PHYSICS CLASS XII
CHAPTER – 4 MOVING CHARGES AND MAGNETISM

Q.1. What is Ampere?

Ans. One Ampere is the current which flows through each of two parallel uniform long linear conductors, which are placed in free space at a distance of 1 m from each other attract or repel with a force of $2 \times 10^{-7} N/m$.

Q.2. What type of force is acting between two parallel wires carrying current in the same direction?

Ans. Force of attraction.

Q.3. What is the magnitude of torque which acts on a coil carrying current placed in a uniform radial magnetic field?

Ans. Torque, τ = NBIA, where the terms have their usual meanings. Here θ = 90°.

Q.4. What is dead beat galvanometer?

Ans. Dead beat galvanometer is one in which the coil comes to rest at once after the passage of current through it. The deflection can be noted in no time.

Q.5. Why is a coil wrapped on a conducting frame in a galvanometer?

Ans. Eddy currents in conducting frame help in stopping the coil soon i.e., in making the galvanometer dead beat.

Q.6. What is the function of soft iron cylinder between the poles of a galvanometer.

Address: Plot No 420, Behind Shopprix Mall, Vaishali Sector 5, Ghaziabad – 201010
M: 9999907099, 9818932244 O: 0120-4130999
Website: www.vaishalieducationpoint.com , www.educationsolution.co

Ans. It concentrates the magnetic field and helps in making the magnetic field radial.

Q.7. Why are poles pieces of galvanometer made concave?

Ans. To have a uniform, strong radial magnetic field.

Q.8. What is the nature of magnetic field in moving coil galvanometer?

Ans. A radial magnetic field.

Q.9. Why should the spring/suspension wire in a moving coil galvanometer have low torsional constant?

Ans. Low torsional constant facilitate greater deflection θ in coil for given value of current and hence sensitivity of galvanometer increases.

Q.10. The coils in certain galvanometers, have a fixed core made of a non-magnetic metallic material. Why does the oscillating coil come to rest so quickly in such a core?

Ans. Due to eddy currents produced in core which opposes the cause (Deflection of coil), that produces it.

Q.11. Under what condition does an electron moving through a magnetic field does not experience any force?

Ans. When $\theta = 0°$, F = 0

Therefore, when the particle moves parallel to a magnetic field, it does not experience any force.

Q.12. The equation F = qvB sin θ involves the magnitude of three vectors F, v, B with pair of vectors is always at right angles why?

Ans. As F = qvB sin θ

F = q|v × B| or F = q(v × B)

F is perpendicular to the plane containing v and B. Hence, F and v are always at right angles, and F, B are also at right angles.

Q.13. What is the magnitude of magnetic force per unit length on a wire carrying a current of 8 A making an angle of 30° with the direct on of a uniform magnetic field of 0.15 T?

Ans. Here, I = 8 A, θ = 30° , B = 0.15 T, F = ? l = 1m

We know that,

F = BIl sin θ

F = 0.15 × 8 × 1 × sin 30°

F = 0.15 × 8 × 1 × (1/2)

F = 0.6 Nm^{-1}

Q.14. A voltmeter, an ammeter and a resistance are connected in series with a lead accumulator. The voltmeter gives some deflection but the deflection of ammeter is zero. Explain.

Ans. Voltmeter resistance being very high when connected in series, it makes the effective resistance of the circuit very high. Due to it current in the circuit becomes extremely small.

Q.15. A conductor of length 2 m carrying current of 2 A is held parallel to an infinity long conductor carrying current of 10 A at a dis ance of 100 mm. Find the force on small conductor.

Address: Plot No 420, Behind Shopprix Mall, Vaishali Sector 5, Ghaziabad – 201010
M: 9999907099, 9818932244 O: 0120-4130999
Website: www.vaishalieducationpoint.com , www.educationsolution.co

Ans. Here, I_1 = 2A, I_2 = 10 A, r = 100 mm, r = 0.1 m

l = 2m, F = ?

We know that force per unit length of short conductor due to long conductor is

$$f = \frac{\mu_0}{4\pi}\frac{2I_1I_2}{r}$$

Total force on length l of the short conductor is

$$F = fl$$

$$F = \frac{\mu_0}{4\pi}\frac{2I_1I_2l}{r}$$

$$F = \frac{10^{-7}\times2\times2\times10\times2}{0.1}$$

$$F = 8\times10^{-5}\text{ N}$$

Q.16. A circular coil of 100 turns, radius 10 cm carries a current of 5 A. It is suspended vertically in a uniform magnetic field of 0.5 T, the field lines making an angle of 60° with the plane of the coil. Calculate the magnitude of the torque that must be applied to it to prevent it from turning.

Ans. Here, N = 100, I = 5A, B = 0.5 T

α = 90° - 60° = 30°

r = 10 cm = 0.10 m

$A = \pi r^2 = \frac{22}{7}\times(0.10)^2 m^2$

Torque, τ = NIBA sin α

$\tau = 100\times5\times0.5\times\frac{22}{7}\times(0.10)^2\sin30°$

τ = 3.927 N-m

Address: Plot No 420, Behind Shopprix Mall, Vaishali Sector 5, Ghaziabad – 201010
M: 9999907099, 9818932244 O: 0120-4130999
Website: www.vaishalieducationpoint.com , www.educationsolution.co

Q.17. A resistance of 1980 Ω is connected in series with a voltmeter, after which the scale division becomes 100 times larger, find the resistance of voltmeter.

Ans. Let R be the resistance of voltmeter.

Let n be the number of divisions in the voltmeter

$I_g R/n$ = V ....(i)

I_g(R + 1980)/n = 100 V ......(ii)

Dividing Eq. (ii) by Eq. (i)

R + 1980 = 100 R

R = 1980/99 = 20 Ω

Q.18. A magnetic field that varies in magnetic from point to point but has a constant direction (East to West) is set up in chamber. A charged particle enters the chamber and travels undeflected along a straight path with constant speed. What can you say about the initial velocity of the particle?

Ans. Initial velocity v is either parallel or anti-parallel to B because only then $F_B = q$(v × B) will have zero value and the charged particle will go undeviated along a straight path with constant speed.

Q.19. A charged particle enters an environment of a strong and non-uniform magnetic field varying from point to point both in magnitude and direction, and comes out of it following a complicated trajectory. Would its final speed equal the initial speed if it suffered no collisions with the environment?

Ans. Yes, because magnetic force, being perpendicular to direction of velocity, can change the direction of velocity v but cannot change its magnitude.

Address: Plot No 420, Behind Shopprix Mall, Vaishali Sector 5, Ghaziabad – 201010
M: 9999907099, 9818932244 O: 0120-4130999
Website: www.vaishalieducationpoint.com , www.educationsolution.co

Q.20. (i) Explain, giving reasons, the basic difference in converting a galvanometer into (a) a voltmeter and (b) an ammeter.

Ans. (i) A galvanometer of range I_g and resistance G_1 can be converted into

(a) a voltmeter of range V, by connecting a high resistance R in series with it where value is given by

$$R = \frac{V}{I_s} - G$$

(b) an ammeter of range, I by connecting a very low resistance (Shunt) in parallel with galvanometer whose value in given by

$$S = \frac{I_g G}{I - I_g}$$

Address: Plot No 420, Behind Shopprix Mall, Vaishali Sector 5, Ghaziabad – 201010
M: 9999907099, 9818932244 O: 0120-4130999
Website: www.vaishalieducationpoint.com , www.educationsolution.co