

# National Testing Agency

**Question Paper Name :** B TECH EM 16th March 2021 Shift 1  
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**Display Marks:** Yes

## B TECH EM

**Group Number :** 1  
**Group Id :** 8643515  
**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 :** 86435125  
**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 :** 86435125  
**Question Shuffling Allowed :** Yes

**Question Number : 1 Question Id : 864351361 Question Type : MCQ Option Shuffling : Yes Is  
Question Mandatory : No  
Correct Marks : 4 Wrong Marks : 1**

For an electromagnetic wave travelling in free space, the relation between average energy densities due to electric ( $U_e$ ) and magnetic ( $U_m$ ) fields is :

**Options :**

8643511081.  $U_e = U_m$

8643511082.  $U_e \neq U_m$

8643511083.  $U_e > U_m$

8643511084.  $U_e < U_m$

**Question Number : 1 Question Id : 864351361 Question Type : MCQ Option Shuffling : Yes Is**

**Question Mandatory : No**

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

मुक्त वातावरणात जाणाऱ्या विद्युत चुंबकीय तरंगासाठी, विद्युत ( $U_e$ ) व चुंबकीय ( $U_m$ ) क्षेत्रामुळे सरासरी ऊर्जा घनतांमधील संबंध \_\_\_\_\_ आहे.

**Options :**

8643511081.  $U_e = U_m$

8643511082.  $U_e \neq U_m$

8643511083.  $U_e > U_m$

8643511084.  $U_e < U_m$

**Question Number : 2 Question Id : 864351362 Question Type : MCQ Option Shuffling : Yes Is**

**Question Mandatory : No**

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

The volume  $V$  of an enclosure contains a mixture of three gases, 16 g of oxygen, 28 g of nitrogen and 44 g of carbon dioxide at absolute temperature  $T$ . Consider  $R$  as universal gas constant. The pressure of the mixture of gases is :

**Options :**

8643511085.  $\frac{5}{2} \frac{RT}{V}$

$$8643511086. \frac{3RT}{V}$$

$$8643511087. \frac{4RT}{V}$$

$$8643511088. \frac{88RT}{V}$$

**Question Number : 2 Question Id : 864351362 Question Type : MCQ Option Shuffling : Yes Is**

**Question Mandatory : No**

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

V आकारमानाच्या एका बंद भांड्यात ह्या तीन वायुंचे मिश्रण आहे. निरपेक्ष T तापमानास 16 g ऑक्सीजन, 28 g नायट्रोजन व 44 g कार्बन डाय-ऑक्साईड. R हा वैश्विक वायू स्थिरांक आहे. वायुंच्या मिश्रणाचा दाब \_\_\_\_\_ आहे.

**Options :**

$$8643511085. \frac{5}{2} \frac{RT}{V}$$

$$8643511086. \frac{3RT}{V}$$

$$8643511087. \frac{4RT}{V}$$

$$8643511088. \frac{88RT}{V}$$

**Question Number : 3 Question Id : 864351363 Question Type : MCQ Option Shuffling : Yes Is**

**Question Mandatory : No**

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

For changing the capacitance of a given parallel plate capacitor, a dielectric material of dielectric constant  $K$  is used, which has the same area as the plates of the capacitor. The thickness of the dielectric slab is  $\frac{3}{4}d$ , where 'd' is the separation between the plates of parallel plate capacitor. The new capacitance ( $C'$ ) in terms of original capacitance ( $C_0$ ) is given by the following relation :

**Options :**

8643511089.  $C' = \frac{4K}{K+3}C_0$

8643511090.  $C' = \frac{4}{3+K}C_0$

8643511091.  $C' = \frac{3+K}{4K}C_0$

8643511092.  $C' = \frac{4+K}{3}C_0$

**Question Number : 3 Question Id : 864351363 Question Type : MCQ Option Shuffling : Yes Is**

**Question Mandatory : No**

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

दिलेल्या समांतर पट्टी संधारित्रातील संधारित्र बदलण्यासाठी,  $K$  पराविद्युत स्थिरांक असलेला पराविद्युत पदार्थ वापरला, ज्याचे क्षेत्रफळ संधारित्राच्या पट्ट्यांएवढेच आहे. पराविद्युत स्थिरांकाच्या स्लॅबची जाडी  $\frac{3}{4}d$  आहे, जेथे 'd' हे समांतर पट्टी संधारित्राच्या पट्ट्यांमधील अंतराल आहे. नवीन धारकता ( $C'$ ) मुळ संधारित्राच्या ( $C_0$ ) धारकतेच्या स्वरूपात खालील संबंधाने दिली आहे :

**Options :**

8643511089.  $C' = \frac{4K}{K+3}C_0$

8643511090.  $C' = \frac{4}{3+K}C_0$

$$C' = \frac{3 + K}{4K} C_0$$

8643511091.

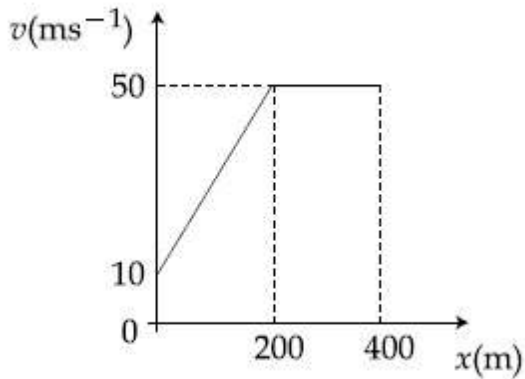
$$C' = \frac{4 + K}{3} C_0$$

8643511092.

**Question Number : 4 Question Id : 864351364 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No**

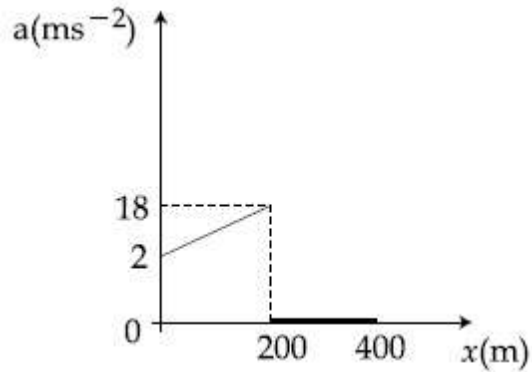
**Correct Marks : 4 Wrong Marks : 1**

The velocity-displacement graph describing the motion of a bicycle is shown in the figure.

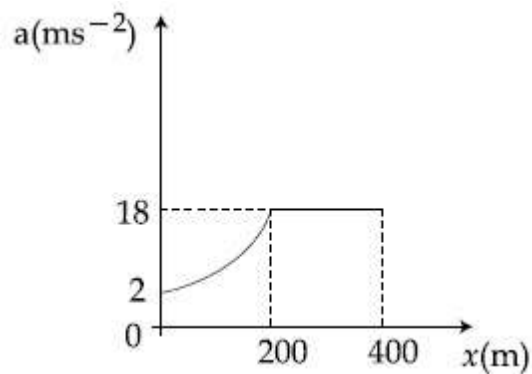


The acceleration-displacement graph of the bicycle's motion is best described by :

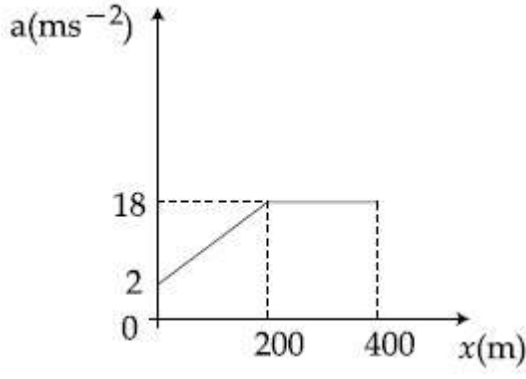
**Options :**



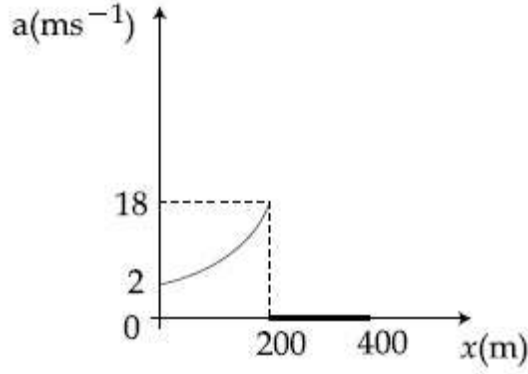
8643511093.



8643511094.



8643511095.

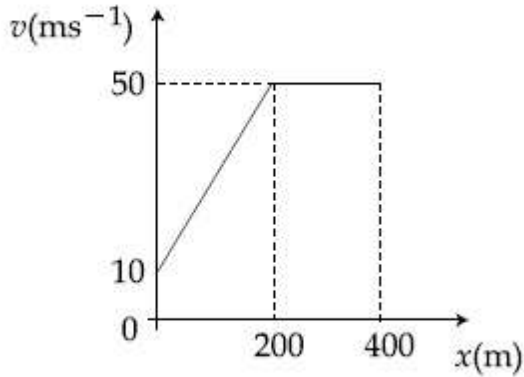


8643511096.

**Question Number : 4 Question Id : 864351364 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No**

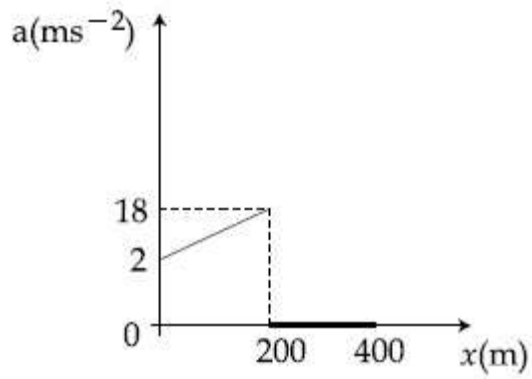
**Correct Marks : 4 Wrong Marks : 1**

दुचाकीची गति वर्णन करण्यासाठी वेग-विस्थापन आलेख आकृतीत दाखविला आहे.

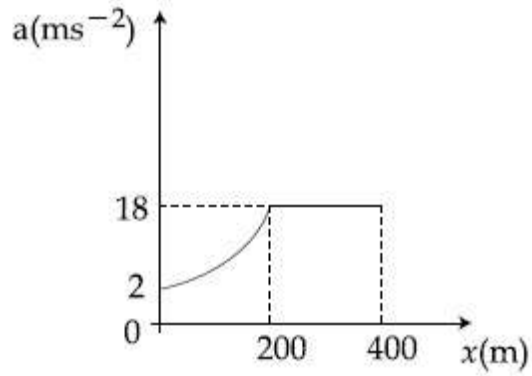


दुचाकीसाठी गतीबाबत त्वरण-विस्थापन आलेख चांगल्या पद्धतीने वर्णन केले आहे तो \_\_\_\_\_ आहे.

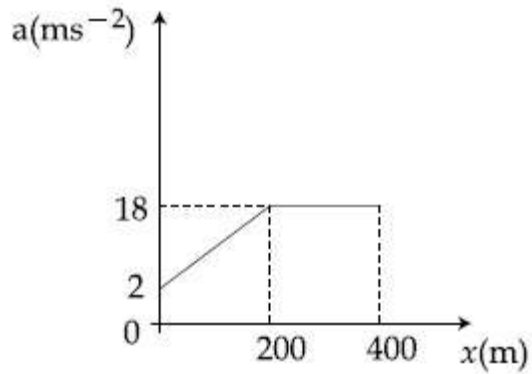
**Options :**



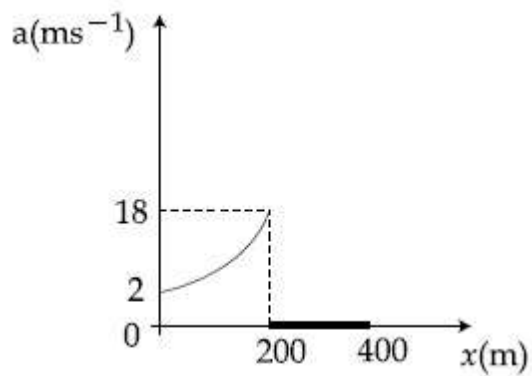
8643511093.



8643511094.



8643511095.

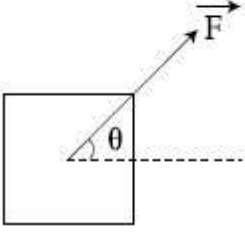


8643511096.

**Question Number : 5 Question Id : 864351365 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1**

A block of mass  $m$  slides along a floor while a force of magnitude  $F$  is applied to it at an angle  $\theta$  as shown in figure. The coefficient of kinetic friction is  $\mu_K$ . Then, the block's acceleration 'a' is given by :

( $g$  is acceleration due to gravity)



Options :

8643511097.  $-\frac{F}{m}\cos\theta - \mu_K\left(g - \frac{F}{m}\sin\theta\right)$

8643511098.  $\frac{F}{m}\cos\theta + \mu_K\left(g - \frac{F}{m}\sin\theta\right)$

8643511099.  $\frac{F}{m}\cos\theta - \mu_K\left(g + \frac{F}{m}\sin\theta\right)$

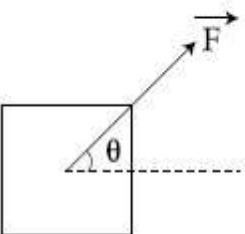
8643511100.  $\frac{F}{m}\cos\theta - \mu_K\left(g - \frac{F}{m}\sin\theta\right)$

Question Number : 5 Question Id : 864351365 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

आकृतीत दाखविल्याप्रमाणे  $m$  वस्तुमानाचा ठोकळा जमीनीवरून घासत जातो जेव्हा  $F$  किंमतीचे बल  $\theta$  कोनातून लावले. गतिज घर्षण गुणांक  $\mu_K$  आहे. तर, ठोकळ्याचे त्वरण 'a' = \_\_\_\_\_ असे दिले आहे.

( $g$  हे गुरुत्वीय त्वरण आहे)



Options :



8643511097.  $-\frac{F}{m}\cos\theta - \mu_K\left(g - \frac{F}{m}\sin\theta\right)$

8643511098.  $\frac{F}{m}\cos\theta + \mu_K\left(g - \frac{F}{m}\sin\theta\right)$

8643511099.  $\frac{F}{m}\cos\theta - \mu_K\left(g + \frac{F}{m}\sin\theta\right)$

8643511100.  $\frac{F}{m}\cos\theta - \mu_K\left(g - \frac{F}{m}\sin\theta\right)$

**Question Number : 6 Question Id : 864351366 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No**

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

A bar magnet of length 14 cm is placed in the magnetic meridian with its north pole pointing towards the geographic north pole. A neutral point is obtained at a distance of 18 cm from the center of the magnet. If  $B_H = 0.4$  G, the magnetic moment of the magnet is ( $1 \text{ G} = 10^{-4}\text{T}$ )

**Options :**

8643511101.  $28.80 \text{ J T}^{-1}$

8643511102.  $2.880 \times 10^2 \text{ J T}^{-1}$

8643511103.  $2.880 \text{ J T}^{-1}$

8643511104.  $2.880 \times 10^3 \text{ J T}^{-1}$

**Question Number : 6 Question Id : 864351366 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No**

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

14 cm लांबीची चुंबकपट्टी चुंबकीय रेखावृत्तात अशी ठेवली कि तिचा उत्तर ध्रुव भौगोलिक उत्तर ध्रुवाकडे आहे. चुंबकाच्या मध्यापासून 18 cm अंतरावर तटस्थ बिंदू मिळाला. जर  $B_H = 0.4$  G, चुंबकाचे चुंबकीय आघूर्ण \_\_\_\_\_ आहे. ( $1 \text{ G} = 10^{-4}\text{T}$ )

**Options :**

8643511101.  $28.80 \text{ J T}^{-1}$

8643511102.  $2.880 \times 10^2 \text{ J T}^{-1}$

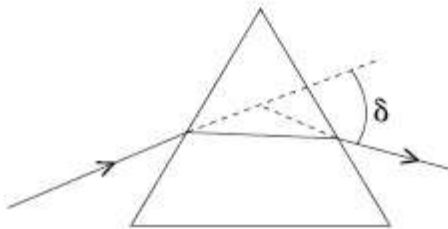
8643511103.  $2.880 \text{ J T}^{-1}$

8643511104.  $2.880 \times 10^3 \text{ J T}^{-1}$

**Question Number : 7 Question Id : 864351367 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No**

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

The angle of deviation through a prism is minimum when



- (A) Incident ray and emergent ray are symmetric to the prism
- (B) The refracted ray inside the prism becomes parallel to its base
- (C) Angle of incidence is equal to that of the angle of emergence
- (D) When angle of emergence is double the angle of incidence

Choose the correct answer from the options given below :

**Options :**

8643511105. Only statements (A) and (B) are true

8643511106. Statements (A), (B) and (C) are true

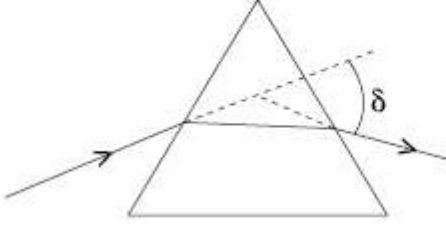
8643511107. Only statement (D) is true

8643511108. Statements (B) and (C) are true

**Question Number : 7 Question Id : 864351367 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No**

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

प्रिझ्म मधील विचलन कोन कमीतकमी असतो जेव्हा :



- (A) आपाती किरण व निर्गमन किरण प्रिझ्मला सममित आहेत.
- (B) प्रिझ्म मधील अपवर्तनीत किरण त्याच्या पायास समांतर होतो.
- (C) आपाती कोन हा निर्गमन कोनाएवढा आहे.
- (D) जेव्हा निर्गमन कोन आपाती कोनाच्या दोनपट आहे.

खाली दिलेल्या पर्यायांमधून योग्य उत्तर निवडा :

Options :

8643511105. फक्त विधान (A) व (B) खरी आहेत.

8643511106. विधाने (A), (B) व (C) खरी आहेत.

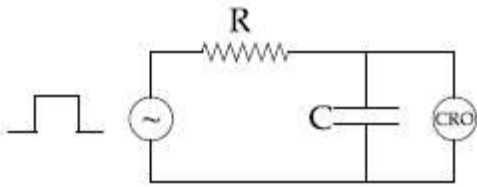
8643511107. फक्त (D) विधान खरे आहे.

8643511108. विधाने (B) व (C) खरी आहेत.

Question Number : 8 Question Id : 864351368 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No

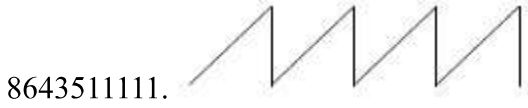
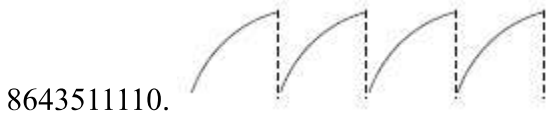
Correct Marks : 4 Wrong Marks : 1

An RC circuit as shown in the figure is driven by a AC source generating a square wave. The output wave pattern monitored by CRO would look close to :



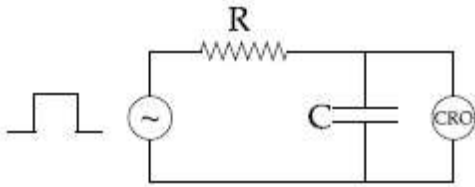
Options :

8643511109.

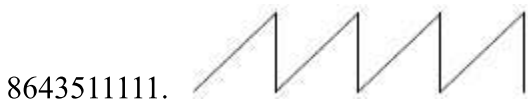
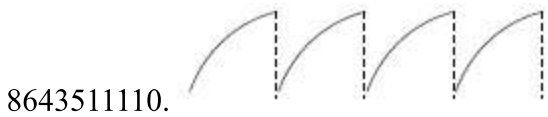


**Question Number : 8 Question Id : 864351368 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1**

आकृतीत दाखविलेल्या RC परिपथात, ते प्रत्यावर्ती धारा उद्गमाने चालवून चौरस तरंग तयार करतो. निष्पन्न तरंग प्रतिरूप CRO ने नियंत्रक केल्यानंतर जवळपास \_\_\_\_\_ असा दिसतो.



