

# National Testing Agency

**Question Paper Name :** B TECH 24th Feb 2021 Shift 2  
**Subject Name :** B TECH  
**Creation Date :** 2021-02-25 09:54:33  
**Duration :** 180  
**Number of Questions :** 90  
**Total Marks :** 300  
**Display Marks:** Yes

## B TECH

**Group Number :** 1  
**Group Id :** 708191175  
**Group Maximum Duration :** 0  
**Group Minimum Duration :** 180  
**Show Attended Group? :** No  
**Edit Attended Group? :** No  
**Break time :** 0  
**Group Marks :** 300  
**Is this Group for Examiner? :** No

## Physics Section A

**Section Id :** 708191628  
**Section Number :** 1  
**Section type :** Online  
**Mandatory or Optional :** Mandatory  
**Number of Questions :** 20  
**Number of Questions to be attempted :** 20

Section Marks :	80
Mark As Answered Required? :	Yes
Sub-Section Number :	1
Sub-Section Id :	708191908
Question Shuffling Allowed :	Yes

Question Number : 1 Question Id : 70819116324 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No  
Correct Marks : 4 Wrong Marks : 1

The period of oscillation of a simple pendulum is  $T = 2\pi\sqrt{\frac{L}{g}}$ . Measured value of 'L' is 1.0 m from meter scale having a minimum division of 1 mm and time of one complete oscillation is 1.95 s measured from stopwatch of 0.01 s resolution. The percentage error in the determination of 'g' will be :

Options :

70819154121. 1.33%

70819154122. 1.03%

70819154123. 1.13%

70819154124. 1.30%

Question Number : 2 Question Id : 70819116325 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No  
Correct Marks : 4 Wrong Marks : 1

A particle is projected with velocity  $v_0$  along  $x$ -axis. A damping force is acting on the particle which is proportional to the square of the distance from the origin i.e.  $ma = -\alpha x^2$ . The distance at which the particle stops :

Options :

70819154125.  $\left(\frac{2v_0^2}{3\alpha}\right)^{\frac{1}{2}}$

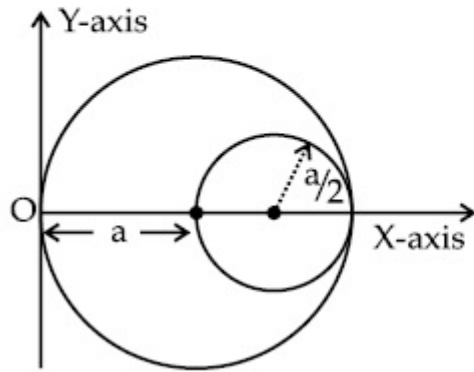
70819154126.  $\left(\frac{3v_0^2}{2\alpha}\right)^{\frac{1}{2}}$

70819154127.  $\left(\frac{3v_0^2}{2\alpha}\right)^{\frac{1}{3}}$

70819154128.  $\left(\frac{2v_0}{3\alpha}\right)^{\frac{1}{3}}$

**Question Number : 3 Question Id : 70819116326 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1**

A circular hole of radius  $\left(\frac{a}{2}\right)$  is cut out of a circular disc of radius 'a' as shown in figure. The centroid of the remaining circular portion with respect to point 'O' will be :



Options :

70819154129.  $\frac{1}{6}a$

70819154130.  $\frac{5}{6}a$

70819154131.  $\frac{2}{3}a$

70819154132.  $\frac{10}{11}a$

Question Number : 4 Question Id : 70819116327 Question Type : MCQ Option Shuffling : Yes Is Question Marked : No  
 Correct Marks : 4 Wrong Marks : 1

A body weighs 49 N on a spring balance at the north pole. What will be its weight recorded on the same weighing machine, if it is shifted to the equator ?

[Use  $g = \frac{GM}{R^2} = 9.8 \text{ ms}^{-2}$  and radius of earth,  $R = 6400 \text{ km}$ .]

Options :

70819154133. 49.17 N

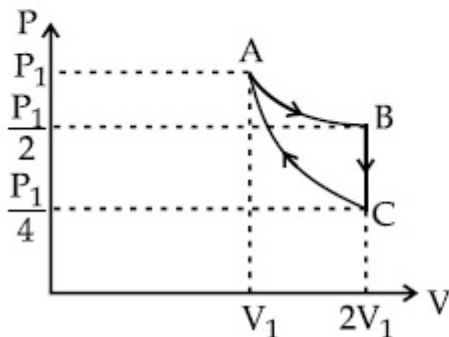
70819154134. 49 N

70819154135. 48.83 N

70819154136. 49.83 N

**Question Number : 5 Question Id : 70819116328 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1**

If one mole of an ideal gas at  $(P_1, V_1)$  is allowed to expand reversibly and isothermally (A to B) its pressure is reduced to one-half of the original pressure (see figure). This is followed by a constant volume cooling till its pressure is reduced to one-fourth of the initial value ( $B \rightarrow C$ ). Then it is restored to its initial state by a reversible adiabatic compression (C to A). The net workdone by the gas is equal to :



**Options :**

70819154137.  $RT \left( \ln 2 - \frac{1}{2(\gamma-1)} \right)$

70819154138.  $-\frac{RT}{2(\gamma-1)}$

70819154139.  $RT \ln 2$

70819154140.  $0$

**Question Number : 6 Question Id : 70819116329 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1**

On the basis of kinetic theory of gases, the gas exerts pressure because its molecules :

**Options :**

70819154141. continuously lose their energy till it reaches wall.

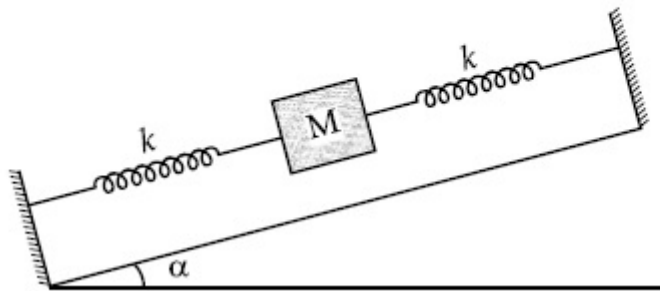
70819154142. continuously stick to the walls of container.

70819154143. are attracted by the walls of container.

70819154144. suffer change in momentum when impinge on the walls of container.

