JEE Main 25 January 2023 Shift 2 Memory-Based Questions

1. Summation of ${}^{51-k}C_3$ for k = 0 to k = 6.
2. A wire of resistance 5 ohms was replaced to increase its length by 5 times. What is the new resistance in the wire?
3. Find the velocity of the particle at t = 2 seconds if the position of the particle is given by $x = 2t^2$
4. A particle performing SMH with amplitude A starts at x = 0 and reaches x = A/2 within 2 seconds. What will be the time required for the particle to go from x = A/2 to x = A?
5. An object of mass m is placed at a height R_e from the surface of the earth where R_e is the radius of the earth. If the height of the object is increased to $2R_e$ from the earth's surface, find its increase in potential energy.
6. A charge of 10 micro coulombs is placed at the origin. Where should a charge of 40 micro coulombs is to be placed on the x-axis such that the electric field is 0 at x = 2?
7. If $[H^+]$ ion concentration is increased by a factor of 1000, then how will its pH be affected?
8. How many of the following orbitals are considered as axial orbitals?
   p_x, p_y, p_z, d_{xy}, d_{yz}, d_{xz}, $d_{x^2-y^2}$, d_{z^2}
9. Arrange elements Si, K, Mg, and Be in increasing order of their metallic character.
10. Assertion (A): Carbon forms two oxides CO and CO_2 where CO is neutral and CO_2 is acidic.
    Reason (R): CO_2 will combine with water and give carbonic acid while CO is soluble.
11. Which of the following has two chiral centres:
    2-bromo-3-duetrobutane, 1-bromo-2-duetrobutane, 1-bromo-3-duetrobutane, and 1-bromo-4-duetrobutane
12. If $f(x) = 2x^n + m$ and f(4) = 133 and f(5) = 255, then the sum of positive integral divisors of f(3) - f(2) is?
13. If $|(z + 2i)/(z - i)| = 2$ is a circle, then what is the centre of this circle?
14. If $\int_{1/3}^{3} |\ln x|\, dx = (m/n)*[\ln (n^2/e)]$, then find $m^2 + n^2 - 5$.
15. The number of numbers between 5000 and 10000 by using the digits 1, 3, 5, 7, 9 without repetition is?
16. In a parallel circuit (diagram given), the current through the 4 ohms resistor connected across A and B is 1/n amperes. Find the value of n.

17. A metal rod of length 1 m is moving perpendicular to its length with 8 m/s velocity along positive x-axis. If a magnetic field B = 2T exists perpendicular to the plane of the motion. Find the emf induced between the two ends of the rod.

18. If the transitions of the elements A, B, C, D goes as --- A: 0 to -2.2 eV, B: 0 to -5.2 eV, C: 0 to x eV, D: 0 to -10 eV. Which of these generates a photon of wavelength 124.1 nm if hc = 1241 eVnm.

19. Two straight lines placed parallel to each other at a distance of 7 cm are carrying currents of 8A and 6A in opposite directions. Point P is equidistant from the wires. Find the magntic field at point P.

20. For an LCR series circuit, X_L = 130 ohms, X_C = 80 ohms and R = 80 ohms. The value of the power factor of the circuit is equal to?

21. What will be the molar specific heat capacity of an isochoric process of a diatomic gas if it has an additional vibrational mode?

22. A disc and solid sphere of the same radius are rotated anticlockwise about their centres. If the mass of the disc and the solid sphere are 4 kg and 5 kg respectively then what is the ratio of the Inertia of Disc to the Inertia of Solid Sphere?

23. Two particles are shown at an angle of projection a and b with the horizontal. If a + b = 90, then the ratio of the range of the two projectiles on the horizontal plane is equal to?

24. Select the correct match:
    Hexan-2-one and Hexan-3-one → Position isomers
    Penan-2-one and Penan-3-one → Functional isomers
    2-pentene and 1-pentene → Metamers
    Pentonic acid and Hexonic acid → Functional isomers

25. Match amies with their pKb values in an aqueous solution.

26. A block is placed on a rough inclined plane with 45 degree inclination. If the minimum force required to push the block up the incline is equal to 2 times the minimum force required to slide the block down the inclined plane. Then find the coefficient of friction between the block and the incline.

27. Match the physical quantities with their dimensions in MLT format. Quantities asked are: Young's modulus, Plank's constant, Work Function, and Coefficient of Viscosity.

28. Match the laws with their formulas. Laws asked are: Gauss law (electrostatics), Amperes circuital law, Gauss law (magnetism), and Faraday's law.