

# nta

<b>Question Paper Name :</b>	B TECH 26th Feb 2021 Shift 2
<b>Subject Name :</b>	B TECH
<b>Creation Date :</b>	2021-02-25 13:49:48
<b>Duration :</b>	180
<b>Number of Questions :</b>	90
<b>Total Marks :</b>	300
<b>Display Marks:</b>	Yes

## B TECH

<b>Group Number :</b>	1
<b>Group Id :</b>	708191228
<b>Group Maximum Duration :</b>	0
<b>Group Minimum Duration :</b>	180
<b>Show Attended Group? :</b>	No
<b>Edit Attended Group? :</b>	No
<b>Break time :</b>	0
<b>Group Marks :</b>	300
<b>Is this Group for Examiner? :</b>	No

## Physics Section A

<b>Section Id :</b>	708191946
<b>Section Number :</b>	1
<b>Section type :</b>	Online

<b>Mandatory or Optional :</b>	Mandatory
<b>Number of Questions :</b>	20
<b>Number of Questions to be attempted :</b>	20
<b>Section Marks :</b>	80
<b>Mark As Answered Required? :</b>	Yes
<b>Sub-Section Number :</b>	1
<b>Sub-Section Id :</b>	7081911226
<b>Question Shuffling Allowed :</b>	Yes

**Question Number : 1 Question Id : 70819121094 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No**

**Correct Marks : 4 Wrong Marks : 1**

A radioactive sample is undergoing  $\alpha$  decay. At any time  $t_1$ , its activity is A and another time  $t_2$ , the activity is  $\frac{A}{5}$ . What is the average life time for the sample ?

**Options :**

70819168431.  $\frac{\ln 5}{t_2 - t_1}$

70819168432.  $\frac{\ln(t_2 + t_1)}{2}$

70819168433.  $\frac{t_2 - t_1}{\ln 5}$

70819168434.  $\frac{t_1 - t_2}{\ln 5}$

**Question Number : 2 Question Id : 70819121095 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No**

**Correct Marks : 4 Wrong Marks : 1**

Given below are two statements : one is labeled as Assertion A and the other is labeled as Reason R.

Assertion A : For a simple microscope, the angular size of the object equals the angular size of the image.

Reason R : Magnification is achieved as the small object can be kept much closer to the eye than 25 cm and hence it subtends a large angle.

In the light of the above statements, choose the most appropriate answer from the options given below :

**Options :**

70819168435. Both A and R are true and R is the correct explanation of A

70819168436. Both A and R are true but R is NOT the correct explanation of A

70819168437. A is true but R is false

70819168438. A is false but R is true

**Question Number : 3 Question Id : 70819121096 Question Type : MCQ Option Shuffling : Yes Is**

**Question Mandatory : No**

**Correct Marks : 4 Wrong Marks : 1**

A tuning fork A of unknown frequency produces 5 beats/s with a fork of known frequency 340 Hz. When fork A is filed, the beat frequency decreases to 2 beats/s. What is the frequency of fork A ?

**Options :**

70819168439. 335 Hz

70819168440. 338 Hz

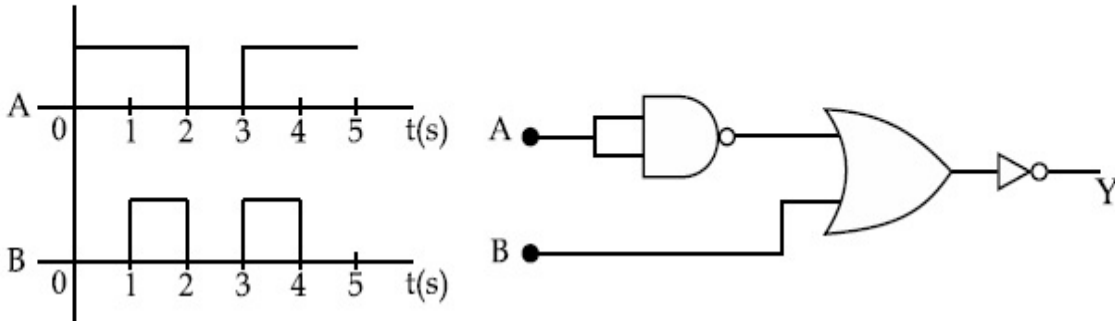
70819168441. 345 Hz

70819168442. 342 Hz

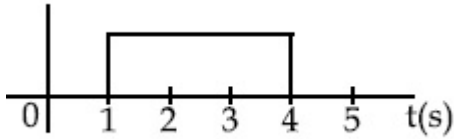
Question Number : 4 Question Id : 70819121097 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

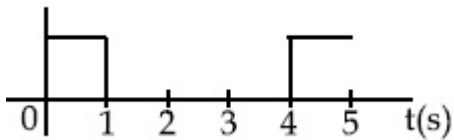
Draw the output signal Y in the given combination of gates.



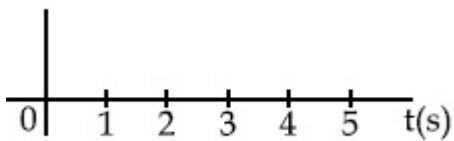
Options :



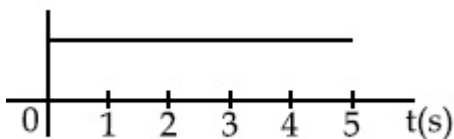
70819168443.



70819168444.



70819168445.



70819168446.

Question Number : 5 Question Id : 70819121098 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No

**Correct Marks : 4 Wrong Marks : 1**

Given below are two statements :

Statement I : A second's pendulum has a time period of 1 second.

Statement II : It takes precisely one second to move between the two extreme positions.

In the light of the above statements, choose the correct answer from the options given below :

**Options :**

70819168447. Both Statement I and Statement II are true

70819168448. Both Statement I and Statement II are false

70819168449. Statement I is true but Statement II is false

70819168450. Statement I is false but Statement II is true

**Question Number : 6 Question Id : 70819121099 Question Type : MCQ Option Shuffling : Yes Is**

**Question Mandatory : No**

**Correct Marks : 4 Wrong Marks : 1**

If 'C' and 'V' represent capacity and voltage respectively then what are the dimensions of  $\lambda$  where  $C/V = \lambda$  ?

**Options :**

70819168451.  $[M^{-2} L^{-3} I^2 T^6]$

70819168452.  $[M^{-3} L^{-4} I^3 T^7]$

70819168453.  $[M^{-2} L^{-4} I^3 T^7]$

70819168454.  $[M^{-1} L^{-3} I^{-2} T^{-7}]$

**Question Number : 7 Question Id : 70819121100 Question Type : MCQ Option Shuffling : Yes Is**

**Question Mandatory : No**

**Correct Marks : 4 Wrong Marks : 1**

An aeroplane, with its wings spread 10 m, is flying at a speed of 180 km/h in a horizontal direction. The total intensity of earth's field at that part is  $2.5 \times 10^{-4}$  Wb/m<sup>2</sup> and the angle of dip is 60°. The emf induced between the tips of the plane wings will be \_\_\_\_\_.

**Options :**

70819168455. 108.25 mV

70819168456. 62.50 mV

70819168457. 88.37 mV

70819168458. 54.125 mV

**Question Number : 8 Question Id : 70819121101 Question Type : MCQ Option Shuffling : Yes Is**

**Question Mandatory : No**

**Correct Marks : 4 Wrong Marks : 1**

A cord is wound round the circumference of wheel of radius r. The axis of the wheel is horizontal and the moment of inertia about it is I. A weight mg is attached to the cord at the end. The weight falls from rest. After falling through a distance 'h', the square of angular velocity of wheel will be :

**Options :**

70819168459.  $2gh$

70819168460.  $\frac{2gh}{I + mr^2}$

70819168461.  $\frac{2mgh}{I + mr^2}$

70819168462.  $\frac{2mgh}{I + 2mr^2}$

**Question Number : 9 Question Id : 70819121102 Question Type : MCQ Option Shuffling : Yes Is**

**Question Mandatory : No**

**Correct Marks : 4 Wrong Marks : 1**

The trajectory of a projectile in a vertical plane is  $y = \alpha x - \beta x^2$ , where  $\alpha$  and  $\beta$  are constants and  $x$  &  $y$  are respectively the horizontal and vertical distances of the projectile from the point of projection. The angle of projection  $\theta$  and the maximum height attained  $H$  are respectively given by :

**Options :**

70819168463.  $\tan^{-1}\beta, \frac{\alpha^2}{2\beta}$

70819168464.  $\tan^{-1}\left(\frac{\beta}{\alpha}\right), \frac{\alpha^2}{\beta}$

70819168465.  $\tan^{-1}\alpha, \frac{\alpha^2}{4\beta}$

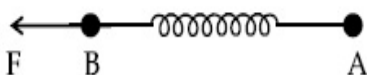
70819168466.  $\tan^{-1}\alpha, \frac{4\alpha^2}{\beta}$

**Question Number : 10 Question Id : 70819121103 Question Type : MCQ Option Shuffling : Yes**

**Is Question Mandatory : No**

**Correct Marks : 4 Wrong Marks : 1**

Two masses A and B, each of mass  $M$  are fixed together by a massless spring. A force acts on the mass B as shown in figure. If the mass A starts moving away from mass B with acceleration 'a', then the acceleration of mass B will be :



**Options :**

70819168467. 
$$\frac{MF}{F + Ma}$$

70819168468. 
$$\frac{F + Ma}{M}$$

70819168469. 
$$\frac{Ma - F}{M}$$

70819168470. 
$$\frac{F - Ma}{M}$$

**Question Number : 11 Question Id : 70819121104 Question Type : MCQ Option Shuffling : Yes**

**Is Question Mandatory : No**

**Correct Marks : 4 Wrong Marks : 1**

Given below are two statements :

**Statement I** : An electric dipole is placed at the centre of a hollow sphere. The flux of electric field through the sphere is zero but the electric field is not zero anywhere in the sphere.

