NEW STANDARD ACADEMY

Marks: 60
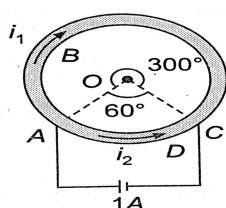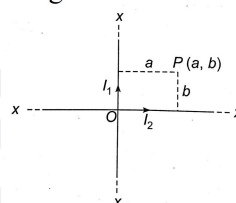
Date : 23-06-25   CLASS : 12TH Time: 3 hours.

PHYSICS

1. An electron revolves in a circular orbit of radius r with uniform angular speed ω. From the expression for magnetic field due to a current carrying circular conductor, deduce the expression for magnetic field at the centre of the electron orbit.

2. Length of a solenoid is 0.2 m and it has 120 turns .Find the magnetic field in its interior , if a current of 2.5 A is flowing through it. Given $\mu_0 = 4\pi \times 10^{-7}$ SI uints.

3. A moving electron can be deflected both by an electric field as well as magnetic field. What is the difference between these deflections?

4. A cathode ray tube is operated at 2500V. What is the speed of electrons emitted?

5. The earth's magnetic induction at a certain point is 7×10^{-5} Wb/m^2.This is to be annulled by the magnetic induction at the center of a circular conduction loop of radius 5cm. Find the required current in the loop.

6. A circular current carrying coil has a radius R . Find the distance from the centre of the coil on the axis where the magnetic induction will $\frac{1}{8}th$ to its value at the centre of the coil.

7. Two long and parallel straight wires A and B carrying currents of 8.0 A and 5.0A in the same direction are separated by a distance of 40cm. Estimate the force on a 10cm section of wire A.

8. A circular Coil of wire consisting of 100 turns, each of radius 8.0 cm carries a current of 0.40A. What is the magnitude of the magnetic field B at the centre of the coil?

9. A cell is connected between the point A and C of a circular conductor ABCD of centre 'O' with angle AOC = 60^0,If B_1 and B_2 are the magnitudes of the magnetic fields at O due to the currents in ABC and ADC respectively ,find the ratio $\frac{B_1}{B_2}$.

10. Two insulating infinitely long wire are lying mutually perpendicular to each other as show in figure.

If the two wires carry currentsI_1 and I_2 as shown in the figure, find the magnetic field at point P(a,b).

CHEMISTRY

1. If a current of 0.5 ampere flows through a metallic wire for 2 hours then how many electrons would flow through the wire?

2. Depict the galvanic cell in which the reaction,
   $$Zn(s) +2Ag^+(aq) \rightarrow Zn^{2+}(aq)+2Ag(s)$$
   Takes place . Further show:
   (i) Which of the electrode is negatively charged?
   (ii) the carriers of the current in the cell.
   (iii) individual reaction at each electrode.

3. Suggest two materials other than hydrogen that can be used as fuels in fuel cells.

4. How much electricity in terms of Faraday is required to produce:
   (i) 20.0g of Ca form molten $CaCl_2$,
   (ii) 40.0g of Al from molten Al_2O_3?

5. Predict the products of electrolysis in each of the following:
   (i) An aqueous solution of $AgNO_3$ with silver electrodes.
   (ii) An aqueous solution of $AgNO_3$ with platinum electrodes.
   (iii) A dilute solution of H_2SO_4 with platinum electrodes.
   (iv) An aqueous solution of $CuCl_2$ with platinum electrodes.

6. The rate of the chemical reaction doubles for an increase of 10K in absolute temperature from 298 K. Calculate E_a.

7. The activation energy for the reaction, $2HI(g) \rightarrow H_2(g) +I_2(g)$, is 209.5kJ mol^{-1} at

581 K. Calculate the fraction of molecules of reactants having energy equal to or greater than activation energy.

8. A reaction is first order in A and second order in B .
(i) Write differential rate equation.
(ii) How is the rate affected on increasing the concentration of B three times?

