AP® Biology
2005 Sample Student Responses
Form B

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BIOLOGY
SECTION II
Planning Time—10 minutes
Writing Time—90 minutes

Directions: Answer all questions.

Answers must be in essay form. Outline form is not acceptable. Labeled diagrams may be used to supplement discussion, but in no case will a diagram alone suffice. It is important that you read each question completely before you begin to write. Write all your answers on the pages following the questions in this booklet.

1. Survival of organisms depends on adaptive behavior and species interactions.

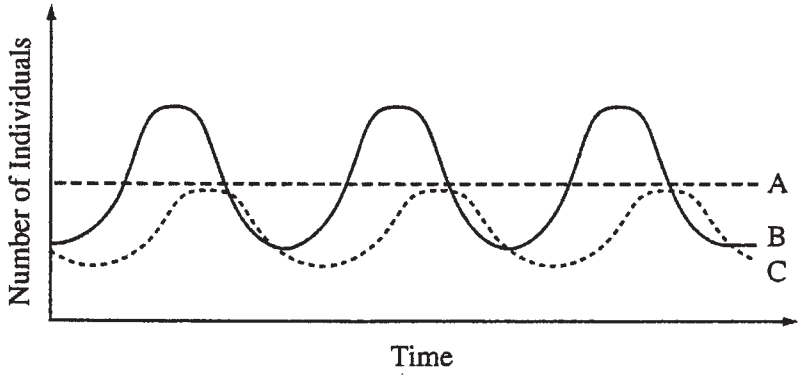
   (a) Behaviors of organisms may be influenced by environmental factors. Select two of the following types of behavior. For each type, explain

   (i) how the environment affects the behavior, and

   (ii) why this behavior increases the survivorship of individuals of a species.

   - Taxis/Kinesis
   - Migration
   - Courtship

   (b) Interactions among populations may have an effect on densities of the species that interact. Predation represents an important interaction among populations. The curves below depict the population densities of three species: a small herbivore, a larger herbivore, and a carnivore.



Identify which curve represents which of the species listed, and **justify** your answer by describing the changes in the population densities of these three species over time.

Taxis is the random movement of an organism in response to a stimulus. Kinesis is movement towards or away from a stimulus when something in the environment changes, for example the organism the organism is exposed to light, the organism will randomly move around until it encounters a favorable condition again. One example is when you flip open a rock, insects hiding under the rock will scuttle to another

GO ON TO THE NEXT PAGE.

ADDITIONAL PAGE FOR ANSWERING QUESTION 1

rock, This behavior will ensure that the organism will remain in an environment that maximizes its chances of survival. Since its activity will increase when met with an unfavorable environment and its activity will decrease when it is met with a favorable environment The animal will stay in the most favorable environment for the longest time.

Migration is the movement of a population from one area to another. Migration is usually caused by seasonal changes. For example, birds may migrate south, when the length of the day shortens. Migration improves the survivorship of an individual by ensuring that it is in a suitable environment. Birds who cannot survive the cold whites might migrate south to warmer areas when winter approaches the north and migrate North when it is winter at the southern hemisphere. This ensures that they are always living in a relatively warm environment.

C -> carnivore.

The carnivore is represented by C because the desity curve of C follows the curve of B. When the population of B rises, the carnivores will have more food thus their populations will also rise. When the population of B drops, Carnivores will have less food and its population drops too. Carnivores cannot be B since the population of carnivores must be lower than the population of the prey. This represents a boom-bust cycle

B -> small herbivore

ADDITIONAL PAGE FOR ANSWERING QUESTION 1

~~Be~~ B represents small herbivores since small animals are usually the prey of carnivores. In the density curves, the populations of B is affected by populations of C. since C is predators, B has to be small herbivores. This is a boom-bust cycle.

A represents large herbivores. Since large animals are usually K strategists, their populations remains fairly stable. The curve of A is fairly stable thus represents large herbivores. large herbivores also, are less affected by carnivores so they will not show the boom-bust cycle

1B1

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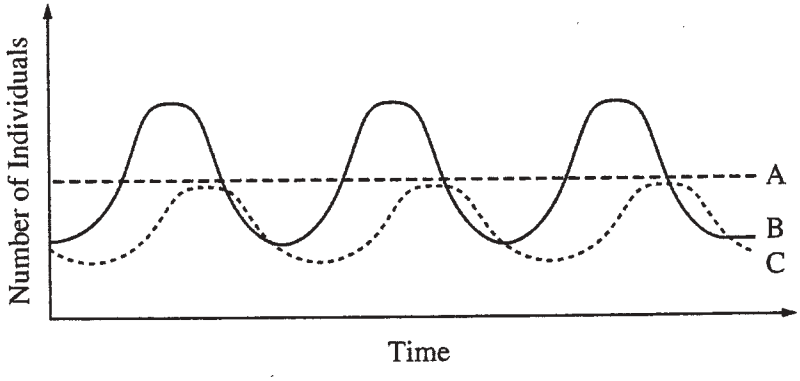

Identify which curve represents which of the species listed, and **justify** your answer by describing the changes in the population densities of these three species over time.

Taxis and Kinesis involve movement related to a specific stimulus. Taxis is movement towards or away from the stimulus and, kinesis is increased or decreased rate of movement under a stimulus. These increase the survivorship of a species by keeping the species camouflaged or hidden in dark places, making it easier to find a mate for sexual reproduction,

GO ON TO THE NEXT PAGE.

ADDITIONAL PAGE FOR ANSWERING QUESTION 1

and aiding the species when foraging for food.

