

JEE Mains Answer Key 2024 -January 30 Shift 1

Candidates can discover below the memory-based questions for JEE Main 30 Jan 2024 Shift 1 of each subject.

JEE Mains Answer Key 2024 -January 30 Shift 1

Physics

Q. If two rings of equal radius R are arranged perpendicular to each other with a common center at C and the rings carry an equal current I , then find the magnetic field at C .

Ans. $\frac{\mu_0 I}{\sqrt{2}R}$

Q. A particle of mass m is projected from the ground with a speed u at an angle of 30° with the horizontal. Find its angular momentum about the point of projection when it reaches its maximum height.

Q. Young's modulus of a material of length L and cross sectional area A is Y . If the length is doubled and cross-sectional area is halved then young's modulus will be

- A) $Y/4$
- b) $4Y$
- C) Y
- d) $2Y$

Answer: Y

Q. Find the ratio of the kinetic energy and the potential energy in the 5th excited state of a hydrogen atom.

Q. Find the acceleration of a 2 kg block on a fixed inclined surface at 37° with the horizontal. The block is tied with a rope that passes over two pulleys (represented through a diagram) such that pulley 1 rests at the top of the inclined surface and pulley 2 carries a weight of 4 kg. Neglect friction.

- A. $4g/15$
- B. $2g/15$
- C. $g/15$
- D. $2g/3$

Answer: A. $4g/15$

Q, Two current-carrying rings of radius R are mutually perpendicular and their center coincides. Find the magnetic field at center 'O'.

Answer:

Q. The work function of a metal is 3 eV. Find its threshold wavelength.

Answer:

Q. A particle of mass m is projected from ground with speed u at an angle of 30° with the horizontal. Find its angular momentum about the point of projection when it reaches its maximum height.

- A. $mv^3/16g$
- B. $\sqrt{mv}/16g$
- C. $mv^3/3g$
- D. $\sqrt{3mv^3}/16g$

Answer: B

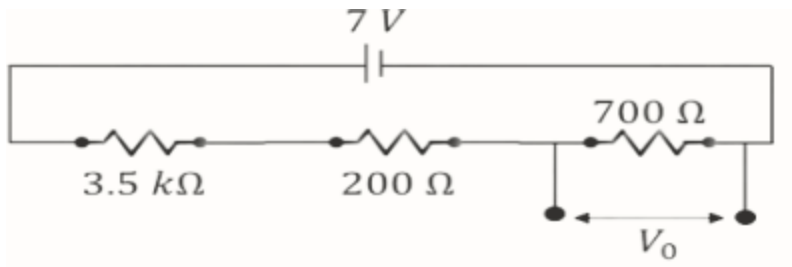
Q. The ratio of KE : PE IN 5th excited state of hydrogen atom is

- A. -2
- B. 2
- C. $-1/2$
- D. $1/2$

Answer: C. $-1/2$

Q. Find the potential difference V0 across the 700Ω resistance.

A diagram was given in which three resistances $3.5 \text{ k}\Omega$, 200Ω , and 700Ω are connected in series across a 7 V battery.



- A. 2V
- B. 0.5V
- C. 1.1V
- D. Zero

Answer: C.1.1 V

Q. In a convex lens, the distance between the object and the image is 45 cm, and the magnification produced by the lens is two. Find the focal length of the lens.

In a convex lens the distance between object and image is 45 cm, and magnification produced by lens is two. Find focal length of the lens.

$$m = -2 = \frac{v}{u} \Rightarrow \boxed{v = -2u}$$

$$\frac{1}{v} - \frac{1}{u} = \frac{1}{f}$$

$$\frac{1}{30} - \frac{1}{(-15)} = \frac{1}{f}$$

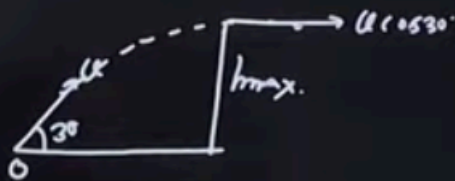
$$\frac{1}{f} = \frac{1}{30} + \frac{1}{15} = \frac{1+2}{30}$$

$$\boxed{f = 10\text{cm}}$$

A ray diagram for a convex lens. The object is placed at a distance u to the left of the lens. The image is formed at a distance v to the right of the lens. The focal length f is marked on both sides of the lens. The distance between the object and the image is given as 45 cm.

Q. A particle of mass m is projected at an angle of 30° with initial velocity u . Find its angular momentum about the point of projection at maximum height.

A particle of mass m is projected at an angle of 30° with initial velocity u . Find its angular momentum about point of projection at maximum height.



$$\begin{aligned}
 L_0 &= m(u \cos 30^\circ) \times h_{\max} = m(v \times L) \\
 &= m u \times \frac{\sqrt{3}}{2} \times \frac{u^2 \sin^2 30^\circ}{2g} \\
 &= \frac{m u^3 \times \sqrt{3}}{16g} = \frac{\sqrt{3}}{16} \frac{m u^3}{g}
 \end{aligned}$$

Q. At which temperature the r.m.s velocity of hydrogen molecule is equal to that of oxygen molecule at 47°C

Answer: $T = 20^\circ\text{C}$

Chemistry

Q. Identify the given reaction.

$\text{C}_6\text{H}_5\text{C}=\text{O}-\text{Cl} \rightarrow$ (in the presence of H_2 , Pd/BaSO_4) \rightarrow Product

