

# National Testing Agency

<b>Question Paper Name :</b>	B TECH EM 17th March 2021 Shift 2
<b>Subject Name :</b>	B TECH EM
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<b>Number of Questions :</b>	90
<b>Total Marks :</b>	300
<b>Display Marks:</b>	Yes

## B TECH EM

<b>Group Number :</b>	1
<b>Group Id :</b>	86435148
<b>Group Maximum Duration :</b>	0
<b>Group Minimum Duration :</b>	180
<b>Show Attended Group? :</b>	No
<b>Edit Attended Group? :</b>	No
<b>Break time :</b>	0
<b>Group Marks :</b>	300
<b>Is this Group for Examiner? :</b>	No

## Physics Section A

<b>Section Id :</b>	864351283
<b>Section Number :</b>	1
<b>Section type :</b>	Online
<b>Mandatory or Optional :</b>	Mandatory
<b>Number of Questions :</b>	20
<b>Number of Questions to be attempted :</b>	20
<b>Section Marks :</b>	80
<b>Mark As Answered Required? :</b>	Yes
<b>Sub-Section Number :</b>	1
<b>Sub-Section Id :</b>	864351283
<b>Question Shuffling Allowed :</b>	Yes

**Question Number : 1 Question Id : 8643514231 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1**

A carrier signal  $C(t) = 25 \sin(2.512 \times 10^{10}t)$  is amplitude modulated by a message signal  $m(t) = 5 \sin(1.57 \times 10^8 t)$  and transmitted through an antenna. What will be the bandwidth of the modulated signal ?

**Options :**

86435112691. 50 MHz

86435112692. 8 GHz

86435112693. 2.01 GHz

86435112694. 1987.5 MHz

**Question Number : 1 Question Id : 8643514231 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No**

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

एक वाहनिक तरंग  $C(t) = 25 \sin(2.512 \times 10^{10}t)$  हा निरोप संकेत  $m(t) = 5 \sin(1.57 \times 10^8 t)$  ने आयाम अपरिवर्तित केला व अँन्टेनामधून पारेषित केला. अपरिवर्तित संकेताची पट्टरुंदी किती असेल?

**Options :**

86435112691. 50 MHz

86435112692. 8 GHz

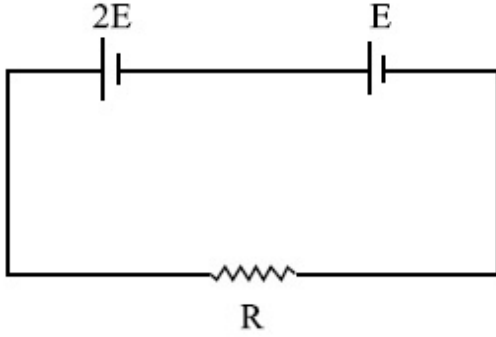
86435112693. 2.01 GHz

86435112694. 1987.5 MHz

**Question Number : 2 Question Id : 8643514232 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No**

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

Two cells of emf  $2E$  and  $E$  with internal resistance  $r_1$  and  $r_2$  respectively are connected in series to an external resistor  $R$  (see figure). The value of  $R$ , at which the potential difference across the terminals of the first cell becomes zero is



Options :

86435112695.  $\frac{r_1}{2} - r_2$

86435112696.  $\frac{r_1}{2} + r_2$

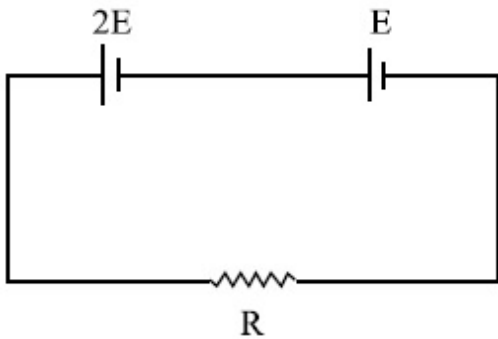
86435112697.  $r_1 - r_2$

86435112698.  $r_1 + r_2$

Question Number : 2 Question Id : 8643514232 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

दोन घट ज्यांचे विद्युतगामक बल  $2E$  व  $E$  आहे व अंतर्गत रोध अनुक्रमे  $r_1$  व  $r_2$  आहे असे बाह्यरोध  $R$  बरोबर एकसरीत जोडले.  $R$  चे मूल्य जेव्हा पहिल्या घटाच्या टोकांमधील विभवांतर शून्य होते, तो \_\_\_\_\_ आहे.



Options :

86435112695.  $\frac{r_1}{2} - r_2$

$$\frac{r_1}{2} + r_2$$

86435112696.

$$r_1 - r_2$$

86435112697.

$$r_1 + r_2$$

86435112698.

**Question Number : 3 Question Id : 8643514233 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No**

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

A sound wave of frequency 245 Hz travels with the speed of  $300 \text{ ms}^{-1}$  along the positive  $x$ -axis. Each point of the wave moves to and fro through a total distance of 6 cm. What will be the mathematical expression of this travelling wave ?

**Options :**

$$86435112699. \quad Y(x, t) = 0.03 [ \sin 5.1x - (0.2 \times 10^3)t ]$$

$$86435112700. \quad Y(x, t) = 0.03 [ \sin 5.1x - (1.5 \times 10^3)t ]$$

$$86435112701. \quad Y(x, t) = 0.06 [ \sin 5.1x - (1.5 \times 10^3)t ]$$

$$86435112702. \quad Y(x, t) = 0.06 [ \sin 0.8x - (0.5 \times 10^3)t ]$$

**Question Number : 3 Question Id : 8643514233 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No**

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

245 Hz वारंवारतेचा ध्वनि तरंग  $300 \text{ ms}^{-1}$  वेगाने धन  $x$ -अक्षाच्या दिशेत प्रवास करित आहे. तरंगाचा प्रत्येक बिंदू एकूण 6 cm अंतरातून पुढे व मागे गतिमान आहे. ह्या प्रवास करणाऱ्या तरंगासाठी गणितीय पदावली कोणती असेल?

**Options :**

$$86435112699. \quad Y(x, t) = 0.03 [ \sin 5.1x - (0.2 \times 10^3)t ]$$

$$86435112700. \quad Y(x, t) = 0.03 [ \sin 5.1x - (1.5 \times 10^3)t ]$$

$$86435112701. \quad Y(x, t) = 0.06 [ \sin 5.1x - (1.5 \times 10^3)t ]$$

86435112702.  $Y(x, t) = 0.06 [ \sin 0.8x - (0.5 \times 10^3)t ]$

**Question Number : 4 Question Id : 8643514234 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No**

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

A geostationary satellite is orbiting around an arbitrary planet 'P' at a height of  $11R$  above the surface of 'P',  $R$  being the radius of 'P'. The time period of another satellite in hours at a height of  $2R$  from the surface of 'P' is \_\_\_\_\_. 'P' has the time period of 24 hours.

**Options :**

86435112703. 5

86435112704.  $6\sqrt{2}$

86435112705. 3

86435112706.  $\frac{6}{\sqrt{2}}$

**Question Number : 4 Question Id : 8643514234 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No**

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

एक भूस्थिर उपग्रह एका स्वेच्छानुसारी 'P' ह्या ग्रहाभोवती 'P' च्या पृष्ठभागापासून  $11R$  उंचीवर कक्षेत भ्रमण करित आहे, जेथे  $R$  ही ग्रह 'P' ची त्रिज्या आहे. 'P' ग्रहाच्या पृष्ठभागापासून  $2R$  ह्या उंचीवर दुसऱ्या उपग्रहाचा काळ तासामध्ये \_\_\_\_\_ आहे. 'P' चा आवर्तकाळ 24 तास आहे.

**Options :**

86435112703. 5

86435112704.  $6\sqrt{2}$

86435112705. 3

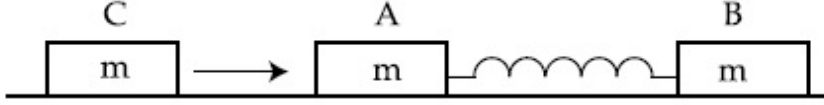
86435112706.  $\frac{6}{\sqrt{2}}$

Question Number : 5 Question Id : 8643514235 Question Type : MCQ Option Shuffling : Yes Is

Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

Two identical blocks A and B each of mass  $m$  resting on the smooth horizontal floor are connected by a light spring of natural length  $L$  and spring constant  $K$ . A third block C of mass  $m$  moving with a speed  $v$  along the line joining A and B collides with A. The maximum compression in the spring is



Options :

86435112707.  $\sqrt{\frac{m}{2K}}$

86435112708.  $v\sqrt{\frac{m}{2K}}$

86435112709.  $\sqrt{\frac{mv}{K}}$

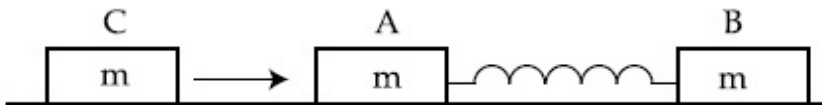
86435112710.  $\sqrt{\frac{mv}{2K}}$

Question Number : 5 Question Id : 8643514235 Question Type : MCQ Option Shuffling : Yes Is

Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

दोन एकसारखे ठोकळे A व B प्रत्येकी  $m$  वस्तुमानाचे गुळगुळीत फरशीवर स्थिर असून  $L$  नैसर्गिक लांबीच्या व  $K$  स्प्रिंगचा स्थिरांक असलेल्या स्प्रिंगला जोडलेले आहेत. C हा तिसरा ठोकळा,  $m$  वस्तुमानाचा A व B जोडणाऱ्या रेषेवर  $v$  वेगाने गतिमान असून A बरोबर संघात करतो. स्प्रिंगमधील महत्तम संपीडन \_\_\_\_\_ आहे.



Options :



86435112707.  $\sqrt{\frac{m}{2K}}$

86435112708.  $v\sqrt{\frac{m}{2K}}$

86435112709.  $\sqrt{\frac{mv}{K}}$

86435112710.  $\sqrt{\frac{mv}{2K}}$

**Question Number : 6 Question Id : 8643514236 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No**

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

Two particles A and B of equal masses are suspended from two massless springs of spring constants  $K_1$  and  $K_2$  respectively. If the maximum velocities during oscillations are equal, the ratio of the amplitude of A and B is

**Options :**

86435112711.  $\frac{K_1}{K_2}$

86435112712.  $\sqrt{\frac{K_1}{K_2}}$

86435112713.  $\frac{K_2}{K_1}$

86435112714.  $\sqrt{\frac{K_2}{K_1}}$

**Question Number : 6 Question Id : 8643514236 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No**

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

सारखाच वस्तुमानाचे A व B हे दोन कण दोन वजनविरहीत स्प्रिंगपासून टांगलेले आहेत व त्यांच्या स्प्रिंगचा स्थिरांक अनुक्रमे  $K_1$  व  $K_2$  आहे. जर दोलनात महत्तम वेग सारखाच आहे, A व B च्या आयामाचे गुणोत्तर \_\_\_\_\_ आहे.

**Options :**

86435112711.  $\frac{K_1}{K_2}$

86435112712.  $\sqrt{\frac{K_1}{K_2}}$

86435112713.  $\frac{K_2}{K_1}$

86435112714.  $\sqrt{\frac{K_2}{K_1}}$

**Question Number : 7 Question Id : 8643514237 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No**

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

**Match List - I with List - II**

**List - I**

**List - II**

- |   |  |
|---|--|
| (a) Phase difference between current and voltage in a purely resistive AC circuit | (i) $\frac{\pi}{2}$ ; current leads voltage      |
| (b) Phase difference between current and voltage in a pure inductive AC circuit   | (ii) zero  |
| (c) Phase difference between current and voltage in a pure capacitive AC circuit  | (iii) $\frac{\pi}{2}$ ; current lags voltage     |
| (d) Phase difference between current and voltage in an LCR series circuit         | (iv) $\tan^{-1}\left(\frac{X_C - X_L}{R}\right)$ |

Choose the most appropriate answer from the options given below :



**Options :**

86435112715. (a)-(i), (b)-(iii), (c)-(iv), (d)-(ii)

86435112716. (a)-(ii), (b)-(iv), (c)-(iii), (d)-(i)

86435112717. (a)-(ii), (b)-(iii), (c)-(i), (d)-(iv)

86435112718. (a)-(ii), (b)-(iii), (c)-(iv), (d)-(i)

**Question Number : 7 Question Id : 8643514237 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

(a) रोधशील प्रत्यावर्ती धारा परिपथात धारा व व्होल्टता

(i)  $\frac{\pi}{2}$ ; धारा व्होल्टतेच्या पुढे

मधील प्रावस्था फरक

(b) प्रवर्तनिक प्रत्यावर्ती धारा परिपथात धारा व व्होल्टता

(ii) शून्य

मधील प्रावस्था फरक

(c) धारितीय प्रत्यावर्ती धारा परिपथात धारा व व्होल्टता

(iii)  $\frac{\pi}{2}$ ; धारा व्होल्टतेच्या मागे

मधील प्रावस्था फरक

(d) LCR एकसरीतील परिपथात धारा व व्होल्टता मधील

(iv)  $\tan^{-1}\left(\frac{X_C - X_L}{R}\right)$ 

प्रावस्था फरक

खाली दिलेल्या पर्यायातून योग्य उत्तर निवडा .:

**Options :**

86435112715. (a)-(i), (b)-(iii), (c)-(iv), (d)-(ii)

86435112716. (a)-(ii), (b)-(iv), (c)-(iii), (d)-(i)

86435112717. (a)-(ii), (b)-(iii), (c)-(i), (d)-(iv)

86435112718. (a)-(ii), (b)-(iii), (c)-(iv), (d)-(i)

**Question Number : 8 Question Id : 8643514238 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No**

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

What happens to the inductive reactance and the current in a purely inductive circuit if the frequency is halved ?

**Options :**

86435112719. Inductive reactance will be doubled and current will be halved.

86435112720. Inductive reactance will be halved and current will be doubled.

86435112721. Both, inductive reactance and current will be halved.

86435112722. Both, inducting reactance and current will be doubled.

**Question Number : 8 Question Id : 8643514238 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No**

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

जर वारंवारता अर्धी केली तर प्रेरण प्ररोध व शुद्ध प्रवर्तनिक परिपथास काय होईल?

**Options :**

86435112719. प्रेरण प्ररोध दोनपट होईल व धारा अर्धी होईल.

86435112720. प्रेरण प्ररोध अर्धी होईल व धारा दोनपट होईल.

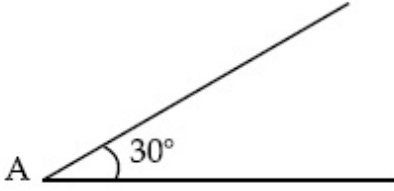
86435112721. दोन्ही, प्रेरण प्ररोध व धारा अर्ध्या होतील.

86435112722. दोन्ही, प्रेरण प्ररोध व धारा दोनपट होतील.

**Question Number : 9 Question Id : 8643514239 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No**

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

A sphere of mass 2 kg and radius 0.5 m is rolling with an initial speed of  $1 \text{ ms}^{-1}$  goes up an inclined plane which makes an angle of  $30^\circ$  with the horizontal plane, without slipping. How long will the sphere take to return to the starting point A ?



**Options :**

86435112723. 0.60 s

86435112724. 0.57 s

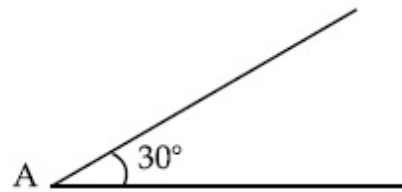
86435112725. 0.52 s

86435112726. 0.80 s

**Question Number : 9 Question Id : 8643514239 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No**

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

2 kg वस्तुमानाचा व 0.5 m त्रिज्येचा गोळा क्षितिजसमांतरशी  $30^\circ$  कोन केलेल्या आनत प्रतलावर सुरुवातीच्या  $1 \text{ ms}^{-1}$  वेगाने वरील दिशेत न घासता घरंगळत जातो. गोळा सुरुवातीच्या A बिंदुपर्यंत उलट येण्यासाठी किती वेळ लागेल?



