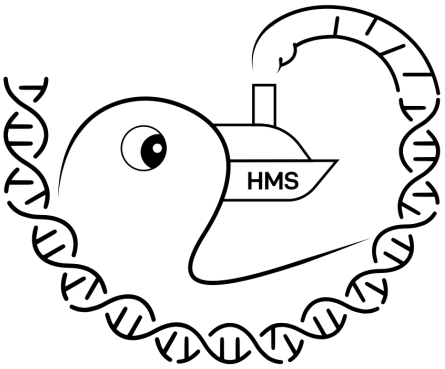


Pravega 2021

What Would Darwin Do
Final Round Question Paper

Some More Instructions!

In addition to the rules sent on the website, please also keep the following in mind:

- All questions, including bonus questions, are compulsory and carry marks. Bonus questions are called so as they are not a part of any interconnected theme.
- The exam is open-book. Please cite sources that you use to answer the questions. You can include the name and authors of the book or article or include the URL of the webpage, whatever you use.
- The whole story, including characters and species are fictional. Any resemblance with real life examples are purely coincidental.
- Please upload a PDF of your answer script to the following Google Forms link: **forms.gle/giiB862HkWDLseTy6**
- Please drop an email to **wwdd.pravega@gmail.com** if you have any issue or doubt.

You still cannot believe your ears. Did he actually say that?

After a gruesome, tiring, and mind-boggling voyage along with Darwin in the Beagle, your mind is tired and inquisitive at the same time. You have thousands of questions in your mind, gathered from this enriching tour around the world. You approach Darwin to ask questions about what you observed during the journey and whether you would be able to accompany him to the realm.

Darwin summons everyone to make an announcement. He says, "Dear colleagues, the last few years would have been a great learning experience for all of you. You would have felt the same breeze of inquisitiveness, knowledge, and learning, which I felt on my very first voyage. I know that you might probably have a lot of questions in your mind, and you all are excited to know who among you have been selected. The selected people would accompany me to my realm."

He then starts selecting people out of the group by calling out their names. Suddenly you hear your name and your excitement and enthusiasm know no bounds as you start thinking about what comes next.

After dropping everyone else at the port, Darwin and the whole group he selected proceed to the realm. From a distance only, you see the realm and are awestruck by the beauty. How well it has been maintained!! You had never dreamt of seeing such a special world and now you are going to be a part of it.

Darwin says, "Young friends, this place is a collection of many beautiful smaller worlds that are a puzzle in themselves. I am visiting this place after some time. So, there are high chances we might bump into some sort of "imbalances"."

As he says this, you start getting hints about what is to come - practical knowledge, awareness of the surroundings, and basic ecological and evolutionary perspectives.

Darwin further continues, "We should better rest for now. You will soon meet the people who live here, playing a significant role in the upbringing of this realm. They will guide us to the various locations inside this realm, make us familiar with the problems they are facing, and you, my friend, would be the best one to pull them out of trouble. Buckle up, this is going to be pretty exciting!"

At the Realm

Your ship reaches the realm. all are greeted at the shore by Darwin's scientific advisor, Helen. Darwin asks her to brief you all about the islands, as you all follow Darwin towards the residential parts of the island.

From what Helen tells you, you learn that the island is somewhere in the middle of the North Atlantic Ocean. Though the island may look small, it has a high density of organisms, and great diversity. The realm consists not only of the island but also the parts of the ocean that hug the coastline of this island, and the air above where you see birds of various kinds flying in different directions.

You learn that Darwin built the island to study the species in their natural habitats. That is the reason behind the various ecosystems in different parts of the island. Broadly there are 5 different regions - Forest, Grassland, Desert, Tundra and the Coast. Several small rivers flow through this island and go out into the sea. You also get a map of the island, so that you do not get lost. (you might have to zoom in a bit to read the legend. Also, the directions are conventional with the upwards direction being North.)

