

JEE Main 25 January 2023 Shift 1 Memory-Based Questions



1. If $y = (1 + x)(1 + x^2)(1 + x^4)(1 + x^{16})$, then $y'(-1) - y''(-1) = ?$
2. If $\tan^{-1}[2x/(1-x^2)] + \cot^{-1}[(1-x^2)/2x] = \pi/3$ and sum of all the solutions of x (belonging to -1 to 1) is $[m-(4/3^{1/2})]$, then find m .
3. Number of lone pair electrons on the oxygen atom of ozone.
4. A car moving in a straight line travels in the same direction half of a distance with uniform velocity V_1 and another half of the distance with uniform velocity V_2 . Find out the average velocity of the car.
5. A car is moving with a constant speed of 2 m/s in a circle having a radius R . A pendulum is suspended from the ceiling of the car. Find the angle made by the pendulum with the vertical. The equation given is $R = 8/15 \text{ m}$ and $g = 10 \text{ m/s}^2$
6. The period of a pendulum at the earth's surface is T . Find the time period of the pendulum at a distance from centre which is twice as that of the radius of the earth.
7. A particle is dropped inside the tunnel of the earth about any diameter. Particles start oscillating, with the time period T . (R equal to the Radius of Earth, G equal to the acceleration due to gravity on Earth's surface. Find out 'T'.
8. If 'T' is the temperature of gas then the RMS velocity of gas molecules is proportional to...
9. Match the following quantities with their appropriate dimensions. The quantities asked are Surface Tension, Pressure, Viscosity, and impulse. Dimensions are given in MLT format.
10. 25 Volume H_2O_2 means?
11. The radius of 2nd orbit of Li^{2+} ion is x , the radius of the 3rd orbit of Be^{3+} will be...
12. If X atoms are present at alternative corners and at the body centre of a cube and Y atoms are present at one by third of face centres then what will be the empirical formula?
13. Thionyl chloride on reaction with phosphorous gives compound A. A on hydrolysis give compound B which is dibasic. Find out A and B.
14. Which of the following shows the least reactivity towards nucleophilic substitution reaction (image given)
15. For a first-order reaction, A gives rise to B one by two is 30 minutes. In how many minutes 75% completion of the reaction is done?

16. Which intermediate is formed when phenol is prepared from cumene?
17. How many of the following ions/elements has/have the same value of magnetic moment?
 v^{3+} , cr^{3+} , Fe^{2+} , Ni^{2+}
18. How many of the following complexes are paramagnetic?
 $[Fe(CN)_6]^{3-}$, $[Fe(CN)_6]^{4-}$, $[NiCl_4]^{2-}$, $[Ni(CN)_4]^{2-}$, $[CuCl_4]^{2-}$, $[Cu(CN)_4]^{3-}$, $[Cu(H_2O)_4]^{2+}$
19. Colour obtained from a flame test of Ba, Sr, Ca
20. Order of electron gain enthalpy of noble gases - He, Xe, Ne, K
21. The logical statement $(p \wedge \sim q) \rightarrow (p \rightarrow \sim q)$ is a...
22. If a_r is the coefficient of x^{10-r} in expansion of $(1+x)^{10}$ then summation (within limits of $r = 1$ to 10) of $\{r^3 \cdot (a_r/a_{r-1})^2\}$ equals?
23. $\lim_{n \rightarrow \infty} \frac{1+2-3+4+5-6+\dots+(3n-2)+(3n-1)-3n}{\sqrt{(2n^4+3n+1)} - \sqrt{(n^4+n+3)}} = ?$
24. Let I_{CM} be the moment of inertia of a disc passing through its centre and perpendicular to its plane. I_{AB} be the moment of inertia about axis AB that is in the plane of the disc at a $2r$ by 3 distance from its centre. Find I_{CM} by I_{AB} .
25. A massless rod of 80 cm is hung at its midpoint by a string, forming an angle of 30 with the string. An 8 kg weight is attached at the end of the rod opposite to the wall. Find the tension in the string. (Image provided).
26. A solenoid of 2m has 1200 turns. The magnetic field inside the solenoid when a current of 2A is passed through it is $N\pi \times 10^{-5}$ T. The diameter of the solenoid is 0.5m. Find the value of N.
27. A solid is made of X and Y. X occupies alternate corners and Y occupies every other face centre. What is the formula for complex?
28. Reactions of NO_2 in sunlight for photochemical smog
29. The volume of 1.2 kg by 1 solution of monobasic acid ($M = 24.2$ g/mol) needed to neutralize 25 ml of 0.24 M NaOH is?
30. Half-Life equals to 30 minutes. Find the time required for 75% completion of the reaction.
31. In the series sequence of 2 engines E_1 and E_2 (diagram shown). $T_1 = 600K$ and $T_2 = 300K$. Both engines working on the Carnot principle have the same efficiency. The temperature T at which the exhaust of E_1 is fed into E_2 is equal to $300n^{1/2}K$. Then what is the value of n ?
32. Find the effective resistance for a given diagram.
33. The correct decreasing order of positive electron gain enthalpy for the inert gases He, Ne, Kr, Xe is?
34. Identify the correct graph for isothermal processes at T_1 , T_2 , and T_3 if $T_3 > T_2 > T_1$

