

National Testing Agency

Question Paper Name : B TECH 16th March 2021 Shift 2
Subject Name : B TECH
Creation Date : 2021-03-16 21:03:26
Duration : 180
Number of Questions : 90
Total Marks : 300
Display Marks: Yes

B TECH

Group Number : 1
Group Id : 86435126
Group Maximum Duration : 0
Group Minimum Duration : 180
Show Attended Group? : No
Edit Attended Group? : No
Break time : 0
Group Marks : 300
Is this Group for Examiner? : No

Physics Section A

Section Id : 864351151
Section Number : 1
Section type : Online
Mandatory or Optional : Mandatory
Number of Questions : 20
Number of Questions to be attempted : 20
Section Marks : 80
Mark As Answered Required? : Yes
Sub-Section Number : 1
Sub-Section Id : 864351151
Question Shuffling Allowed : Yes

Question Number : 1 Question Id : 8643512251 Question Type : MCQ Option Shuffling : Yes Is
Question Mandatory : No
Correct Marks : 4 Wrong Marks : 1

Two identical antennas mounted on identical towers are separated from each other by a distance of 45 km. What should nearly be the minimum height of receiving antenna to receive the signals in line of sight ?

(Assume radius of earth is 6400 km)

Options :

8643516751. 79.1 m

8643516752. 39.55 m

8643516753. 158.2 m

8643516754. 19.77 m

Question Number : 2 Question Id : 8643512252 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

The de-Broglie wavelength associated with an electron and a proton were calculated by accelerating them through same potential of 100 V. What should nearly be the ratio of their wavelengths ? ($m_p = 1.00727u$ $m_e = 0.00055u$)

Options :

8643516755. 43 : 1

8643516756. 1860 : 1

8643516757. 41.4 : 1

8643516758. $(1860)^2 : 1$

Question Number : 3 Question Id : 8643512253 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

The refractive index of a converging lens is 1.4. What will be the focal length of this lens if it is placed in a medium of same refractive index ? Assume the radii of curvature of the faces of lens are R_1 and R_2 respectively.

8643516759. Zero

8643516760. 1

8643516761. Infinite

8643516762. $\frac{R_1 R_2}{R_1 - R_2}$

Question Number : 4 Question Id : 8643512254 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

Red light differs from blue light as they have :

Options :

8643516763. Same frequencies and same wavelengths

8643516764. Different frequencies and different wavelengths

8643516765. Same frequencies and different wavelengths

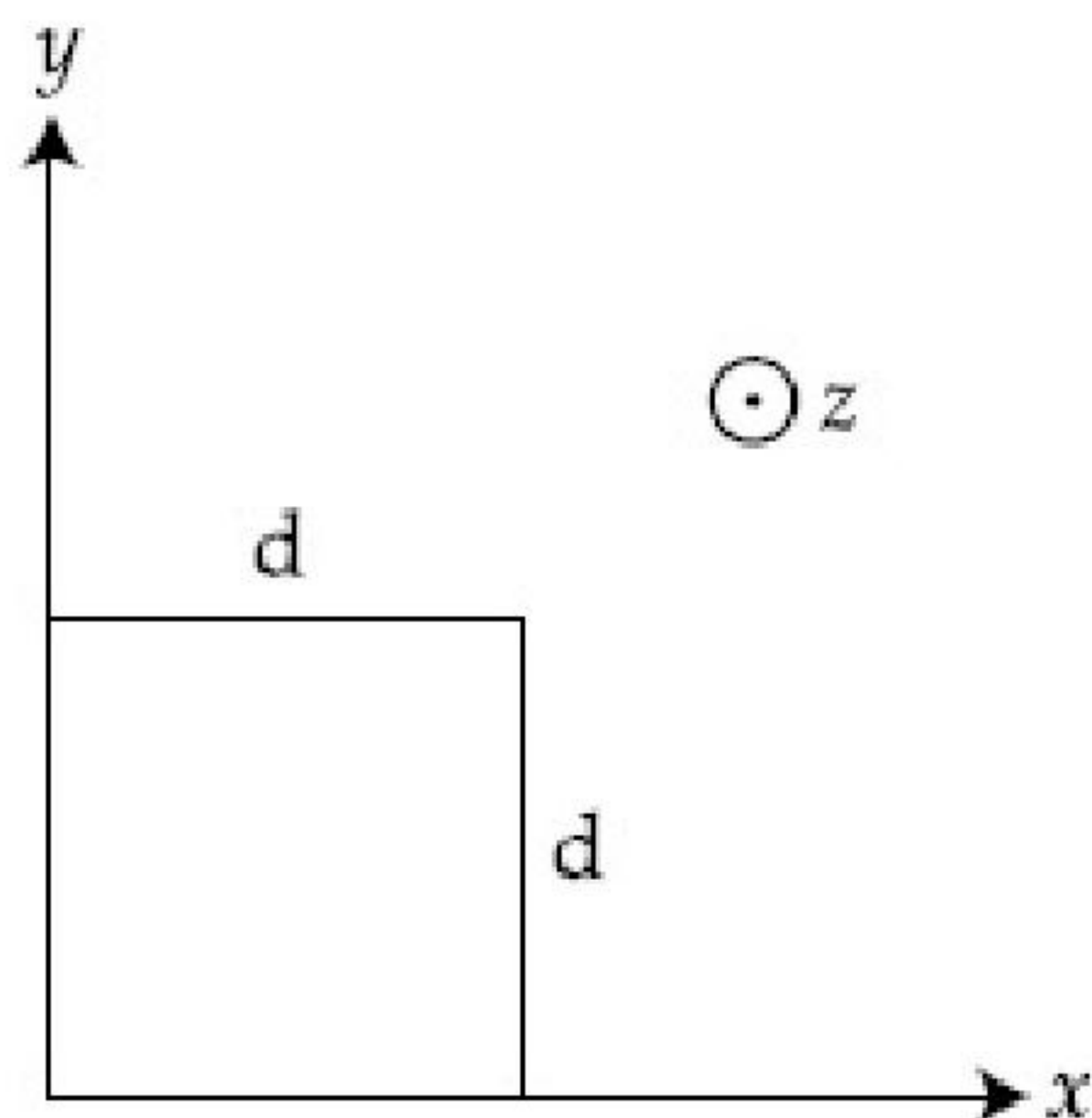
8643516766. Different frequencies and same wavelengths