**Options :**

86435112723. 0.60 s

86435112724. 0.57 s

86435112725. 0.52 s

86435112726. 0.80 s

**Question Number : 10 Question Id : 8643514240 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No**

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

A rubber ball is released from a height of 5 m above the floor. It bounces back repeatedly, always rising to  $\frac{81}{100}$  of the height through which it falls. Find the average speed of the ball.

(Take  $g = 10 \text{ ms}^{-2}$ )

**Options :**

86435112727.  $2.0 \text{ ms}^{-1}$

86435112728.  $2.50 \text{ ms}^{-1}$

86435112729.  $3.0 \text{ ms}^{-1}$

86435112730.  $3.50 \text{ ms}^{-1}$

**Question Number : 10 Question Id : 8643514240 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No**

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

जमिनीपासून 5 m उंचीवरून एक रबराचा चेंडू टाकला. जेवढ्या उंचीवरून तो पडतो त्याच्या  $\frac{81}{100}$  उंचीपर्यंत

तो पुन्हा पुन्हा वर येतो. चेंडूचा सरासरी वेग काढा.

( $g = 10 \text{ ms}^{-2}$  घ्या)

**Options :**

86435112727.  $2.0 \text{ ms}^{-1}$

86435112728.  $2.50 \text{ ms}^{-1}$

86435112729.  $3.0 \text{ ms}^{-1}$

86435112730.  $3.50 \text{ ms}^{-1}$

**Question Number : 11 Question Id : 8643514241 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No**

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

The velocity of a particle is  $v = v_0 + gt + Ft^2$ . Its position is  $x = 0$  at  $t = 0$ ; then its displacement after time ( $t = 1$ ) is :

**Options :**

86435112731.  $v_0 + \frac{g}{2} + F$

86435112732.  $v_0 + 2g + 3F$

86435112733.  $v_0 + \frac{g}{2} + \frac{F}{3}$

86435112734.  $v_0 + g + F$

**Question Number : 11 Question Id : 8643514241 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No**

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

एका कणाचा वेग  $v = v_0 + gt + Ft^2$  आहे. त्याची स्थिती  $x = 0$  हि  $t = 0$  असताना आहे, तर त्याची वेळ ( $t = 1$ ) असताना विस्थापन \_\_\_\_\_ आहे.

**Options :**

86435112731.  $v_0 + \frac{g}{2} + F$

86435112732.  $v_0 + 2g + 3F$

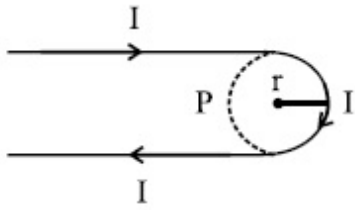
86435112733.  $v_0 + \frac{g}{2} + \frac{F}{3}$

86435112734.  $v_0 + g + F$

**Question Number : 12 Question Id : 8643514242 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No**

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

A hairpin like shape as shown in figure is made by bending a long current carrying wire. What is the magnitude of a magnetic field at point P which lies on the centre of the semicircle ?



Options :

86435112735.  $\frac{\mu_0 I}{2\pi r}(2 - \pi)$

86435112736.  $\frac{\mu_0 I}{2\pi r}(2 + \pi)$

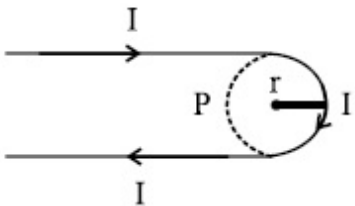
86435112737.  $\frac{\mu_0 I}{4\pi r}(2 + \pi)$

86435112738.  $\frac{\mu_0 I}{4\pi r}(2 - \pi)$

Question Number : 12 Question Id : 8643514242 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

धारा वाहून नेणारी लांब तार केसातील पिनेच्या आकृतीत दाखविल्याप्रमाणे आकारात वाकविली. चुंबकीय क्षेत्राची P बिंदूवर किंमत किती आहे जो अर्धवर्तुळाच्या मध्यावर आहे?



Options :

86435112735.  $\frac{\mu_0 I}{2\pi r}(2 - \pi)$

86435112736.  $\frac{\mu_0 I}{2\pi r}(2 + \pi)$



86435112737.  $\frac{\mu_0 I}{4\pi r}(2 + \pi)$

86435112738.  $\frac{\mu_0 I}{4\pi r}(2 - \pi)$

**Question Number : 13 Question Id : 8643514243 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No**

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

The atomic hydrogen emits a line spectrum consisting of various series. Which series of hydrogen atomic spectra is lying in the visible region ?

**Options :**

86435112739. Paschen series

86435112740. Balmer series

86435112741. Lyman series

86435112742. Brackett series

**Question Number : 13 Question Id : 8643514243 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No**

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

अण्विक हायड्रोजन वेगवेगळ्या श्रेणी असलेल्या रेषीय पंक्ती बाहेर टाकतो. हायड्रोजन अण्विक पंक्तीतील कोणती श्रेणी दृश्य भागात आहे?

**Options :**

86435112739. पाशन श्रेणी

86435112740. बामर श्रेणी

86435112741. लायमन श्रेणी

86435112742. ब्रॅकेट श्रेणी

**Question Number : 14 Question Id : 8643514244 Question Type : MCQ Option Shuffling : Yes Is**

**Question Mandatory : No**

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

Two identical photocathodes receive the light of frequencies  $f_1$  and  $f_2$  respectively. If the velocities of the photo-electrons coming out are  $v_1$  and  $v_2$  respectively, then

**Options :**

$$v_1 - v_2 = \left[ \frac{2h}{m}(f_1 - f_2) \right]^{\frac{1}{2}}$$

86435112743.

$$v_1^2 - v_2^2 = \frac{2h}{m}[f_1 - f_2]$$

86435112744.

$$v_1 + v_2 = \left[ \frac{2h}{m}(f_1 + f_2) \right]^{\frac{1}{2}}$$

86435112745.

$$v_1^2 + v_2^2 = \frac{2h}{m}[f_1 + f_2]$$

86435112746.

**Question Number : 14 Question Id : 8643514244 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No**

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

दोन एकसारखे प्रकाशकॅथोड  $f_1$  व  $f_2$  वारंवारतेचे प्रकाश घेतात. जर बाहेर पडलेल्या प्रकाश इलेक्ट्रॉनचे वेग अनुक्रमे  $v_1$  व  $v_2$  आहेत, तर

**Options :**

$$v_1 - v_2 = \left[ \frac{2h}{m}(f_1 - f_2) \right]^{\frac{1}{2}}$$

86435112743.

$$v_1^2 - v_2^2 = \frac{2h}{m}[f_1 - f_2]$$

86435112744.

$$v_1 + v_2 = \left[ \frac{2h}{m}(f_1 + f_2) \right]^{\frac{1}{2}}$$

86435112745.

$$v_1^2 + v_2^2 = \frac{2h}{m}[f_1 + f_2]$$

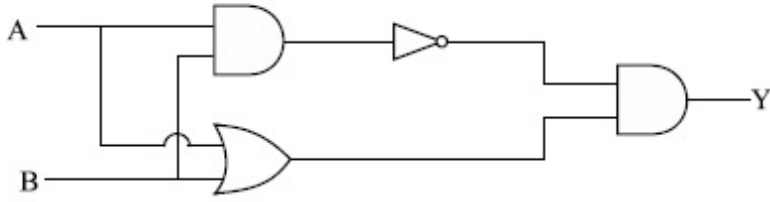
86435112746.

Question Number : 15 Question Id : 8643514245 Question Type : MCQ Option Shuffling : Yes Is

Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

Which one of the following will be the output of the given circuit ?



Options :

86435112747. AND Gate

86435112748. NAND Gate

86435112749. XOR Gate

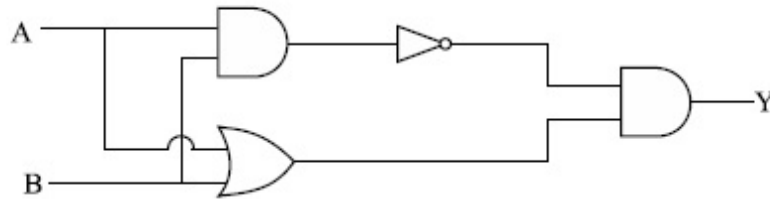
86435112750. NOR Gate

Question Number : 15 Question Id : 8643514245 Question Type : MCQ Option Shuffling : Yes Is

Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

दिलेल्या परिपथात खालीलपैकी कोणते एक निष्पन्न आहे?



Options :

86435112747. AND द्वार

86435112748. NAND द्वार

86435112749. XOR द्वार

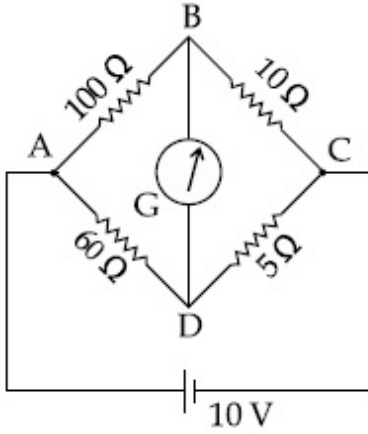
86435112750. NOR द्वार

Question Number : 16 Question Id : 8643514246 Question Type : MCQ Option Shuffling : Yes Is

Question Mandatory : No

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

The four arms of a Wheatstone bridge have resistances as shown in the figure. A galvanometer of  $15\ \Omega$  resistance is connected across BD. Calculate the current through the galvanometer when a potential difference of  $10\ \text{V}$  is maintained across AC.



**Options :**

86435112751.  $2.44\ \mu\text{A}$

86435112752.  $2.44\ \text{mA}$

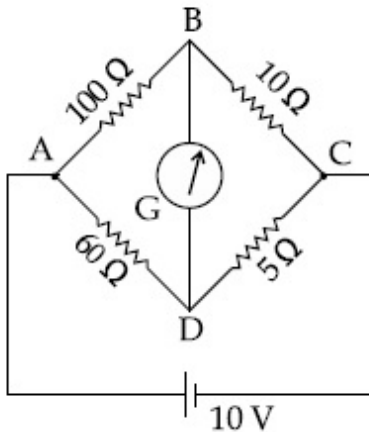
86435112753.  $4.87\ \mu\text{A}$

86435112754.  $4.87\ \text{mA}$

**Question Number : 16 Question Id : 8643514246 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No**

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

व्हिस्टोनच्या सेतुमध्ये चार भुजांमधील रोध आकृतीत दाखविल्याप्रमाणे आहे.  $15\ \Omega$  रोधाचा गॅल्व्हानोमीटर BD मध्ये जोडला आहे. जेव्हा AC मध्ये  $10\ \text{V}$  चे विभवांतर ठेवले तेव्हा गॅल्व्हानोमीटर मधून जाणारी धारा काढा.



**Options :**

86435112751. 2.44  $\mu\text{A}$ 

86435112752. 2.44 mA

86435112753. 4.87  $\mu\text{A}$ 

86435112754. 4.87 mA

**Question Number : 17 Question Id : 8643514247 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No**

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

A block of mass 1 kg attached to a spring is made to oscillate with an initial amplitude of 12 cm. After 2 minutes the amplitude decreases to 6 cm. Determine the value of the damping constant for this motion. ( take  $\ln 2 = 0.693$  )

**Options :**

86435112755.  $1.16 \times 10^2 \text{ kg s}^{-1}$ 86435112756.  $0.69 \times 10^2 \text{ kg s}^{-1}$ 86435112757.  $5.7 \times 10^{-3} \text{ kg s}^{-1}$ 86435112758.  $3.3 \times 10^2 \text{ kg s}^{-1}$ 

**Question Number : 17 Question Id : 8643514247 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No**

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

1 kg वस्तुमानाचा ठोकळा स्प्रिंगला जोडलेला असून तो 12 cm एवढ्या सुरुवातीच्या आयामाने दोलन करित आहे. दोन मिनिटांनंतर आयाम 6 cm पर्यंत कमी होतो. ह्या गतिकरिता अवमंदन स्थिरांक काढा. ( घ्या  $\ln 2 = 0.693$  )

**Options :**

86435112755.  $1.16 \times 10^2 \text{ kg s}^{-1}$ 86435112756.  $0.69 \times 10^2 \text{ kg s}^{-1}$ 86435112757.  $5.7 \times 10^{-3} \text{ kg s}^{-1}$

86435112758.  $3.3 \times 10^2 \text{ kg s}^{-1}$

**Question Number : 18 Question Id : 8643514248 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No**

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

If one mole of the polyatomic gas is having two vibrational modes and  $\beta$  is the ratio of molar specific heats for polyatomic gas  $\left( \beta = \frac{C_P}{C_V} \right)$  then the value of  $\beta$  is :

**Options :**

86435112759. 1.25

86435112760. 1.2

86435112761. 1.35

86435112762. 1.02

**Question Number : 18 Question Id : 8643514248 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No**

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

जर एक मोलच्या बहूअणू वायूसाठी दोन कंपनीक प्रकार आहेत व बहुअण्विक वायूसाठी  $\beta$  हा मोलर विशिष्ट उष्णतेचे गुणोत्तर  $\left( \beta = \frac{C_P}{C_V} \right)$  आहे तर  $\beta$  चे मूल्य \_\_\_\_\_ आहे.

**Options :**

86435112759. 1.25

86435112760. 1.2

86435112761. 1.35

86435112762. 1.02

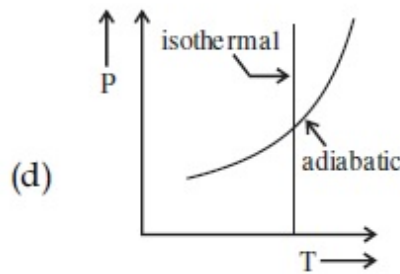
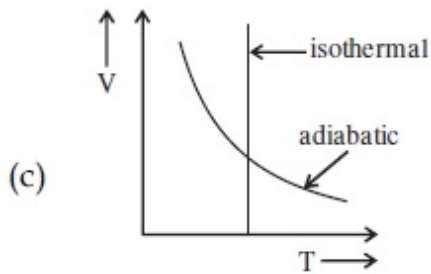
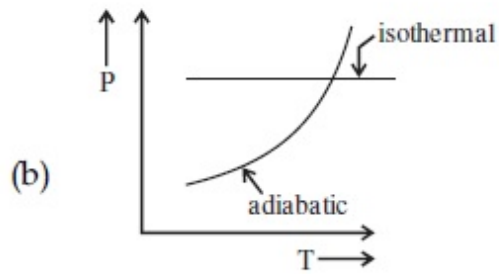
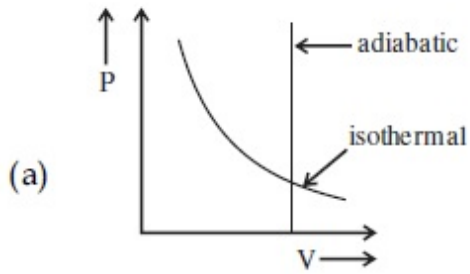
**Question Number : 19 Question Id : 8643514249 Question Type : MCQ Option Shuffling : Yes Is**



**Question Mandatory : No**

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

Which one is the correct option for the two different thermodynamic processes ?



**Options :**

86435112763. (a) only

86435112764. (b) and (c)

86435112765. (c) and (a)

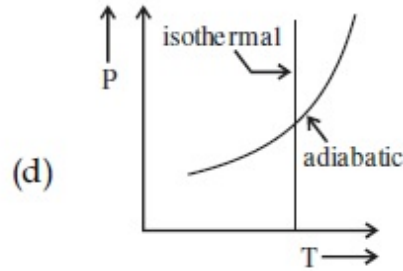
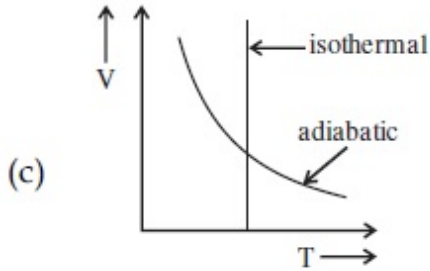
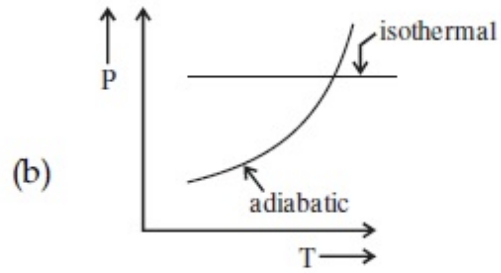
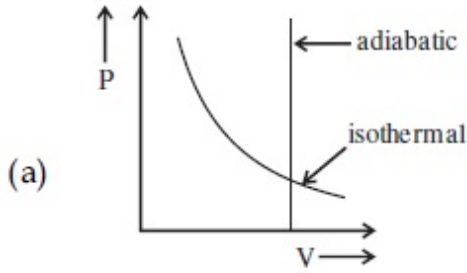
86435112766. (c) and (d)

**Question Number : 19 Question Id : 8643514249 Question Type : MCQ Option Shuffling : Yes Is**

**Question Mandatory : No**

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

दोन वेगवेगळ्या उष्मागतिक पद्धतीमध्ये कोणता एक पर्याय बरोबर आहे?