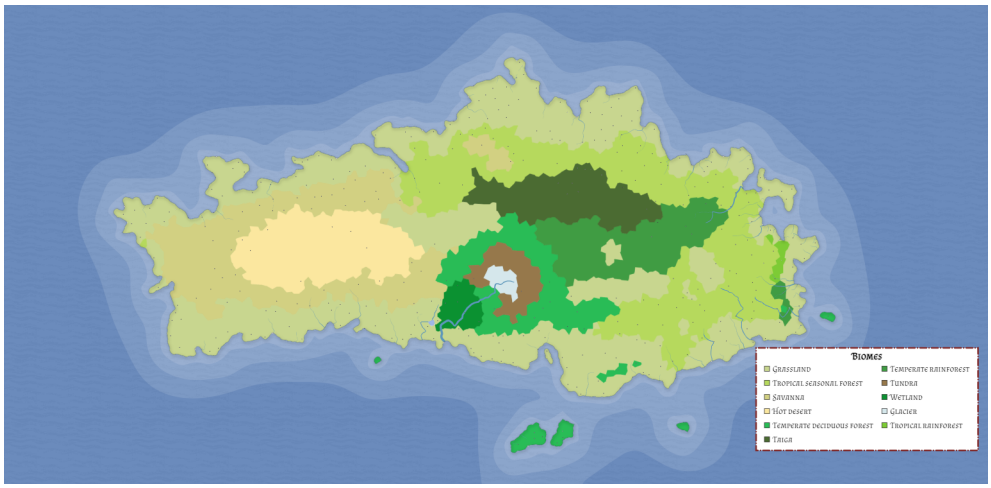


Figure 1 Map of Darwin's Realm

There are human settlements located in the forest and the grassland region. While some of your group decide to stay at the Forest House, the other decides to stay at the Grassland Lodge. To your surprise and slight disappointment, you also see some factories in the Grassland region and curiously look towards Darwin. He says that you will learn about it soon enough.

Now, for a few weeks, you and the rest of the group visit various parts of the island, noting down interesting observations, and marvelling at the sheer beauty of it all. However, you start getting impatient about the "imbalances" that Darwin had mentioned, and you ask him about it. He tells you that very soon the members of his advisory team will be contacting you all regarding that.

The Coast

Question A To disturb the Wonderblooms, or to not?

One day, you and your friends were wandering around the eastern coast of the island. It's then when you chance upon the beautiful algal species spread along the shallow seabed and on the shore, in the marine intertidal zone. You are curious about the unusually high density of algae in this region, as you clearly remember not observing something similar on the western coast of the island.

It's when one of your friends explain that being in the middle of the North Atlantic Ocean, the island experiences strong Westerly winds. This causes upwelling of nutritious cold sea water from the bottom of the sea to the top along the east coast of the island. This highly nutritious water promotes the growth of the algae. You realise that this nutritious water also comes to the shore during the high tide, explaining the algal growth there.

You become especially interested in the algae growing on the boulders at the shore. You observe the algal patterns and colours and compare it with the one growing directly on the shore and realise that there is greater variety among the algae growing on the rocks than on the shore. Suddenly, you all see Mike coming towards you.

You already know Mike. He is an oceanographer and a marine biologist who cares for the coastal ecosystems of the island. He explains that what you all see are **Wonderblooms**, a genus of Algae that Darwin had discovered somewhere off the coast of Canada and had brought along with him. Mike also tells you that disturbance can affect diversity significantly and asks you to find out how that happens.

You are confused as to how you would measure disturbance. Mike gives you all a hint.
Disturbance is a process that removes biomass from the community. It is an important factor in influencing species coexistence and the maintenance of biodiversity. The boulders get overturned due to the physical force of wave action, and the algae growing on the boulders get crushed and/or smothered as a result. Because the frequency of boulder movement is inversely proportional to boulder size (i.e., small boulders overturn often, while large boulders do not), boulder size can be used as a proxy for disturbance frequency.

1.1 Explain how and why disturbance might affect the diversity of algal species.

(4 marks)

1.2 Draw a graph supporting your explanation.

(2 marks)

After you are done with this and present your results to Mike, he tells you about the problem. He takes you all along the east coast towards the north. You see that there as well, the algal density is very high. But the diversity is very low. You are confused. Mike says, "You can get to the root of this problem later, but for now can you please give a quick solution to remedy this issue?"

1.3 Suggest ways to bring back species diversity of the algae in this community.

(2 marks)

After you provide him with a remedy, you decide to explore another part of the island, as only then can you get to the root cause of this, and so you head off to the forest.

The Forest

Question B <u>The Curious Case of the Birds</u>

For the last few weeks, you have been focusing on a particular trophic system in the forest that has caught your eye. Following is an account of all the observations you have made here supplemented by the information you have gathered from Forest officer Chen.

There are 4 different species of **Flybeaks** (an omnivore species, which otherwise is quite similar to finches). There are 4 different species of flybeaks that exist in the forest:

1. **Preying Flybeak** is the only one that eats worms. They also eat seeds but not very much. It has developed more strength and visual abilities to be able to find moving prey. This also makes it more easily able to evade preying by predators (like the Eyehawks). They may be a bit small, but they are strong and agile.