Question Number : 5 Question Id : 8643512255 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

The magnetic field in a region is given by $\vec{B} = B_0 \left(\frac{x}{a} \right) \hat{k}$. A square loop of side d is placed with its edges along the x and y axes. The loop is moved with a constant velocity $\vec{v} = v_0 \hat{i}$.

The emf induced in the loop is :



Options :

8643516767. $\frac{B_0 v_0 d}{2a}$

8643516768. $\frac{B_0 v_0 d^2}{a}$

8643516769. $\frac{B_0 v_0^2 d}{2a}$

8643516770. $\frac{B_0 v_0 d^2}{2a}$

Question Number : 6 Question Id : 8643512256 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

Amplitude of a mass-spring system, which is executing simple harmonic motion decreases with time. If mass = 500g, Decay constant = 20 g/s then how much time is required for the amplitude of the system to drop to half of its initial value ?

($\ln 2 = 0.693$)

Options :

8643516771. 34.65 s

8643516773. 0.034 s

8643516774. 17.32 s

Question Number : 7 Question Id : 8643512257 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

Calculate the value of mean free path (λ) for oxygen molecules at temperature 27°C and pressure $1.01 \times 10^5 \text{ Pa}$. Assume the molecular diameter 0.3 nm and the gas is ideal. ($k = 1.38 \times 10^{-23} \text{ JK}^{-1}$)

Options :

8643516775. 32 nm

8643516776. 58 nm

8643516777. 86 nm

8643516778. 102 nm

Question Number : 8 Question Id : 8643512258 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

What will be the nature of flow of water from a circular tap, when its flow rate increased from 0.18 L/min to 0.48 L/min ? The radius of the tap and viscosity of water are 0.5 cm and 10^{-3} Pa s , respectively.

(Density of water : 10^3 kg/m^3)

Options :

8643516779. Steady flow to unsteady flow

8643516780. Unsteady to steady flow

8643516781. Remains steady flow

Question Number : 9 Question Id : 8643512259 Question Type : MCQ Option Shuffling : Yes Is

Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

A charge Q is moving $d\vec{l}$ distance in the magnetic field $\vec{B}$. Find the value of work done by $\vec{B}$.

Options :

8643516783. 1

8643516784. Zero

8643516785. Infinite

8643516786. -1

Question Number : 10 Question Id : 8643512260 Question Type : MCQ Option Shuffling : Yes Is

Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

Calculate the time interval between 33% decay and 67% decay if half-life of a substance is 20 minutes.

Options :