Options :

86435112763. फक्त (a)

86435112764. (b) व (c)

86435112765. (c) व (a)

86435112766. (c) व (d)

Question Number : 20 Question Id : 8643514250 Question Type : MCQ Option Shuffling : Yes Is

Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

An object is located at 2 km beneath the surface of the water. If the fractional compression

$\frac{\Delta V}{V}$  is 1.36%, the ratio of hydraulic stress to the corresponding hydraulic strain will be

\_\_\_\_\_.

[ Given : density of water is  $1000 \text{ kgm}^{-3}$  and  $g = 9.8 \text{ ms}^{-2}$ .]

Options :

86435112767.  $1.96 \times 10^7 \text{ Nm}^{-2}$

86435112768.  $1.44 \times 10^7 \text{ Nm}^{-2}$

86435112769.  $2.26 \times 10^9 \text{ Nm}^{-2}$

86435112770.  $1.44 \times 10^9 \text{ Nm}^{-2}$

**Question Number : 20 Question Id : 8643514250 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No**

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

पाण्याच्या पृष्ठभागाखाली 2 km वर एक वस्तू दिसली. जर अंशात्मक संपीडन  $\frac{\Delta V}{V}$  हे 1.36% आहे, द्रविक

प्रतिबल चे द्रविक विकार याबरोबरचे गुणोत्तर \_\_\_\_\_ असेल.

[ पाण्याची घनता  $1000 \text{ kgm}^{-3}$  आहे व  $g=9.8 \text{ ms}^{-2}$ .]

**Options :**

86435112767.  $1.96 \times 10^7 \text{ Nm}^{-2}$

86435112768.  $1.44 \times 10^7 \text{ Nm}^{-2}$

86435112769.  $2.26 \times 10^9 \text{ Nm}^{-2}$

86435112770.  $1.44 \times 10^9 \text{ Nm}^{-2}$

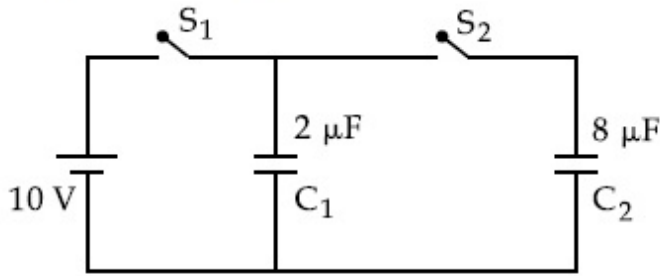
## Physics Section B

<b>Section Id :</b>	864351284
<b>Section Number :</b>	2
<b>Section type :</b>	Online
<b>Mandatory or Optional :</b>	Mandatory
<b>Number of Questions :</b>	10
<b>Number of Questions to be attempted :</b>	5
<b>Section Marks :</b>	20
<b>Mark As Answered Required? :</b>	Yes
<b>Sub-Section Number :</b>	1
<b>Sub-Section Id :</b>	864351284
<b>Question Shuffling Allowed :</b>	Yes

**Question Number : 21 Question Id : 8643514251 Question Type : SA**

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

A  $2 \mu\text{F}$  capacitor  $C_1$  is first charged to a potential difference of  $10 \text{ V}$  using a battery. Then the battery is removed and the capacitor is connected to an uncharged capacitor  $C_2$  of  $8 \mu\text{F}$ . The charge in  $C_2$  on equilibrium condition is \_\_\_\_\_  $\mu\text{C}$ . (Round off to the Nearest Integer)



**Response Type :** Numeric

**Evaluation Required For SA :** Yes

**Show Word Count :** Yes

**Answers Type :** Equal

**Text Areas :** PlainText

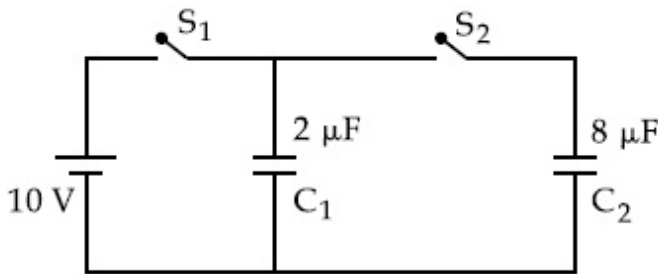
**Possible Answers :**

100

**Question Number :** 21 **Question Id :** 8643514251 **Question Type :** SA

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

$C_1$  हे  $2 \mu\text{F}$  चे संधारित्र प्रथम बॅटरी वापरून  $10 \text{ V}$  विभवांतराने प्रभारित केले. नंतर बॅटरी काढून टाकली व  $8 \mu\text{F}$  चे  $C_2$  हे प्रभारित नसलेले संधारित्र संधारित्रास जोडले. समतुल्य अटीवर  $C_2$  वरील प्रभार \_\_\_\_\_  $\mu\text{C}$  आहे. (जवळच्या पूर्णांकापर्यंत)



**Response Type :** Numeric

**Evaluation Required For SA :** Yes

**Show Word Count :** Yes

**Answers Type :** Equal

**Text Areas :** PlainText

**Possible Answers :**

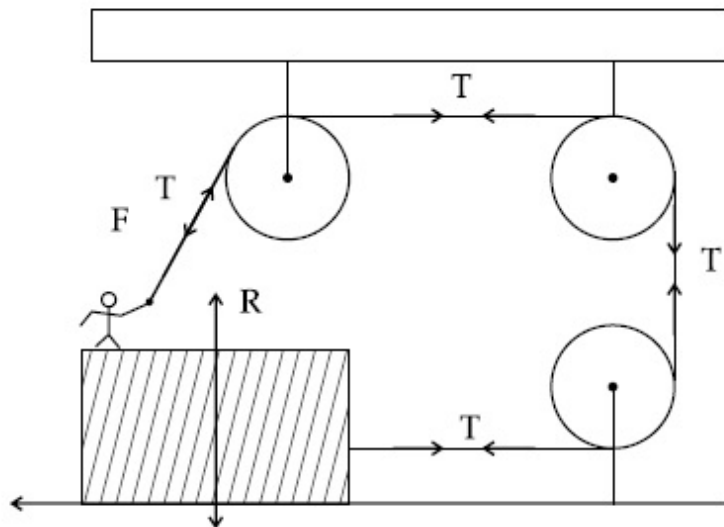
100

**Question Number :** 22 **Question Id :** 8643514252 **Question Type :** SA

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

A boy of mass 4 kg is standing on a piece of wood having mass 5 kg. If the coefficient of friction between the wood and the floor is 0.5, the maximum force that the boy can exert on the rope so that the piece of wood does not move from its place is \_\_\_\_\_ N. (Round off to the Nearest Integer)

[Take  $g = 10 \text{ ms}^{-2}$ ]



**Response Type :** Numeric

**Evaluation Required For SA :** Yes

**Show Word Count :** Yes

**Answers Type :** Equal

**Text Areas :** PlainText

**Possible Answers :**

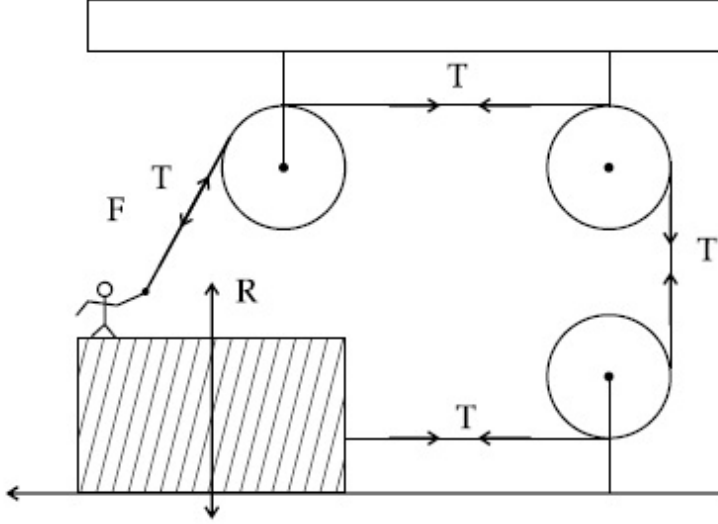
100

**Question Number :** 22 **Question Id :** 8643514252 **Question Type :** SA

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

5 kg वस्तुमानाच्या लाकडाच्या तुकड्यावर एक 4 kg वस्तुमानाचा मुलगा उभा आहे. जर लाकूड व जमीन यातील घर्षण गुणांक 0.5 आहे, वस्तु असे महत्तम बल दोरावर लावू शकेल कि लाकडाचा तुकडा त्याच्या जागेवरून हलणार नाही, ते \_\_\_\_\_ N आहे. (जवळच्या पूर्णांकापर्यंत)

[ घ्या  $g = 10 \text{ ms}^{-2}$  ]



**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 :** 8643514253 **Question Type :** SA

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

The image of an object placed in air formed by a convex refracting surface is at a distance of

10 m behind the surface. The image is real and is at  $\frac{2^{\text{rd}}}{3}$  of the distance of the object from

the surface. The wavelength of light inside the surface is  $\frac{2}{3}$  times the wavelength in air. The

radius of the curved surface is  $\frac{x}{13}$  m . 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 : 23 Question Id : 8643514253 Question Type : SA**

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

बहिर्गोल खंडीत आरशामुळे आरशाच्या मागे 10 m अंतरावर हवेतील वस्तुची प्रतिमा तयार झाली व प्रतिमा खरी असून वस्तुच्या  $\frac{2}{3}$  अंतरावर आहे. आरशातील प्रकाशाची तरंगलांबी हवेतील तरंगलांबीच्या  $\frac{2}{3}$  पट आहे.

आरशाच्या वक्र पृष्ठभागाची त्रिज्या  $\frac{x}{13}$  m आहे.  $x$  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 : 24 Question Id : 8643514254 Question Type : SA**

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

The electric field intensity produced by the radiation coming from a 100 W bulb at a distance of 3 m is E. The electric field intensity produced by the radiation coming from 60 W at the same distance is

$\sqrt{\frac{x}{5}}$  E. Where the value of  $x =$  \_\_\_\_\_.

**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 : 8643514254 Question Type : SA**

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

3 m अंतरावरील 100 W फुग्यापासून बाहेर पडलेले प्रारणाची विद्युत क्षेत्राची तीव्रता E आहे. त्याच अंतरावरून

60 W मुळे बाहेर पडलेल्या प्रारणामुळे विद्युत क्षेत्राची तीव्रता  $\sqrt{\frac{x}{5}}$  E आहे. जेथे  $x =$  \_\_\_\_\_ 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 :** 25 **Question Id :** 8643514255 **Question Type :** SA**Correct Marks :** 4 **Wrong Marks :** 0

Seawater at a frequency  $f=9 \times 10^2$  Hz, has permittivity  $\epsilon=80\epsilon_0$  and resistivity

$\rho=0.25 \Omega\text{m}$ . Imagine a parallel plate capacitor is immersed in seawater and is driven by an

alternating voltage source  $V(t)=V_0 \sin(2\pi ft)$ . Then the conduction current density

becomes  $10^x$  times the displacement current density after time  $t = \frac{1}{800}$  s. The value of  $x$  is

\_\_\_\_\_.

(Given :  $\frac{1}{4\pi\epsilon_0} = 9 \times 10^9 \text{ Nm}^2\text{C}^{-2}$ )

**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 :** 8643514255 **Question Type :** SA**Correct Marks :** 4 **Wrong Marks :** 0

$f=9 \times 10^2$  Hz वारंवारतेला समुद्राच्या पाण्याचा पराविद्युतांक  $\epsilon=80\epsilon_0$  व रोधिता  $\rho=0.25 \Omega\text{m}$  आहे. अशी कल्पना करा कि समुद्राच्या पाण्यात समांतर पट्टी संधारित्र बुडविले व  $V(t)=V_0 \sin(2\pi ft)$  ह्या प्रत्यावर्ती व्होल्टेच्या उद्गमाने चालीत केले. तर वहन धारा घनता  $10^x$  पट  $t = \frac{1}{800}$  s च्या विस्थापन वहन धार घनतेच्या आहे.  $x$  चे मूल्य \_\_\_\_\_ आहे.

(दिले आहे :  $\frac{1}{4\pi\epsilon_0} = 9 \times 10^9 \text{ Nm}^2\text{C}^{-2}$ )

**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 : 8643514256 Question Type : SA**

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

The electric field in a region is given by  $\vec{E} = \frac{2}{5}E_0 \hat{i} + \frac{3}{5}E_0 \hat{j}$  with  $E_0 = 4.0 \times 10^3 \frac{\text{N}}{\text{C}}$ . The flux of this field through a rectangular surface area  $0.4 \text{ m}^2$  parallel to the Y-Z plane is \_\_\_\_\_  $\text{Nm}^2 \text{C}^{-1}$ .

**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 : 8643514256 Question Type : SA**

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

एक भागातील विद्युत क्षेत्र दिले आहे,  $\vec{E} = \frac{2}{5}E_0 \hat{i} + \frac{3}{5}E_0 \hat{j}$  जेथे  $E_0 = 4.0 \times 10^3 \frac{\text{N}}{\text{C}}$ . ह्या क्षेत्राचे Y-Z

प्रतलाला समांतर असलेल्या  $0.4 \text{ m}^2$  आयताकृती पृष्ठभाग क्षेत्रफळातून जाणारे अभिवाह \_\_\_\_\_  $\text{Nm}^2 \text{C}^{-1}$  आहे.

**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 :** 8643514257 **Question Type :** SA

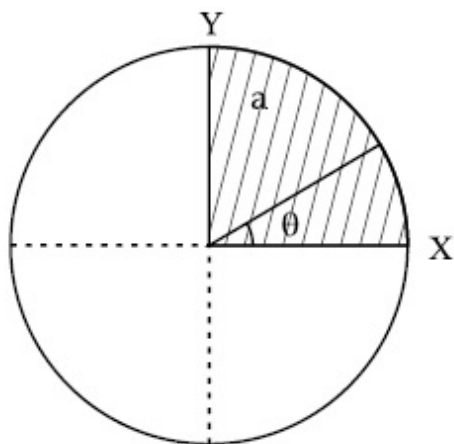
**Correct Marks :** 4 **Wrong Marks :** 0

The disc of mass  $M$  with uniform surface mass density  $\sigma$  is shown in the figure. The centre of

mass of the quarter disc (the shaded area) is at the position  $\frac{x}{3} \frac{a}{\pi}, \frac{x}{3} \frac{a}{\pi}$  where

$x$  is \_\_\_\_\_. (Round off to the Nearest Integer)

[ $a$  is an area as shown in the figure ]



**Response Type :** Numeric

**Evaluation Required For SA :** Yes

**Show Word Count :** Yes

**Answers Type :** Equal

**Text Areas :** PlainText

**Possible Answers :**

100

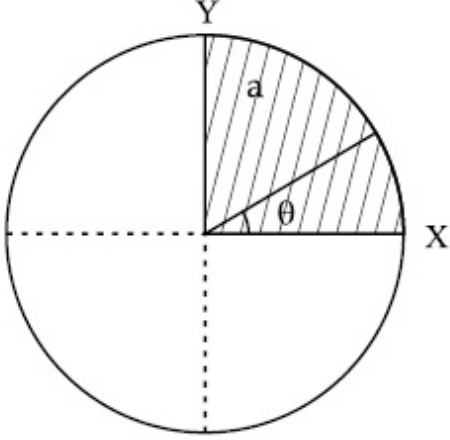
**Question Number :** 27 **Question Id :** 8643514257 **Question Type :** SA

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

आकृतीत दाखविल्याप्रमाणे एकसमान वस्तुमान  $M$  असलेल्या तबकडीची पृष्ठभाग घनता  $\sigma$  आहे.  $\left(\frac{1}{4}\right)^{\text{th}}$

तबकडीचा वस्तुकेंद्र (आच्छादीत क्षेत्रफळ पहा)  $\left(\frac{x}{3} \frac{a}{\pi}, \frac{x}{3} \frac{a}{\pi}\right)$  येथे असल्यास  $x$  \_\_\_\_\_ आहे.

