

Cell Reactions To Its Environment

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<http://waponpoint.com/cell-reactions-to-its-environment/>

Hello Candidates, firstly, all waponpoint.com tutors dearly apologizes to all our candidates for our downtime during past weeks.

Our today's topic on biology is cell reactions to its environment, last class we discussed about [regulation of growth by hormones](#) in both plants and animals, so today we will be discussing about cell reactions to its environment.

So let get started, shall we? After you..

Cell Reactions To Its Environment

One of the characteristics of [living things](#) is the ability to respond to stimuli.

What is stimuli or simply what is a stimulus.

Stimulus Or Stimuli

A **Stimulus** is an environmental change which induces or brings about a response in [a cell](#) or an organism.

For example:

If you mistakenly place your hand on a hot object, you will quickly withdraw your hand. So here is it...

You see..... the heat of the object is a *stimulus*, to which you respond by withdrawing your hand.

If someone pricks your body with a pin, you will withdraw from the pin. The pricks of the pin is a stimulus to which you respond by withdrawing your body. Other examples of stimuli(plural) include [but not limited to]:

Temperature, light intensity, presence of chemical, concentration of carbon dioxide, hydrogen ion or oxygen.

Now you should have understand what a stimulus or stimuli mean, right? So if you did, then let talk about what makes an organism or a cell respond to stimuli.

Irritability Or Sensitivity

Irritability is the ability of a [living organisms](#) to respond to stimuli.

Organisms show irritability or sensitivity in a variety of ways. In cell reactions to its environment, there are three types of responses to stimuli, which are:

- a) Taxism
- b) Tropism
- c) Nastism.

Now let get the meaning and explanation on those three but before we proceed, please note that:

Responses of organisms to stimuli are usually advantageous to them

Taxis Or Taxism

Let get the explanation first.

Let say:

If you step on a cat's tail by chance, the cat will quickly withdraw the foot and move away from you. And if you present food to the cat, the cat will move towards the food. Meaning that, the cat is responding to a stimuli of pain or food.

So in this case, there are two types of stimuli response.

Types Of Stimuli Responses

a} When the response of a body to a stimuli is moving away from the stimulus, it is said to be a **negative response**. For example, when the cat moved away when you stepped on its tail.

Or when you have an electric shock.

b} When the response of a body to a stimuli is moving towards the stimulus, it is said to be a **positive response**. For example when you present food to the cat..

Now we have explained in plain text, now let talk in biology

Taxis is the movement of a whole organism or a freely moving part of an organism towards or away from a stimulus. #Just Like As We Have Explained Above#

And please note that **tactic movement** bears a relationship with the direction of the stimulus, that is, *tactic movement is a directional movement.*

Now let discuss about taxis in some organism.

(a)

Taxis In Protista

In the protista, the organism consists of only one cell that is, it is a [unicellular organism](#).

And it respond to stimulus, even these organisms shows sensitivity or responsibility which clearly shows that sensitivity is a property of *protoplasm*.

Now let talk about taxis in Chlamydomonas.

(b)

Taxis In Chlamydomonas

I believed you should know what a [chlamydomonas](#) is, because we have already treat the question, but if you are new here, just click the hypertext "chlamydomonas" above.

Chlamydomonas relies on photosynthesis to produce its food.

It possesses an eye spot with which it locates areas of suitable light intensity and then swims towards the area with its flagella.

Hence, chlamydomonas shows positive *photoaxis*.

What is photoaxis?

Photoaxis is defined as the movement of a whole organism in response to an external stimulus of light.

Note That: anytime you heard the word "*PHOTO*", what it mean is "**light**".

(c)

Taxis In Euglena Viridis

[Euglena viridis](#) is a protist which produces it own food by photosynthesis.

Euglena viridis responds to the stimulus of light by swimming parallel to light rays towards the source of light. So basically, Euglena is positively *phototactic*.

(d)

Taxis In Amoeba

Amoeba prefers dim [diffuses](#) light to bright light, hence, it shows negative photoaxis to bright light.