**Statement II** : If R is the radius of a solid metallic sphere and Q be the total charge on it. The electric field at any point on the spherical surface of radius r (< R) is zero but the electric flux passing through this closed spherical surface of radius r is not zero.

In the light of the above statements, choose the correct answer from the options given below :

**Options :**

70819168471. Both Statement I and Statement II are true

70819168472. Both Statement I and Statement II are false

70819168473. Statement I is true but Statement II is false



70819168474. Statement I is false but Statement II is true

**Question Number : 12 Question Id : 70819121105 Question Type : MCQ Option Shuffling : Yes  
Is Question Mandatory : No**

**Correct Marks : 4 Wrong Marks : 1**

A scooter accelerates from rest for time  $t_1$  at constant rate  $a_1$  and then retards at constant rate  $a_2$  for time  $t_2$  and comes to rest. The correct value of  $\frac{t_1}{t_2}$  will be :

**Options :**

70819168475.  $\frac{a_1}{a_2}$

70819168476.  $\frac{a_2}{a_1}$

70819168477.  $\frac{a_1 + a_2}{a_1}$

70819168478.  $\frac{a_1 + a_2}{a_2}$

**Question Number : 13 Question Id : 70819121106 Question Type : MCQ Option Shuffling : Yes  
Is Question Mandatory : No**

**Correct Marks : 4 Wrong Marks : 1**

The internal energy (U), pressure (P) and volume (V) of an ideal gas are related as  $U = 3PV + 4$ .  
The gas is :

**Options :**

70819168479. monoatomic only.

70819168480. diatomic only.

70819168481. polyatomic only.

70819168482. either monoatomic or diatomic.

**Question Number : 14 Question Id : 70819121107 Question Type : MCQ Option Shuffling : Yes**

**Is Question Mandatory : No**

**Correct Marks : 4 Wrong Marks : 1**

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

**Options :**

70819168483. 4.34 m/s

70819168484. 4.17 m/s

70819168485. 3.25 m/s

70819168486. 2.19 m/s

**Question Number : 15 Question Id : 70819121108 Question Type : MCQ Option Shuffling : Yes**

**Is Question Mandatory : No**

**Correct Marks : 4 Wrong Marks : 1**

The length of metallic wire is  $l_1$  when tension in it is  $T_1$ . It is  $l_2$  when the tension is  $T_2$ . The original length of the wire will be :

**Options :**

70819168487.  $\frac{l_1 + l_2}{2}$

70819168488.  $\frac{T_2 l_1 + T_1 l_2}{T_1 + T_2}$

70819168489.  $\frac{T_1 l_1 - T_2 l_2}{T_2 - T_1}$

70819168490.  $\frac{T_2 l_1 - T_1 l_2}{T_2 - T_1}$

**Question Number : 16 Question Id : 70819121109 Question Type : MCQ Option Shuffling : Yes**

**Is Question Mandatory : No**

**Correct Marks : 4 Wrong Marks : 1**

A particle executes S.H.M., the graph of velocity as a function of displacement is :

**Options :**

70819168491. a circle.

70819168492. a parabola.

70819168493. an ellipse.

70819168494. a helix.

**Question Number : 17 Question Id : 70819121110 Question Type : MCQ Option Shuffling : Yes**

**Is Question Mandatory : No**

**Correct Marks : 4 Wrong Marks : 1**

The incident ray, reflected ray and the outward drawn normal are denoted by the unit vectors  $\vec{a}$ ,  $\vec{b}$  and  $\vec{c}$  respectively. Then choose the correct relation for these vectors.

**Options :**

70819168495.  $\vec{b} = \vec{a} - \vec{c}$

70819168496.  $\vec{b} = \vec{a} - 2(\vec{a} \cdot \vec{c})\vec{c}$

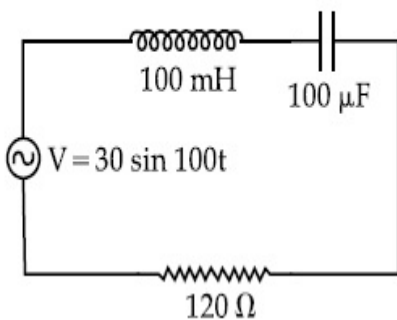
70819168497.  $\vec{b} = \vec{a} + 2\vec{c}$

70819168498.  $\vec{b} = 2\vec{a} + \vec{c}$

**Question Number : 18 Question Id : 70819121111 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No**

**Correct Marks : 4 Wrong Marks : 1**

Find the peak current and resonant frequency of the following circuit (as shown in figure).



**Options :**

70819168499. 2 A and 50 Hz

70819168500. 0.2 A and 50 Hz

70819168501. 2 A and 100 Hz

70819168502. 0.2 A and 100 Hz

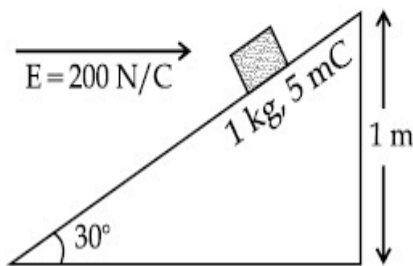
**Question Number : 19 Question Id : 70819121112 Question Type : MCQ Option Shuffling : Yes**

**Is Question Mandatory : No**

**Correct Marks : 4 Wrong Marks : 1**

An inclined plane making an angle of  $30^\circ$  with the horizontal is placed in a uniform horizontal electric field  $200 \frac{\text{N}}{\text{C}}$  as shown in the figure. A body of mass  $1 \text{ kg}$  and charge  $5 \text{ mC}$  is allowed to slide down from rest at a height of  $1 \text{ m}$ . If the coefficient of friction is  $0.2$ , find the time taken by the body to reach the bottom.

$$[g = 9.8 \text{ m/s}^2; \sin 30^\circ = \frac{1}{2}; \cos 30^\circ = \frac{\sqrt{3}}{2}]$$



**Options :**

70819168503. 2.3 s

70819168504. 1.3 s

70819168505. 0.92 s

70819168506. 0.46 s

**Question Number : 20 Question Id : 70819121113 Question Type : MCQ Option Shuffling : Yes**

**Is Question Mandatory : No**

**Correct Marks : 4 Wrong Marks : 1**

A wire of  $1\ \Omega$  has a length of 1 m. It is stretched till its length increases by 25%. The percentage change in resistance to the nearest integer is :

**Options :**

70819168507. 76%

70819168508. 56%

70819168509. 25%

70819168510. 12.5%

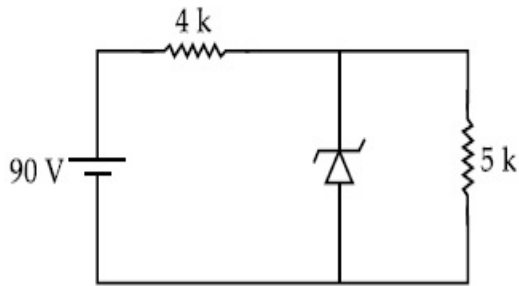
## Physics Section B

<b>Section Id :</b>	708191947
<b>Section Number :</b>	2
<b>Section type :</b>	Online
<b>Mandatory or Optional :</b>	Mandatory
<b>Number of Questions :</b>	10
<b>Number of Questions to be attempted :</b>	5
<b>Section Marks :</b>	20
<b>Mark As Answered Required? :</b>	Yes
<b>Sub-Section Number :</b>	1
<b>Sub-Section Id :</b>	7081911227
<b>Question Shuffling Allowed :</b>	Yes

**Question Number : 21 Question Id : 70819121114 Question Type : SA**

**Correct Marks : 4 Wrong Marks : 0**

The zener diode has a  $V_z = 30$  V. The current passing through the diode for the following circuit is \_\_\_\_\_ mA.



**Response Type :** Numeric

**Evaluation Required For SA :** Yes

**Show Word Count :** Yes

**Answers Type :** Range

**Text Areas :** PlainText

**Possible Answers :**

5 to 5.001

**Question Number :** 22 **Question Id :** 70819121115 **Question Type :** SA

**Correct Marks :** 4 **Wrong Marks :** 0

Time period of a simple pendulum is  $T$ . The time taken to complete  $\frac{5}{8}$  oscillations starting from mean position is  $\frac{\alpha}{\beta}T$ . The value of  $\alpha$  is \_\_\_\_\_.