(आकृतीत दाखविल्याप्रमाणे  $a$  हे क्षेत्रफळ आहे  $\pi$  हे पाय आहे) (जवळच्या पूर्णांकापर्यंत)



**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 :** 8643514258 **Question Type :** SA

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

A body of mass 1 kg rests on a horizontal floor with which it has a coefficient of static friction  $\frac{1}{\sqrt{3}}$ . It is desired to make the body move by applying the minimum possible force

F N. The value of F will be \_\_\_\_\_. (Round off to the Nearest Integer)

[ Take  $g = 10 \text{ ms}^{-2}$  ]

**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 : 8643514258 Question Type : SA****Correct Marks : 4 Wrong Marks : 0**

1 kg वस्तुमानाची वस्तु क्षितिजसमांतर जमिनीवर स्थिर आहे जेथे स्थितिक घर्षण गुणांक  $\frac{1}{\sqrt{3}}$  आहे. असे

अपेक्षित आहे कि ती वस्तु F N एवढ्या कमीत कमी शक्य असलेल्या बलाने गतिमान होईल. F चे मूल्य \_\_\_\_\_ असेल. (जवळच्या पूर्णांकापर्यंत)

[ घ्या  $g = 10 \text{ ms}^{-2}$  ]**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 : 8643514259 Question Type : SA****Correct Marks : 4 Wrong Marks : 0**

A particle of mass  $m$  moves in a circular orbit in a central potential field  $U(r) = U_0 r^4$ . If

Bohr's quantization conditions are applied, radii of possible orbitals  $r_n$  vary with  $n^{\frac{1}{\alpha}}$ , where  $\alpha$  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 : 8643514259 Question Type : SA****Correct Marks : 4 Wrong Marks : 0**

$U(r) = U_0 r^4$  एवढ्या केंद्रीय विभव क्षेत्रात  $m$  वस्तुमानाचा कण वर्तुळाकार कक्षेत गतिमान आहे. बोहरच्या

क्वांटीकरण अटी वापरून शक्य असलेल्या कक्षांची त्रिज्या  $r_n$  ही  $n^{\frac{1}{\alpha}}$  प्रमाणे बदलते, जेथे  $\alpha =$  \_\_\_\_\_ 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 : 8643514260 Question Type : SA**

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

Suppose you have taken a dilute solution of oleic acid in such a way that its concentration

becomes  $0.01 \text{ cm}^3$  of oleic acid per  $\text{cm}^3$  of the solution. Then you make a thin film of this

solution (monomolecular thickness) of area  $4 \text{ cm}^2$  by considering 100 spherical drops of

radius  $\left(\frac{3}{40\pi}\right)^{\frac{1}{3}} \times 10^{-3} \text{ cm}$ . Then the thickness of oleic acid layer will be  $x \times 10^{-14} \text{ m}$ .

Where  $x$  is \_\_\_\_\_.

**Response Type :** Numeric

**Evaluation Required For SA :** Yes

**Show Word Count :** Yes

**Answers Type :** Equal

**Text Areas :** PlainText

**Possible Answers :**

100

**Question Number : 30 Question Id : 8643514260 Question Type : SA**

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

ऑलीक आम्लाचे विरल द्रावण असे घेतले की त्याचे संकेंद्रण एका  $\text{cm}^3$  ऑलीक आम्लासाठी  $0.01 \text{ cm}^3$  होते.

नंतर  $\left(\frac{3}{40\pi}\right)^{\frac{1}{3}} \times 10^{-3} \text{ cm}$  त्रिज्येचे 100 गोलाकार थेंब विचारात घेउन  $4 \text{ cm}^2$  क्षेत्रफळाची बारीक फिल्म ह्या

द्रावणापासून तयार केली (एक रेणु जाडीची) नंतर ऑलीक आम्लाच्या रेणुचा आकार

\_\_\_\_\_  $\times 10^{-14} \text{ m}$  असेल.

**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 :	864351285
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 :	864351285
Question Shuffling Allowed :	Yes

Question Number : 31 Question Id : 8643514261 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

Amongst the following, the linear species is :

Options :

86435112781.  $\text{N}_3^-$

86435112782.  $\text{NO}_2$

86435112783.  $\text{O}_3$

86435112784.  $\text{Cl}_2\text{O}$

Question Number : 31 Question Id : 8643514261 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

दिलेल्या जार्तीपैकी रेखीय जाती \_\_\_\_\_ आहे.

Options :

86435112781.  $\text{N}_3^-$

86435112782.  $\text{NO}_2$

86435112783.  $\text{O}_3$

86435112784.  $\text{Cl}_2\text{O}$

**Question Number : 32 Question Id : 8643514262 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No**

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

During which of the following processes, does entropy decrease ?

- (A) Freezing of water to ice at  $0^\circ\text{C}$
- (B) Freezing of water to ice at  $-10^\circ\text{C}$
- (C)  $\text{N}_2(\text{g}) + 3\text{H}_2(\text{g}) \rightarrow 2\text{NH}_3(\text{g})$
- (D) Adsorption of  $\text{CO}(\text{g})$  on lead surface.
- (E) Dissolution of  $\text{NaCl}$  in water

Choose the correct answer from the options given below :

**Options :**

86435112785. (A), (B), (C) and (D) only

86435112786. (A), (C) and (E) only

86435112787. (A) and (E) only

86435112788. (B) and (C) only

**Question Number : 32 Question Id : 8643514262 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No**

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

खालीलपैकी कोणत्या प्रक्रियेत एन्ट्रॉपी कमी होते?

- (A) पाण्याचे 0°C ला बर्फात गोठणे  
 (B) पाण्याचे -10°C ला बर्फात गोठणे  
 (C)  $N_2(g) + 3H_2(g) \rightarrow 2NH_3(g)$   
 (D) CO(g) चे लेडच्या पृष्ठभागावर अधिशोषण होणे  
 (E) NaCl चे पाण्यात विरघळणे

खालील पर्यायांमधून बरोबर उत्तर निवडा :

**Options :**

86435112785. (A), (B), (C) आणि (D) फक्त

86435112786. (A), (C) आणि (E) फक्त

86435112787. (A) आणि (E) फक्त

86435112788. (B) आणि (C) फक्त

**Question Number : 33 Question Id : 8643514263 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No**

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

For the coagulation of a negative sol, the species below, that has the highest flocculating power is :

**Options :**

86435112789.  $Ba^{2+}$

86435112790.  $Na^+$

86435112791.  $PO_4^{3-}$

86435112792.  $SO_4^{2-}$

**Question Number : 33 Question Id : 8643514263 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No**

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

ऋण सॉलच्या साकळण्यासाठी खालील जातीं पैकी सगळ्यात जास्त ऊर्णनाची शक्ति असलेली जाती \_\_\_\_\_ आहे.

**Options :**

86435112789.  $Ba^{2+}$

86435112790.  $Na^{+}$

86435112791.  $PO_4^{3-}$

86435112792.  $SO_4^{2-}$

**Question Number : 34 Question Id : 8643514264 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No**

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

The set of elements that differ in mutual relationship from those of the other sets is :

**Options :**

86435112793. Be - Al

86435112794. B - Si

86435112795. Li - Na

86435112796. Li - Mg

**Question Number : 34 Question Id : 8643514264 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No**

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

मूलद्रव्यांचा गट जो इतर गटांपेक्षा वेगळ आहे तो \_\_\_\_\_ आहे.

**Options :**

86435112793. Be - Al

86435112794. B - Si

86435112795. Li - Na

86435112796. Li - Mg

**Question Number : 35 Question Id : 8643514265 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No**

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

Match List - I with List - II :

List - I	List - II
(a) Haematite	(i) $Al_2O_3 \cdot xH_2O$
(b) Bauxite	(ii) $Fe_2O_3$
(c) Magnetite	(iii) $CuCO_3 \cdot Cu(OH)_2$
(d) Malachite	(iv) $Fe_3O_4$

Choose the correct answer from the options given below :

**Options :**

86435112797. (a)-(i), (b)-(iii), (c)-(ii), (d)-(iv)

86435112798. (a)-(ii), (b)-(i), (c)-(iv), (d)-(iii)

86435112799. (a)-(iv), (b)-(i), (c)-(ii), (d)-(iii)

86435112800. (a)-(ii), (b)-(iii), (c)-(i), (d)-(iv)

**Question Number : 35 Question Id : 8643514265 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No**

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

यादी - I यादी - II शी जुळवा :

यादी - I	यादी - II
(a) हिमटाइट	(i) $Al_2O_3 \cdot xH_2O$
(b) बॉक्साइट	(ii) $Fe_2O_3$
(c) मॅग्नेटाइट	(iii) $CuCO_3 \cdot Cu(OH)_2$
(d) मॅलाकाइट	(iv) $Fe_3O_4$

खालील पर्यायांमधून बरोबर उत्तर निवडा.

**Options :**

86435112797. (a)-(i), (b)-(iii), (c)-(ii), (d)-(iv)



86435112798. (a)-(ii), (b)-(i), (c)-(iv), (d)-(iii)

86435112799. (a)-(iv), (b)-(i), (c)-(ii), (d)-(iii)

86435112800. (a)-(ii), (b)-(iii), (c)-(i), (d)-(iv)

**Question Number : 36 Question Id : 8643514266 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No**

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

The functional groups that are responsible for the ion-exchange property of cation and anion exchange resins, respectively, are :

**Options :**

86435112801.  $-\text{SO}_3\text{H}$  and  $-\text{NH}_2$

86435112802.  $-\text{NH}_2$  and  $-\text{COOH}$

86435112803.  $-\text{NH}_2$  and  $-\text{SO}_3\text{H}$

86435112804.  $-\text{SO}_3\text{H}$  and  $-\text{COOH}$

**Question Number : 36 Question Id : 8643514266 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No**

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

अनुक्रमे धनायन आणि ऋणायन विनिमय राळेतील आयनांच्या विनिमय गुणधर्मासाठी जबाबदार असलेले क्रियात्मक गट \_\_\_\_\_ आहेत.

**Options :**

86435112801.  $-\text{SO}_3\text{H}$  आणि  $-\text{NH}_2$

86435112802.  $-\text{NH}_2$  आणि  $-\text{COOH}$

86435112803.  $-\text{NH}_2$  आणि  $-\text{SO}_3\text{H}$

86435112804.  $-\text{SO}_3\text{H}$  आणि  $-\text{COOH}$

**Question Number : 37 Question Id : 8643514267 Question Type : MCQ Option Shuffling : Yes Is**

**Question Mandatory : No**

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

One of the by-products formed during the recovery of  $\text{NH}_3$  from Solvay process is :

**Options :**

86435112805.  $\text{NH}_4\text{Cl}$

86435112806.  $\text{Ca}(\text{OH})_2$

86435112807.  $\text{CaCl}_2$

86435112808.  $\text{NaHCO}_3$

**Question Number : 37 Question Id : 8643514267 Question Type : MCQ Option Shuffling : Yes Is**

**Question Mandatory : No**

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

सॉल्वेच्या पद्धतीत  $\text{NH}_3$  परत मिळवण्यासाठी केलेल्या प्रक्रियेत तयार होणारा उप-उत्पाद \_\_\_\_\_ आहे.

**Options :**

86435112805.  $\text{NH}_4\text{Cl}$

86435112806.  $\text{Ca}(\text{OH})_2$

86435112807.  $\text{CaCl}_2$

86435112808.  $\text{NaHCO}_3$

**Question Number : 38 Question Id : 8643514268 Question Type : MCQ Option Shuffling : Yes Is**

**Question Mandatory : No**

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

The set that represents the pair of neutral oxides of nitrogen is :

**Options :**

86435112809.  $\text{NO}$  and  $\text{N}_2\text{O}$

86435112810.  $\text{N}_2\text{O}$  and  $\text{NO}_2$

86435112811. NO and NO<sub>2</sub>

86435112812. N<sub>2</sub>O and N<sub>2</sub>O<sub>3</sub>

**Question Number : 38 Question Id : 8643514268 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No**

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

नायट्रोजनच्या उदासिन ऑक्साइड्सच्या जोड्यांचा गट \_\_\_\_\_ आहे.

**Options :**

86435112809. NO आणि N<sub>2</sub>O

86435112810. N<sub>2</sub>O आणि NO<sub>2</sub>

86435112811. NO आणि NO<sub>2</sub>

86435112812. N<sub>2</sub>O आणि N<sub>2</sub>O<sub>3</sub>

**Question Number : 39 Question Id : 8643514269 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No**

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

The common positive oxidation states for an element with atomic number 24, are :

**Options :**

86435112813. +1 to +6

86435112814. +2 to +6

86435112815. +1 and +3 to +6

86435112816. +1 and +3

**Question Number : 39 Question Id : 8643514269 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No**

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

24 अणु अंक असणाऱ्या मूलद्रव्याच्या साधारण ऑक्सिडन स्थिती \_\_\_\_\_ आहेत.

**Options :**

86435112813. +1 ते +6

86435112814. +2 ते +6

86435112815. +1 आणि +3 ते +6

86435112816. +1 आणि +3

**Question Number : 40 Question Id : 8643514270 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No**

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

**Match List - I with List - II :**

**List - I**

**List - II**

- |   |                               |
|---|-------------------------------|
| (a) $[\text{Co}(\text{NH}_3)_6] [\text{Cr}(\text{CN})_6]$ | (i) Linkage isomerism         |
| (b) $[\text{Co}(\text{NH}_3)_3 (\text{NO}_2)_3]$          | (ii) Solvate isomerism        |
| (c) $[\text{Cr}(\text{H}_2\text{O})_6]\text{Cl}_3$        | (iii) Co-ordination isomerism |
| (d) $\text{cis-}[\text{CrCl}_2(\text{ox})_2]^{3-}$        | (iv) Optical isomerism        |

Choose the correct answer from the options given below :

**Options :**

86435112817. (a)-(i), (b)-(ii), (c)-(iii), (d)-(iv)

86435112818. (a)-(ii), (b)-(i), (c)-(iii), (d)-(iv)

86435112819. (a)-(iii), (b)-(i), (c)-(ii), (d)-(iv)

86435112820. (a)-(iv), (b)-(ii), (c)-(iii), (d)-(i)

**Question Number : 40 Question Id : 8643514270 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
(a) $[\text{Co}(\text{NH}_3)_6] [\text{Cr}(\text{CN})_6]$	(i) बंध समसूत्रता
(b) $[\text{Co}(\text{NH}_3)_3(\text{NO}_2)_3]$	(ii) विद्राव समसूत्रता
(c) $[\text{Cr}(\text{H}_2\text{O})_6]\text{Cl}_3$	(iii) सहबद्धता समसूत्रता
(d) $\text{cis-}[\text{CrCl}_2(\text{ox})_2]^{3-}$	(iv) प्रकाशीय समसूत्रता

खालील पर्यायांमधून बरोबर उत्तर निवडा :

**Options :**

86435112817. (a)-(i), (b)-(ii), (c)-(iii), (d)-(iv)

86435112818. (a)-(ii), (b)-(i), (c)-(iii), (d)-(iv)

86435112819. (a)-(iii), (b)-(i), (c)-(ii), (d)-(iv)

86435112820. (a)-(iv), (b)-(ii), (c)-(iii), (d)-(i)

**Question Number : 41 Question Id : 8643514271 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No**

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

Which of the following statement(s) is (are) incorrect reason for eutrophication ?

- (A) excess usage of fertilisers
- (B) excess usage of detergents
- (C) dense plant population in water bodies
- (D) lack of nutrients in water bodies that prevent plant growth

Choose the most appropriate answer from the options given below :

**Options :**

86435112821. (A) only

86435112822. (B) and (D) only

86435112823. (C) only

86435112824. (D) only

**Question Number : 41 Question Id : 8643514271 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No**

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

खालीलपैकी सुपोषणासंबंधातील (eutrophication) कोणते विधान/विधाने चुकीचे/चुकीची आहे/आहेत ?

