural frequency ω_0 is driven by a periodic force of frequency ω . The amplitude of oscillation is maximum when

- (a) ω is slightly lower than ω_0 .
- (b) $\omega = \omega_0$.
- (c) ω is slightly higher than ω_0 .
- (d) the force is in phase with the displacement

Options :

- 12820641875. A

12820641876. B
12820641877. C
12820641878. D

Question Number : 36 Question Id : 12820610594 Question Type : MCQ Option Shuffling : No Display Question Number : Yes
Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 2 Wrong Marks : 0

One mole of an ideal gas with average molecular speed v_0 is kept in a container of fixed volume. If the temperature of the gas is increased such that the average speed gets doubled, then

- (a) the mean free path of the gas molecule will increase.
- (b) the mean free path of the gas molecule will not change.
- (c) the mean free path of the gas molecule will decrease.
- (d) the collision frequency of the gas molecule with wall of the container remains unchanged.

Options :

12820641879. A
12820641880. B
12820641881. C
12820641882. D

Question Number : 37 Question Id : 12820610595 Question Type : MCQ Option Shuffling : No Display Question Number : Yes
Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 2 Wrong Marks : 0

Consider a small bar magnet undergoing simple harmonic motion (SHM) along the x-axis. A coil whose plane is perpendicular to the x-axis is placed such that the magnet passes in and out of it during its motion. Which one of the following statements is correct? Neglect damping effects.

- (a) Induced e.m.f. is minimum when the center of the bar magnet crosses the coil.
- (b) The frequency of the induced current in the coil is half of the frequency of the SHM.
- (c) Induced e.m.f. in the coil will not change with the velocity of the magnet.
- (d) The sign of the e.m.f. depends on the pole (N or S) face of the magnet which enters into the coil.

Options :

12820641883. A
12820641884. B
12820641885. C
12820641886. D

Question Number : 38 Question Id : 12820610596 Question Type : MCQ Option Shuffling : No Display Question Number : Yes
Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 2 Wrong Marks : 0

The eigen values of the matrix representing the following pair of linear equations

$$x + iy = 0$$

$$ix + y = 0$$

are:

(a) $1+i, 1+i$

(b) $1-i, 1-i$

(c) $1, i$

(d) $1+i, 1-i$

Options :

12820641887. A

12820641888. B

12820641889. C

12820641890. D

Question Number : 39 Question Id : 12820610597 Question Type : MCQ Option Shuffling : No Display Question Number : Yes
Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 2 Wrong Marks : 0

A charged particle in a uniform magnetic field $\vec{B} = B_0 \hat{e}_z$ starts moving from the origin with velocity $\vec{v} = (3\hat{e}_x + 2\hat{e}_z) \text{ m/s}$. The trajectory of the particle and the time t at which it reaches 2 meters above the xy - plane are (\hat{e}_x , \hat{e}_y , and \hat{e}_z are unit vectors in Cartesian – coordinate system.)

(a) Helical path ; = 1 s.

(b) Helical path ; = 2/3 s.

(c) Circular path ; = 1 s.

(d) Circular path ; = 2/3 s.

Options :

12820641891. A

12820641892. B

12820641893. C

12820641894. D

Question Number : 40 Question Id : 12820610598 Question Type : MCQ Option Shuffling : No Display Question Number : Yes
Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 2 Wrong Marks : 0

High speed electrons from particle detectors are used to determine

(a) arrangement of atoms in metals

(b) diameter of atomic nuclei

(c) inter atomic distance

(d) circumference of atomic nuclei

Options :

- 12820641895. A
- 12820641896. B
- 12820641897. C
- 12820641898. D

Question Number : 41 Question Id : 12820610599 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 2 Wrong Marks : 0

If a secondary coil has 40 turns, and, a primary coil with 20 turns is charged with 50 V of potential difference, then potential difference in secondary coil would be

- (a) 50 V in secondary coil
- (b) 25 V in secondary coil
- (c) 60 V in secondary coil
- (d) 100 V in secondary coil

Options :

- 12820641899. A
- 12820641900. B
- 12820641901. C
- 12820641902. D

Question Number : 42 Question Id : 12820610600 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 2 Wrong Marks : 0

Over-damping results in

- (a) slower return to equilibrium
- (b) faster return to equilibrium
- (c) equilibrium is never achieved
- (d) arrhythmic return to equilibrium

Options :

- 12820641903. A
- 12820641904. B
- 12820641905. C
- 12820641906. D

Question Number : 43 Question Id : 12820610601 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 2 Wrong Marks : 0

In a magnetic field of 2.50×10^{-3} T, if magnetic force is equal to proton's weight, then proton moves with speed of

- (a) $3.09 \times 10^{-5} \text{ m s}^{-1}$
- (b) $4.09 \times 10^{-5} \text{ m s}^{-1}$
- (c) $2.09 \times 10^{-5} \text{ m s}^{-1}$
- (d) $0.09 \times 10^{-5} \text{ m s}^{-1}$

Options :

- 12820641907. A
- 12820641908. B
- 12820641909. C
- 12820641910. D

Question Number : 44 Question Id : 12820610602 Question Type : MCQ Option Shuffling : No Display Question Number : Yes
Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 2 Wrong Marks : 0

When $K.E_{\text{max}}$ of photoelectrons is zero, then frequency of incident photon relative to threshold frequency is

- (a) less
- (b) equal
- (c) greater
- (d) small

Options :

