NEW STANDARD ACADEMY

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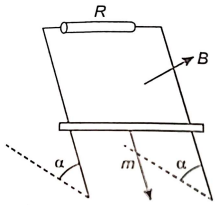
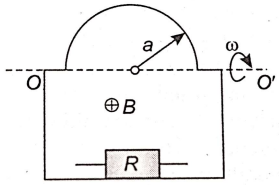
CLASS 12 DPP (Academy) 30-06-2025

PHYSICS

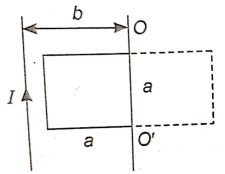
1. The system differs from the one examined in the foregoing problem by a capacitor of capacitance Creplacing the resistance R Find the acceleration of the connector



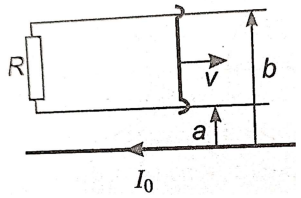
2. A wire shaped as a semi-circle of radius a rotates about an axis OO with an angular velocity in a uniform magnetic field of induction B. The rotation axis is perpendicular to the field direction The total resistance of the circuit is equal to R. Neglecting the magnetic field of the induced current, find the mean amount of thermal power being generated in the loop during a rotation period.



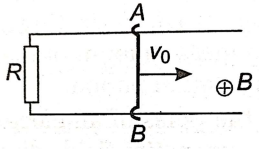
3. A small coil is introduced between the poles of an electromagnet so that its axis coincides with the magnetic field direction. The cross-sectional area of the coil is equal to S 3.0 mm², the number of turns is N60 When the coil turns through 180° about its diameter, a ballistic galvanometer connected to the coil indicates a charge q = 4.5 μC flowing through it Find the magnetic induction magnitude between the poles provided the total resistance of the electric circuit equals R = 40Ω
4. A square wire frame with side a and a straight conductor carrying a constant current / are located in the same plane . The inductance and the resistance of the frame are equal to L and R respectively. The frame was turned through 180° about the axis OO' separated from the current-carrying conductor by a distance b Find the electric charge having flown through the frame



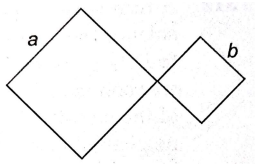
5. A long straight wire carries a current lo. At distances a and b from it there are two other wires, parallel to the former one, which are interconnected by a resistance R . A connector slides without friction along the wires with a constant velocity v. Assuming the resistances of the wires, the connector, the sliding contacts, and the self-inductance of the frame to be negligible, find:
(a) the magnitude and the direction of the current induced in the connector,
(b) the force required to maintain the connector's velocity constant.



6. A conducting rod AB of mass m slides without friction over two long conducting rails separated by a distance . At the left end the rails are interconnected by a resistance R. The system is located in a uniform magnetic field perpendicular to the plane of the loop. At the moment 10 the rod AB starts moving to the right with an initial velocity va. Neglecting the resistances of the rails and the rod AB, as well as the self-inductance, find:
(a) the distance covered by the rod until it comes to a standstill;
(b) the amount of heat generated in the resistance R during this process.



7. A plane loop shown in Fig is shaped as two squares with sides a = 20 cm and b = 10 cm and is introduced into a uniform magnetic field at right angles to the loop's plane. The magnetic induction varies with time as $B = B_0$, sin ωt, where B_0 = 10 mT and $\omega = 100s^{-1}$. Find the amplitude of the current induced in the loop if its resistance per unit length is equal to rho = 50mΩ / m The inductance of the loop is to be neglected



8. A long straight solenoid of cross-sectional diameter d = 5 cm and with n = 20 turns per one cm of its length has a round turn of copper wire of cross-sectional area S = 1.0 m m^2 tightly put on its winding. Find the current flowing in the turn if the current in the solenoid winding is increased with a constant velocity $\dot{I}$ = 100A / s The inductance of the turn is to be neglected.
9. A long solenoid of cross-sectional radius a has a thin insulated wire ring tightly put on its winding; one half of the ring has the resistance η times that of the other half. The magnetic induction produced by the solenoid varies with time as B = bt, where b is a constant. Find the magnitude of the electric field strength in the ring
10. A magnetic flux through a stationary loop with a resistance R varies during the time interval τ as$\Phi = at(\tau - t)$ Find the amount of heat generated in the loop during that time. The inductance of the loop is to be neglected