**Options :**



**Question Number : 9 Question Id : 864351369 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1**

A block of 200 g mass moves with a uniform speed in a horizontal circular groove, with vertical side walls of radius 20 cm. If the block takes 40 s to complete one round, the normal force by the side walls of the groove is :

**Options :**

8643511113. 0.0314 N

8643511114.  $9.859 \times 10^{-4}$  N

8643511115.  $6.28 \times 10^{-3}$  N

8643511116.  $9.859 \times 10^{-2}$  N

**Question Number : 9 Question Id : 864351369 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No**

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

200 g वस्तुमानाचा एक ठोकळा एकसमान वेगाने क्षितिजसमांतर वर्तुळाकार खाचेतून गतिमान होतो, जेथे उभ्या बाजूच्या भिंतीची त्रिज्या 20 cm आहे. जर ठोकळ्यास एक फेरी पूर्ण करण्यासाठी 40 सेकंद लागतात, खाचेच्या बाजूच्या भिंतीमुळे लंबरूप बल \_\_\_\_\_ आहे.

**Options :**

8643511113. 0.0314 N

8643511114.  $9.859 \times 10^{-4}$  N

8643511115.  $6.28 \times 10^{-3}$  N

8643511116.  $9.859 \times 10^{-2}$  N

**Question Number : 10 Question Id : 864351370 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No**

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

In thermodynamics, heat and work are :

**Options :**

8643511117. Point functions

8643511118. Path functions

8643511119. Intensive thermodynamic state variables

8643511120. Extensive thermodynamic state variables

**Question Number : 10 Question Id : 864351370 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No**

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

उष्मागतिकीमध्ये, उष्णता व कार्य हे \_\_\_\_\_ आहेत.

**Options :**

8643511117. बिंदुफल

8643511118. पथफल

8643511119. सधन उष्मागतिक स्थिती चल

8643511120. विस्तृत उष्मागतिक स्थिती चल

**Question Number : 11 Question Id : 864351371 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No**

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

The maximum and minimum distances of a comet from the Sun are  $1.6 \times 10^{12}$  m and  $8.0 \times 10^{10}$  m respectively. If the speed of the comet at the nearest point is  $6 \times 10^4$  ms<sup>-1</sup>, the speed at the farthest point is :

**Options :**

8643511121.  $1.5 \times 10^3$  m/s

8643511122.  $3.0 \times 10^3$  m/s

8643511123.  $6.0 \times 10^3$  m/s

8643511124.  $4.5 \times 10^3$  m/s

**Question Number : 11 Question Id : 864351371 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No**

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

कॉमेटची सूर्यापासून ची महत्तम व लघुत्तम अंतरे अनुक्रमे  $1.6 \times 10^{12}$  m व  $8.0 \times 10^{10}$  m आहेत. जर कॉमेटचा वेग जवळच्या बिंदुवर  $6 \times 10^4 \text{ ms}^{-1}$  आहे, लांबच्या बिंदुजवळ वेग \_\_\_\_\_ आहे.

**Options :**

8643511121.  $1.5 \times 10^3 \text{ m/s}$

8643511122.  $3.0 \times 10^3 \text{ m/s}$

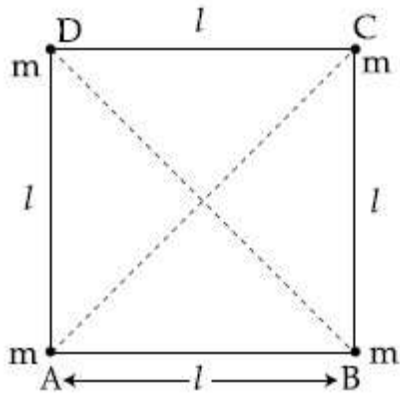
8643511123.  $6.0 \times 10^3 \text{ m/s}$

8643511124.  $4.5 \times 10^3 \text{ m/s}$

**Question Number : 12 Question Id : 864351372 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No**

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

Four equal masses,  $m$  each are placed at the corners of a square of length ( $l$ ) as shown in the figure. The moment of inertia of the system about an axis passing through A and parallel to DB would be :



**Options :**

8643511125.  $2 ml^2$

8643511126.  $\sqrt{3} ml^2$

8643511127.  $3 ml^2$

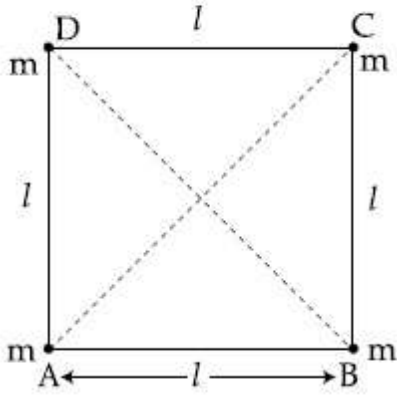
8643511128.  $ml^2$

**Question Number : 12 Question Id : 864351372 Question Type : MCQ Option Shuffling : Yes Is**

**Question Mandatory : No**

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

चार सारखी  $m$  वस्तुमाने, ( $l$ ) लांबीच्या चौकोनाच्या प्रत्येक कोपऱ्यांवर ठेवली आहेत असे आकृतीत दाखविले आहे. संहतीचे  $A$  बिंदुतून जाणाऱ्या अक्षाभोवती व  $DB$  ला समांतर जडत्व आघूर्ण \_\_\_\_\_ असू शकेल.



**Options :**

8643511125.  $2 ml^2$

8643511126.  $\sqrt{3} ml^2$

8643511127.  $3 ml^2$

8643511128.  $ml^2$

**Question Number : 13 Question Id : 864351373 Question Type : MCQ Option Shuffling : Yes Is**

**Question Mandatory : No**

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

A 25 m long antenna is mounted on an antenna tower. The height of the antenna tower is 75 m. The wavelength (in meter) of the signal transmitted by this antenna would be :

**Options :**

8643511129. 200

8643511130. 300

8643511131. 400

8643511132. 100

**Question Number : 13 Question Id : 864351373 Question Type : MCQ Option Shuffling : Yes Is**



**Question Mandatory : No**

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

अँन्टेनाच्या टॉवरवर 25 m लांबीची अँन्टेना ठेवलेली आहे. अँन्टेनाच्या टॉवरची उंची 75 m आहे. अँन्टेनाने पारेषित केलेल्या संकेताची तरंगलांबी (मिटरमध्ये) \_\_\_\_\_ असेल.

**Options :**

8643511129. 200

8643511130. 300

8643511131. 400

8643511132. 100

**Question Number : 14 Question Id : 864351374 Question Type : MCQ Option Shuffling : Yes Is**

**Question Mandatory : No**

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

The stopping potential in the context of photoelectric effect depends on the following property of incident electromagnetic radiation :

**Options :**

8643511133. Frequency

8643511134. Amplitude

8643511135. Intensity

8643511136. Phase

**Question Number : 14 Question Id : 864351374 Question Type : MCQ Option Shuffling : Yes Is**

**Question Mandatory : No**

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

प्रकाशविद्युत परिणामासंदर्भात थांबविणारे विभव आपाती विद्युत चुंबकीय उत्सर्जनाच्या खालील गुणधर्मावर अवलंबून आहे :

**Options :**

8643511133. वारंवारिता

8643511134. आयाम

8643511135. तीव्रता

8643511136. प्रावस्था

**Question Number : 15 Question Id : 864351375 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No**

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

Time period of a simple pendulum is  $T$  inside a lift when the lift is stationary. If the lift moves upwards with an acceleration  $g/2$ , the time period of pendulum will be :

**Options :**

8643511137.  $\frac{T}{\sqrt{3}}$

8643511138.  $\sqrt{3}T$

8643511139.  $\sqrt{\frac{3}{2}} T$

8643511140.  $\sqrt{\frac{2}{3}} T$

**Question Number : 15 Question Id : 864351375 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No**

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

जेव्हा विजेरी पाळणा स्थिर आहे तेव्हा विजेरी पाळण्यात साध्या दोलकाचा काल  $T$  आहे. जर विजेरी पाळणा वरील दिशेत  $g/2$  त्वरणाने जात आहे, दोलकाचा काल \_\_\_\_\_ असेल.

**Options :**

8643511137.  $\frac{T}{\sqrt{3}}$

8643511138.  $\sqrt{3}T$

8643511139.  $\sqrt{\frac{3}{2}} T$

8643511140.  $\sqrt{\frac{2}{3}} T$

**Question Number : 16 Question Id : 864351376 Question Type : MCQ Option Shuffling : Yes Is**

**Question Mandatory : No**

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

A plane electromagnetic wave of frequency 500 MHz is travelling in vacuum along  $y$ -direction.

At a particular point in space and time,  $\vec{B} = 8.0 \times 10^{-8} \hat{z} T$ . The value of electric field at this point is :

(speed of light =  $3 \times 10^8 \text{ ms}^{-1}$ )

$\hat{x}, \hat{y}, \hat{z}$  are unit vectors along  $x, y$  and  $z$  directions.

**Options :**

8643511141.  $-24 \hat{x} \text{ V/m}$

8643511142.  $2.6 \hat{x} \text{ V/m}$

8643511143.  $24 \hat{x} \text{ V/m}$

8643511144.  $-2.6 \hat{y} \text{ V/m}$

**Question Number : 16 Question Id : 864351376 Question Type : MCQ Option Shuffling : Yes Is**

**Question Mandatory : No**

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

निर्वातातून  $y$ -दिशेत एक 500 MHz वारंवारतेचा प्रतल विद्युतचुंबकीय तरंग प्रवास करीत आहे. जागा व वेळ

यातील एका विशिष्ट बिंदुवर,  $\vec{B} = 8.0 \times 10^{-8} \hat{z} T$ . त्या बिंदुवर विद्युत क्षेत्राचे मूल्य \_\_\_\_\_ आहे.

(प्रकाशाचा वेग =  $3 \times 10^8 \text{ ms}^{-1}$ )

$\hat{x}, \hat{y}, \hat{z}$  हे  $x, y$  व  $z$  दिशेतील एकक सदिश आहेत.

**Options :**

8643511141.  $-24 \hat{x} \text{ V/m}$

8643511142.  $2.6 \hat{x}$  V/m

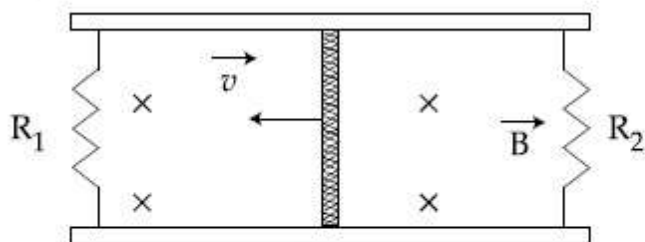
8643511143.  $24 \hat{x}$  V/m

8643511144.  $-2.6 \hat{y}$  V/m

**Question Number : 17 Question Id : 864351377 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No**

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

A conducting bar of length  $L$  is free to slide on two parallel conducting rails as shown in the figure



Two resistors  $R_1$  and  $R_2$  are connected across the ends of the rails. There is a uniform magnetic field  $\vec{B}$  pointing into the page. An external agent pulls the bar to the left at a constant speed  $v$ .

The correct statement about the directions of induced currents  $I_1$  and  $I_2$  flowing through  $R_1$  and  $R_2$  respectively is :

**Options :**

8643511145.  $I_1$  is in anticlockwise direction and  $I_2$  is in clockwise direction

8643511146.  $I_1$  is in clockwise direction and  $I_2$  is in anticlockwise direction

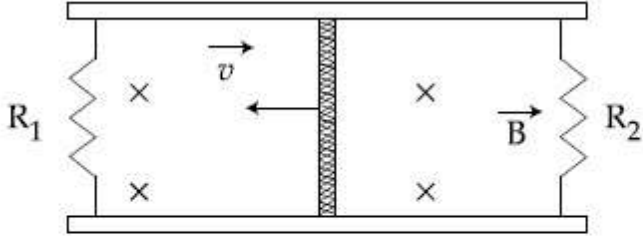
8643511147. Both  $I_1$  and  $I_2$  are in anticlockwise direction

8643511148. Both  $I_1$  and  $I_2$  are in clockwise direction

**Question Number : 17 Question Id : 864351377 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No**

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

आकृतीत दाखविल्याप्रमाणे दोन समांतर वाहनिक रूळांवरून  $L$  लांबीची वाहनिक पट्टी मुक्तपणे घासत आहे.



रूळांच्या टोकांना  $R_1$  व  $R_2$  हे दोन रोध जोडलेले आहेत, तेथे पानाकडे एकसमान चुंबकीय क्षेत्र  $\vec{B}$  आहे. बाह्यशक्ति पट्टीला डावीकडे  $v$  स्थिर वेगाने ओढत आहे.  $R_1$  व  $R_2$  रोधातून जाणारी प्रेरित धारा अनुक्रमे  $I_1$  व  $I_2$  यांच्या दिशांसंदर्भात योग्य विधान \_\_\_\_\_ आहे.

**Options :**

8643511145.  $I_1$  घड्याळाच्या विरुद्ध दिशेत व  $I_2$  घड्याळाच्या दिशेत.

8643511146.  $I_1$  घड्याळाच्या दिशेत व  $I_2$  घड्याळाच्या विरुद्ध दिशेत.

8643511147.  $I_1$  व  $I_2$  दोन्ही घड्याळाच्या विरुद्ध दिशेत.

8643511148.  $I_1$  व  $I_2$  दोन्ही घड्याळाच्या दिशेत.

**Question Number : 18 Question Id : 864351378 Question Type : MCQ Option Shuffling : Yes Is**

**Question Mandatory : No**

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

The pressure acting on a submarine is  $3 \times 10^5$  Pa at a certain depth. If the depth is doubled, the percentage increase in the pressure acting on the submarine would be :

(Assume that atmospheric pressure is  $1 \times 10^5$  Pa density of water is  $10^3 \text{ kg m}^{-3}$ ,  $g = 10 \text{ ms}^{-2}$ )

**Options :**

8643511149.  $\frac{5}{200}\%$

8643511150.  $\frac{200}{5}\%$

8643511151.  $\frac{200}{3}\%$

8643511152.  $\frac{3}{200}\%$

**Question Number : 18 Question Id : 864351378 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No**

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

एका ठराविक खोलीवर पाणबुडीवरील दाब  $3 \times 10^5$  Pa आहे. जर खोली दोनपट केली, पाणबुडीवरील दाबातील टक्केवारीतील वाढ \_\_\_\_\_ असू शकेल.

(असे माना कि वातावरणातील दाब  $1 \times 10^5$  Pa, पाण्याची घनता  $10^3$  kg m<sup>-3</sup>,  $g = 10$  ms<sup>-2</sup>)

**Options :**

8643511149.  $\frac{5}{200}\%$

8643511150.  $\frac{200}{5}\%$

8643511151.  $\frac{200}{3}\%$

8643511152.  $\frac{3}{200}\%$

**Question Number : 19 Question Id : 864351379 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No**

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

A conducting wire of length ' $l$ ', area of cross-section  $A$  and electric resistivity  $\rho$  is connected between the terminals of a battery. A potential difference  $V$  is developed between its ends, causing an electric current.

If the length of the wire of the same material is doubled and the area of cross-section is halved, the resultant current would be :

**Options :**

8643511153.  $4 \frac{VA}{\rho l}$

8643511154.  $\frac{1}{4} \frac{\rho l}{VA}$

8643511155.  $\frac{1}{4} \frac{VA}{\rho l}$

8643511156.  $\frac{3}{4} \frac{VA}{\rho l}$

**Question Number : 19 Question Id : 864351379 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No**

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

'l' लांबीची, A काटछेदाची व  $\rho$  विद्युत रोधितेची वाहक तार बॅटरीच्या टोकांमध्ये जोडली. टोकांमध्ये V एवढे विभवांतर तयार झाले व त्यामुळे विद्युत धारा झाली.

जर त्या पदार्थाच्या तारेची लांबी दोनपट केली व काटछेद निम्मा केला, परिणामी धारा \_\_\_\_\_ असेल.

**Options :**

8643511153.  $4 \frac{VA}{\rho l}$

8643511154.  $\frac{1}{4} \frac{\rho l}{VA}$

8643511155.  $\frac{1}{4} \frac{VA}{\rho l}$

8643511156.  $\frac{3}{4} \frac{VA}{\rho l}$

**Question Number : 20 Question Id : 864351380 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No**

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

One main scale division of a vernier callipers is 'a' cm and  $n^{\text{th}}$  division of the vernier scale coincide with  $(n - 1)^{\text{th}}$  division of the main scale. The least count of the callipers in mm is :

**Options :**

8643511157.  $\left(\frac{n - 1}{10n}\right)a$

8643511158.  $\frac{10 na}{(n-1)}$

8643511159.  $\frac{10 a}{n}$

8643511160.  $\frac{10 a}{(n-1)}$

**Question Number : 20 Question Id : 864351380 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1**

व्हर्नियर कॅलीपर्सच्या एका मुख्य श्रेणीतील भाग  $a$  cm व व्हर्नियर श्रेणीतील  $n^{\text{th}}$  भाग मुख्य श्रेणीच्या  $(n-1)^{\text{th}}$  भागाबरोबर जुळतो. व्हर्नियर कॅलीपर्सचा लघुत्तम मापांक mm मध्ये \_\_\_\_\_ आहे.

**Options :**

8643511157.  $\left(\frac{n-1}{10n}\right)a$

8643511158.  $\frac{10 na}{(n-1)}$

8643511159.  $\frac{10 a}{n}$

8643511160.  $\frac{10 a}{(n-1)}$

## Physics Section B

|  |           |
|--|-----------|
| <b>Section Id :</b>                          | 86435126  |
| <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       |



**Sub-Section Number :** 1  
**Sub-Section Id :** 86435126  
**Question Shuffling Allowed :** Yes

**Question Number : 21 Question Id : 864351381 Question Type : SA**

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

A sinusoidal voltage of peak value 250 V is applied to a series LCR circuit, in which  $R = 8 \Omega$ ,  $L = 24 \text{ mH}$  and  $C = 60 \mu\text{F}$ . The value of power dissipated at resonant condition is 'x' kW.

The value of x to the nearest integer is \_\_\_\_\_.

**Response Type :** Numeric

**Evaluation Required For SA :** Yes

**Show Word Count :** Yes

**Answers Type :** Equal

**Text Areas :** PlainText

**Possible Answers :**

100

**Question Number : 21 Question Id : 864351381 Question Type : SA**

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

एकसरीतील LCR परिपथास 250 V शिखर मुल्याचे ज्या वक्रीय व्होल्टेज लावले, ज्यामध्ये  $R = 8 \Omega$ ,  $L = 24 \text{ mH}$  व  $C = 60 \mu\text{F}$  आहे. संस्पंदी अटीवर अपाकृत शक्तीचे मूल्य 'x' kW आहे. x चे मूल्य जवळच्या पूर्णांकापर्यंत \_\_\_\_\_ आहे.

**Response Type :** Numeric

**Evaluation Required For SA :** Yes

**Show Word Count :** Yes

**Answers Type :** Equal

**Text Areas :** PlainText

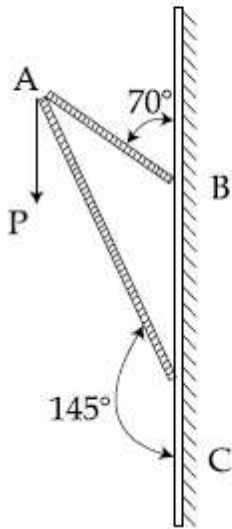
**Possible Answers :**

100

**Question Number : 22 Question Id : 864351382 Question Type : SA**

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

Consider a frame that is made up of two thin massless rods AB and AC as shown in the figure. A vertical force  $\vec{P}$  of magnitude 100 N is applied at point A of the frame.