**Question Number : 7 Question Id : 70819116330 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1**

In the given figure, a body of mass  $M$  is held between two massless springs, on a smooth inclined plane. The free ends of the springs are attached to firm supports. If each spring has spring constant  $k$ , the frequency of oscillation of given body is :



Options :

70819154145.  $\frac{1}{2\pi} \sqrt{\frac{k}{Mg \sin\alpha}}$

70819154146.  $\frac{1}{2\pi} \sqrt{\frac{2k}{Mg \sin\alpha}}$

70819154147.  $\frac{1}{2\pi} \sqrt{\frac{2k}{M}}$

70819154148.  $\frac{1}{2\pi} \sqrt{\frac{k}{2M}}$

Question Number : 8 Question Id : 70819116331 Question Type : MCQ Option Shuffling : Yes Is Question Marked Correct : Yes Correct Marks : 4 Wrong Marks : 1

When a particle executes SHM, the nature of graphical representation of velocity as a function of displacement is :

**Options :**

70819154149. circular

70819154150. elliptical

70819154151. parabolic

70819154152. straight line

**Question Number : 9 Question Id : 70819116332 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1**

Which of the following equations represents a travelling wave ?

**Options :**

70819154153.  $y = Ae^x \cos(\omega t - \theta)$

70819154154.  $y = Ae^{-x^2} (vt + \theta)$

70819154155.  $y = A \sin(15x - 2t)$

70819154156.  $y = A \sin x \cos \omega t$

**Question Number : 10 Question Id : 70819116333 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1**



Two electrons each are fixed at a distance '2d'. A third charge proton placed at the midpoint is displaced slightly by a distance  $x$  ( $x \ll d$ ) perpendicular to the line joining the two fixed charges. Proton will execute simple harmonic motion having angular frequency :  
( $m$  = mass of charged particle)

Options :

70819154157.  $\left( \frac{q^2}{2\pi\epsilon_0 md^3} \right)^{\frac{1}{2}}$

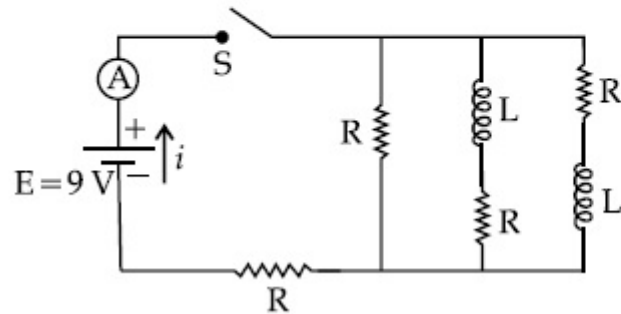
70819154158.  $\left( \frac{2q^2}{\pi\epsilon_0 md^3} \right)^{\frac{1}{2}}$

70819154159.  $\left( \frac{\pi\epsilon_0 md^3}{2q^2} \right)^{\frac{1}{2}}$

70819154160.  $\left( \frac{2\pi\epsilon_0 md^3}{q^2} \right)^{\frac{1}{2}}$

Question Number : 11 Question Id : 70819116334 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No  
Correct Marks : 4 Wrong Marks : 1

Figure shows a circuit that contains four identical resistors with resistance  $R=2.0\ \Omega$ , two identical inductors with inductance  $L=2.0\ \text{mH}$  and an ideal battery with *emf*  $E=9\ \text{V}$ . The current ' $i$ ' just after the switch ' $S$ ' is closed will be :



Options :

70819154161. 2.25 A
70819154162. 3.0 A
70819154163. 3.37 A
70819154164. 9 A

Question Number : 12 Question Id : 70819116335 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No  
 Correct Marks : 4 Wrong Marks : 1

A soft ferromagnetic material is placed in an external magnetic field. The magnetic domains :

Options :

70819154165. increase in size but no change in orientation.
70819154166. decrease in size and changes orientation.

70819154167. may increase or decrease in size and change its orientation.

70819154168. have no relation with external magnetic field.

**Question Number : 13 Question Id : 70819116336 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1**

Match List - I with List - II.

List - I

- (a) Source of microwave frequency
- (b) Source of infrared frequency
- (c) Source of Gamma Rays
- (d) Source of X-rays

List - II

- (i) Radioactive decay of nucleus
- (ii) Magnetron
- (iii) Inner shell electrons
- (iv) Vibration of atoms and molecules
- (v) LASER
- (vi) RC circuit

Choose the correct answer from the options given below :

**Options :**

70819154169. (a)-(vi), (b)-(v), (c)-(i), (d)-(iv)

70819154170. (a)-(vi), (b)-(iv), (c)-(i), (d)-(v)

70819154171. (a)-(ii), (b)-(iv), (c)-(i), (d)-(iii)

70819154172. (a)-(ii), (b)-(iv), (c)-(vi), (d)-(iii)

**Question Number : 14 Question Id : 70819116337 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1**

If the source of light used in a Young's double slit experiment is changed from red to violet :

**Options :**

70819154173. the fringes will become brighter.
70819154174. consecutive fringe lines will come closer.
70819154175. the intensity of minima will increase.
70819154176. the central bright fringe will become a dark fringe.

**Question Number : 15 Question Id : 70819116338 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1**

An X-ray tube is operated at 1.24 million volt. The shortest wavelength of the produced photon will be :

**Options :**

70819154177.  $10^{-1}$  nm
70819154178.  $10^{-2}$  nm
70819154179.  $10^{-3}$  nm
70819154180.  $10^{-4}$  nm

**Question Number : 16 Question Id : 70819116339 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1**

The de Broglie wavelength of a proton and  $\alpha$ -particle are equal. The ratio of their velocities is :

**Options :**

70819154181. 4 : 1

70819154182. 4 : 2

70819154183. 4 : 3

70819154184. 1 : 4

**Question Number : 17 Question Id : 70819116340 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1**

According to Bohr atom model, in which of the following transitions will the frequency be maximum ?

**Options :**

70819154185.  $n=2$  to  $n=1$

70819154186.  $n=3$  to  $n=2$

70819154187.  $n=4$  to  $n=3$

70819154188.  $n=5$  to  $n=4$

**Question Number : 18 Question Id : 70819116341 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1**

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

**Options :**

70819154189. lightly doped and have narrow depletion layer.

70819154190. lightly doped and have wide depletion layer.

70819154191. heavily doped and have narrow depletion layer.

70819154192. heavily doped and have wide depletion layer.

**Question Number : 19 Question Id : 70819116342 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No  
Correct Marks : 4 Wrong Marks : 1**

Given below are two statements :

**Statement I :** PN junction diodes can be used to function as transistor, simply by connecting two diodes, back to back, which acts as the base terminal.

**Statement II :** In the study of transistor, the amplification factor  $\beta$  indicates ratio of the collector current to the base current.