2. **Majestic Flybeak** eats large seeds. They are very large compared to the 3 other species and are easily able to drive the other 3 species away by intimidation. However, their large size makes them less agile.

3. **Petite Flybeak** eats small, smooth seeds. They are smaller compared to the 2 species above.

4. **Royal Flybeak** eats small sized seeds with ridges. They are like the Petite Flybeak except the males (not the females) have a colourful plumage to attract mates in this case.

Among the many worm species, the species that is generally eaten by the flybeaks are **Tree-worms**, so called because they inhabit the branches of the tall **Emtrees**, while eating the leaves of the trees. Emtrees produce large seeds.

In the same biome, there is another plant species, **Eden-Grass**, producing small seeds. Eden-Grass makes 2 types of seeds - smooth and ridged - which is controlled

by a single biallelic gene, where the *ridged* allele is completely dominant over the *smooth* allele.

Eyehawks are birds of prey that mainly prey on smaller birds like the flybeaks. They are entirely carnivores and also, they are nocturnal (like owls).

To understand this complex system, you get back to your room and draw a food web.

2.1 Draw a food web including the all the different species of organisms mentioned above. Also draw a Pyramid of Energy for the trophic system. For each of these species, also mention which of the food forms a major part of their diet.

(4 marks)

2.2 Arrange the species in descending order of the size of their population.

(3 marks)

You now decide to conduct a population count of all these species to find out whether it as you would expect it to be. You observe an unusually higher population for Eden-Grass and ElmTrees, while an unusually lower population of the Majestic and the Petite Flybeaks.

You are confused as to why this might be the case. Chen sees you and says, "So, now you probably know what I am dealing with. Any idea why this might be happening?"

2.3 Why do you think is there an imbalance?

(3 marks)

2.4 Do you think the imbalance can get larger with time? In either case, why? If you think it will, how will you restore the balance here?

(4 marks)

2.5 Bonus question: Can you estimate the numbers of *ridged* and *smooth* seeds produced by Eden-Grass, if each plant produces 50 seeds, and one plant can produce only one type of seeds? Assume the population to be 500 in the region.

(1 mark)

2.6 Bonus question: Can you explain why among the Royal Flybeaks, only the males have the colourful plumage? Is it an advantage or a disadvantage? (Assume that the only predators of the flybeaks are the eyehawks.)

(3 marks)

2.7 Bonus question: Why do you think that not all flybeaks can eat all kinds of seeds? Does this remind of you of an example out of this story? What is the phenomenon called?

(2 marks)

You are still confused on why this is happening and how it might be connected to what you saw at the Coast. You wander along the river at the night and then observe what looks like a fish in the river eating something along the river shore.

Suddenly, you see some kind of a bird swoop down and grab that fish and fly away. You are not entirely sure, but you think that it might be an Eyehawk. However, this gives you a clue and you talk about this with your friends.

The next morning you all start moving along the river shore, opposite in direction from the coast, eventually arriving at the factory beside the river in the grasslands.

Forest Station: Some Rest and Some puzzles!

While you all were going to the factory, you decided to get some rest at one of the forest stations. While you were there, you observed what looked like some species of fox chasing a species of a rabbit.

You all were bored, so you started making up puzzles about preys and predators and giving those puzzles to one another. You get the following 2 puzzles from your friend. Can you solve it?

Note: The next two questions are bonus questions not related to the ongoing story.

Question C The Predator and the Prey

An ecosystem is populated by foxes and rabbits. The rabbits feed on plants which are abundant in the ecosystem. The foxes' only source of food are the rabbits, and the environment does not change in any significant manner.

If the population of the foxes is plotted against the population of the rabbits over time, a closed loop is obtained as shown.