CHEMISTRY

1. Silver atom has completely filled d-orbitals ($4d^{10}$) in its ground state. How can you say that it is a transition element?
2. In the series Sc (Z = 21) to Zn (Z = 30), the enthalpy of atomisation of zinc is the lowest, i.e, 126 kJ mol^1. Why?
3. Which of the 3d series of the transition metals exhibits the largest number of oxidation states and why?
4. How would you account for the irregular variation of ionisation enthalpies (first and second) in first series of the transition elements?
5. Why is the hightest oxidation state of a metal exhibited in its oxide or fluoride only?
6. Calculate the spin only magnetic moment of M^{2+}(aq.)ion (Z = 27).
7. Write down the electronic configuration of:
   (i) Cr^{3+} (ii) Pm^{3+} (iii) Cu^{+}
8. Why are Mn^{2+} compounds more stable than Fe^{2+} towards oxidation to their +3 state?
9. Explain briefly how +2 state becomes more and more stable in the first half of the first row transition elements with increasing atomic number.
10. What may be the stable oxidation state of the transition element with the following d electron configurations in the ground state of their atoms:
    $3d^3$,$3d^{5,}$ $3d^8$ and $3d^4$

BIOLOGY

1. Draw a schematic representation of a nucleotide. Label the following:
   (i) The components of a nucleotide (ii) 5° end
   (iii) N-glycosidic linkage (iv) phosphodiester
2. How do histones acquire positive change?
3. Base sequence in one of the strands of DNA is TAG CAT GAT.
   (i) Give the base sequences of its complementary strand.
   (ii) How are these base pairs held together in a DNA molecule?
   (iii) Explain the base complementarity rule. Name the scientist who framed this rule.
4. Write the full form of VNTR. How is VNTR different from probe?
5. Draw a neat labeled sketch of replicating fork of DNA.
6. Draw a labeled schematic diagram of a transcription unit.
7. Draw the structure of a tRNA charged with methionine.
8. Draw a schematic diagram of lac operon in its 'switched off position. Label
   (i) The Structural genes (ii) Repressor bound to its correct position
   (iii) Promoter gene (iv) Regulator gene
9. It is established that RNA is the first genetic material. Explain giving three reasons.
10. Name the enzyme responsible for transcription of tRNA and the amino acid to which initiator tRNA gets linked with.

MATHS

1. Evaluate the following intergral

(i) $\int \frac{\cos}{1-c\,os^2\,x}\,dx$ (ii) $\int \frac{e^{\log_e\sqrt{x}}}{x}\,dx$

2. Evaluate the following intergrals

(i) $\int \left(\sqrt{x}-\frac{1}{x^2}\right)^2 dx$ (ii) $\int (3x^5 - 7\sin x + 2\,)dx$

3. Evaluate: $\int cosec\,x\,(cosec\,x + \cot x)\,dx$
4. Evaluate the following intergrals

(i) $\int \left(x-\frac{1}{x}\right)^3 dx$ (ii) $\int \frac{(a^x+b^x)^2}{a^x b^x}$

5. Evaluate: $\int \frac{sin^3x+c\quad ^3x}{sin^2xcos^2x}dx$
6. Evaluate the following intergral

(i) $\int \frac{1}{1+\sec x}\,dx$ (ii) $\int \frac{1+\sin}{1-\mathrm{si}}dx.$

7. Evaluate the following intergrals

(i) $\int tan^2x\;dx$ (ii) $\int \sqrt{1-sin2x}\,dx,\ \frac{\pi}{4} < x < \frac{\pi}{2}.$

8. Evaluate the following intergrals

(i) $\int cos^{-1}(\sin x\,)\,dx$ (ii) $\int tan^{-1}(\sec x + \tan x)dx.$

9. Evaluate : $\int (ax^2 + bx + c)dx$
10. $\int tan^{-1}(cosec\,x - \cot x)\,dx$