Test Human Practice

You have decided to join iGEM Grenoble adventure! First, you would like to assess your knowledge in Synthetic Biology:

A. The **Figure 1** represents a regulated genetic circuit (Case 1 & Case 2). Its composed by all the elements involved in the gene **(G)** expression and then the protein **(P)** production.

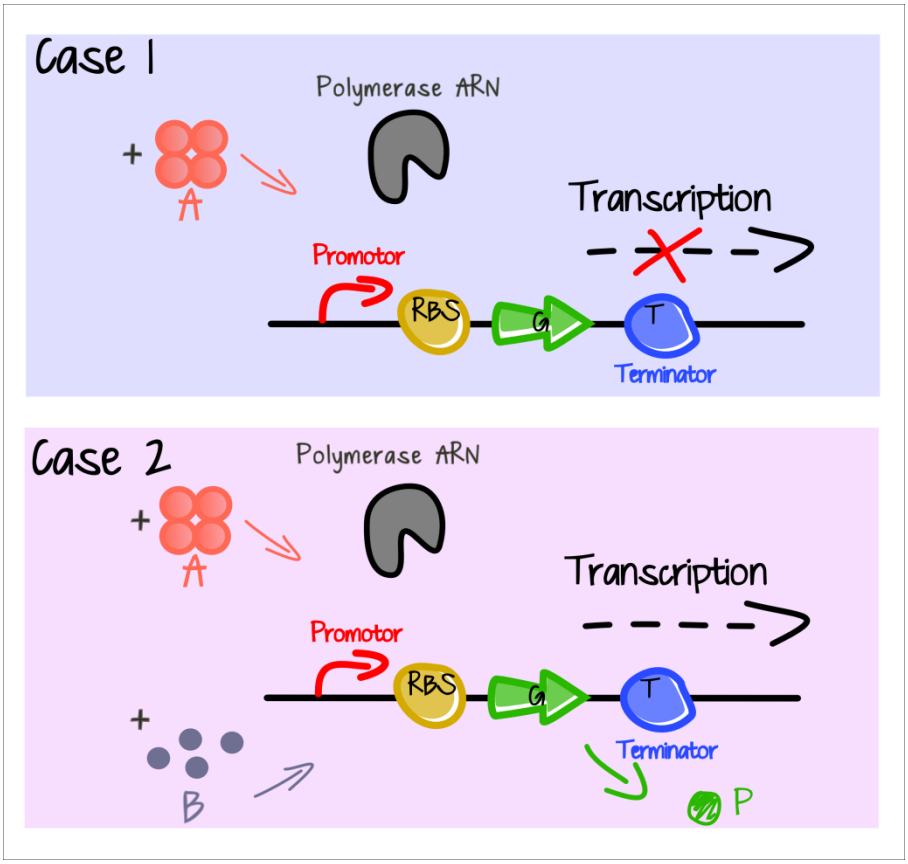


Figure 1. Representation of a regulated genetic c circuit.

NB : Circle the correct answer.

1. From this figure, what can you deduce about the function of A molecule?

   a. Repressor
   b. Activator
   c. Without effect

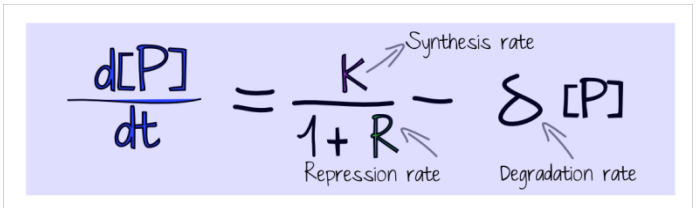
2. What is the function of B molecules?

   a. Repression's activator
   b. Repression's inhibitor
   c. Wihout effect

3. To which element the B molecules are bound ?

   a. The gene
   b. The promotor
   c. A molecule

B. The behavior of a genetic circuit is generally translated into mathematical equations. The equation below describes the global functioning of the latest system (Figure 1).