Migration is a large movement of a species between environment. This is usually caused by environmental factors such as day length. Migration increases survivorship by shifting to a climate more suitable for reproduction, predator/pray relationships, or metabolic rates. Some examples of this are birds migrating to warmer climates for the winter and salmon swimming upstream to spawn.

On the graph, line A represents a small herbivore, line ~~B~~ C represents a large herbivore, and line ~~C~~ B represents a carnivore. The carnivore is only interested in the large herbivore, so the small herbivore is not affected by it. As the large herbivore population increases, so does the carnivore population. As the carnivore population increases, they kill off the large herbivores faster than they can reproduce. As the large herbivore population decreases, the carnivores run out of food and also die off. With fewer carnivores, the large herbivores are able to increase in number again, and the cycle starts over again.

GO ON TO THE NEXT PAGE.

1C1

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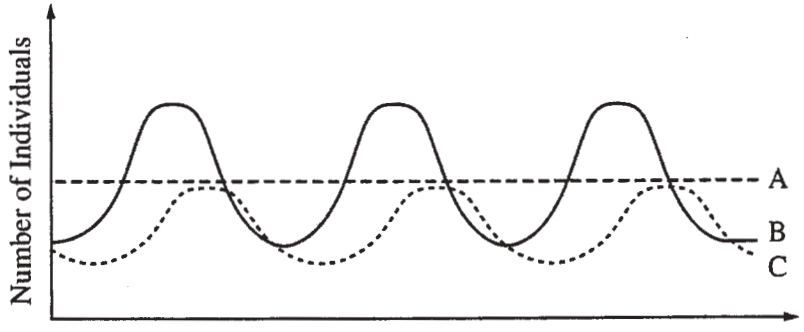


Identify which curve represents which of the species listed, and **justify** your answer by describing the changes in the population densities of these three species over time.

Migration is affected by temperature changes (~~seem~~ seasons) and availability of resources. A dramatic drop in the temperature makes it difficult for species to carry out normal functions as it affects their resources (freezing drinking water, causing plants to die and/or prey to leave). This thus results in the migration of the species to more favorable environments where there is abundant resources. Similarly, a rise in the temperature also changes the availability of resources (drying up water) and pushes the species to more to another environment where conditions are in their advantage.

GO ON TO THE NEXT PAGE.

1C2

ADDITIONAL PAGE FOR ANSWERING QUESTION 1

in the face of other catastrophes like floods, fires, earthquakes, and human development, the destruction of ~~their~~ homes and environments affects migration of a species as well. Migration allows the species to move to favorable environments where resources are ample enough to ensure survival, thus increasing the survivorship.

Courtship is also affected by temperature changes (seasons), resources, and maintainence of environmental conditions. In the spring (or in the fall when it drops) when the temperature rises, the body is stimulated into producing hormones and changes that call for reproduction. Thus individuals of species respond to them by engaging in fights and making nests/dens for future offspring. A change in environmental stability like ~~destruction of~~ flooding that destroys food sources may cause stress on the species that decreases occurrances of courtship and mating. Courtship is important to the survivorship of a species in that the competition between males for females allows the stronger one to mate and produce ~~more~~ healthy offspring, adding to the vitality of the species. Also, in fighting with each other, social hierarchies are established among males in which the alpha male protects the group and weaker males are able to save energy from unnecessary activities ~~like~~ that they won't win.

In the graph, curve A represents the carnivore, curve B the larger herbivore, and Curve C the smaller herbivore. The competition between the two herbivore groups results, over time, in the decrease of food and resources, which in turn results in a decrease in their population densities. The carnivores' consumption of them helps bring back their numbers as fewer individuals ~~or~~ need fewer amounts of resources. Thus, this pattern repeats over time as competition between herbivores B and C bring down their numbers and are brought up by carnivore A. Carnivore A remains stable in numbers because its resources — the herbivores — are never out of range.

GO ON TO THE NEXT PAGE.

2. In the evolution of organisms, major adaptations arose in certain groups, opening new evolutionary possibilities. For **two** of the following types of organisms, discuss the evolutionary significance of the features listed.

(a) Flowering plants: flowers, fruits and seeds, and broad leaves

(b) Flatworms: three germ layers, bilateral symmetry, and cephalization

(c) Segmented worms: segmentation, coelom, and digestive system

(d) Reptiles: amniotic eggs, waterproof skin, and well-developed lungs

A) Flowing plants evolved flowers (a highly organized and complex structure) ~~because~~. The significance of this feature is in the fact that first of all, flowers attract pollinators with their bright colors, thus pollinators pick up the ~~seeds~~ pollen of the plants and because these pollinators are usually capable of flying their ~~seeds~~ pollen is distributed over vast ~~areas~~ far from parent plant usually ending up in another plant ~~for~~ with a completely different genotype creating more variety and thus a larger gene pool.

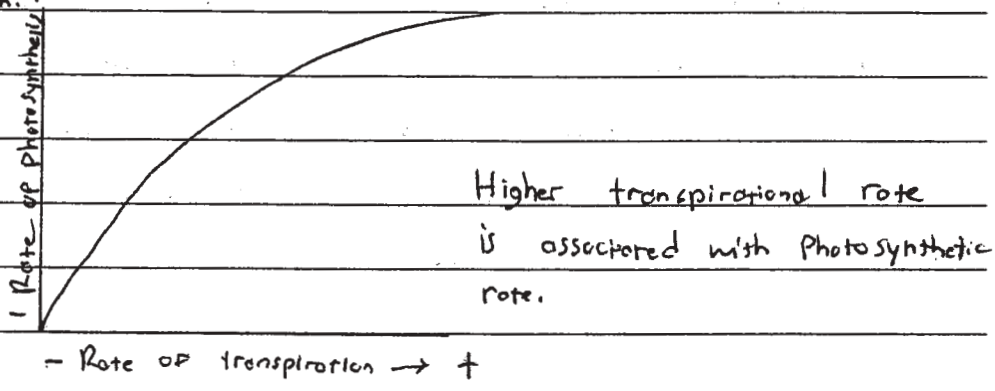
Fruits are produced after pollination and once again the juicy fruit entises (attracts) distributers for an example monkeys who eat the fruit and ingest the seeds within. The seeds are kept safe and cannot be digested and thus when the monkey produces waste (solid) far from the parent plant the seeds have a higher chance of not having to compete with the parent plant.