**Response Type :** Numeric

**Evaluation Required For SA :** Yes

**Show Word Count :** Yes

**Answers Type :** Range

**Text Areas :** PlainText

**Possible Answers :**

5 to 5.001

**Question Number :** 23 **Question Id :** 70819121116 **Question Type :** SA

**Correct Marks :** 4 **Wrong Marks :** 0

The volume  $V$  of a given mass of monoatomic gas changes with temperature  $T$  according to

the relation  $V = KT^{\frac{2}{3}}$ . The workdone when temperature changes by 90 K will be  $xR$ . The value of  $x$  is \_\_\_\_\_.

[ $R$  = universal gas constant]

**Response Type :** Numeric

**Evaluation Required For SA :** Yes

**Show Word Count :** Yes

**Answers Type :** Range

**Text Areas :** PlainText

**Possible Answers :**

5 to 5.001

**Question Number :** 24 **Question Id :** 70819121117 **Question Type :** SA

**Correct Marks :** 4 **Wrong Marks :** 0

Two stream of photons, possessing energies equal to twice and ten times the work function of metal are incident on the metal surface successively. The value of ratio of maximum velocities of the photoelectrons emitted in the two respective cases is  $x : y$ . The value of  $x$  is \_\_\_\_\_.

**Response Type :** Numeric

**Evaluation Required For SA :** Yes

**Show Word Count :** Yes

**Answers Type :** Range

**Text Areas :** PlainText

**Possible Answers :**

5 to 5.001

**Question Number :** 25 **Question Id :** 70819121118 **Question Type :** SA

**Correct Marks :** 4 **Wrong Marks :** 0

If the highest frequency modulating a carrier is 5 kHz, then the number of AM broadcast stations accommodated in a 90 kHz bandwidth are \_\_\_\_\_.

**Response Type :** Numeric



**Evaluation Required For SA :** Yes

**Show Word Count :** Yes

**Answers Type :** Range

**Text Areas :** PlainText

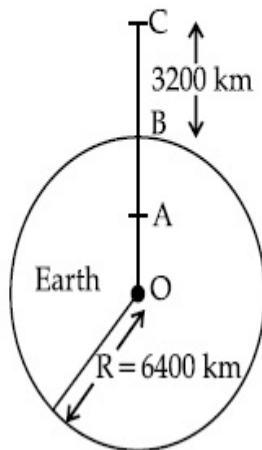
**Possible Answers :**

5 to 5.001

**Question Number :** 26 **Question Id :** 70819121119 **Question Type :** SA

**Correct Marks :** 4 **Wrong Marks :** 0

In the reported figure of earth, the value of acceleration due to gravity is same at point A and C but it is smaller than that of its value at point B (surface of the earth). The value of OA : AB will be  $x : y$ . The value of  $x$  is \_\_\_\_\_.



**Response Type :** Numeric

**Evaluation Required For SA :** Yes

**Show Word Count :** Yes

**Answers Type :** Range

**Text Areas :** PlainText

**Possible Answers :**

5 to 5.001

**Question Number :** 27 **Question Id :** 70819121120 **Question Type :** SA

**Correct Marks :** 4 **Wrong Marks :** 0

1 mole of rigid diatomic gas performs a work of  $\frac{Q}{5}$  when heat  $Q$  is supplied to it. The molar heat capacity of the gas during this transformation is  $\frac{xR}{8}$ . The value of  $x$  is \_\_\_\_\_.

[ $R$  = universal gas constant]

**Response Type :** Numeric

**Evaluation Required For SA :** Yes

**Show Word Count :** Yes

**Answers Type :** Range

**Text Areas :** PlainText

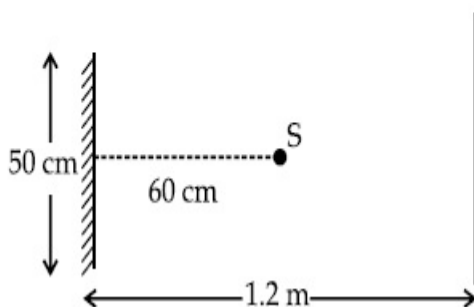
**Possible Answers :**

5 to 5.001

**Question Number :** 28 **Question Id :** 70819121121 **Question Type :** SA

**Correct Marks :** 4 **Wrong Marks :** 0

A point source of light  $S$ , placed at a distance 60 cm in front of the centre of a plane mirror of width 50 cm, hangs vertically on a wall. A man walks in front of the mirror along a line parallel to the mirror at a distance 1.2 m from it (see in the figure). The distance between the extreme points where he can see the image of the light source in the mirror is \_\_\_\_\_ cm.



**Response Type :** Numeric

**Evaluation Required For SA :** Yes

**Show Word Count :** Yes

**Answers Type :** Range

**Text Areas :** PlainText

**Possible Answers :**

5 to 5.001

**Question Number : 29 Question Id : 70819121122 Question Type : SA**

**Correct Marks : 4 Wrong Marks : 0**

A particle executes S.H.M. with amplitude 'a' and time period 'T'. The displacement of the particle when its speed is half of maximum speed is  $\frac{\sqrt{x} a}{2}$ . The value of x is \_\_\_\_\_.

**Response Type :** Numeric

**Evaluation Required For SA :** Yes

**Show Word Count :** Yes

**Answers Type :** Range

**Text Areas :** PlainText

**Possible Answers :**

5 to 5.001

**Question Number : 30 Question Id : 70819121123 Question Type : SA**

**Correct Marks : 4 Wrong Marks : 0**

27 similar drops of mercury are maintained at 10 V each. All these spherical drops combine into a single big drop. The potential energy of the bigger drop is \_\_\_\_\_ times that of a smaller drop.

**Response Type :** Numeric

**Evaluation Required For SA :** Yes

**Show Word Count :** Yes

**Answers Type :** Range

**Text Areas :** PlainText

**Possible Answers :**

5 to 5.001

## **Chemistry Section A**

**Section Id :** 708191948

**Section Number :** 3

<b>Section type :</b>	Online
<b>Mandatory or Optional :</b>	Mandatory
<b>Number of Questions :</b>	20
<b>Number of Questions to be attempted :</b>	20
<b>Section Marks :</b>	80
<b>Mark As Answered Required? :</b>	Yes
<b>Sub-Section Number :</b>	1
<b>Sub-Section Id :</b>	7081911228
<b>Question Shuffling Allowed :</b>	Yes

**Question Number : 31 Question Id : 70819121124 Question Type : MCQ Option Shuffling : Yes**

**Is Question Mandatory : No**

**Correct Marks : 4 Wrong Marks : 1**

Match List-I with List-II.

List-I		List-II	
(Molecule)		(Bond order)	
(a)	Ne <sub>2</sub>	(i)	1
(b)	N <sub>2</sub>	(ii)	2
(c)	F <sub>2</sub>	(iii)	0
(d)	O <sub>2</sub>	(iv)	3

Choose the correct answer from the options given below :

**Options :**

70819168521. (a) → (i), (b) → (ii), (c) → (iii), (d) → (iv)

70819168522. (a) → (iv), (b) → (iii), (c) → (ii), (d) → (i)

70819168523. (a) → (ii), (b) → (i), (c) → (iv), (d) → (iii)

70819168524. (a) → (iii), (b) → (iv), (c) → (i), (d) → (ii)

**Question Number : 32 Question Id : 70819121125 Question Type : MCQ Option Shuffling : Yes**

**Is Question Mandatory : No**

**Correct Marks : 4 Wrong Marks : 1**

The nature of charge on resulting colloidal particles when  $\text{FeCl}_3$  is added to excess of hot water is :

**Options :**

70819168525. positive

70819168526. negative

70819168527. neutral

70819168528. sometimes positive and sometimes negative

**Question Number : 33 Question Id : 70819121126 Question Type : MCQ Option Shuffling : Yes**

**Is Question Mandatory : No**

**Correct Marks : 4 Wrong Marks : 1**

The correct order of electron gain enthalpy is :

**Options :**

70819168529.  $\text{O} > \text{S} > \text{Se} > \text{Te}$

70819168530.  $\text{Te} > \text{Se} > \text{S} > \text{O}$

70819168531.  $\text{S} > \text{O} > \text{Se} > \text{Te}$

70819168532.  $\text{S} > \text{Se} > \text{Te} > \text{O}$

**Question Number : 34 Question Id : 70819121127 Question Type : MCQ Option Shuffling : Yes**

**Is Question Mandatory : No**

**Correct Marks : 4 Wrong Marks : 1**

Match List-I with List-II.

List-I	List-II
(a) Siderite	(i) Cu
(b) Calamine	(ii) Ca
(c) Malachite	(iii) Fe
(d) Cryolite	(iv) Al
	(v) Zn

Choose the correct answer from the options given below :

**Options :**

70819168533. (a) → (i), (b) → (ii), (c) → (v), (d) → (iii)

70819168534. (a) → (iii), (b) → (v), (c) → (i), (d) → (iv)

70819168535. (a) → (i), (b) → (ii), (c) → (iii), (d) → (iv)

70819168536. (a) → (iii), (b) → (i), (c) → (v), (d) → (ii)

**Question Number : 35 Question Id : 70819121128 Question Type : MCQ Option Shuffling : Yes**

**Is Question Mandatory : No**

**Correct Marks : 4 Wrong Marks : 1**

Which of the following forms of hydrogen emits low energy  $\beta^-$  particles ?