- (A) खतांचा अतिशय जास्त वापर  
 (B) निर्मलकाचा अतिशय जास्त वापर  
 (C) पाण्यातील वनस्पतींची दाट वस्ती  
 (D) पाण्यातील पोषकांचा अभाव ज्यामुळे वनस्पतींची वाढ होत नाही

खालील पर्यायांमधून सर्वात जास्त योग्य उत्तर निवडा.

**Options :**

86435112821. (A) फक्त

86435112822. (B) आणि (D) फक्त

86435112823. (C) फक्त

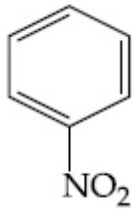
86435112824. (D) फक्त

**Question Number : 42 Question Id : 8643514272 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No**

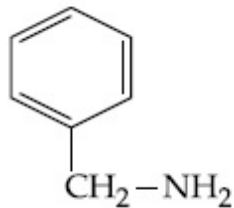
**Correct Marks : 4 Wrong Marks : 1**

Nitrogen can be estimated by Kjeldahl's method for which of the following compound ?

**Options :**

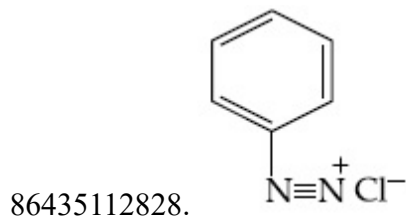
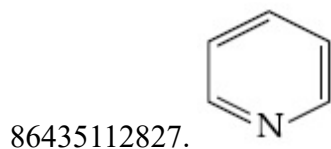


86435112825.



86435112826.



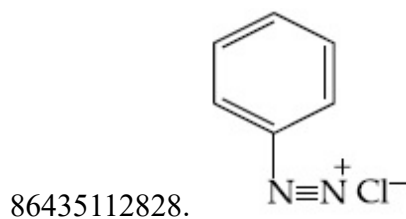
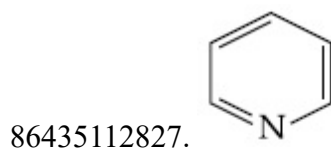
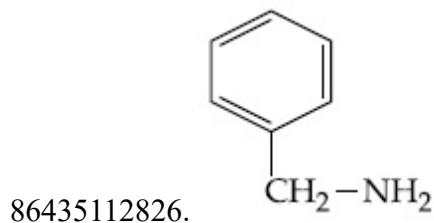
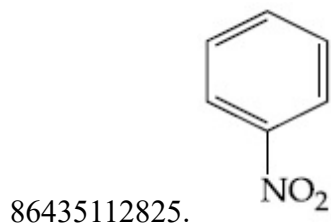


**Question Number : 42 Question Id : 8643514272 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No**

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

जेल्डाच्या पद्धतीने नायट्रोजनचे निश्चितीकरण खालीलपैकी कोणत्या संयुगात करता येईल ?

**Options :**



**Question Number : 43 Question Id : 8643514273 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No**

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

The correct pair(s) of the ambident nucleophiles is (are) :

- (A) AgCN/KCN
- (B) RCOOAg/RCOOK
- (C) AgNO<sub>2</sub>/KNO<sub>2</sub>
- (D) AgI/KI

**Options :**

86435112829. (A) only

86435112830. (B) only

86435112831. (A) and (C) only

86435112832. (B) and (C) only

**Question Number : 43 Question Id : 8643514273 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No**

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

उभयदंती (ambident) केंद्राकर्षीची जोडी/जोड्या \_\_\_\_\_ आहे/आहेत.

- (A) AgCN/KCN
- (B) RCOOAg/RCOOK
- (C) AgNO<sub>2</sub>/KNO<sub>2</sub>
- (D) AgI/KI

**Options :**

86435112829. (A) फक्त

86435112830. (B) फक्त

86435112831. (A) आणि (C) फक्त

86435112832. (B) आणि (C) फक्त

**Question Number : 44 Question Id : 8643514274 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No**

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

Given below are two statements :

**Statement I :** 2-methylbutane on oxidation with  $\text{KMnO}_4$  gives 2-methylbutan-2-ol.

**Statement II :** n-alkanes can be easily oxidised to corresponding alcohols with  $\text{KMnO}_4$ .

Choose the correct option :

**Options :**

86435112833. Both statement I and statement II are correct

86435112834. Both statement I and statement II are incorrect

86435112835. Statement I is correct but statement II is incorrect

86435112836. Statement I is incorrect but statement II is correct

**Question Number : 44 Question Id : 8643514274 Question Type : MCQ Option Shuffling : Yes Is**

**Question Mandatory : No**

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

खाली दोन विधाने दिलेली आहेत.

**विधान I :** 2-मिथाइलब्युटेनच्या  $\text{KMnO}_4$  सोबत ऑक्सिडीकरणातून 2-मिथाइलब्युटेन-2-ऑल मिळते.

**विधान II :**  $\text{KMnO}_4$  सोबत n-अल्केन्सचे सरळपणे ऑक्सिडीकरण होऊन तत्सम अल्कोहोलस् मिळतात.

बरोबर पर्याय निवडा :

**Options :**

86435112833. विधान I व विधान II दोन्ही बरोबर आहेत

86435112834. विधान I व विधान II दोन्ही चूक आहेत

86435112835. विधान I बरोबर आहे पण विधान II चूक आहे

86435112836. विधान I चूक आहे पण विधान II बरोबर आहे

**Question Number : 45 Question Id : 8643514275 Question Type : MCQ Option Shuffling : Yes Is**

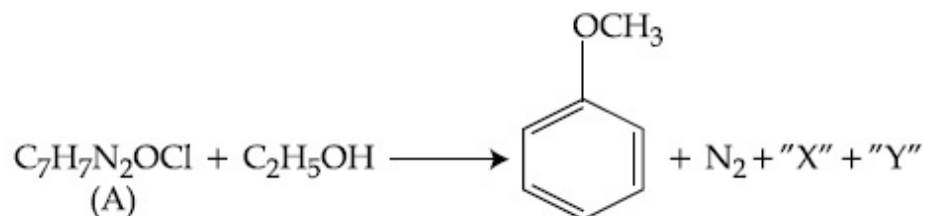
**Question Mandatory : No**

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



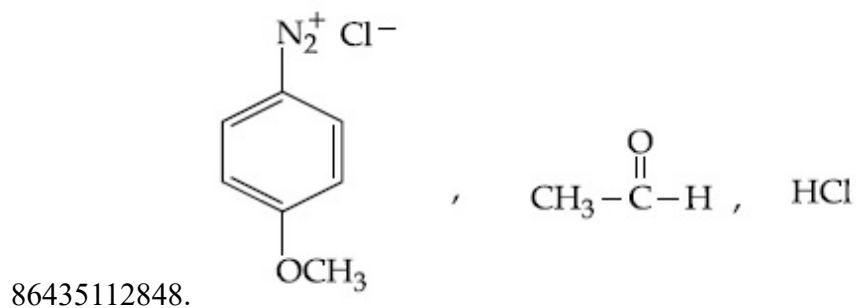
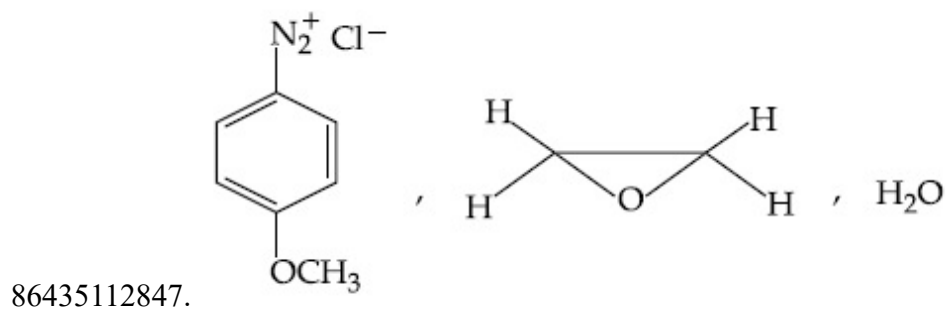
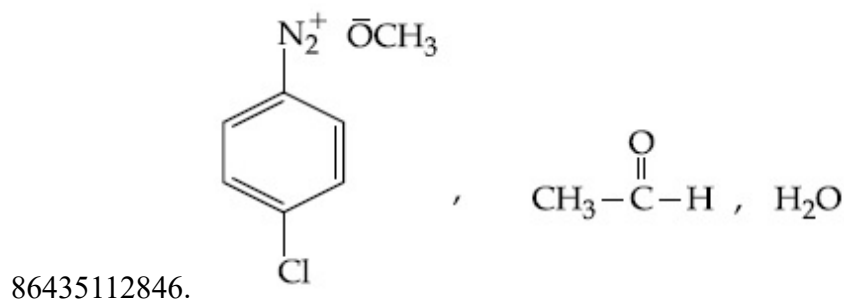
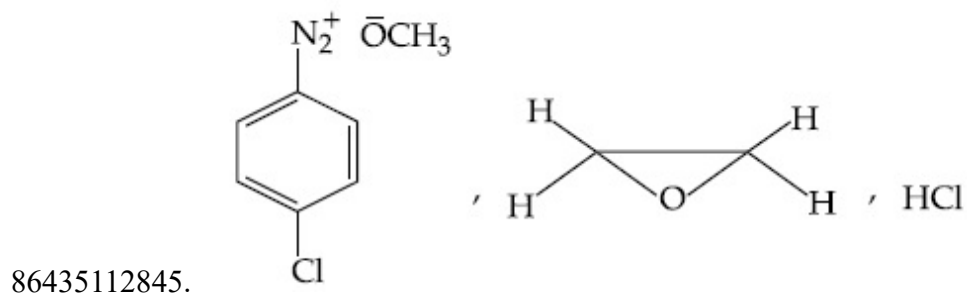


Question Number : 47 Question Id : 8643514277 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1



In the above reaction, the structural formula of (A), "X" and "Y" respectively are :

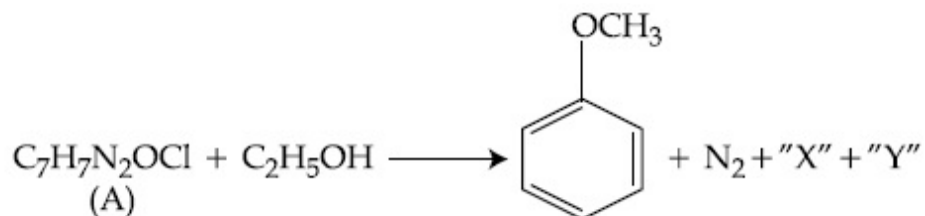
Options :





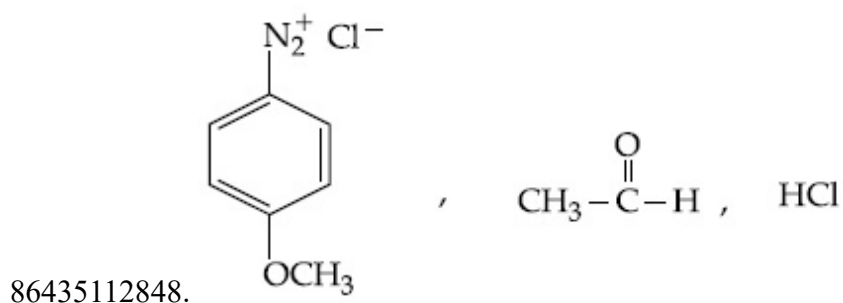
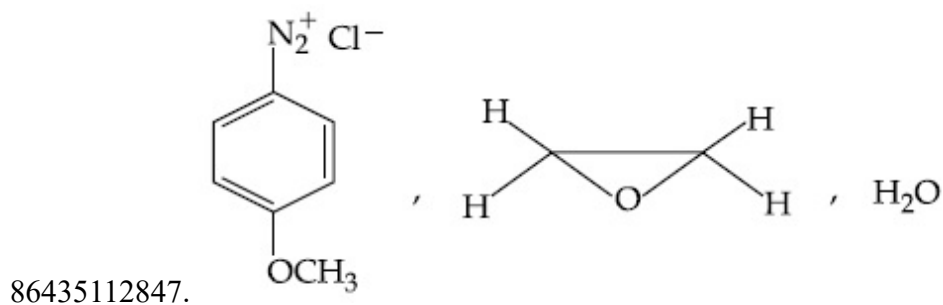
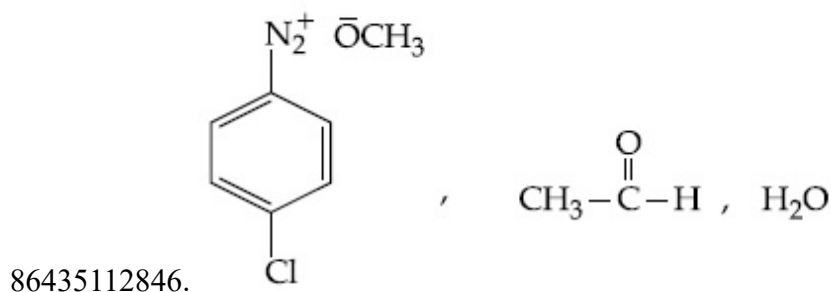
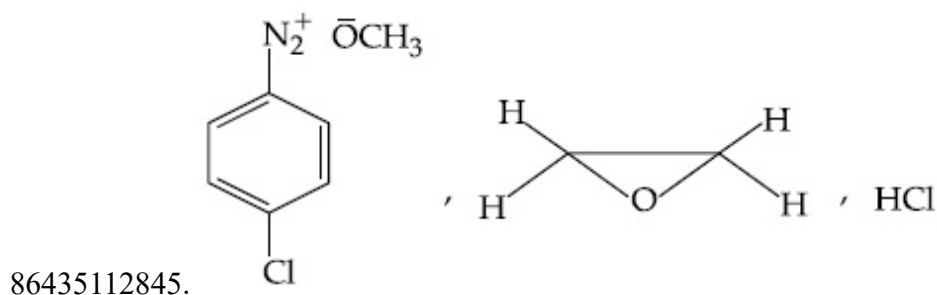
Question Number : 47 Question Id : 8643514277 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1



वरील अभिक्रियेतील (A), "X" आणि "Y" ह्यांची अनुक्रमे संरचना \_\_\_\_\_ आहे.

Options :



**Question Number : 48 Question Id : 8643514278 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No**

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

Primary, secondary and tertiary amines can be separated using :

**Options :**

86435112849. Chloroform and KOH

86435112850. Benzene sulphonic acid

86435112851. para-Toluene sulphonyl chloride

86435112852. Acetyl amide

**Question Number : 48 Question Id : 8643514278 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No**

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

प्रथमक, द्वितीयक आणि तृतीयक अमाइन्स \_\_\_\_\_ वापरून वेगवेगळे करता येतात.

**Options :**

86435112849. क्लोरोफॉर्म आणि KOH

86435112850. बेंझिन सल्फॉनिक आम्ल

86435112851. पैरा-टोल्युइन सल्फोनील क्लोराइड

86435112852. अॅसिटील अमाइड

**Question Number : 49 Question Id : 8643514279 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
Chemical Compound	Used as
(a) Sucralose	(i) Synthetic detergent
(b) Glyceryl ester of stearic acid	(ii) Artificial sweetener
(c) Sodium benzoate	(iii) Antiseptic
(d) Bithionol	(iv) Food preservative

Choose the correct match :

## Options :

86435112853. (a)-(i), (b)-(ii), (c)-(iv), (d)-(iii)

86435112854. (a)-(ii), (b)-(i), (c)-(iv), (d)-(iii)

86435112855. (a)-(iv), (b)-(iii), (c)-(ii), (d)-(i)

86435112856. (a)-(iii), (b)-(ii), (c)-(iv), (d)-(i)

Question Number : 49 Question Id : 8643514279 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
रासायनिक संयुग	वापरात येते
(a) सुक्रालोज	(i) संश्लेषित निर्मलक
(b) स्टिअरिक आम्लाचा ग्लिसरिल ईस्टर	(ii) कृत्रिम माधुर्यक
(c) सोडिअम बेंझोएट	(iii) पूतिरोधक
(d) बिथिओनल	(iv) अन्न परिरक्षक

बरोबर पर्याय निवडा :

## Options :

86435112853. (a)-(i), (b)-(ii), (c)-(iv), (d)-(iii)

86435112854. (a)-(ii), (b)-(i), (c)-(iv), (d)-(iii)

86435112855. (a)-(iv), (b)-(iii), (c)-(ii), (d)-(i)

86435112856. (a)-(iii), (b)-(ii), (c)-(iv), (d)-(i)

**Question Number : 50 Question Id : 8643514280 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No**

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

Fructose is an example of :

**Options :**

86435112857. Aldohexose

86435112858. Ketohexose

86435112859. Pyranose

86435112860. Heptose

**Question Number : 50 Question Id : 8643514280 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No**

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

फ्रुक्टोज हे \_\_\_\_\_ ह्याचे उदाहरण आहे.

