JEE Main 2024 Question Paper April 6 Shift 2
(B.E./B.Tech)

JEE Main Physics Questions

Ques 1. There are two fixed charged spheres P and Q repelling each other with a force of 16 N. A third neutral sphere is placed between the charged spheres. The new force between the spheres is ________ (assuming all the spheres are insulating)

A. 8N  
B. 32 N  
C. 16 N  
D. 4N

Ans. C

Ques 2. A tree branch holds a weight of 200 N by a uniform chain of mass 10 kg. The force applied by branch to hold this weight is ______ (Take g = 10 m/s² )

A. 150 N  
B. 100 N  
C. 200 N  
D. 300 N

Ans. D

Ques 3. If the kinetic energy of a block of mass m becomes 36 times by keeping its mass constant, by what percentage will the momentum increase?
A. 6 %
B. 600 %
C. 60 %
D. 500 %

Ans. D

Ques 4. A ball is projected vertically upwards from a building. The time taken to reach ground is $T_1$. Another ball is projected downwards from the same building, with the same speed. The time taken to reach ground is $T_2$. If a third ball is released from the same building, the time taken to reach the ground is

A. $\sqrt{T_1T_2}$
B. $\sqrt{T_1^2 + T_2^2}$
C. $\sqrt{T_1^2 - T_2^2}$
D. $2\sqrt{T_1T_2}$

Ans. A

Ques 5. The weight of an object measured on the surface of earth is 300 N. What will be weight of the same object at depth $R/4$ inside the earth? (Given $R = $ Radius of earth)

A. 220 N
B. 225 N
C. 200 N
D. 210 N

Ans. B
Ques 6. An isolated system contains one mole of helium, given a heat of 48 J. If the temperature of the system changes by 2°C, then find work done. (take R = 8.35/mole-K)

A. 32.20 J
B. 37.34 J
C. 40.74 J
D. 41.74 J

Ans. D

Ques 7. Find the longest wavelength of the Paschen series for hydrogen atom. (Rydberg constant = 10⁷ /m)

A. 2.06 μm
B. 20.6 μm
C. 4.86 μm
D. 48.6 μm

Ans. A

Ques 8. An ammeter consisting of 240 Ω galvanometer and 10 Ω shunt resistance is connected in circuit as shown. Reading of ammeter is

![Diagram of circuit]

A. 0.18 A
B. 0.16 A
C. 0.32 A
D. 3.2 A
Ques 9. Find net kinetic energy (maximum possible) associated with 20 diatomic molecules (Here $k_B$ is Boltzmann constant and $T$ is absolute temperature of diatomic gas).

A. $35 k_B T$
B. $70 k_B T$
C. $60 k_B T$
D. $30 k_B T$

Ans. B

Ques 10. A convex lens has a focal length of $f = 20$ cm, $R_1 = 15$ cm, $R_2 = 30$ cm. The refractive index of the lens is $x/2$ The value of $x$ is _______.

Ans. 3

Ques 11. For a device, power consumed = $110$ W and voltage supplied is $220$ V. The number of electrons that flow in 1 is $x/4 \times 10^{17}$. Find $x$.

Ans. 125

Ques 12. A car of mass $800$ kg is moving in a circular path of radius $300$ m on a banked road with an angle $30^\circ$. Coefficient of friction between the car and road is $0.2$. Find the maximum safe speed (to the nearest integer in m/s) with which the car can travel. (Take $\sqrt{3} = 1.7$)

Ans. 52
Ques 1. The molarity of NaCl solution is 3 M. Calculate the morality of the solution.
(Given density of the solution = 1.25 g/mL)

A. 2.9  
B. 2.79  
C. 1.85  
D. 3.85

Ans. B

Ques 2. Identify the product formed in the following reaction:

\[
\text{Cl} + \text{aq NaOH} \rightarrow
\]

A.  
B.
Ques 3. Product B is:

\[ \text{C.} \]

\[ \text{D.} \]

Ans. C
Ques 4. For a certain reaction, $\Delta H_r$ is 400 kJ/mol and $\Delta S=0.2$ kJ/mol K. Above what minimum temperature in Kelvin, the reaction becomes spontaneous.

Ans. 2000

Ques 5. Find out the shortest wavelength of paschen series for H-atom

A. $9/R$
B. $16/R$
C. $144/7R$
D. $7R/144$

Ans. A

Ques 6. Which of the following d-block elements has maximum unpaired electron in ground state electronic configuration?
A. Ti (22)
B. V (23)
C. Mn (25)
D. Cr (24)

Ans. D

Ques 7. Match the column.