Finally the the evolution of broad leaves may help to increase the surface area for photosynthesis and in some areas like a tropical rainforest broader leaves generate a larger transpirational pull increasing bulk flow in the plant so that it may photosynthesize faster. (this is one of the

ADDITIONAL PAGE FOR ANSWERING QUESTION 2

reasons behind the fast growth rate of young trees in a tropical rain forest.

Note graph. +



(D) Reptiles one of the first terrestrial organisms had to evolve in ways which would allow them to survive on land and not dehydrate in addition to this they also had to reproduce on land.

Reptiles evolved eggs with extra membrane layers in a whole the amniotic egg which provided nutrients to the embryo inside (it contained its own supply of food) Shock protection was provided by the outer hard shell which also assisted in prevention of dessication and also had to serve as a means for respiratory activity.

Reptiles also evolved waterproof skin which gave distinct advantages, one of which was of course the prevention of massive water loss to the environment. Another advantage was the fact that the waterproof skin was able to divide the outside environment from the inner body of the reptile. In doing so it became much easier to control the environment within the body (homeostesis).

GO ON TO THE NEXT PAGE.

ADDITIONAL PAGE FOR ANSWERING QUESTION 2

Reptiles developed well developed lungs which solved the problem of obtaining oxygen in an terrestrial environment without having to lose ~~water~~ or expose fragile organs. Lungs were highly folded and kept within the body, this offered protection and provided enough surface area for sufficient amounts of O_2 to diffuse through.

GO ON TO THE NEXT PAGE.

2B1

2. In the evolution of organisms, major adaptations arose in certain groups, opening new evolutionary possibilities. For **two** of the following types of organisms, discuss the evolutionary significance of the features listed.

   (a) Flowering plants: flowers, fruits and seeds, and broad leaves

   (b) Flatworms: three germ layers, bilateral symmetry, and cephalization

   (c) Segmented worms: segmentation, coelom, and digestive system

   (d) Reptiles: amniotic eggs, waterproof skin, and well-developed lungs

For flowering plants, the evolution of flowers allowed the plant to increase its chances of reproduction. Flowers attracts pollinators to help fertilize plants of the same species. Flowers also allows the plant to disperse their pollen in the air. Since there are no water available for fertilization, the plant must fertilize by the use of wind. The flowers are specdized to allow the maximum dispersal of pollen by its structure. The sweet smell and bright colors of a flower attracts pollinators to transport pollen from one flower to the other. By the use of symbiosis and wind, the plant produces flowers to help reproduction without water. Fruits and seeds ensures the dispersal of the same species. to reduce conflict with the same species. Fruits ensure that the pollinator is able to survive and also attracts the pollinators to transport the seeds of the plant. The seeds are made specifically so that they will not be digested by the animal. When the animal moves, it brings the seed with them, therefore it increases the chance that the same species of the plant will not be together. Broad leaves increase the exposure of chloroplasts to the sunlight, making more food for the plant. Broad leaves also outcompetes other plants by blocking off the

GO ON TO THE NEXT PAGE.

sunlight to the other plants.

Since reptiles spend part or all of their life on land, they must find a way to conserve water. The development of the amniotic eggs allows reproduction without water. The embryo is bathed in a solution of rich proteins and sugars but the shell keeps the solution from flowing out. The egg is semi-permiable, allowing gasses to diffuse in and out but not permiable to liquid. The egg allows the embryo to grow on land rather than having to develope in a watery surrounding. The waterproof skin keeps the moisture in the organism, conserving water and reducing evaporation. The skin also keeps unwanted materials out of the body. The lungs have a large surface area, allowing high rates of gas exchange and low rates of moisture lost. Lungs allow gas exchange without losing moisture. Instead of having every cell exposed to the dry air, the lung exchanges the CO_2 with O_2 for the whole body.

GO ON TO THE NEXT PAGE.

2C1

2. In the evolution of organisms, major adaptations arose in certain groups, opening new evolutionary possibilities. For **two** of the following types of organisms, discuss the evolutionary significance of the features listed.

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2(a) Flowering Plants:

Flowers: the evolution of flowers by few species of plants provided a means of containing all the reproductive organs in one place. ~~Also the shape of the flowers is so to complement the~~ Flowers are often brightly coloured, ~~and~~ have nectar guide-lines and an appealing smell. These attract insects that serve as pollinators for the flowers and the nectar guides lead the insect to the nectar gland which is situated near the stigma, ~~permitting~~ so the ~~one insect~~ chance of ~~the stigma~~ pollination greatly increases. Flowers could also have other structures eg. feathery stigmas, to increase the likelyhood of pollination.