**Options :**

70819168537. Proton  $H^+$

70819168538. Protium  ${}^1_1H$

70819168539. Deuterium  ${}^2_1H$

70819168540. Tritium  ${}^3_1H$

Question Number : 36 Question Id : 70819121129 Question Type : MCQ Option Shuffling : Yes

Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

Match List-I with List-II.

List-I	List-II
(a) Sodium Carbonate	(i) Deacon
(b) Titanium	(ii) Castner-Kellner
(c) Chlorine	(iii) van-Arkel
(d) Sodium hydroxide	(iv) Solvay

Choose the correct answer from the options given below :

Options :

70819168541. (a) → (iv), (b) → (iii), (c) → (i), (d) → (ii)

70819168542. (a) → (iv), (b) → (i), (c) → (ii), (d) → (iii)

70819168543. (a) → (i), (b) → (iii), (c) → (iv), (d) → (ii)

70819168544. (a) → (iii), (b) → (ii), (c) → (i), (d) → (iv)

Question Number : 37 Question Id : 70819121130 Question Type : MCQ Option Shuffling : Yes

Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

Which pair of oxides is acidic in nature ?

Options :

70819168545.  $B_2O_3$ ,  $SiO_2$

70819168546.  $B_2O_3$ ,  $CaO$

70819168547.  $N_2O$ ,  $BaO$

70819168548.  $CaO$ ,  $SiO_2$

**Question Number : 38 Question Id : 70819121131 Question Type : MCQ Option Shuffling : Yes**

**Is Question Mandatory : No**

**Correct Marks : 4 Wrong Marks : 1**

Given below are two statements : one is labelled as Assertion A and the other is labelled as Reason R.

**Assertion A** : In  $TlI_3$ , isomorphous to  $CsI_3$ , the metal is present in +1 oxidation state.

**Reason R** : Tl metal has fourteen *f* electrons in its electronic configuration.

In the light of the above statements, choose the most appropriate answer from the options given below :

**Options :**

70819168549. Both A and R are correct and R is the correct explanation of A

70819168550. Both A and R are correct but R is NOT the correct explanation of A

70819168551. A is correct but R is not correct

70819168552. A is not correct but R is correct

**Question Number : 39 Question Id : 70819121132 Question Type : MCQ Option Shuffling : Yes**

**Is Question Mandatory : No**

**Correct Marks : 4 Wrong Marks : 1**

Calgon is used for water treatment. Which of the following statement is NOT true about Calgon ?

**Options :**

70819168553. Calgon contains the 2<sup>nd</sup> most abundant element by weight in the Earth's crust.

70819168554. It is polymeric compound and is water soluble.

70819168555. It is also known as Graham's salt.



70819168556. It doesnot remove  $\text{Ca}^{2+}$  ion by precipitation.

**Question Number : 40 Question Id : 70819121133 Question Type : MCQ Option Shuffling : Yes**

**Is Question Mandatory : No**

**Correct Marks : 4 Wrong Marks : 1**

Ceric ammonium nitrate and  $\text{CHCl}_3/\text{alc. KOH}$  are used for the identification of functional groups present in \_\_\_\_\_ and \_\_\_\_\_ respectively.

**Options :**

70819168557. alcohol, amine

70819168558. amine, alcohol

70819168559. alcohol, phenol

70819168560. amine, phenol

**Question Number : 41 Question Id : 70819121134 Question Type : MCQ Option Shuffling : Yes**

**Is Question Mandatory : No**

**Correct Marks : 4 Wrong Marks : 1**

In  $\overset{1}{\text{C}}\text{H}_2 = \overset{2}{\text{C}} = \overset{3}{\text{C}}\text{H} - \overset{4}{\text{C}}\text{H}_3$  molecule, the hybridization of carbon 1, 2, 3 and 4 respectively, are :

**Options :**

70819168561.  $sp^2, sp^2, sp^2, sp^3$

70819168562.  $sp^3, sp, sp^3, sp^3$

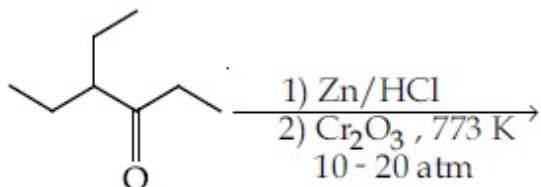
70819168563.  $sp^2, sp, sp^2, sp^3$

70819168564.  $sp^2, sp^3, sp^2, sp^3$

Question Number : 42 Question Id : 70819121135 Question Type : MCQ Option Shuffling : Yes

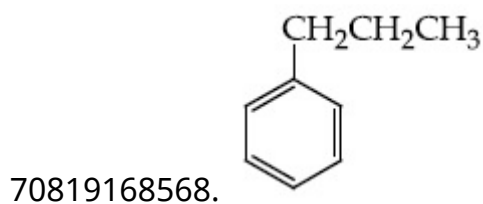
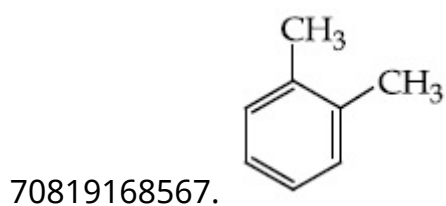
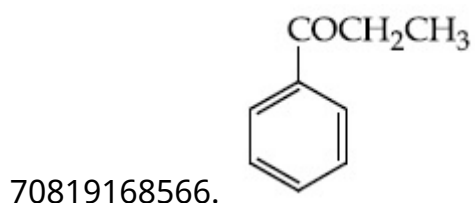
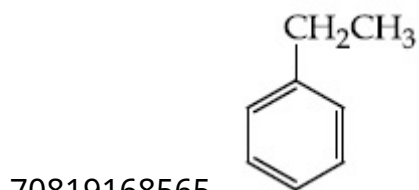
Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1



Considering the above reaction, the major product among the following is :

Options :

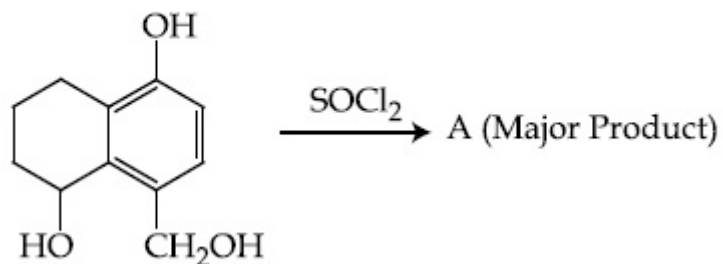


Question Number : 43 Question Id : 70819121136 Question Type : MCQ Option Shuffling : Yes

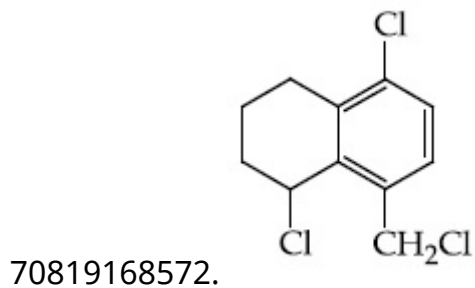
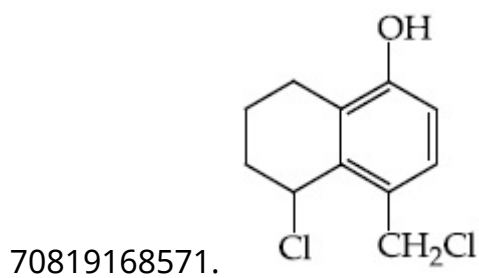
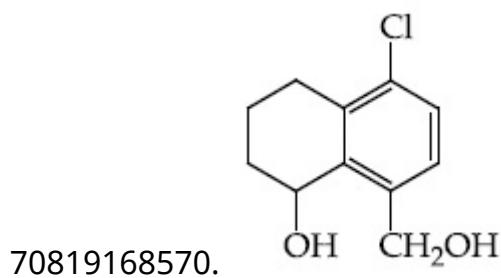
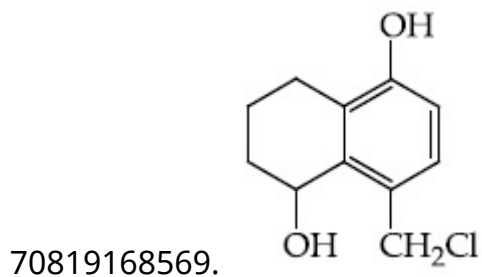
Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

Identify A in the given reaction.