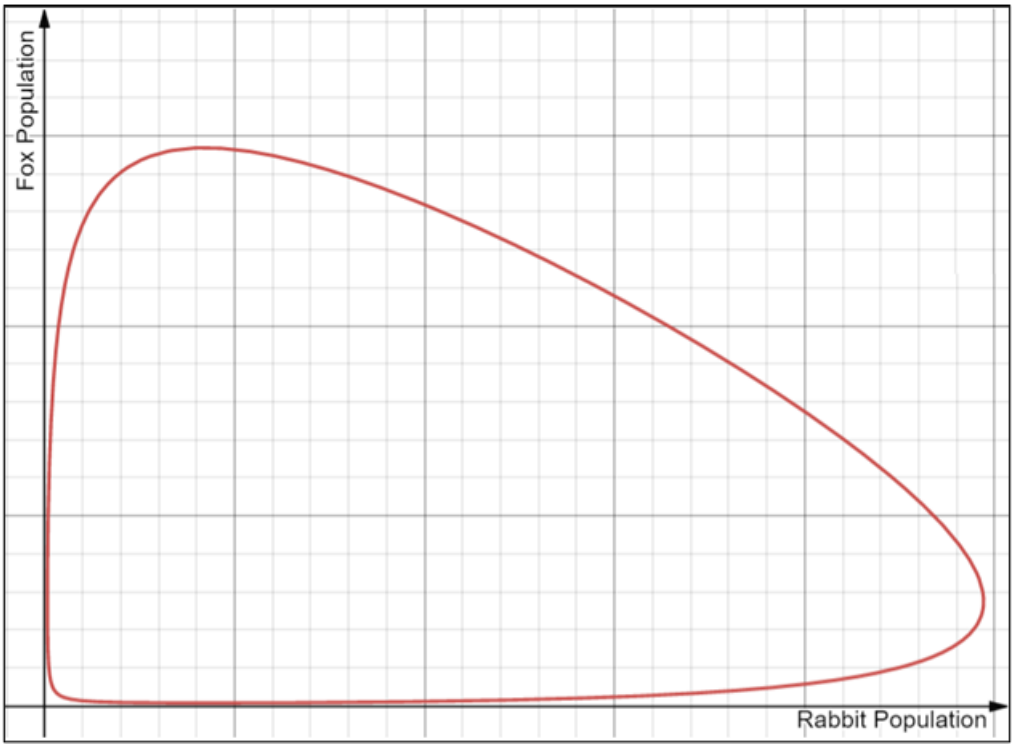


Figure 2

In what direction would the trajectory be over time? (i.e., from a certain point on the curve, would the populations follow the curve in the clockwise direction or the anticlockwise direction) *(2 marks)*

Question D The Hunted

In a different ecosystem, there are two species of rabbits which differ in size. The environmental conditions are the same as in the previous situation. The larger rabbits are vectors for a virus (but the rabbits are **NOT** affected by it). The virus infects foxes which eat carrier rabbits (The foxes are affected by the virus). The smaller rabbits are more efficient than the larger ones at grazing and can competitively exclude the larger rabbits.

Look at the state diagram below. Each node in the diagram represents the state of the population of the foxes, large rabbits and small rabbits, respectively at a given time. For example, (HLH) indicates that the population of the foxes is high, that of the large rabbits is low and that of the small rabbits is high.

Draw the trajectory in which the system will evolve in as time passes and explain the trajectory you have drawn. Find out if there are any stable states (a state which does not transition into another one as time passes) and/or any paths (a closed loop of states).
(That is, draw arrows between the states indicating how, over time, the population moves from one state to another. For example, if one particular state (State 1) is

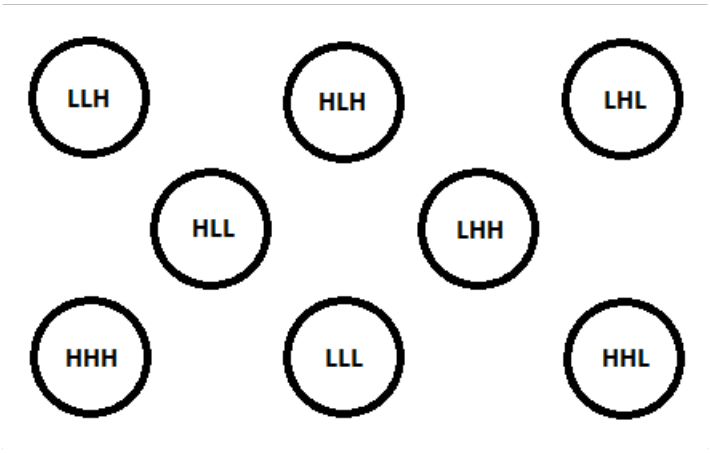


Figure 3

likely to transition to another state (state 2), draw an arrow from state 1 to state 2.) *(3 marks)*

The Grasslands

Question E The Factory – Evil, but necessary?

You are still confused as to why Darwin would agree to get a factory set up on this beautiful island. You all decide to meet the Operations Head, Alyx to talk about this. This what Alyx tells you:

"In the Darwin realm, there exists a considerable population of humans, who are in some sort of a symbiotic relationship with the different ecosystems in this realm. This is justified by the fact that these humans carry out the nurturing and development of various plant species and in return, obtain various medicinal, nutritional and ornamental products from these plants and trees.