Suppose the force is  $\vec{P}$  resolved parallel to the arms AB and AC of the frame.

The magnitude of the resolved component along the arm AC is  $x$ N.

The value of  $x$ , to the nearest integer, is \_\_\_\_\_.

[Given :  $\sin(35^\circ) = 0.573$ ,  $\cos(35^\circ) = 0.819$   
 $\sin(110^\circ) = 0.939$ ,  $\cos(110^\circ) = -0.342$  ]

**Response Type :** Numeric

**Evaluation Required For SA :** Yes

**Show Word Count :** Yes

**Answers Type :** Equal

**Text Areas :** PlainText

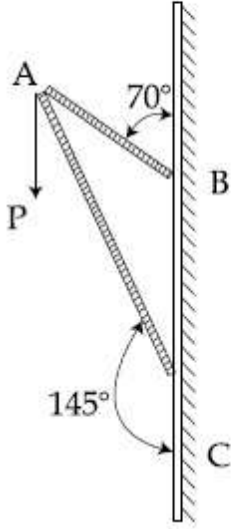
**Possible Answers :**

100

**Question Number :** 22 **Question Id :** 864351382 **Question Type :** SA

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

आकृतीत दाखविल्याप्रमाणे AB व AC ह्या दोन बारीक वजनविरहित दांड्यांपासून सांगाडा तयार झाला आहे असे विचारात घ्या. सांगाड्याच्या A बिंदुवर 100 N किंमतीचे उभ्या दिशेत  $\vec{P}$  बल लावले आहे.



समजा  $\vec{P}$  बल सांगाड्याच्या AB व AC ह्या भुजांना समांतर वियोजित केले. वियोजित घटकाची AC भुजेवरील किंमत  $xN$  आहे.  $x$  चे मूल्य जवळच्या पूर्णांकापर्यंत \_\_\_\_\_ आहे.

[ दिले आहे :  $\sin(35^\circ) = 0.573$ ,  $\cos(35^\circ) = 0.819$

$\sin(110^\circ) = 0.939$ ,  $\cos(110^\circ) = -0.342$  ]

**Response Type :** Numeric

**Evaluation Required For SA :** Yes

**Show Word Count :** Yes

**Answers Type :** Equal

**Text Areas :** PlainText

**Possible Answers :**

100

**Question Number :** 23 **Question Id :** 864351383 **Question Type :** SA

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

The first three spectral lines of H-atom in the Balmer series are given  $\lambda_1, \lambda_2, \lambda_3$  considering the

Bohr atomic model, the wave lengths of first and third spectral lines  $\left(\frac{\lambda_1}{\lambda_3}\right)$  are related by a

factor of approximately ' $x$ '  $\times 10^{-1}$ .

The value of  $x$ , to the nearest integer, is \_\_\_\_\_.

**Response Type :** Numeric

**Evaluation Required For SA :** Yes

Show Word Count : Yes

Answers Type : Equal

Text Areas : PlainText

Possible Answers :

100

Question Number : 23 Question Id : 864351383 Question Type : SA

Correct Marks : 4 Wrong Marks : 0

बामर श्रेणीतील हायड्रोजन अणूसाठी पहिल्या तीन पंक्ती रेखा  $\lambda_1, \lambda_2, \lambda_3$  दिलेल्या आहेत. बोहरची अण्विक

प्रतिकृती विचारात घेऊन पहिल्या व तिसऱ्या पंक्ती रेषांच्या  $\left(\frac{\lambda_1}{\lambda_3}\right)$  तरंगलांबी अंदाजे ' $x$ '  $\times 10^{-1}$  ह्या अवयवाने

संबोधित केल्या आहेत.

$x$  चे मूल्य जवळच्या पूर्णांकापर्यंत \_\_\_\_\_ आहे.

Response Type : Numeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Equal

Text Areas : PlainText

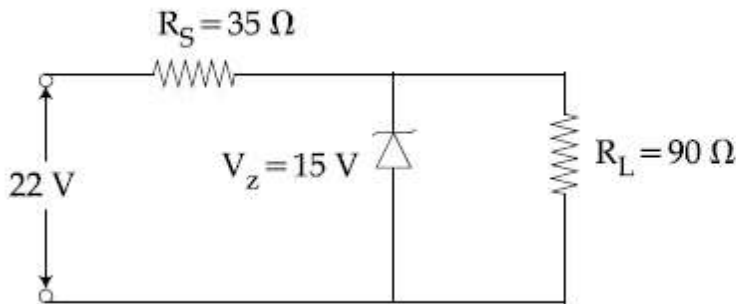
Possible Answers :

100

Question Number : 24 Question Id : 864351384 Question Type : SA

Correct Marks : 4 Wrong Marks : 0

The value of power dissipated across the zener diode ( $V_z = 15$  V) connected in the circuit as shown in the figure is  $x \times 10^{-1}$  watt.



The value of  $x$ , to the nearest integer, is \_\_\_\_\_.

Response Type : Numeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Equal

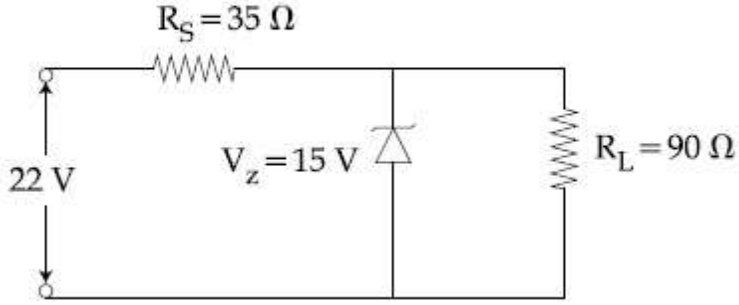
Text Areas : PlainText

Possible Answers :

Question Number : 24 Question Id : 864351384 Question Type : SA

Correct Marks : 4 Wrong Marks : 0

आकृतीत दाखविलेल्या परिपथात जोडलेल्या झिनर डायोड ने ( $V_z = 15 \text{ V}$ ) अपाकृत शक्तीचे मूल्य  $x \times 10^{-1}$  watt आहे.



$x$  चे मूल्य जवळच्या पूर्णांकापर्यंत \_\_\_\_\_ आहे.

Response Type : Numeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Equal

Text Areas : PlainText

Possible Answers :

100

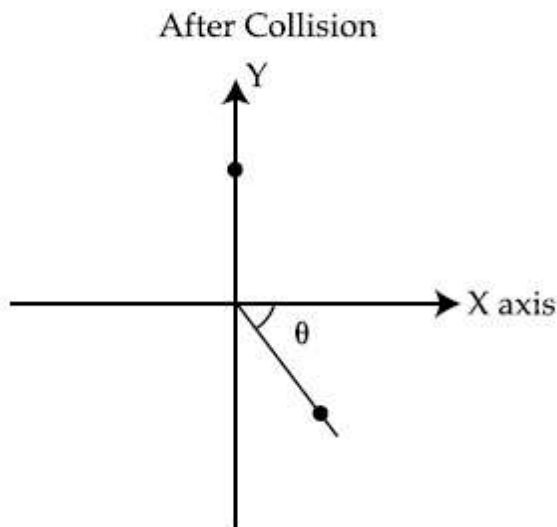
Question Number : 25 Question Id : 864351385 Question Type : SA

Correct Marks : 4 Wrong Marks : 0

A ball of mass 10 kg moving with a velocity  $10\sqrt{3} \text{ m s}^{-1}$  along X-axis, hits another ball of mass 20 kg which is at rest. After collision, the first ball comes to rest and the second one disintegrates into two equal pieces. One of the pieces starts moving along Y-axis at a speed of 10 m/s. The second piece starts moving at a speed of 20 m/s at an angle  $\theta$  (degree) with respect to the X-axis.

The configuration of pieces after collision is shown in the figure.

The value of  $\theta$  to the nearest integer is \_\_\_\_\_.



**Response Type :** Numeric

**Evaluation Required For SA :** Yes

**Show Word Count :** Yes

**Answers Type :** Equal

**Text Areas :** PlainText

**Possible Answers :**

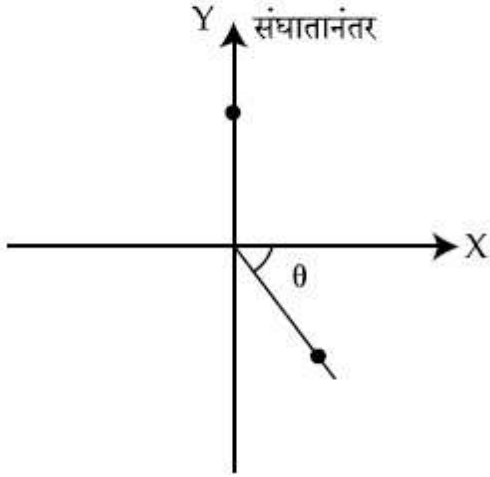
100

**Question Number :** 25 **Question Id :** 864351385 **Question Type :** SA

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

10 kg वस्तुमानाचा चेंडू  $10\sqrt{3} \text{ m s}^{-1}$  वेगाने X-अक्षावर गतिमान असून स्थिर असलेल्या 20 kg वस्तुमानाच्या दुसऱ्या चेंडूवर आपटतो. संघातानंतर, पहिला चेंडू स्थिर होतो तर दुसऱ्या चेंडूचे दोन सारखे तुकडे होतात. एक तुकडा Y-अक्षावर  $10 \text{ m/s}$  वेगाने गतिमान होतो. दुसरा तुकडा X-अक्षाशी  $\theta$  (डिग्री) कोन करून  $20 \text{ m/s}$  वेगाने गतिमान होतो.

तुकड्यांचे संघातानंतरचे संरूपण खाली आकृतीत दाखविले आहे.  $\theta$  चे मूल्य जवळच्या पूर्णांकापर्यंत \_\_\_\_\_ आहे.



**Response Type :** Numeric

**Evaluation Required For SA :** Yes

**Show Word Count :** Yes

**Answers Type :** Equal

**Text Areas :** PlainText

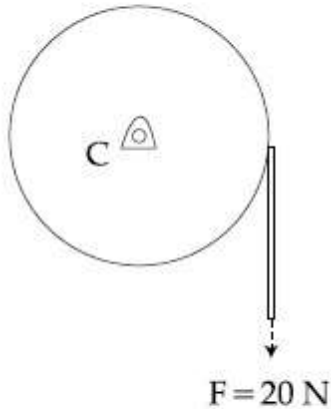
**Possible Answers :**

100

**Question Number :** 26 **Question Id :** 864351386 **Question Type :** SA

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

Consider a 20 kg uniform circular disk of radius 0.2 m. It is pin supported at its center and is at rest initially. The disk is acted upon by a constant force  $F = 20 \text{ N}$  through a massless string wrapped around its periphery as shown in the figure.



Suppose the disk makes  $n$  number of revolutions to attain an angular speed of  $50 \text{ rad s}^{-1}$ . The value of  $n$ , to the nearest integer, is \_\_\_\_\_.

[Given : In one complete revolution, the disk rotates by 6.28 rad]

**Response Type :** Numeric

**Evaluation Required For SA :** Yes

**Show Word Count :** Yes

**Answers Type :** Equal

**Text Areas :** PlainText

**Possible Answers :**

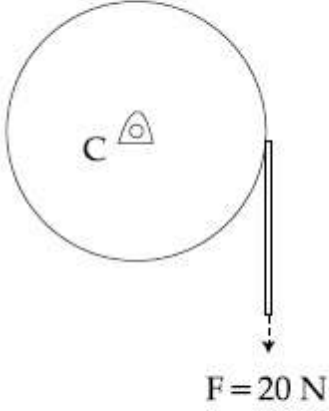
100

**Question Number :** 26 **Question Id :** 864351386 **Question Type :** SA

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



0.2 m त्रिज्येची व 20 kg ची एकसमान वर्तुळाकार तबकडी विचारात घ्या. मध्यावर टाचणीने आधार दिला असून ति सुरुवातीस स्थिर आहे. आकृतीत दाखविल्याप्रमाणे परिघाभोवती गुंढाळलेल्या वजनविरहीत दोरीच्या सहाय्याने तबकडीवर  $F=20\text{ N}$  एवढे स्थिर बल लावले.



समजा तबकडीस  $50\text{ rad s}^{-1}$  कोनिय वेग मिळविण्यासाठी 'n' एवढी घूर्णने केली.

n चे मूल्य जवळच्या पूर्णांकापर्यंत \_\_\_\_\_ आहे.

[ दिले आहे : एका पूर्ण घूर्णनात, तबकडी  $6.28\text{ rad}$  घूर्णन करते ]

**Response Type :** Numeric

**Evaluation Required For SA :** Yes

**Show Word Count :** Yes

**Answers Type :** Equal

**Text Areas :** PlainText

**Possible Answers :**

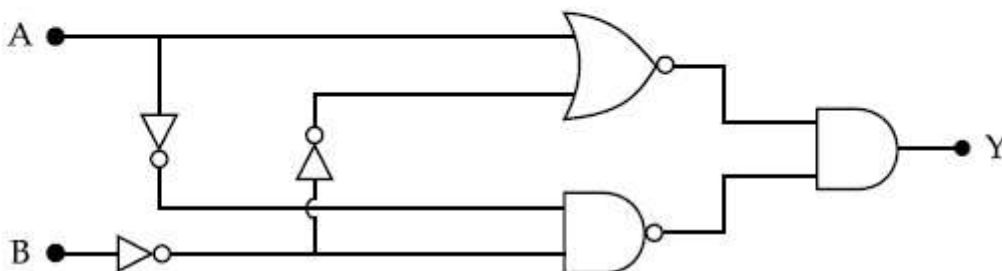
100

**Question Number :** 27 **Question Id :** 864351387 **Question Type :** SA

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

In the logic circuit shown in the figure, if input A and B are 0 to 1 respectively, the output at Y would be 'x'.

The value of x is \_\_\_\_\_.



**Response Type :** Numeric

**Evaluation Required For SA :** Yes

Show Word Count : Yes

Answers Type : Equal

Text Areas : PlainText

Possible Answers :

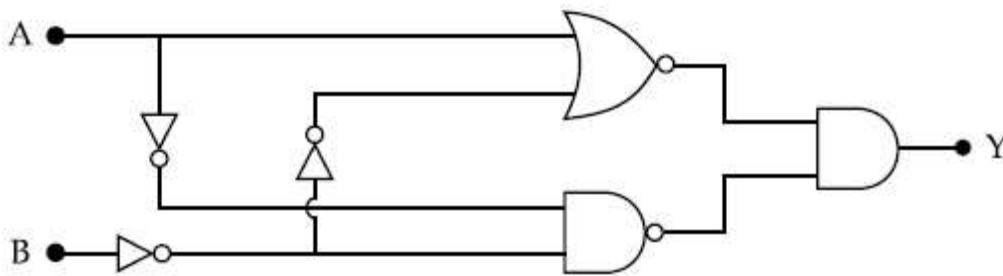
100

Question Number : 27 Question Id : 864351387 Question Type : SA

Correct Marks : 4 Wrong Marks : 0

आकृतीतील लॉजिक परिपथात, जर निविष्टी A व B हे 0 व 1 अनुक्रमे आहेत. Y येथे निष्पन्न 'x' असेल.

x चे मूल्य \_\_\_\_\_ आहे.



Response Type : Numeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Equal

Text Areas : PlainText

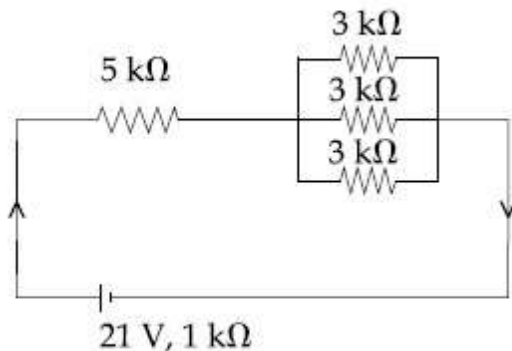
Possible Answers :

100

Question Number : 28 Question Id : 864351388 Question Type : SA

Correct Marks : 4 Wrong Marks : 0

In the figure given, the electric current flowing through the 5 k $\Omega$  resistor is 'x' mA.



The value of x to the nearest integer is \_\_\_\_\_.

Response Type : Numeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Equal

Text Areas : PlainText

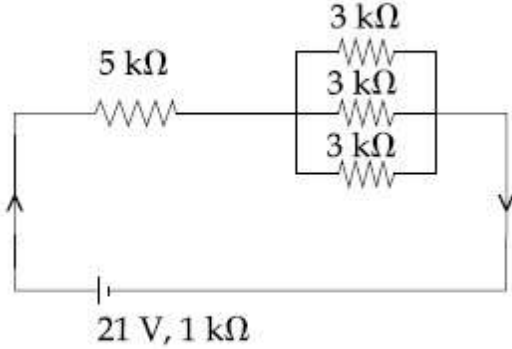
Possible Answers :

100

Question Number : 28 Question Id : 864351388 Question Type : SA

Correct Marks : 4 Wrong Marks : 0

दिलेल्या आकृतीत,  $5\text{ k}\Omega$  रोधातून वाहणारी विद्युत धारा ' $x$ ' mA आहे.



$x$  चे मूल्य जवळच्या पूर्णांकापर्यंत \_\_\_\_\_ आहे.

Response Type : Numeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Equal

Text Areas : PlainText

Possible Answers :

100

Question Number : 29 Question Id : 864351389 Question Type : SA

Correct Marks : 4 Wrong Marks : 0

A fringe width of 6 mm was produced for two slits separated by 1 mm apart. The screen is placed 10 m away. The wavelength of light used is ' $x$ ' nm.

The value of ' $x$ ' to the nearest integer is \_\_\_\_\_.

Response Type : Numeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Equal

Text Areas : PlainText

Possible Answers :

100

Question Number : 29 Question Id : 864351389 Question Type : SA

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

1 mm अंतर असलेल्या दोन फटींमुळे 6 mm ची झल्लरी रुंदी तयार झाली. पडदा 10 m लांब ठेवला आहे. वापरलेली तरंगलांबी 'x' nm आहे.

'x' चे मूल्य जवळच्या पूर्णांकापर्यंत \_\_\_\_\_ आहे.

**Response Type : Numeric**

**Evaluation Required For SA : Yes**

**Show Word Count : Yes**

**Answers Type : Equal**

**Text Areas : PlainText**

**Possible Answers :**

100

**Question Number : 30 Question Id : 864351390 Question Type : SA**

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

The resistance  $R = \frac{V}{I}$ , where  $V = (50 \pm 2)V$  and  $I = (20 \pm 0.2)A$ . The percentage error in R is

'x' %.

The value of 'x' to the nearest integer is \_\_\_\_\_.

**Response Type : Numeric**

**Evaluation Required For SA : Yes**

**Show Word Count : Yes**

**Answers Type : Equal**

**Text Areas : PlainText**

**Possible Answers :**

100

**Question Number : 30 Question Id : 864351390 Question Type : SA**

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

रोध  $R = \frac{V}{I}$  जेथे  $V = (50 \pm 2)V$  व  $I = (20 \pm 0.2)A$ . R मधील टक्केवारीतील त्रुटी 'x' % आहे.

'x' चे मूल्य जवळच्या पूर्णांकापर्यंत \_\_\_\_\_ आहे.

**Response Type : Numeric**

**Evaluation Required For SA : Yes**

**Show Word Count : Yes**

**Answers Type : Equal**

**Text Areas : PlainText**

**Possible Answers :**

100

## Chemistry Section A

|                                       |           |
|---------------------------------------|-----------|
| Section Id :                          | 86435127  |
| Section Number :                      | 3         |
| 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 :                      | 86435127  |
| Question Shuffling Allowed :          | Yes       |

**Question Number : 31 Question Id : 864351391 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 :** The H–O–H bond angle in water molecule is  $104.5^\circ$ .

