

JEE Main 8 April 2023 Shift 1 Memory-Based Questions

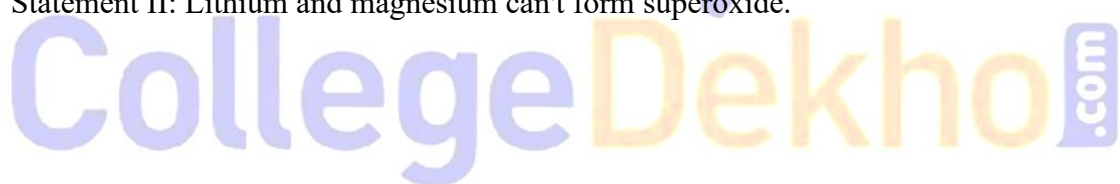
PHYSICS

1. For an electron and a proton ($m_p = 1847 m_e$) with the same de-Broglie wavelength, find the ratio of linear momentum.
2. If the weight of an object on the earth's surface is 400 N, then find the weight of the same particle at a depth $R/2$ from the surface if R is the radius of the earth.
3. Two forces of magnitude A and $A/2$ act perpendicular to each other. What will be the magnitude of the resultant force?
4. An air bubble having a volume of 1 cm^3 at a depth of 40 m inside water comes to the surface. What will be the volume of the bubble at the surface?
5. The height of the antenna is 98 m. The radius of Earth is 6400 km. Find the area up to which it will transmit the signal.
6. Two mirrors A (left) and B (right) are facing each other such that they are 10 cm apart and Mirror A is at a distance of 2 cm from object O located between the two mirrors. Find the distance in cm between the 2nd and 3rd images of object O formed left of Mirror A.
7. If mass, radius of cross-section and height of a cylinder are $(0.4 + 0.01) \text{ g}$, $(6 + 0.03) \text{ m}$ and $(8 + 0.04) \text{ m}$. Find the maximum percentage of error in the measurement of the density of the cylinder.
8. Identify the graph showing the variation of electric field (E) with the distance (r) from the centre of a conducting spherical shell.
9. An atom of atomic mass 242, having binding energy per nucleon 8.4 MeV, breaks into two atoms of atomic mass 121 each (with binding energy per nucleon 7.1 MeV). Find the absolute Q value of the reaction.
10. If the velocity of charged particle has the component both in and perpendicular to the direction of the magnetic field, then what will be the shape of the path traced by the charged particle?
11. Find the moment of inertia of a semi-circular ring of mass m and radius R about an axis passing through the centre and perpendicular to the plane of the ring.
12. Find the dimensions (in MLT) of $1/\mu_0\epsilon_0$.
13. Find the ratio of potential difference across two capacitors C_1 and C_2 at steady state for the given circuit. (Diagram provided)
14. In an LC oscillating circuit with $L = 75 \text{ mH}$ and $C = 30 \mu\text{F}$, the maximum charge of capacitor is $2.7 \times 10^{-4} \text{ C}$. What will be the maximum current through the circuit?

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CHEMISTRY

1. Consider the following reaction: $\text{XeF}_4 + \text{SbF}_5 \rightarrow [\text{XeF}_m]^{+n} + [\text{SbF}_p]^{q-}$
Find $m + n + p + q$.
2. The extraction of which one of the following metals involves the concentration of the ore by leaching?
i. Copper, ii. Magnesium, iii. Aluminium, iv. Potassium
3. Which of the following factors will contribute to a major role in the covalent character of a compound?
i. Polarising power of cation
ii. Polarisability of the anion
iii. Distortion caused by cation
iv. Polarisability of cation
4. Consider the reaction: $\text{Cu}^{2+} + \text{X} \rightarrow \text{Cu}_2\text{X}_2 + \text{X}_2$. Find X_2 .
5. Identify the correct/incorrect statement(s).
Statement I: Ionic radius of Li^+ is greater than Mg^{2+} .
Statement II: Lithium and magnesium can't form superoxide.

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MATHEMATICS

1. Consider the word "INDEPENDENCE". What will be the number of words such that all the vowels are together?
2. Find the shortest distance between the lines:
 - i. $(x - 5)/4 = (y - 3)/6 = (z - 2)/4$
 - ii. $(x - 3)/7 = (y - 2)/5 = (z - 9)/6$
3. Find the number of ways such that 7 boys and 5 girls are to be seated around a circular table such that no two girls sit together.
4. Find the coefficient independent of x in the expansion of $(3x^2 - (1/2x^5))$.
5. If $P = \begin{bmatrix} \sqrt{3}/2 & 1/2 \\ -1/2 & \sqrt{3}/2 \end{bmatrix}$, $Q = PAP^T$, $A = \begin{bmatrix} 1 & 1 \\ 0 & 1 \end{bmatrix}$, then $P^T Q^{2007} P = \begin{bmatrix} a & b \\ c & d \end{bmatrix}$.
Find $2a + b + 3c - 4d$.
6. If $A = \begin{bmatrix} 2 & 1 & 0 \\ 1 & 2 & -1 \\ 0 & 1 & 2 \end{bmatrix}$ and $|\text{adj}(\text{adj}(\text{adj}(A)))| = 16^n$, then find the value of n .
7. Consider the data: $x, y, 10, 12, 4, 6, 8, 12$. If its mean is 9 and its variance is 9.25, then find the value of $3x - 2y$ if $x > y$.
8. Dot product of two vectors is 12 and the cross product is $4i + 6j + 8k$, then find the product of the modulus of vectors.
9. If the coefficient of three consecutive terms in the expansion of $(1 + x)^n$ are in the ratio 1:5:20, then find the coefficient of the fourth term of the expansion.
10. A bolt manufacturing factory has three products A, B & C. 50% and 30% of the product are A and B types respectively and the remaining is a C type. Then the probability that product A is defective is 4%, that of B is 3% and that of C is 2%. If a product is picked randomly and found to be defective, then what is the probability that it is a Type C?
11. Find the area under the curve of equations: $x^2 \leq y$, $y \leq 8 - x^2$ and $y \leq 7$.
12. Identify if the given function is even, odd, or neither.
 $f(x) = (1 + 2^x)^7 / 2$