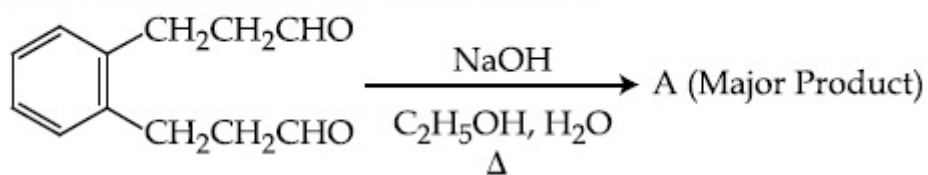
Options :



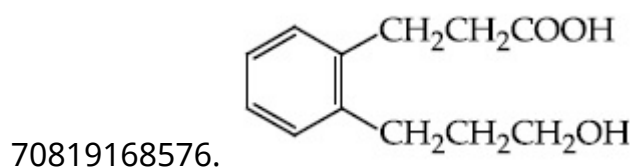
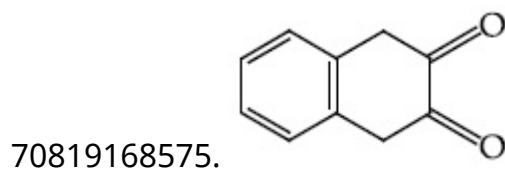
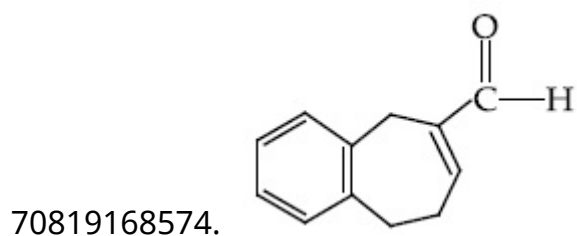
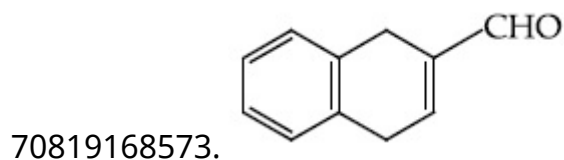
Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

Identify A in the given chemical reaction.



Options :

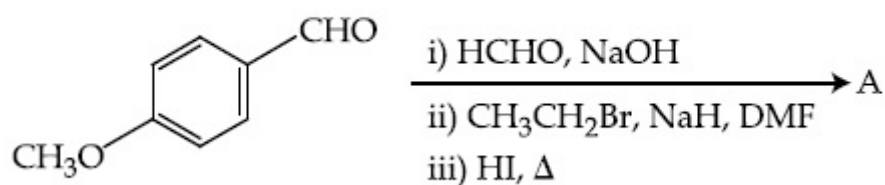


Question Number : 45 Question Id : 70819121138 Question Type : MCQ Option Shuffling : Yes

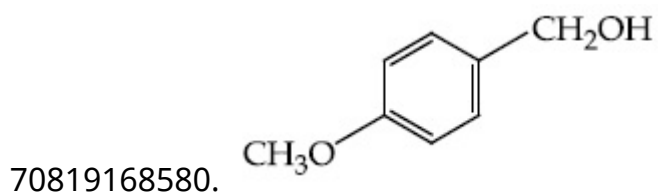
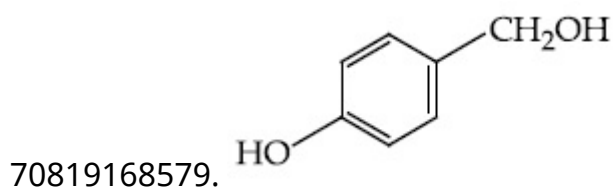
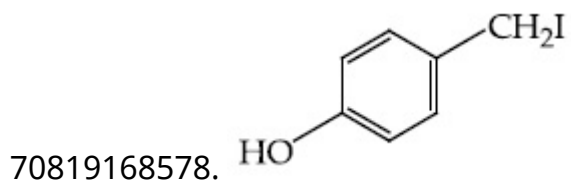
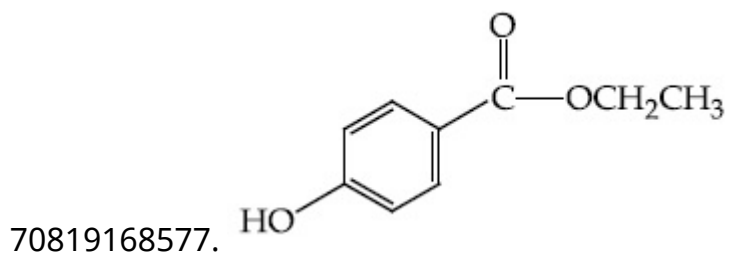
Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

Identify A in the following chemical reaction.



Options :



Question Number : 46 Question Id : 70819121139 Question Type : MCQ Option Shuffling : Yes

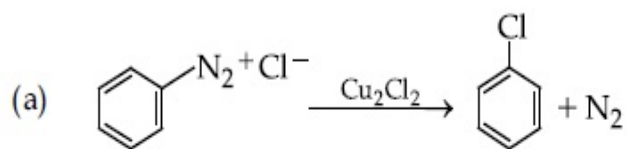
Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

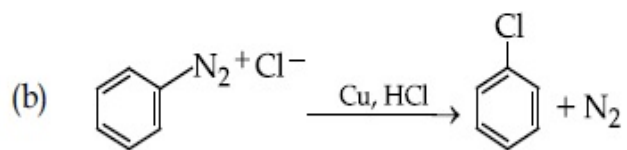
Match List-I with List-II.

List-I

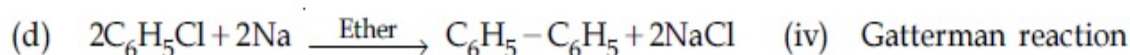
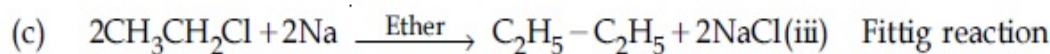
List-II



(i) Wurtz reaction



(ii) Sandmeyer reaction



Choose the correct answer from the options given below :

**Options :**

70819168581. (a)  $\rightarrow$  (ii), (b)  $\rightarrow$  (iv), (c)  $\rightarrow$  (i), (d)  $\rightarrow$  (iii)

70819168582. (a)  $\rightarrow$  (ii), (b)  $\rightarrow$  (i), (c)  $\rightarrow$  (iv), (d)  $\rightarrow$  (iii)

70819168583. (a)  $\rightarrow$  (iii), (b)  $\rightarrow$  (i), (c)  $\rightarrow$  (iv), (d)  $\rightarrow$  (ii)

70819168584. (a)  $\rightarrow$  (iii), (b)  $\rightarrow$  (iv), (c)  $\rightarrow$  (i), (d)  $\rightarrow$  (ii)

**Question Number : 47 Question Id : 70819121140 Question Type : MCQ Option Shuffling : Yes**

**Is Question Mandatory : No**

**Correct Marks : 4 Wrong Marks : 1**

Seliwanoff test and Xanthoproteic test are used for the identification of \_\_\_\_\_ and \_\_\_\_\_ respectively.

**Options :**

70819168585. aldoses, ketoses

70819168586. ketoses, aldoses

70819168587. ketoses, proteins

70819168588. proteins, ketoses

**Question Number : 48 Question Id : 70819121141 Question Type : MCQ Option Shuffling : Yes**

**Is Question Mandatory : No**

**Correct Marks : 4 Wrong Marks : 1**

Match List-I with List-II.

List-I	List-II
(a) Sucrose	(i) $\beta$ -D-Galactose and $\beta$ -D-Glucose
(b) Lactose	(ii) $\alpha$ -D-Glucose and $\beta$ -D-Fructose
(c) Maltose	(iii) $\alpha$ -D-Glucose and $\alpha$ -D-Glucose

Choose the correct answer from the options given below :

**Options :**

70819168589. (a)  $\rightarrow$  (ii), (b)  $\rightarrow$  (i), (c)  $\rightarrow$  (iii)

70819168590. (a)  $\rightarrow$  (iii), (b)  $\rightarrow$  (ii), (c)  $\rightarrow$  (i)

70819168591. (a)  $\rightarrow$  (i), (b)  $\rightarrow$  (iii), (c)  $\rightarrow$  (ii)

70819168592. (a)  $\rightarrow$  (iii), (b)  $\rightarrow$  (i), (c)  $\rightarrow$  (ii)

**Question Number : 49 Question Id : 70819121142 Question Type : MCQ Option Shuffling : Yes**

**Is Question Mandatory : No**

**Correct Marks : 4 Wrong Marks : 1**

2,4-DNP test can be used to identify :

**Options :**

70819168593. halogens

70819168594. aldehyde

70819168595. amine

70819168596. ether

**Question Number : 50 Question Id : 70819121143 Question Type : MCQ Option Shuffling : Yes**

**Is Question Mandatory : No**

**Correct Marks : 4 Wrong Marks : 1**

A. Phenyl methanamine

B. N,N-Dimethylaniline

C. N-Methyl aniline

D. Benzenamine

Choose the correct order of basic nature of the above amines.

