

**Maths**

1.

Shortest distance between the line  $y = x$  and the curve  $y^2 = x - 2$  is

Ans =  $\frac{7}{4\sqrt{2}}$

2.

$$\lim_{x \rightarrow 0} \left( \frac{\sin^2(x)}{\sqrt{2} - \sqrt{1 + \cos(x)}} \right)$$

Ans =  $4\sqrt{2}$

3.

If you are born in India, you are a citizen of India. What is the contrapositive Statement?

Ans =

If you are not born in India, then you are not a citizen of India.

4.

all possible numbers are formed using the digits 1,1,2,2,2,2,3,4.4 number of such numbers where odd number occupy even places?

Ans = 180

5.

$$\int \frac{\sin\left(\frac{5x}{2}\right)}{\sin\left(\frac{x}{2}\right)} dx = ?$$

Ans =  $\sin(2x) + \sin(x) + x + C$

6.

$(x + \sqrt{x^3 - 1})^6 + (x - \sqrt{x^3 - 1})^6$  ( $x > 1$ ) what is the sum of the coefficients of all even degree forms

Ans = 26

7.

$\cos(\alpha + \beta) = \frac{3}{5}$ ,  $\sin(\alpha - \beta) = \frac{5}{13}$   $0 < \alpha, \beta < \frac{\pi}{4}$  what is the value of  $\tan(2\alpha)$

Ans=63/16

8.

If  $\alpha = \cos^{-1}\left(\frac{3}{5}\right)$ ,  $\beta = \tan^{-1}\left(\frac{1}{3}\right)$  where  $0 < \alpha, \beta < \frac{\pi}{2}$   $\alpha - \beta = ?$

Ans. =  $\tan^{-1}\left(\frac{9}{13}\right)$

9.

Mean and variance of 7 observation is 8 and 16. If 5 observations are 2,4,10,12,14 product of 2 observation is ?

Ans = 48

10.

$A = \begin{pmatrix} \cos(\alpha) & -\sin(\alpha) \\ \sin(\alpha) & \cos(\alpha) \end{pmatrix}$ , ( $\alpha \in \mathbb{R}$ ) such that  $A^{32} = \begin{pmatrix} 0 & -1 \\ 1 & 0 \end{pmatrix}$ ,  
value of  $\alpha$  is?

Ans =  $\alpha = \frac{\pi}{64} + \frac{\pi n}{16}$

## Chemistry

**Q.1** An organic compound neither reacts with neutral ferric chloride nor with Fehling solution. However, reacts with Grignard reagent it gives positive iodoform. What is the compound

Answer:

$\text{CH}_3\text{CO}(\text{CH}_2)_n\text{-OH}$ ,  $n = 1, 2, 3, 4$  as given in the options.

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**Q.2** The size of isoelectronic species  $\text{Cl}^-$ , Ar,  $\text{Ca}^{2+}$  is affected by-

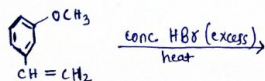
Answer:

Size increases, remains same, decreases. because of the change in ratio of e/p.

(Can be different in the options)

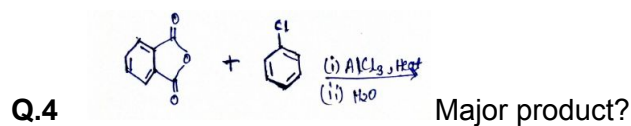
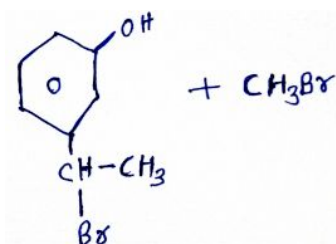
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**Q.3**

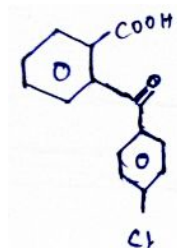


Major product?

**Answer**



Answer-



## Physics

Q.1) In SI units, the dimension of  $\sqrt{\frac{\epsilon_0}{\mu_0}}$  is

Answer  $M^{-1}L^{-2}T^3A^2$

Q.2) If  $10^{22}$  gas molecules each of mass  $10^{-26}$  Kg collide over the area of  $1m^2$  in unit second with Speed  $10^4m/s$ , the pressure exerted will be ?

Answer Pressure =  $2 Nm^2$

Q.3) Consider a Steel wire of radius = 2mm of a load equal to 4 kg to be suspended from rigid support and its top end, such that it is in hanging in a vertical position.

What is its tensile stress due to its own weight. (take  $g = 3.1\pi ms^{-2}$ )

Answer stress =  $3.1 * 10^6 Nm^2$

**Q.4)** Bob at pendulum mass 2g, charge  $5.0\mu C$ , an electric field of intensity 2000v/m. Angle of pendulum with vertical at equilibrium?

**Answer**  $\Theta = \tan^{-1} \frac{1}{2}$

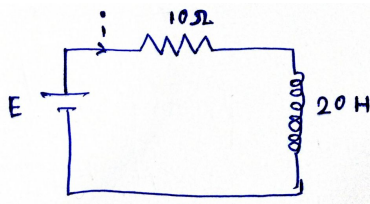
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**Q.5** Plane electromagnetic wave travelled in x-direction has electric field component  $E = 6V/m$  which is in y-direction. Corresponding Magnetic field component (B) is-

**Answer**  $B_0 = 2 * 10^{-8} T$  (in z - axis)

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**Q.6** What is time at which the rate of dissipation is equal to the rate at which magnetic energy stored in the inductor?



**Answer** 1.4 sec

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**Q.7** An interference experiment ratio of amplitude of coherent waves is  $\frac{a_1}{a_2} = \frac{1}{3}$ . What is the ratio of maximum and minimum intensities of fringes?

**Answer** 4

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**Q.8** Two particles move at right angle to each other de Broglie wavelengths as  $\lambda_1$  and  $\lambda_2$ , particle suffers a perfectly inelastic collision. The de Broglie wavelength  $\lambda$  of final particle is given by

**Answer**  $\lambda_{CM} = \frac{\lambda_1 \lambda_2}{\sqrt{\lambda_1^2 + \lambda_2^2}}$

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