**Options :**

86435112857. अल्डोहेक्सोज

86435112858. किटोहेक्सोज

86435112859. पायरनोज

86435112860. हेप्टोज

## Chemistry Section B

<b>Section Id :</b>	864351286
<b>Section Number :</b>	4
<b>Section type :</b>	Online
<b>Mandatory or Optional :</b>	Mandatory
<b>Number of Questions :</b>	10
<b>Number of Questions to be attempted :</b>	5

Section Marks :	20
Mark As Answered Required? :	Yes
Sub-Section Number :	1
Sub-Section Id :	864351286
Question Shuffling Allowed :	Yes

Question Number : 51 Question Id : 8643514281 Question Type : SA

Correct Marks : 4 Wrong Marks : 0

The number of chlorine atoms in 20 mL of chlorine gas at STP is \_\_\_\_\_  $10^{21}$ . (Round off to the Nearest Integer).

[Assume chlorine is an ideal gas at STP

$R = 0.083 \text{ L bar mol}^{-1} \text{ K}^{-1}$ ,  $N_A = 6.023 \times 10^{23}$ ]

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 : 8643514281 Question Type : SA

Correct Marks : 4 Wrong Marks : 0

20 mL क्लोरिन वायुमधील STP परिस्थितीत क्लोरिनच्या अणुंची संख्या \_\_\_\_\_  $10^{21}$  आहे.  
(जवळच्या पूर्णांकात)

[ क्लोरिन हा STP ला आदर्श वायू आहे असे समजा

$R = 0.083 \text{ L bar mol}^{-1} \text{ K}^{-1}$ ,  $N_A = 6.023 \times 10^{23}$ ]

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 : 8643514282 Question Type : SA

Correct Marks : 4 Wrong Marks : 0

KBr is doped with  $10^{-5}$  mole percent of  $\text{SrBr}_2$ . The number of cationic vacancies in 1 g of KBr crystal is \_\_\_\_\_  $10^{14}$ . (Round off to the Nearest Integer).

[Atomic Mass : K : 39.1 u, Br : 79.9 u

$N_A = 6.023 \times 10^{23}$ ]

**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 :** 8643514282 **Question Type :** SA

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

$\text{SrBr}_2$  च्या  $10^{-5}$  मोल टक्का KBr चा प्रलेप केला आहे. 1 ग्रॅ KBr च्या स्फटिकातील कटायनांच्या रिक्तस्थानांची संख्या \_\_\_\_\_  $10^{14}$  आहे. (जवळच्या पूर्णांकात)

(अणु वस्तुमान: K : 39.1 u, Br : 79.9 u

$N_A = 6.023 \times 10^{23}$ ]

**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 :** 8643514283 **Question Type :** SA

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

In the ground state of atomic Fe ( $Z = 26$ ), the spin-only magnetic moment is \_\_\_\_\_  $\times 10^{-1}$  BM. (Round off to the Nearest Integer).

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

**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 : 8643514283 Question Type : SA**

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

Fe( $Z=26$ ) च्या मूल अवस्थेतील स्पीन फक्त चुंबकिय आघूर्ण \_\_\_\_\_  $\times 10^{-1}$  BM आहे.  
(जवळच्या पूर्णांकात)

(दिलेले आहे :  $\sqrt{3} = 1.73, \sqrt{2} = 1.41$ )

**Response Type : Numeric**

**Evaluation Required For SA : Yes**

**Show Word Count : Yes**

**Answers Type : Equal**

**Text Areas : PlainText**

**Possible Answers :**

100

**Question Number : 54 Question Id : 8643514284 Question Type : SA**

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

A 1 molal  $K_4Fe(CN)_6$  solution has a degree of dissociation of 0.4. Its boiling point is equal to that of another solution which contains 18.1 weight percent of a non electrolytic solute A. The molar mass of A is \_\_\_\_\_ u. (Round off to the Nearest Integer).

[Density of water =  $1.0 \text{ g cm}^{-3}$ ]

**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 : 8643514284 Question Type : SA**

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

एका 1 मोलल  $K_4Fe(CN)_6$  च्या द्रावणाचा विचरणांश 0.4 आहे. त्याचा उत्कलनांक दुसऱ्या एका द्रावणाच्या बरोबर आहे ज्यात 18.1 वजन टक्का A हे एक विद्युत अनअपघटनी द्राव्य आहे. A चे रेणु वस्तुमान \_\_\_\_\_ u आहे. (जवळच्या पूर्णांकात)

(पाण्याची घनता =  $1.0 \text{ g cm}^{-3}$ )

**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 : 8643514285 Question Type : SA****Correct Marks : 4 Wrong Marks : 0**

Consider the reaction  $\text{N}_2\text{O}_4(\text{g}) \rightleftharpoons 2\text{NO}_2(\text{g})$ . The temperature at which  $K_C = 20.4$  and  $K_P = 600.1$ , is \_\_\_\_\_ K. (Round off to the Nearest Integer).

[Assume all gases are ideal and  $R = 0.0831 \text{ L bar K}^{-1} \text{ mol}^{-1}$ ]

**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 : 8643514285 Question Type : SA****Correct Marks : 4 Wrong Marks : 0**

लक्षात घ्या  $\text{N}_2\text{O}_4(\text{g}) \rightleftharpoons 2\text{NO}_2(\text{g})$   $K_C = 20.4$  अभिक्रिया आणि  $K_P = 600.1$  असलेले तापमान \_\_\_\_\_ K असेल (जवळच्या पूर्णांकात)

(सर्व आदर्श वायू आहेत असे समजा  $R = 0.0831 \text{ L bar K}^{-1} \text{ mol}^{-1}$ )

**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 : 8643514286 Question Type : SA****Correct Marks : 4 Wrong Marks : 0**

A KCl solution of conductivity  $0.14 \text{ S m}^{-1}$  shows a resistance of  $4.19 \Omega$  in a conductivity cell. If the same cell is filled with an HCl solution, the resistance drops to  $1.03 \Omega$ . The conductivity of the HCl solution is \_\_\_\_\_  $\times 10^{-2} \text{ S m}^{-1}$ . (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 : 8643514286 Question Type : SA**

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

एका वाहकता घटात  $0.14 \text{ S m}^{-1}$  वाहकता असणाऱ्या KCl च्या द्रावणाचा रोध  $4.19 \Omega$  आहे. जर त्याच वाहकता घटात HCl चे द्रावण भरले तर रोध  $1.03 \Omega$  इतका पडतो. HCl च्या द्रावणाची वाहकता \_\_\_\_\_  $\times 10^{-2} \text{ S m}^{-1}$  आहे. (जवळच्या पूर्णांकात)

**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 : 8643514287 Question Type : SA**

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

The reaction  $2A + B_2 \rightarrow 2AB$  is an elementary reaction.

For a certain quantity of reactants, if the volume of the reaction vessel is reduced by a factor of 3, the rate of the reaction increases by a factor of \_\_\_\_\_. (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 : 8643514287 Question Type : SA**

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

$2A + B_2 \rightarrow 2AB$  हि एक प्राथमिक अभिक्रिया आहे.

अभिक्रियाकारकांच्या एका विशिष्ट मात्रेसाठी जर भांडयाचे आकारमान 3 च्या गुणकाने कमी केले तर अभिक्रियेचा वेग \_\_\_\_\_ गुणकाने वाढेल. (जवळच्या पूर्णांकात)

**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 : 8643514288 Question Type : SA**

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

On complete reaction of  $\text{FeCl}_3$  with oxalic acid in aqueous solution containing  $\text{KOH}$ , resulted in the formation of product A. The secondary valency of Fe in the product A 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 : 58 Question Id : 8643514288 Question Type : SA**

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

$\text{KOH}$  असलेल्या जलीय द्रावणातील ऑक्झॅलिक आम्लासोबत  $\text{FeCl}_3$  ची अभिक्रिया केली असता उत्पाद A तयार झाले. उत्पाद A तील Fe ची द्वितीयक संयुजा \_\_\_\_\_ आहे. (जवळच्या पूर्णांकात)

**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 : 8643514289 Question Type : SA**

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

The total number of C-C sigma bond/s in mesityl oxide ( $\text{C}_6\text{H}_{10}\text{O}$ ) 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 : 8643514289 Question Type : SA

Correct Marks : 4 Wrong Marks : 0

ऑसिटोन ची NaOH बरोबर अभिक्रिया केली असता मेसिटिल ऑक्साइड ( $C_6H_{10}O$ ) तयार होते. मेसिटिल ऑक्साइड मधील एकूण C-C सिग्मा (sigma) बंध/बंधांची संख्या \_\_\_\_\_ आहे. (जवळच्या पूर्णांकात)

Response Type : Numeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Equal

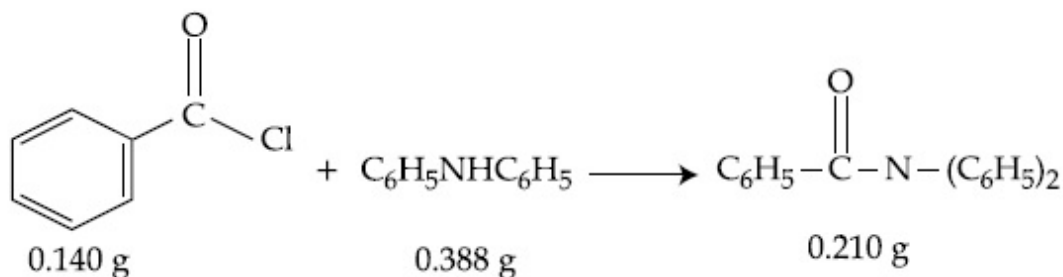
Text Areas : PlainText

Possible Answers :

100

Question Number : 60 Question Id : 8643514290 Question Type : SA

Correct Marks : 4 Wrong Marks : 0



Consider the above reaction. The percentage yield of amide product is \_\_\_\_\_. (Round off to the Nearest Integer).

(Given : Atomic mass : C : 12.0 u, H : 1.0 u, N : 14.0 u, O : 16.0 u, Cl : 35.5 u)

Response Type : Numeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Equal

Text Areas : PlainText

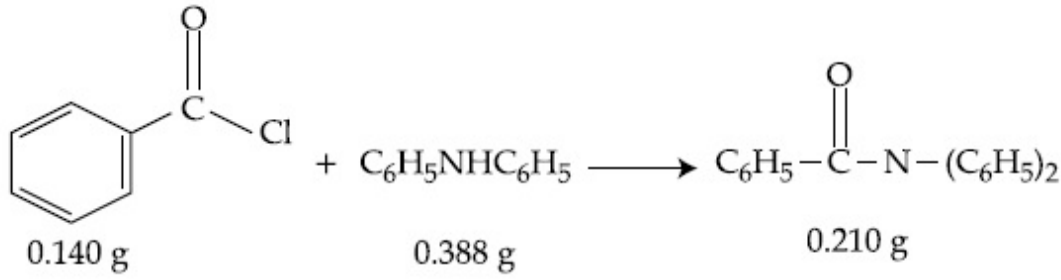
Possible Answers :

100

Question Number : 60 Question Id : 8643514290 Question Type : SA

Correct Marks : 4 Wrong Marks : 0





वरील अभिक्रिया लक्षात घ्या अमाइड उत्पादाची टक्का प्राप्ती \_\_\_\_\_ आहे. (जवळच्या पूर्णांकात).

(दिलेले आहे : अणु वस्तुमान : C : 12.0 u, H : 1.0 u, N : 14.0 u, O : 16.0 u, Cl : 35.5 u)

**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>	864351287
<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>	864351287
<b>Question Shuffling Allowed :</b>	Yes

**Question Number :** 61 **Question Id :** 8643514291 **Question Type :** MCQ **Option Shuffling :** Yes **Is**

**Question Mandatory :** No

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

The number of solutions of the equation  $\sin^{-1}\left[x^2 + \frac{1}{3}\right] + \cos^{-1}\left[x^2 - \frac{2}{3}\right] = x^2$ , for

$x \in [-1, 1]$ , and  $[x]$  denotes the greatest integer less than or equal to  $x$ , is :

**Options :**

86435112871. 0

86435112872. 2



86435112873. 4

86435112874. Infinite

**Question Number : 61 Question Id : 8643514291 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No**

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

$\sin^{-1}\left[x^2 + \frac{1}{3}\right] + \cos^{-1}\left[x^2 - \frac{2}{3}\right] = x^2$  या समीकरणाच्या उकलींची संख्या,  $x \in [-1, 1]$  साठी आणि

$[x]$  हे  $x$  किंवा  $x$  पेक्षा लहान असणारे महत्तम पूर्णांक (greatest integer) दर्शविते, बरोबर \_\_\_\_\_ आहे.

**Options :**

86435112871. 0

86435112872. 2

86435112873. 4

86435112874. अनंत

**Question Number : 62 Question Id : 8643514292 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No**

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

If the Boolean expression  $(p \wedge q) \oplus (p \otimes q)$  is a tautology, then  $\oplus$  and  $\otimes$  are respectively given by :

**Options :**

86435112875.  $\wedge, \vee$ 86435112876.  $\vee, \rightarrow$ 86435112877.  $\rightarrow, \rightarrow$ 86435112878.  $\wedge, \rightarrow$ 

**Question Number : 62 Question Id : 8643514292 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No**

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

जर  $(p \wedge q) \oplus (p \otimes q)$  ही बूलीय पदावली (Boolean expression) अनुलाप (tautology) आहे, तर  $\oplus$  आणि  $\otimes$  अनुक्रमे दिलेले आहेत \_\_\_\_\_.

**Options :**

86435112875.  $\wedge, \vee$

86435112876.  $\vee, \rightarrow$

86435112877.  $\rightarrow, \rightarrow$

86435112878.  $\wedge, \rightarrow$

**Question Number : 63 Question Id : 8643514293 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No**

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

Let O be the origin. Let  $\vec{OP} = x\hat{i} + y\hat{j} - \hat{k}$  and  $\vec{OQ} = -\hat{i} + 2\hat{j} + 3x\hat{k}$ ,  $x, y \in \mathbf{R}$ ,  $x > 0$ , be

such that  $|\vec{PQ}| = \sqrt{20}$  and the vector  $\vec{OP}$  is perpendicular to  $\vec{OQ}$ . If  $\vec{OR} = 3\hat{i} + z\hat{j} - 7\hat{k}$ ,

$z \in \mathbf{R}$ , is coplanar with  $\vec{OP}$  and  $\vec{OQ}$ , then the value of  $x^2 + y^2 + z^2$  is equal to :

**Options :**

86435112879. 1

86435112880. 2

86435112881. 7

86435112882. 9

**Question Number : 63 Question Id : 8643514293 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No**

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

समजा  $O$  हा आरंभबिंदू आहे. समजा  $\vec{OP} = x\hat{i} + y\hat{j} - \hat{k}$  आणि  $\vec{OQ} = -\hat{i} + 2\hat{j} + 3x\hat{k}$ ,  $x, y \in \mathbf{R}$ ,  $x > 0$ , जसे की  $|\vec{PQ}| = \sqrt{20}$  आणि सदिश  $\vec{OP}$  हा  $\vec{OQ}$  ला लंब (perpendicular) आहे. जर  $\vec{OR} = 3\hat{i} + z\hat{j} - 7\hat{k}$ ,  $z \in \mathbf{R}$ ,  $\vec{OR}$ ,  $\vec{OP}$  आणि  $\vec{OQ}$  हे एकप्रतलीय आहेत, तर  $x^2 + y^2 + z^2$  चे मूल्य बरोबर \_\_\_\_\_ आहे.