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

**Options :**

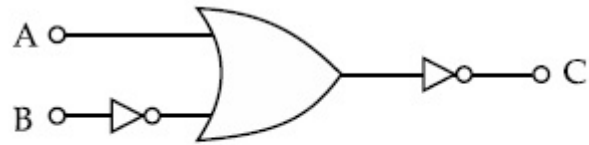
70819154193. Both Statement I and Statement II are true

70819154194. Both Statement I and Statement II are false

70819154195. Statement I is true but Statement II is false

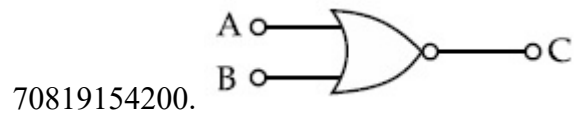
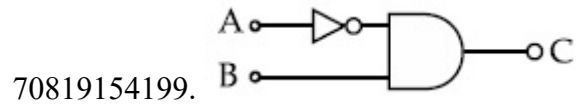
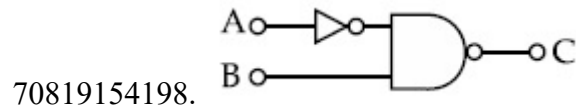
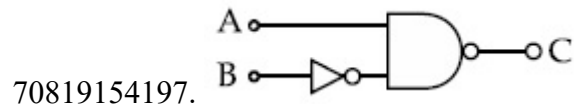
70819154196. Statement I is false but Statement II is true

**Question Number : 20 Question Id : 70819116343 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No  
Correct Marks : 4 Wrong Marks : 1**



The logic circuit shown above is equivalent to :

Options :



## Physics Section B

Section Id :	708191629
Section Number :	2
Section type :	Online
Mandatory or Optional :	Mandatory
Number of Questions :	10
Number of Questions to be attempted :	5
Section Marks :	20
Mark As Answered Required? :	Yes

**Sub-Section Number :**

1

**Sub-Section Id :**

708191909

**Question Shuffling Allowed :**

Yes

**Question Number : 21 Question Id : 70819116344 Question Type : SA**

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

Two solids A and B of mass 1 kg and 2 kg respectively are moving with equal linear momentum. The ratio of their kinetic energies  $(K.E.)_A : (K.E.)_B$  will be  $\frac{A}{1}$ , so the value of A will be \_\_\_\_\_.

**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 : 70819116345 Question Type : SA**

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

A uniform metallic wire is elongated by 0.04 m when subjected to a linear force F. The elongation, if its length and diameter is doubled and subjected to the same force will be \_\_\_\_\_ 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 : 23 Question Id : 70819116346 Question Type : SA**

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

A uniform thin bar of mass 6 kg and length 2.4 meter is bent to make an equilateral hexagon. The moment of inertia about an axis passing through the centre of mass and perpendicular to the plane of hexagon is \_\_\_\_\_  $\times 10^{-1}$  kg m<sup>2</sup>.

**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 : 70819116347 Question Type : SA**

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

The root mean square speed of molecules of a given mass of a gas at 27°C and 1 atmosphere pressure is 200 ms<sup>-1</sup>. The root mean square speed of molecules of the gas at 127°C and 2 atmosphere pressure is  $\frac{x}{\sqrt{3}}$  ms<sup>-1</sup>. The value of  $x$  will be \_\_\_\_\_.

**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 : 70819116348 Question Type : SA**

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

Two cars are approaching each other at an equal speed of 7.2 km/hr. When they see each other, both blow horns having frequency of 676 Hz. The beat frequency heard by each driver will be \_\_\_\_\_ Hz. [Velocity of sound in air is 340 m/s.]

**Response Type :** Numeric

**Evaluation Required For SA :** Yes

**Show Word Count :** Yes

**Answers Type :** Range

**Text Areas :** PlainText

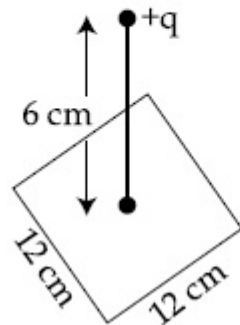
**Possible Answers :**

5 to 5.001

**Question Number :** 26 **Question Id :** 70819116349 **Question Type :** SA

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

A point charge of  $+12 \mu\text{C}$  is at a distance 6 cm vertically above the centre of a square of side 12 cm as shown in figure. The magnitude of the electric flux through the square will be \_\_\_\_\_  $\times 10^3 \text{ Nm}^2/\text{C}$ .



**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 : 70819116350 Question Type : SA**

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

A cylindrical wire of radius 0.5 mm and conductivity  $5 \times 10^7$  S/m is subjected to an electric field of 10 mV/m. The expected value of current in the wire will be  $x^3\pi$  mA. 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 : 28 Question Id : 70819116351 Question Type : SA**

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

A series LCR circuit is designed to resonate at an angular frequency  $\omega_0 = 10^5$  rad/s. The circuit draws 16 W power from 120 V source at resonance. The value of resistance 'R' in the circuit is \_\_\_\_\_  $\Omega$ .

**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 : 70819116352 Question Type : SA**

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

An electromagnetic wave of frequency 3 GHz enters a dielectric medium of relative electric permittivity 2.25 from vacuum. The wavelength of this wave in that medium will be \_\_\_\_\_  $\times 10^{-2}$  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 :** 30 **Question Id :** 70819116353 **Question Type :** SA

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

A signal of 0.1 kW is transmitted in a cable. The attenuation of cable is  $-5$  dB per km and cable length is 20 km. The power received at receiver is  $10^{-x}$  W. The value of  $x$  is \_\_\_\_\_.

$$\left[ \text{Gain in dB} = 10 \log_{10} \left( \frac{P_o}{P_i} \right) \right]$$

**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 :**

708191630

**Section Number :**

3

**Section type :**

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>	708191910
<b>Question Shuffling Allowed :</b>	Yes

**Question Number : 31 Question Id : 70819116354 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1**

According to Bohr's atomic theory :

- (A) Kinetic energy of electron is  $\propto \frac{Z^2}{n^2}$ .
- (B) The product of velocity (v) of electron and principal quantum number (n),  $'vn' \propto Z^2$ .
- (C) Frequency of revolution of electron in an orbit is  $\propto \frac{Z^3}{n^3}$ .
- (D) Coulombic force of attraction on the electron is  $\propto \frac{Z^3}{n^4}$ .

Choose the most appropriate answer from the options given below :

**Options :**

70819154211. (A), (C) and (D) only

70819154212. (A) and (D) only

70819154213. (C) only

70819154214. (A) only

**Question Number : 32 Question Id : 70819116355 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1**

The correct shape and I–I–I bond angles respectively in  $I_3^-$  ion are :

**Options :**

70819154215. Linear;  $180^\circ$

70819154216. Distorted trigonal planar;  $135^\circ$  and  $90^\circ$

70819154217. T-shaped;  $180^\circ$  and  $90^\circ$

70819154218. Trigonal planar;  $120^\circ$

**Question Number : 33 Question Id : 70819116356 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1**

Most suitable salt which can be used for efficient clotting of blood will be :

**Options :**

70819154219.  $NaHCO_3$

70819154220.  $Mg(HCO_3)_2$

70819154221.  $FeCl_3$

70819154222.  $FeSO_4$

**Question Number : 34 Question Id : 70819116357 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1**

The correct set from the following in which both pairs are in correct order of melting point is :

**Options :**

70819154223.  $\text{LiCl} > \text{LiF}$  ;  $\text{MgO} > \text{NaCl}$

70819154224.  $\text{LiF} > \text{LiCl}$  ;  $\text{MgO} > \text{NaCl}$

70819154225.  $\text{LiCl} > \text{LiF}$  ;  $\text{NaCl} > \text{MgO}$

70819154226.  $\text{LiF} > \text{LiCl}$  ;  $\text{NaCl} > \text{MgO}$

**Question Number : 35 Question Id : 70819116358 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1**

Match List - I with List - II.