**Options :**

70819168597.  $A > B > C > D$

70819168598.  $D > C > B > A$

70819168599.  $A > C > B > D$

70819168600.  $D > B > C > A$

## Chemistry Section B

<b>Section Id :</b>	708191949
<b>Section Number :</b>	4
<b>Section type :</b>	Online
<b>Mandatory or Optional :</b>	Mandatory
<b>Number of Questions :</b>	10
<b>Number of Questions to be attempted :</b>	5



**Section Marks :** 20  
**Mark As Answered Required? :** Yes  
**Sub-Section Number :** 1  
**Sub-Section Id :** 7081911229  
**Question Shuffling Allowed :** Yes

**Question Number : 51 Question Id : 70819121144 Question Type : SA**

**Correct Marks : 4 Wrong Marks : 0**

The  $\text{NaNO}_3$  weighed out to make 50 mL of an aqueous solution containing 70.0 mg  $\text{Na}^+$  per mL is \_\_\_\_\_ g. (Rounded off to the nearest integer)

[Given : Atomic weight in  $\text{g mol}^{-1}$  - Na : 23 ; N : 14 ; O : 16]

**Response Type :** Numeric

**Evaluation Required For SA :** Yes

**Show Word Count :** Yes

**Answers Type :** Range

**Text Areas :** PlainText

**Possible Answers :**

5 to 5.001

**Question Number : 52 Question Id : 70819121145 Question Type : SA**

**Correct Marks : 4 Wrong Marks : 0**

The number of octahedral voids per lattice site in a lattice is \_\_\_\_\_. (Rounded off to the nearest integer)

**Response Type :** Numeric

**Evaluation Required For SA :** Yes

**Show Word Count :** Yes

**Answers Type :** Range

**Text Areas :** PlainText

**Possible Answers :**

5 to 5.001

**Question Number : 53 Question Id : 70819121146 Question Type : SA**

**Correct Marks : 4 Wrong Marks : 0**

A ball weighing 10 g is moving with a velocity of  $90 \text{ ms}^{-1}$ . If the uncertainty in its velocity is 5%, then the uncertainty in its position is \_\_\_\_\_  $\times 10^{-33} \text{ m}$ . (Rounded off to the nearest integer)

[Given :  $h = 6.63 \times 10^{-34} \text{ Js}$ ]

**Response Type :** Numeric

**Evaluation Required For SA :** Yes

**Show Word Count :** Yes

**Answers Type :** Range

**Text Areas :** PlainText

**Possible Answers :**

5 to 5.001

**Question Number : 54 Question Id : 70819121147 Question Type : SA**

**Correct Marks : 4 Wrong Marks : 0**

The average S–F bond energy in  $\text{kJ mol}^{-1}$  of  $\text{SF}_6$  is \_\_\_\_\_. (Rounded off to the nearest integer)

[Given : The values of standard enthalpy of formation of  $\text{SF}_6(\text{g})$ ,  $\text{S}(\text{g})$  and  $\text{F}(\text{g})$  are - 1100, 275 and  $80 \text{ kJ mol}^{-1}$  respectively.]

**Response Type :** Numeric

**Evaluation Required For SA :** Yes

**Show Word Count :** Yes

**Answers Type :** Range

**Text Areas :** PlainText

**Possible Answers :**

5 to 5.001

**Question Number : 55 Question Id : 70819121148 Question Type : SA**

**Correct Marks : 4 Wrong Marks : 0**

When 12.2 g of benzoic acid is dissolved in 100 g of water, the freezing point of solution was found to be  $-0.93^\circ\text{C}$  ( $K_f(\text{H}_2\text{O}) = 1.86 \text{ K kg mol}^{-1}$ ). The number (n) of benzoic acid molecules associated (assuming 100% association) is \_\_\_\_\_.

**Response Type :** Numeric

**Evaluation Required For SA :** Yes

**Show Word Count :** Yes

**Answers Type :** Range

**Text Areas :** PlainText

**Possible Answers :**

5 to 5.001

**Question Number : 56 Question Id : 70819121149 Question Type : SA**

**Correct Marks : 4 Wrong Marks : 0**

The pH of ammonium phosphate solution, if  $pK_a$  of phosphoric acid and  $pK_b$  of ammonium hydroxide are 5.23 and 4.75 respectively, is \_\_\_\_\_.

**Response Type :** Numeric

**Evaluation Required For SA :** Yes

**Show Word Count :** Yes

**Answers Type :** Range

**Text Areas :** PlainText

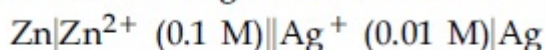
**Possible Answers :**

5 to 5.001

**Question Number : 57 Question Id : 70819121150 Question Type : SA**

**Correct Marks : 4 Wrong Marks : 0**

Emf of the following cell at 298 K in V is  $x \times 10^{-2}$ .



The value of  $x$  is \_\_\_\_\_. (Rounded off to the nearest integer)

[Given :  $E_{\text{Zn}^{2+}/\text{Zn}}^\theta = -0.76 \text{ V}$  ;  $E_{\text{Ag}^+/\text{Ag}}^\theta = +0.80 \text{ V}$  ;  $\frac{2.303RT}{F} = 0.059$ ]

**Response Type :** Numeric

**Evaluation Required For SA :** Yes

**Show Word Count :** Yes

**Answers Type :** Range

**Text Areas :** PlainText

**Possible Answers :**

5 to 5.001

**Question Number : 58 Question Id : 70819121151 Question Type : SA**

**Correct Marks : 4 Wrong Marks : 0**

If the activation energy of a reaction is  $80.9 \text{ kJ mol}^{-1}$ , the fraction of molecules at  $700 \text{ K}$ , having enough energy to react to form products is  $e^{-x}$ . The value of  $x$  is \_\_\_\_\_.  
(Rounded off to the nearest integer)

[Use  $R = 8.31 \text{ J K}^{-1} \text{ mol}^{-1}$ ]

**Response Type :** Numeric

**Evaluation Required For SA :** Yes

**Show Word Count :** Yes

**Answers Type :** Range

**Text Areas :** PlainText

**Possible Answers :**

5 to 5.001

**Question Number : 59 Question Id : 70819121152 Question Type : SA**

**Correct Marks : 4 Wrong Marks : 0**

In mildly alkaline medium, thiosulphate ion is oxidized by  $\text{MnO}_4^-$  to "A". The oxidation state of sulphur in "A" is \_\_\_\_\_.

**Response Type :** Numeric

**Evaluation Required For SA :** Yes

**Show Word Count :** Yes

**Answers Type :** Range

**Text Areas :** PlainText

**Possible Answers :**

5 to 5.001

**Question Number : 60 Question Id : 70819121153 Question Type : SA**

**Correct Marks : 4 Wrong Marks : 0**

The number of stereoisomers possible for  $[\text{Co}(\text{ox})_2(\text{Br})(\text{NH}_3)]^{2-}$  is \_\_\_\_\_.  
[ox = oxalate]

**Response Type :** Numeric

**Evaluation Required For SA :** Yes

**Show Word Count :** Yes

**Answers Type :** Range

**Text Areas :** PlainText

**Possible Answers :**

5 to 5.001

## Mathematics Section A

<b>Section Id :</b>	708191950
<b>Section Number :</b>	5
<b>Section type :</b>	Online
<b>Mandatory or Optional :</b>	Mandatory
<b>Number of Questions :</b>	20
<b>Number of Questions to be attempted :</b>	20
<b>Section Marks :</b>	80
<b>Mark As Answered Required? :</b>	Yes
<b>Sub-Section Number :</b>	1
<b>Sub-Section Id :</b>	7081911230
<b>Question Shuffling Allowed :</b>	Yes

**Question Number : 61 Question Id : 70819121154 Question Type : MCQ Option Shuffling : Yes**

**Is Question Mandatory : No**

**Correct Marks : 4 Wrong Marks : 1**

If the mirror image of the point  $(1, 3, 5)$  with respect to the plane  $4x - 5y + 2z = 8$  is  $(\alpha, \beta, \gamma)$ , then  $5(\alpha + \beta + \gamma)$  equals :

**Options :**

70819168611. 39

70819168612. 41

70819168613. 43

70819168614. 47

**Question Number : 62 Question Id : 70819121155 Question Type : MCQ Option Shuffling : Yes**

**Is Question Mandatory : No**

**Correct Marks : 4 Wrong Marks : 1**

Let  $A = \{1, 2, 3, \dots, 10\}$  and  $f: A \rightarrow A$  be defined as

$$f(k) = \begin{cases} k + 1 & \text{if } k \text{ is odd} \\ k & \text{if } k \text{ is even} \end{cases}$$

Then the number of possible functions  $g: A \rightarrow A$  such that  $g \circ f = f$  is :

**Options :**

70819168615.  $5!$

70819168616.  ${}^{10}C_5$

70819168617.  $5^5$

70819168618.  $10^5$

**Question Number : 63 Question Id : 70819121156 Question Type : MCQ Option Shuffling : Yes**

**Is Question Mandatory : No**

**Correct Marks : 4 Wrong Marks : 1**

Let  $A_1$  be the area of the region bounded by the curves  $y = \sin x$ ,  $y = \cos x$  and  $y$ -axis in the first quadrant. Also, let  $A_2$  be the area of the region bounded by the curves  $y = \sin x$ ,  $y = \cos x$ ,