- 12820641911. A
- 12820641912. B
- 12820641913. C
- 12820641914. D

Question Number : 45 Question Id : 12820610603 Question Type : MCQ Option Shuffling : No Display Question Number : Yes
Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 2 Wrong Marks : 0

During x-ray formation, if voltage is increased, then

- (a) min wave length decreases
- (b) min wave length increases
- (c) intensity decreases
- (d) intensity increases

Options :

- 12820641915. A
- 12820641916. B
- 12820641917. C
- 12820641918. D

Question Number : 46 Question Id : 12820610604 Question Type : MCQ Option Shuffling : No Display Question Number : Yes
Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 2 Wrong Marks : 0

Square coil of side 16 cm having 200 turns rotating in magnetic field of 0.05 T with peak EMF of 12 V will produce angular velocity of

- (a) 47 rad s^{-1}
- (b) 49 rad s^{-1}
- (c) 42 rad s^{-1}
- (d) 48 rad s^{-1}

Options :

12820641919. A

12820641920. B

12820641921. C

12820641922. D

Question Number : 47 Question Id : 12820610605 Question Type : MCQ Option Shuffling : No Display Question Number : Yes
Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 2 Wrong Marks : 0

Air trapped inside a single-piston-cylinder exerts a pressure of 760 mmHg. If its volume is increased by 30% at a constant temperature, pressure exerted would be equal to

- (a) 533 mmHg
- (b) 544 mmHg
- (c) 584 mmHg
- (d) 633 mmHg

Options :

12820641923. A

12820641924. B

12820641925. C

12820641926. D

Question Number : 48 Question Id : 12820610606 Question Type : MCQ Option Shuffling : No Display Question Number : Yes
Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 2 Wrong Marks : 0

If air at a pressure of 2 MPa is compressed such that new volume of air is one eighth of its initial volume, then new pressure of air is

- (a) 0.25 M Pa
- (b) 2 M Pa
- (c) 8 M Pa
- (d) 16 M Pa

Options :

12820641927. A

12820641928. B

12820641929. C

12820641930. D

Question Number : 49 Question Id : 12820610607 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 2 Wrong Marks : 0

In a magnetic field of 2.50×10^{-3} T, if magnetic force is equal to proton's weight, then proton moves with speed of

- (a) $3.09 \times 10^{-5} \text{ m s}^{-1}$
- (b) $4.09 \times 10^{-5} \text{ m s}^{-1}$
- (c) $2.09 \times 10^{-5} \text{ m s}^{-1}$
- (d) $0.09 \times 10^{-5} \text{ m s}^{-1}$

Options :

12820641931. A

12820641932. B

12820641933. C

12820641934. D

Question Number : 50 Question Id : 12820610608 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 2 Wrong Marks : 0

In a laboratory, Bunsen burner is used to increase temperature of lime from $10\text{ }^{\circ}\text{C}$ to $50\text{ }^{\circ}\text{C}$ with thermal energy of 80000 J . If mass of lime is 20 kg , specific heat capacity of lime would be

- (a) $25\text{ J kg}^{-1}\text{ }^{\circ}\text{C}^{-1}$
- (b) $50\text{ J kg}^{-1}\text{ }^{\circ}\text{C}^{-1}$
- (c) $75\text{ J kg}^{-1}\text{ }^{\circ}\text{C}^{-1}$
- (d) $100\text{ J kg}^{-1}\text{ }^{\circ}\text{C}^{-1}$

Options :

12820641935. A

12820641936. B

12820641937. C

12820641938. D

Part B Section II (Chemistry)

Section Id :	128206301
Section Number :	3
Section type :	Online
Mandatory or Optional:	Optional
Number of Questions:	35
Number of Questions to be attempted:	35
Section Marks:	70
Display Number Panel:	Yes
Group All Questions:	No

Sub-Section Number:	1
Sub-Section Id:	128206484
Question Shuffling Allowed :	Yes

Question Number : 51 Question Id : 12820610609 Question Type : MCQ Option Shuffling : No Display Question Number : Yes
Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 2 Wrong Marks : 0

Among the following which is the strongest oxidizing agent?

- a) Br_2
- b) Cl_2
- c) I_2
- d) F_2

Options :

12820641939. A

12820641940. B

12820641941. C

12820641942. D

Question Number : 52 Question Id : 12820610610 Question Type : MCQ Option Shuffling : No Display Question Number : Yes
Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 2 Wrong Marks : 0

Which of the following is true for a closed system?

- (a) mass entering = mass leaving
- (b) mass does not enter or leave the system
- (c) mass entering can be more or less than the mass leaving
- (d) there is no change of energy

Options :

12820641943. A

12820641944. B

12820641945. C

12820641946. D

Question Number : 53 Question Id : 12820610611 Question Type : MCQ Option Shuffling : No Display Question Number : Yes
Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 2 Wrong Marks : 0

An acid (HA) has $K_a = 10^{-7}$, what will be its pK_a ?

