Biology 4605 / 7220 Name ____Key_____
Quiz #3b 23 September 2002

The Nicholson-Bailey equations of parasitoid-host interactions are as follows.

$H(t+1) = b \cdot H(t) \cdot [e^{-a \cdot P(t)}]$ *for hosts*

$P(t+1) = c \cdot H(t) \cdot [1 - e^{-a \cdot P(t)}]$ *for parasitoids*

H(t+1) = number of hosts in the next generation *(t+1)*
P(t+1) = number of parasitoids in the next generation *(t+1)*
a = search efficiency of the parasitoid
c = number of parasitoid offspring resulting from an attack of a host
b = per capita birth rate of hosts

1. If *H(t), H(t+1), and P(t+1)* all have units of organisms per meter along a transect in a potato field, what must be the units of

search efficiency *a* has units of m/organism
because it must have same units as $[P(t)]^{-1}$ = $[organism/m]^{-1}$

offspring per attack *c* has no units, it is a dimensionless ratio

2. Complete the following table.

P(t)	*H(t)*	*a*	*c*	*P(t+1)*
10	100	4%	2	65.9
10	100	8%	2	110.1
10	100	16%	2	159.6

3. In words, what happens to the number of parasitoids in the next generation when efficiency doubles?
the number of parasitoids will increase, but not by a factor of 2

4. If *t* has units of days, what units will the quantity ΔP have ?

$$\frac{organisms}{m} \cdot \frac{1}{day} = \frac{organisms}{m \cdot day}$$

$$\Delta P = \frac{P(t+1) - P(t)}{t}$$

5. For a density of 100 potato nematode (hosts) per square meter, which is the more effective means of increasing parasitoids, doubling the parasitoid efficiency or doubling *c* by increasing the survival of parasitoid offspring ?

doubling the survival is more effective, because doubling the efficiency does not double the number of parasitoids