$x$ -axis and  $x = \frac{\pi}{2}$  in the first quadrant. Then,

**Options :**

70819168619.  $A_1 : A_2 = 1 : 2$  and  $A_1 + A_2 = 1$

70819168620.  $A_1 : A_2 = 1 : \sqrt{2}$  and  $A_1 + A_2 = 1$

70819168621.  $A_1 = A_2$  and  $A_1 + A_2 = \sqrt{2}$

70819168622.  $2A_1 = A_2$  and  $A_1 + A_2 = 1 + \sqrt{2}$

**Question Number : 64 Question Id : 70819121157 Question Type : MCQ Option Shuffling : Yes**

**Is Question Mandatory : No**

**Correct Marks : 4 Wrong Marks : 1**

If  $0 < a, b < 1$ , and  $\tan^{-1} a + \tan^{-1} b = \frac{\pi}{4}$ , then the value of

$$(a + b) - \left( \frac{a^2 + b^2}{2} \right) + \left( \frac{a^3 + b^3}{3} \right) - \left( \frac{a^4 + b^4}{4} \right) + \dots \text{ is :}$$

**Options :**

70819168623.  $e$

70819168624.  $e^2 - 1$

70819168625.  $\log_e 2$

70819168626.  $\log_e \left( \frac{e}{2} \right)$

Question Number : 65 Question Id : 70819121158 Question Type : MCQ Option Shuffling : Yes

Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

Let slope of the tangent line to a curve at any point  $P(x, y)$  be given by  $\frac{xy^2 + y}{x}$ . If the curve intersects the line  $x + 2y = 4$  at  $x = -2$ , then the value of  $y$ , for which the point  $(3, y)$  lies on the curve, is :

Options :

70819168627.  $-\frac{4}{3}$

70819168628.  $-\frac{18}{19}$

70819168629.  $\frac{18}{35}$

70819168630.  $-\frac{18}{11}$

Question Number : 66 Question Id : 70819121159 Question Type : MCQ Option Shuffling : Yes

Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

The sum of the series  $\sum_{n=1}^{\infty} \frac{n^2 + 6n + 10}{(2n + 1)!}$  is equal to :

Options :

70819168631.  $\frac{41}{8}e + \frac{19}{8}e^{-1} - 10$

70819168632.  $\frac{41}{8}e + \frac{19}{8}e^{-1} + 10$



70819168633.  $-\frac{41}{8}e + \frac{19}{8}e^{-1} - 10$

70819168634.  $\frac{41}{8}e - \frac{19}{8}e^{-1} - 10$

**Question Number : 67 Question Id : 70819121160 Question Type : MCQ Option Shuffling : Yes**

**Is Question Mandatory : No**

**Correct Marks : 4 Wrong Marks : 1**

Let  $f(x) = \int_0^x e^t f(t) dt + e^x$  be a differentiable function for all  $x \in \mathbb{R}$ . Then  $f(x)$  equals :

**Options :**

70819168635.  $2e^{(e^x-1)} - 1$

70819168636.  $e^{(e^x-1)}$

70819168637.  $e^{e^x} - 1$

70819168638.  $2e^{e^x} - 1$

**Question Number : 68 Question Id : 70819121161 Question Type : MCQ Option Shuffling : Yes**

**Is Question Mandatory : No**

**Correct Marks : 4 Wrong Marks : 1**

Let  $f(x)$  be a differentiable function at  $x = a$  with  $f'(a) = 2$  and  $f(a) = 4$ . Then  $\lim_{x \rightarrow a} \frac{xf(a) - af(x)}{x - a}$  equals :

**Options :**

70819168639.  $2a - 4$

70819168640.  $4 - 2a$

70819168641.  $2a + 4$

70819168642.  $a + 4$

**Question Number : 69 Question Id : 70819121162 Question Type : MCQ Option Shuffling : Yes  
Is Question Mandatory : No**

**Correct Marks : 4 Wrong Marks : 1**

Let  $f(x) = \sin^{-1} x$  and  $g(x) = \frac{x^2 - x - 2}{2x^2 - x - 6}$ . If  $g(2) = \lim_{x \rightarrow 2} g(x)$ , then the domain of the function  $f \circ g$  is :

**Options :**

70819168643.  $(-\infty, -2] \cup \left[-\frac{3}{2}, \infty\right)$

70819168644.  $(-\infty, -2] \cup \left[-\frac{4}{3}, \infty\right)$

70819168645.  $(-\infty, -1] \cup [2, \infty)$

70819168646.  $(-\infty, -2] \cup [-1, \infty)$

**Question Number : 70 Question Id : 70819121163 Question Type : MCQ Option Shuffling : Yes  
Is Question Mandatory : No**

**Correct Marks : 4 Wrong Marks : 1**

Let A(1, 4) and B(1, -5) be two points. Let P be a point on the circle  $(x-1)^2 + (y-1)^2 = 1$  such that  $(PA)^2 + (PB)^2$  have maximum value, then the points, P, A and B lie on :

**Options :**

70819168647. an ellipse

70819168648. a hyperbola

70819168649. a parabola

70819168650. a straight line

**Question Number : 71 Question Id : 70819121164 Question Type : MCQ Option Shuffling : Yes**

**Is Question Mandatory : No**

**Correct Marks : 4 Wrong Marks : 1**

If vectors  $\vec{a}_1 = x\hat{i} - \hat{j} + \hat{k}$  and  $\vec{a}_2 = \hat{i} + y\hat{j} + z\hat{k}$  are collinear, then a possible unit vector parallel to the vector  $x\hat{i} + y\hat{j} + z\hat{k}$  is :

**Options :**

70819168651.  $\frac{1}{\sqrt{2}} (-\hat{j} + \hat{k})$

70819168652.  $\frac{1}{\sqrt{3}} (\hat{i} - \hat{j} + \hat{k})$

70819168653.  $\frac{1}{\sqrt{3}} (\hat{i} + \hat{j} - \hat{k})$

70819168654.  $\frac{1}{\sqrt{2}} (\hat{i} - \hat{j})$

Question Number : 72 Question Id : 70819121165 Question Type : MCQ Option Shuffling : Yes

Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

Let  $F_1(A, B, C) = (A \wedge \sim B) \vee [\sim C \wedge (A \vee B)] \vee \sim A$  and  $F_2(A, B) = (A \vee B) \vee (B \rightarrow \sim A)$  be two logical expressions. Then :

Options :

70819168655.  $F_1$  and  $F_2$  both are tautologies

70819168656.  $F_1$  is a tautology but  $F_2$  is not a tautology

70819168657.  $F_1$  is not a tautology but  $F_2$  is a tautology

70819168658. Both  $F_1$  and  $F_2$  are not tautologies

Question Number : 73 Question Id : 70819121166 Question Type : MCQ Option Shuffling : Yes

Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

A seven digit number is formed using digits 3, 3, 4, 4, 4, 5, 5. The probability, that number so formed is divisible by 2, is :

Options :

70819168659.  $\frac{3}{7}$

70819168660.  $\frac{6}{7}$

70819168661.  $\frac{1}{7}$

70819168662.  $\frac{4}{7}$

**Question Number : 74 Question Id : 70819121167 Question Type : MCQ Option Shuffling : Yes**

**Is Question Mandatory : No**

**Correct Marks : 4 Wrong Marks : 1**

Consider the following system of equations :

$$x + 2y - 3z = a$$

$$2x + 6y - 11z = b$$

$$x - 2y + 7z = c,$$

where a, b and c are real constants. Then the system of equations :

**Options :**

70819168663. has a unique solution for all a, b and c

70819168664. has a unique solution when  $5a = 2b + c$

70819168665. has infinite number of solutions when  $5a = 2b + c$

70819168666. has no solution for all a, b and c

**Question Number : 75 Question Id : 70819121168 Question Type : MCQ Option Shuffling : Yes**

**Is Question Mandatory : No**

**Correct Marks : 4 Wrong Marks : 1**

The triangle of maximum area that can be inscribed in a given circle of radius 'r' is :

**Options :**

70819168667. An isosceles triangle with base equal to  $2r$ .

70819168668. A right angle triangle having two of its sides of length  $2r$  and  $r$ .

70819168669. An equilateral triangle of height  $\frac{2r}{3}$ .

70819168670. An equilateral triangle having each of its side of length  $\sqrt{3} r$ .

**Question Number : 76 Question Id : 70819121169 Question Type : MCQ Option Shuffling : Yes**  
**Is Question Mandatory : No**

**Correct Marks : 4 Wrong Marks : 1**

Let  $L$  be a line obtained from the intersection of two planes  $x + 2y + z = 6$  and  $y + 2z = 4$ . If point  $P(\alpha, \beta, \gamma)$  is the foot of perpendicular from  $(3, 2, 1)$  on  $L$ , then the value of  $21(\alpha + \beta + \gamma)$  equals :

**Options :**

70819168671. 68

70819168672. 102

70819168673. 136

70819168674. 142

**Question Number : 77 Question Id : 70819121170 Question Type : MCQ Option Shuffling : Yes**  
**Is Question Mandatory : No**