**Reason R :** The lone pair - lone pair repulsion of electrons is higher than the bond pair - bond pair repulsion.

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

**Options :**

8643511171. Both A and R are true, and R is the correct explanation of A

8643511172. Both A and R are true, but R is not the correct explanation of A

8643511173. A is true but R is false

8643511174. A is false but R is true

**Question Number : 31 Question Id : 864351391 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1**

खाली दोन विधाने दिली आहेत. एक कथन A आणि दुसरे कारण R असे लिहिलेले आहे.

कथन A : पाण्यातील H-O-H बंध कोन  $104.5^\circ$  आहे.

कारण R : विविक्त युग्म – विविक्त युग्म इलेक्ट्रॉन्स मधील प्रतिकर्षण बंध युग्म – बंध युग्म प्रतिकर्षणापेक्षा जास्त असते.

वरील विधानांस अनुसरून खालील पर्यायामधून बरोबर उत्तर निवडा.

**Options :**

8643511171. दोन्ही A आणि R खरे आहेत आणि R हे A चे बरोबर स्पष्टीकरण आहे.

8643511172. दोन्ही A आणि R खरे आहेत, परंतु R हे A चे बरोबर स्पष्टीकरण नाही.

8643511173. A खरे आहे परंतु R खोटे आहे.

8643511174. A खोटे आहे परंतु R खरे आहे.

**Question Number : 32 Question Id : 864351392 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                              |
|--------------------------|--|
| Industrial process       | Application                            |
| (a) Haber's process      | (i) $\text{HNO}_3$ synthesis           |
| (b) Ostwald's process    | (ii) Aluminium extraction              |
| (c) Contact process      | (iii) $\text{NH}_3$ synthesis          |
| (d) Hall-Heroult process | (iv) $\text{H}_2\text{SO}_4$ synthesis |

Choose the correct answer from the options given below :

**Options :**

8643511175. (a)-(iv), (b)-(i), (c)-(ii), (d)-(iii)

8643511176. (a)-(iii), (b)-(i), (c)-(iv), (d)-(ii)

8643511177. (a)-(ii), (b)-(iii), (c)-(iv), (d)-(i)

8643511178. (a)-(iii), (b)-(iv), (c)-(i), (d)-(ii)

Question Number : 32 Question Id : 864351392 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

यादी – I यादी – II बरोबर जुळवा :

| यादी – I                 | यादी – II                             |
|--------------------------|---------------------------------------|
| कारखान्यातील प्रक्रिया   | वापर/उपयोग                            |
| (a) हेबर प्रक्रिया/पद्धत | (i) $\text{HNO}_3$ संश्लेषण           |
| (b) ऑस्टवल्ड पद्धत       | (ii) अॅल्युमिनिअम निष्कर्षण           |
| (c) कॉन्टॅक्ट पद्धत      | (iii) $\text{NH}_3$ संश्लेषण          |
| (d) हॉल-हेरॉल्ट पद्धत    | (iv) $\text{H}_2\text{SO}_4$ संश्लेषण |

खालील पर्यायांमधून बरोबर उत्तर निवडा :

Options :

8643511175. (a)-(iv), (b)-(i), (c)-(ii), (d)-(iii)

8643511176. (a)-(iii), (b)-(i), (c)-(iv), (d)-(ii)

8643511177. (a)-(ii), (b)-(iii), (c)-(iv), (d)-(i)

8643511178. (a)-(iii), (b)-(iv), (c)-(i), (d)-(ii)

Question Number : 33 Question Id : 864351393 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

A group 15 element, which is a metal and forms a hydride with strongest reducing power among group 15 hydrides. The element is :

Options :

8643511179. Bi

8643511180. P

8643511181. As

8643511182. Sb

**Question Number : 33 Question Id : 864351393 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No**

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

15 व्या गटातील मूलद्रव्य, जे धातु असून गट 15 तील सर्वात शक्तिशाली क्षपण शक्ति असलेले हायड्राइड तयार करते. ते मूलद्रव्य \_\_\_\_\_ आहे.

**Options :**

8643511179. Bi

8643511180. P

8643511181. As

8643511182. Sb

**Question Number : 34 Question Id : 864351394 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No**

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

The process that involves the removal of sulphur from the ores is :

**Options :**

8643511183. Refining

8643511184. Roasting

8643511185. Smelting

8643511186. Leaching

**Question Number : 34 Question Id : 864351394 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No**

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

धातुकातून सल्फर काढून टाकण्याच्या पद्धतीला \_\_\_\_\_ म्हणतात.

**Options :**



8643511183. परिष्करण करणे

8643511184. भाजणे

8643511185. विगालन

8643511186. निक्षालन

**Question Number : 35 Question Id : 864351395 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No**

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

Given below are two statements :

**Statement I :**  $H_2O_2$  can act as both oxidising and reducing agent in basic medium.

**Statement II :** In the hydrogen economy, the energy is transmitted in the form of dihydrogen.

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

**Options :**

8643511187. Both statement I and statement II are true

8643511188. Both statement I and statement II are false

8643511189. Statement I is true but statement II is false

8643511190. Statement I is false but statement II is true

**Question Number : 35 Question Id : 864351395 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No**

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

खाली दोन विधाने दिलेली आहेत :

**विधान I :**  $H_2O_2$  आम्लारी माध्यमात ऑक्सिडीकारक तसेच क्षपणकारक असे दोन्ही करू शकतो.

**विधान II :** हायड्रोजन आर्थिकतेत, ऊर्जा डायहायड्रोजनच्या स्वरूपात पारेषित होते.

वरील विधानांना अनुसरून खालील पर्यायांमधून बरोबर उत्तर निवडा :

**Options :**

8643511187. दोन्ही विधान I आणि विधान II खरे आहेत.

8643511188. दोन्ही विधान I आणि विधान II खोटे आहेत.

8643511189. विधान I खरे परंतु विधान II खोटे आहे.

8643511190. विधान I खोटे परंतु विधान II खरे आहे.

**Question Number : 36 Question Id : 864351396 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No**

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

Given below are two statements :

**Statement I :** Both  $\text{CaCl}_2 \cdot 6\text{H}_2\text{O}$  and  $\text{MgCl}_2 \cdot 8\text{H}_2\text{O}$  undergo dehydration on heating.

**Statement II :**  $\text{BeO}$  is amphoteric whereas the oxides of other elements in the same group are acidic.

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

**Options :**

8643511191. Both statement I and statement II are true

8643511192. Both statement I and statement II are false

8643511193. Statement I is true but statement II is false

8643511194. Statement I is false but statement II is true

**Question Number : 36 Question Id : 864351396 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No**

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

खाली दोन विधाने दिलेली आहेत :

विधान I : दोन्ही  $\text{CaCl}_2 \cdot 6\text{H}_2\text{O}$  आणि  $\text{MgCl}_2 \cdot 8\text{H}_2\text{O}$  तापवल्यास त्यांचे निर्जलीकरण होते.

विधान II :  $\text{BeO}$  हे उभयधर्मी ऑक्साइड आहे तर त्याच गटातील इतर मूलद्रव्यांची ऑक्साइड्स आम्लधर्मी आहेत.

वरील विधानांना अनुसरून खालील पर्यायांमधून बरोबर उत्तर निवडा.

**Options :**

8643511191. दोन्ही विधान I आणि विधान II खरे आहेत.

8643511192. दोन्ही विधान I आणि विधान II खोटे आहेत.

8643511193. विधान I खरे आहे परंतु विधान II खोटे आहे.

8643511194. विधान I खोटे आहे परंतु विधान II खरे आहे.

**Question Number : 37 Question Id : 864351397 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              |     |
|------------------|-----------------------|------------------------|-----|
| Name of oxo acid |                       | Oxidation state of 'P' |     |
| (a)              | Hypophosphorous acid  | (i)                    | + 5 |
| (b)              | Orthophosphoric acid  | (ii)                   | + 4 |
| (c)              | Hypophosphoric acid   | (iii)                  | + 3 |
| (d)              | Orthophosphorous acid | (iv)                   | + 2 |
|                  |                       | (v)                    | + 1 |

Choose the correct answer from the options given below :

**Options :**

8643511195. (a)-(v), (b)-(iv), (c)-(ii), (d)-(iii)

8643511196. (a)-(iv), (b)-(i), (c)-(ii), (d)-(iii)

8643511197. (a)-(iv), (b)-(v), (c)-(ii), (d)-(iii)

8643511198. (a)-(v), (b)-(i), (c)-(ii), (d)-(iii)

**Question Number : 37 Question Id : 864351397 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No**

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

यादी – I यादी – II बरोबर जुळवा :

| यादी – I                | यादी – II             |
|-------------------------|-----------------------|
| ऑक्झो आम्लाचे नाव       | 'P' ची ऑक्सिडन स्थिती |
| (a) हायपोफॉस्फरस आम्ल   | (i) + 5               |
| (b) ऑर्थोफॉस्फोरिक आम्ल | (ii) + 4              |
| (c) हायपोफॉस्फोरिक आम्ल | (iii) + 3             |
| (d) ऑर्थोफॉस्फरस आम्ल   | (iv) + 2              |
|                         | (v) + 1               |

खालील पर्यायांमधून बरोबर उत्तर निवडा :

**Options :**

8643511195. (a)-(v), (b)-(iv), (c)-(ii), (d)-(iii)

8643511196. (a)-(iv), (b)-(i), (c)-(ii), (d)-(iii)

8643511197. (a)-(iv), (b)-(v), (c)-(ii), (d)-(iii)

8643511198. (a)-(v), (b)-(i), (c)-(ii), (d)-(iii)

**Question Number : 38 Question Id : 864351398 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No**

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

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

**Assertion A :** Size of  $Bk^{3+}$  ion is less than  $Np^{3+}$  ion.

**Reason R :** The above is a consequence of the lanthanoid contraction.

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

**Options :**

8643511199. Both A and R are true and R is the correct explanation of A

8643511200. Both A and R are true but R is not the correct explanation of A

8643511201. A is true but R is false

8643511202. A is false but R is true

**Question Number : 38 Question Id : 864351398 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No**

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

खाली दोन विधाने दिलेली आहेत. एक कथन A आणि दुसरे कारण R असे लिहिलेले आहे.

कथन A :  $Bk^{3+}$  आयनाचा आकार  $Np^{3+}$  आयनाच्या आकारापेक्षा लहान आहे.

कारण R : लॅन्थानाइड आकुंचनामुळे वरील गोष्ट आढळते.

वरील विधानांस अनुसरून खालील पर्यायांमधून बरोबर उत्तर निवडा.

**Options :**

8643511199. दोन्ही A आणि R खरे आहेत आणि R हे A चे बरोबर स्पष्टीकरण आहे.

8643511200. दोन्ही A आणि R खरे आहेत परंतु R हे A चे बरोबर स्पष्टीकरण नाही.

8643511201. A खरे आहे परंतु R खोटे आहे.

8643511202. A खोटे आहे परंतु R खरे आहे.

**Question Number : 39 Question Id : 864351399 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No**

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

Given below are two statements :

**Statement I :** The  $E^\ominus$  value for  $Ce^{4+}/Ce^{3+}$  is +1.74 V.

**Statement II :** Ce is more stable in  $Ce^{4+}$  state than  $Ce^{3+}$  state.

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

**Options :**

8643511203. Both statement I and statement II are correct
8643511204. Both statement I and statement II are incorrect
8643511205. Statement I is correct but statement II is incorrect
8643511206. Statement I is incorrect but statement II is correct

**Question Number : 39 Question Id : 864351399 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No**

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

खाली दोन विधाने दिलेली आहेत.

विधान I :  $Ce^{4+}/Ce^{3+}$  साठी  $E^\circ$  ची किंमत  $+1.74 V$  आहे.

विधान II :  $Ce$  हे  $Ce^{4+}$  ह्या स्थितीत  $Ce^{3+}$  ह्या स्थितीपेक्षा जास्त स्थिर आहे.

वरील विधानांना अनुसरून खालील पर्यायांमधून बरोबर उत्तर निवडा.

**Options :**

8643511203. दोन्ही विधान I आणि विधान II बरोबर आहेत.
8643511204. दोन्ही विधान I आणि विधान II चुकीची आहेत.
8643511205. विधान I बरोबर परंतु विधान II चुकीचे आहे.
8643511206. विधान I चुकीचे परंतु विधान II बरोबर आहे.

**Question Number : 40 Question Id : 864351400 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No**

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

The type of pollution that gets increased during the day time and in the presence of  $O_3$  is :

**Options :**

8643511207. Reducing smog
8643511208. Oxidising smog

8643511209. Acid rain

8643511210. Global warming

**Question Number : 40 Question Id : 864351400 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No**

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

दिवसा  $O_3$  च्या उपस्थितीत \_\_\_\_\_ प्रकारच्या प्रदूषणात वाढ आढळून येते.

**Options :**

8643511207. क्षपणकारक स्मॉग

8643511208. ऑक्सिडीकारक स्मॉग

8643511209. आम्ल पाऊस

8643511210. ग्लोबल उष्मा (Global warming)

**Question Number : 41 Question Id : 864351401 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No**

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

In chromatography technique, the purification of compound is independent of :

**Options :**

8643511211. Solubility of the compound

8643511212. Mobility or flow of solvent system

8643511213. Length of the column or TLC plate

8643511214. Physical state of the pure compound

**Question Number : 41 Question Id : 864351401 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No**

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

वर्णलेखन पद्धतीने संयुगाचे शुद्धीकरण \_\_\_\_\_ अवलंबून नसते.

**Options :**

8643511211. संयुगाच्या द्रावणीयतेवर

8643511212. द्रावक संस्थेचा प्रवाहित होण्यावर

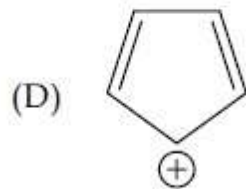
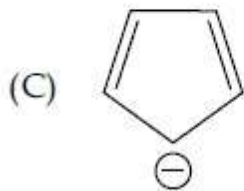
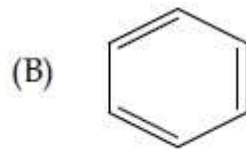
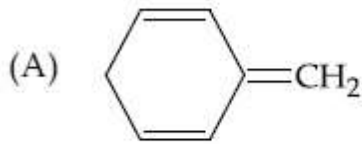
8643511213. स्तंभाची किंवा TLC च्या पट्टीच्या लांबीवर

8643511214. शुद्ध संयुगाच्या भौतिक अवस्थेवर

**Question Number : 42 Question Id : 864351402 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No**

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

Among the following, the aromatic compounds are :



Choose the correct answer from the following options :

**Options :**

8643511215. (A) and (B) only

8643511216. (A), (B) and (C) only

8643511217. (B), (C) and (D) only

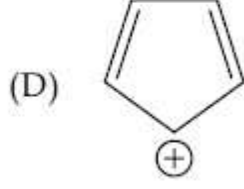
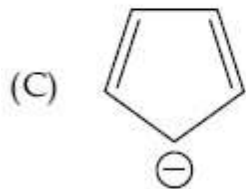
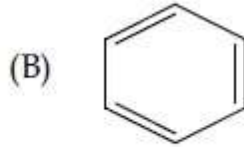
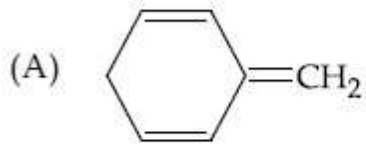
8643511218. (B) and (C) only

**Question Number : 42 Question Id : 864351402 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No**



Correct Marks : 4 Wrong Marks : 1

खालीलपैकी अॅरोमॅटिक संयुगे \_\_\_\_\_ आहेत.



खालील पर्यायांमधून बरोबर उत्तर निवडा :

Options :

8643511215. (A) आणि (B) फक्त

8643511216. (A), (B) आणि (C) फक्त

8643511217. (B), (C) आणि (D) फक्त

8643511218. (B) आणि (C) फक्त

Question Number : 43 Question Id : 864351403 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

Which of the following is Lindlar catalyst ?

Options :

8643511219. Partially deactivated palladised charcoal

8643511220. Sodium and Liquid  $\text{NH}_3$

8643511221. Cold dilute solution of  $\text{KMnO}_4$

8643511222. Zinc chloride and HCl

Question Number : 43 Question Id : 864351403 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

खालीलपैकी कोणता लिंडलर उत्प्रेरक आहे?

Options :

8643511219. आंशिक अक्रियाशील केलेला पॅलाडाइझड चारकोल

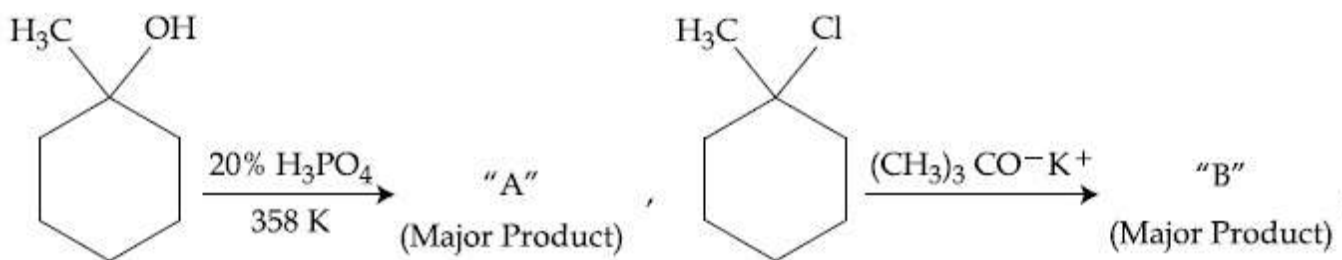
8643511220. सोडिअम आणि लिक्विड अमोनिया

8643511221. थंड, विरल  $\text{KMnO}_4$  चे द्रावण

8643511222. झिंक क्लोराइड आणि  $\text{HCl}$

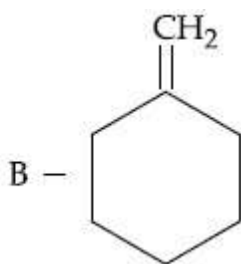
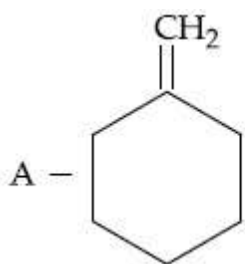
Question Number : 44 Question Id : 864351404 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

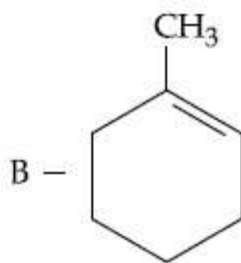
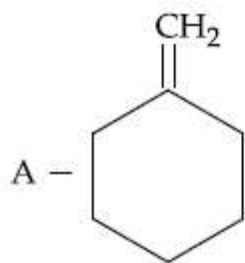


The products "A" and "B" formed in above reactions are :

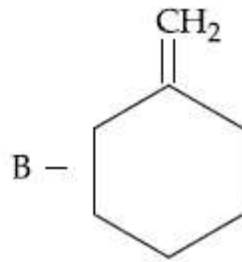
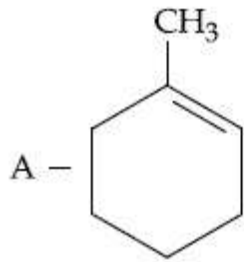
Options :



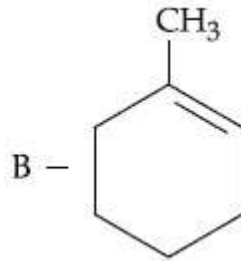
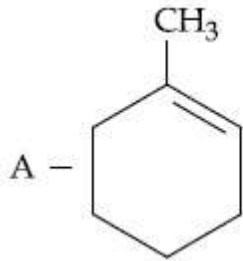
8643511223.



8643511224.