Amoeba also shows other kinds of taxis. Let me explain:

When amoeba comes in contact with a strong(concentrated) chemical, such as an acid, it stops, and then quickly reverse its movement. Hence, amoeba displays a negative taxis.

Also, when amoeba gives an electric shock, it withdraws all its pseudopodia and then moves in a spherical shape.

(e)

Paramecium

[Paramecium](#) is sensitive to dissolved chemicals, such as oxygen, carbon dioxide concentrations, touch, light, and temperature all over the body surface. Apart from a few long tactile cilia at the posterior end, *it has no special sense organelles*.

I believed I have already explained [about paramecium before](#) but for the sake of new candidates;

Paramecium has cilia in the oral groove which beat strongly, drawing water towards the organization.

This helps the organism to sample water that lies ahead of it.

Paramecium reacts to unfavourable conditions by stopping the beat of the cilia for a few seconds, then the cilia beat in the reverse direction causing the organism to move back, and then resumes forward movement at a different angle of direction.

This type of behavior exhibited by paramecium is called **Avoidance Behavior Or Avoiding Reaction**.

Below is the avoiding behavior of paramecium

This behavior enables paramecium to avoid unfavourable stimulus and obstacles.

Also in plants,

In plants and animals, motile(something that can move) gametes show taxis. For explanation, the male gamete moves towards the female gamete in a liquid medium.

Tropism

Tropism is the bending of seedlings towards light coming from one direction. Most plants are fixed in their positions, that is, they do not move from place to place. Nevertheless, parts of plants can carry out limited movement.

For example: when a pot containing seedlings of maize, beans or other plant, is placed near a window, the seedlings tend to bend towards light coming in through the window. Such bending of seedlings occurs because *one side of the stem grows faster than the other side*. #plain Text#

Now in biology:

Tropism is a bending [growth](#) movement, by a plant organ, in response to a stimulus from one direction, by which the plant organ assumes a particular posture, which bears a relationship to the direction from which the stimulus is received.

The stimuli to which plants respond in this way include light, touch, [gravity](#), water and chemical substances.

A tropic movement is described as positive or negative depending on whether the bending movement is towards or away from the direction of the stimulus respectively, just like as we have explained above.

Below are examples of various tropic responses made by plants.

Stimulus Name Of Tropic Movement

- a) Heat : Thermotropism
- b) Gravitational force : Geotropism
- c) Concentration of chemicals : Chemotropism
- d) Unidirectional light : Phototropism
- e) Electric current : Galvanotropism
- f) Water current : Rheotropism.

Those are the theory part of tropism and part of cell reactions to its environment, now let practicalise it.

Let call this one experiment a

Experiment That Observe The Response Of The Stem To The Force Of Gravity

Materials Needed : Seeds of beans or balsam, a large dark cupboard (enough to take the two pot) and

pots.

Procedures :

a) Allow the seeds to germinate in the pots which are filled with good garden soil.

Only two seedlings in each pot is required and do ensure that the shoots of the seedlings are upright and straight as they grow, by regularly turning the pots round.

b) When the shoots are about 3cm tall, place both pots in the dark cupboard, one on its side and the other upright.

c) After two days, observe both pots of seedlings.

Observations And Conclusions

If your experiment was perfectly performed, you should find that the stems of the plants in the pot laid on its side *grew upwards*.

Main Point : The [force](#) of [gravity](#) acts downwards, so the stem may be said to show negative **geotropism** because they are bending away from the stimulus.

Also note that: stems are nearly always negatively geotropic.

Now let observe the response of roots to the force of gravity.

Experiment That Observe The Response Of Roots To The Force Of Gravity

Materials Needed : A large beaker (500 cm³) black paper or sheets of carbon paper, blotting paper, cellotape, cotton wool, two petridishes, seeds of beans or balsam, a cupboard, wooden blocks or plasticine to support petridishes.

You will also need seedlings with straight roots, which can be obtained by proper germination of the seeds.

