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Class: XII
Subject: Physics
Topic: Moving Charges, Magnetism
No. of Questions: 20
Duration: 60 Min
Maximum Marks: 60

1. A bar magnet suspended by a suspension fibre is placed in magnetic meridian with no twist in the suspension fibre. On turning the upper end of the suspension fibre through 120° from the meridian, the magnet is deflected through 30° from the meridian. Then the angle through which the upper end of the suspension fibre has to be twisted to deflect the magnet through 90° from the meridian is
A. 270°
B. 240°
C. 330°
D. 180°
Ans. A
Solution:

If C is restoring couple per unit angular twist of the ___ and ϕ is the angular twist, then

$\tau = C\phi = MH \sin \theta.$

In the 1st case, $\theta = 30°, \phi = 120° - 30° = 90°$

$\therefore C \times 90° = MH \sin 30°$

In the 2nd case, $\theta = 90°, \phi = ?$

$\therefore \qquad C(\phi - 90°) = MH \sin 90°$

So, $\qquad \dfrac{\phi - 90°}{90°} = \dfrac{MH \sin 90°}{MH \sin 30°} = \dfrac{1}{1/2} = 2$

or $\qquad \phi - 90° = 180°$

$\therefore \qquad\qquad \phi = 180° + 90° = 270°$

2. When the radius of the T.G. coil is decreased its sensitiveness
A. Increases
B. May increase or decrease
C. Decreases
D. Remains unaltered
Ans. A

3. Magnetic field inside an ideal solenoid of 1000 turns/m carrying a current of 2A at its center is (in T)
A. 20 μ_0
B. 2000 μ_0
C. zero
D. 200 μ_0

Ans. B

4. A certain current on passing through a galvanometer produces a deflection of 100 divisions. When a shunt of 1 Ω is connected, the deflection reduces to 1 division. Then the galvanometer resistance is
A. 99 Ω
B. 990 Ω
C. 9.9 Ω
D. 0.99 Ω

Ans. A

5. A tangent galvanometer has coil of 50 turns and a mean diameter of 22 cm. The current through it when the needle is deflected through 60° at a place where horizontal components of earth is H = 30μ0 A/m, is
A. 300 mA
B. 130 mA
C. 228 mA
D. 158 mA

Ans. C
Solution:
The reduction factor

$$k = \frac{2rH}{\mu_0 N} = \frac{2 \times 11 \times 10^{-2} \times 30 \times \mu_0}{\mu_0 \times 50}$$

$$k = 132 \times 10^{-3}\, A$$

Current is k tan 60°.

∴ $i = 228.6 \times 10^{-3}\, A$

∴ $\approx 228 mA$

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6. A current flows in a circuit containing a resistance, a battery and an ammeter. When the ammeter is replaced by a voltmeter, the current in the circuit will
A. remain the same
B. increases
C. decreases
D. depends on the range of the voltmeter

Ans. C

7. A particle of mass m and charge q moves along a circular orbit of radius r with an angular speed ω. The ratio of the magnitude of its magnetic moment to that of its angular momentum depends on
A. ω and q
B. ω, q and m
C. q and m
D. ω and m

Ans. C

8. A magnetic needle is kept in a non-uniform magnetic field. It experiences
A. a torque but not a force
B. neither a force nor a torque
C. a force and a toque
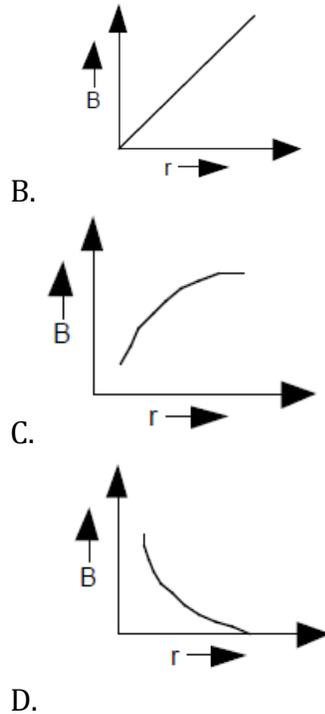D. a force but not a torque

Ans. C
Solution:
Magnetic needle is placed in non-uniform magnetic field. It experiences force and torque both due to unequal force acting on poles

9. Which of the following graphs represent variation of magnetic field B with distance 'r' for a straight long wire carrying current

A.

