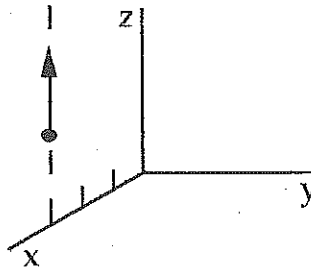


A.P. "C" Magnetic Field Practice

1.

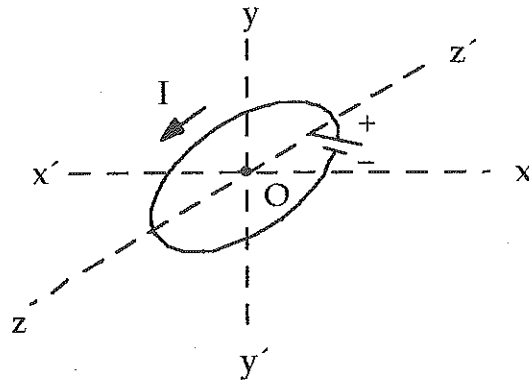
$$\mathbf{v} = 2.5 \times 10^7 \text{ m/s } \mathbf{k}$$



A point charge of $q_1 = 5.8 \text{ nC}$ is moving with speed $2.5 \times 10^7 \text{ m/s}$ parallel to the z axis along the line $x = 3 \text{ m}$. The magnetic field produced by this charge at the origin when it is at the point $x = 3 \text{ m}$, $z = 4 \text{ m}$ is approximately

- a. $0.70 \text{ nT } \mathbf{j}$ b. $-0.70 \text{ nT } \mathbf{j}$ c. $3.2 \text{ nT } \mathbf{j}$ d. $-1.6 \text{ nT } \mathbf{j}$ e. $-0.35 \text{ nT } \mathbf{j}$
2. At a certain instant of time a particle with charge $q = 15 \text{ } \mu\text{C}$ is located at $x = 2.0 \text{ m}$, $y = 5.0 \text{ m}$; its velocity at that time is $\mathbf{v} = 40 \text{ m/s } \mathbf{i}$. If you are at the origin, what do you measure as the magnitude of the magnetic field due to this moving point charge?
 - a. 1.9 pT b. 3.8 pT c. 2.7 pT d. 4.1 pT e. 5.9 pT
 3. At a certain instant of time a particle with charge $q = 25 \text{ } \mu\text{C}$ is located at $x = 4.0 \text{ m}$, $y = 2.0 \text{ m}$; its velocity at that time is $\mathbf{v} = -20 \text{ m/s } \mathbf{j}$. If you are at the origin, what do you measure as the magnitude of the magnetic field due to this moving point charge?
 - a. 6.8 pT b. 1.1 pT c. 5.6 pT d. 2.2 pT e. 4.4 pT
 4. A wire carries an electric current straight upward. What is the direction of the magnetic field due to the current north of the wire?
 - a. north b. east c. west d. south e. upward
 5. The Biot-Savart law is similar to Coulomb's law in that both
 - a. are inverse square laws. b. include the permeability of free space.
 - c. deal with excess charges. d. are not electrical in nature.
 - e. are described by none of the above.
 6. What is the magnetic field at the center of a circular loop with a diameter of 15.0 cm that carries a current of 1.50 A ?
 - a. zero b. $6.28 \times 10^{-6} \text{ T}$ c. $1.26 \times 10^{-5} \text{ T}$ d. $2.51 \times 10^{-5} \text{ T}$ e. $1.68 \times 10^{-4} \text{ T}$
 7. A 1000-turn solenoid is 50 cm long and has a radius of 2.0 cm . It carries a current of 8.0 A . What is the magnetic field inside the solenoid near its center?
 - a. $2.0 \times 10^{-2} \text{ T}$ b. $3.2 \times 10^{-3} \text{ T}$ c. $4.0 \times 10^{-4} \text{ T}$ d. 1.0 T e. $2.0 \times 10^{-4} \text{ T}$
 8. At great axial distances x from a current-carrying loop the magnetic field varies as
 - a. x^2 b. x^{-3} c. x^{-2} d. x^3 e. x^{-1}

9.



