ST. LAWRENCE HIGH SCHOOL

A JESUIT CHRISTIAN MINORITY INSTITUTION

WORK SHEET 18

Subject : PHYSICS

CLASS : XII

19.6.20

Chapter : Electromagnetism

Topic : Oersted's expt., Biot-Savart law and it's applications

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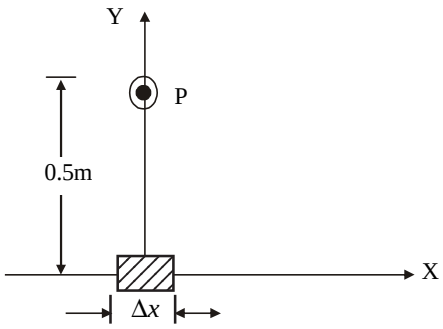
Multiple Choice Question : **1 x 15 = 15**

1. Vector form of Biot-Savart's law is

   (a) $d\boldsymbol{B} = \frac{\mu_0}{4\pi}\frac{\boldsymbol{I}\times d\boldsymbol{l}}{r^2}$ (b) $d\boldsymbol{B} = \frac{I\, d\boldsymbol{l}\times\mathbf{r}}{r^3}$ (c) $d\boldsymbol{B} = \frac{\mu_0}{4\pi}\frac{I\, d\boldsymbol{l}\times\mathbf{r}}{r^3}$ (d) $d\boldsymbol{B} = \frac{\mu_0}{4\pi}\frac{I\, d\boldsymbol{l}\times\mathbf{r}}{r^2}$

2. An element $\Delta I = \Delta x\,\hat{\mathbf{i}}$ is placed at the origin and carries a current I = 10A.



   If Δx = 1 cm, magnetic field at point P is

   (a) 4 x 10^{-8} $\hat{\mathbf{k}}$ T (b) 4 x 10^{-8} $\hat{\mathbf{i}}$ T (c) 4 x 10^{-8} $\hat{\mathbf{j}}$ T (d) –4 x 10^{-8} $\hat{\mathbf{j}}$ T

3. There is a thin conducting wire carrying current. What is the value of magnetic field induction at any point on the conductor itself?

   (a) 1 (b) Zero (c) –1 (d) Either (a) or (b)

4. A straight wire carrying a current of 12 A is sent into a semicircular loop of radius 2.0 cm. What will be magnetic field at the centre of semicircularloop?

   (a) **B** = 1.9 x 10^{-4} T (b) **B** = 1.9 x 10^{4} T

   (c) **B** = 1.9 x 10^{-4} T, $\otimes$ (d) **B** = 1.9 x 10^{4} T, $\otimes$

5. If a current loop of radius R carrying a anti-clockwise current I is placed in a plane parallel to YZ–plane, then magnetic field at a point on the axis of the loop is given by

   (a) $\mathbf{B} = \frac{\mu_0 IR^2}{2(x^2+R^2)^{3/2}}\hat{\mathbf{j}}$ (b) $\mathbf{B} = \frac{\mu_0 IR^2}{2(x^2+R^2)^{3/2}}\hat{\mathbf{k}}$

   (c) $\mathbf{B} = \frac{\mu_0 IR^2}{2(x^2+R^2)^{3/2}}\hat{\mathbf{i}}$ (d) $\mathbf{B} = \frac{\mu_0 IR^2}{2(x^2+R^2)^{3/2}}(\hat{\mathbf{i}}\times\hat{\mathbf{k}})$

6. The magnetic field at the centre of a circular current carrying-conductor of radius r is B_c. The magnetic field on its axis at a distance r from the centre B_a. The value of $B_c : B_a$ will be

   (a) $1:\sqrt{2}$ (b) $1:2\sqrt{2}$ (c) $2\sqrt{2}:1$ (d) $\sqrt{2}:1$

7. A long straight wire of radius a carries *a* steady current *I*. The current is uniformly distributed over its cross-section. The ratio of the magnetic fields **B** and B' at radial distances $\frac{a}{2}$ and $2a$ respectively, from the axis of the wire is

(a) $\frac{1}{2}$ (b) 1 (c) 4 (d) $\frac{1}{4}$

8. Biot-Savart, law indicates that the moving electrons (Velocity *v*) produce a magnetic field **B** such that

(a) **B** is perpendicular to *v* (b) **B** is parallel to *v*

(c) it obeys inverse cube law (d) it is along the line joining the electron and point of observation

9. Current *I* is flowing through a vertical long wire in the upward direction. The direction of magnetic field at a point, on the east of the wire is

(a) upward (b) towards north (c) towards south (d) towards west

10. If we double the radius of a current carrying coil keeping the current unchanged, the magnetic field at its centre will

(a) remain unchanged (b) become double (c) be halved (d) become four times

11. A current I flows along the length of an infinitely long, straight and thin-walled pipe. Then :

(a) The magnetic field at all points inside the pipe is the same but not zero.

(b) The magnetic field at any point inside the pipe is zero.

(c) The magnetic field is zero only on the axis of the pipe.

(d) The magnetic field is different at different points inside the pipe.

12. Ratio of magnetic field induction at the centre of a current carrying coil of radius *r* and at a distance $3r$ on its axis is

(a) $\sqrt{10}$ (b) $2\sqrt{10}$ (c) $10\sqrt{10}$ (d) $20\sqrt{10}$

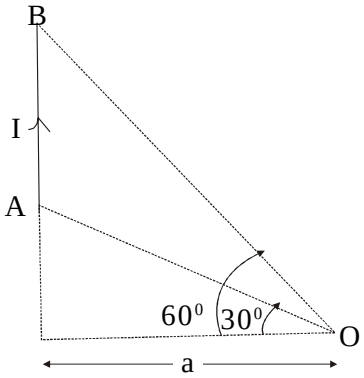
13. The strength of the magnetic field at a point *r* near a long straight current carrying wire is *B*. The field at a distance $\frac{r}{2}$ will be

(a) $\frac{B}{2}$ (b) $\frac{B}{4}$ (c) $2B$ (d) $4B$

14. A long wire carries a steady current. It is bent into a circle of one turn and the magnetic field at the centre of the coil is B. It is then bent into a circular loop of n turns. The magnetic field at the centre of the coil will be

(a) nB (b) n^2B (c) 2nB (4) $2n^2B$

15. The magnetic field at the point O in the given figure is



(a) $\frac{\mu_0 I}{8\pi a}(\sqrt{3}-1)$

(b) $\frac{\mu_0 I}{8\pi a}(\sqrt{3}+1)$

(c) $\frac{\mu_0 I}{4\pi a}(\sqrt{3}-1)$

(d) Zero

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