8643516787. 20 minutes

8643516788. 40 minutes

8643516789. 60 minutes

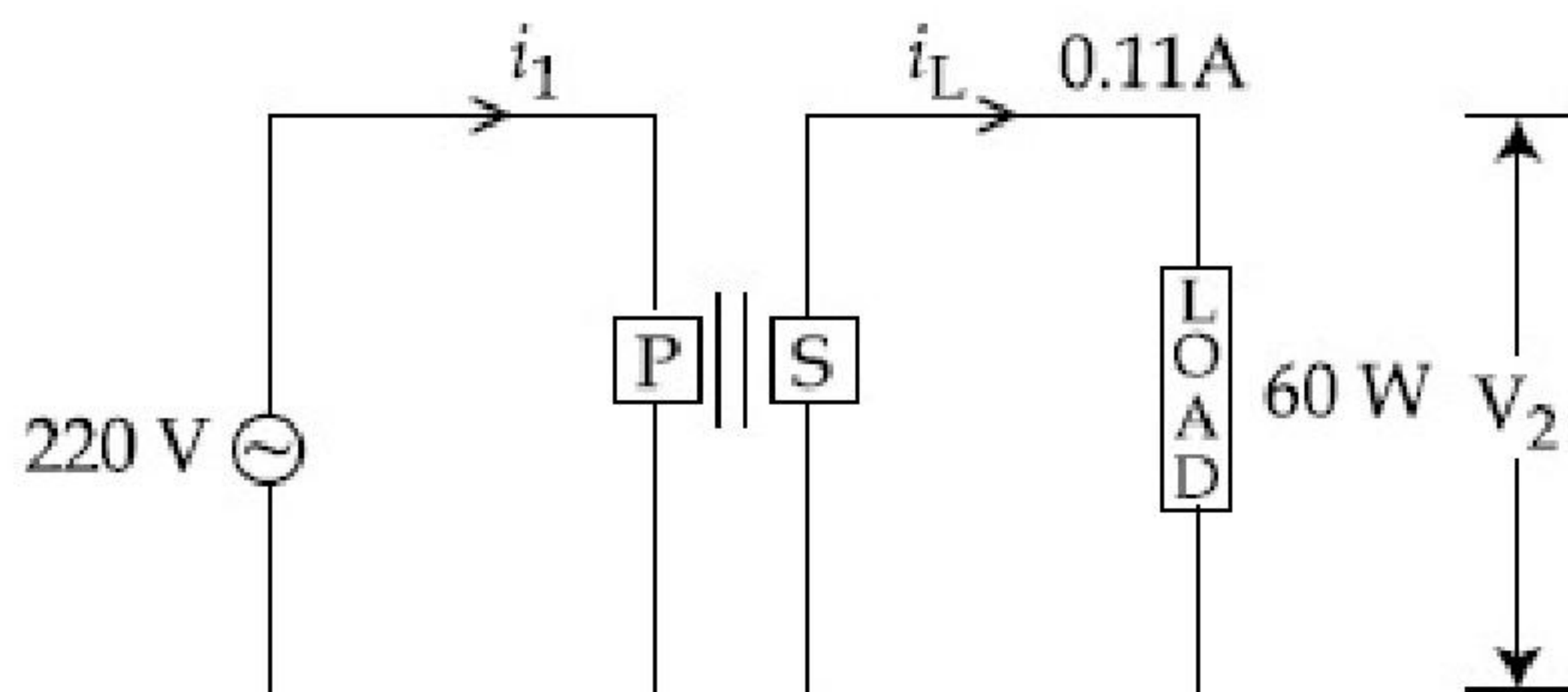
8643516790. 13 minutes

Question Number : 11 Question Id : 8643512261 Question Type : MCQ Option Shuffling : Yes Is

Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

For the given circuit, comment on the type of transformer used.



Options :

8643516791. Step - up transformer

8643516792. Step down transformer

8643516793. Auto transformer

8643516794. Auxilliary transformer

Question Number : 12 Question Id : 8643512262 Question Type : MCQ Option Shuffling : Yes Is

Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

The half-life of Au^{198} is 2.7 days. The activity of 1.50 mg of Au^{198} if its atomic weight is 198 g mol^{-1} is, ($N_A = 6 \times 10^{23} / \text{mol}$).

Options :

8643516795. 240 Ci

8643516796. 357 Ci

8643516797. 252 Ci

8643516798. 535 Ci

Question Number : 13 Question Id : 8643512263 Question Type : MCQ Option Shuffling : Yes Is

Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

8643516821. 1500 J

8643516822. 2000 J

Question Number : 19 Question Id : 8643512269 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

Find out the surface charge density at the intersection of point $x=3$ m plane and x -axis, in the region of uniform line charge of 8 nC/m lying along the z -axis in free space.

Options :

8643516823. 47.88 C/m

8643516824. 0.07 nC m⁻²

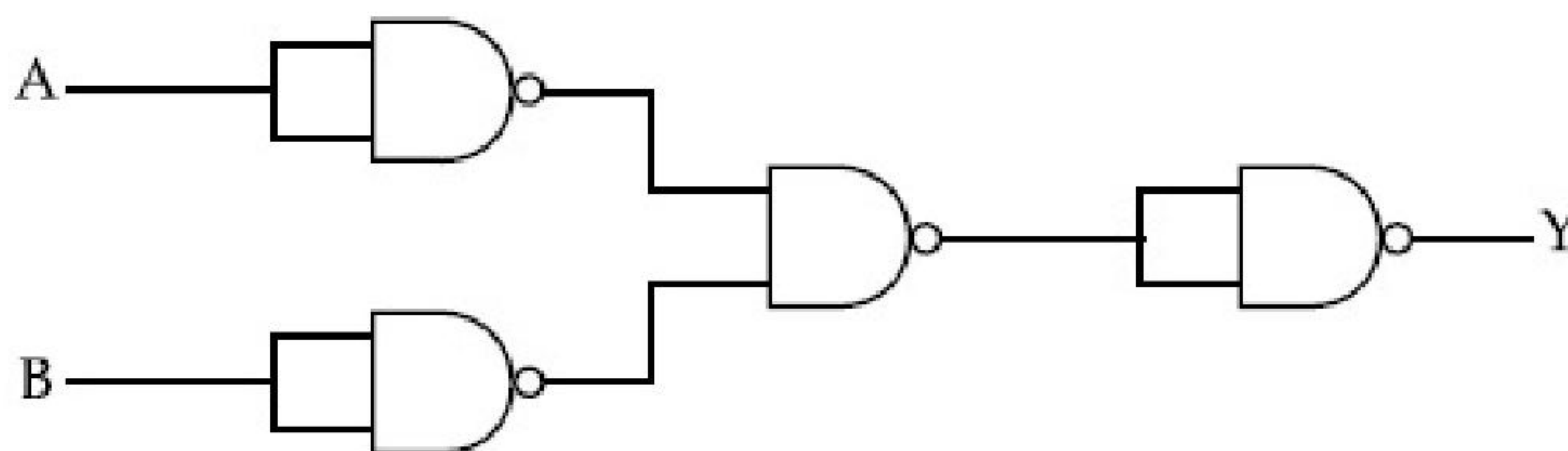
8643516825. 0.424 nC m⁻²

8643516826. 4.0 nC m⁻²

Question Number : 20 Question Id : 8643512270 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