**Options :**

86435112879. 1

86435112880. 2

86435112881. 7

86435112882. 9

**Question Number : 64 Question Id : 8643514294 Question Type : MCQ Option Shuffling : Yes Is**

**Question Mandatory : No**

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

If  $x, y, z$  are in arithmetic progression with common difference  $d$ ,  $x \neq 3d$ , and the determinant

of the matrix  $\begin{bmatrix} 3 & 4\sqrt{2} & x \\ 4 & 5\sqrt{2} & y \\ 5 & k & z \end{bmatrix}$  is zero, then the value of  $k^2$  is :

**Options :**

86435112883. 6

86435112884. 12

86435112885. 36

86435112886. 72

**Question Number : 64 Question Id : 8643514294 Question Type : MCQ Option Shuffling : Yes Is**

**Question Mandatory : No**

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

जर  $x, y, z$  हे गणित श्रेढी (arithmetic progression) मध्ये आहेत. त्यांचे समान अंतर (common

difference)  $d$  आहे,  $x \neq 3d$ , आणि  $\begin{bmatrix} 3 & 4\sqrt{2} & x \\ 4 & 5\sqrt{2} & y \\ 5 & k & z \end{bmatrix}$  या सारणीचा सारणिक (determinant) शून्य आहे, तर

$k^2$  चे मूल्य \_\_\_\_\_ आहे.

**Options :**

86435112883. 6

86435112884. 12

86435112885. 36

86435112886. 72

**Question Number : 65 Question Id : 8643514295 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No**

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

The value of the limit  $\lim_{\theta \rightarrow 0} \frac{\tan(\pi \cos^2 \theta)}{\sin(2\pi \sin^2 \theta)}$  is equal to :

**Options :**

86435112887.  $\frac{1}{4}$

86435112888.  $-\frac{1}{2}$

86435112889.  $-\frac{1}{4}$

86435112890. 0

**Question Number : 65 Question Id : 8643514295 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No**

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

$\lim_{\theta \rightarrow 0} \frac{\tan(\pi \cos^2 \theta)}{\sin(2\pi \sin^2 \theta)}$  या सीमांकाचे (limit) मूल्य बरोबर \_\_\_\_\_ आहे.

**Options :**

86435112887.  $\frac{1}{4}$

86435112888.  $-\frac{1}{2}$

86435112889.  $-\frac{1}{4}$

86435112890. 0

**Question Number : 66 Question Id : 8643514296 Question Type : MCQ Option Shuffling : Yes Is**

**Question Mandatory : No**

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

If the integral  $\int_0^{10} \frac{[\sin 2\pi x]}{e^x - [x]} dx = \alpha e^{-1} + \beta e^{-\frac{1}{2}} + \gamma$ , where  $\alpha, \beta, \gamma$  are integers and  $[x]$  denotes

the greatest integer less than or equal to  $x$ , then the value of  $\alpha + \beta + \gamma$  is equal to :

**Options :**

86435112891. 0

86435112892. 10

86435112893. 20

86435112894. 25

**Question Number : 66 Question Id : 8643514296 Question Type : MCQ Option Shuffling : Yes Is**

**Question Mandatory : No**

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

जर  $\int_0^{10} \frac{[\sin 2\pi x]}{e^x - [x]} dx = \alpha e^{-1} + \beta e^{-\frac{1}{2}} + \gamma$ , जेव्हा  $\alpha, \beta, \gamma$  हे पूर्णांक आहेत आणि  $[x]$  हे  $x$  किंवा  $x$  पेक्षा

लहान असणारे महत्तम पूर्णांक (greatest integer) दर्शविते, तर  $\alpha + \beta + \gamma$  चे मूल्य बरोबर \_\_\_\_\_ आहे.

**Options :**

86435112891. 0

86435112892. 10

86435112893. 20

86435112894. 25

**Question Number : 67 Question Id : 8643514297 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No**

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

If the curve  $y = y(x)$  is the solution of the differential equation

$2(x^2 + x^{5/4}) dy - y(x + x^{1/4}) dx = 2x^{9/4} dx, x > 0$  which passes through the point

$\left(1, 1 - \frac{4}{3} \log_e 2\right)$ , then the value of  $y(16)$  is equal to :

**Options :**

86435112895.  $4\left(\frac{31}{3} - \frac{8}{3} \log_e 3\right)$

86435112896.  $\left(\frac{31}{3} - \frac{8}{3} \log_e 3\right)$

86435112897.  $\left(\frac{31}{3} + \frac{8}{3} \log_e 3\right)$

86435112898.  $4\left(\frac{31}{3} + \frac{8}{3} \log_e 3\right)$

**Question Number : 67 Question Id : 8643514297 Question Type : MCQ Option Shuffling : Yes Is**



**Question Mandatory : No**

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

जर  $y = y(x)$  हा वक्र  $2(x^2 + x^{5/4}) dy - y(x + x^{1/4}) dx = 2x^{9/4} dx, x > 0$  या विकलक समीकरण

(differential equation) ची उकल आहे आणि तो वक्र  $\left(1, 1 - \frac{4}{3} \log_e 2\right)$  या बिंदूमधून जातो, तर  $y(16)$

चे मूल्य बरोबर \_\_\_\_\_ आहे.

**Options :**

86435112895.  $4\left(\frac{31}{3} - \frac{8}{3} \log_e 3\right)$

86435112896.  $\left(\frac{31}{3} - \frac{8}{3} \log_e 3\right)$

86435112897.  $\left(\frac{31}{3} + \frac{8}{3} \log_e 3\right)$

86435112898.  $4\left(\frac{31}{3} + \frac{8}{3} \log_e 3\right)$

**Question Number : 68 Question Id : 8643514298 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No**

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

Let  $y = y(x)$  be the solution of the differential equation

$\cos x(3\sin x + \cos x + 3) dy = (1 + y \sin x(3\sin x + \cos x + 3))dx, 0 \leq x \leq \frac{\pi}{2}, y(0) = 0$ . Then,  $y\left(\frac{\pi}{3}\right)$  is

equal to :

**Options :**

86435112899.  $2 \log_e \left(\frac{3\sqrt{3} - 8}{4}\right)$

86435112900.  $2 \log_e \left(\frac{\sqrt{3} + 7}{2}\right)$

$$2 \log_e \left( \frac{2\sqrt{3} + 9}{6} \right)$$

86435112901.

$$2 \log_e \left( \frac{2\sqrt{3} + 10}{11} \right)$$

86435112902.

**Question Number : 68 Question Id : 8643514298 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No**

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

समजा  $y = y(x)$  हे

$\cos x(3\sin x + \cos x + 3) dy = (1 + y \sin x(3\sin x + \cos x + 3))dx, 0 \leq x \leq \frac{\pi}{2}$ , या विकलक समीकरण

(differential equation) ची उकल आहे,  $y(0) = 0$  तर  $y\left(\frac{\pi}{3}\right)$  बरोबर \_\_\_\_\_ आहे.

**Options :**

$$2 \log_e \left( \frac{3\sqrt{3} - 8}{4} \right)$$

86435112899.

$$2 \log_e \left( \frac{\sqrt{3} + 7}{2} \right)$$

86435112900.

$$2 \log_e \left( \frac{2\sqrt{3} + 9}{6} \right)$$

86435112901.

$$2 \log_e \left( \frac{2\sqrt{3} + 10}{11} \right)$$

86435112902.

**Question Number : 69 Question Id : 8643514299 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No**

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

Consider the function  $f: \mathbb{R} \rightarrow \mathbb{R}$  defined by  $f(x) = \begin{cases} \left(2 - \sin\left(\frac{1}{x}\right)\right) |x|, & x \neq 0 \\ 0, & x = 0 \end{cases}$ . Then  $f$  is :

**Options :**

86435112903. monotonic on  $(0, \infty)$  only
86435112904. monotonic on  $(-\infty, 0)$  only
86435112905. monotonic on  $(-\infty, 0) \cup (0, \infty)$
86435112906. not monotonic on  $(-\infty, 0)$  and  $(0, \infty)$

**Question Number : 69 Question Id : 8643514299 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No**

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

$f: \mathbb{R} \rightarrow \mathbb{R}$  या फलाचा विचार करा, हे

$$f(x) = \begin{cases} \left(2 - \sin\left(\frac{1}{x}\right)\right) |x|, & x \neq 0 \\ 0, & x = 0 \end{cases} \text{ द्वारा निश्चित होणारे}$$

फल आहे. तर  $f$  हे \_\_\_\_\_ आहे.

**Options :**

86435112903. फक्त  $(0, \infty)$  वर एकस्वनिक (monotonic)
86435112904. फक्त  $(-\infty, 0)$  वर एकस्वनिक
86435112905.  $(-\infty, 0) \cup (0, \infty)$  वर एकस्वनिक
86435112906.  $(-\infty, 0)$  आणि  $(0, \infty)$  वर एकस्वनिक नसणारे

**Question Number : 70 Question Id : 8643514300 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No**

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

The value of

$$\lim_{n \rightarrow \infty} \frac{[r] + [2r] + \dots + [nr]}{n^2},$$

where  $r$  is a non-zero real number and  $[r]$  denotes the greatest integer less than or equal to  $r$ , is equal to :

**Options :**

86435112907.  $r$

86435112908.  $\frac{r}{2}$

86435112909.  $2r$

86435112910.  $0$

**Question Number : 70 Question Id : 8643514300 Question Type : MCQ Option Shuffling : Yes Is**

**Question Mandatory : No**

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

$\lim_{n \rightarrow \infty} \frac{[r] + [2r] + \dots + [nr]}{n^2}$  चे मूल्य बरोबर \_\_\_\_\_ आहे, जेव्हा  $r$  ही शून्य नसलेली (non-zero)

वास्तव संख्या (real number) आहे आणि  $[r]$  हे  $r$  किंवा  $r$  पेक्षा लहान असणारे महत्तम पूर्णांक (greatest integer) दर्शविते.

**Options :**

86435112907.  $r$

86435112908.  $\frac{r}{2}$

86435112909.  $2r$

86435112910.  $0$

**Question Number : 71 Question Id : 8643514301 Question Type : MCQ Option Shuffling : Yes Is**

**Question Mandatory : No**

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

Let a computer program generate only the digits 0 and 1 to form a string of binary numbers with probability of occurrence of 0 at even places be  $\frac{1}{2}$  and probability of occurrence of 0 at the odd place be  $\frac{1}{3}$ . Then the probability that '10' is followed by '01' is equal to :

**Options :**

86435112911.  $\frac{1}{9}$

86435112912.  $\frac{1}{6}$

86435112913.  $\frac{1}{3}$

86435112914.  $\frac{1}{18}$

**Question Number : 71 Question Id : 8643514301 Question Type : MCQ Option Shuffling : Yes Is**

**Question Mandatory : No**

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

समजा द्विपद संख्यांची (binary numbers) एक लड (string) बनवण्यासाठी एक कम्प्यूटर प्रोग्राम केवळ अंक 0 आणि 1 ला अशाप्रकारे निर्माण करते की सम स्थानावर 0 होण्यासाठीची संभाव्यता  $\frac{1}{2}$  आहे आणि विषम स्थानावर 0 होण्यासाठीची संभाव्यता  $\frac{1}{3}$  आहे. तर '10' च्या नंतर '01' येण्यासाठीची संभाव्यता बरोबर \_\_\_\_\_ आहे.

**Options :**

86435112911.  $\frac{1}{9}$

86435112912.  $\frac{1}{6}$

86435112913.  $\frac{1}{3}$

86435112914.  $\frac{1}{18}$

**Question Number : 72 Question Id : 8643514302 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No**

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

If the sides AB, BC and CA of a triangle ABC have 3, 5 and 6 interior points respectively, then the total number of triangles that can be constructed using these points as vertices, is equal to :

**Options :**

86435112915. 360

86435112916. 364

86435112917. 333

86435112918. 240

**Question Number : 72 Question Id : 8643514302 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No**

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

जर एका त्रिकोण ABC च्या तीन बाजू AB, BC आणि CA वर अनुक्रमे 3, 5 आणि 6 आंतर भागातील बिंदू आहेत, तर या बाजूंची शिरोबिंदू घेवून तयार करण्यात आलेल्या त्रिकोणांची एकूण संख्या बरोबर \_\_\_\_\_ आहे.

**Options :**

86435112915. 360

86435112916. 364

86435112917. 333

86435112918. 240



**Question Number : 73 Question Id : 8643514303 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No**

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

Let the tangent to the circle  $x^2 + y^2 = 25$  at the point  $R(3, 4)$  meet  $x$ -axis and  $y$ -axis at points  $P$  and  $Q$ , respectively. If  $r$  is the radius of the circle passing through the origin  $O$  and having centre at the incentre of the triangle  $OPQ$ , then  $r^2$  is equal to :

**Options :**

86435112919.  $\frac{125}{72}$

86435112920.  $\frac{625}{72}$

86435112921.  $\frac{529}{64}$

86435112922.  $\frac{585}{66}$

**Question Number : 73 Question Id : 8643514303 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No**

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

समजा  $x^2 + y^2 = 25$  या वर्तुळ वरील  $R(3, 4)$  या बिंदूतील स्पर्शिका  $x$ -अक्ष आणि  $y$ -अक्ष यांना अनुक्रमे  $P$  आणि  $Q$  बिंदूत भेटते. जर  $r$  ही वर्तुळची त्रिज्या (radius) आहे. ते वर्तुळ आरंभबिंदू  $O$  मधून जाते आणि त्याचा केंद्रबिंदू  $\Delta OPQ$  च्या आंतरकेंद्रा (incentre) वर आहे, तर  $r^2$  बरोबर \_\_\_\_\_ आहे.

**Options :**

86435112919.  $\frac{125}{72}$

86435112920.  $\frac{625}{72}$

86435112921.  $\frac{529}{64}$

86435112922.  $\frac{585}{66}$

**Question Number : 74 Question Id : 8643514304 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No**

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

Let  $S_1, S_2$  and  $S_3$  be three sets defined as

$$S_1 = \{z \in \mathbb{C} : |z-1| \leq \sqrt{2}\}$$

$$S_2 = \{z \in \mathbb{C} : \operatorname{Re}((1-i)z) \geq 1\}$$

$$S_3 = \{z \in \mathbb{C} : \operatorname{Im}(z) \leq 1\}$$

Then the set  $S_1 \cap S_2 \cap S_3$

**Options :**

86435112923. has exactly two elements

86435112924. has exactly three elements

86435112925. is a singleton

86435112926. has infinitely many elements

**Question Number : 74 Question Id : 8643514304 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No**

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

समजा  $S_1, S_2$  आणि  $S_3$  हे

$$S_1 = \{z \in \mathbb{C} : |z-1| \leq \sqrt{2}\}$$

$$S_2 = \{z \in \mathbb{C} : \operatorname{Re}((1-i)z) \geq 1\}$$

$$S_3 = \{z \in \mathbb{C} : \operatorname{Im}(z) \leq 1\} \text{ यांनी निश्चित}$$

केलेली तीन संच आहेत. तर  $S_1 \cap S_2 \cap S_3$  या संचात \_\_\_\_\_.

**Options :**

86435112923. तंतोतंत दोन घटक आहेत

86435112924. तंतोतंत तीन घटक आहेत

86435112925. एकेरी संच (singleton) आहे

86435112926. अनंत बहु घटक (infinitely many elements) आहेत

**Question Number : 75 Question Id : 8643514305 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No**

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

Let  $f: \mathbb{R} \rightarrow \mathbb{R}$  be defined as  $f(x) = e^{-x}\sin x$ . If  $F: [0, 1] \rightarrow \mathbb{R}$  is a differentiable function such

that  $F(x) = \int_0^x f(t) dt$ , then the value of  $\int_0^1 (F'(x) + f(x))e^x dx$  lies in the interval

**Options :**

86435112927.  $\left[ \frac{330}{360}, \frac{331}{360} \right]$

86435112928.  $\left[ \frac{327}{360}, \frac{329}{360} \right]$

86435112929.  $\left[ \frac{331}{360}, \frac{334}{360} \right]$

86435112930.  $\left[ \frac{335}{360}, \frac{336}{360} \right]$

**Question Number : 75 Question Id : 8643514305 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No**

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

समजा  $f: \mathbb{R} \rightarrow \mathbb{R}$  हे  $f(x) = e^{-x}\sin x$  ने निश्चित केले आहे. जर  $F: [0, 1] \rightarrow \mathbb{R}$  हे विकलनीय फल

(differentiable function) आहे जसे की  $F(x) = \int_0^x f(t) dt$ , तर  $\int_0^1 (F'(x) + f(x))e^x dx$  चे मूल्य हे

\_\_\_\_\_ अंतराला मधील आहे.