It is very well known that disease tends to occur where human populations and crop plantations exist. A very common example can be diseases caused due to insects. Insects that act as vectors, which destroy the crops and floras planted in the ecosystem, etc. To tackle this, the inhabitants' union decided to set up a factory for producing medicines, insecticides, and pesticides, using the available resources in that area.

The factory is established near the river, so that the factory's discharge could be disposed into the river. Darwin opposed this, stating the discharge would inevitably cause an imbalance in the ecosystem. A pact was signed within the habitats, that utmost care would be taken to avoid any problems to the aquatic lives."

After telling you all this, Alyx sighs, as he continues, "With the passage of time, various medicines and pest control substances were produced. Accidentally, Substance X, an important chemical used for treating insect-borne diseases and for pest control, started to leak along with the discharge into the water bodies. This results in the entry of Substance X into the food chain of aquatic species. Few more of such 'accidents' led to the following situation."

Saying this, Alyx briefs about the trophic system in the river and how they have been affected by the Substance X.

- There exist four aquatic species: **Plankzoo**, **Merfish**, **Shark-tooth**, **Hiltla**. Except the 1st species, which is a zooplankton, all others are different kinds of fish.
- Plankzoo consumes the WonderBlooms that are an important part of their diet.
- The food chain of these species is as flows: Merfish preys on Plankzoo and Shark-tooth preys on Merfish. Hiltla does exist in that system, though it is not a part of this current food chain.

Incidentally, after the Substance X release accident, some organisms were randomly picked up and examined thoroughly for any new development (there is always a new evolutionary perspective). The results are presented as follows:

Examination of the Plankzoo:

Scenario	Population	Average amount of X inside a Plankzoo individual (**Safe limit:** 3g/kg body weight)
Before Release of X	60-75	1-2 g/kg body weight
After Release of X	40-45	7-8 g/kg body weight

Table 1

(**Safe limit of X for Plankzoo:** 3g/kg body weight)

Examination of the Merfish:

Scenario	Population	Average amount of X inside a Merfish
Before Release of X	30-40	2-3 g/kg body weight
After Release of X	20-25	8-9 g/kg body weight

Table 2

(**Safe limit of X for Merfish:** 4g/kg body weight)

Examination of the Shark-tooth:

Scenario	Population preying on Merfish	Population preying on Hiltla
Before Release of X	20-25	5-10
After Release of X	10-12	23-27

Table 3

Based on the above, Alyx tells you all about his observations:

- There are some metabolic phenomena that have taken place due to the accidental leakage and are now spreading manifolds with an increase in factory discharge.
- Studies found the existence of two subgroups of Shark-tooth. One, which has changed its food chain, and now is no longer dependent on Merfish, and another, which still feeds on Merfish, yet does not get affected.
- A decrease in the sudden population of Hiltla has been noticed.
- From the information collected from human inhabitants, he has observed that more children are developing abnormal health conditions.

He now turns towards you and asks you a few questions so that you help him.

5.1 Briefly describe the phenomenon that might be responsible for the imbalance, stating how it affects all the species. (Answer in not more than 6-7 sentences)

(3 marks)

5.2 What is the possible reason for the creation of two subgroups in the case of Shark-tooth? How did they diverge in lineage? Relate this to Darwin's theory and name the two phenomena responsible for this. What changes (morphological/biological/physiological) do you expect in these two subgroups?

(4 marks)

5.3 Supposing that the habitants have a protein-rich sea-food as their staple food, what is the cause of the health problems in the children, and which species, in particular, could be mainly responsible for that? (Answer in not more than 6-7 sentences.)

(3 marks)

5.4 Given all this chaos that has taken place inside the water body, which species, by now, would have the largest population, and why? (Answer in not more than 3 sentences)

(2 marks)

5.5 Suggest any reasonable and practical changes you will put in this system, so as to restore normality and briefly explain how you will put them into place. (Answer in not more than 3-4 suggestions, with each suggestion having a complete idea.)

(4 marks)

From further studies of your own, you realise that the Substance X negatively affects the growth of Wonderblooms. Also, you notice that only one species of Wonderblooms is affected by this. You also notice that in areas upstream of the river, this particular species of Wonderbloom only grows on the top of the boulders. When Alyx hears about this, he concludes that this is probably how Substance X is entering the food chain.