The following logic gate is equivalent to :



Options :

8643516827. AND Gate

8643516828. NAND Gate

8643516829. OR Gate

8643516830. NOR Gate

Physics Section B

Section Id : 864351152
Section Number : 2
Section type : Online
Mandatory or Optional : Mandatory
Number of Questions : 10
Number of Questions to be attempted : 5
Section Marks : 20
Mark As Answered Required? : Yes
Sub-Section Number : 1
Sub-Section Id : 864351152
Question Shuffling Allowed : Yes

Question Number : 21 Question Id : 8643512271 Question Type : SA

Correct Marks : 4 Wrong Marks : 0

If one wants to remove all the mass of the earth to infinity in order to break it up completely.

The amount of energy that needs to be supplied will be $\frac{x}{5} \frac{GM^2}{R}$ where x is _____

(Round off to the Nearest Integer)

(M is the mass of earth, R is the radius of earth, G is the gravitational constant)

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 : 8643512272 Question Type : SA

Correct Marks : 4 Wrong Marks : 0

Possible Answers :

100

Question Number : 25 Question Id : 8643512275 Question Type : SA

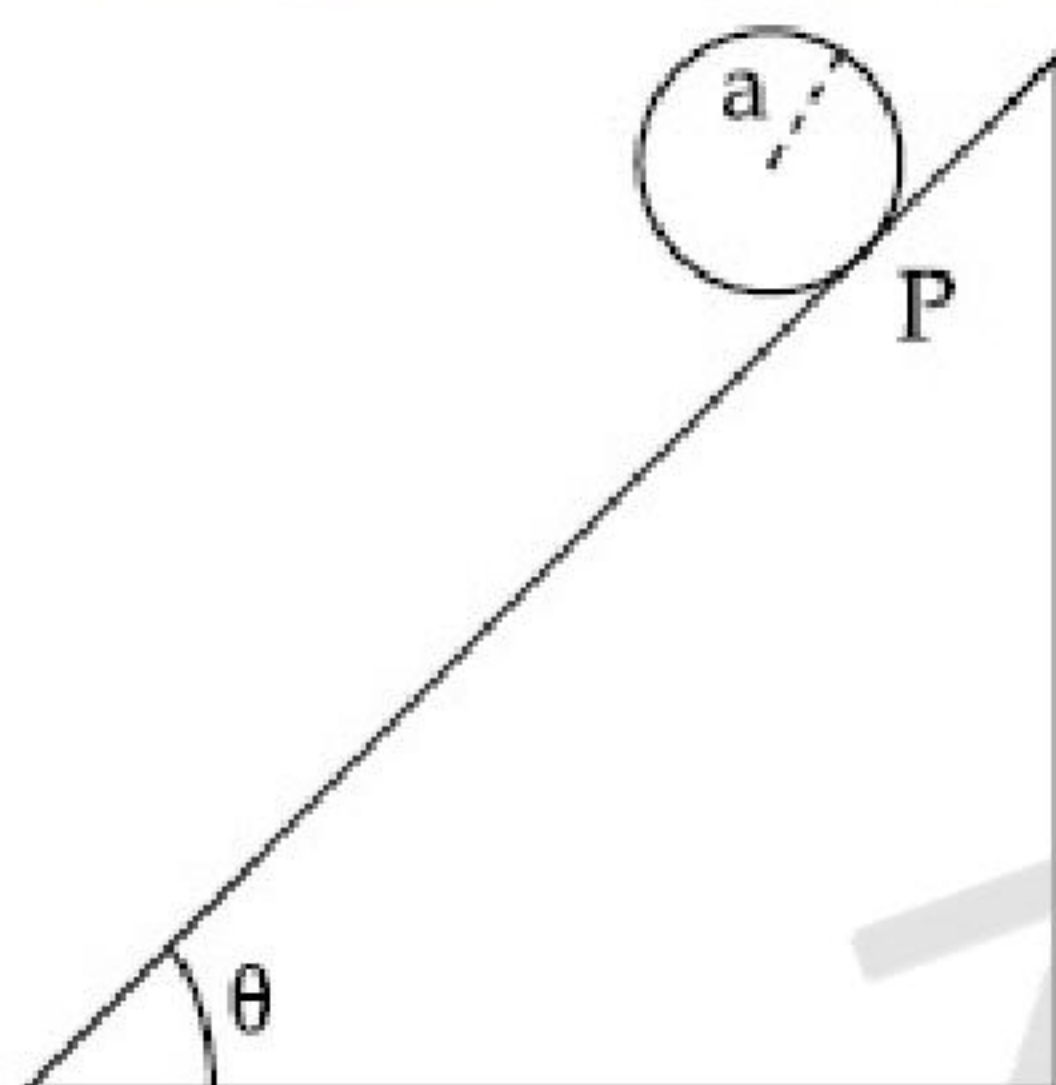
Correct Marks : 4 Wrong Marks : 0

A solid disc of radius 'a' and mass 'm' rolls down without slipping on an inclined plane making an angle θ with the horizontal. The acceleration of the disc will be $\frac{2}{b} g \sin\theta$ where

b is _____. (Round off to the Nearest Integer)