4. In this equation what does the term ***d[P]/dt*** *mean* ?

   a. Variation of protein (***P***) production at a defined time (***t***).
   b. Protein (***P***) degradation at a defined time (***t***).
   c. Variation of protein (***P)*** production over time.

5. In the second term of the equation, for which reason the denominator is equal to **1+R** ?

   ……

After months of intensive brainstorming, you've just defined the genetic network of your project. Your goal is to understand how this biological system works.

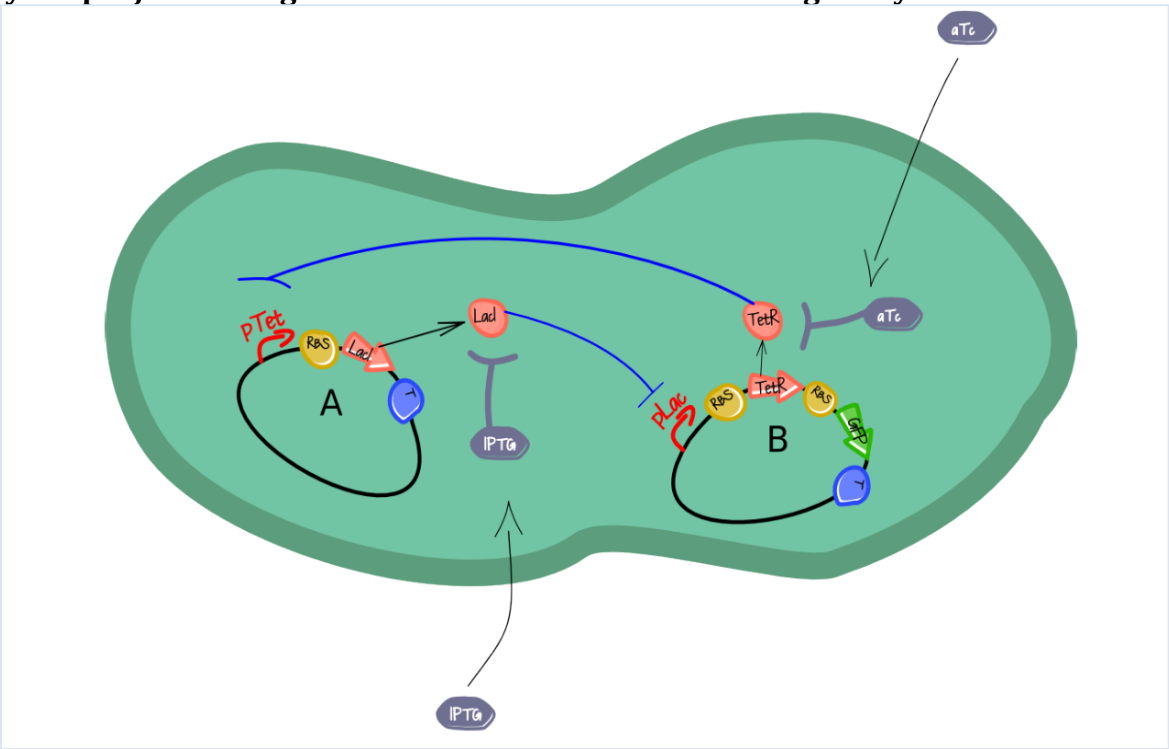


Figure 2. Representation of the developped genetic circuit.

C. To simplify the functionning of the system. We will consider that all the kinetics are equal.

- IPTG and aTc are two molecules. They can be added to the medium during the experiment. These two molecules can also go into the bacteria.
- GFP is a fluorescent protein. We see this fluorescence with naked eyes.
- This system is composed by two ways A abd B. Both ways can't be active at the same time. In fact, when A is active, B is repressed and vice versa.

