

Question 1: Physics

The dimension of $\frac{1}{2} \epsilon_0 E^2$ is

1. MLT^{-2}
2. $MLL^{-1} T^{-2}$
3. MLT^{-1}
4. $ML^{-1}T^{-1}$

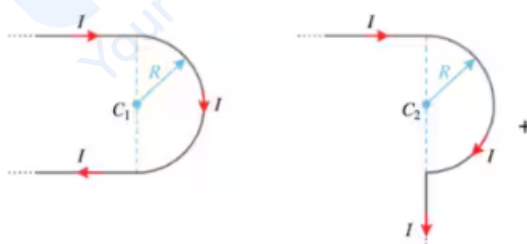
Question 2:

A wooden cubic block of relative density 0.4 is floating in water. Side of cubic block is 10 cm. When a coin is placed on the block, it dips 0.3 cm in equilibrium. Weight of coin is

1. 0.2 N
2. 30 N
3. 30.3 N
4. 3 N

Question 3:

Consider two arrangements of wires, find ratio of magnetic field at centre of the semi-circular part.



1. $(\pi + 3) / (\pi - 1)$
2. $(\pi + 4) / (\pi + 2)$
3. $(\pi + 2) / (\pi + 1)$
4. $(\pi - 2) / (\pi + 1)$

Question 4:

$\theta = t^4/4 - t^2$, find α at $t = 1$ sec

Question 5:

$$\vec{r} = 10t^2 \hat{i} + 5t^2 \hat{j}$$

1. $\vec{\beta} = 2\hat{i} + 1.5\hat{j}$

2. $\vec{F} = 2\hat{i} + 3\hat{i}$

3. $\vec{v} = 5\hat{k}$

4. $\vec{r} = 20\hat{k}$

Question 6:

In isobaric reversible process on a diatomic gas, ratio of $\Delta Q : \Delta U : W$ shall be

1. $7 : 5 : 2$

2. $5 : 3 : 2$

3. $3 : 2 : 1$

4. $6 : 5 : 1$

Question 7:

The velocity of a particle is given as $\vec{v} = -x \hat{i} + 2y \hat{j} - 2\hat{k}$ m/s. The magnitude of acceleration at point (1, 2, 4) is _____ m/s^2 .

Question 8:

In circular motion, angular position θ and time t are related as $\theta = 5t^4/4 - 6t^3/3$, then angular acceleration at $t = 10$ second is

1. 1180 rad/s^2
2. 130 rad/s^2
3. 1480 rad/s^2
4. 98 rad/s^2

Question 9:

The equation of a plane progressive wave is given by $y = 5 \cos \pi(200t - x/150)$. Where x & y are in cm and t is in seconds. Find the wave velocity for the given wave function.

Question 10:

Angular momentum of the electron in a hydrogen atom is $3h / 2\pi$, then find the energy of the electron in ____ eV.

Question 1:

The correct increasing order of bond length among the following is:

1. O_2^+ , O_2 , O_2^- , O_2^{2-}
2. O_2^{2-} , O_2 , O_2^- , O_2^+
3. O_2^{2-} , O_2^- , O_2 , O_2^+
4. O_2^- , O_2^{2-} , O_2^+ , O_2

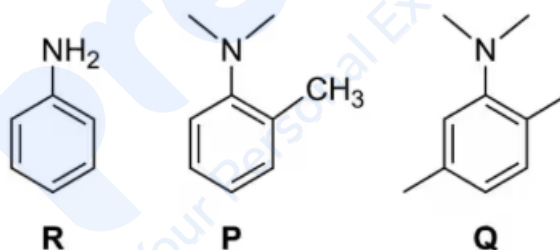
Question 2:

For first order reaction, rate constant at 27°C and $t^\circ\text{C}$ is 1.5×10^3 and 4.5×10^3 respectively. If activation energy of reaction is 60 kJ, then find temperature t.

Question 3:

Write the correct order of rate of reaction of following with PhN_2Cl :

1. $R > P > Q$
2. $P > R > Q$
3. $P > Q > R$
4. $Q > P > R$

**Question 4:**

Compound of molecular formula C_5H_{10} cannot decolorize Baeyer's reagent. How many monohalo products (structural) are obtained by all isomers of C_5H_{10} ?