35. Identify the correct sequence of reactants for the following conversion:
n-heptane $\rightarrow \dots \rightarrow \dots \rightarrow \dots \rightarrow \text{PhCOOH} + \text{PhCH}_2\text{OH}$
36. What is the correct order of basic strength in aqueous solution for the given compounds?
37. What are the colours of K, Ca, Sr, Ba? (Match the pair question)
38. Mean of a data set is 10 and its variance is 4. If one entry of data set changes from 8 to 12, then new mean becomes 10.2. Now new variance is?
39. If $|z - z_1|^2 + |z - z_2|^2 = |z_1 - z_2|^2$ if $z_1 = 2 + 3i$ and $z_2 = 3 + 4i$. Then what is the locus of z ?
40. $f(x) = x^b + 3$ and $g(x) = ax + c$. If $(g(f(x)))^{-1} = [(x-7)/2]^{1/3}$, then $f \circ g(a) + g \circ f(b) = ?$
41. Temperature of a hot soup in a bowl goes 98C to 86C in 2 minutes. The temperature of the surrounding environment is 22C. Assuming that Newton's law of cooling is valid, find the time taken for the soup to go down from 75C to 69C.
42. When an electron is accelerated by 20kV, its de-Broglie's wavelength is x_0 . If the electron is accelerated by 40kV, what will be its de-Broglie wavelength?
43. Find the equivalent resistance of a given circuit across the terminals of the battery.
44. What is the minimum value of $\int_0^2 e^{|x-t|} dt$?
45. At STP conditions, find the ratio of the density of oxygen (O_8^{16}) to the density of Helium (He_2^4).
46. From an AM signal, it is given that $f_{\text{carrier}} = 10 \text{ MHz}$ and $f_{\text{signal}} = 5 \text{ kHz}$. Find the bandwidth of the transmitted signal.
47. Find the ratio of resonance frequencies of two LC circuits. Diagrams were given with the following information: $L_1 = L$, $C_1 = C$ and $L_2 = 8L$, $C_2 = 2C$.
48. Let the nuclear densities of ${}^4_2\text{He}$ and ${}^{40}_{20}\text{Ca}$ as p_1 and p_2 respectively. Find the ratio of p_1/p_2 .
49. A particle is projected with 0.5 eV kinetic energy in a uniform electric field $E = -10 \text{ N/C } \hat{j}$ (diagram given). Find the angle made by the particle with x-axis when it leaves the electric field.
50. The term independent of x in the expansion of $[2x + (1/x^7) - 7x^2]^5$ is?
51. Let $L_1 = (x-3)/1 = (y-2)/2 = (z-1)/3$ and $L_2 = (x-1)/1 = (y-2)/2 = (z-3)/3$ and direction ratios of L_3 are $(1, -1, 3)$. P is the point of intersection of L_1 and L_3 and Q is the point of intersection of L_2 and L_3 . What is distance PQ?
52. If $a = -i + 2j + k$ is rotated by 90 degrees about the origin. If a new vector b is passing through the y-axis and $c = 5i + 4j + 3k$, then what is the projection of b on c ?
53. Given that $dy/dx = (y/x) \cdot (1 + xy^2(1 + \ln(x)))$ and $y(1) = 3$, then find $y^2(3)/9$.

54. If natural numbers a, b belong to $[1, 25]$ such that $a + b$ is a multiple of 5, then the number of ordered pair (a, b) is?
55. Match the name of the compounds with their diagrammatic representations. The given compounds are α -D-Glucopyranose, β -D-Glucopyranose, α -D-fructofuranose, and β -D-fructofuranose.
56. Identify A in the following reactions:
$$\text{N}_2\text{O} \rightarrow \text{A} + \text{B}$$
$$\text{B} + \text{O}_2 \rightarrow \text{O}_3(\text{g})$$
57. Identify the paramagnetic complexes from the options.
58. Identify the correct graph between osmotic pressure and concentration of solute at a constant temperature.
59. Which of the following is correct about antibiotics?
Antibiotics promote the growth of microorganisms
Penicillin has a bacteriostatic effect
Erythromycin has a bactericidal effect
They are synthesized artificially
60. An athlete is given 100g of glucose energy equivalent to 1560KJ to utilize 50% of this gained energy in an event. Enthalpy of evaporation of H_2O 44KJ/mol. In order to avoid storage of energy in the body, the mass of water (in g) he would have to perspire is?
61. Which of the following is a correct structure?