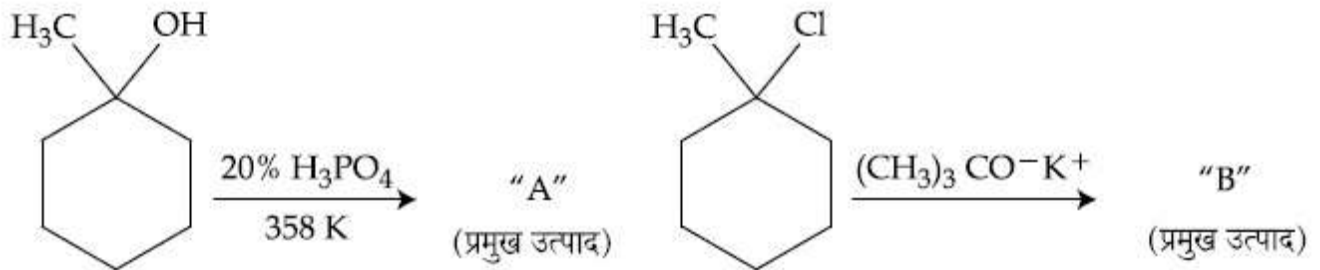


8643511225.



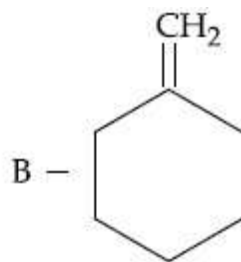
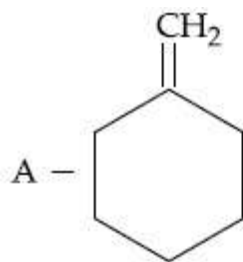
8643511226.

Question Number : 44 Question Id : 864351404 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1

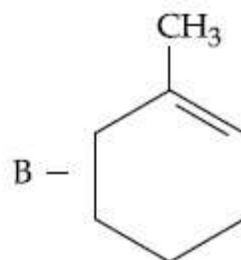
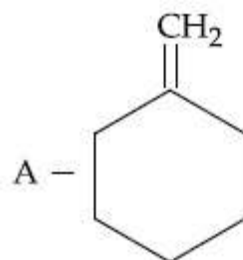


वरील अभिक्रियांत तयार होणारे उत्पाद "A" आणि "B" \_\_\_\_\_ आहेत.

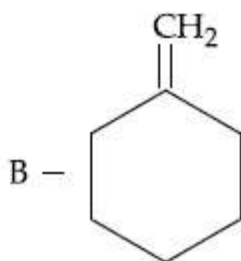
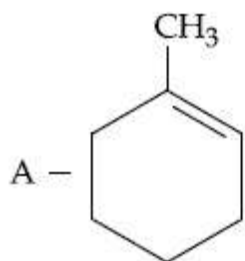
Options :



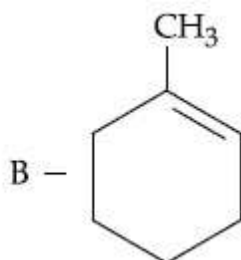
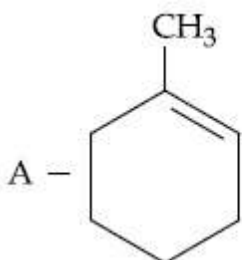
8643511223.



8643511224.



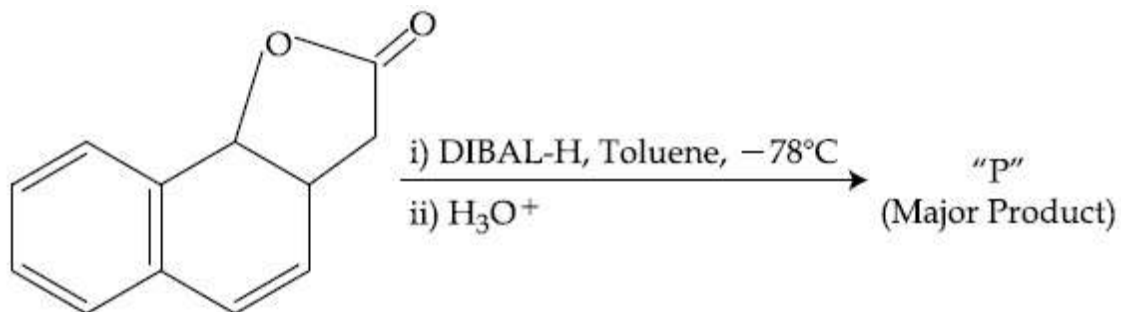
8643511225.



8643511226.

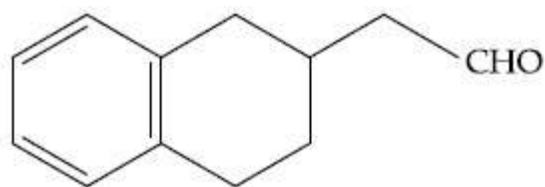
Question Number : 45 Question Id : 864351405 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

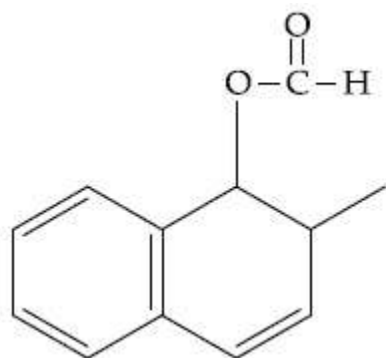


The product "P" in the above reaction is :

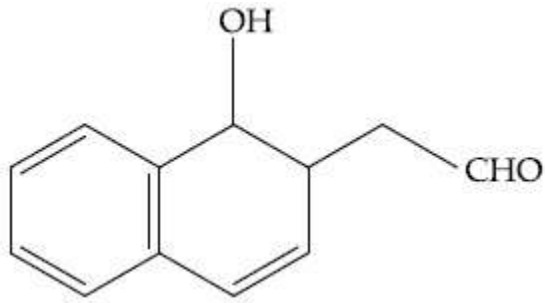
Options :



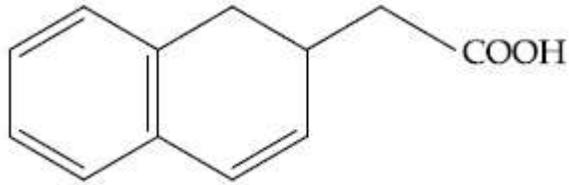
8643511227.



8643511228.



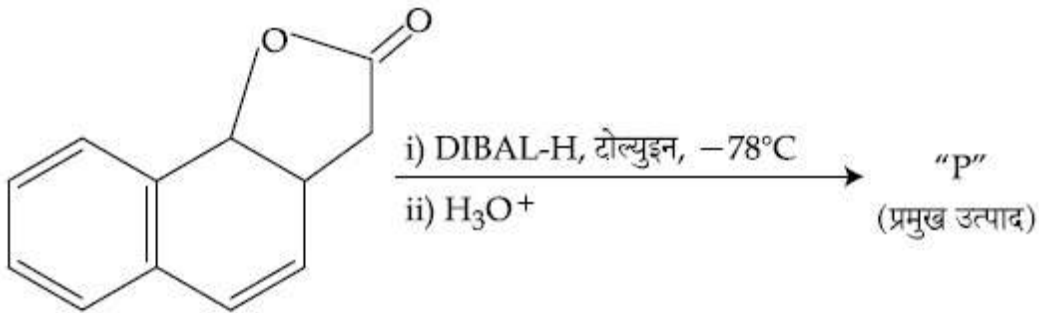
8643511229.



8643511230.

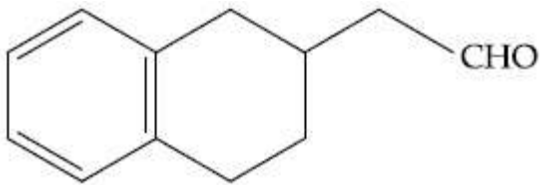
Question Number : 45 Question Id : 864351405 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

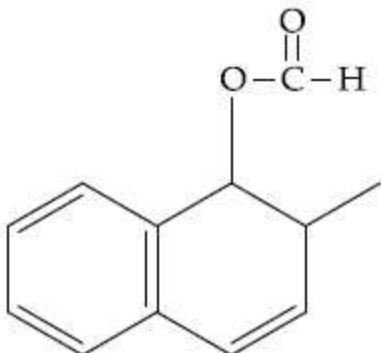


वरील अभिक्रियेतील उत्पाद "P" \_\_\_\_\_ आहे.

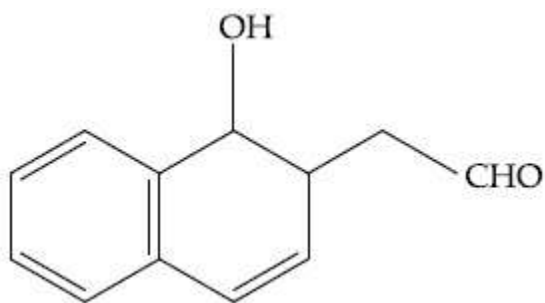
Options :



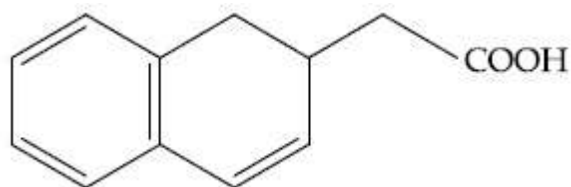
8643511227.



8643511228.



8643511229.



8643511230.

**Question Number : 46 Question Id : 864351406 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No**

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

**Assertion A :** Enol form of acetone [ $\text{CH}_3\text{COCH}_3$ ] exists in  $< 0.1\%$  quantity. However, the enol form of acetyl acetone [ $\text{CH}_3\text{COCH}_2\text{OCCH}_3$ ] exists in approximately 15% quantity.

**Reason R :** Enol form of acetyl acetone is stabilized by intramolecular hydrogen bonding, which is not possible in enol form of acetone.

Choose the correct statement :

**Options :**

8643511231. Both A and R are true and R is the correct explanation of A

8643511232. Both A and R are true but R is not the correct explanation of A

8643511233. A is true but R is false

8643511234. A is false but R is true

**Question Number : 46 Question Id : 864351406 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No**

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

कथन A :  $[\text{CH}_3\text{COCH}_3]$  अॅसिटोनचे इन्ॉल स्वरूप  $< 0.1\%$  आढळते. परंतु अॅसिटिल अॅसिटोन  $[\text{CH}_3\text{COCH}_2\text{OCCH}_3]$  चे इन्ॉल स्वरूप जवळजवळ  $15\%$  आढळते.

कारण R : अंतर्रेणु हायड्रोजन बंधनामुळे अॅसिटिल अॅसिटोनच्या इन्ॉल चे स्वरूप जास्त स्थिर होते जे कि अॅसिटोनमध्ये शक्य नाही.

बरोबर विधान निवडा :

Options :

8643511231. दोन्ही A आणि R खरे आहेत आणि R हे A चे बरोबर स्पष्टीकरण आहे.

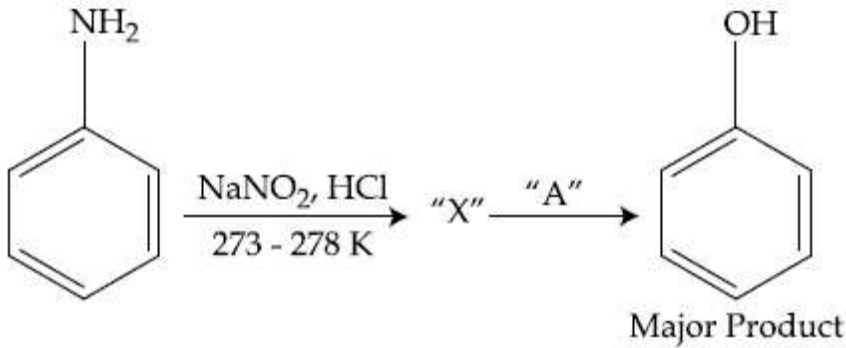
8643511232. दोन्ही A आणि R खरे आहेत परंतु R हे A चे बरोबर स्पष्टीकरण नाही.

8643511233. A खरे आहे परंतु R खोटे आहे.

8643511234. A खोटे आहे परंतु R खरे आहे.

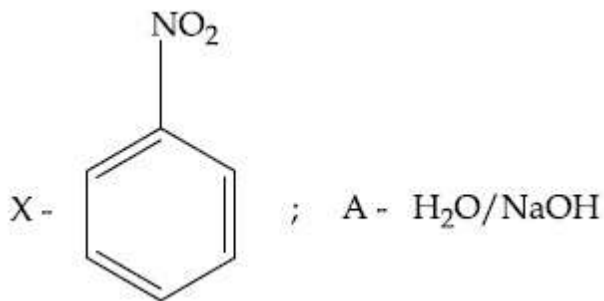
Question Number : 47 Question Id : 864351407 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

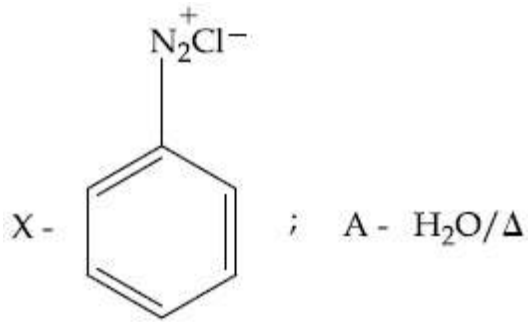


In the above chemical reaction, intermediate "X" and reagent/condition "A" are :

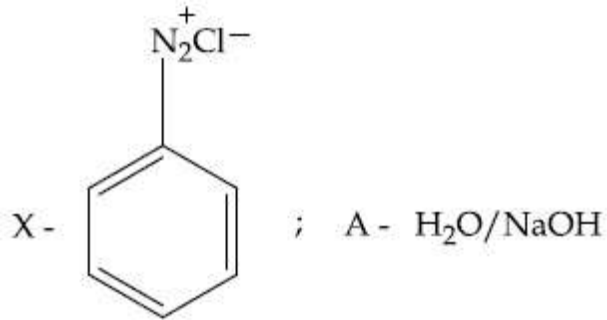
Options :



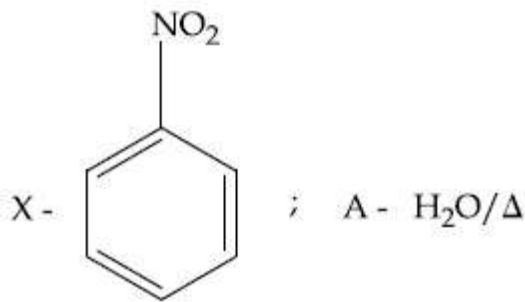
8643511235.



8643511236.

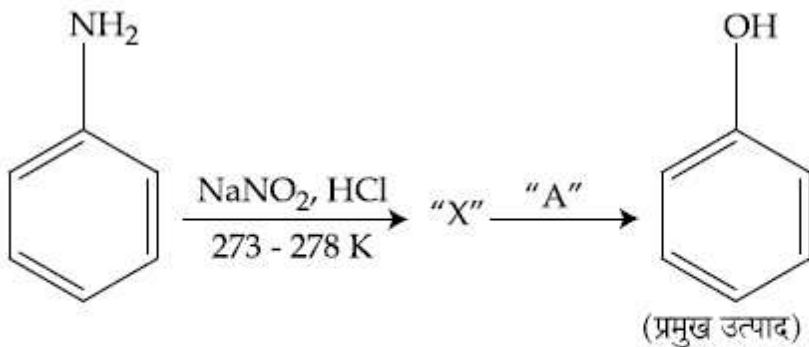


8643511237.



8643511238.

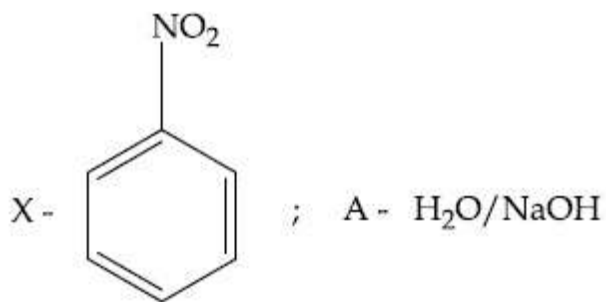
**Question Number : 47 Question Id : 864351407 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1**



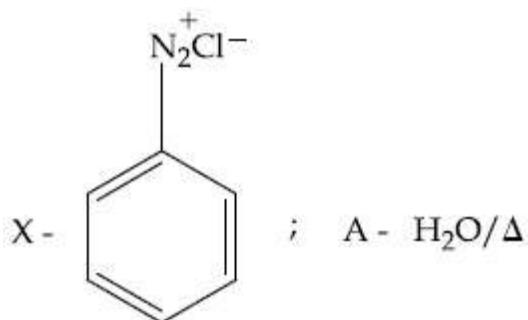
वरील रासायनिक अभिक्रियेतील माध्यमिक "X" आणि अभिक्रियाकारक/परिस्थिती "A" \_\_\_\_\_ आहेत.

**Options :**

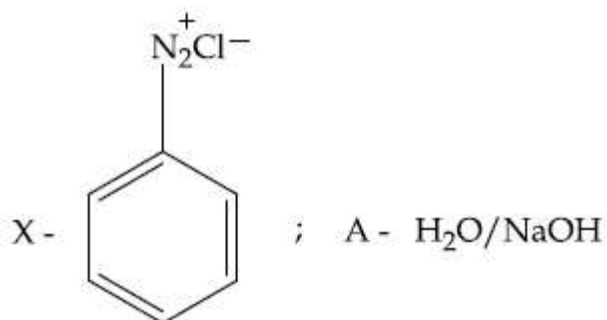




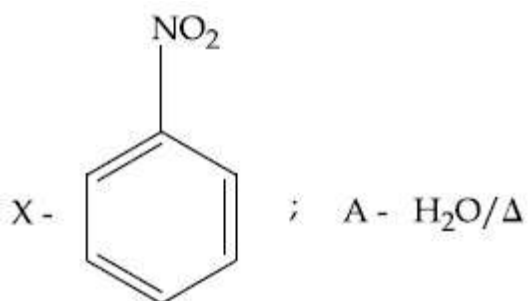
8643511235.



8643511236.



8643511237.



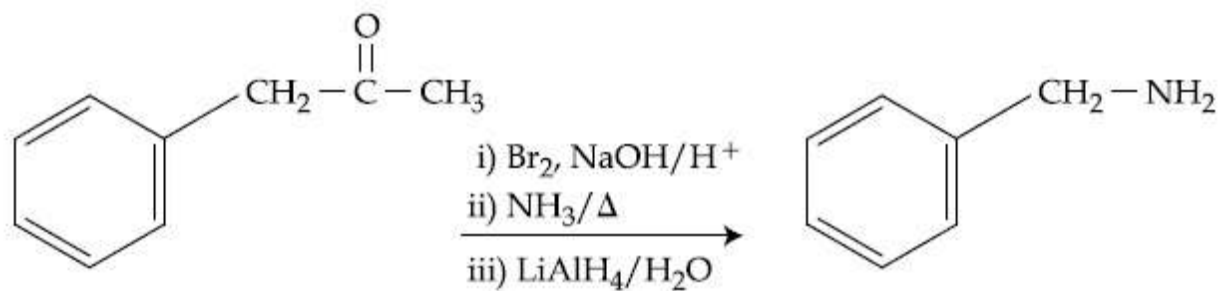
8643511238.

**Question Number : 48 Question Id : 864351408 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1**

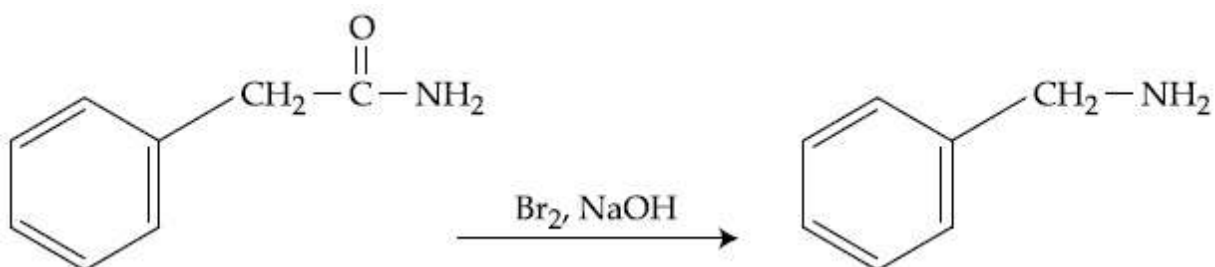
Which of the following reaction DOES NOT involve Hoffmann bromamide degradation ?