Question 5:

Which is decreasing priority order of given functional group:

1. amide > aldehyde > ketone > amine > alkyne
2. aldehyde > amide > ketone > amine > alkyne
3. aldehyde > amide > amine > alkyne > ketone
4. alkyne > aldehyde > amide > amine > ketone

Question 6:

For diatomic gas, find the ratio of $\Delta Q : \Delta U : W$ for isobaric process:

1. 2 : 5 : 7
2. 2 : 3 : 5
3. 2 : 7 : 3
4. 7 : 5 : 2

Question 7:

Match List-I with List-II

List-I	List-II
I. Vitamin C II. Vitamin B ₁ III. Vitamin B ₆ IV. Vitamin B ₂	(A) Thiamine (B) Riboflavin (C) Ascorbic Acid (D) Pyridoxin

1. I-A, II-B, III-C, IV-D
2. I-C, II-A, III-D, IV-B
3. I-A, II-C, III-B, IV-D
4. I-C, II-D, III-A, IV-B

Question 8:

Arrange following functional groups in the increasing order of priority:

(1) $-\text{CONH}_2$, (2) $-\text{C}(=\text{O})-$, (3) $-\text{CHO}$, (4) $-\text{CN}$, (5) $-\text{C}\equiv\text{C}-$, (6) $-\text{NH}_2$

1. $1 > 4 > 2 > 3 > 6 > 5$

2. $1 > 4 > 2 > 3 > 5 > 6$

3. $1 > 4 > 3 > 2 > 6 > 5$

4. $1 > 2 > 4 > 3 > 6 > 5$

Question 9:

Which compound gives apple green colour in flame test?

1. BaSO_4

2. $\text{Mn}_3(\text{PO}_4)_2$

3. $\text{Ca}_3(\text{PO}_4)_2$

4. $\text{Al}_2(\text{SO}_4)_3$

Question 10:

One mole of alkane reacts with 8 mole of O_2 . The molecular formula of alkane is:

1. C_4H_{10}

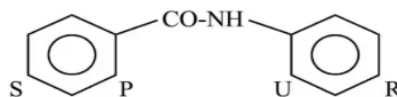
2. C_5H_{12}

3. C_7H_{14}

4. C_3H_8

Question 11:

Consider the electrophilic attack on given compound:



1. Predominately at U position
2. Predominately at R position
3. Predominately at P position
4. Predominately at S position

Question 1:

If $y = f(x)$ is the solution of the differential equation $(1 + \sin x) (dy/dx) + \cos x = 0$, such that $f(0) = 0$, then $f(\pi/2)$ is equal to:

1. $\ln 2$
2. $-\ln 2$
3. $\ln 3$
4. $\ln 4$

Question 2:

If eccentricity of an ellipse $x^2/a^2 + y^2/b^2 = 1$, which passes through point $(3, 4)$ is $\sqrt{5}/3$, then length of latus rectum of ellipse is:

1. $(4\sqrt{5})/3$
2. $(8\sqrt{5})/3$
3. $(4\sqrt{7})/3$
4. $(8\sqrt{7})/3$

Question 3:

How many seven-digit numbers can be formed using the digits 1, 2, 3, 4, and 5, such that each digit is used at least once?

1. 16800
2. 13200
3. 15200
4. 15800

Question 4:

Let $x \in [-\pi, \pi]$. Consider the set $S = \{x : \sin x (\sin x + \cos x) = a, a \in I\}$, where I denotes the set of integers. The number of elements in the set S is:

1. 5
2. 10
3. 9
4. 4

Question 5:

Find the range of $f(x) = \sin^{-1} \frac{1}{x^2 - 2x + 2}$

1. $(0, \pi/2)$
2. $[0, \pi/2)$
3. $(0, \pi/2]$
4. $[0, \pi/2]$

Question 6:

The value of $\int_0^3 \frac{e^x + e^{-x}}{[x]!} dx$ equals (Here $[.]$ denotes greatest integer function)

1. $\frac{1}{2} (e^2 + e^3 - e^{-2} - e^{-3})$
2. $e^2 - e^3 + e^{-2} - e^{-3}$
3. $\frac{1}{4} (e^2 + e^3 - e^{-2} - e^{-3})$
4. $\frac{1}{2} (e^2 + e - e^{-1} - e^{-2})$

Question 7:

If the roots of the equation $x(x+2) + (x+1)(x+3) + \dots + (x+(n-1))(x+n+1) = 4n$ are α and $\alpha + 2$, then the value of $|2\alpha + n|$ is:

Question 8:

Find midpoint of sides of triangle ABC as $(\frac{5}{2}, 7)$, $(\frac{5}{2}, 3)$ and $(4, 5)$. If incentre is (h, k) , then $3h + k$ is equal to:

Question 9:

Let $k = \sin(\pi/18) \cdot \sin(5\pi/18) \cdot \sin(7\pi/18)$. Then, the value of $\sin(10k\pi / 3)$ is equal to:

Question 10:

$\lim_{x \rightarrow 2} \frac{\sin(\pi x^2 - 5x^2 + ax + b)}{(\sqrt{x-1}) \log(x-1)} = m$, then $a + b + m$ is equal to:

Question 11:

Let $\sum a_k = 6n^3$, then $\sum \frac{(a_{k+1} - a_k)^2}{36}$ is equal to: