CHAPTER - 14

MOVING CHARGES AND MAGNETISM & MAGNETISM AND MATTER

JEE MAIN - SECTION I

1. 2
2. 4
3. 2
4. 2
5. 2
6. 1
7. 1
8. 2
9. 1
10. 3

11. 1 Hint:

$\pi r = 10\pi$

$r = 10 cm$

$= 10^{-1} m$

$\therefore M = m \times 2r$

$= 0.5 \times 2 \times 10^{-1}$

$= 10^{-1} = 0.1\ Am^2$

12. 4 $W = MB[\cos\theta_1 - \cos\theta_2]$

$= \{2\times10^4 \times 6\times10^{-4}\}\{\cos 0 - \cos 60\}$

$= 12\{1 - 1/2\}$

$= \underline{\underline{6J}}$

13. 1 $PE = -MB\cos 0$

$= -0.32\times0.15$

$= -4.\underline{\underline{8\times10^{-2}}}\ J$

14. 4 $Q = VAft$

$S = \frac{Q}{m\times\Delta T}$

$\therefore \Delta T = \frac{Q}{S\times m} = \frac{VAft}{S\times m}$

$= \frac{Aft}{S\times S} = \frac{10^{-2}\times 50\times 60}{0.5\times10^3\times 4.2\times 7\times10^3}$

$= \frac{30\times10^{-6}}{14.7}$

$= \underline{\underline{2\times10^{-6}}}$

SECTION II (NUMERICAL)

15. 2

16. 2

17. 3 $\frac{x_1}{x_2} = \frac{T_2}{T_1}$

$\therefore T_2 = \frac{x_1}{x_2} \times T_1 = \frac{1.2\times10^{-5}}{1.8\times10^{-5}} \times 300$

$T_2 = 300\left(\frac{2}{3}\right)$

$= 200K$

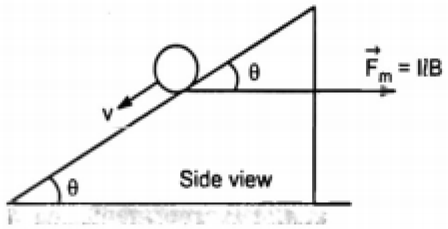
18. 1

JEE ADVANCED LEVEL

SECTION III

19. A

20. B **[b]** Magnetic force acts in the direction shown in figure



Road will move downward with constant velocity if net force on it is zero.

or $F_m \cos\theta = mg \sin\theta$

or $IlB \cos\theta = mg \sin\theta$

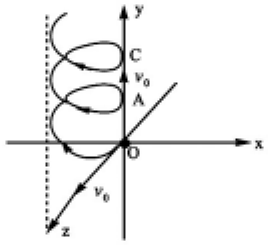
$\therefore B = \left(\frac{mg}{Il}\right)\tan\theta$

21. C

1**SECTION IV (More than one correct)**

22. B,D The path of the particle will be helix as shown in Fig. Clearly x-coordinate is always negative. z-coordinate can be negative and positive both. x and z coordinate will be zero at the same time at points A, C etc.

$$y = v_0 t \Rightarrow y\alpha t$$



23. A,B,C,D

$$r = \frac{mv_0}{qB} \qquad PQ = 2r\sin\alpha = 2\frac{mv_0}{qB}\sin\alpha \qquad \alpha = \beta$$

$$\text{Time taken} = T = \frac{2\pi r}{v} \qquad T = \frac{2\pi r}{qB}$$

$$\text{For t time, } t = \frac{T}{2\pi}(2\pi - 2\alpha) = \frac{2m}{qB}(\pi - \alpha)$$

24. A,C,D

SECTION V - (Numerical type)

25. 250 $\frac{B_{center}}{B_{axis}} = \left(1 + \frac{x^2}{r^2}\right)^{3/2} \Rightarrow \frac{B_{center}}{54} = \left(1 + \left(\frac{4}{3}\right)^2\right)^{3/2} = \frac{125}{27}$

$B_{center} = 250\,\mu T$

26. 5

27. 12

SECTION VI - (Matrix match type)

28. A A-P,R,S; B-P,R,S; C-P,Q; D-P,Q

i. Kinetic energy of the particle can remain constant, if both the fields are present. This is possible if th eforce due to both fields cencel each other.
Kinetic energy of the particle can also remain constant if lnly magnetic field is present, because magnetic field does not do any work.
Obviously KE will remain constant if no field is present

ii. This is possible if either both the fields are present of no field is present.
iv. This is possible if only electric field is present and velocity and electric field are along the parallel lines. Magnetic field may also be present if it is parsent if it is parallel to velocity.