**Options :**

$$86435112927. \left[ \frac{330}{360}, \frac{331}{360} \right]$$

$$86435112928. \left[ \frac{327}{360}, \frac{329}{360} \right]$$

$$86435112929. \left[ \frac{331}{360}, \frac{334}{360} \right]$$

$$86435112930. \left[ \frac{335}{360}, \frac{336}{360} \right]$$

**Question Number : 76 Question Id : 8643514306 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No**

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

The value of  $\sum_{r=0}^6 ({}^6C_r \cdot {}^6C_{6-r})$  is equal to :

**Options :**

$$86435112931. 924$$

$$86435112932. 1024$$

$$86435112933. 1124$$

$$86435112934. 1324$$

**Question Number : 76 Question Id : 8643514306 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No**

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

$\sum_{r=0}^6 ({}^6C_r \cdot {}^6C_{6-r})$  चे मूल्य बरोबर \_\_\_\_\_ आहे.

**Options :**

$$86435112931. 924$$

$$86435112932. 1024$$

86435112933. 1124

86435112934. 1324

**Question Number : 77 Question Id : 8643514307 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1**

If the equation of plane passing through the mirror image of a point (2, 3, 1) with respect to line  $\frac{x+1}{2} = \frac{y-3}{1} = \frac{z+2}{-1}$  and containing the line  $\frac{x-2}{3} = \frac{1-y}{2} = \frac{z+1}{1}$  is  $\alpha x + \beta y + \gamma z = 24$ , then  $\alpha + \beta + \gamma$  is equal to :

**Options :**

86435112935. 21

86435112936. 20

86435112937. 19

86435112938. 18

**Question Number : 77 Question Id : 8643514307 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1**

जर  $\frac{x+1}{2} = \frac{y-3}{1} = \frac{z+2}{-1}$  या रेषेच्या संदर्भात (2, 3, 1) या बिंदूच्या आरशातील प्रतिमे (mirror image)

मधून जाणारे आणि  $\frac{x-2}{3} = \frac{1-y}{2} = \frac{z+1}{1}$  या रेषेला सामावणारे प्रतल आहे. या प्रतलाचे समीकरण

$\alpha x + \beta y + \gamma z = 24$  आहे, तर  $\alpha + \beta + \gamma$  बरोबर \_\_\_\_\_ आहे.

**Options :**

86435112935. 21

86435112936. 20

86435112937. 19

86435112938. 18

**Question Number : 78 Question Id : 8643514308 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1**

Two tangents are drawn from a point P to the circle  $x^2 + y^2 - 2x - 4y + 4 = 0$ , such that the angle between these tangents is  $\tan^{-1}\left(\frac{12}{5}\right)$ , where  $\tan^{-1}\left(\frac{12}{5}\right) \in (0, \pi)$ . If the centre of the circle is denoted by C and these tangents touch the circle at points A and B, then the ratio of the areas of  $\Delta PAB$  and  $\Delta CAB$  is :

**Options :**

86435112939. 9 : 4

86435112940. 3 : 1

86435112941. 2 : 1

86435112942. 11 : 4

**Question Number : 78 Question Id : 8643514308 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1**

$x^2 + y^2 - 2x - 4y + 4 = 0$  या वर्तुळाला P बिंदू पासून दोन स्पर्शिका (tangents) काढल्या आहेत, जसे की त्या स्पर्शिका मधील कोन  $\tan^{-1}\left(\frac{12}{5}\right)$  आहे, जेव्हा  $\tan^{-1}\left(\frac{12}{5}\right) \in (0, \pi)$ . जर वर्तुळाचा केंद्रबिंदू C ने दर्शविला आहे आणि या स्पर्शिका वर्तुळाला बिंदू A आणि B मध्ये स्पर्श करतात, तर  $\Delta PAB$  आणि  $\Delta CAB$  च्या क्षेत्रफळांचे शक्य गुणोत्तर (possible ratio) \_\_\_\_\_ आहे.

**Options :**

86435112939. 9 : 4



86435112940. 3 : 1

86435112941. 2 : 1

86435112942. 11 : 4

**Question Number : 79 Question Id : 8643514309 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No**

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

The number of solutions of the equation  $x + 2 \tan x = \frac{\pi}{2}$  in the interval  $[0, 2\pi]$  is :

**Options :**

86435112943. 2

86435112944. 3

86435112945. 4

86435112946. 5

**Question Number : 79 Question Id : 8643514309 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No**

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

$x + 2 \tan x = \frac{\pi}{2}$  या समीकरणाची  $[0, 2\pi]$  या अंतराला मधील (in the interval) उकलींची संख्या \_\_\_\_\_

आहे.

**Options :**

86435112943. 2

86435112944. 3

86435112945. 4

86435112946. 5

**Question Number : 80 Question Id : 8643514310 Question Type : MCQ Option Shuffling : Yes Is**

**Question Mandatory : No**

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

Let L be a tangent line to the parabola  $y^2 = 4x - 20$  at (6, 2). If L is also a tangent to the ellipse

$$\frac{x^2}{2} + \frac{y^2}{b} = 1, \text{ then the value of } b \text{ is equal to :}$$

**Options :**

86435112947. 11

86435112948. 14

86435112949. 16

86435112950. 20

**Question Number : 80 Question Id : 8643514310 Question Type : MCQ Option Shuffling : Yes Is**

**Question Mandatory : No**

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

समजा L ही  $y^2 = 4x - 20$  या अन्वस्ता (parabola) च्या (6, 2) या बिंदूतील स्पर्शिका रेषा (tangent line) आहे.

जर L ही  $\frac{x^2}{2} + \frac{y^2}{b} = 1$  या विवृत्ताची (ellipse) सुद्धा स्पर्शिका आहे, तर b चे मूल्य बरोबर \_\_\_\_\_

आहे.

**Options :**

86435112947. 11

86435112948. 14

86435112949. 16

86435112950. 20

## Mathematics Section B

Section Id :

864351288

<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>	864351288
<b>Question Shuffling Allowed :</b>	Yes

**Question Number : 81 Question Id : 8643514311 Question Type : SA**  
**Correct Marks : 4 Wrong Marks : 0**

Let  $I_n = \int_1^e x^{19} (\log|x|)^n dx$ , where  $n \in \mathbb{N}$ . If  $(20)I_{10} = \alpha I_9 + \beta I_8$ , for natural numbers  $\alpha$  and  $\beta$ , then  $\alpha - \beta$  equals 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 : 8643514311 Question Type : SA**  
**Correct Marks : 4 Wrong Marks : 0**

समजा  $I_n = \int_1^e x^{19} (\log|x|)^n dx$ , जेव्हा  $n \in \mathbb{N}$ , जर  $(20)I_{10} = \alpha I_9 + \beta I_8$ ,  $\alpha$  आणि  $\beta$  नैसर्गिक संख्ये (natural numbers) साठी, 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 : 82 Question Id : 8643514312 Question Type : SA**  
**Correct Marks : 4 Wrong Marks : 0**

Let  $\tan\alpha$ ,  $\tan\beta$  and  $\tan\gamma$ ;  $\alpha, \beta, \gamma \neq \frac{(2n-1)\pi}{2}$ ,  $n \in \mathbf{N}$  be the slopes of three line segments OA, OB and OC, respectively, where O is origin. If circumcentre of  $\Delta ABC$  coincides with origin and its orthocentre lies on  $y$ -axis, then the value of  $\left(\frac{\cos 3\alpha + \cos 3\beta + \cos 3\gamma}{\cos \alpha \cos \beta \cos \gamma}\right)^2$  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 : 82 Question Id : 8643514312 Question Type : SA**

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

OA, OB आणि OC या तीन रेषाखंडांचा (line segments) चढ (slope) अनुक्रमे  $\tan\alpha$ ,  $\tan\beta$  आणि  $\tan\gamma$ ;  $\alpha, \beta, \gamma \neq \frac{(2n-1)\pi}{2}$ ,  $n \in \mathbf{N}$  आहे, जेव्हा O हा आरंभबिंदू (origin) आहे. जर  $\Delta ABC$  चा परिकेंद्र (circumcentre) आरंभ बिंदूशी अभिन्न आहे आणि त्याचा लंबसंपात (orthocentre)  $y$ -अक्षावर आहे, तर

$\left(\frac{\cos 3\alpha + \cos 3\beta + \cos 3\gamma}{\cos \alpha \cos \beta \cos \gamma}\right)^2$  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 : 8643514313 Question Type : SA**

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

If  $1, \log_{10}(4^x - 2)$  and  $\log_{10}\left(4^x + \frac{18}{5}\right)$  are in arithmetic progression for a real number  $x$ , then

the value of the determinant  $\begin{vmatrix} 2\left(x - \frac{1}{2}\right) & x - 1 & x^2 \\ 1 & 0 & x \\ x & 1 & 0 \end{vmatrix}$  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 :** 8643514313 **Question Type :** SA

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

जर  $x$  या वास्तव संख्येसाठी  $1, \log_{10}(4^x - 2)$  आणि  $\log_{10}\left(4^x + \frac{18}{5}\right)$  हे गणित श्रेढी (arithmetic progression)

मध्ये आहेत, तर  $\begin{vmatrix} 2\left(x - \frac{1}{2}\right) & x - 1 & x^2 \\ 1 & 0 & x \\ x & 1 & 0 \end{vmatrix}$  या सारणीक (determinant) 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 :** 8643514314 **Question Type :** SA

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

Consider a set of  $3n$  numbers having variance 4. In this set, the mean of first  $2n$  numbers is 6 and the mean of the remaining  $n$  numbers is 3. A new set is constructed by adding 1 into each of first  $2n$  numbers, and subtracting 1 from each of the remaining  $n$  numbers. If the variance of the new set is  $k$ , then  $9k$  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 : 8643514314 Question Type : SA**

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

3n संख्येच्या संचाचा प्रचरण (variance) 4 आहे. या संचाचा विचार करा. या संचामध्ये पहिल्या 2n संख्येचा मध्य 6 आहे आणि राहिलेल्या n संख्येचा मध्य 3 आहे. एक नवीन संच असा तयार केला आहे की पहिल्या 2n संख्येच्या प्रत्येका मध्ये 1 मिळविले आणि राहिलेल्या; n संख्येच्या प्रत्येका मधून 1 वजा केले. जर नवीन संचाचा प्रचरण k आहे, तर 9k 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 : 8643514315 Question Type : SA**

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

Let  $f: [-1, 1] \rightarrow \mathbb{R}$  be defined as  $f(x) = ax^2 + bx + c$  for all  $x \in [-1, 1]$ , where  $a, b, c \in \mathbb{R}$  such that  $f(-1) = 2, f'(-1) = 1$  and for  $x \in (-1, 1)$  the maximum value of  $f''(x)$  is  $\frac{1}{2}$ . If  $f(x) \leq \alpha, x \in [-1, 1]$ , then the least 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 : 85 Question Id : 8643514315 Question Type : SA**

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



समजा  $f: [-1, 1] \rightarrow \mathbf{R}$  हे  $f(x) = ax^2 + bx + c$ , सर्व  $x \in [-1, 1]$  साठी, जेव्हा  $a, b, c \in \mathbf{R}$  द्वारा निश्चित करते. जसे की  $f(-1) = 2, f'(-1) = 1$  आणि सर्व  $x \in (-1, 1)$  साठी  $f''(x)$  चे कमाल मूल्य (maximum value)  $\frac{1}{2}$  आहे, जर  $f(x) \leq \alpha, x \in [-1, 1]$  तर  $\alpha$  चे लहान (least) 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 :** 86 **Question Id :** 8643514316 **Question Type :** SA

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

Let the coefficients of third, fourth and fifth terms in the expansion of  $\left(x + \frac{a}{x^2}\right)^n, x \neq 0$ , be

in the ratio 12 : 8 : 3. Then the term independent of  $x$  in the expansion, 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 :** 8643514316 **Question Type :** SA

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

समजा  $\left(x + \frac{a}{x^2}\right)^n, x \neq 0$  या विस्तारा (expansion) मधील तिसऱ्या, चौथ्या आणि पाचव्या पदांचे सहगुणक

(coefficients) 12 : 8 : 3 या प्रमाणात आहेत. तर या विस्तारा मधील  $x$  चे अनधीन (independent) पद 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 : 8643514317 Question Type : SA**

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

Let  $f: [-3, 1] \rightarrow \mathbb{R}$  be given as

$$f(x) = \begin{cases} \min \{(x + 6), x^2\}, & -3 \leq x \leq 0 \\ \max \{\sqrt{x}, x^2\}, & 0 \leq x \leq 1. \end{cases}$$

If the area bounded by  $y=f(x)$  and  $x$ -axis is  $A$ , then the value of  $6A$  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 : 8643514317 Question Type : SA**

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

समजा  $f: [-3, 1] \rightarrow \mathbb{R}$  दिलेले आहे की

$$f(x) = \begin{cases} \min \{(x + 6), x^2\}, & -3 \leq x \leq 0 \\ \max \{\sqrt{x}, x^2\}, & 0 \leq x \leq 1 \end{cases}$$

जर  $y=f(x)$  आणि  $x$ -अक्ष यांनी बंदीस्त (bounded) केलेले क्षेत्रफळ  $A$  आहे, तर  $6A$  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 : 88 Question Id : 8643514318 Question Type : SA**

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

Let P be an arbitrary point having sum of the squares of the distances from the planes  $x + y + z = 0$ ,  $lx - nz = 0$  and  $x - 2y + z = 0$ , equal to 9. If the locus of the point P is  $x^2 + y^2 + z^2 = 9$ , then the value of  $l - n$  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 :** 8643514318 **Question Type :** SA

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

समजा P हा एक कोणताही बिंदू असून  $x + y + z = 0$ ,  $lx - nz = 0$  आणि  $x - 2y + z = 0$  या प्रतलां पासूनच्या अंतराच्या वर्गाची बेरीज बरोबर 9 आहे. जर  $x^2 + y^2 + z^2 = 9$  हे बिंदू P चे निधान (locus) आहे, तर  $l - n$  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 :** 89 **Question Id :** 8643514319 **Question Type :** SA

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

Let  $\vec{x}$  be a vector in the plane containing vectors  $\vec{a} = 2\hat{i} - \hat{j} + \hat{k}$  and  $\vec{b} = \hat{i} + 2\hat{j} - \hat{k}$ . If the vector  $\vec{x}$  is perpendicular to  $(3\hat{i} + 2\hat{j} - \hat{k})$  and its projection on  $\vec{a}$  is  $\frac{17\sqrt{6}}{2}$ , then the value of

$|\vec{x}|^2$  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 : 8643514319 Question Type : SA**

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

समजा  $\vec{a} = 2\hat{i} - \hat{j} + \hat{k}$  आणि  $\vec{b} = \hat{i} + 2\hat{j} - \hat{k}$  या सदिशांनी समाविष्ट असणाऱ्या प्रतलामध्ये  $\vec{x}$  हे एक सदिश आहे. जर सदिश  $\vec{x}$  हे  $(3\hat{i} + 2\hat{j} - \hat{k})$  ला लंब आहे आणि त्याचा  $\vec{a}$  वरील प्रक्षेप (projection)  $\frac{17\sqrt{6}}{2}$  आहे,

तर  $|\vec{x}|^2$  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 : 90 Question Id : 8643514320 Question Type : SA**

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

Let  $A = \begin{bmatrix} a & b \\ c & d \end{bmatrix}$  and  $B = \begin{bmatrix} \alpha \\ \beta \end{bmatrix} \neq \begin{bmatrix} 0 \\ 0 \end{bmatrix}$  such that  $AB = B$  and  $a + d = 2021$ , then the value of  $ad - bc$  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 : 8643514320 Question Type : SA**

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

समजा  $A = \begin{bmatrix} a & b \\ c & d \end{bmatrix}$  आणि  $B = \begin{bmatrix} \alpha \\ \beta \end{bmatrix} \neq \begin{bmatrix} 0 \\ 0 \end{bmatrix}$  जसे की  $AB = B$  आणि  $a + d = 2021$ , तर  $ad - bc$  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