**Options :**

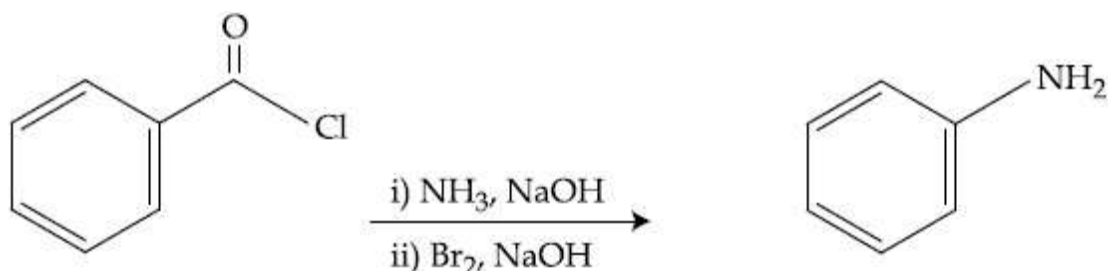
8643511239.



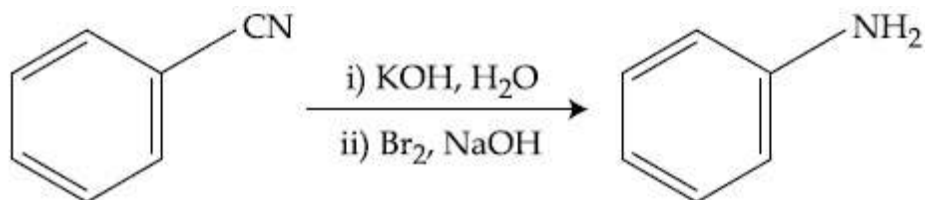
8643511240.



8643511241.



8643511242.



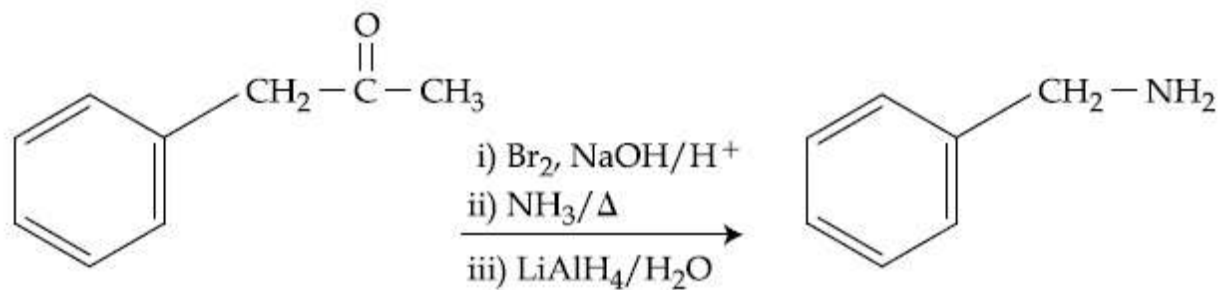
Question Number : 48 Question Id : 864351408 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No

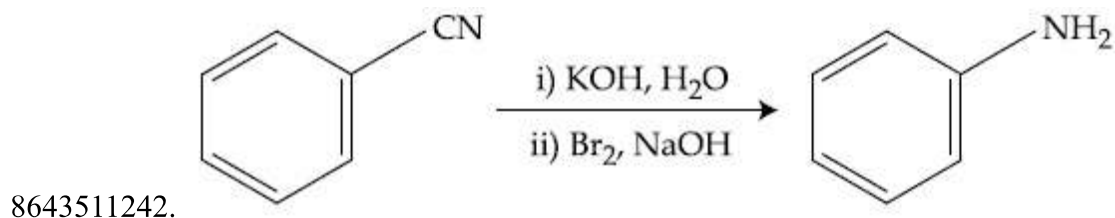
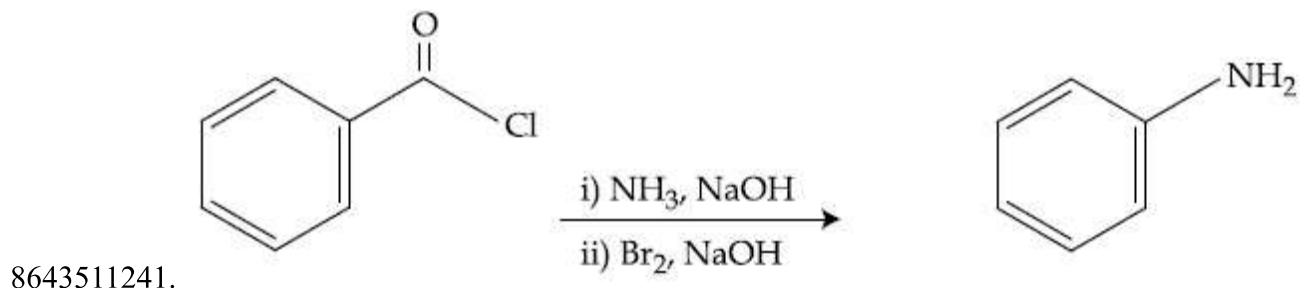
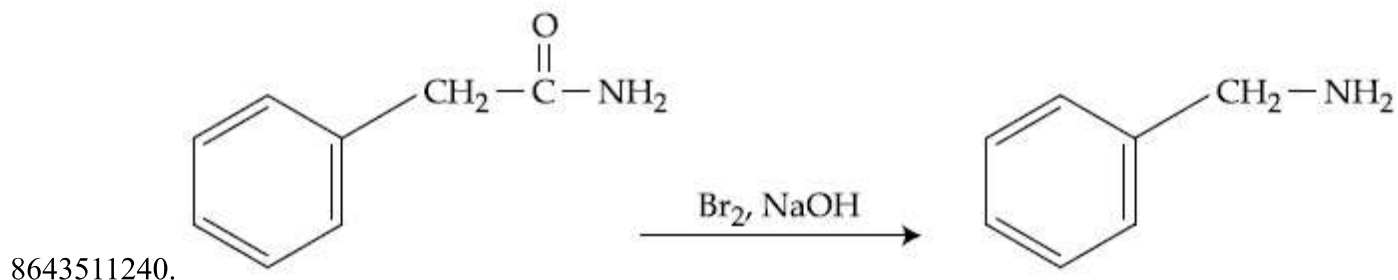
Correct Marks : 4 Wrong Marks : 1

खालीलपैकी कोणती अभिक्रिया हॉफमन ब्रोमामाईड विचयन दाखवत नाही?

Options :

8643511239.





Question Number : 49 Question Id : 864351409 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

The functions of antihistamine are :

Options :

8643511243. Antiallergic and Analgesic

8643511244. Analgesic and antacid

8643511245. Antacid and antiallergic

8643511246. Antiallergic and antidepressant

Question Number : 49 Question Id : 864351409 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

अँटिहिस्टॅमीनचे कार्य \_\_\_\_\_ असते.

**Options :**

8643511243. अँटिअँलर्जीक आणि वेदनाशामक
8643511244. वेदनाशामक आणि प्रतिआम्ल
8643511245. प्रतिआम्ल आणि अँटिअँलर्जीक
8643511246. अँटिअँलर्जीक आणि विषण्णतारोधक

**Question Number : 50 Question Id : 864351410 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No**

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

Which among the following pairs of Vitamins is stored in our body relatively for longer duration ?

**Options :**

8643511247. Thiamine and Ascorbic acid
8643511248. Vitamin A and Vitamin D
8643511249. Thiamine and Vitamin A
8643511250. Ascorbic acid and Vitamin D

**Question Number : 50 Question Id : 864351410 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No**

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

खालील जीवनसत्वांच्या जोड्यांपैकी कोणती जोडी शरीरात जास्त काळपर्यंत साठून राहते?

**Options :**

8643511247. थायामिन आणि अँस्कॉर्बिक आम्ल
8643511248. जीवनसत्व A आणि जीवनसत्व D
8643511249. थायामिन आणि जीवनसत्व A

## Chemistry Section B

|                                       |           |
|---------------------------------------|-----------|
| Section Id :                          | 86435128  |
| 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 :                      | 86435128  |
| Question Shuffling Allowed :          | Yes       |

Question Number : 51 Question Id : 864351411 Question Type : SA  
Correct Marks : 4 Wrong Marks : 0

A 6.50 molal solution of KOH (aq.) has a density of  $1.89 \text{ g cm}^{-3}$ . The molarity of the solution is \_\_\_\_\_  $\text{mol dm}^{-3}$ . (Round off to the Nearest Integer).

[Atomic masses : K : 39.0 u; O : 16.0 u; H : 1.0 u]

Response Type : Numeric  
Evaluation Required For SA : Yes  
Show Word Count : Yes  
Answers Type : Equal  
Text Areas : PlainText  
Possible Answers :

100

Question Number : 51 Question Id : 864351411 Question Type : SA  
Correct Marks : 4 Wrong Marks : 0

एका 6.50 मोलल KOH (aq.) च्या द्रावणाची घनता  $1.89 \text{ g cm}^{-3}$  आहे. ह्या द्रावणाची ग्रॅमरेणुता \_\_\_\_\_  $\text{mol dm}^{-3}$  आहे. (जवळच्या पूर्णांकात)

[अणु वस्तुमान K : 39.0 u; O : 16.0 u; H : 1.0 u]

Response Type : Numeric  
Evaluation Required For SA : Yes  
Show Word Count : Yes  
Answers Type : Equal

**Text Areas :** PlainText

**Possible Answers :**

100

**Question Number : 52 Question Id : 864351412 Question Type : SA**

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

A certain element crystallises in a bcc lattice of unit cell edge length  $27\text{\AA}$ . If the same element under the same conditions crystallises in the fcc lattice, the edge length of the unit cell in  $\text{\AA}$  will be \_\_\_\_\_. (Round off to the Nearest Integer).

[Assume each lattice point has a single atom]

[Assume  $\sqrt{3} = 1.73$ ,  $\sqrt{2} = 1.41$ ]

**Response Type :** Numeric

**Evaluation Required For SA :** Yes

**Show Word Count :** Yes

**Answers Type :** Equal

**Text Areas :** PlainText

**Possible Answers :**

100

**Question Number : 52 Question Id : 864351412 Question Type : SA**

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

$27\text{\AA}$  कडांची लांबी असलेल्या एका bcc जालकाच्या एकल सेल मध्ये एका मूलद्रव्याचे स्फटिकीकरण होते. जर त्याच मूलद्रव्याचे, सारख्याच परिस्थितीत fcc जालकात स्फटिकीकरण झाले, तर एकल सेल च्या कडांची लांबी \_\_\_\_\_  $\text{\AA}$  असेल. (जवळच्या पूर्णांकात)

[ जालकातील प्रत्येक बिंदुवर एक अणु आहे असे समजा ]

[ समजा  $\sqrt{3} = 1.73$ ,  $\sqrt{2} = 1.41$  ]

**Response Type :** Numeric

**Evaluation Required For SA :** Yes

**Show Word Count :** Yes

**Answers Type :** Equal

**Text Areas :** PlainText

**Possible Answers :**

100

**Question Number : 53 Question Id : 864351413 Question Type : SA**

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

When light of wavelength 248 nm falls on a metal of threshold energy 3.0 eV, the de-Broglie wavelength of emitted electrons is \_\_\_\_\_ Å. (Round off to the Nearest Integer).

[Use :  $\sqrt{3} = 1.73$ ,  $h = 6.63 \times 10^{-34}$  Js

$m_e = 9.1 \times 10^{-31}$  kg ;  $c = 3.0 \times 10^8$  ms<sup>-1</sup> ;  $1\text{eV} = 1.6 \times 10^{-19}$ J]

**Response Type :** Numeric

**Evaluation Required For SA :** Yes

**Show Word Count :** Yes

**Answers Type :** Equal

**Text Areas :** PlainText

**Possible Answers :**

100

**Question Number : 53 Question Id : 864351413 Question Type : SA**

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

3.0 eV सीमा ऊर्जा असणाऱ्या एका धातुवर 248 nm तरंगलांबी असलेला प्रकाश पडला असता, बाहेर पडणाऱ्या इलेक्ट्रॉनची डी ब्रॉग्ली तरंगलांबी \_\_\_\_\_ Å आहे. (जवळच्या पूर्णांकात)

[ वापरा :  $\sqrt{3} = 1.73$ ,  $h = 6.63 \times 10^{-34}$  Js

$m_e = 9.1 \times 10^{-31}$  kg ;  $c = 3.0 \times 10^8$  ms<sup>-1</sup> ;  $1\text{eV} = 1.6 \times 10^{-19}$ J]

**Response Type :** Numeric

**Evaluation Required For SA :** Yes

**Show Word Count :** Yes

**Answers Type :** Equal

**Text Areas :** PlainText

**Possible Answers :**

100

**Question Number : 54 Question Id : 864351414 Question Type : SA**

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

For the reaction  $A(g) \rightleftharpoons B(g)$  at 495 K,  $\Delta_r G^\circ = -9.478$  kJ mol<sup>-1</sup>.

If we start the reaction in a closed container at 495 K with 22 millimoles of A, the amount of B in the equilibrium mixture is \_\_\_\_\_ millimoles. (Round off to the Nearest Integer).

[ $R = 8.314$  J mol<sup>-1</sup> K<sup>-1</sup> ;  $\ln 10 = 2.303$ ]

**Response Type :** Numeric

**Evaluation Required For SA :** Yes

**Show Word Count :** Yes

**Answers Type :** Equal

**Text Areas :** PlainText

**Possible Answers :**

100

**Question Number : 54 Question Id : 864351414 Question Type : SA**

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

$A(g) \rightleftharpoons B(g)$  495 K,  $\Delta_r G^\circ = -9.478 \text{ kJ mol}^{-1}$  ह्या अभिक्रियेसाठी, जर आपण हि अभिक्रिया 495 K ला बंद डब्यात 22 मिलीमोलस् A सोबत सुरु केली, तर समतोल मिश्रणातील B ची मात्रा \_\_\_\_\_ मिलीमोलस् असेल. (जवळच्या पूर्णांकात)

[ $R = 8.314 \text{ J mol}^{-1} \text{ K}^{-1}$  ;  $\ln 10 = 2.303$ ]

**Response Type : Numeric**

**Evaluation Required For SA : Yes**

**Show Word Count : Yes**

**Answers Type : Equal**

**Text Areas : PlainText**

**Possible Answers :**

100

**Question Number : 55 Question Id : 864351415 Question Type : SA**

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

$AB_2$  is 10% dissociated in water to  $A^{2+}$  and  $B^-$ . The boiling point of a 10.0 molal aqueous solution of  $AB_2$  is \_\_\_\_\_ $^\circ\text{C}$ . (Round off to the Nearest Integer).

[Given : Molal elevation constant of water  $K_b = 0.5 \text{ K kg mol}^{-1}$  boiling point of pure water =  $100^\circ\text{C}$ ]

**Response Type : Numeric**

**Evaluation Required For SA : Yes**

**Show Word Count : Yes**

**Answers Type : Equal**

**Text Areas : PlainText**

**Possible Answers :**

100

**Question Number : 55 Question Id : 864351415 Question Type : SA**

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

$AB_2$  चे पाण्यात 10% विचरण होऊन  $A^{2+}$  आणि  $B^-$  तयार होतात. 10.0 मोलल  $AB_2$  जलीय द्रावणाचा उत्कलनांक \_\_\_\_\_ $^\circ\text{C}$  आहे. (जवळच्या पूर्णांकात)

[ दिलेले आहे : पाण्याचा मोलल वर्धन स्थिरांक  $K_b = 0.5 \text{ K kg mol}^{-1}$ , शुद्ध पाण्याचा उत्कलनांक =  $100^\circ\text{C}$ ]

**Response Type : Numeric**



**Evaluation Required For SA : Yes**

**Show Word Count : Yes**

**Answers Type : Equal**

**Text Areas : PlainText**

**Possible Answers :**

100

**Question Number : 56 Question Id : 864351416 Question Type : SA**

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

Two salts  $A_2X$  and  $MX$  have the same value of solubility product of  $4.0 \times 10^{-12}$ . The ratio of

their molar solubilities i.e.  $\frac{S(A_2X)}{S(MX)} = \text{_____}$ . (Round off to the Nearest Integer).

**Response Type : Numeric**

**Evaluation Required For SA : Yes**

**Show Word Count : Yes**

**Answers Type : Equal**

**Text Areas : PlainText**

**Possible Answers :**

100

**Question Number : 56 Question Id : 864351416 Question Type : SA**

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

$A_2X$  आणि  $MX$  ह्या दोन क्षारांचे द्रावणीयता गुणाकार सारखे असून त्याची किंमत  $4.0 \times 10^{-12}$  आहे. त्यांच्या

ग्रॅमरेणु द्रावणीयतांचे गुणोत्तर म्हणजे  $\frac{S(A_2X)}{S(MX)} = \text{_____}$ . (पूर्णांकात उत्तर)

**Response Type : Numeric**

**Evaluation Required For SA : Yes**

**Show Word Count : Yes**

**Answers Type : Equal**

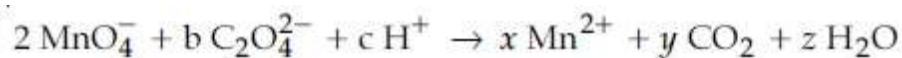
**Text Areas : PlainText**

**Possible Answers :**

100

**Question Number : 57 Question Id : 864351417 Question Type : SA**

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



If the above equation is balanced with integer coefficients, the value of  $c$  is \_\_\_\_\_.  
(Round off to the Nearest Integer).

**Response Type :** Numeric

**Evaluation Required For SA :** Yes

**Show Word Count :** Yes

**Answers Type :** Equal

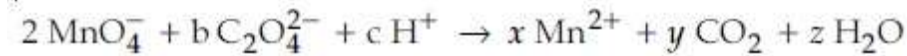
**Text Areas :** PlainText

**Possible Answers :**

100

**Question Number : 57 Question Id : 864351417 Question Type : SA**

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



जर वरील समीकरण पूर्णाकातील गुणांक वापरून संतुलित केले तर c ची किंमत \_\_\_\_\_ आहे.  
(पूर्णाकात उत्तर)

**Response Type :** Numeric

**Evaluation Required For SA :** Yes

**Show Word Count :** Yes

**Answers Type :** Equal

**Text Areas :** PlainText

**Possible Answers :**

100

**Question Number : 58 Question Id : 864351418 Question Type : SA**

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

The decomposition of formic acid on gold surface follows first order kinetics. If the rate constant at 300 K is  $1.0 \times 10^{-3} \text{ s}^{-1}$  and the activation energy  $E_a = 11.488 \text{ kJ mol}^{-1}$ , the rate constant at 200 K is \_\_\_\_\_  $\times 10^{-5} \text{ s}^{-1}$ . (Round off to the Nearest Integer).

(Given :  $R = 8.314 \text{ J mol}^{-1} \text{ K}^{-1}$ )

**Response Type :** Numeric

**Evaluation Required For SA :** Yes

**Show Word Count :** Yes

**Answers Type :** Equal

**Text Areas :** PlainText

**Possible Answers :**

100

**Question Number : 58 Question Id : 864351418 Question Type : SA**

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

फॉर्मिक आम्लाचे सोन्याच्या पृष्ठभागावरील विघटन प्रथम कोटीची गतिज दाखवते. जर 300 K ला गती स्थिरांक  $1.0 \times 10^{-3} \text{ s}^{-1}$  आणि सक्रियण ऊर्जा  $E_a = 11.488 \text{ kJ mol}^{-1}$  आहे, तर 200 K ला गती स्थिरांक \_\_\_\_\_  $\times 10^{-5} \text{ s}^{-1}$  आहे. (जवळच्या पूर्णाकात)

(दिलेले आहे  $R = 8.314 \text{ J mol}^{-1} \text{ K}^{-1}$ )

**Response Type :** Numeric

**Evaluation Required For SA :** Yes

**Show Word Count :** Yes

**Answers Type :** Equal

**Text Areas :** PlainText

**Possible Answers :**

100

**Question Number : 59 Question Id : 864351419 Question Type : SA**

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

The equivalents of ethylene diamine required to replace the neutral ligands from the coordination sphere of the trans-complex of  $\text{CoCl}_3 \cdot 4\text{NH}_3$  is \_\_\_\_\_. (Round off to the Nearest Integer).