List - I (Metal)	List - II (Ores)
(a) Aluminium	(i) Siderite
(b) Iron	(ii) Calamine
(c) Copper	(iii) Kaolinite
(d) Zinc	(iv) Malachite

Choose the correct answer from the options given below :

**Options :**

70819154227. (a)-(i), (b)-(ii), (c)-(iii), (d)-(iv)

70819154228. (a)-(iv), (b)-(iii), (c)-(ii), (d)-(i)

70819154229. (a)-(ii), (b)-(iv), (c)-(i), (d)-(iii)

70819154230. (a)-(iii), (b)-(i), (c)-(iv), (d)-(ii)

**Question Number : 36 Question Id : 70819116359 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 :** Hydrogen is the most abundant element in the Universe, but it is not the most abundant gas in the troposphere.

**Reason R :** Hydrogen is the lightest element.

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

**Options :**

70819154231. Both A and R are true and R is the correct explanation of A

70819154232. Both A and R are true but R is NOT the correct explanation of A

70819154233. A is true but R is false

70819154234. A is false but R is true

**Question Number : 37 Question Id : 70819116360 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1**



Match List - I with List - II.

List - I (Salt)	List - II (Flame colour wavelength)
(a) LiCl	(i) 455.5 nm
(b) NaCl	(ii) 670.8 nm
(c) RbCl	(iii) 780.0 nm
(d) CsCl	(iv) 589.2 nm

Choose the correct answer from the options given below :

Options :

70819154235. (a)-(iv), (b)-(ii), (c)-(iii), (d)-(i)

70819154236. (a)-(ii), (b)-(iv), (c)-(iii), (d)-(i)

70819154237. (a)-(i), (b)-(iv), (c)-(ii), (d)-(iii)

70819154238. (a)-(ii), (b)-(i), (c)-(iv), (d)-(iii)

Question Number : 38 Question Id : 70819116361 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No  
Correct Marks : 4 Wrong Marks : 1

The incorrect statement among the following is :

Options :

70819154239.  $\text{VO}_2$  is a reducing agent

70819154240.  $\text{RuO}_4$  is an oxidizing agent

70819154241.  $\text{Cr}_2\text{O}_3$  is an amphoteric oxide

70819154242. Red colour of ruby is due to the presence of  $\text{Co}^{3+}$

**Question Number : 39 Question Id : 70819116362 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1**

What is the correct order of the following elements with respect to their density ?

**Options :**

70819154243.  $\text{Cr} < \text{Fe} < \text{Co} < \text{Cu} < \text{Zn}$

70819154244.  $\text{Zn} < \text{Cr} < \text{Fe} < \text{Co} < \text{Cu}$

70819154245.  $\text{Zn} < \text{Cu} < \text{Co} < \text{Fe} < \text{Cr}$

70819154246.  $\text{Cr} < \text{Zn} < \text{Co} < \text{Cu} < \text{Fe}$

**Question Number : 40 Question Id : 70819116363 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1**

The calculated magnetic moments (spin only value) for species  $[\text{FeCl}_4]^{2-}$ ,  $[\text{Co}(\text{C}_2\text{O}_4)_3]^{3-}$  and  $\text{MnO}_4^{2-}$  respectively are :

**Options :**

70819154247. 4.90, 0 and 1.73 BM

70819154248. 5.92, 4.90 and 0 BM

70819154249. 5.82, 0 and 0 BM

70819154250. 4.90, 0 and 2.83 BM

**Question Number : 41 Question Id : 70819116364 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1**

Given below are two statements :

**Statement I :** The value of the parameter “Biochemical Oxygen Demand (BOD)” is important for survival of aquatic life.

**Statement II :** The optimum value of BOD is 6.5 ppm.

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

**Options :**

70819154251. Both Statement I and Statement II are true

70819154252. Both Statement I and Statement II are false

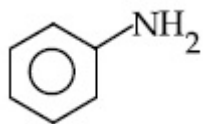
70819154253. Statement I is true but Statement II is false

70819154254. Statement I is false but Statement II is true

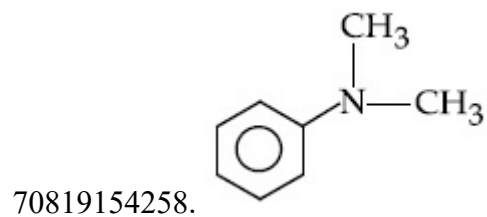
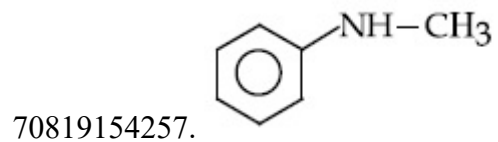
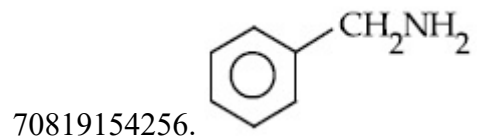
**Question Number : 42 Question Id : 70819116365 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1**

The diazonium salt of which of the following compounds will form a coloured dye on reaction with  $\beta$ -Naphthol in NaOH ?

**Options :**



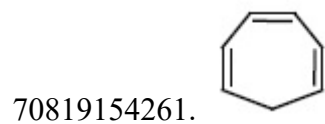
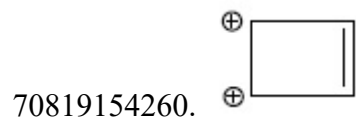
70819154255.

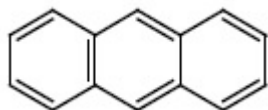


**Question Number : 43 Question Id : 70819116366 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1**

Which one of the following compounds is non-aromatic ?

**Options :**



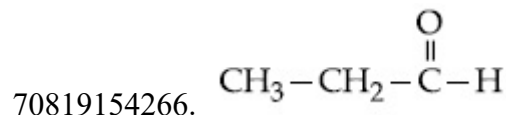
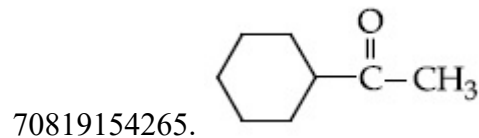
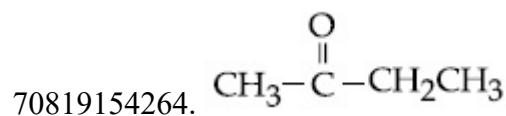
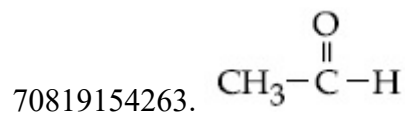


70819154262.