<table>
<thead>
<tr>
<th>Column-I (Compounds)</th>
<th>Column-II (Configurations)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. TiCl₄</td>
<td>(1) e³t³₂</td>
</tr>
<tr>
<td>B. FeO₂⁻</td>
<td>(2) e²t¹₂</td>
</tr>
<tr>
<td>C. FeCl₂⁻</td>
<td>(3) e²t³₂</td>
</tr>
<tr>
<td>D. MnCl₄⁻</td>
<td>(4) e⁰t⁰₂</td>
</tr>
</tbody>
</table>

A. A(4), B(2), C(1), D(3)
B. A(4), B(3), C(2), D(1)
C. A(1), B(2), C(3), D(4)
D. A(2), B(4), C(3), D(1)

Ans. A

Ques 8. Which of the following statement is incorrect-

A. Enzymes are biocatalyst
B. Enzymes are not specific
C. Enzymes are globular protein
D. Oxidase enzymes catalyse the oxidation of CN and C-O bonds

Ans. B
Ques 9. Among the following anions, identify the anion which gives pale yellow precipitate with aq. AgNO₃. The precipitate is partially soluble in aq. NH₄OH solution.

A. I⁻
B. Cl⁻
C. Br⁻
D. NO₂⁻

Ans. C

Ques 10. IUPAC name of complex compound [Pt(Br)₂(PPh₃)₂].

A. Dibromido di(triphenyl phosphine) platinum(II)
B. Dibromido bis(triphenyl phosphine) platinum(II)
C. bis(triphenyl phosphine) dibromide platinum(II)
D. bis(triphenyl phosphine) dibromide platinate(II)

Ans. B

JEE Main Mathematics Questions

Ques 1. If

\[ \int \frac{dx}{a^2 \sin x + b^2 \cos^2 x} = \frac{1}{12} \tan^{-1}(3 \tan x) + c \]

then the maximum value of \( a \sin x + b \cos x \) is___

A. \( \sqrt{10} \)
B. \( \sqrt{20} \)
C. \( 2\sqrt{10} \)
D. \( 2\sqrt{5} \)
Ques 2. Find the range of $\frac{1}{7} - \sin 5x$

A. $\left[\frac{1}{7}, \frac{1}{5}\right]$
B. $\left[\frac{1}{7}, \frac{1}{6}\right]$
C. $\left[\frac{1}{8}, \frac{1}{5}\right]$
D. $\left[\frac{1}{8}, \frac{1}{6}\right]$

Ans. D

Ques 3. If $\alpha, \beta$ are the roots of the equation $x^2 - \sqrt{2} x - 8 = 0$ and $A_n = \alpha^n + \beta^n$, $n \epsilon N$, then the value of $(A_{10} - \sqrt{2}A_9) / 2A_8$

Ans. 4

Ques 4. If $^{n+1}C_{r+1} : ^nC_r : ^{n-1}C_{r-1} = 55 : 35 : 21$ then the value of $n + r$ is _____.

Ans. 16

Ques 5. Sides of a triangle are $AB = 9$, $BC = 7$, $AC = 8$. Then $\cos 3C$ equals to

A. $\frac{-262}{343}$
B. $\frac{181}{247}$
Ques 6. The locus of \( P \) such that the ratio of distance \( P \) from \( A(3, 1) \) and \( B(1, 2) \) is 5 : 4 is

A. \( 81x^2 - 92x + 81y^2 - 180y = 35 \)
B. \( 81x^2 + 92x + 81y^2 - 19y = 35 \)
C. \( 81x^2 - 48x + 81y^2 + 20y = 35 \)
D. \( 81x^2 - 90x + 81y^2 - 180y = 35 \)

Ans. D

Ques 7. If the orthocentre of triangle formed by \( (8, 3) \), \( (5, 1) \) and \( (h, k) \) is \( (6, 1) \), then \( (h, k) \) lie on

A. \( x^2 + y^2 = 64 \)
B. \( x^2 + y^2 = 68 \)
C. \( x^2 + y^2 = 65 \)
D. \( x^2 + y^2 = 71 \)

Ans. B

Ques 8. \( \lim_{n \to \infty} \frac{\sum (n^4 - 2n^3 + n^2)}{\sum ((3n)^4 + n^3 - n^2)} \) is equal to

A. \( 1/81 \)
B. \( 1/72 \)
C. \( 1/57 \)
D. \( 1/93 \)
Ques 9. Let $A = [1, 2, 3, 4, 5]$, $m$ be the number of relations such as $4x \leq 5y$ XRY and $n$ be the minimum number of elements to be added from $A \times A$ to make a symmetric relation. Then the value of $n + m$.

A. 26  
B. 25  
C. 24  
D. 23

Ans. B

Ques 10. The 315th word in dictionary arranged in order for the word 'NAGPUR' is

A. NRAGPU  
B. NRPGUA  
C. NPRGUA  
D. NRAPGU

Ans. D