However, you get some more profound realisations from your time spent at the coast and in the forest. Since, Substance X is water-soluble, you realise that it can make its way back to the sea as it passes through the forest. In light of this new information, answer the following questions:

5.6 Can you now explain why in the north eastern coast, even thought the algal density is very high, the overall diversity is much lower compared to the eastern coast?

(3 marks)

5.7 Last night, when you saw the bird swoop down to eat the fish, you guessed it might have been an Eyehawk. Do you think your guess is correct? Why? (Hint: Think about what fish the bird might have caught last night.)

(3 marks)

5.8 <u>Bonus question:</u> Draw the entire food web including all the species from the 3 parts of your journey till now around the island.

(5 marks)

Finally believing that you have solved the mystery behind this whole imbalance permeating through the 2 regions and the river, you decide to enjoy for now on in the island. So, you and your friends decide to go for a safari through the grasslands.

Question F Logical Flowering!

Note: This is a bonus question.

While you are on your Safari, you notice a really lavender-coloured flower. (Note: The flower is not lavender.)
When you ask about it, the Safari Guide Mrinalini tells you about an interesting tidbit about the flower.

"That particular flowering plant is called **Tropica**. Flowering in this plant is regulated by 2 molecules A and B." (Assumption: Sunlight is Boolean function, 1 when there is sunlight, 0 when there is none)

- A is slowly synthesized in the presence of sunlight in a slow manner once the plant starts getting any sunlight. When there is no sunlight, it quickly degrades.
- Once A reaches a threshold concentration, B starts getting synthesized. It degrades after A falls below the critical concentration.

You ask Mrinalini to slow down and borrow a piece of paper to draw a graph as follows:

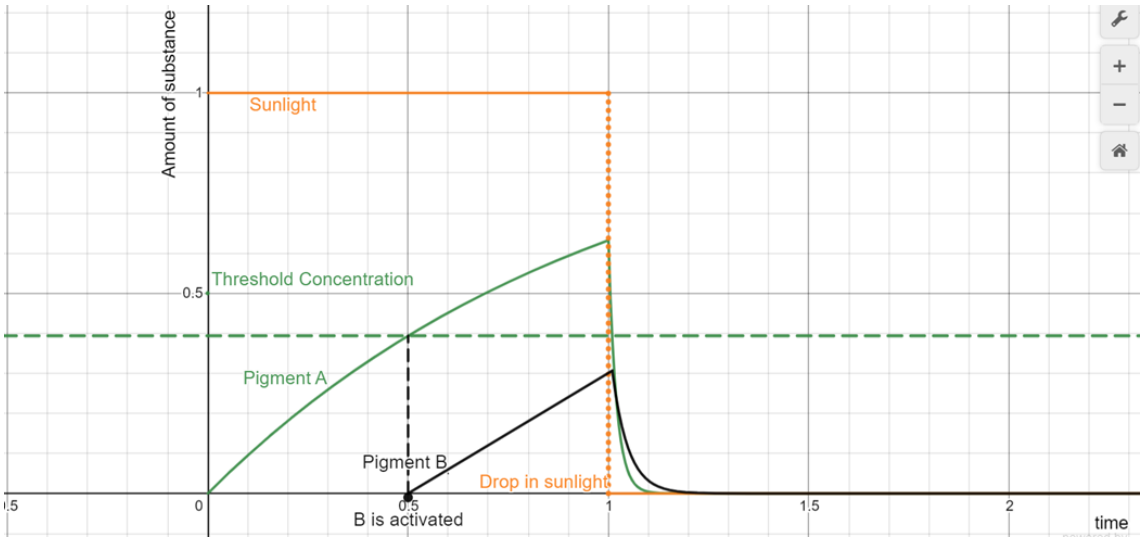


Figure 4

Mrinalini continues: "There is an internal mechanism that acts like a logic gate. If the concentration of A is close to zero(say 0.01),then the input given to the gate is 0, else it Is 1. Same is the case for B.

The two inputs are combined according to the logic gate. If the logic gate outputs 1, then Flowering occurs, if it outputs 0, flowering doesn't occur."