Fruits: fruits are formed from the fertilized ovum in the flower. The ovary swells and forms the seed. The nectar gland then grows around the ovary, forming a fleshy ~~covering or edible~~ sometimes edible area called the fruit. Fruits aid the dispersal of seeds using animals as a carrier. ~~Also~~ Fruits serve as food for many animals and the seeds often pass undigested through the animal, excreted in a different place then excreted egested in a different place, ~~The seed may break its dor~~ where there is less competition and greater resources.

Seeds: Seeds are formed of the ovary after the embryo has been fertilized. Seeds of flowering plants usually contain cotyledons that serve as a food store for the ~~g~~ embryo when it grows. The seeds of flowering

GO ON TO THE NEXT PAGE.

plants can remain in a state of dormancy & until the right conditions appear. This is beneficial because the embryo & will then grow under optimal conditions, promoting its success

broad leaves: Flowering plants are autotrophs, they produce their organic compounds from raw materials derived from the earth (sunlight, water, CO_2, minerals). These plants produce their nutrients through photosynthesis. Photosynthesis occurs most abundantly in the palisade leaf cells. The larger the surface area of the leaf, the more of the leaf exposed to sunlight and the larger the amount of sunlight and carbondioxide absorbed (larger number of stomata). This will greatly increase the rate of photosynthesis. Also the thin cross sectional area of broad leaves implies that the CO_2 and O_2 ~~carbondioxide~~ has less distance to travel therefore gas exchange is made more efficient.

(b) Flatworms:

3 germ layers: Flatworms have three germ layers:

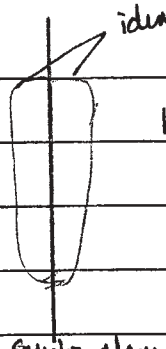
~~endoderm~~ ectoderm: the outermost layer that develops into the skin and ~~nerv~~ nervous system

mesoderm: the middle layer that develops into the gut, ~~or~~ respiratory system and other systems

endoderm: the innermost layer that develops into the connective tissue, muscles and bones.

The evolution of these layers implies that the organism can undergo further specialization, enabling it to perform its bodily functions better. Specialized areas to perform specific tasks => tasks performed better and faster => grow & reproduce faster.

2C3



bilateral symmetery: The flatworms are have only one specific plane axis which divides the organism into two identical halves This plays an integral part in the locomotion of the organism, allowing the organism to have a more streamlined shape therefore it can move faster

cephalization: there more by movement of their body which is not segmented. This allows them to move faster.

3A1

3. Protein synthesis is vital for cell growth and metabolism.

(a) Describe transcription and translation.

(b) Identify similarities between transcription and translation.

(c) Identify differences between transcription and translation.

(d) Describe structural changes that can occur to a protein after translation to make it function properly.

3 a) ~~Translation~~ Transcription occurs in the nucleus of the cell it is the first step of protein synthesis. In transcription RNA polymerase binds to a DNA strand at the begining of the specific gene coding for the ~~base~~ desired protien. The RNA polymerase untwists the double helix of DNA and in doing so temporarily seperates the two antiparrell strands and breaks the hydrogen bonds between complimentary base pairs. Free activated mRNA nucleosides then enter the space between the two strands they then pair against one of the 2 DNA strands which acts as a template. The mRNA nucleosides pair as a result of complimentary base pairing between the nucleosides and the DNA. The activated mRNA nucleosides then join to each other by breaking off there end two phosphates, this provides the energy for the ~~nucleo~~ nucleosides to join, and form the mRNA strand. once the RNA polymerase reaches the end of the gene the mRNA strand passes out of the nucleus. and to #

Translation involves several steps. Firstly Firstly amino acids join to ~~to~~ tRNA molecules (*) with specific anticodons. The synthesised strand of mRNA the binds to a ribosome usually on the RER. The ribosome attaches to the mRNA at the contains two sites that allow the binding of tRNA molecules. Once bound mRNA is bound to the ~~tRNA~~ ribosome tRNA molecules with complimentary anticodons to the codons on the mRNA section attached to the ribosome enter the ribosomes to sites and

(*) (using amino acyl tRNA synthetase)

GO ON TO THE NEXT PAGE.

ADDITIONAL PAGE FOR ANSWERING QUESTION 3

pair up with the mRNA using complimentary base pairing. The amino acids on the two adjacent tRNA molecules then bind to each other using energy they obtain from breaking ~~a~~ there bonds with the tRNA ~~molecule~~. The ribosome then moves along to the next codon were a new tRNA mole pairs, this process is repeated until the ribosome reaches a stop condon ~~at the~~ on the mRNA at which point the ~~an~~ protein is released.

b). Transcription and translation both involve the use of mRNA and do both occur within the cell. Complimentary base pairing is present in both and plays a key role in each without it neither would be possible

c) Transcription ends up ~~prod~~ producing a mRNA strand while translations produces a protein strand. Both process use diffent functional units in translations tRNA mole and ribosomes are both used and needed. Were as -transcription uses neither it does use however use RNA polymerase and activated nucleosides. For Transcription involves base pairing between the mRNA nucleosides and DNA were as base pairing translation is between t mRNA codons and tRNA anticodons.

GO ON TO THE NEXT PAGE.

ADDITIONAL PAGE FOR ANSWERING QUESTION 3

d)

Once the protein is released several changes can occur. Firstly Methyanine which is always the first amino acid to be laid down is cleaved off. Also the protein can be transported to the golgi apparatus where it is packaged and chemically modified usually by adding carbohydrates to form a glycoprotein. Once re Also once released from the ribosome the protein is able to fold into its overall 3D structure that is determined by the sequence of bases in its primary structure. This folding is due to R group interactions, th the structure is held and maintained by hydrogen bond, ionic bonds, covalent hydrophobic interactions and disulphide bridges. This 3D structure must be present especially for enzymes which have to have an active site of specific shape and charge.