- a) 7
- b) -7
- c) -0.7
- d) 1/7

Options :

12820641947. A

12820641948. B

12820641949. C

12820641950. D

Question Number : 54 Question Id : 12820610612 Question Type : MCQ Option Shuffling : No Display Question Number : Yes
Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 2 Wrong Marks : 0

Vander Waal's equation for n moles of a gas is

- a) $(P + a / V^2) (V - b) = RT$
- b) $(P + na / V^2) (V - nb) = nRT$
- c) $(P + na / V^2) (V - b) = nRT$
- d) $(P + n^2 a / V^2) (V - nb) = nRT$

Options :

12820641951. A

12820641952. B

12820641953. C

12820641954. D

Question Number : 55 Question Id : 12820610613 Question Type : MCQ Option Shuffling : No Display Question Number : Yes
Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 2 Wrong Marks : 0

For the first order reaction, if the time taken for 50% of the reaction is t secs; the time required for completion of 99.99% reaction is

- a) $5t$
- b) $10t$
- c) $2t$
- d) $100t$

Options :

- 12820641955. A
- 12820641956. B
- 12820641957. C
- 12820641958. D

Question Number : 56 Question Id : 12820610614 Question Type : MCQ Option Shuffling : No Display Question Number : Yes
Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 2 Wrong Marks : 0

Higher the bond order greater is

- a) Bond energy
- b) Bond angle
- c) Bond length
- d) paramagnetism

Options :

- 12820641959. A
- 12820641960. B
- 12820641961. C
- 12820641962. D

Question Number : 57 Question Id : 12820610615 Question Type : MCQ Option Shuffling : No Display Question Number : Yes
Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 2 Wrong Marks : 0

A first order reaction is 50% completed in 1.26×10^{14} s. How much time would it take for 100% completion?

- a) 1.26×10^{28}
- b) 2.54×10^{28}
- c) infinite
- d) 2.54×10^{14}

Options :

- 12820641963. A
- 12820641964. B
- 12820641965. C
- 12820641966. D

Question Number : 58 Question Id : 12820610616 Question Type : MCQ Option Shuffling : No Display Question Number : Yes
Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 2 Wrong Marks : 0

According to Debye's theory of specific heat at high temperature specific heat is proportional to

- a) T
- b) T^2
- c) T^3
- d) Independent of T

Options :

- 12820641967. A
- 12820641968. B
- 12820641969. C
- 12820641970. D

Question Number : 59 Question Id : 12820610617 Question Type : MCQ Option Shuffling : No Display Question Number : Yes
Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 2 Wrong Marks : 0

According to Maxwell's law of distribution of velocities of molecules, the most probable velocity is

- a) Greater than the mean velocity
- b) Equal to the mean velocity
- c) Equal to root mean square velocity
- d) Less than the root mean square velocity

Options :

- 12820641971. A
- 12820641972. B
- 12820641973. C
- 12820641974. D

Question Number : 60 Question Id : 12820610618 Question Type : MCQ Option Shuffling : No Display Question Number : Yes
Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 2 Wrong Marks : 0

In a grand canonical ensemble, a system A of fixed volume is in contact with a large reservoir B. Then

- a) A can exchange only energy with B
- b) A can exchange only particles with B
- c) A can exchange neither energy nor particles with B
- d) A can exchange both energy and particles with B

Options :

- 12820641975. A
- 12820641976. B
- 12820641977. C

12820641978. D

Question Number : 61 Question Id : 12820610619 Question Type : MCQ Option Shuffling : No Display Question Number : Yes
Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 2 Wrong Marks : 0

The compound that contains the most acidic hydrogen is

- a) $\text{H}_2\text{C}=\text{CH}_2$
- b) $\text{HC}\equiv\text{CH}$
- c) $\text{H}_2\text{C}=\text{C}=\text{CH}_2$
- d) $\text{H}_3\text{C}-\text{CH}_3$

Options :

12820641979. A

12820641980. B

12820641981. C

12820641982. D

Question Number : 62 Question Id : 12820610620 Question Type : MCQ Option Shuffling : No Display Question Number : Yes
Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 2 Wrong Marks : 0

Which of the following relationships is true for an acidic solution at 25°C ?

- a) $[\text{H}^+] > [\text{OH}^-]$
- b) $\text{pH} > 7.00$
- c) $K_w > 1 \times 10^{-14}$
- d) The solution is negatively-charged

Options :

12820641983. A

12820641984. B

12820641985. C

12820641986. D

Question Number : 63 Question Id : 12820610621 Question Type : MCQ Option Shuffling : No Display Question Number : Yes
Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 2 Wrong Marks : 0

An aqueous solution containing a concentration of 2.5×10^{-8} OH^- ions will have a pH of which of the following?

- a) 6.40
- b) 6.42
- c) 7.40
- d) 7.60

Options :

12820641987. A
12820641988. B
12820641989. C
12820641990. D

Question Number : 64 Question Id : 12820610622 Question Type : MCQ Option Shuffling : No Display Question Number : Yes
Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 2 Wrong Marks : 0

A buffer solution contains ethanoic acid and its conjugate base; the pK_a of ethanoic acid is 4.74. At what pH does the solution buffer?

- a) 3.0
b) 4.0
c) 5.0
d) 6.0

Options :

12820641991. A
12820641992. B
12820641993. C
12820641994. D

Question Number : 65 Question Id : 12820610623 Question Type : MCQ Option Shuffling : No Display Question Number : Yes
Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 2 Wrong Marks : 0

BF_3 acts as acids according to the concept of _____ ?