9. During nuclear explosion one of the products is ^{90}Sr with half – life of 28.1 years. If one μg of ^{90}Sr was absorbed in the bones of a newly born baby instead of calcium , how much of it will remain after 10 years and 60 years if it is not lost metabolically

10. The conductivity of sodium chloride at 298 K has been determined at different concentrations and the results are given below

Concentrations(M)	0.001	0.010	0.020	0.050	0.100
Conductivity ($10^2 \times$k/s m^{-1})	1.237	11.085	23.15	55.53	106.74

Calculate Λ_m for all concentration and draw a plot between Λ_m and c$^{1/2}$.Find the value of Λ_m°.

BIOLOGY

1. Describe the structure of a typical/polygonum type embryo sac found in flowering plants. Why is it called monosporic?
2. Draw a vertical section of a Maize grain and label. (i) pericarp (ii) scutellum (iii) coleoptile (iv) radicle
3. Differentiate between geitonogamy and xenogamy in plants. Which one between the two will lead to inbreeding depression and why ?
4. When do the oogenesis and spermatogenesis initiate in human females and males respectively?
5. Mention the function of mitochondria in sperm.
6. Mention the fate of corpus luteum and its effects on the uterus in the absence of fertilization of the ovum in the human female.
7. Explain the zygote intrafallopian transfer technique (ZIFT). How is intrauterine transfer technique (IUT) different from it?
8. Why do certain genes tend to be inherited together in a cell at the time of cell division
9. A human being suffering from Down's syndrome show trisomy of 21st chromosome. Mention the cause of this chromosomal abnormality.
10. A plant of Antirrhinum majus with red flowers was crossed with another plant of the same species with white flowers. The plants of F$_1$ generation bore pink flowers. Explain the pattern of inheritance with the help of a cross.

MATH

1. Using principle values, evaluate :
$\cos^{-1}\left(cos\frac{2\pi}{3}\right) + sin^{-1}\left(sin\frac{2\pi}{3}\right)$.

2. (i) If $\begin{bmatrix} x - y & z \\ 2x - y & w \end{bmatrix} = \begin{bmatrix} -1 & 4 \\ 0 & 5 \end{bmatrix}$, find the value of (x +y).
(ii) If $\begin{bmatrix} x + y & x + 2 \\ 2x - y & 16 \end{bmatrix} = \begin{bmatrix} 8 & 5 \\ 1 & 3y + 1 \end{bmatrix}$,then write the value of (y-x).

3. Given $3\begin{bmatrix} x & y \\ z & w \end{bmatrix} = \begin{bmatrix} x & 6 \\ -1 & 2w \end{bmatrix} + \begin{bmatrix} 4 & x + y \\ z + w & 3 \end{bmatrix}$, find the value of x,y ,z and w .

4. Find the value of k if M $=\begin{bmatrix} 1 & 2 \\ 2 & 3 \end{bmatrix}$and M^2-kM-I$_2$=O

5. If $[2x\ 3] \begin{bmatrix} 1 & 2 \\ -3 & 0 \end{bmatrix}\begin{bmatrix} x \\ 3 \end{bmatrix} = O$
$find\ the\ value(s) of\ x$.

6. If the function f defined by f(x)
$=\begin{cases} 3ax + b & if\ x > 1 \\ 11 & if\ x = 1 \\ 5ax - 2b & if\ x < 1 \end{cases}$ is continuous at x=1 ,find the value of a and b

7. Following function for continuity
(i) f(x) $=\begin{cases} \frac{sin\ 2x}{x} & if\ x > 0 \\ 2 & if\ x \le 0 \end{cases}$
(ii) f(x) = $\begin{cases} x^{10} - 1, & if\ \le 1 \\ x^2, & if\ > 1 \end{cases}$

8. Find whether the following function is differentiable at x=1 and x=2 or not f(x)
$\begin{cases} x & x < 1 \\ 2 - x & 1 \le x \le 2 \\ -2 + 3x - x^2 & x > 2 \end{cases}$

9. Number of integral values of a for which f(x)= log(log$_{1/3}$(log$_7$(sinx+a))) be defined for every real value of x is_____.

10. Show that : $\tan\left(\frac{1}{2}sin^{-1}\frac{3}{4}\right) = \frac{4 - \sqrt{7}}{3}$.