3B,

3. Protein synthesis is vital for cell growth and metabolism.

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(b) Identify similarities between transcription and translation.

(c) Identify differences between transcription and translation.

(d) Describe structural changes that can occur to a protein after translation to make it function properly.

Transcription is the copying of DNA to create mRNA. Transcription is facilitated through multiple enzymes such as DNA polymerase and RNA primer. DNA polymerase "unzips" the two strands of DNA. DNA opens in little pockets throughout the strand. The mRNA can only be created in one direction. However, since the bubble opens in two directions Okasaki fragments are small fragments that copy as the bubble opens further. RNA primase is use to start the copying of the DNA, once an Okasaki fragment reaches the primase. The primase is removed and the mRNA connects to the mRNA fragment in front of it. The mRNA, once completed, leaves the Nucleus through proteins in the membrane. From there the mRNA goes into the cytoplasm where it attaches to a ribosome. The two parts of the ribosome come together with the mRNA in the center. Meanwhile codons (3 bases) of tRNA attach to an amino acid throughout the cytoplasm. The tRNA brings the amino acid to the large half of the ribosome if the codon is complementary to the mRNA. the tRNA enters the ribosome in the rightmost slot. As the mRNA shifts down a codon the tRNA is moved to the middle slot in the Ribosome. While this is occuring another tRNA codon enters the rightmost slot in the ribosome

GO ON TO THE NEXT PAGE.

ADDITIONAL PAGE FOR ANSWERING QUESTION 3

and becomes attached to the mRNA temporarily. The tRNA in the middle slot then moves its amino acid on top of the amino acid in the rightmost slot. The two amino acids are connected through a peptide bond. This process repeats until the mRNA expresses the stop codon causing the amino acid chain to be released into the cytoplasm. Translation is the creation of an amino acid chain with the help of a ribosome.

There are several similarities between transcription and translation. For example both the DNA in transcription and the mRNA in translation attach to their complimentary base pairs. (eg G attaches to C, and A attaches to U) Both also use enzymes to help speed of the processes. Transcription and translation also both also essential to the creation of proteins. In both translation and transcription the strands of RNA only copy and move in one direction, 3' to 5' and cannot be copied or move through the ribosome in the opposite direction.

The primary structure of the protein is the sequence of its amino acids.

Structural changes that occur in a protein to make sure it functions properly are the different levels of organization. In the secondary structure level, different parts of the protein hydrogen to each other in two ways. Every fourth amino acid bonds to create the α formation of coils or the bonds create the β structure

GO ON TO THE NEXT PAGE.

ADDITIONAL PAGE FOR ANSWERING QUESTION 3

which is folded of bonds. The tertiary structure of the protein then takes shape. During this time the different R groups on the protein bond with the each other. Some examples of these bonds are di-sulfide bonds and Van Der Walls bonding. The tertiary structure gives the protein to give it ~~its~~ the shape it needs to preform functions. The last level of structure that occurs is the interaction between more than one polypeptide chain to create a protein. After this last structural change the protein is completely shaped and should function properly. This structural organization of proteins occur in the protection of the golgi apparatus.

There are also many differences between translation and transcription, like where they occur. transcription occurs in the nucleus and translation occurs on bound ribosomes in the rough endoplasmic reticulum or in the cytoplasm.

3. Protein synthesis is vital for cell growth and metabolism.

3C,

(a) Describe transcription and translation.

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Protein synthesis is necessary for cell growth and metabolism; DNA transcription and translation is necessary for protein synthesis.

DNA transcription is the unzipping of a gene, the formation of an opposite mRNA strand, and the re-zipping of the gene. This is done using RNA polymerase to read down the gene. When the opposite RNA is put together, the nucleotide thymine is replaced with uracil. All of this happens in the nucleus. The RNA strand then goes outside the nucleus and is transcribed by a ribosome. During ~~transcription~~ translation, the ribosome reads down the mRNA and attaches tRNA according to the codon (three base code) for each amino acid. The tRNA has the amino acid attached and as each ~~chain~~ codon is read, the chain of amino acids grows. When ~~complete transcription~~ translation is complete, the protein (or chain of amino acids) is also finished.

Translation and transcription are really only similar in that they both involve RNA and they are both part of the protein synthesis process. They are different in many ways. ~~Translation~~ Transcription occurs in the nucleus; ~~transcription~~ translation in the cytoplasm. ~~Translation~~ transcription is the formation of mRNA and involves DNA; ~~transcription~~ translation is the reading of mRNA.

GO ON TO THE NEXT PAGE.

and formation of a protein and involves tRNA and ribosomes.

After translation is complete, the product is an amino acid chain or protein in it's rawest form. Before it can be used, it may be joined with other chains or have hydrogen bonds form which twist it into shape. Only when it is in the correct shape and joined with the right chains can the protein function properly.

4 A,

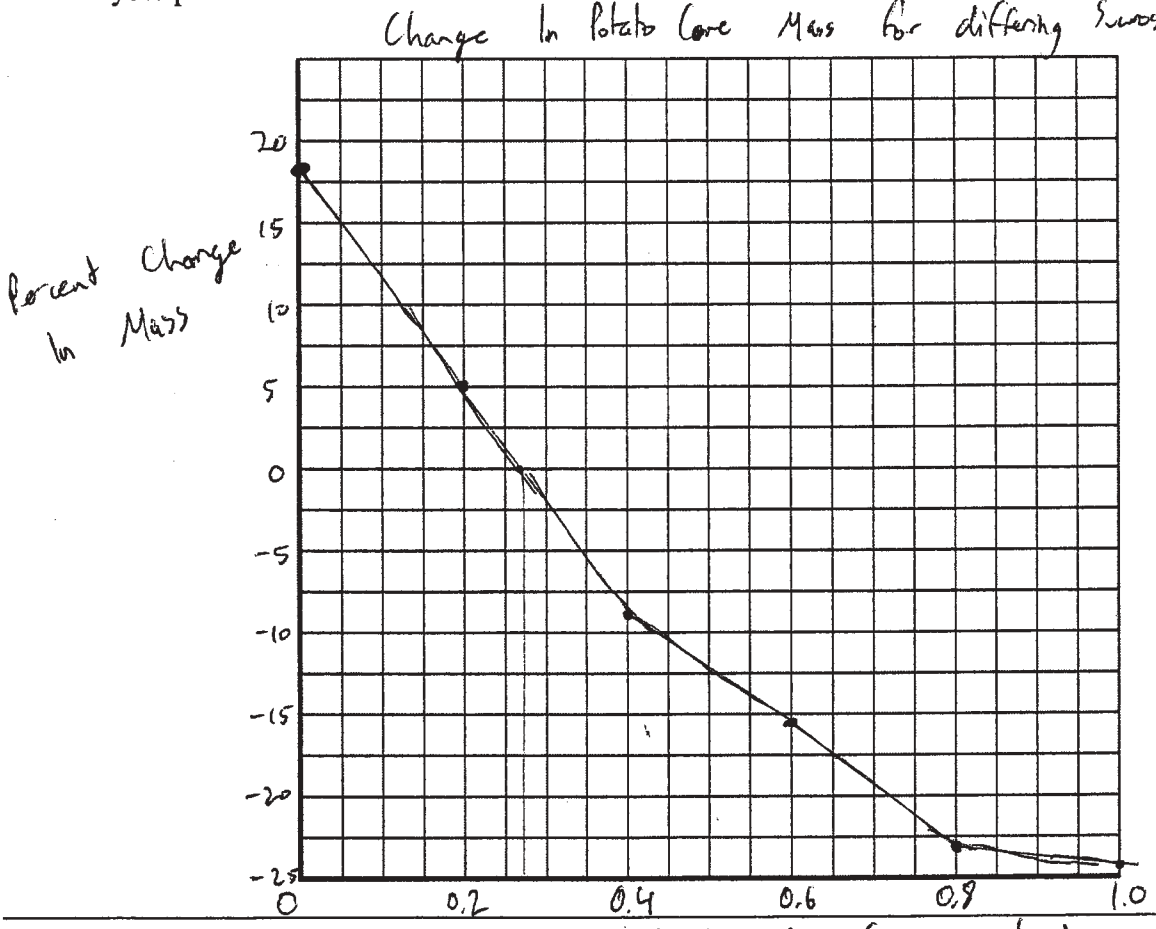
4. Water potential in potato cells was determined in the following manner. The initial masses of six groups of potato cores were measured. The potato cores were placed in sucrose solutions of various molarities. The masses of the cores were measured again after 24 hours. Percent changes in mass were calculated. The results are shown below.

Molarity of Sucrose in Beaker	Percent Change in Mass
0.0 *M*	18.0
0.2	5.0
0.4	-8.0
0.6	-16.0
0.8	-23.5
1.0	-24.0

(a) Graph these data on the axes provided. From your graph, find the apparent molar concentration (osmolarity) of the potato core cells.

(b) What are the components of water potential, and why is water potential important for the movement of water in plants?

(c) Predict what would happen to typical animal cells placed in 0.0 *M* and 1.0 *M* sucrose solutions, and explain your prediction.



a) The osmolarity of the potato cells is about 0.275 M

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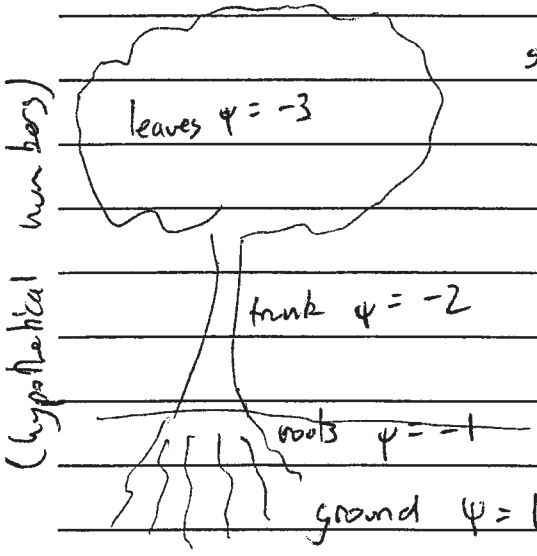
ADDITIONAL PAGE FOR ANSWERING QUESTION 4

b) Water potential measure the potential of water to move. Water will move from areas of high concentration to low concentration. ~~Therefore~~ Therefore the higher the water potential, the more likely the water is to move to a lesser water potential. The equation is $\psi_p + \psi_s = \psi$, which means that the ~~solute~~ pressure potential plus the solute potential equals the total water potential. This is important for plants because it allows water to be pulled up the trunks and stems to the leaves. The ground has higher water potential than the roots, so water moves into the roots through osmosis. The trunk has lower potential than the roots, so the water moves up through the trunk. Water in the leaves is always evaporating, so the potential is lower than the trunk, and the water moves into the leaves. The sky has a very low water potential, so water evaporates out of the leaves into the sky.