- a) Bronsted
b) Arrhenius
c) Lewis
d) Nernst

Options :

12820641995. A
12820641996. B
12820641997. C
12820641998. D

Question Number : 66 Question Id : 12820610624 Question Type : MCQ Option Shuffling : No Display Question Number : Yes
Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 2 Wrong Marks : 0

Ionization constant of acetic acid is 1.8×10^{-5} . Concentration of H^+ ion in 0.1M solution is

- a) $1.34 \times 10^{-3} M$
b) $1.1 \times 10^{-3} M$
c) $1.8 \times 10^{-5} M$
d) $1.34 \times 10^{-4} M$

Options :

12820641999. A
12820642000. B

12820642001. C

12820642002. D

Question Number : 67 Question Id : 12820610625 Question Type : MCQ Option Shuffling : No Display Question Number : Yes
Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 2 Wrong Marks : 0

Which among the following does not exhibit geometric isomerism

- a) 1-hexene
- b) 2-hexene
- c) 3-hexene
- d) 4-hexene

Options :

12820642003. A

12820642004. B

12820642005. C

12820642006. D

Question Number : 68 Question Id : 12820610626 Question Type : MCQ Option Shuffling : No Display Question Number : Yes
Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 2 Wrong Marks : 0

The work done by a closed system in a reversible process is always ____ that done in an irreversible process.

- a) less than or more than
- b) equal to
- c) less than
- d) more than

Options :

12820642007. A

12820642008. B

12820642009. C

12820642010. D

Question Number : 69 Question Id : 12820610627 Question Type : MCQ Option Shuffling : No Display Question Number : Yes
Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 2 Wrong Marks : 0

Which of the following is true for a steady flow system?

- a) mass entering = mass leaving
- b) mass does not enter or leave the system
- c) mass entering can be more or less than the mass leaving
- d) none of the mentioned

Options :

12820642011. A

12820642012. B

12820642013. C

12820642014. D

Question Number : 70 Question Id : 12820610628 Question Type : MCQ Option Shuffling : No Display Question Number : Yes
Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 2 Wrong Marks : 0

According to Dalton's law the total pressure of the mixture of gases is equal to

- a) greater than partial pressure for all
- b) average of partial pressure for all
- c) sum of partial pressure for all
- d) atmospheric pressure

Options :

12820642015. A

12820642016. B

12820642017. C

12820642018. D

Question Number : 71 Question Id : 12820610629 Question Type : MCQ Option Shuffling : No Display Question Number : Yes
Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 2 Wrong Marks : 0

The work done in free expansion process

- a) maximum
- b) negative
- c) zero
- d) positive

Options :

12820642019. A

12820642020. B

12820642021. C

12820642022. D

Question Number : 72 Question Id : 12820610630 Question Type : MCQ Option Shuffling : No Display Question Number : Yes
Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 2 Wrong Marks : 0

The activation energy of a reaction at a given temperature is found to be $2.303 RT \text{ J mol}^{-1}$.

The ratio of rate constant to the Arrhenius factor is

- a) 0.1
- b) 0.01
- c) 0.001
- d) 0.02

Options :

- 12820642023. A
- 12820642024. B
- 12820642025. C
- 12820642026. D

Question Number : 73 Question Id : 12820610631 Question Type : MCQ Option Shuffling : No Display Question Number : Yes
Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 2 Wrong Marks : 0

Radioactivity of a sample ($z = 22$) decreases 90% after 10 years. What will be the half-life of the sample?

- a) 5 years
- b) 6 years
- c) 3 years
- d) 10 years

Options :

- 12820642027. A
- 12820642028. B
- 12820642029. C
- 12820642030. D

Question Number : 74 Question Id : 12820610632 Question Type : MCQ Option Shuffling : No Display Question Number : Yes
Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 2 Wrong Marks : 0

In a protein molecule, various amino acids are linked together by

- a) Peptide bond
- b) Dative bond
- c) α -glycosidic bond
- d) β -glycosidic bond

Options :

- 12820642031. A
- 12820642032. B
- 12820642033. C
- 12820642034. D

Question Number : 75 Question Id : 12820610633 Question Type : MCQ Option Shuffling : No Display Question Number : Yes
Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 2 Wrong Marks : 0

Which one of the following statements is correct?

- a) All amino acids except lysine are optically active
- b) All amino acids are optically active
- c) All amino acids except glycine are optically active
- d) All amino acids except glutamic acids are optically active

Options :

- 12820642035. A

12820642036. B

12820642037. C

12820642038. D

Question Number : 76 Question Id : 12820610634 Question Type : MCQ Option Shuffling : No Display Question Number : Yes
Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 2 Wrong Marks : 0

What should be the correct IUPAC name for diethylbromomethane?

- a) 1-Bromo-1,1-diethylmethane
- b) 3-Bromopentane
- c) 1-Bromo-1-ethylpropane
- d) 1-Bromopentane

Options :

12820642039. A

12820642040. B

12820642041. C

12820642042. D

Question Number : 77 Question Id : 12820610635 Question Type : MCQ Option Shuffling : No Display Question Number : Yes
Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 2 Wrong Marks : 0

Which among the following is formed when an alcohol is dehydrated?