**Question Number : 44 Question Id : 70819116367 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1**

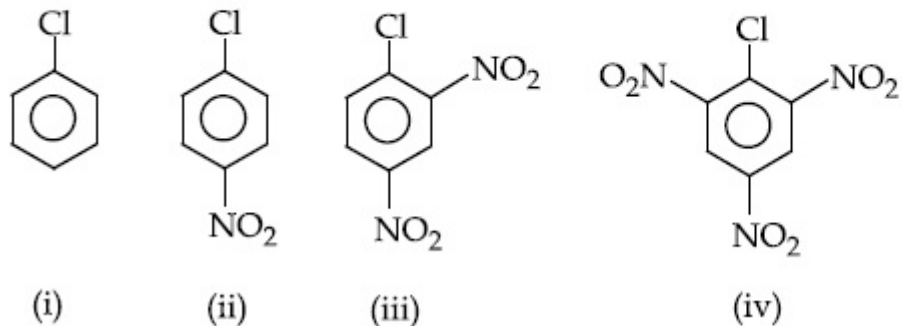
Which one of the following carbonyl compounds cannot be prepared by addition of water on an alkyne in the presence of  $\text{HgSO}_4$  and  $\text{H}_2\text{SO}_4$  ?

**Options :**



**Question Number : 45 Question Id : 70819116368 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1**

The correct order of the following compounds showing increasing tendency towards nucleophilic substitution reaction is :



Options :

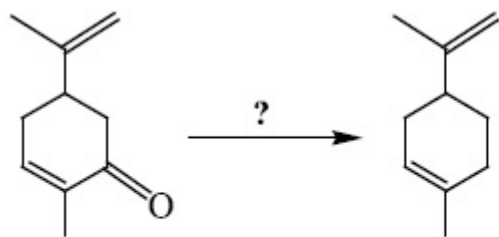
70819154267. (iv) < (iii) < (ii) < (i)

70819154268. (iv) < (i) < (iii) < (ii)

70819154269. (i) < (ii) < (iii) < (iv)

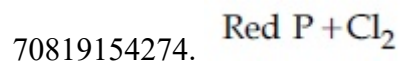
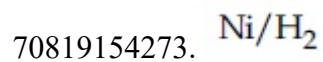
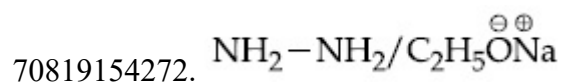
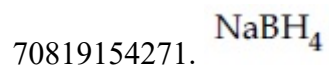
70819154270. (iv) < (i) < (ii) < (iii)

Question Number : 46 Question Id : 70819116369 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No  
 Correct Marks : 4 Wrong Marks : 1



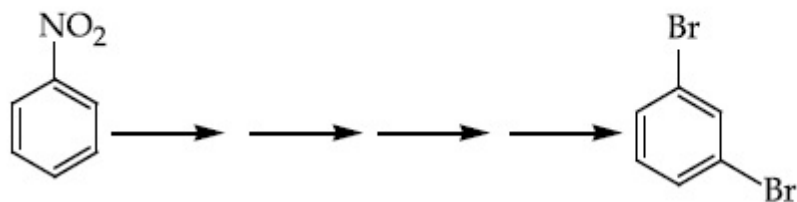
Which of the following reagent is suitable for the preparation of the product in the above reaction ?

Options :

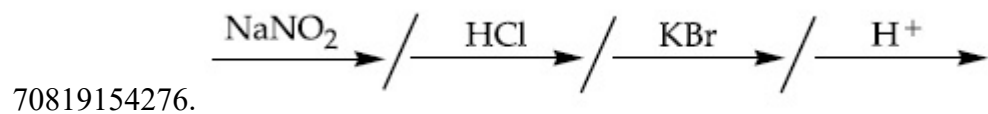
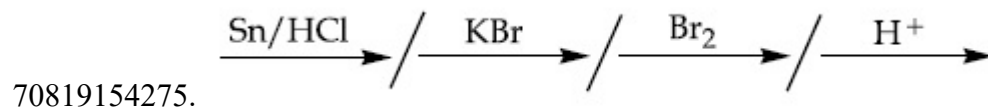


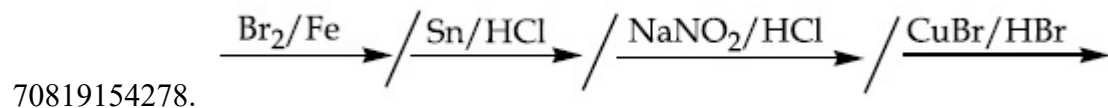
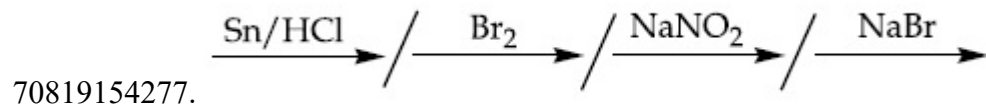
Question Number : 47 Question Id : 70819116370 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1

What is the correct sequence of reagents used for converting nitrobenzene into *m*-dibromobenzene ?



Options :





**Question Number : 48 Question Id : 70819116371 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1**

In polymer Buna-S : 'S' stands for :

**Options :**

70819154279. Sulphur

70819154280. Strength

70819154281. Styrene

70819154282. Sulphonation

**Question Number : 49 Question Id : 70819116372 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1**

**Match List - I and List - II.**

**List - I**

- (a) Valium
- (b) Morphine
- (c) Norethindrone
- (d) Vitamin B<sub>12</sub>

**List - II**

- (i) Antifertility drug
- (ii) Pernicious anaemia
- (iii) Analgesic
- (iv) Tranquilizer



**Options :**

70819154283. (a)-(i), (b)-(iii), (c)-(iv), (d)-(ii)

70819154284. (a)-(iv), (b)-(iii), (c)-(ii), (d)-(i)

70819154285. (a)-(iv), (b)-(iii), (c)-(i), (d)-(ii)

70819154286. (a)-(ii), (b)-(iv), (c)-(iii), (d)-(i)

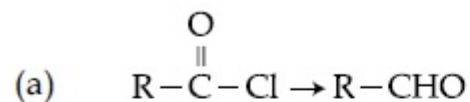
**Question Number : 50 Question Id : 70819116373 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No**

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

Match List - I and List - II.

