

4. A beam of protons with speed  $4 \times 10^5 \text{ ms}^{-1}$  enters a uniform magnetic field of  $0.3 \text{ T}$  at an angle of  $60^\circ$  to the magnetic field. The pitch of the resulting helical path of protons is close to : (Mass of the proton =  $1.67 \times 10^{-27} \text{ kg}$ , charge of the proton =  $1.69 \times 10^{-19} \text{ C}$ ) **[Sep. 02, 2020 (I)]**

- (a) 2 cm      (b) 5 cm      (c) 12 cm      (d) 4 cm

4. (d) Pitch =  $(v \cos \theta)T$  and  $T = \frac{2\pi m}{qB}$

$$\therefore \text{Pitch} = (V \cos \theta) \frac{2\pi m}{qB}$$

$$= (4 \times 10^5 \cos 60^\circ) \frac{2\pi}{0.3} \left( \frac{1.67 \times 10^{-27}}{1.69 \times 10^{-19}} \right) = 4 \text{ cm}$$