- a) alkane
- b) alkyne
- c) alkene
- d) aldehyde

Options :

12820642043. A

12820642044. B

12820642045. C

12820642046. D

Question Number : 78 Question Id : 12820610636 Question Type : MCQ Option Shuffling : No Display Question Number : Yes
Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 2 Wrong Marks : 0

The rate of the reaction is equal to the product of three factors listed below except

- a) Collision frequency
- b) Energy factor
- c) Orientation factor
- d) pH factor

Options :

12820642047. A

12820642048. B

12820642049. C

12820642050. D

Question Number : 79 Question Id : 12820610637 Question Type : MCQ Option Shuffling : No Display Question Number : Yes
Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 2 Wrong Marks : 0

Which is not a type of catalyst:

- a) Positive catalyst
- b) Negative catalyst
- c) Autocatalyst
- d) homogeneous catalysis

Options :

12820642051. A

12820642052. B

12820642053. C

12820642054. D

Question Number : 80 Question Id : 12820610638 Question Type : MCQ Option Shuffling : No Display Question Number : Yes
Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 2 Wrong Marks : 0

How many protons contain the nucleus of an atom of element with atomic number 6?

- a) 2
- b) 3
- c) 6
- d) 5

Options :

12820642055. A

12820642056. B

12820642057. C

12820642058. D

Question Number : 81 Question Id : 12820610639 Question Type : MCQ Option Shuffling : No Display Question Number : Yes
Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 2 Wrong Marks : 0

The mass of the substance (m) and its volume (V) are:

- a) intensive properties
- b) state functions of the system
- c) thermodynamic properties
- d) extensive properties

Options :

12820642059. A

12820642060. B

12820642061. C

12820642062. D

Question Number : 82 Question Id : 12820610640 Question Type : MCQ Option Shuffling : No Display Question Number : Yes
Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 2 Wrong Marks : 0

The main source of energy for the human organism is:

- a) ATP
- b) carbohydrates
- c) proteins
- d) vitamins and minerals

Options :

12820642063. A

12820642064. B

12820642065. C

12820642066. D

Question Number : 83 Question Id : 12820610641 Question Type : MCQ Option Shuffling : No Display Question Number : Yes
Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 2 Wrong Marks : 0

When the value of rate constant and rate of reaction are equal?

- a) reaction take place in homogeneous system
- b) reaction take place in heterogeneous system
- c) concentrations of reactants are equal 1 mol/L
- d) concentrations of reactants are the same, but not equal 1 mol/L

Options :

12820642067. A

12820642068. B

12820642069. C

12820642070. D

Question Number : 84 Question Id : 12820610642 Question Type : MCQ Option Shuffling : No Display Question Number : Yes
Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 2 Wrong Marks : 0

What is the relations between Gibbs energy and the solubility product constant K_{sp} ?

- a) $\log K_{sp} = \Delta G / (2,303RT)$
- b) $\log K_{sp} = -\Delta G / (2,303RT)$
- c) $\Delta G = RT \log K_{sp}$
- d) $\Delta G = RT \ln K_{sp}$

Options :

12820642071. A

12820642072. B

12820642073. C

12820642074. D

Question Number : 85 Question Id : 12820610643 Question Type : MCQ Option Shuffling : No Display Question Number : Yes
Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 2 Wrong Marks : 0

In which case the precipitate of slightly dissolved salt will form?(IP – ion product)

- a) $IP \approx K_{sp}$
- b) $IP < K_{sp}$
- c) $IP > K_{sp}$
- d) $IP = K_{sp}$

Options :

- 12820642075. A
- 12820642076. B
- 12820642077. C
- 12820642078. D

Part B Section III (Mathematics)

Section Id :	128206302
Section Number :	4
Section type :	Online
Mandatory or Optional:	Optional
Number of Questions:	35
Number of Questions to be attempted:	35
Section Marks:	70
Display Number Panel:	Yes
Group All Questions:	No

Sub-Section Number:	1
Sub-Section Id:	128206485
Question Shuffling Allowed :	Yes

Question Number : 86 Question Id : 12820610644 Question Type : MCQ Option Shuffling : No Display Question Number : Yes
Single Line Question Option : No Option Orientation : Vertical
Correct Marks : 2 Wrong Marks : 0

The Eigen values of a skew-symmetric matrix are:

- (a) Always zero
- (b) always pure imaginary
- (c) Either zero or pure imaginary
- (d) always real

Options :

- 12820642079. A
- 12820642080. B
- 12820642081. C
- 12820642082. D

Question Number : 87 Question Id : 12820610645 Question Type : MCQ Option Shuffling : No Display Question Number : Yes
Single Line Question Option : No Option Orientation : Vertical
Correct Marks : 2 Wrong Marks : 0

A is a 3×4 real matrix and $Ax = b$ is an inconsistent system of equations. The highest possible rank of A is:

- (a) 1
- (b) 2
- (c) 3
- (d) 4

Options :

- 12820642083. A
- 12820642084. B
- 12820642085. C
- 12820642086. D

Question Number : 88 Question Id : 12820610646 Question Type : MCQ Option Shuffling : No Display Question Number : Yes
Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 2 Wrong Marks : 0

The product of matrices $(PQ)^{-1}P$ is:

- (a) P^{-1}
- (b) Q^{-1}
- (c) $P^{-1}Q^{-1}P$
- (d) $PQ P^{-1}$

Options :

- 12820642087. A
- 12820642088. B
- 12820642089. C
- 12820642090. D

Question Number : 89 Question Id : 12820610647 Question Type : MCQ Option Shuffling : No Display Question Number : Yes
Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 2 Wrong Marks : 0

For the following set of simultaneous equations:

$$1.5x - 0.5y = 2$$

$$4x + 2y + 3z = 9$$

$$7x + y + 5z = 10$$

- (a) The solution is unique
- (b) Infinitely many solutions exist
- (c) The equations are incompatible
- (d) Finite number of multiple solutions exist

