55. Suppose that an electron (charge $-e$) could orbit a proton (charge $+e$) in a circular orbit of constant radius R. Assuming that the proton is stationary and only electrostatic forces act on the particles, which of the following represents the kinetic energy of the two-particle system?

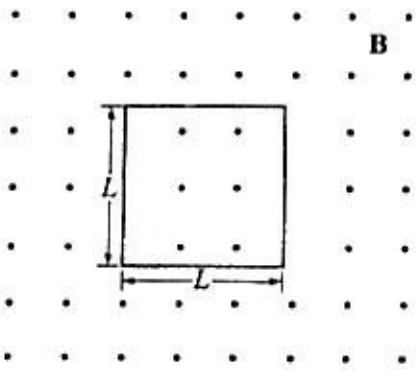
(A) $\frac{1}{4\pi\epsilon_0}\frac{e}{R}$

(B) $\frac{1}{8\pi\epsilon_0}\frac{e^2}{R}$

(C) $-\frac{1}{8\pi\epsilon_0}\frac{e^2}{R}$

(D) $\frac{1}{4\pi\epsilon_0}\frac{e^2}{R^2}$

(E) $-\frac{1}{4\pi\epsilon_0}\frac{e^2}{R^2}$



56. A square wire loop with side L and resistance R is held at rest in a uniform magnetic field of magnitude B directed out of the page, as shown above. The field decreases with time t according to the equation $B = a - bt$, where a and b are positive constants. The current I induced in the loop is

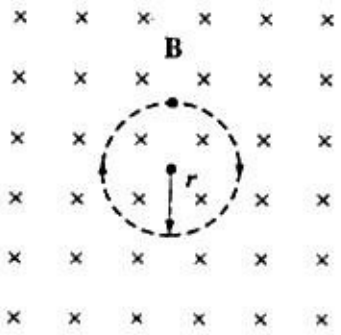
(A) zero

(B) aL^2/R, clockwise

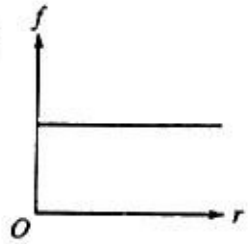
(C) aL^2/R, counterclockwise

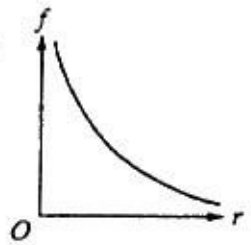
(D) bL^2/R, clockwise

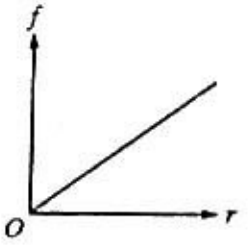
(E) bL^2/R, counterclockwise

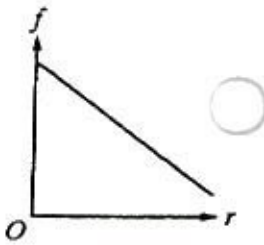


57. A negatively charged particle in a uniform magnetic field **B** moves in a circular path of radius r, as shown above. Which of the following graphs best depicts how the frequency of revolution f of the particle depends on the radius r ?

(A)


(B)


(C)


(D)


(E)