**List - I**

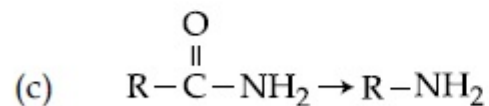
**List - II**



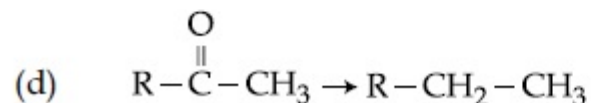
(i)  $\text{Br}_2/\text{NaOH}$



(ii)  $\text{H}_2/\text{Pd}-\text{BaSO}_4$



(iii)  $\text{Zn}(\text{Hg})/\text{Conc. HCl}$



(iv)  $\text{Cl}_2/\text{Red P, H}_2\text{O}$

Choose the correct answer from the options given below :

**Options :**

70819154287. (a)-(iii), (b)-(iv), (c)-(i), (d)-(ii)

70819154288. (a)-(iii), (b)-(i), (c)-(iv), (d)-(ii)

70819154289. (a)-(ii), (b)-(i), (c)-(iv), (d)-(iii)

70819154290. (a)-(ii), (b)-(iv), (c)-(i), (d)-(iii)

## Chemistry Section B

Section Id :	708191631
Section Number :	4
Section type :	Online
Mandatory or Optional :	Mandatory
Number of Questions :	10
Number of Questions to be attempted :	5
Section Marks :	20
Mark As Answered Required? :	Yes
Sub-Section Number :	1
Sub-Section Id :	708191911
Question Shuffling Allowed :	Yes

Question Number : 51 Question Id : 70819116374 Question Type : SA

Correct Marks : 4 Wrong Marks : 0

The formula of a gaseous hydrocarbon which requires 6 times of its own volume of  $O_2$  for complete oxidation and produces 4 times its own volume of  $CO_2$  is  $C_xH_y$ . The value of  $y$  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 : 52 Question Id : 70819116375 Question Type : SA

Correct Marks : 4 Wrong Marks : 0

The volume occupied by 4.75 g of acetylene gas at 50°C and 740 mmHg pressure is \_\_\_\_\_ L. (Rounded off to the nearest integer)

[Given  $R = 0.0826 \text{ L atm K}^{-1} \text{ mol}^{-1}$ ]

Response Type : Numeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Range

Text Areas : PlainText

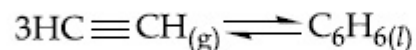
Possible Answers :

5 to 5.001

Question Number : 53 Question Id : 70819116376 Question Type : SA

Correct Marks : 4 Wrong Marks : 0

Assuming ideal behaviour, the magnitude of  $\log K$  for the following reaction at 25°C is  $x \times 10^{-1}$ . The value of  $x$  is \_\_\_\_\_. (Integer answer)



[Given :  $\Delta_f G^\circ(\text{HC}\equiv\text{CH}) = -2.04 \times 10^5 \text{ J mol}^{-1}$  ;  $\Delta_f G^\circ(\text{C}_6\text{H}_6) = -1.24 \times 10^5 \text{ J mol}^{-1}$  ;  $R = 8.314 \text{ J K}^{-1} \text{ mol}^{-1}$ ]

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 : 54 Question Id : 70819116377 Question Type : SA**

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

$C_6H_6$  freezes at  $5.5^\circ C$ . The temperature at which a solution of 10 g of  $C_4H_{10}$  in 200 g of  $C_6H_6$  freeze is \_\_\_\_\_  $^\circ C$ . (The molal freezing point depression constant of  $C_6H_6$  is  $5.12^\circ C/m$ .)

**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 : 70819116378 Question Type : SA**

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

The solubility product of  $PbI_2$  is  $8.0 \times 10^{-9}$ . The solubility of lead iodide in 0.1 molar solution of lead nitrate is  $x \times 10^{-6}$  mol/L. The value of  $x$  is \_\_\_\_\_. (Rounded off to the nearest integer)

[Given  $\sqrt{2} = 1.41$ ]

**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 : 70819116379 Question Type : SA**

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

The magnitude of the change in oxidising power of the  $\text{MnO}_4^-/\text{Mn}^{2+}$  couple is  $x \times 10^{-4}$  V, if the  $\text{H}^+$  concentration is decreased from 1 M to  $10^{-4}$  M at  $25^\circ\text{C}$ . (Assume concentration of  $\text{MnO}_4^-$  and  $\text{Mn}^{2+}$  to be same on change in  $\text{H}^+$  concentration). The value of  $x$  is \_\_\_\_\_. (Rounded off to the nearest integer)

$$\left[ \text{Given : } \frac{2.303 RT}{F} = 0.059 \right]$$

**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 :** 70819116380 **Question Type :** SA

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

Sucrose hydrolyses in acid solution into glucose and fructose following first order rate law with a half-life of 3.33 h at  $25^\circ\text{C}$ . After 9 h, the fraction of sucrose remaining is  $f$ . The value

of  $\log_{10} \left( \frac{1}{f} \right)$  is \_\_\_\_\_  $\times 10^{-2}$ . (Rounded off to the nearest integer)

[Assume :  $\ln 10 = 2.303$ ,  $\ln 2 = 0.693$ ]

**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 : 70819116381 Question Type : SA

Correct Marks : 4 Wrong Marks : 0

Among the following allotropic forms of sulphur, the number of allotropic forms, which will show paramagnetism is \_\_\_\_\_.

(A)  $\alpha$ -sulphur (B)  $\beta$ -sulphur (C)  $S_2$ -form

Response Type : Numeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Range

Text Areas : PlainText

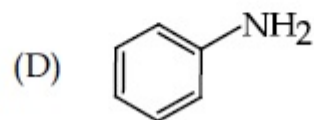
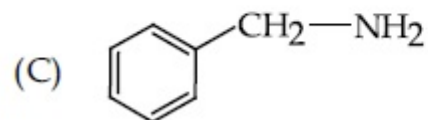
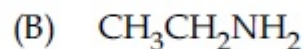
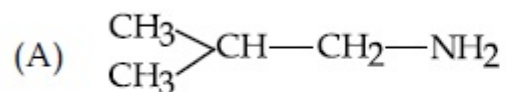
Possible Answers :

5 to 5.001

Question Number : 59 Question Id : 70819116382 Question Type : SA

Correct Marks : 4 Wrong Marks : 0

The total number of amines among the following which can be synthesized by Gabriel synthesis 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 : 70819116383 Question Type : SA**

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

1.86 g of aniline completely reacts to form acetanilide. 10% of the product is lost during purification. Amount of acetanilide obtained after purification (in g) is \_\_\_\_\_  $\times 10^{-2}$ .