Options :

- 12820642091. A
- 12820642092. B
- 12820642093. C
- 12820642094. D

Question Number : 90 Question Id : 12820610648 Question Type : MCQ Option Shuffling : No Display Question Number : Yes
Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 2 Wrong Marks : 0

For a given matrix $\begin{bmatrix} 2 & -2 & 3 \\ -2 & -1 & 6 \\ 1 & 2 & 0 \end{bmatrix}$, one of the eigen value is 3, the other two eigen

values are:

- (a) 2,-5
- (b) 3,-5
- (c) 2,5
- (d) 3,5

Options :

- 12820642095. A
- 12820642096. B
- 12820642097. C
- 12820642098. D

Question Number : 91 Question Id : 12820610649 Question Type : MCQ Option Shuffling : No Display Question Number : Yes
Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 2 Wrong Marks : 0

Solution of differential equation $\frac{d^2x}{dt^2} = -9x$, with initial condition $x(0) = 1$, $\left. \frac{dx}{dt} \right|_{t=0} = 1$

is:

- (a) $t^2 + t + 1$
- (b) $\sin 3t + \frac{1}{3} \cos 3t + \frac{2}{3}$
- (c) $\frac{1}{3} \sin 3t + \cos 3t$
- (d) $\cos 3t + t$

Options :

- 12820642099. A
- 12820642100. B
- 12820642101. C
- 12820642102. D

Question Number : 92 Question Id : 12820610650 Question Type : MCQ Option Shuffling : No Display Question Number : Yes
Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 2 Wrong Marks : 0

Derivative of $f(x) = |x|$ at $x = 0$ is :

- (a) 1
- (b) -1
- (c) 0
- (d) Does not exist

Options :

- 12820642103. A
- 12820642104. B
- 12820642105. C
- 12820642106. D

Question Number : 93 Question Id : 12820610651 Question Type : MCQ Option Shuffling : No Display Question Number : Yes
Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 2 Wrong Marks : 0

The function $f(x) = x + 1$ on the interval $[-2, 0]$ is:

- (a) Continuous and differentiable
- (b) Continuous in the interval but not differentiable at all points
- (c) Neither continuous nor differentiable
- (d) Differentiable but not continuous

Options :

- 12820642107. A
- 12820642108. B
- 12820642109. C
- 12820642110. D

Question Number : 94 Question Id : 12820610652 Question Type : MCQ Option Shuffling : No Display Question Number : Yes
Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 2 Wrong Marks : 0

What should be the value of λ if the function defined below is continuous at $x = \pi/2$:

$$f(x) = \begin{cases} \frac{\lambda \cos x}{\frac{\pi}{2} - x} & \text{if } x \neq \frac{\pi}{2} \\ 1 & \text{if } x = \frac{\pi}{2} \end{cases}$$

- (a) 0
- (b) $2/\pi$
- (c) 1
- (d) $/2\pi$

Options :

- 12820642111. A
- 12820642112. B
- 12820642113. C

12820642114. D

Question Number : 95 Question Id : 12820610653 Question Type : MCQ Option Shuffling : No Display Question Number : Yes
Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 2 Wrong Marks : 0

The function $f(x) = x^3 - 6x^2 + 9x + 25$ has :

- (a) A maxima at $x = 1$ and a minima at $x = 3$
- (b) A maxima at $x = 3$ and a minima at $x = 1$
- (c) Not maxima, but a minima at $x = 3$
- (d) A maxima at $x = 1$, but not minima

Options :

12820642115. A

12820642116. B

12820642117. C

12820642118. D

Question Number : 96 Question Id : 12820610654 Question Type : MCQ Option Shuffling : No Display Question Number : Yes
Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 2 Wrong Marks : 0

The magnitude of the gradient of the function $f(x) = xyz^2$ at $(1, 0, 2)$ is :

- (a) 0
- (b) 3
- (c) 8
- (d) ∞

Options :

12820642119. A

12820642120. B

12820642121. C

12820642122. D

Question Number : 97 Question Id : 12820610655 Question Type : MCQ Option Shuffling : No Display Question Number : Yes
Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 2 Wrong Marks : 0

The Gauss divergence theorem relates certain:

- (a) Surface integrals to volume integrals
- (b) Surface integrals to line integrals
- (c) Vector quantities to other vector quantities
- (d) Line integrals to volume integrals

Options :

- 12820642123. A
- 12820642124. B
- 12820642125. C
- 12820642126. D

Question Number : 98 Question Id : 12820610656 Question Type : MCQ Option Shuffling : No Display Question Number : Yes
Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 2 Wrong Marks : 0

The area common to the circles $r = a$ and $r = 2a \cos \theta$ is:

- (a) $0.524 a^2$
- (b) $0.614 a^2$
- (c) $1.047 a^2$
- (d) $1.228 a^2$

Options :

- 12820642127. A
- 12820642128. B
- 12820642129. C
- 12820642130. D

Question Number : 99 Question Id : 12820610657 Question Type : MCQ Option Shuffling : No Display Question Number : Yes
Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 2 Wrong Marks : 0

Taylor series expansion of e^x about, $x = 2$ the coefficient of $(x - 2)^4$ is:

- (a) $1/4!$
- (b) $2^4/4!$
- (c) $e^2/4!$
- (d) $e^4/4!$

Options :