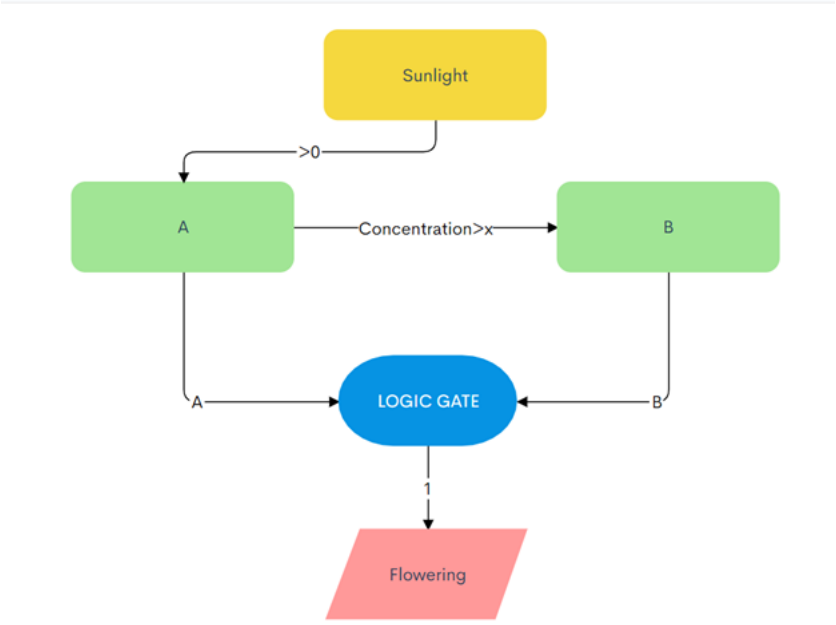


Figure 5 Flow Chart to explain the logic behind the flowering

(Note: See the reference charts at the end for help.)

Now this mechanism can be used to make the flowering of the plant dependent on the sunlight conditions, which can also be used to establish seasonal control.

e.g.: If the Logic gate is AND: If the sunlight hours are less than that required for A to reach the threshold, then the plant will not flower at all. Therefore, this plant will not flower in the winter when there is less sunlight hours.

Different variants of the plant have different logic gates. Select the appropriate logic gates(among the 6 given) which gives the plant the desired seasonal control.

- Variant A (**Aestas**): Flowers in Summers daylight hours only.
- Variant B (**Semper**): Flowers more in summer, less in Winter.(during daylight hours)
- Variant C(**Hiems**) : Flowers in the Winter daylight hours and Summer Dawn.
- Variant D(**Noctis**): Flowers all the time (even at night), except summer afternoons.

6.1 Give (with 1-2 lines of reasoning) the gate used by each variant.

(4 marks)

6.2 For each variant, name the pollinators that it is most likely to use: Birds, Bees and Bats

(1 mark)

6.3 For each variant , give an explanation/scenario where the flowering follows such a seasonal pattern.

(2 marks)

You answer all the above. Mrinalini says, "The deserts of this island look a little barren. We have been planning to transfer some of these Tropica plants from the grasslands to the deserts. Do you think that will be apprpropriate?"

6.4 Arrange the variants according to their fitness in a desert climate.

(1 mark)

The Desert

After the grassland, you and your group decided to cover the remaining regions of the island. So, you head off first to the hot desert before you can go to the chilling tundras.

In the hot desert, you notice a kind of fern, called **Fernpetals**.

Your Desert Officer, Tom, tells about an incident that happens few years ago.

Note: This is a bonus question.

Question G Viral Sensation of the Ferns

"There are two closely related Fernpetal species, **Mollis** and **Durum**. They both are very similar in most ways but they are found in different parts of the desert, one closer to the forest border, and one away.

There was a species of virus, **V** which effects only A.
A human introduced durum into the region of mollis. For a while, the virus had not affected durum.

A mutated form of the virus $\mathbf{V}'$ evolved with time and could effect both species A and B. Analysing the genetic contents of the mutated virus, it was revealed that the amount of genetic material in V' was higher than that in V.
After a while. Fern B infected with V' was introduced back to the original population. Over time V' evolved into V'' which no longer affected A, and the amount of genetic material dropped back to the original amount, present in V."

You ask Tom if anyone on the island ever found out how that had happened. Tom asks you to guess and he gladly makes a rough table, summarising what he said:

Species of Virus	Mollis	Durum	Genetic Material of the virus
V	Affected	Not affected	1x
V′	Affected	Affected	1.1x
V″	Not affected	Affected	1x

Table 4

Explain the change in the amount of genetic material (why it first increased and then decreased) when the virus mutated. *(3 marks)*

The Chilling Tundras!

Note: This is a bonus question.

Question H Karcel and Gobin

While you were trekking up Mt. Wallace (named after Darwin's rival Wallace), you see the furry **Karcel** catch a **Gobin** and run back to its habitat with the Gobin between its teeth. Your mountain guide, Mary, tells you that that is one interesting case they have not been able to understand. You offer to help as you don't want to let an interesting puzzle pass away like that.