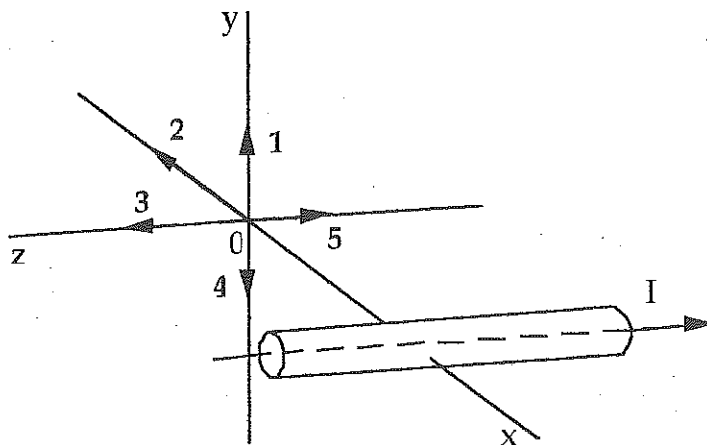
The sketch shows a circular coil in the xz plane carrying a current I . The direction of the magnetic field at point O is

- a. x b. x' c. y d. y' e. z'

10. A circular loop of wire 10 cm in radius carries a current of 20 A. The axial magnetic field 15 cm from the center of the loop is approximately

- a. $37 \mu\text{T}$ b. $13 \mu\text{T}$ c. $21 \mu\text{T}$ d. $41 \mu\text{T}$ e. $18 \mu\text{T}$

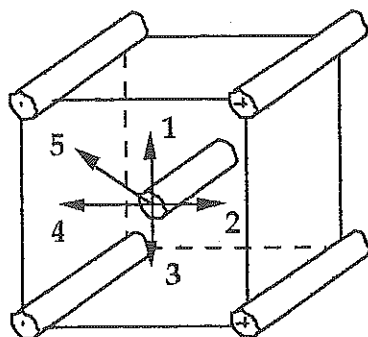
11.



A long conductor carrying current I lies in the xz plane parallel to the z axis. The current travels in the negative z direction, as shown in the figure. The vector that represents the magnetic field at the origin O is

- a. 1 b. 2 c. 3 d. 4 e. 5

12.



Four wires carry equal currents along the four parallel edges of a cube. A parallel current-carrying wire through the center of the cube is free to move. The vector that might represent the direction in which the center wire will move is

- a. 1 b. 2 c. 3 d. 4 e. 5

13. The force per unit length between two current-carrying wires is expressed as

$$F/l = (\mu_0/2\pi d)I^2$$

where I is the current, d the separation of the wires, and l the length of each wire. A plot of force per unit length versus I^2 gives a straight line, the slope of which is

- a. μ_0 b. F/l c. $(2\pi d/\mu_0)^{1/2}$ d. $\mu_0/2\pi d$ e. FI^2/l

14. Two long, parallel wires are spaced 1 m apart in air, and you have established a current of 1 A in each. The force per unit length that each wire exerts on the other is approximately

- a. 2×10^{-6} N/m b. 2×10^{-5} N/m c. 2×10^{-7} N/m
d. $2\pi \times 10^{-5}$ N/m e. $2\pi \times 10^{-6}$ N/m

15. Two long, straight parallel wires 9.3 cm apart carry currents of equal magnitude I . They repel each other with a force per unit length of 5.8 nN/m. The current I is approximately

- a. 27 mA b. 65 mA c. 43 mA d. 52 mA e. 2.7 mA

16. Ampère's law is valid

- a. when there is a high degree of symmetry in the geometry of the situation.
b. when there is no symmetry.
c. when the current is constant.
d. when the magnetic field is constant.
e. for all of these conditions.

17. A wire of radius 0.35 cm carries a current of 75 A that is uniformly distributed over its cross-sectional area. The magnetic field B at the surface of the wire is approximately

- a. 8.4 mT b. 4.3 mT c. 6.7 mT d. 2.3 mT e. 5.7 mT

A.P. C^u Magnetic Field Practice

1. e

2. a

3. d

4. c

5. a

6. c

7. a

8. b

9. c

10. c

11. a

12. d

13. d

14. c

15. d

16. e

17. b