(g = acceleration due to gravity

θ = angle as shown in figure)



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 : 8643512276 Question Type : SA

Correct Marks : 4 Wrong Marks : 0

For an ideal heat engine, the temperature of the source is 127°C . In order to have 60% efficiency the temperature of the sink should be _____ $^\circ\text{C}$. (Round off to the Nearest Integer)

Response Type : Numeric

Evaluation Required For SA : Yes

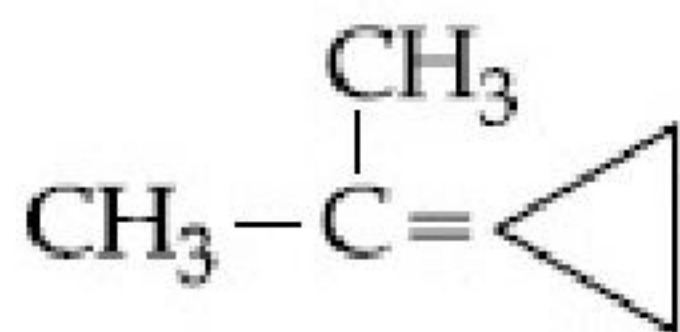
Show Word Count : Yes

Answers Type : Equal

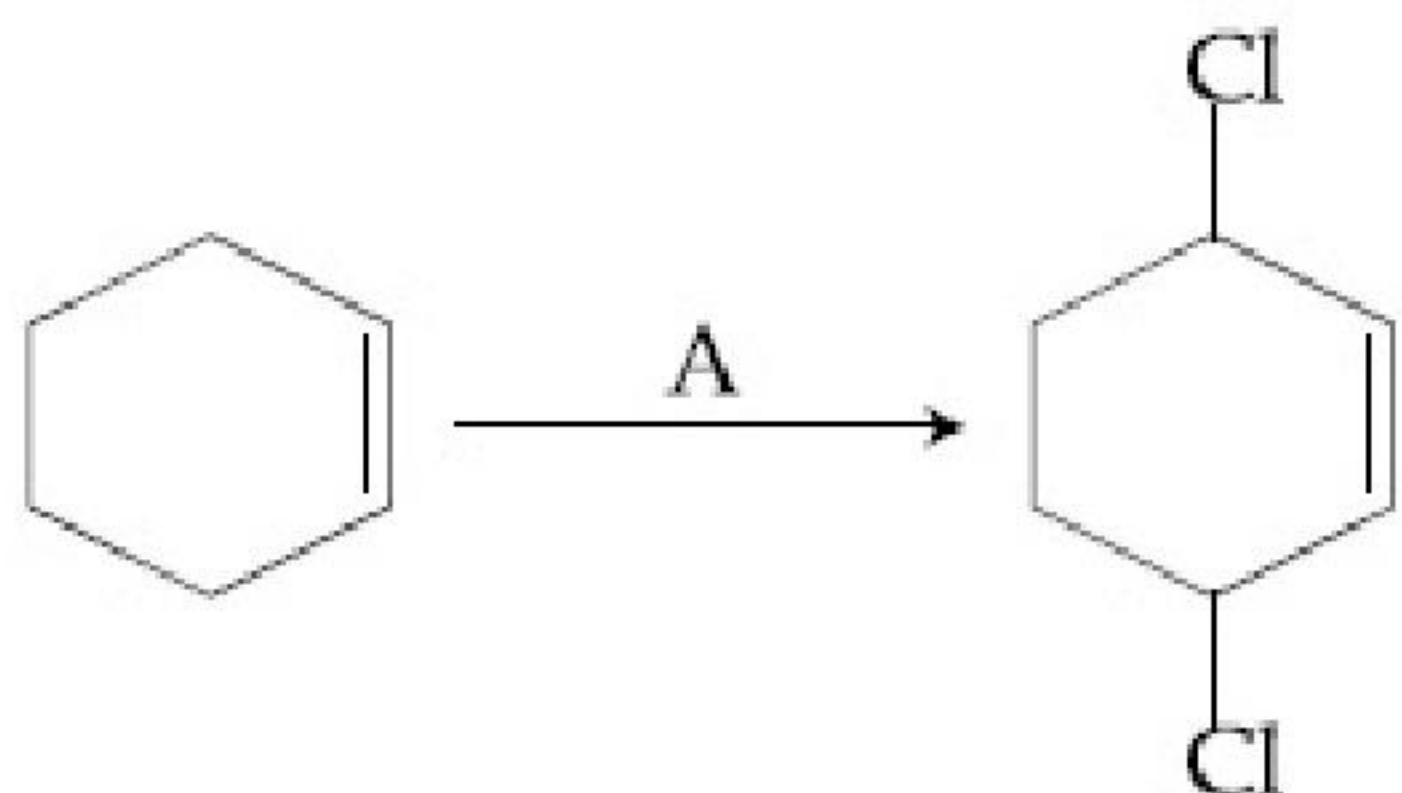
Text Areas : PlainText

Possible Answers :

8643516892.



