

**Question 10****(12 marks)**

In a laboratory experiment, the population of a particular bacteria began with 400 present. The bacteria grew at a rate of 35% each week, where  $P$  is the number of bacteria and  $t$  is the number of weeks from the start of the experiment.

- (a) Four possible equations were produced to model this experiment:

$$P = 400(1.35)^t$$

$$P = 400(0.35)^t$$

$$P = 540(1.35)^{t-1}$$

$$P = 540(1.35)^{t+1}.$$

Circle the correct equation(s).

(2 marks)

- (b) Calculate the population of bacteria after three weeks.

(1 mark)

- (c) During which week did the population of bacteria first reach 1800?

(2 marks)

- (d) After eight weeks the growth rate slowed to 20% each week. How many weeks in total did it take for the population of bacteria to reach 15 812? (3 marks)

- (e) What constant weekly growth rate would produce the same change in population from 400 to 15 812 in the same time as found in part (d)? (2 marks)

- (f) Once the bacteria population reached 15 812 it began to die out at a rate of 250 each day. Approximately how many weeks did it take for the bacteria to die out completely?  
(2 marks)