- i. Etard Reaction
- ii. Stephen's Reaction
- iii. Wolff Kishner Reduction
- iv. Rosenmund Reaction

Answer: iv. Rosenmund Reaction

Q. Find out the maximum number of hybrid orbitals formed when $2s$ and $2p$ orbitals are mixed.

Answer: 4

Q. Find out the sum of the coefficients of all the species involved in the balanced equation:

$2\text{MnO}_4^- + \text{I}^- \rightarrow$ (in the presence of a slightly alkaline medium) \rightarrow Product

Answer: 9

Q. What is the geometry of Aluminium chloride in an aqueous solution?

- i. Square planar

- ii. Octahedral
- iii. Tetrahedral
- iv. Square pyramidal

Answer: ii. Octahedral

Q. Find out the work done in Joules for the cyclic process ABCA such that $P_A = 30 \text{ kPa}$, $V_A = 10 \text{ dm}^3$, $P_B = 10 \text{ kPa}$, $V_B = 30 \text{ dm}^3$, $P_C = 10 \text{ kPa}$, $V_C = 10 \text{ dm}^3$

Answer: 200 J

Q. If a 250 mL solution of CH_3COONa of molarity 0.35 M is to be prepared, what is the mass of CH_3COONa required in grams? Round off the answer to the nearest integer.

Answer:

Q. Match the following:

Column I

i. BrF_5

ii. H_2O

iii. ClF_3

iv. SF_4

Column II

a. Sea-Saw

b. T-Shape

c. Bent

d. Square Pyramidal

Answer:

Q. Which of the following sets contain both diamagnetic ions?

i. Ni^{2+} , Cu^{2+}

ii. Eu^{3+} , Gd^{3+}

iii. Cu^+ , Zn^{2+}

iv. Ce^{4+} , Pm^{3+}

Answer:

Q. Which of the given compounds will not give the Fehling test?

i. Lactose

ii. Maltose

- iii. Sucrose
- iv. Glucose

Answer:

Q . Statement I: For hydrogen atoms, 3p and 3d are degenerate.
Statement II: Degenerate orbitals have the same energy.

- i. Both statements I and II are correct.
- ii. Both statements I and II are incorrect.
- iii. Statement I is correct and statement II is incorrect.
- iv. Statement I is incorrect and statement II is correct.

Answer:

Q. Identify the correct structure for the compound named "3-Methylpent-2-enal" as per IUPAC nomenclature.

Answer:

Q . Find the final product when C_6H_6-Br reacts with i. Mg, Dry Ether, ii. CO_2, H^+ , iii. NH_3 , heat, and iv. Br_2, KOH

Answer:

Q. The number of atoms in a silver plate having an area of 0.05 cm^2 and a thickness of 0.05 cm is $m \times 10^{19}$. If the density of silver is 7.9 g/cm^3 , find the value of m .

Answer:

Q. What is the group number of unununnium?

Answer:

Q. Identify the correct structure for the compound named "3-Methylpent-2-enal" as per IUPAC nomenclature.

Answer:

Mathematics

Q, If the length of the minor axis of an ellipse is equal to half of the distance between the foci, then the eccentricity of the ellipse is.

Answer: $2/\sqrt{5}$

Q. Let A(2,3,5) and C(-3, 4, -2) be 'opposite vertices of a Parallelogram ABCD. If the diagonal vector $\vec{BD} = \hat{i} + 2\hat{j} + 3\hat{k}$ then the area of the Parallelogram is equal to.

Answer. $\sqrt{474}/2$

Q. Let A(2,3,5) and C(-3, 4, -2) be 'opposite vertices of a Parallelogram ABCD. If the diagonal vector $\vec{BD} = \hat{i} + 2\hat{j} + 3\hat{k}$ then the area of the Parallelogram is equal to.

Answer: 101

Q. Let (α, β, γ) be the foot of perpendicular from the point (1,2,3) on the line $(x + 3)/5 = (y - 1)/2 = (z + 4)/3$ then $19(\alpha + \beta + \gamma)$. If $z = x + iy$, $xy \neq 0$ satisfies the equation $z^2 + iz = 0$, then $|z^2|$; equal to

Answer: 1

Q5. Find the value of

$$\lim_{n \rightarrow \infty} \sum_{k=1}^n \frac{n^3}{(n^2 + k^2)(n^2 + 3k^2)}$$

Answer: $\frac{1}{2}[\sqrt{3}\pi/4 - \pi/4]$

Q. If the foot of the perpendicular from (1, 2, 3) to the line $(x + 1)/2 = (y - 2)/5 = (z - 4)/1$ is (α, β, γ) , then find $\alpha + \beta + \gamma$.

Answer: 5.8

Q. In an arithmetic progression, if the sum of 20 terms is 790 and the sum of 10 terms is 145, then $S_{15} - S_5 = ?$

Answer: 395.

Q. Find the value of the maximum area possible (in sq. units) of $\triangle ABC$ with vertices A(0, 0), B(x, y) and C(-x, y) such that $y = -2x^2 + 54x$.

Answer: 5832

Q.4: What is the range of r for which circles $(x + 1)^2 + (y + 2)^2 = r^2$ and $x^2 + y^2 - 4x - 4y + 4 = 0$ coincide at two distinct points?

Answer: $3 < r < 7$