**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>	708191632
<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>	708191912
<b>Question Shuffling Allowed :</b>	Yes

**Question Number : 61 Question Id : 70819116384 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No**

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

Let  $a, b \in \mathbb{R}$ . If the mirror image of the point  $P(a, 6, 9)$  with respect to the line

$$\frac{x-3}{7} = \frac{y-2}{5} = \frac{z-1}{-9} \text{ is } (20, b, -a-9), \text{ then } |a+b| \text{ is equal to :}$$

**Options :**

70819154301. 84

70819154302. 86

70819154303. 88

70819154304. 90

**Question Number : 62 Question Id : 70819116385 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1**

Let  $a, b, c$  be in arithmetic progression. Let the centroid of the triangle with vertices

$(a, c), (2, b)$  and  $(a, b)$  be  $\left(\frac{10}{3}, \frac{7}{3}\right)$ . If  $\alpha, \beta$  are the roots of the equation  $ax^2 + bx + 1 = 0$ , then

the value of  $\alpha^2 + \beta^2 - \alpha\beta$  is :

**Options :**

70819154305.  $-\frac{69}{256}$

70819154306.  $-\frac{71}{256}$

70819154307.  $\frac{69}{256}$



70819154308.  $\frac{71}{256}$

**Question Number : 63 Question Id : 70819116386 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1**

If P is a point on the parabola  $y = x^2 + 4$  which is closest to the straight line  $y = 4x - 1$ , then the co-ordinates of P are :

**Options :**

70819154309. (3, 13)

70819154310. (2, 8)

70819154311. (-2, 8)

70819154312. (1, 5)

**Question Number : 64 Question Id : 70819116387 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1**

For which of the following curves, the line  $x + \sqrt{3}y = 2\sqrt{3}$  is the tangent at the point

$$\left( \frac{3\sqrt{3}}{2}, \frac{1}{2} \right) ?$$

**Options :**

70819154313.  $x^2 + y^2 = 7$

70819154314.  $x^2 + 9y^2 = 9$

70819154315.  $y^2 = \frac{1}{6\sqrt{3}}x$

70819154316.  $2x^2 - 18y^2 = 9$

**Question Number : 65 Question Id : 70819116388 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1**

The value of the integral,  $\int_1^3 [x^2 - 2x - 2]dx$ , where  $[x]$  denotes the greatest integer less than or equal to  $x$ , is :

**Options :**

70819154317.  $-5$

70819154318.  $-4$

70819154319.  $-\sqrt{2} - \sqrt{3} - 1$

70819154320.  $-\sqrt{2} - \sqrt{3} + 1$

**Question Number : 66 Question Id : 70819116389 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1**

The negation of the statement  $\sim p \wedge (p \vee q)$  is :

**Options :**

70819154321.  $\sim P \vee q$

70819154322.  $\sim P \wedge q$

70819154323.  $P \wedge \sim q$

70819154324.  $P \vee \sim q$

**Question Number : 67 Question Id : 70819116390 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1**

Let A and B be  $3 \times 3$  real matrices such that A is symmetric matrix and B is skew-symmetric matrix. Then the system of linear equations  $(A^2B^2 - B^2A^2)X = O$ , where X is a  $3 \times 1$  column matrix of unknown variables and O is a  $3 \times 1$  null matrix, has :

**Options :**

70819154325. no solution

70819154326. a unique solution

70819154327. exactly two solutions

70819154328. infinitely many solutions

**Question Number : 68 Question Id : 70819116391 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1**

Let  $f(x)$  be a differentiable function defined on  $[0, 2]$  such that  $f'(x) = f'(2-x)$  for all  $x \in (0, 2)$ ,  $f(0) = 1$  and  $f(2) = e^2$ . Then the value of  $\int_0^2 f(x) dx$  is :

**Options :**

70819154329.  $1 - e^2$

70819154330.  $1 + e^2$

70819154331.  $2(1 + e^2)$

70819154332.  $2(1 - e^2)$

**Question Number : 69 Question Id : 70819116392 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1**

Let  $f$  be a twice differentiable function defined on  $\mathbb{R}$  such that  $f(0) = 1$ ,  $f'(0) = 2$  and

$f'(x) \neq 0$  for all  $x \in \mathbb{R}$ . If  $\begin{vmatrix} f(x) & f'(x) \\ f'(x) & f''(x) \end{vmatrix} = 0$ , for all  $x \in \mathbb{R}$ , then the value of  $f(1)$  lies in the

interval :

**Options :**

70819154333.  $(0, 3)$

70819154334.  $(3, 6)$

70819154335.  $(6, 9)$

70819154336.  $(9, 12)$

**Question Number : 70 Question Id : 70819116393 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1**

If the curve  $y = ax^2 + bx + c$ ,  $x \in \mathbb{R}$ , passes through the point (1, 2) and the tangent line to this curve at origin is  $y = x$ , then the possible values of a, b, c are :

**Options :**

70819154337.  $a = 1, b = 1, c = 0$

70819154338.  $a = 1, b = 0, c = 1$

70819154339.  $a = -1, b = 1, c = 1$

70819154340.  $a = \frac{1}{2}, b = \frac{1}{2}, c = 1$

**Question Number : 71 Question Id : 70819116394 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1**

If  $n \geq 2$  is a positive integer, then the sum of the series

${}^{n+1}C_2 + 2({}^2C_2 + {}^3C_2 + {}^4C_2 + \dots + {}^nC_2)$  is :

**Options :**

70819154341.  $\frac{n(n-1)(2n+1)}{6}$

70819154342.  $\frac{n(n+1)(2n+1)}{6}$

70819154343. 
$$\frac{n(2n+1)(3n+1)}{6}$$

70819154344. 
$$\frac{n(n+1)^2(n+2)}{12}$$

**Question Number : 72 Question Id : 70819116395 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1**

For the system of linear equations :

$$x - 2y = 1, x - y + kz = -2, ky + 4z = 6, k \in \mathbf{R},$$

consider the following statements :

- (A) The system has unique solution if  $k \neq 2, k \neq -2$ .
- (B) The system has unique solution if  $k = -2$ .
- (C) The system has unique solution if  $k = 2$ .
- (D) The system has no-solution if  $k = 2$ .
- (E) The system has infinite number of solutions if  $k \neq -2$ .

Which of the following statements are correct ?

**Options :**

70819154345. (A) and (D) only

70819154346. (A) and (E) only

70819154347. (C) and (D) only

70819154348. (B) and (E) only

Question Number : 73 Question Id : 70819116396 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

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

$$f(x) = \begin{cases} -55x, & \text{if } x < -5 \\ 2x^3 - 3x^2 - 120x, & \text{if } -5 \leq x \leq 4 \\ 2x^3 - 3x^2 - 36x - 336, & \text{if } x > 4, \end{cases}$$

Let  $A = \{x \in \mathbf{R} : f \text{ is increasing}\}$ . Then A is equal to :

Options :

70819154349.  $(-\infty, -5) \cup (4, \infty)$

70819154350.  $(-5, -4) \cup (4, \infty)$

70819154351.  $(-\infty, -5) \cup (-4, \infty)$

70819154352.  $(-5, \infty)$

Question Number : 74 Question Id : 70819116397 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

A possible value of  $\tan\left(\frac{1}{4}\sin^{-1}\frac{\sqrt{63}}{8}\right)$  is :

Options :