- 12820642131. A
- 12820642132. B
- 12820642133. C
- 12820642134. D

Question Number : 100 Question Id : 12820610658 Question Type : MCQ Option Shuffling : No Display Question Number : Yes
Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 2 Wrong Marks : 0

For the function $\frac{\sin z}{z^3}$ of a complex variable z , the point $z = 0$ is :

- (a) a pole of order 3
- (b) a pole of order 2
- (c) a pole of order 1
- (d) not a singularity

Options :

- 12820642135. A
- 12820642136. B
- 12820642137. C
- 12820642138. D

Question Number : 101 Question Id : 12820610659 Question Type : MCQ Option Shuffling : No Display Question Number : Yes
Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 2 Wrong Marks : 0

The order of error in the Simpson's $\frac{1}{3}$ rule for numerical integration with a step size h is:

- (a) h
- (b) h^2
- (c) h^3
- (d) h^4

Options :

- 12820642139. A
- 12820642140. B
- 12820642141. C
- 12820642142. D

Question Number : 102 Question Id : 12820610660 Question Type : MCQ Option Shuffling : No Display Question Number : Yes
Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 2 Wrong Marks : 0

Starting from $x_0 = 1$, one step of Newton-Raphson method in solving the equation $x^2 + 3x - 7 = 0$ gives the next value (x_1) as :

- (a) $x_1 = 0.5$
- (b) $x_1 = 1.406$
- (c) $x_1 = 1.5$
- (d) $x_1 = 2$

Options :

- 12820642143. A
- 12820642144. B
- 12820642145. C
- 12820642146. D

Question Number : 103 Question Id : 12820610661 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 2 Wrong Marks : 0

A differential equation $\frac{dx}{dt} = e^{-2t} u(t)$ has to be solved using trapezoidal rule of integration with a step size $h = .01$ Function $u(t)$ indicates a unit step function. If $x(0) = 0$, then value of x at $t = 0.01$ will be given by

- (a) 0.00099
- (b) 0.00495
- (c) 0.0099
- (d) 0.0198

Options :

- 12820642147. A
- 12820642148. B
- 12820642149. C
- 12820642150. D

Question Number : 104 Question Id : 12820610662 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 2 Wrong Marks : 0

The given series $\sum_{n=1}^{\infty} \frac{(-1)^{n+1}}{n^2 + 1}$ is :

- (a) Convergent
- (b) Absolutely Convergent
- (c) Conditionally Convergent
- (d) Divergent

Options :

- 12820642151. A
- 12820642152. B
- 12820642153. C
- 12820642154. D

Question Number : 105 Question Id : 12820610663 Question Type : MCQ Option Shuffling : No Display Question Number : Yes
Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 2 Wrong Marks : 0

If a_n is a bounded decreasing sequence and b_n is a bounded increasing sequence if

$x_n = a_n + b_n$ for $n \in \mathbb{N}$, then $\sum_{n=1}^{\infty} |x_n - x_{n+1}|$ is :

- (a) Convergent
- (b) Conditionally Convergent
- (c) Divergent
- (d) None of these

Options :

- 12820642155. A
- 12820642156. B
- 12820642157. C
- 12820642158. D

Question Number : 106 Question Id : 12820610664 Question Type : MCQ Option Shuffling : No Display Question Number : Yes
Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 2 Wrong Marks : 0

Let I be the identity transformation of the finite dimensional vector space V , then the nullity of I is :

(a) $\dim V$

(b) 0

(c) 1

(d) $\dim V - 1$

Options :

12820642159. A

12820642160. B

12820642161. C

12820642162. D

Question Number : 107 Question Id : 12820610665 Question Type : MCQ Option Shuffling : No Display Question Number : Yes
Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 2 Wrong Marks : 0

The minimal polynomial of $\begin{pmatrix} 2 & 1 & 0 & 0 \\ 0 & 2 & 0 & 0 \\ 0 & 0 & 2 & 0 \\ 0 & 0 & 0 & 5 \end{pmatrix}$ is:

(a) $(x - 2)$

(b) $(x - 2)(x - 5)$

(c) $(x - 2)^2(x - 5)$

(d) $(x - 2)^3(x - 5)$

Options :

12820642163. A

12820642164. B

12820642165. C

12820642166. D

Question Number : 108 Question Id : 12820610666 Question Type : MCQ Option Shuffling : No Display Question Number : Yes
Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 2 Wrong Marks : 0

A is a unitary matrix. Then eigen value of A are:

(a) $1, -1$

(b) $1, -i$

(c) $i, -i$

(d) $-1, i$

Options :

12820642167. A

12820642168. B

12820642169. C

12820642170. D

Question Number : 109 Question Id : 12820610667 Question Type : MCQ Option Shuffling : No Display Question Number : Yes
Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 2 Wrong Marks : 0

Which of the statement is correct :

I) $\langle N, * \rangle$ is monoid with identity 1.

II) $\langle Z, + \rangle$ is monoid with identity 0.