**Correct Marks : 4 Wrong Marks : 1**

Let  $f: \mathbb{R} \rightarrow \mathbb{R}$  be defined as

$$f(x) = \begin{cases} 2 \sin\left(-\frac{\pi x}{2}\right), & \text{if } x < -1 \\ ax^2 + x + b, & \text{if } -1 \leq x \leq 1 \\ \sin(\pi x), & \text{if } x > 1 \end{cases}$$

If  $f(x)$  is continuous on  $\mathbb{R}$ , then  $a + b$  equals :

**Options :**

70819168675. -3

70819168676. -1

70819168677. 1

70819168678. 3

**Question Number : 78 Question Id : 70819121171 Question Type : MCQ Option Shuffling : Yes**

**Is Question Mandatory : No**

**Correct Marks : 4 Wrong Marks : 1**

If the locus of the mid-point of the line segment from the point (3, 2) to a point on the circle,  $x^2 + y^2 = 1$  is a circle of radius  $r$ , then  $r$  is equal to :

**Options :**

70819168679.  $\frac{1}{4}$

70819168680.  $\frac{1}{3}$

70819168681.  $\frac{1}{2}$

70819168682. 1

**Question Number : 79 Question Id : 70819121172 Question Type : MCQ Option Shuffling : Yes**

**Is Question Mandatory : No**

**Correct Marks : 4 Wrong Marks : 1**

A natural number has prime factorization given by  $n = 2^x 3^y 5^z$ , where  $y$  and  $z$  are such that

$y + z = 5$  and  $y^{-1} + z^{-1} = \frac{5}{6}$ ,  $y > z$ . Then the number of odd divisors of  $n$ , including 1, is :

**Options :**

70819168683. 6

70819168684. 11

70819168685. 12

70819168686.  $6x$

**Question Number : 80 Question Id : 70819121173 Question Type : MCQ Option Shuffling : Yes**

**Is Question Mandatory : No**

**Correct Marks : 4 Wrong Marks : 1**

For  $x > 0$ , if  $f(x) = \int_1^x \frac{\log_e t}{(1+t)} dt$ , then  $f(e) + f\left(\frac{1}{e}\right)$  is equal to :

**Options :**

70819168687. 0

70819168688. 1

70819168689.  $\frac{1}{2}$

70819168690.  $-1$

## Mathematics Section B

**Section Id :** 708191951

**Section Number :** 6

**Section type :** Online

**Mandatory or Optional :** Mandatory

**Number of Questions :** 10



<b>Number of Questions to be attempted :</b>	5
<b>Section Marks :</b>	20
<b>Mark As Answered Required? :</b>	Yes
<b>Sub-Section Number :</b>	1
<b>Sub-Section Id :</b>	7081911231
<b>Question Shuffling Allowed :</b>	Yes

**Question Number : 81 Question Id : 70819121174 Question Type : SA**

**Correct Marks : 4 Wrong Marks : 0**

If  $I_{m,n} = \int_0^1 x^{m-1}(1-x)^{n-1} dx$ , for  $m, n \geq 1$ , and  $\int_0^1 \frac{x^{m-1} + x^{n-1}}{(1+x)^{m+n}} dx = \alpha I_{m,n}$ ,  $\alpha \in \mathbb{R}$ , then  $\alpha$  equals \_\_\_\_\_.

**Response Type :** Numeric

**Evaluation Required For SA :** Yes

**Show Word Count :** Yes

**Answers Type :** Range

**Text Areas :** PlainText

**Possible Answers :**

5 to 5.001

**Question Number : 82 Question Id : 70819121175 Question Type : SA**

**Correct Marks : 4 Wrong Marks : 0**

Let  $z$  be those complex numbers which satisfy

$$|z+5| \leq 4 \text{ and } z(1+i) + \bar{z}(1-i) \geq -10, i = \sqrt{-1}.$$

If the maximum value of  $|z+1|^2$  is  $\alpha + \beta\sqrt{2}$ , then the value of  $(\alpha + \beta)$  is \_\_\_\_\_.

**Response Type :** Numeric

**Evaluation Required For SA :** Yes

**Show Word Count :** Yes

**Answers Type :** Range

**Text Areas :** PlainText

**Possible Answers :**

5 to 5.001

**Question Number : 83 Question Id : 70819121176 Question Type : SA**

**Correct Marks : 4 Wrong Marks : 0**

Let the normals at all the points on a given curve pass through a fixed point  $(a, b)$ . If the curve passes through  $(3, -3)$  and  $(4, -2\sqrt{2})$ , and given that  $a - 2\sqrt{2}b = 3$ , then  $(a^2 + b^2 + ab)$  is equal to \_\_\_\_\_.

**Response Type :** Numeric

**Evaluation Required For SA :** Yes

**Show Word Count :** Yes

**Answers Type :** Range

**Text Areas :** PlainText

**Possible Answers :**

5 to 5.001

**Question Number : 84 Question Id : 70819121177 Question Type : SA**

**Correct Marks : 4 Wrong Marks : 0**

Let  $a$  be an integer such that all the real roots of the polynomial  $2x^5 + 5x^4 + 10x^3 + 10x^2 + 10x + 10$  lie in the interval  $(a, a + 1)$ . Then,  $|a|$  is equal to \_\_\_\_\_.

**Response Type :** Numeric

**Evaluation Required For SA :** Yes

**Show Word Count :** Yes

**Answers Type :** Range

**Text Areas :** PlainText

**Possible Answers :**

5 to 5.001

**Question Number : 85 Question Id : 70819121178 Question Type : SA**

**Correct Marks : 4 Wrong Marks : 0**

Let  $X_1, X_2, \dots, X_{18}$  be eighteen observations such that  $\sum_{i=1}^{18} (X_i - \alpha) = 36$  and  $\sum_{i=1}^{18} (X_i - \beta)^2 = 90$ ,

where  $\alpha$  and  $\beta$  are distinct real numbers. If the standard deviation of these observations is 1, then the value of  $|\alpha - \beta|$  is \_\_\_\_\_.

**Response Type :** Numeric

**Evaluation Required For SA :** Yes

**Show Word Count :** Yes

**Answers Type :** Range

**Text Areas :** PlainText

**Possible Answers :**

5 to 5.001

**Question Number : 86 Question Id : 70819121179 Question Type : SA**

**Correct Marks : 4 Wrong Marks : 0**

If the matrix  $A = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 2 & 0 \\ 3 & 0 & -1 \end{bmatrix}$  satisfies the equation  $A^{20} + \alpha A^{19} + \beta A = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 4 & 0 \\ 0 & 0 & 1 \end{bmatrix}$  for some

real numbers  $\alpha$  and  $\beta$ , then  $\beta - \alpha$  is equal to \_\_\_\_\_.

**Response Type :** Numeric

**Evaluation Required For SA :** Yes

**Show Word Count :** Yes

**Answers Type :** Range

**Text Areas :** PlainText

**Possible Answers :**

5 to 5.001

**Question Number : 87 Question Id : 70819121180 Question Type : SA**

**Correct Marks : 4 Wrong Marks : 0**

Let  $\alpha$  and  $\beta$  be two real numbers such that  $\alpha + \beta = 1$  and  $\alpha\beta = -1$ . Let  $p_n = (\alpha)^n + (\beta)^n$ ,  $p_{n-1} = 11$  and  $p_{n+1} = 29$  for some integer  $n \geq 1$ . Then, the value of  $p_n^2$  is \_\_\_\_\_.

**Response Type :** Numeric

**Evaluation Required For SA :** Yes

**Show Word Count :** Yes

**Answers Type :** Range

**Text Areas :** PlainText

**Possible Answers :**

5 to 5.001

**Question Number : 88 Question Id : 70819121181 Question Type : SA**

**Correct Marks : 4 Wrong Marks : 0**

The total number of 4-digit numbers whose greatest common divisor with 18 is 3, is \_\_\_\_\_.

**Response Type :** Numeric

**Evaluation Required For SA :** Yes

**Show Word Count :** Yes

**Answers Type :** Range

**Text Areas :** PlainText

**Possible Answers :**

5 to 5.001

**Question Number : 89 Question Id : 70819121182 Question Type : SA**

**Correct Marks : 4 Wrong Marks : 0**

If the arithmetic mean and geometric mean of the  $p^{\text{th}}$  and  $q^{\text{th}}$  terms of the sequence  $-16, 8, -4, 2, \dots$  satisfy the equation  $4x^2 - 9x + 5 = 0$ , then  $p + q$  is equal to \_\_\_\_\_.

**Response Type :** Numeric

**Evaluation Required For SA :** Yes

**Show Word Count :** Yes

**Answers Type :** Range

**Text Areas :** PlainText

**Possible Answers :**

5 to 5.001

**Question Number : 90 Question Id : 70819121183 Question Type : SA**

**Correct Marks : 4 Wrong Marks : 0**

Let L be a common tangent line to the curves  $4x^2 + 9y^2 = 36$  and  $(2x)^2 + (2y)^2 = 31$ . Then the square of the slope of the line L is \_\_\_\_\_.

**Response Type :** Numeric

**Evaluation Required For SA :** Yes

**Show Word Count :** Yes

**Answers Type :** Range

**Text Areas :** PlainText

**Possible Answers :**

5 to 5.001