

YEAR 11 PZ #1 - REVISION

(Inv Sci, Microscopes, Cells, Cell membrane and Transport of Materials, Tissues, cellular metabolism, Nutrients, Enzymes)

1. Read the following investigation and then answer the questions (***) that follow.

"DRINKING TEA DECREASES BLOOD CHOLESTEROL LEVELS"

Aim: To determine if drinking tea decreases blood cholesterol levels.

Independent Variable: The amount of tea ingested.

Dependent variable: Blood cholesterol levels.

Hypothesis: Ingesting tea decreases blood cholesterol levels.

Materials:

- Black tea, Green tea, Camomile tea
- Placebo 'tea' - (looks like, smells like, tastes like tea)
- Distilled water
- Volunteers/Subjects (160, comprising 20 males and 20 females in each of the groups listed above - allows for gender differences if any - given that it is a human biology experiment - planning for validity in an experiment.)
- Sterile syringes, sample bottles etc
- Blood Cholesterol levels tester (automatically testing cholesterol levels in mg/dL)

Methods:

1. Randomly assign the numbers 1 to 80 to each of the 80 male volunteers.
2. Repeat part 1 with the 80 female subjects.
3. Randomly choose a number between 1 and 80 inclusive - the male corresponding to that number is placed in the Black tea group.
4. Repeat part 3 above - this male is placed into the Green tea group.
5. Repeat part 3 above - this male is placed into the Camomile tea group.
6. Repeat part 3 above - this male is placed into the Placebo 'tea' group.
7. Repeat parts 4 - 6 with the rest of the male subjects until all individuals are assigned a group.
8. Repeat parts 4 - 7 with all the female volunteers until they are also assigned tea drinking groups.
9. Measure the blood cholesterol of all the volunteers to establish baseline data.
10. Mix all the drinks in the same way - 50mg of tea is mixed with 250mL distilled water @ 70°C.
11. All subjects are to drink all the 'tea' within 5 minutes of the tea being made.
12. Blood cholesterol levels are measured at the time of the tea being ingested, and for the next 2 hours at 15-minute intervals.
13. All values are recorded in a suitable table.

Results:

TABLE SHOWING BLOOD CHOLESTEROL LEVELS OF 160 SUBJECTS INGESTING DIFFERENT TYPES
OF TEA BEFORE AND DURING THE 2 HOURS OF THE EXPERIMENT

TABLE 1 - RAW DATA TABLE (INDIVIDUAL RESULTS)

[illegible]

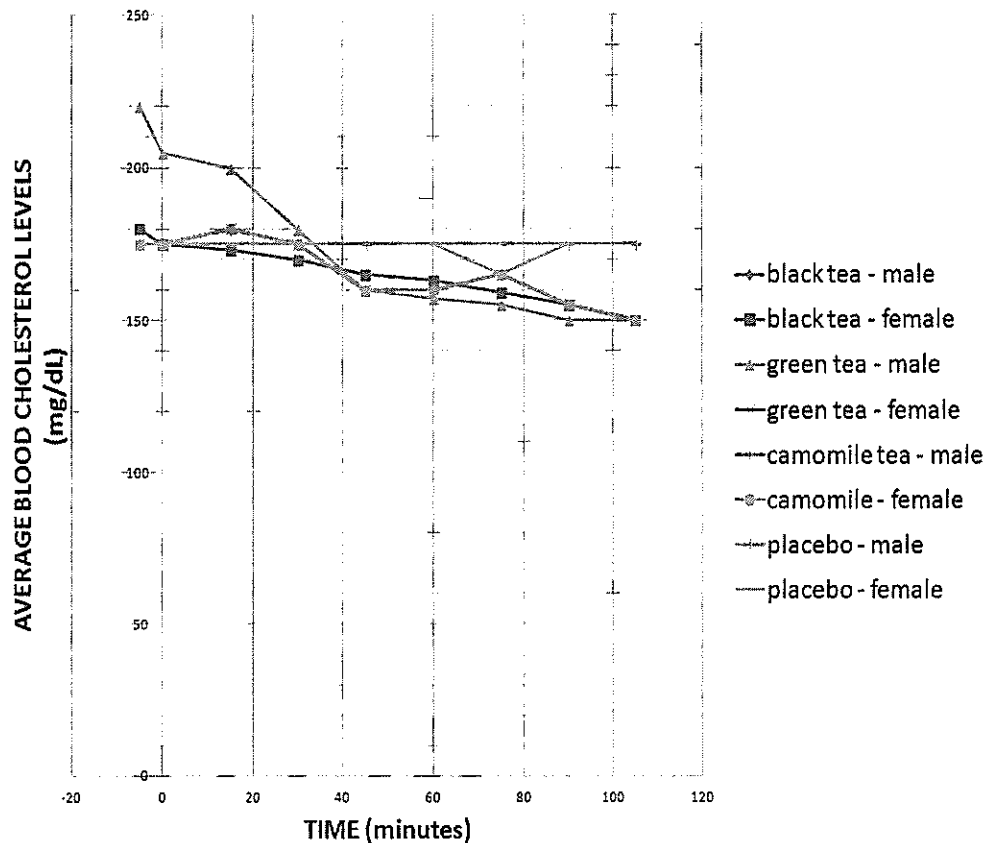
KEY: M - male, F - female, C - camomile tea, B - black tea, G - green tea, P - placebo 'tea'