Question Number : 44 Question Id : 8643512294 Question Type : MCQ Option Shuffling : Yes Is
Question Mandatory : No
Correct Marks : 4 Wrong Marks : 1



Identify the reagent(s) 'A' and condition(s) for the reaction

Options :

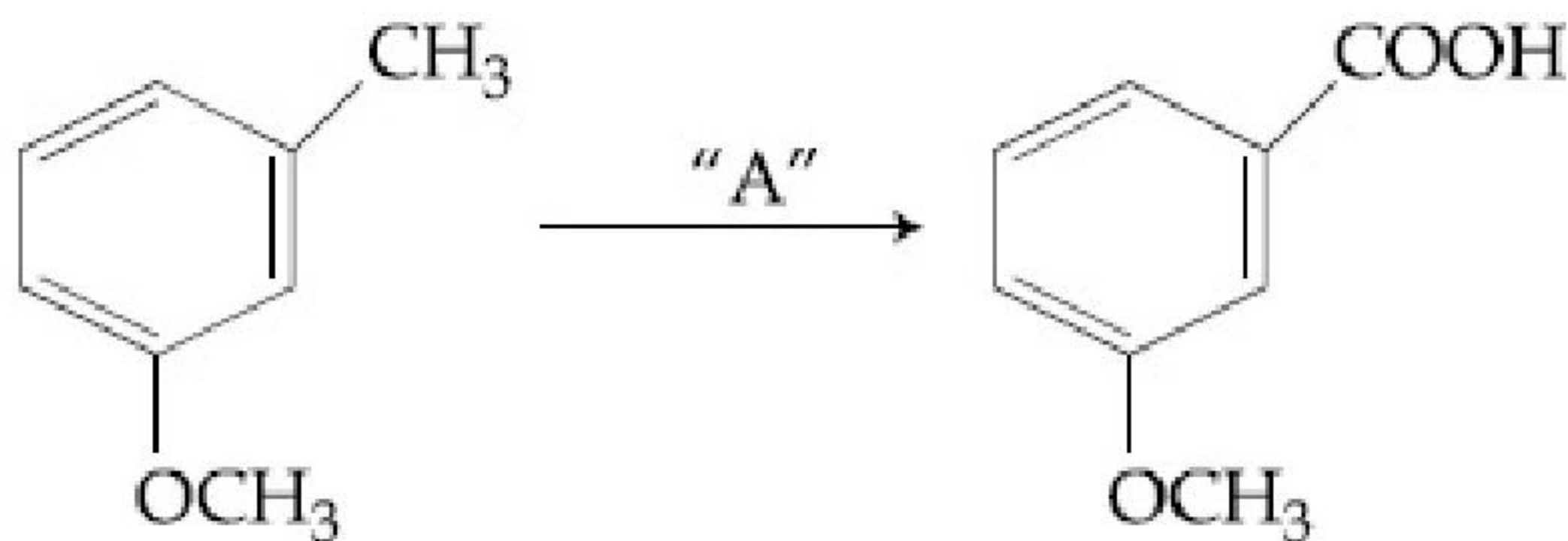
8643516893. A = Cl_2 ; dark, Anhydrous AlCl_3

8643516894. A = HCl , ZnCl_2

8643516895. A = Cl_2 ; UV light

8643516896. A = HCl ; Anhydrous AlCl_3

Question Number : 45 Question Id : 8643512295 Question Type : MCQ Option Shuffling : Yes Is
Question Mandatory : No
Correct Marks : 4 Wrong Marks : 1



In the above reaction, the reagent "A" is :

Options :