The water moves up from the ground into the sky, following the lower water potential.

GO ON TO THE NEXT PAGE.

ADDITIONAL PAGE FOR ANSWERING QUESTION 4

c) An animal cell placed in a 0 M solution would probably lyse. This is because the solution would by hypotonic to the plant cell. This would cause water to diffuse into the cell until equal water potentials were obtained. Before this could happen the cell would become too filled with water and burst, or lyse.

An animal cell in 1 M solution would shrivel. This is because the solution would be hypertonic to the cell and this would cause water to diffuse out, from higher water potential to lower water potential. The solution would have more solutes than the cell, so the water would diffuse out and the cell would shrivel and die.

GO ON TO THE NEXT PAGE.

4 B.

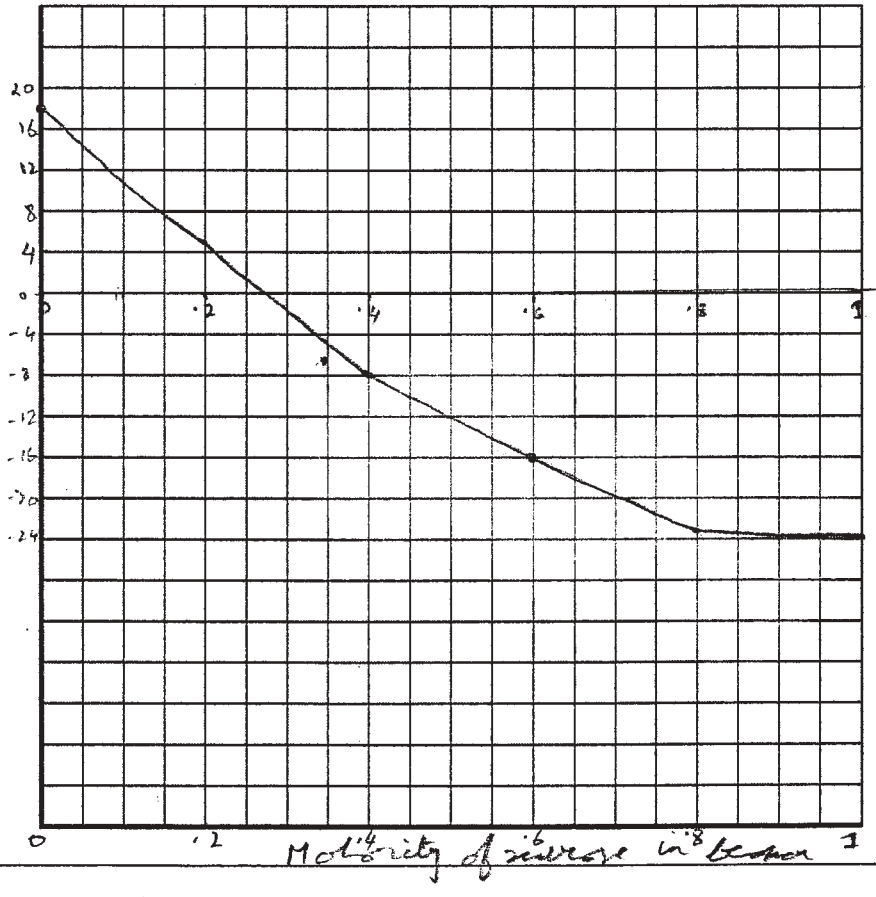
4. Water potential in potato cells was determined in the following manner. The initial masses of six groups of potato cores were measured. The potato cores were placed in sucrose solutions of various molarities. The masses of the cores were measured again after 24 hours. Percent changes in mass were calculated. The results are shown below.

Molarity of Sucrose in Beaker	Percent Change in Mass
0.0 *M*	18.0
0.2	5.0
0.4	-8.0
0.6	-16.0
0.8	-23.5
1.0	-24.0

(a) Graph these data on the axes provided. From your graph, find the apparent molar concentration (osmolarity) of the potato core cells.

(b) What are the components of water potential, and why is water potential important for the movement of water in plants?

(c) Predict what would happen to typical animal cells placed in 0.0 *M* and 1.0 *M* sucrose solutions, and explain your prediction.



4 B 2

ADDITIONAL PAGE FOR ANSWERING QUESTION 4

Apparent osmolality is .25 M

b) Solute potential and osmotic potential are the component of the water potential.

c) A kind of cell in 0 M sucrose solution will show greatest percentage change in mass (gain most weight/water) as water potential will be high in the solution than in the cell and water moves from the solution to the cell. and the cell might burst. Cell in .2 M solution will gain less weight/water relative to the cell in 0 M solution as water potential of .2 M solution is lower than the 0 M solution cell. Cell in .4 M, .6, .8 and 1 M solution will lose water as cells water potential will be higher than that of the solution and water leaks out of the cell and into the solution by osmosis. Cell in .4 M solution will loose less water than the cell in .6 M. Cell in .6 M solution will lose more water than cell in .8 M solution and cell in .8 M solution will lose more water than the cell in 1 M as water potential of the solution is decreasing as their Molarity is increasing and the cell will become plasmolized when its water potential is zero.

GO ON TO THE NEXT PAGE.