While returning back from your trek, you make a pitstop at the mountain cabin to collect data regarding whatever studies the people there might have conducted on the Karcel and the Gobin. You get the following:

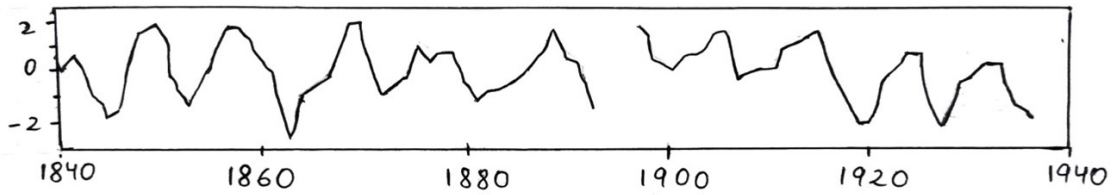


Figure 6 Population of Karcel along the years

Figure 7 Population of Gobin along the years

Karcel predates upon Gobins. It was observed that the population of the two species cyclically changes (oscillates) over a period of 9-10 years. Mary gives you a list of questions that you plan to answer based on this data once you are back at the Forest House.

8.1 Suggest a probable reason as to why the population density varies in this manner.

(2 marks)

8.2 As an extended experiment, elimination of the predator species, Karcel, does not affect the oscillation of the population of the Gobins in that region.Why do you think the periodic oscillation of the species population size is unaffected by the removal of the predator organism? Does this stand in support of your answer to the previous question?

(3 marks)

Finally after you realise the solution, you call up Mary and tell her the solution. Finally when you go out to have your dinner, your friend tells you, "Most probably, tonight is our last night on this island."

Back to Where We Started!

Question I <u>One Last Thing!</u>

Having spent a few months in Darwin's Realm, getting to solve a lot of mysteries as you went around fixing the ecosystems in the island, while also teasing your brain with a lot of ecological puzzles, you come to know that your time at the island is coming to an end.

During dinner, Darwin tells you all that he will be dropping you all back at Plymouth. He says that he will later send letters to all those whom he will select to be the part of his advisory teams for the island, and ultimately his successor.

On the last night, after you all pack your bags, you all decide to have a small party by the side of the fire on the beach. During this time, Darwin casually remarks, "Oh but what fools we are to believe that nature bends to our will! What I think is that variability is not actually caused by man; he only unintentionally exposes organic beings to new conditions of life, and then nature acts on the organisation and causes it to vary."

You all ponder on this statement, and try to think whether it is really true or not. A debate breaks out. What do you think? Give some real-life examples to support your argument. *(4 marks)*

Finally Darwin drops you along with all others back at Plymouth, and tells you all to remain patient for the results.

Logic Gate	Symbol	Description	Boolean
AND		Output is at logic 1 when, and only when all its inputs are at logic 1,otherwise the output is at logic 0.	X = A•B
OR		Output is at logic 1 when one or more are at logic 1.If all inputs are at logic 0,output is at logic 0.	X = A+B
NAND		Output is at logic 0 when,and only when all its inputs are at logic 1,otherwise the output is at logic 1	$X = \overline{A \cdot B}$
NOR		Output is at logic 0 when one or more of its inputs are at logic 1.If all the inputs are at logic 0,the output is at logic 1.	$X = \overline{A+B}$
XOR		Output is at logic 1 when one and Only one of its inputs is at logic 1. Otherwise is it logic 0.	$X = A \oplus B$
XNOR		Output is at logic 0 when one and only one of its inputs is at logic1.Otherwise it is logic 1. Similar to XOR but inverted.	$X = \overline{A \oplus B}$
NOT		Output is at logic 0 when its only input is at logic 1, and at logic 1 when its only input is at logic 0.That's why it is called and INVERTER	$X = \overline{A}$

Figure 8 For Reference for Question F

AND

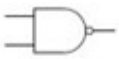
A	B	Output
0	0	0
0	1	0
1	0	0
1	1	1

OR

A	B	Output
0	0	0
0	1	1
1	0	1
1	1	1

XOR

A	B	Output
0	0	0
0	1	1
1	0	1
1	1	0



NAND

A	B	Output
0	0	1
0	1	1
1	0	1
1	1	0

NOR

A	B	Output
0	0	1
0	1	0
1	0	0
1	1	0

XNOR

A	B	Output
0	0	1
0	1	0
1	0	0
1	1	1

Figure 9 For Reference for Question F