**Response Type :** Numeric

**Evaluation Required For SA :** Yes

**Show Word Count :** Yes

**Answers Type :** Equal

**Text Areas :** PlainText

**Possible Answers :**

100

**Question Number : 59 Question Id : 864351419 Question Type : SA**

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

$\text{CoCl}_3 \cdot 4\text{NH}_3$  च्या पार (trans) जटिलाच्या सहबद्धता गोलातून उदासिन संलग्नीना बदलण्यासाठी लागणारे इथायलिन डायअमाइनचे सममूल्य \_\_\_\_\_ आहेत. (जवळच्या पूर्णाकात)

**Response Type :** Numeric

**Evaluation Required For SA :** Yes

**Show Word Count :** Yes

**Answers Type :** Equal

**Text Areas :** PlainText

**Possible Answers :**

100

**Question Number : 60 Question Id : 864351420 Question Type : SA**

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

Complete combustion of 750 g of an organic compound provides 420 g of CO<sub>2</sub> and 210 g of H<sub>2</sub>O. The percentage composition of carbon and hydrogen in organic compound is 15.3 and \_\_\_\_\_ respectively. (Round off to the Nearest Integer).

**Response Type :** Numeric

**Evaluation Required For SA :** Yes

**Show Word Count :** Yes

**Answers Type :** Equal

**Text Areas :** PlainText

**Possible Answers :**

100

**Question Number : 60 Question Id : 864351420 Question Type : SA**

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

750 g एका कार्बनी संयुगाचे पूर्ण ज्वलन केले असता 420 g CO<sub>2</sub> आणि 210 g H<sub>2</sub>O तयार झाले. कार्बन आणि हायड्रोजनचे ह्या कार्बनी संयुगातील शेकडा घटकप्रमाण 15.3 आणि \_\_\_\_\_ अनुक्रमे आहे. (जवळच्या पूर्णांकात)

**Response Type :** Numeric

**Evaluation Required For SA :** Yes

**Show Word Count :** Yes

**Answers Type :** Equal

**Text Areas :** PlainText

**Possible Answers :**

100

## Mathematics Section A

|  |           |
|--|-----------|
| <b>Section Id :</b>                          | 86435129  |
| <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>                      | 86435129  |
| <b>Question Shuffling Allowed :</b>          | Yes       |

**Question Number : 61 Question Id : 864351421 Question Type : MCQ Option Shuffling : Yes Is**

**Question Mandatory : No**

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

Let  $A = \begin{bmatrix} i & -i \\ -i & i \end{bmatrix}$ ,  $i = \sqrt{-1}$ . Then, the system of linear equations  $A^8 \begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 8 \\ 64 \end{bmatrix}$  has :

**Options :**

8643511261. No solution

8643511262. A unique solution

8643511263. Infinitely many solutions

8643511264. Exactly two solutions

**Question Number : 61 Question Id : 864351421 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No**

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

समजा  $A = \begin{bmatrix} i & -i \\ -i & i \end{bmatrix}$ ,  $i = \sqrt{-1}$ , जर  $A^8 \begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 8 \\ 64 \end{bmatrix}$  या रेखीय समीकरणांच्या (linear equations)

प्रणालीची :

**Options :**

8643511261. उकल नाही आहे.

8643511262. एकमेव उकल आहे.

8643511263. अनंत बहुउकली आहेत.

8643511264. तंतोतंत दोन उकली आहेत.

**Question Number : 62 Question Id : 864351422 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No**

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

Let the functions  $f: \mathbb{R} \rightarrow \mathbb{R}$  and  $g: \mathbb{R} \rightarrow \mathbb{R}$  be defined as :

$$f(x) = \begin{cases} x + 2, & x < 0 \\ x^2, & x \geq 0 \end{cases} \text{ and } g(x) = \begin{cases} x^3, & x < 1 \\ 3x - 2, & x \geq 1 \end{cases}$$

Then, the number of points in  $\mathbb{R}$  where  $(f \circ g)(x)$  is NOT differentiable is equal to :

**Options :**

8643511265. 0

8643511266. 1

8643511267. 2

8643511268. 3

**Question Number : 62 Question Id : 864351422 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No**

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

समजा  $f: \mathbb{R} \rightarrow \mathbb{R}$  आणि  $g: \mathbb{R} \rightarrow \mathbb{R}$  :

$$f(x) = \begin{cases} x + 2, & x < 0 \\ x^2, & x \geq 0 \end{cases} \text{ आणि } g(x) = \begin{cases} x^3, & x < 1 \\ 3x - 2, & x \geq 1 \end{cases}$$

यांना निश्चित करणारे आहे तर,  $\mathbb{R}$  मधील त्या बिंदूची संख्या, जेव्हा  $(f \circ g)(x)$  हे विकलनीय (differentiable) नाही, बरोबर \_\_\_\_\_ आहे.

**Options :**

8643511265. 0

8643511266. 1

8643511267. 2

8643511268. 3

**Question Number : 63 Question Id : 864351423 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No**

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

Let P be a plane  $lx + my + nz = 0$  containing the line,  $\frac{1-x}{1} = \frac{y+4}{2} = \frac{z+2}{3}$ . If plane P divides the line segment AB joining points A(-3, -6, 1) and B(2, 4, -3) in ratio k : 1 then the value of k is equal to :

Options :

8643511269. 2

8643511270. 1.5

8643511271. 3

8643511272. 4

Question Number : 63 Question Id : 864351423 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

समजा P हे  $\frac{1-x}{1} = \frac{y+4}{2} = \frac{z+2}{3}$  या रेषेला समाविष्ट करणारे प्रतल  $lx + my + nz = 0$  आहे. जर प्रतल P हे A(-3, -6, 1) आणि B(2, 4, -3) या बिंदूना जोडणाऱ्या रेषाखंड AB ला k : 1 या प्रमाणात विभागत असेल, तर k चे मूल्य बरोबर \_\_\_\_\_ आहे.

Options :

8643511269. 2

8643511270. 1.5

8643511271. 3

8643511272. 4

Question Number : 64 Question Id : 864351424 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

If for a > 0, the feet of perpendiculars from the points A(a, -2a, 3) and B(0, 4, 5) on the plane  $lx + my + nz = 0$  are points C(0, -a, -1) and D respectively, then the length of line segment CD is equal to :

Options :

8643511273.  $\sqrt{31}$

8643511274.  $\sqrt{66}$

8643511275.  $\sqrt{41}$

8643511276.  $\sqrt{55}$

**Question Number : 64 Question Id : 864351424 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No**

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

जर  $a > 0$  साठी,  $lx + my + nz = 0$  या प्रतलावरील  $A(a, -2a, 3)$  आणि  $B(0, 4, 5)$  या बिंदूंचा लंबाचा पाया (foot of perpendiculars) अनुक्रमे बिंदू  $C(0, -a, -1)$  आणि  $D$  आहेत. तर रेषाखंड (line segment)  $CD$  ची लांबी बरोबर \_\_\_\_\_ आहे.

**Options :**

8643511273.  $\sqrt{31}$

8643511274.  $\sqrt{66}$

8643511275.  $\sqrt{41}$

8643511276.  $\sqrt{55}$

**Question Number : 65 Question Id : 864351425 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No**

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

Consider three observations  $a$ ,  $b$  and  $c$  such that  $b = a + c$ . If the standard deviation of  $a + 2$ ,  $b + 2$ ,  $c + 2$  is  $d$ , then which of the following is true ?

**Options :**

8643511277.  $b^2 = 3(a^2 + c^2) - 9d^2$

8643511278.  $b^2 = 3(a^2 + c^2) + 9d^2$

8643511279.  $b^2 = a^2 + c^2 + 3d^2$



8643511280.  $b^2 = 3(a^2 + c^2 + d^2)$

**Question Number : 65 Question Id : 864351425 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No**

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

a, b आणि c या तीन निरीक्षणांचा विचार करा जसे की  $b = a + c$ . जर  $a + 2, b + 2, c + 2$  यांचे प्रमाण विचलन (standard deviation) d आहे, तर खालीलपैकी कोणते सत्य आहे?

**Options :**

8643511277.  $b^2 = 3(a^2 + c^2) - 9d^2$

8643511278.  $b^2 = 3(a^2 + c^2) + 9d^2$

8643511279.  $b^2 = a^2 + c^2 + 3d^2$

8643511280.  $b^2 = 3(a^2 + c^2 + d^2)$

**Question Number : 66 Question Id : 864351426 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No**

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

Let the position vectors of two points P and Q be  $3\hat{i} - \hat{j} + 2\hat{k}$  and  $\hat{i} + 2\hat{j} - 4\hat{k}$ ,

respectively. Let R and S be two points such that the direction ratios of lines PR and QS are

$(4, -1, 2)$  and  $(-2, 1, -2)$ , respectively. Let lines PR and QS intersect at T. If the

vector  $\vec{TA}$  is perpendicular to both  $\vec{PR}$  and  $\vec{QS}$  and the length of vector  $\vec{TA}$  is  $\sqrt{5}$  units,

then the modulus of a position vector of A is :

**Options :**

8643511281.  $\sqrt{5}$

8643511282.  $\sqrt{171}$

8643511283.  $\sqrt{227}$

8643511284.  $\sqrt{482}$

**Question Number : 66 Question Id : 864351426 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No**

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

समजा P आणि Q या दोन बिंदूचा स्थान सदिश (position vectors) अनुक्रमे  $3\hat{i} - \hat{j} + 2\hat{k}$  आणि  $\hat{i} + 2\hat{j} - 4\hat{k}$  आहे. समजा R आणि S हे दोन बिंदू आहेत जसे की PR आणि QS या रेषांचे दिक् गुणोत्तर (direction ratios) अनुक्रमे (4, -1, 2) आणि (-2, 1, -2) आहे. समजा PR आणि QS या रेषा T मध्ये छेदतात.

जर  $\vec{TA}$  हा सदिश  $\vec{PR}$  आणि  $\vec{QS}$  या दोघांना लंब आहे आणि  $\vec{TA}$  या सदिशाची लांबी  $\sqrt{5}$  एकक आहे, तर A च्या स्थान सदिशाचा मापांक (modulus) \_\_\_\_\_ आहे.

**Options :**

8643511281.  $\sqrt{5}$

8643511282.  $\sqrt{171}$

8643511283.  $\sqrt{227}$

8643511284.  $\sqrt{482}$

**Question Number : 67 Question Id : 864351427 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No**

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

Let a vector  $\alpha\hat{i} + \beta\hat{j}$  be obtained by rotating the vector  $\sqrt{3}\hat{i} + \hat{j}$  by an angle  $45^\circ$  about the origin in counterclockwise direction in the first quadrant. Then the area of triangle having vertices  $(\alpha, \beta)$ ,  $(0, \beta)$  and  $(0, 0)$  is equal to :

**Options :**

8643511285.  $\frac{1}{2}$

8643511286. 1

8643511287.  $2\sqrt{2}$

8643511288.  $\frac{1}{\sqrt{2}}$

**Question Number : 67 Question Id : 864351427 Question Type : MCQ Option Shuffling : Yes Is**

**Question Mandatory : No**

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

समजा आरंभ बिंदूच्या संदर्भात सदिश  $\sqrt{3}\hat{i} + \hat{j}$  ला प्रथम चरणामध्ये घड्याळ्याच्या काट्यांच्या विरुद्ध दिशेने (counterclockwise direction)  $45^\circ$  च्या कोनापर्यंत फिरविल्यानंतर सदिश  $\alpha\hat{i} + \beta\hat{j}$  प्राप्त होते. तर  $(\alpha, \beta)$ ,  $(0, \beta)$  आणि  $(0, 0)$  हे शिरोबिंदू असणाऱ्या त्रिकोणाचे क्षेत्रफळ बरोबर \_\_\_\_\_ आहे.

**Options :**

8643511285.  $\frac{1}{2}$

8643511286. 1

8643511287.  $2\sqrt{2}$

8643511288.  $\frac{1}{\sqrt{2}}$

**Question Number : 68 Question Id : 864351428 Question Type : MCQ Option Shuffling : Yes Is**

**Question Mandatory : No**

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

The number of roots of the equation,

$$(81)^{\sin^2 x} + (81)^{\cos^2 x} = 30$$

in the interval  $[0, \pi]$  is equal to :

**Options :**

8643511289. 2

8643511290. 3

8643511291. 4

8643511292. 8

**Question Number : 68 Question Id : 864351428 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No**

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

$(81)^{\sin^2 x} + (81)^{\cos^2 x} = 30$  या समीकरणाच्या  $[0, \pi]$  या अंतराला मधील (in the interval) मूळांची संख्या बरोबर \_\_\_\_\_ आहे.

**Options :**

8643511289. 2

8643511290. 3

8643511291. 4

8643511292. 8

**Question Number : 69 Question Id : 864351429 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No**

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

A pack of cards has one card missing. Two cards are drawn randomly and are found to be spades. The probability that the missing card is not a spade, is :

**Options :**

8643511293.  $\frac{22}{425}$

8643511294.  $\frac{52}{867}$

8643511295.  $\frac{39}{50}$

8643511296.  $\frac{3}{4}$

**Question Number : 69 Question Id : 864351429 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No**

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

एका पत्त्याच्या (cards) गड्ड्यामधून (pack) एक पत्ता गहाळ आहे. दोन पत्ते यादृच्छिक (randomly) पणे काढले आणि ते इस्पिकचा पत्ते असल्याचे आढळले. गहाळ झालेला पत्ता हा इस्पिक (spade) चा पत्ता नाही याची संभाव्यता (probability) \_\_\_\_\_ आहे.

**Options :**

8643511293.  $\frac{22}{425}$

8643511294.  $\frac{52}{867}$

8643511295.  $\frac{39}{50}$

8643511296.  $\frac{3}{4}$

**Question Number : 70 Question Id : 864351430 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No**

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

The range of  $a \in \mathbb{R}$  for which the function

$f(x) = (4a - 3)(x + \log_e 5) + 2(a - 7) \cot\left(\frac{x}{2}\right) \sin^2\left(\frac{x}{2}\right)$ ,  $x \neq 2n\pi, n \in \mathbb{N}$  has critical points,

is :

**Options :**

8643511297.  $[1, \infty)$

8643511298.  $(-\infty, -1]$

8643511299.  $\left[-\frac{4}{3}, 2\right]$

8643511300.  $(-3, 1)$

**Question Number : 70 Question Id : 864351430 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No**

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

$a \in \mathbb{R}$  ची व्याप्ती (range) \_\_\_\_\_ आहे.

ज्यासाठी  $f(x) = (4a - 3)(x + \log_e 5) + 2(a - 7) \cot\left(\frac{x}{2}\right) \sin^2\left(\frac{x}{2}\right)$ ,  $x \neq 2n\pi, n \in \mathbb{N}$  या फलाचे क्रांतिक बिंदू (critical points) आहेत.

**Options :**

8643511297.  $[1, \infty)$

8643511298.  $(-\infty, -1]$

8643511299.  $\left[-\frac{4}{3}, 2\right]$

8643511300.  $(-3, 1)$

**Question Number : 71 Question Id : 864351431 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No**

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

If  $n$  is the number of irrational terms in the expansion of  $(3^{1/4} + 5^{1/8})^{60}$ , then  $(n - 1)$  is divisible by :

**Options :**

8643511301. 30

8643511302. 8

8643511303. 26

8643511304. 7

Question Number : 71 Question Id : 864351431 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

जर  $n$  ही  $(3\frac{1}{4} + 5\frac{1}{8})^{60}$  या विस्तारा मधील अपरिमेय (irrational) पदांची संख्या आहे, तर  $(n-1)$  ला \_\_\_\_\_ ने विभाज्य (divisible) आहे.

Options :

8643511301. 30

8643511302. 8

8643511303. 26

8643511304. 7

Question Number : 72 Question Id : 864351432 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

Let  $[x]$  denote greatest integer less than or equal to  $x$ . If for  $n \in \mathbb{N}$ ,

$$(1 - x + x^3)^n = \sum_{j=0}^{3n} a_j x^j, \text{ then}$$

$$\sum_{j=0}^{\left[\frac{3n}{2}\right]} a_{2j} + 4 \sum_{j=0}^{\left[\frac{3n-1}{2}\right]} a_{2j+1} \text{ is equal to :}$$

Options :

8643511305.  $2^{n-1}$

8643511306.  $n$

8643511307. 2

8643511308. 1

Question Number : 72 Question Id : 864351432 Question Type : MCQ Option Shuffling : Yes Is  
Question Mandatory : No  
Correct Marks : 4 Wrong Marks : 1

समजा  $[x]$  हे  $x$  किंवा  $x$  पेक्षा लहान असणारे महत्तम पूर्णांक (greatest integer) दर्शविते.

जर  $n \in \mathbb{N}$  साठी,  $(1 - x + x^3)^n = \sum_{j=0}^{3n} a_j x^j$ , तर  $\sum_{j=0}^{\lfloor \frac{3n}{2} \rfloor} a_{2j} + 4 \sum_{j=0}^{\lfloor \frac{3n-1}{2} \rfloor} a_{2j+1}$  बरोबर \_\_\_\_\_

आहे.

Options :

8643511305.  $2^{n-1}$

8643511306.  $n$

8643511307.  $2$

8643511308.  $1$

Question Number : 73 Question Id : 864351433 Question Type : MCQ Option Shuffling : Yes Is  
Question Mandatory : No  
Correct Marks : 4 Wrong Marks : 1

Which of the following Boolean expression is a tautology ?

Options :

8643511309.  $(p \wedge q) \vee (p \vee q)$

8643511310.  $(p \wedge q) \vee (p \rightarrow q)$

8643511311.  $(p \wedge q) \wedge (p \rightarrow q)$

8643511312.  $(p \wedge q) \rightarrow (p \rightarrow q)$

Question Number : 73 Question Id : 864351433 Question Type : MCQ Option Shuffling : Yes Is  
Question Mandatory : No



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

खालीलपैकी कोणत्या बुलीय पदावलीचा (Boolean expression) अनुलाप (tautology) आहे ?

**Options :**

8643511309.  $(p \wedge q) \vee (p \vee q)$

8643511310.  $(p \wedge q) \vee (p \rightarrow q)$

8643511311.  $(p \wedge q) \wedge (p \rightarrow q)$

8643511312.  $(p \wedge q) \rightarrow (p \rightarrow q)$

**Question Number : 74 Question Id : 864351434 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No**

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

Let  $S_k = \sum_{r=1}^k \tan^{-1} \left( \frac{6^r}{2^{2r+1} + 3^{2r+1}} \right)$ . Then  $\lim_{k \rightarrow \infty} S_k$  is equal to :

**Options :**

8643511313.  $\frac{\pi}{2}$

8643511314.  $\cot^{-1} \left( \frac{3}{2} \right)$

8643511315.  $\tan^{-1} \left( \frac{3}{2} \right)$

8643511316.  $\tan^{-1} (3)$

**Question Number : 74 Question Id : 864351434 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No**

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

समजा  $S_k = \sum_{r=1}^k \tan^{-1} \left( \frac{6^r}{2^{2r+1} + 3^{2r+1}} \right)$ , तर  $\lim_{k \rightarrow \infty} S_k$  बरोबर \_\_\_\_\_ आहे.