8643516897. LiAlH_4

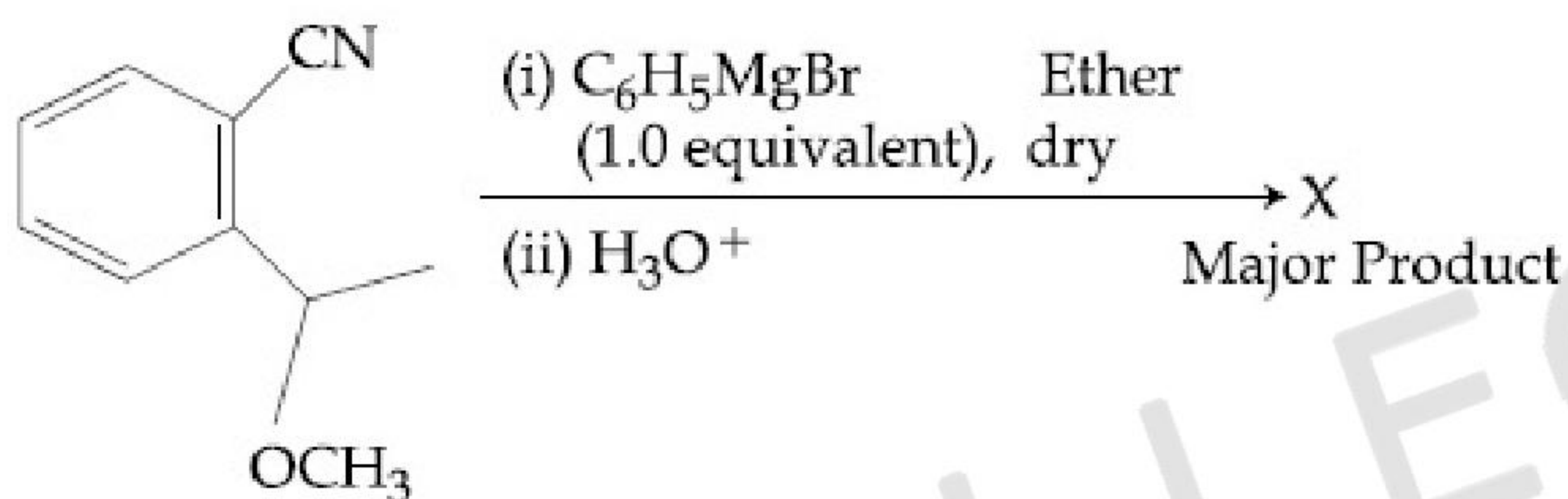
8643516898. Alkaline KMnO_4 , H^+

8643516899. HCl , Zn-Hg

8643516900. NaBH_4 , H_3O^+

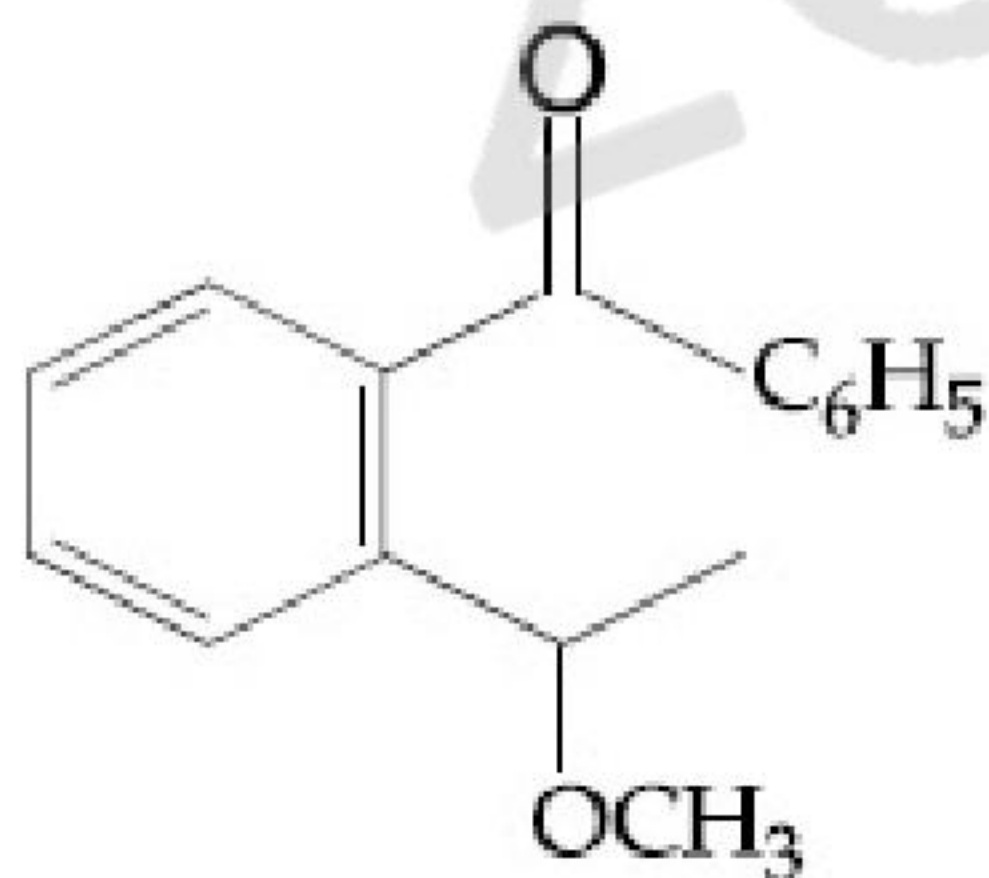
Question Number : 46 Question Id : 8643512296 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No

