## PHYSICS

1. A Circular coil of 0.2 m diameter has 100 turns and carries a current of 0.1 ampere. The intensity of magnetic field at the centre of the coil will be?

2. A wire loop PQRSP is constructed by joining two semi- circular coils of radii $r_1$ and $r_2$ respectively as shown in the figure. Current is flowing in the loop. The magnetic induction at point O will be?
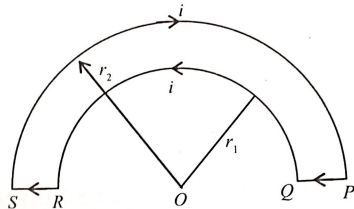


3. A wire in the form of a square of side "a" carries a current $i$. Then the magnetic induction at the centre of the square wire is (Magnetic permeability of free space = $\mu_0$)

4. A wire carrying current I and other carrying 2I in the same direction produces a magnetic field B at the mid-point. What will be the field when 2I wire is switched off?

5. Figure shows a square loop ABCD with edge length a. The resistance of the wire ABC is r and that of ADC is 2r. The value of magnetic field at the centre of the loop assuming uniform wire is?
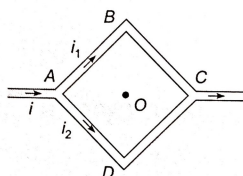


6. A current $i$ is flowing in a straight conductor of length L. The magnetic induction B at a point distant L/4 from its centre will be

7. A straight wire current element is carrying current of 100 A. as shown in figure. The magnitude of magnetic field ar point P which is at perpendicular distance (√3-1)m from the current element if end A and end B of the element subtend angle 30° and 60° at point P, as shown, is?
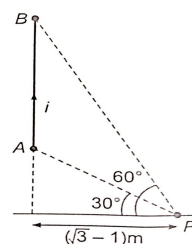


8. Two circular segments of a metallic wire having radiir $r_1$ and $r_2$ are joined to form a wire loop. The two segments subtend an angle $\theta$ at the centre O. If a current $I$ passes through the wire loop in the direction as shown in figure, find the magnetic field at the centre O?
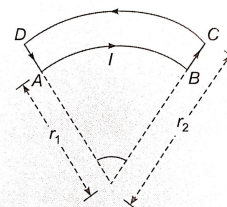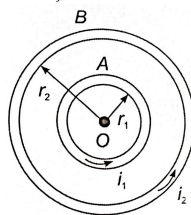


9. In the figure, shown the magnetic induction at the centre of the are due to the current in portion AB will be
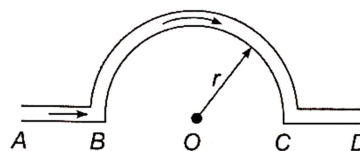


10. A and B are two concentric circular conductors of centre O and carrying currents $i_1$ and $i_2$ as shown in the adjacent figure If ratio of their radii is 1: 2 and ratio of the flux densities at O due to A and B is

1: 3, then the value of $i_1/i_2$ is



## CHEMISTRY

1. The ionisation energies of first five members of 3d-series increase with increase in atomic number and then become constant or irregular for next five members. Explain.

2. While Cu, Ag and Au are considered as transition elements but Zn, Cd and Hg are not considered as transition elements although all the mentioned elements have complete d-orbitals. Explain.

3. Complete the following reaction
   i) $CrO_2Cl_2 + 2H_2O \rightarrow$
   ii) $Cr_2O_7^{2-} + 14H^+ + 6Fe^{2+} \rightarrow$

4. Why is AgBr used in photography?

5. When copper is exposed to atmosphere, a loose layer of green material is formed over its surface. What is this green mass?

6. A dark blue precipitate is formed when sodium hydroxide solution is added to copper sulphate solution. The precipitate darkness on heating.

7. An accident would occur if a student dissolves $KMnO_4$, in conc. $H_2SO_4$ instead of dilute $H_2SO_4$ Explain

8. A hydrated metallic salt (A), light green in colour, on careful heating gives a white anhydrous residue (B) (B) is soluble in water and it aqueous solution reacts with NO to give a dark brown compound (C). (B) gives a brown residue (D) and a mixture of two gases (E) and (F). The gaseous mixture when passed through an acidified $KMnO_4$ solution discharges the pink colour and when passed through acidified $BaCl_2$, solution gave a white precipitate. Identify (A), (B), (C), (D), (E) and (F).

9. Copper sulphate dissolves in $NH_4OH$ solution but $FeSO_4$ does not.

10. Explain how the colour of $K_2Cr_2O_7$ solution depends on pH of the solution

## MATHS

1. If $f(x) = \begin{cases} e^x + ax & , \quad x < 0 \\ b(x-1)^2, & \quad x \geq 0 \end{cases}$ is differentiable at x = 0, then (a,b) is

2. The function $y = e^{-|x|}$ is continuous but not differentiable at x =?

3. Let $f(x) = \begin{cases} 3x^2 - 4\sqrt{x} + 1 & for \ x < 1 \\ ax + b & for \ x \geq 1 \end{cases}$. If f(x) is the continuous and differentiable for all real values in its domain then a, b is

4. The points of non – differentiability of $f(x) = \sin^{-1} (\sin x)$ are given by

5. The function $y = [x] + |1-x|$, $-1 \leq x \leq 3$. then $f(x)$ is not differentiable at

6. If $f(x) = \begin{cases} tan^{-1}(\tan x), x \leq \frac{\pi}{4} \\ \pi[x] + 1, \quad x > \frac{\pi}{4} \end{cases}$ ,then jump of discontinuity is

7. Let $f(x) = \begin{cases} g(x).\cos\frac{1}{x}, x \neq 0 \\ 0, \quad x = 0 \end{cases}$ where g(x) is an even function differentiable at x=0, passing through the origin .Then $f'(0)$

8. Let $f(x) = \begin{cases} \frac{\alpha \cot x}{x} + \frac{\beta}{x^2}, 0 < |x| \leq 1 \\ \frac{1}{3}, \quad x = 0 \end{cases}$ if f(x) is continuous at x =0 ,then the value of $\alpha^2 + \beta^2$

9. If $f(x) = \begin{cases} \frac{1}{|x|}; \quad |x| \geq 1 \\ ax^2 + b; -1 < x < 1 \end{cases}$ is differentiable $\forall$ x, then values of a and b are

10. If $= \begin{cases} \left(sin\frac{2x^2}{a} + \cos\left(\frac{3x}{b}\right)\right)^{ab/x^2} , x \neq 0 \\ e^{x^2 - 2x + 3}, \quad x = 0 \end{cases}$, is continuous at x =0 $\forall$ b$\in$ R then $a_{min}$ is