(a) I True II False

(b) I False II True

(c) I & II Both are True

(d) I & II Both are False

Options :

12820642171. A

12820642172. B

12820642173. C

12820642174. D

Question Number : 110 Question Id : 12820610668 Question Type : MCQ Option Shuffling : No Display Question Number : Yes
Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 2 Wrong Marks : 0

The number of generators for the group $\langle \mathbb{Z}_{20}, +_{20} \rangle$ are :

- (a) 2
- (b) 4
- (c) 1
- (d) 8

Options :

- 12820642175. A
- 12820642176. B
- 12820642177. C
- 12820642178. D

Question Number : 111 Question Id : 12820610669 Question Type : MCQ Option Shuffling : No Display Question Number : Yes
Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 2 Wrong Marks : 0

In 5 throws of a die, if getting 1 or 2 is a success, then the expected number of successes is

- a) $3/5$
- b) $5/3$
- c) $9/5$
- d) $5/9$

Options :

- 12820642179. A
- 12820642180. B
- 12820642181. C
- 12820642182. D

Question Number : 112 Question Id : 12820610670 Question Type : MCQ Option Shuffling : No Display Question Number : Yes
Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 2 Wrong Marks : 0

In a sports club, 65 % of members play tennis, 40 % play golf and 20 % play both tennis and golf. A member is chosen at random. Given that he plays tennis, the probability that he also plays golf is

- a) 85 %
- b) $40 / 65$ %
- c) $20 / 65$ %
- d) $40 / 85$ %

Options :

- 12820642183. A
- 12820642184. B
- 12820642185. C
- 12820642186. D

Question Number : 113 Question Id : 12820610671 Question Type : MCQ Option Shuffling : No Display Question Number : Yes
Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 2 Wrong Marks : 0

The square of a standard normal distribution is a

- a) normal distribution
- b) chi-square distribution
- c) cauchy distribution
- d) poisson distribution.

Options :

- 12820642187. A
- 12820642188. B
- 12820642189. C
- 12820642190. D

Question Number : 114 Question Id : 12820610672 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 2 Wrong Marks : 0

An urn contains five chips, two red and three white. Suppose that two are drawn at random, *without replacement*. Let X denote the number of red chips in the sample. Find variance of X , $\text{Var}(X)$.

- a) 0.85
- b) 0.97
- c) 0
- d) 0.36

Options :

- 12820642191. A
- 12820642192. B
- 12820642193. C
- 12820642194. D

Question Number : 115 Question Id : 12820610673 Question Type : MCQ Option Shuffling : No Display Question Number : Yes Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 2 Wrong Marks : 0

A super market has two express lines. Let X and Y denote the number of customers in the first and in the second, respectively, at any given time. Find the probability, $P(|X-Y|=1)$, that X and Y differ by exactly one. The joint pdf of X and Y is summarized in the table below:

		X			
		0	1	2	3
Y	0	0.1	0.2	0	0
	1	0.2	0.25	0.05	0
	2	0	0.05	0.05	0.025
	3	0	0	0.025	0.025

- a) 1
- b) 0.15
- c) 0.55
- d) 0.85

Options :

- 12820642195. A
- 12820642196. B
- 12820642197. C
- 12820642198. D

Question Number : 116 Question Id : 12820610674 Question Type : MCQ Option Shuffling : No Display Question Number : Yes
Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 2 Wrong Marks : 0

Let G be a finite group and H be a subgroup. Then

- a. The order of H not divides the order of G .
- b. The order of H divides the order of G .
- c. The order of G not defined.
- d. The order of H not defined.

Options :

- 12820642199. A
- 12820642200. B
- 12820642201. C
- 12820642202. D

Question Number : 117 Question Id : 12820610675 Question Type : MCQ Option Shuffling : No Display Question Number : Yes
Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 2 Wrong Marks : 0

A manufacturer, who produces medicine bottles, finds that 0.1% of the bottles are defective. The bottles are packed in boxes containing 500 bottles. A drug manufacturer buys 100 boxes from the producer of the bottles. How many bottles will contain no defectives?
(Given $e^{-0.5} = 0.6065$)

- a) 10
- b) 50
- c) 61
- d) 100

Options :

- 12820642203. A
- 12820642204. B
- 12820642205. C
- 12820642206. D

Question Number : 118 Question Id : 12820610676 Question Type : MCQ Option Shuffling : No Display Question Number : Yes
Single Line Question Option : No Option Orientation : Vertical

Correct Marks : 2 Wrong Marks : 0

. If x is the maximum element of X , then

- a. x is not supremum element of X .
- b. x is also the supremum element of X .
- c. x is also the infimum element of X .
- d. x is nither supremum nor infimum element of X .

Options :

- 12820642207. A

12820642208. B
12820642209. C
12820642210. D

Question Number : 119 Question Id : 12820610677 Question Type : MCQ Option Shuffling : No Display Question Number : Yes
Single Line Question Option : No Option Orientation : Vertical
Correct Marks : 2 Wrong Marks : 0

. How many matrices of order 2×3 can be formed, in which the digits from 0 to 9 occur not more than once?

- a. 3P_2
- b. 9P_6
- c. 9P_3
- d. ${}^{10}P_6$

Options :

12820642211. A
12820642212. B
12820642213. C
12820642214. D

Question Number : 120 Question Id : 12820610678 Question Type : MCQ Option Shuffling : No Display Question Number : Yes
Single Line Question Option : No Option Orientation : Vertical
Correct Marks : 2 Wrong Marks : 0

Identify the statement which is true

- a. Transportation problem can be solved using U – V method only.
- b. Unbalanced Transportation problem can not solved.
- c. Transportation problem is the special case of linear programming problem.
- d. Transportation problem is always minimization type.

Options :

12820642215. A
12820642216. B
12820642217. C
12820642218. D