70819154353.  $\frac{1}{\sqrt{7}}$

70819154354.  $\frac{1}{2\sqrt{2}}$

70819154355.  $\sqrt{7} - 1$

70819154356.  $2\sqrt{2} - 1$

**Question Number : 75 Question Id : 70819116398 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1**

The angle of elevation of a jet plane from a point A on the ground is  $60^\circ$ . After a flight of 20 seconds at the speed of 432 km/hour, the angle of elevation changes to  $30^\circ$ . If the jet plane is flying at a constant height, then its height is :

**Options :**

70819154357.  $3600\sqrt{3}$  m

70819154358.  $2400\sqrt{3}$  m

70819154359.  $1800\sqrt{3}$  m

70819154360.  $1200\sqrt{3}$  m

**Question Number : 76 Question Id : 70819116399 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1**

The vector equation of the plane passing through the intersection of the planes

$\vec{r} \cdot (\hat{i} + \hat{j} + \hat{k}) = 1$  and  $\vec{r} \cdot (\hat{i} - 2\hat{j}) = -2$ , and the point  $(1, 0, 2)$  is :

**Options :**



70819154361.  $\vec{r} \cdot (3\hat{i} + 7\hat{j} + 3\hat{k}) = 7$

70819154362.  $\vec{r} \cdot (\hat{i} + 7\hat{j} + 3\hat{k}) = 7$

70819154363.  $\vec{r} \cdot (\hat{i} - 7\hat{j} + 3\hat{k}) = \frac{7}{3}$

70819154364.  $\vec{r} \cdot (\hat{i} + 7\hat{j} + 3\hat{k}) = \frac{7}{3}$

**Question Number : 77 Question Id : 70819116400 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1**

For the statements p and q, consider the following compound statements :

(a)  $(\sim q \wedge (p \rightarrow q)) \rightarrow \sim p$

(b)  $((p \vee q) \wedge \sim p) \rightarrow q$

Then which of the following statements is correct ?

**Options :**

70819154365. (a) is a tautology but not (b).

70819154366. (b) is a tautology but not (a).

70819154367. (a) and (b) both are tautologies.

70819154368. (a) and (b) both are not tautologies.

**Question Number : 78 Question Id : 70819116401 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1**

If a curve  $y=f(x)$  passes through the point  $(1, 2)$  and satisfies  $x \frac{dy}{dx} + y = bx^4$ , then for

what value of  $b$ ,  $\int_1^2 f(x)dx = \frac{62}{5}$  ?

**Options :**

70819154369. 10

70819154370.  $\frac{31}{5}$

70819154371. 5

70819154372.  $\frac{62}{5}$

**Question Number : 79 Question Id : 70819116402 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1**

The probability that two randomly selected subsets of the set  $\{1, 2, 3, 4, 5\}$  have exactly two elements in their intersection, is :

**Options :**

70819154373.  $\frac{65}{2^7}$

70819154374.  $\frac{65}{2^8}$

70819154375.  $\frac{135}{2^9}$

70819154376.  $\frac{35}{2^7}$

**Question Number : 80 Question Id : 70819116403 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1**

The area of the region :  $R = \{(x, y) : 5x^2 \leq y \leq 2x^2 + 9\}$  is :

**Options :**

70819154377.  $6\sqrt{3}$  square units

70819154378.  $9\sqrt{3}$  square units

70819154379.  $11\sqrt{3}$  square units

70819154380.  $12\sqrt{3}$  square units

## Mathematics Section B

<b>Section Id :</b>	708191633
<b>Section Number :</b>	6
<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 :** 708191913  
**Question Shuffling Allowed :** Yes

**Question Number : 81 Question Id : 70819116404 Question Type : SA**  
**Correct Marks : 4 Wrong Marks : 0**

If the variance of 10 natural numbers  $1, 1, 1, \dots, 1, k$  is less than 10, then the maximum possible value of  $k$  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 : 82 Question Id : 70819116405 Question Type : SA**  
**Correct Marks : 4 Wrong Marks : 0**

Let a point  $P$  be such that its distance from the point  $(5, 0)$  is thrice the distance of  $P$  from the point  $(-5, 0)$ . If the locus of the point  $P$  is a circle of radius  $r$ , then  $4r^2$  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 : 83 Question Id : 70819116406 Question Type : SA**

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

If the area of the triangle formed by the positive  $x$ -axis, the normal and the tangent to the circle  $(x-2)^2 + (y-3)^2 = 25$  at the point  $(5, 7)$  is  $A$ , then  $24A$  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 : 70819116407 Question Type : SA**

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

Let  $i = \sqrt{-1}$ . If  $\frac{(-1 + i\sqrt{3})^{21}}{(1 - i)^{24}} + \frac{(1 + i\sqrt{3})^{21}}{(1 + i)^{24}} = k$ , and  $n = [|k|]$  be the greatest integral part

of  $|k|$ . Then  $\sum_{j=0}^{n+5} (j+5)^2 - \sum_{j=0}^{n+5} (j+5)$  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 : 70819116408 Question Type : SA**

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

The students  $S_1, S_2, \dots, S_{10}$  are to be divided into 3 groups A, B and C such that each group has at least one student and the group C has at most 3 students. Then the total number of possibilities of forming such groups 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 :** 70819116409 **Question Type :** SA

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

For integers  $n$  and  $r$ , let 
$$\binom{n}{r} = \begin{cases} {}^n C_r, & \text{if } n \geq r \geq 0 \\ 0, & \text{otherwise} \end{cases}$$

The maximum value of  $k$  for which the sum

$$\sum_{i=0}^k \binom{10}{i} \binom{15}{k-i} + \sum_{i=0}^{k+1} \binom{12}{i} \binom{13}{k+1-i}$$
 exists, 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 :** 70819116410 **Question Type :** SA

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

If  $a + \alpha = 1$ ,  $b + \beta = 2$  and  $af(x) + \alpha f\left(\frac{1}{x}\right) = bx + \frac{\beta}{x}$ ,  $x \neq 0$ , then the value of the expression

$$\frac{f(x) + f\left(\frac{1}{x}\right)}{x + \frac{1}{x}} \text{ is } \underline{\hspace{2cm}}.$$

**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 :** 70819116411 **Question Type :** SA

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

Let  $\lambda$  be an integer. If the shortest distance between the lines  $x - \lambda = 2y - 1 = -2z$  and

$$x = y + 2\lambda = z - \lambda \text{ is } \frac{\sqrt{7}}{2\sqrt{2}}, \text{ then the value of } |\lambda| \text{ is } \underline{\hspace{2cm}}.$$

**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 :** 70819116412 **Question Type :** SA

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

The sum of first four terms of a geometric progression (G.P.) is  $\frac{65}{12}$  and the sum of their respective reciprocals is  $\frac{65}{18}$ . If the product of first three terms of the G.P. is 1, and the third term is  $\alpha$ , then  $2\alpha$  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 :** 90 **Question Id :** 70819116413 **Question Type :** SA

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

The number of the real roots of the equation  $(x+1)^2 + |x-5| = \frac{27}{4}$  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