Correct Marks : 4 Wrong Marks : 1

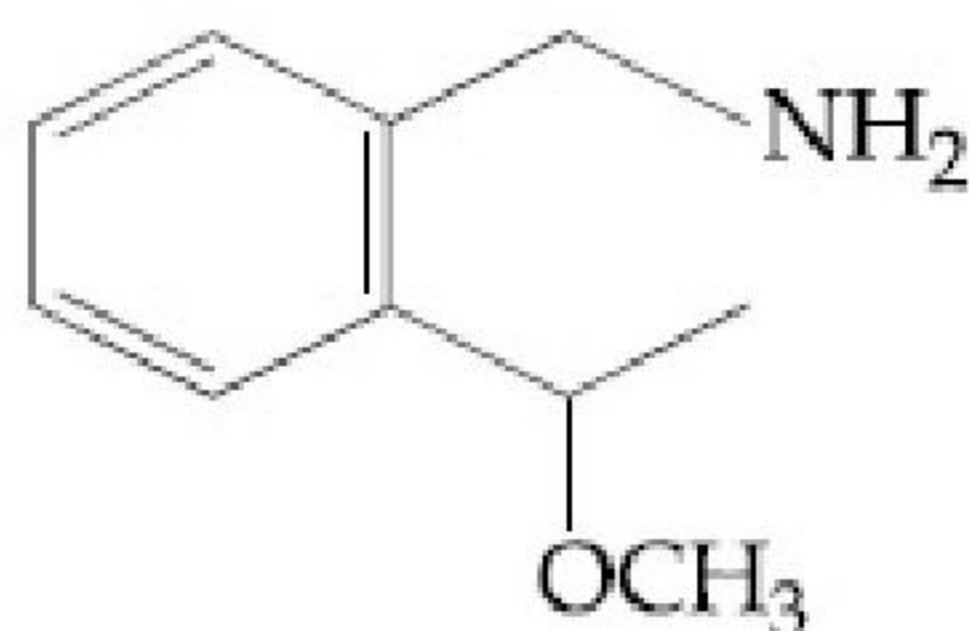


The structure of X is :

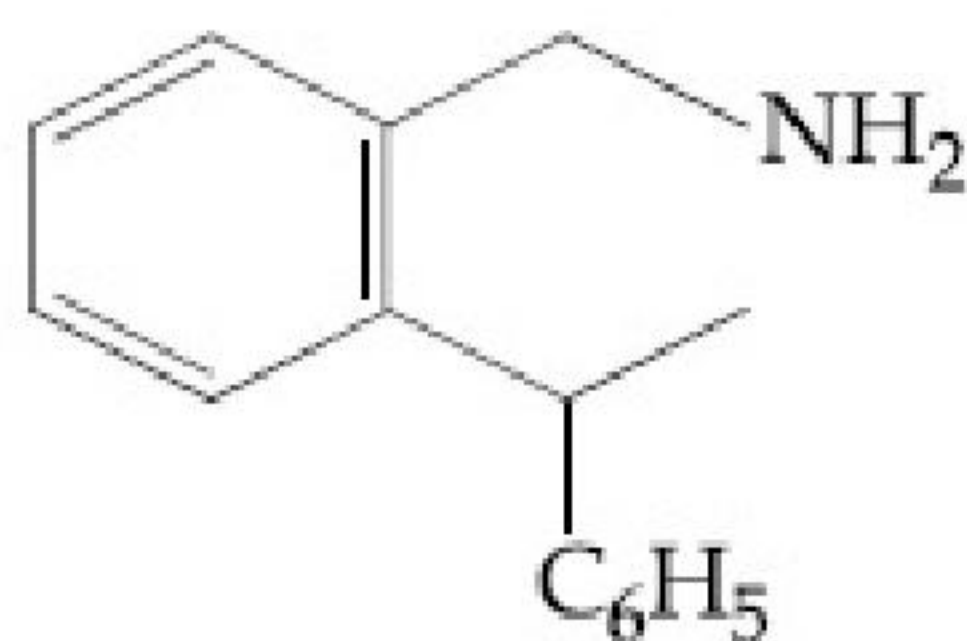
Options :



8643516901.



8643516902.



8643516990. 3

Question Number : 76 Question Id : 8643512326 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1

The least value of $|z|$ where z is complex number which satisfies the inequality

$$\exp\left(\frac{(|z| + 3)(|z| - 1)}{|z| + 1} \log_e 2\right) \geq \log_{\sqrt{2}} |5\sqrt{7} + 9i|, i = \sqrt{-1}, \text{ is equal to :}$$

Options :

8643516991. 2

8643516992. $\sqrt{5}$

8643516993. 3

8643516994. 8

Question Number : 77 Question Id : 8643512327 Question Type : MCQ Option Shuffling : Yes Is Question Mandatory : No Correct Marks : 4 Wrong Marks : 1

The maximum value of $f(x) = \begin{vmatrix} \sin^2 x & 1 + \cos^2 x & \cos 2x \\ 1 + \sin^2 x & \cos^2 x & \cos 2x \\ \sin^2 x & \cos^2 x & \sin 2x \end{vmatrix}, x \in \mathbb{R}$ is :

Options :

8643516995. $\sqrt{5}$

8643516996. 5

8643516997. $\sqrt{7}$

8643516998. $\frac{3}{4}$

Let C_1 be the curve obtained by the solution of differential equation $2xy \frac{dy}{dx} = y^2 - x^2, x > 0$.

Let the curve C_2 be the solution of $\frac{2xy}{x^2 - y^2} = \frac{dy}{dx}$. If both the curves pass through $(1, 1)$, then

the area enclosed by the curves C_1 and C_2 is equal to :

Options :

8643517007. $\frac{\pi}{4} + 1$

8643517008. $\pi - 1$

8643517009. $\frac{\pi}{2} - 1$

8643517010. $\pi + 1$

Mathematics Section B

Section Id :	864351156
Section Number :	6
Section type :	Online
Mandatory or Optional :	Mandatory
Number of Questions :	10
Number of Questions to be attempted :	5
Section Marks :	20
Mark As Answered Required? :	Yes
Sub-Section Number :	1
Sub-Section Id :	864351156
Question Shuffling Allowed :	Yes

Question Number : 81 Question Id : 8643512331 Question Type : SA

Correct Marks : 4 Wrong Marks : 0

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