

PHY 212 General Physics II - Electricity, Magnetism and Light
Summer 2007

Quiz 5 Tuesday, July 24

Name: WORKED OUT COPY

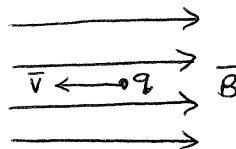
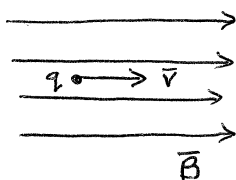
1. (4 points) Consider the equation $\vec{F} = q\vec{v} \times \vec{B}$. (i) Which vector quantities always are perpendicular to each other? (ii) Which are not necessarily perpendicular to each other?

(i) $\vec{v} \perp \vec{F}$, $\vec{B} \perp \vec{F}$

(ii) \vec{v} and \vec{B}

2. (4 points) A charge q is moving with velocity \vec{v} in a magnetic field, yet experiences zero magnetic force. Indicate in a sketch and with a short explanation how can this happen.

$$\vec{F} = q\vec{v} \times \vec{B} = 0 \Rightarrow \vec{v} \text{ and } \vec{B} \text{ are parallel or anti-parallel}$$



3. (7 points) The current in a charging RC circuit is given by $i = I_0 e^{-t/RC}$. How long does it take for current i to decay to half its value? Express your result in terms of the time constant of the circuit.

$$i = I_0 e^{-t/RC}$$

when the current is half its initial value,

$$\frac{I_0}{2} = I_0 e^{-t/RC} \rightarrow \frac{1}{2} = e^{-t/RC}$$

$$2^{-1} = e^{-t/RC}$$

$$-\ln 2 = -\frac{t}{RC} \rightarrow t = RC \ln 2$$

$$\text{so } t = \tau \ln 2, \quad \tau : \text{time constant.}$$