Problem 1. [a non-biological problem]

A standard deck of cards contains 52 different cards of which 4 are aces and 4 are kings.

(I) How many ways are there to select two aces from a deck? (Assume that order does not matter.)

(II) How many ways are there to select three kings from the deck? (Assume that order does not matter.)
(III) Now suppose that you are dealt a hand of five cards. (Assume that all outcomes are equally likely, and order does not matter, i.e., you can rearrange the cards however you want.)

(a) What is the total number of outcomes?

(b) How many ways are there to get two aces and three kings? (Consider selecting two aces and three as two tasks: the first task is choosing two aces, and the second task is choosing the three kings.)

(c) What is the probability that you get two aces and three kings?
Problem 2. [a more biologically relevant problem]

A petri dish contains four green bacteria, six blue bacteria, and two red bacteria. All of the bacteria are distinguishable by their shapes. You take three bacteria out of the petri dish without replacement. (Assume that order of your selections doesn’t matter and that all outcomes are equally likely.)

(a) What is the total number of outcomes?
(b) What is the number of ways to get all green bacteria?

(c) What is the number of ways to get all three bacteria of different colors?
(d) What is the probability that all bacteria are green?

(e) What is the probability that all three bacteria are different colors?