4 C.

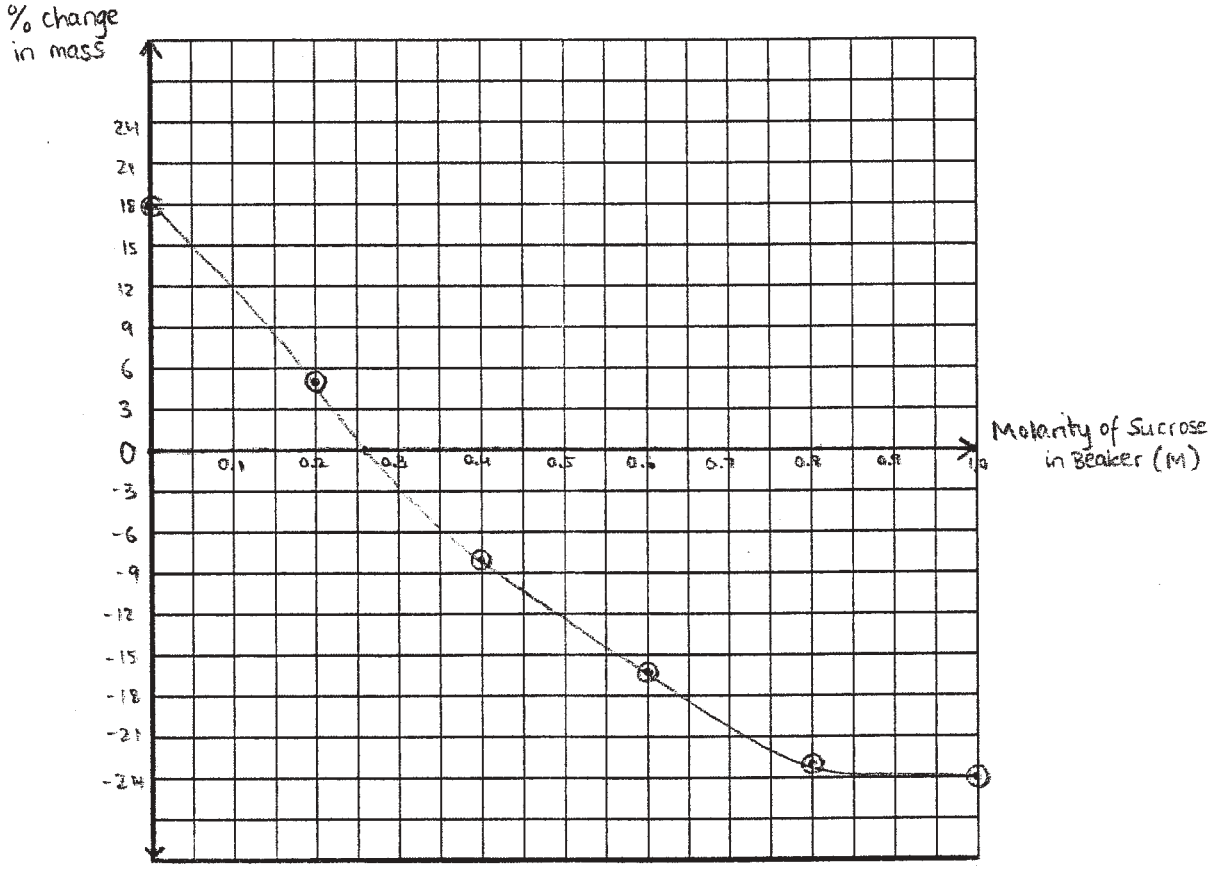
4. Water potential in potato cells was determined in the following manner. The initial masses of six groups of potato cores were measured. The potato cores were placed in sucrose solutions of various molarities. The masses of the cores were measured again after 24 hours. Percent changes in mass were calculated. The results are shown below.

Molarity of Sucrose in Beaker	Percent Change in Mass
0.0 *M*	18.0
0.2	5.0
0.4	-8.0
0.6	-16.0
0.8	-23.5
1.0	-24.0

(a) Graph these data on the axes provided. From your graph, find the apparent molar concentration (osmolarity) of the potato core cells.

(b) What are the components of water potential, and why is water potential important for the movement of water in plants?

(c) Predict what would happen to typical animal cells placed in 0.0 *M* and 1.0 *M* sucrose solutions, and explain your prediction.



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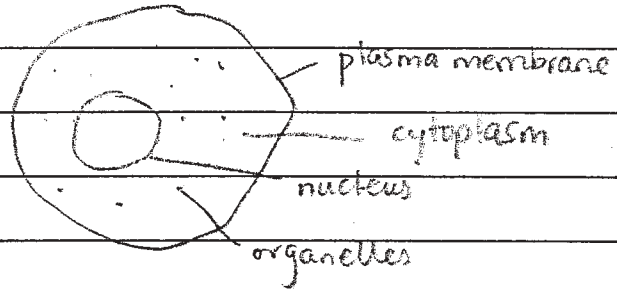
ADDITIONAL PAGE FOR ANSWERING QUESTION 4

a) From the graph, we can see that the apparent molar concentration (osmolarity) of the potato core cells is 0.26 M

b) Osmosis is the movement of water from a region of higher concentration to a region of lower concentration, down the ~~(o)~~ water potential gradient. The components of water potential are turgor pressure and ~~pres~~ atmospheric pressure. ~~(Water)~~ Water needs to have some sort of gradient ~~it~~ that it can diffuse down. In order that water flows through dead xylem, it has to be more concentration at 1 region than another, otherwise, water will not diffuse across cell membranes by osmosis.

c)



← Typical animal cell

If animal cells were placed in 1.0 M sucrose solution, water in the cytoplasm will diffuse out of the plasma membrane and into the sucrose solution outside the cell. ~~The~~ This great loss of water will cause the animal cells to die.

If animal cells were placed in 0.0 M sucrose solution, there will be a % change in mass after 24 hours, equal to 18.0.

GO ON TO THE NEXT PAGE.