AP Biology
1999 Sample Student Responses

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Cell-to-cell communication is shown in all organisms in a variety of ways. One of those ways is between two neurons. These neurons must together carry on an action potential to reach to the brain, muscle, etc. Those neurons continue on the impulse chemically. When the impulse reaches the axon of the first neuron, the membrane becomes permeable to Ca ions, causing them to rush in. These calcium ions allow for the synaptic vesicles to bind to the presynaptic membrane. Those synaptic vesicles then release transmitter substances, such as acetylcholine. The transmitter substance then binds to the postsynaptic membrane and allows for the action potential to continue to the next neuron as an all-or-none response. So that the next neuron does not continue to fire, another enzyme then inhibits the transmitter substance.

Cell-to-cell communication is also shown in an endocrine gland and its target cell. An endocrine gland and its target cell use the feedback mechanism for communication. The endocrine gland sends hormones to the target cell which then tell the target cell to produce something, or to cease production. The product of that target cell then determines if more should be made, or if production should stop because there is enough. An example is with ~~the~~ a insulin. If too much sugar in the blood is present, then the production of insulin is ~~made~~ initiated by the endocrine gland, to break down sugar, which tells the pancreas to make and secrete insulin.

2P2

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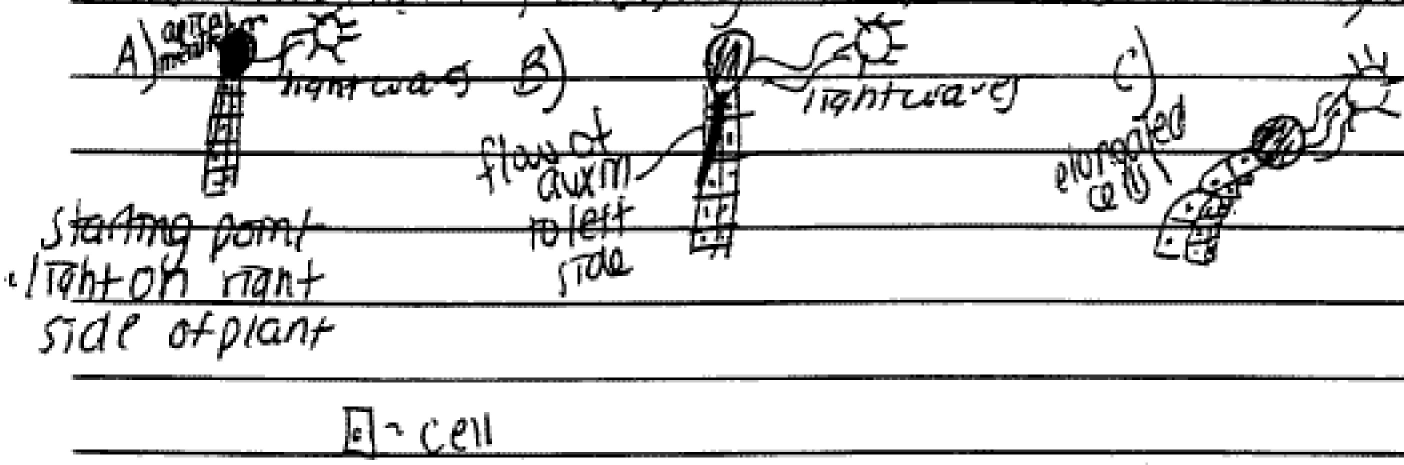
However, when the sugar level is low enough, the endocrine gland is signaled to "tell" the pancreas to cease production of insulin.

Lastly is the communication between two cells of a plant. In the apical meristem of the plant there are cells that produce auxin. In phototropism, a plant bends toward the light by the action of auxin. If one side of the plant's cells are receiving more light, it then stimulates the cells in the apical meristem to produce auxin. The auxin goes to the side of the plant away from the light, causing those cells to elongate.



This shows how the affects on one cell communicates to another, which then takes action.

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2

Communication among cells in an eukaryotic organism is a neccessary and vital feature. Different cells, however, have different means of communication.

Immune system cells rely on antigens and antibodys as their means for communication. B-lymphocytes, for example, have specific antigens on the membrane of it's body. When a pathogen enters the body, their is a good chance that it will encounter a B-lymphocyte. When it does, the B-lymphocyte will not recognize the antigens on it's cell membrane. It will respond by producing antibodies specific to the pathogen's antigens. These antibodies will in turn clump up the pathogens, interfere with with the vital functions of the pathogen, or will lyse the pathogen. Communication among immune system cells is extremely important.

Nerve cells as well communicate through chemical messangers. When a nerve is initially stimulated, a pulse is propagated along the neuron's membrane through a shift in polarity resulting from Na^+ ions from the outside of the membrane moving in the membrane and K^+ ions moving from inside the membrane to it's outside. Eventually this pulse will reach the end of the neuron's axon. The neuron will then release neurotransmitters such as acetylcholide or seratonin. After these chemicals travel through the synapse they meet receptors on the dendrites of the next nerve cell. This, in turn, causes a reverse in polarity, thus continueing the propagation of the nerve pulse

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Communication between endocrine glands and target cells depends on the chemical messanger deployed. Steroids, such as testosterone from the testes, are lipids. This allows them to move directly across the phospholipid bilayer of the target cell and activate the production of needed proteins. Others are not so lucky. When thyroxine from the thyroid comes in contact with the target cells, it binds to special receptors on it's membrane. This activates a second messanger, such as cAMP, which delivers the message to the target cell.

Communication amongst cells in multicellular organism is reliant on chemical messangers.

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#2

Communication is vital among cells in a multicellular organism. Three examples ~~are~~ of cell to cell communication include plant cells, Neurons, and endocrine-gland cells and their target cells.

Plant cells have a unique adaptation for exchanging and sharing information. They usually have a plasmodesmata, that Acts as channel b/t plant cells. In it materials are shared, and chemical messages are sent. For example, auxin may travel via the channel, thus promoting growth.

Neurons also communicate with other neurons to perform tasks vital to an organisms success. Neurons intra-communication drive the nervous system. The foundation for their communication are axons and dendrites. An axon sends a nerve impulse, and a dendrite receives it. Their is a gap between the two, and at this gap, neurotransmitters jump from the presynaptic area to the postsynaptic area. This "jump" is due to a stimulus that depolarizes the neuron membrane. The result of this communication is an impulse sent to the CNS (central nervous system), which allows organisms to respond to their environment.

Endocrine-gland cells also communicate, as they commonly secrete hormones to target cells. Endocrine cells first release their hormone into the blood to be distributed. The target cells are located due to chemical receptors on their plasma membrane. The next

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step in communication is then a ~~??~~ signal transduction pathway. In this, the hormone goes through a series of steps in the target cell, which communicate the desired message. The message may relate to the cell which products to make ~~??~~ or to not make. ~~?~~ The messages from the endocrine could also affect the permeability of the cells to certain molecules.