B.

C.

D.
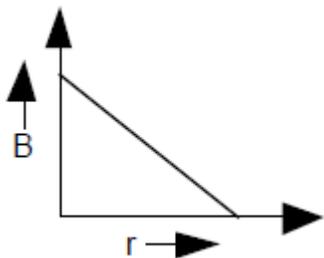
Ans. D

10. Two T.G.'s have their coils of same radius but the ratio of the number of turns is 1 : 3. Then the ratio of their reduction factors is
A. 3 : 2
B. 3 : 1
C. 4 : 1
D. 1 : 2
Ans. B

11. The magnetic compass is not useful for navigation near the magnetic poles. Since
A. B= 0
B. V=0
C. H =0
D. q =0°

Ans. C
Solution:
Near the magnetic poles, H = 0, so magnetic compass will not work

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12. If the distance between two similar magnetic poles held one cm apart be doubled, then the force of interaction between them will be
A. doubled
B. halved
C. unchanged
D. one quarter of the original value

Ans. D

13. Ferromagnetic substances used in a transformer must have
A. high susceptibility and high hysteresis loss
B. high permeability and low hysteresis loss
C. low permeability and high hysteresis loss
D. low permeability and low hysteresis loss

Ans. B

14. The sensitivity of a M.G. can be increased by
A. increasing area of the coil
B. decreasing torque per unit twist
C. increasing magnetic induction B
D. all of the above

Ans. D

15. The sensitivity of a moving coil galvanometer can be increased by using
A. a thicker suspension
B. A thinner suspension
C. both of the above
D. none of the above

Ans. B

16. A 0 to 10 mA ammeter has a resistance of 10 ohms. To convert this into a voltmeter of range 0 to 10 V, the resistance to be connected in series with it is
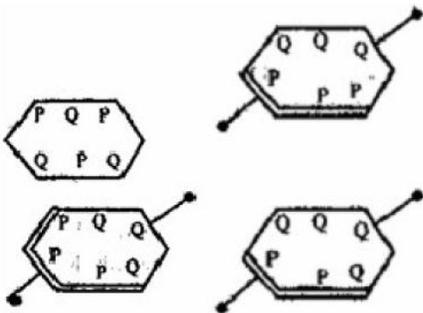A. 9 Ω
B. 90 Ω
C. 990 Ω
D. 9990 Ω

Ans. C

17. Figures below show 4 ways of making a regular hexagon out of wires of 2 different kinds P, Q with current beads, at the middle of opposite wires, the magnetic field at the centre of the hexagon is not zero in

A. was (iii) & (iv) only
B. case (iii) only
C. case (i) & (ii) only
D. case (i) only

Ans. A

18. Two tangent galvanometers are connected in series and a current is passed through them. The radii of the TG's are r_1 and r_2, the number of turns in them are n_1 and n_2 and the deflections produced are θ_1 and θ_2. Then the correct relation is

A $\quad r_1 \tan\theta_1 \, n_1 = r_2 \tan\theta_2 \, n_2$

B $$\frac{r_1 \tan \theta_2}{n_1} = \frac{r_2 \tan \theta_1}{n_2}$$

C $$\frac{r_1 \tan \theta_1}{n_1} = \frac{r_2 \tan \theta_2}{n_2}$$

D. none of the above

19. The resistance of galvanometer is 30Ω. The shunt required to increase its range 10 times is

A. $\dfrac{9}{30}$ Ω

B. $0.3\ \dot{U}$

C $\dfrac{10}{3}$ Ω

D. $\dfrac{30}{9}$ Ω

Ans. D

20. The current that must flow through the coil of a galvanometer so as to produce a deflection of one division on its scale is called
A. current sensitivity of the galvanometer
B. charge sensitivity of the galvanometer
C. microvolt sensitivity
D. reduction factor

Ans. A