Procedures

a) Select three seeds and place them on the bottom of a petridish so that the radicles lie flat and are at right angle to each other.

b) Hold them in place with moist cotton wool and cover with a second petridish.

c) Mark an arrow on the top dish pointing in the same direction as any one of the three radicles and tape the two dishes together.

d) Stand your taped-together petridishes on their edge in the cupboard so that the arrow marked on the top dish points vertically downwards. And then, hold the dishes in place with wooden blocks or plasticine and cover the standing dishes with the beaker you covered in black paper.

e) After two days, take out the petridishes, with the indicator arrow pointing downward.

Observations And Conclusions

If your experiment was properly performed, you should have found out that, no matter in what direction the radicles were pointing at the beginning of the experiment, by the end of the experiment, all were pointing downwards.

This indicates that, the radicles are showing *positive geotropism*.

This shouldn't be surprising, because the roots of plants always grow downwards no matter in what position the seeds are planted.

If you are to carry out this experiment, a need of an instrument called *a Klinostat* is required. This instrument keeps the seedlings with their roots in continuous [rotation](#). In this way, the force of gravity acts equally on all sides of the roots of the seedlings. This is kept going for a couple of days. Below is the structure of klinostat.

Second Observations

You will observe that the radicles continue to grow and elongate without bending either way up or down.

Conclusion

This shows clearly that when the force of gravity is eliminated or neutralised, the root does not grow downwards as it did in experiment above.

Now let experiment on effect of light and water to stems and roots of a plant respectively.

Experiment That Observe The Response Of Stems To Light Coming From One Side

Materials Needed : two pots of growing seedlings and a large cardboard box

Note : in order to observe a clear response, more light rays must strike the plant from one direction than any other sides #Put That In Mind#

Procedures :

a) Place one of the pots with its growing seedlings near a window in the laboratory.

ai) Ensure that more light comes in from the window than from opposite direction.

In about two to three days, the shoots bend. In what direction do they bend?

Turn the pot round through 180° , so that the bent shoots now point away from the window.

1) In another few days, what do you observe?

2) Towards what direction do the shoots now bend?

3) You should observe that, the shoots has bend again towards the brighter light from the window.

b) Now, cut a hole about 10cm by 10cm from one side of the cardboard box and place the box at a

window such that the cut surface is away from the window.

bi) Place the second pot with its growing seedlings in the box.

bii) Ensure that the only light available to the seedlings is that from the cut on the box and leave it to stand for two or three days.

biii) Examine the seedlings, are the stem bent? If bent then give yourself a thumbs up, if I were there, I would have pat you on your shoulder. In which direction are they bent?

Observations And Conclusions

It will be observed that the shoots has bent towards the light.

Hence, the shoots are thus *positively phototropic* which is usually true of shoots.

One more experiment to go, and we're done with cell reactions to its environment

Experiment That Observe The Response Of Roots To Water

Materials needed : Two porous pots{clay pots}, 2 large troughs, a small quantity of garden soil, healthy seeds e.g beans or balsam

Procedures :

a) Set up two sets of apparatus such that in each the porous pots is held in the middle of the trough of garden soil.

b) Moisten the soil.

i) sow four to six seeds, each of about 5cm away from the porous clay pot.

ii) As soon as the plumule appears above the soil, **stop wetting the soil.**

iii) Now fill up the pot in one set of apparatus with water.

iv) leave the porous pot in the other set up *dry{without water}*.

c) Leave both pots to stand for two or three days, then carefully uncover the roots of the seedlings in each trough.

i) In which trough have the roots begun to bend?

ii) What is the direction of the bending of the roots?

iii) then carefully compare your observations of the roots of the seedlings in the two trough.

Observations And Conclusions

a) The roots of the seedlings in the trough with a pot of water will have bent towards the porous pot.

b) In the second trough, the roots grow straight down.

Main Points : roots are sensitive to water and will bend towards it. Meaning roots are positively hydrotrophic.

You may be wondering on what hydrotropic is, well here it is.

Hydrotropic is the movement of plants or other organisms towards or away from water.

And now we've come to the end of today's class session on cell reactions to its environment and our next topic on biology will be on movement of plants and animals.

Before you set off to another class session, why don't you hit the share button below, download the "cell reactions to its environment" *pdf* format and help us spread the word, Waponpoint.com and also tell your friends about today's class topic as "cell reactions to its environment", thanks.

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