**Options :**

8643511313.  $\frac{\pi}{2}$

8643511314.  $\cot^{-1}\left(\frac{3}{2}\right)$

8643511315.  $\tan^{-1}\left(\frac{3}{2}\right)$

8643511316.  $\tan^{-1}(3)$

**Question Number : 75 Question Id : 864351435 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No**

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

The number of elements in the set  $\{x \in \mathbb{R} : (|x| - 3) |x + 4| = 6\}$  is equal to :

**Options :**

8643511317. 1

8643511318. 2

8643511319. 3

8643511320. 4

**Question Number : 75 Question Id : 864351435 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No**

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

$\{x \in \mathbb{R} : (|x| - 3) |x + 4| = 6\}$  या संचामधील घटकांची (elements) संख्या बरोबर \_\_\_\_\_ आहे.

**Options :**

8643511317. 1

8643511318. 2

8643511319. 3

8643511320. 4

**Question Number : 76 Question Id : 864351436 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No**

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

If for  $x \in \left(0, \frac{\pi}{2}\right)$ ,  $\log_{10} \sin x + \log_{10} \cos x = -1$  and  $\log_{10}(\sin x + \cos x) = \frac{1}{2}(\log_{10} n - 1)$ ,  $n > 0$ ,

then the value of  $n$  is equal to :

**Options :**

8643511321. 9

8643511322. 12

8643511323. 16

8643511324. 20

**Question Number : 76 Question Id : 864351436 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No**

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

जर  $x \in \left(0, \frac{\pi}{2}\right)$  साठी,  $\log_{10} \sin x + \log_{10} \cos x = -1$  आणि  $\log_{10}(\sin x + \cos x) = \frac{1}{2}(\log_{10} n - 1)$ ,

$n > 0$ , तर  $n$  चे मूल्य बरोबर \_\_\_\_\_ आहे.

**Options :**

8643511321. 9

8643511322. 12

8643511323. 16

8643511324. 20

**Question Number : 77 Question Id : 864351437 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No**

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

If  $y=y(x)$  is the solution of the differential equation,  $\frac{dy}{dx} + 2y \tan x = \sin x$ ,  $y\left(\frac{\pi}{3}\right) = 0$ , then the maximum value of the function  $y(x)$  over  $\mathbf{R}$  is equal to :

**Options :**

8643511325. 8

8643511326.  $\frac{1}{2}$

8643511327.  $-\frac{15}{4}$

8643511328.  $\frac{1}{8}$

**Question Number : 77 Question Id : 864351437 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No**

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

जर  $y=y(x)$  ही  $\frac{dy}{dx} + 2y \tan x = \sin x$  या विकलक समीकरणाची (differential equation) उकल आहे,

$y\left(\frac{\pi}{3}\right) = 0$ , तर  $y(x)$  या फलाचे  $\mathbf{R}$  वरील कमाल मूल्य (maximum value) बरोबर \_\_\_\_\_ आहे.

**Options :**

8643511325. 8

8643511326.  $\frac{1}{2}$

8643511327.  $-\frac{15}{4}$

8643511328.  $\frac{1}{8}$

**Question Number : 78 Question Id : 864351438 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No**

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

The locus of the midpoints of the chord of the circle,  $x^2 + y^2 = 25$  which is tangent to the

hyperbola,  $\frac{x^2}{9} - \frac{y^2}{16} = 1$  is :

**Options :**

8643511329.  $(x^2 + y^2)^2 - 9x^2 + 144y^2 = 0$

8643511330.  $(x^2 + y^2)^2 - 9x^2 - 16y^2 = 0$

8643511331.  $(x^2 + y^2)^2 - 9x^2 + 16y^2 = 0$

8643511332.  $(x^2 + y^2)^2 - 16x^2 + 9y^2 = 0$

**Question Number : 78 Question Id : 864351438 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No**

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

$x^2 + y^2 = 25$  या वर्तुळाची जीवा (chord) ही  $\frac{x^2}{9} - \frac{y^2}{16} = 1$  या अपास्त (hyperbola) ची स्पर्शिका (tangent)

आहे. त्या जीवेच्या मध्यबिंदूचे निधान (locus) \_\_\_\_\_ आहे.

**Options :**

8643511329.  $(x^2 + y^2)^2 - 9x^2 + 144y^2 = 0$

8643511330.  $(x^2 + y^2)^2 - 9x^2 - 16y^2 = 0$

8643511331.  $(x^2 + y^2)^2 - 9x^2 + 16y^2 = 0$

8643511332.  $(x^2 + y^2)^2 - 16x^2 + 9y^2 = 0$

**Question Number : 79 Question Id : 864351439 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No**

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

If the three normals drawn to the parabola,  $y^2 = 2x$  pass through the point  $(a, 0)$   $a \neq 0$ , then 'a' must be greater than :

**Options :**

8643511333. 1

8643511334. -1

8643511335.  $\frac{1}{2}$

8643511336.  $-\frac{1}{2}$

**Question Number : 79 Question Id : 864351439 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No**

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

जर  $y^2 = 2x$  या अन्वस्त (parabola) वर काढलेले तीन प्रलंब (normals),  $(a, 0)$   $a \neq 0$  या बिंदू मधून जातात, तर  $a$  हा \_\_\_\_\_ पेक्षा जास्त असलाच पाहिजे.

**Options :**

8643511333. 1

8643511334. -1

8643511335.  $\frac{1}{2}$

8643511336.  $-\frac{1}{2}$

**Question Number : 80 Question Id : 864351440 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No**

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

Let a complex number  $z$ ,  $|z| \neq 1$ , satisfy  $\log_{\frac{1}{\sqrt{2}}} \left( \frac{|z| + 11}{(|z| - 1)^2} \right) \leq 2$ . Then, the largest value of

$|z|$  is equal to \_\_\_\_\_.

**Options :**

8643511337. 5

8643511338. 6

8643511339. 7

8643511340. 8

**Question Number : 80 Question Id : 864351440 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No**

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

समजा एक संमिश्र संख्या  $z$ ,  $|z| \neq 1$  ही  $\log_{\frac{1}{\sqrt{2}}} \left( \frac{|z| + 11}{(|z| - 1)^2} \right) \leq 2$  चे समाधान करते. तर  $|z|$  चे मोठे मूल्य

(largest value) बरोबर \_\_\_\_\_ आहे.

**Options :**

8643511337. 5

8643511338. 6

8643511339. 7

8643511340. 8

## Mathematics Section B

|  |           |
|--|-----------|
| <b>Section Id :</b>                          | 86435130  |
| <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         |
| <b>Section Marks :</b>                       | 20        |
| <b>Mark As Answered Required? :</b>          | Yes       |
| <b>Sub-Section Number :</b>                  | 1         |
| <b>Sub-Section Id :</b>                      | 86435130  |
| <b>Question Shuffling Allowed :</b>          | Yes       |

**Question Number : 81 Question Id : 864351441 Question Type : SA Correct Marks : 4 Wrong Marks : 0**

Let  $z$  and  $w$  be two complex numbers such that  $w = z\bar{z} - 2z + 2$ ,  $\left|\frac{z+i}{z-3i}\right| = 1$  and  $\text{Re}(w)$  has minimum value. Then, the minimum value of  $n \in \mathbb{N}$  for which  $w^n$  is real, is equal to \_\_\_\_\_.

**Response Type :** Numeric

**Evaluation Required For SA :** Yes

**Show Word Count :** Yes

**Answers Type :** Equal

**Text Areas :** PlainText

**Possible Answers :**

100

**Question Number : 81 Question Id : 864351441 Question Type : SA**

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

समजा  $z$  आणि  $w$  या दोन संमिश्र संख्या (complex number) आहेत. जसे की  $w = z\bar{z} - 2z + 2$ ,  $\left|\frac{z+i}{z-3i}\right| = 1$  आणि  $\text{Re}(w)$  हे किमान मूल्य (minimum value) आहे. तर  $n \in \mathbb{N}$  चे किमान मूल्य (minimum value) ज्यासाठी  $w^n$  हे वास्तव (real) आहे, बरोबर \_\_\_\_\_ आहे.

**Response Type :** Numeric

**Evaluation Required For SA :** Yes

**Show Word Count :** Yes

**Answers Type :** Equal

**Text Areas :** PlainText

**Possible Answers :**

100

**Question Number : 82 Question Id : 864351442 Question Type : SA**

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

Let  $f: \mathbb{R} \rightarrow \mathbb{R}$  be a continuous function such that  $f(x) + f(x+1) = 2$ , for all  $x \in \mathbb{R}$ . If  $I_1 = \int_0^8 f(x) dx$  and  $I_2 = \int_{-1}^3 f(x) dx$ , then the value of  $I_1 + 2I_2$  is equal to \_\_\_\_\_.

**Response Type :** Numeric

**Evaluation Required For SA :** Yes

**Show Word Count :** Yes

**Answers Type :** Equal

**Text Areas :** PlainText

**Possible Answers :**



Question Number : 82 Question Id : 864351442 Question Type : SA

Correct Marks : 4 Wrong Marks : 0

समजा  $f: \mathbb{R} \rightarrow \mathbb{R}$  हे संतत फल (continuous function) आहे जसे की  $f(x) + f(x+1) = 2$ , सर्व  $x \in \mathbb{R}$  साठी,

जर  $I_1 = \int_0^8 f(x) dx$  आणि  $I_2 = \int_{-1}^3 f(x) dx$ , तर  $I_1 + 2I_2$  चे मूल्य बरोबर \_\_\_\_\_ आहे.

Response Type : Numeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Equal

Text Areas : PlainText

Possible Answers :

100

Question Number : 83 Question Id : 864351443 Question Type : SA

Correct Marks : 4 Wrong Marks : 0

If the normal to the curve  $y(x) = \int_0^x (2t^2 - 15t + 10) dt$  at a point  $(a, b)$  is parallel to the line

$x + 3y = -5$ ,  $a > 1$ , then the value of  $|a + 6b|$  is equal to \_\_\_\_\_.

Response Type : Numeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Equal

Text Areas : PlainText

Possible Answers :

100

Question Number : 83 Question Id : 864351443 Question Type : SA

Correct Marks : 4 Wrong Marks : 0

जर  $y(x) = \int_0^x (2t^2 - 15t + 10) dt$  या वक्राचा  $(a, b)$ ,  $a > 1$  या बिंदू वरील प्रलंब (normal)  $x + 3y = -5$

या रेषेला समांतर आहे, तर  $|a + 6b|$  चे मूल्य बरोबर \_\_\_\_\_ आहे.

Response Type : Numeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Equal

Text Areas : PlainText

Possible Answers :

100

Question Number : 84 Question Id : 864351444 Question Type : SA

Correct Marks : 4 Wrong Marks : 0

If  $\lim_{x \rightarrow 0} \frac{ae^x - b\cos x + ce^{-x}}{x \sin x} = 2$ , then  $a + b + c$  is equal to \_\_\_\_\_.

Response Type : Numeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Equal

Text Areas : PlainText

Possible Answers :

100

Question Number : 84 Question Id : 864351444 Question Type : SA

Correct Marks : 4 Wrong Marks : 0

जर  $\lim_{x \rightarrow 0} \frac{ae^x - b\cos x + ce^{-x}}{x \sin x} = 2$ , तर  $a + b + c$  बरोबर \_\_\_\_\_ आहे.

Response Type : Numeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Equal

Text Areas : PlainText

Possible Answers :

100

Question Number : 85 Question Id : 864351445 Question Type : SA

Correct Marks : 4 Wrong Marks : 0

Consider an arithmetic series and a geometric series having four initial terms from the set  $\{11, 8, 21, 16, 26, 32, 4\}$ . If the last terms of these series are the maximum possible four digit numbers, then the number of common terms in these two series is equal to \_\_\_\_\_.

Response Type : Numeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Equal

Text Areas : PlainText

Possible Answers :

100

**Question Number : 85 Question Id : 864351445 Question Type : SA**

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

{11, 8, 21, 16, 26, 32, 4} या संचापासून चार पहिली पदे (four initial terms) असणारे गणित श्रेणी (arithmetic series) आणि भूमिती श्रेणी (Geometric series) यांचा विचार करा. जर या श्रेणींची शेवटची पदे ही जास्तीत जास्त (maximum) शक्य असणारे 4 अंकी संख्या आहेत, तर या दोन श्रेणींमधील समाईक पदां (common terms)ची संख्या बरोबर \_\_\_\_\_ आहे.

**Response Type : Numeric**

**Evaluation Required For SA : Yes**

**Show Word Count : Yes**

**Answers Type : Equal**

**Text Areas : PlainText**

**Possible Answers :**

100

**Question Number : 86 Question Id : 864351446 Question Type : SA**

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

Let  $P = \begin{bmatrix} -30 & 20 & 56 \\ 90 & 140 & 112 \\ 120 & 60 & 14 \end{bmatrix}$  and  $A = \begin{bmatrix} 2 & 7 & \omega^2 \\ -1 & -\omega & 1 \\ 0 & -\omega & -\omega + 1 \end{bmatrix}$  where  $\omega = \frac{-1 + i\sqrt{3}}{2}$ , and  $I_3$  be the

identity matrix of order 3. If the determinant of the matrix  $(P^{-1}AP - I_3)^2$  is  $\alpha\omega^2$ , then the value of  $\alpha$  is equal to \_\_\_\_\_.

**Response Type : Numeric**

**Evaluation Required For SA : Yes**

**Show Word Count : Yes**

**Answers Type : Equal**

**Text Areas : PlainText**

**Possible Answers :**

100

**Question Number : 86 Question Id : 864351446 Question Type : SA**

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

समजा  $P = \begin{bmatrix} -30 & 20 & 56 \\ 90 & 140 & 112 \\ 120 & 60 & 14 \end{bmatrix}$  आणि  $A = \begin{bmatrix} 2 & 7 & \omega^2 \\ -1 & -\omega & 1 \\ 0 & -\omega & -\omega+1 \end{bmatrix}$  जेव्हा  $\omega = \frac{-1 + i\sqrt{3}}{2}$ , आणि  $I_3$  ही 3

कोटीका (order of 3) असणारी अविकारक सारणी (identity matrix) आहे. जर  $(P^{-1}AP - I_3)^2$  या सारणीचा सारणिक (determinant)  $\alpha\omega^2$  आहे, तर  $\alpha$  चे मूल्य बरोबर \_\_\_\_\_ आहे.

**Response Type :** Numeric

**Evaluation Required For SA :** Yes

**Show Word Count :** Yes

**Answers Type :** Equal

**Text Areas :** PlainText

**Possible Answers :**

100

**Question Number : 87 Question Id : 864351447 Question Type : SA**

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

Let  $f: (0, 2) \rightarrow \mathbb{R}$  be defined as  $f(x) = \log_2 \left( 1 + \tan \left( \frac{\pi x}{4} \right) \right)$ .

Then,  $\lim_{n \rightarrow \infty} \frac{2}{n} \left( f \left( \frac{1}{n} \right) + f \left( \frac{2}{n} \right) + \dots + f(1) \right)$  is equal to \_\_\_\_\_.

**Response Type :** Numeric

**Evaluation Required For SA :** Yes

**Show Word Count :** Yes

**Answers Type :** Equal

**Text Areas :** PlainText

**Possible Answers :**

100

**Question Number : 87 Question Id : 864351447 Question Type : SA**

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

समजा  $f: (0, 2) \rightarrow \mathbb{R}$ ,  $f(x) = \log_2 \left( 1 + \tan \left( \frac{\pi x}{4} \right) \right)$  द्वारा निश्चित (defined) करते.

तर  $\lim_{n \rightarrow \infty} \frac{2}{n} \left( f \left( \frac{1}{n} \right) + f \left( \frac{2}{n} \right) + \dots + f(1) \right)$  बरोबर \_\_\_\_\_ आहे.

**Response Type :** Numeric

**Evaluation Required For SA : Yes**

**Show Word Count : Yes**

**Answers Type : Equal**

**Text Areas : PlainText**

**Possible Answers :**

100

**Question Number : 88 Question Id : 864351448 Question Type : SA**

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

The total number of  $3 \times 3$  matrices  $A$  having entries from the set  $\{0, 1, 2, 3\}$  such that the sum of all the diagonal entries of  $AA^T$  is 9, is equal to \_\_\_\_\_.

**Response Type : Numeric**

**Evaluation Required For SA : Yes**

**Show Word Count : Yes**

**Answers Type : Equal**

**Text Areas : PlainText**

**Possible Answers :**

100

**Question Number : 88 Question Id : 864351448 Question Type : SA**

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

$\{0, 1, 2, 3\}$  या संचामधून प्रवेश असलेल्या  $A$  च्या एकूण  $3 \times 3$  सारणीची संख्या, जसे की  $AA^T$  च्या सर्व कर्णात्मक (diagonal) प्रविष्टांची (entries) बेरीज 9 आहे, बरोबर \_\_\_\_\_ आहे.

**Response Type : Numeric**

**Evaluation Required For SA : Yes**

**Show Word Count : Yes**

**Answers Type : Equal**

**Text Areas : PlainText**

**Possible Answers :**

100

**Question Number : 89 Question Id : 864351449 Question Type : SA**

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

Let  $ABCD$  be a square of side of unit length. Let a circle  $C_1$  centered at  $A$  with unit radius is drawn. Another circle  $C_2$  which touches  $C_1$  and the lines  $AD$  and  $AB$  are tangent to it, is also drawn. Let a tangent line from the point  $C$  to the circle  $C_2$  meet the side  $AB$  at  $E$ . If the length of  $EB$  is  $\alpha + \sqrt{3} \beta$ , where  $\alpha, \beta$  are integers, then  $\alpha + \beta$  is equal to \_\_\_\_\_.

**Response Type : Numeric**

**Evaluation Required For SA : Yes**

**Show Word Count : Yes**

Answers Type : Equal

Text Areas : PlainText

Possible Answers :

100

Question Number : 89 Question Id : 864351449 Question Type : SA

Correct Marks : 4 Wrong Marks : 0

समजा बाजूची एकक लांबी असणारा चौरस ABCD आहे. समजा एकक त्रिज्येसह A केंद्र असणारे  $C_1$  हे एक वर्तुळ काढले आहे. दुसरे वर्तुळ  $C_2$  हे  $C_1$  ला स्पर्श करते आणि AD आणि AB या त्यांच्या स्पर्शिका (tangent) सुद्धा काढल्या आहेत. समजा बिंदू C पासून  $C_2$  वर्तुळाची स्पर्शिका रेषा (tangent line) बाजू AB ला E बिंदूत भेटते. जर EB ची लांबी  $\alpha + \sqrt{3} \beta$  आहे, जेव्हा  $\alpha, \beta$  पूर्णांक आहेत, तर  $\alpha + \beta$  बरोबर \_\_\_\_\_ आहे.

Response Type : Numeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Equal

Text Areas : PlainText

Possible Answers :

100

Question Number : 90 Question Id : 864351450 Question Type : SA

Correct Marks : 4 Wrong Marks : 0

Let the curve  $y = y(x)$  be the solution of the differential equation,  $\frac{dy}{dx} = 2(x + 1)$ . If the numerical value of area bounded by the curve  $y = y(x)$  and  $x$ -axis is  $\frac{4\sqrt{8}}{3}$ , then the value of  $y(1)$  is equal to \_\_\_\_\_.

Response Type : Numeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Equal

Text Areas : PlainText

Possible Answers :

100

Question Number : 90 Question Id : 864351450 Question Type : SA

Correct Marks : 4 Wrong Marks : 0

समजा  $y=y(x)$  हे वक्र,  $\frac{dy}{dx}=2(x+1)$  या विकलक समीकरणाची (differential equation) उकल आहे.

जर वक्र  $y=y(x)$  आणि  $x$ -अक्ष यांच्या द्वारे परिबद्ध (bounded) केलेल्या क्षेत्रफळाचे संख्यात्मक मूल्य (numerical value)  $\frac{4\sqrt{8}}{3}$  आहे, तर  $y(1)$  चे मूल्य बरोबर \_\_\_\_\_ आहे.

**Response Type :** Numeric

**Evaluation Required For SA :** Yes

**Show Word Count :** Yes

**Answers Type :** Equal

**Text Areas :** PlainText

**Possible Answers :**

100