6. What are the molecules or proteins responsible for repression of each way?

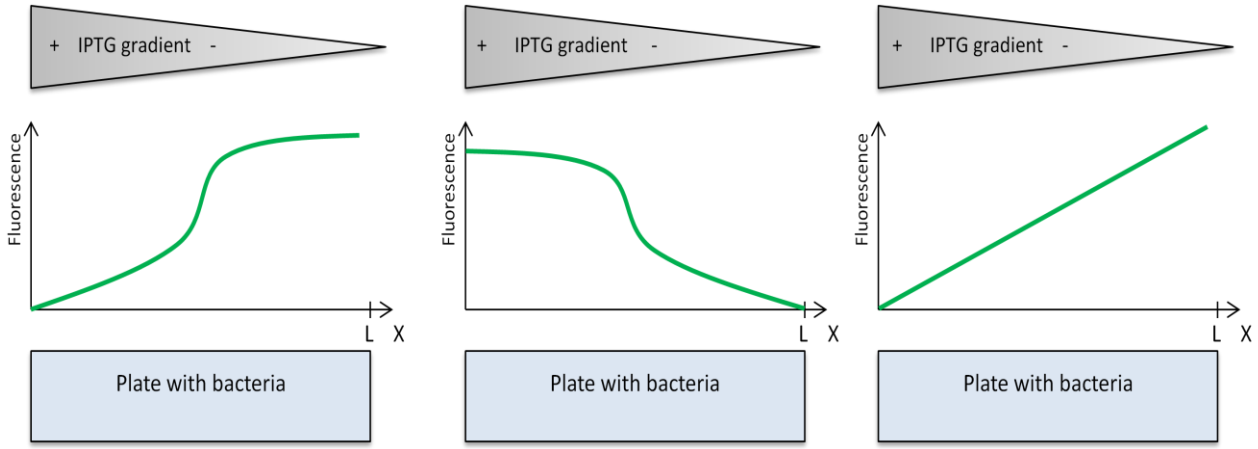
   a. aTC/IPTG
   b. IPTG/GFP
   c. LacI/TetR
   d. TetR/ATC

7. By considering all the kinetics similar. What kind of behavior could be expected from the system if IPTG concentration is bigger than aTc?

   a. Apparition of fluorescence
   b. Absence of fluorescence
   c. Cyclic behavior

8. If Bacteria are spread homogeneously on a plate submitted to a linear gradient of IPTG (aTc concentration is constant). What is the behavior of system ?

a. b. c.



9. The simplified equations system which governs the system is as follows::

$$\begin{cases} \frac{d[TetR]}{dt} = \frac{\alpha_{pLac}}{1+(\frac{[lacI]}{1+[IPTG]})} - \delta_{TetR}.[TetR] \\ \frac{d[lacI]}{dt} = \frac{\alpha_{pTet}}{1+(\frac{[TetR]}{1+[aTc]})} - \delta_{lacI}.[lacI] \\ \frac{d[GFP]}{dt} = \dots \end{cases}$$

From this system, deduce which of these four equations reflects the variation of GFP concentration over time?

a. $$\frac{d[GFP]}{dt} = \frac{\alpha_{pLac}}{1+(\frac{[TetR]}{1+[aTc]})} - \delta_{GFP}.[GFP]$$

b. $$\frac{d[GFP]}{dt} = \frac{\alpha_{pLac}}{1+(\frac{[lacI]}{1+[IPTG]})} - \delta_{GFP}.[GFP]$$

c. $$\frac{d[GFP]}{dt} = \frac{\alpha_{pTet}}{1+(\frac{[TetR]}{1+[IPTG]})} - \delta_{GFP}.[GFP]$$

10. Why modelling is useful in Synthetic biology ?

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NB : The questions below concern only the students that have used the flyers.

1. Did the flyer contents help you to better understand the questions ?

    a. **Yes**
    b. **No**

2. Did the use of flyers help you to better inetract with workmate ?

    a. **Yes**
    b. **No**

3. Do you think that additional information should appear in these flyers?

    a. **Yes (Precise:……)**
    b. **No**