TABLE SHOWING BLOOD CHOLESTEROL LEVELS OF EACH OF THE DIFFERENT TYPES OF TEA
BEFORE AND DURING THE 2 HOURS OF THE EXPERIMENT

TABLE 2 - SUMMARY DATA TABLE (AVERAGES PER GENDER AND THE TYPE OF TEA INGESTED)

[illegible]

GRAPH SHOWING AVERAGE BLOOD CHOLESTEROL LEVELS OF EACH OF THE DIFFERENT TYPES OF TEA AND GENDER BEFORE AND DURING THE 2 HOURS OF THE EXPERIMENT



Results/Data supporting the Hypothesis:

1. Average blood cholesterol levels significantly drop after drinking black tea compared to the placebo 'group'.

Results/Data refuting the Hypothesis:

1. The average blood cholesterol levels of the placebo group significantly drop compared to the test groups after ingesting the drinks.
2. There is no difference between the tea drinking groups and the placebo group in the levels for average blood cholesterol

No "I, we, my, us, our, accurate, prove" written in your report/answer - find other words/ways of writing answers...Disprove is OK!

Does the experiment follow the Ethical Procedures/Considerations of conducting experiments? (Including the practice on animals before human clinical trials!) What are these ethical procedures?

Have you planned for **VALIDITY** and **RELIABILITY** in the experiment?

***How could you improve the experiment? ***

A. In general;

- i. Repeat the experiment - why?
- ii. Replicate the experiment - why?
- iii. Increase the sample size - why?
- iv. Blind and double-blind experiments - why?
- v. Awareness of subconscious cues by the 'technicians' conducting the experiment - why?

B. Specific to this experiment;

- i. Other types of tea - why?
- ii. Other brands of tea - why?
- iii. Addition of sugar/milk - why?
- iv. Cold/ice tea - why?
- v. Prior levels of tea drunk taken into account - why?
- vi. A "Before-After" experiment - why?

C. A chemist has invented a new drug commercially called Memarx. Using the above planning page, write how you will conduct an experiment to test the claim that "it improves memory".

EXPERIMENT PLAN

TITLE

AIM

IV

DV

HYPOTHESIS

CONTROL GROUP

CONTROLLED VARIABLES

- Gender differences
(males = female numbers)

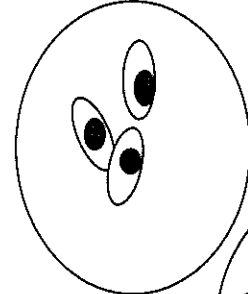
TEST GROUP

2. Complete the following table and then use it to calculate the sizes (L and B) of the cells in each of the field of views a,b,c. SHOW ALL WORKING!

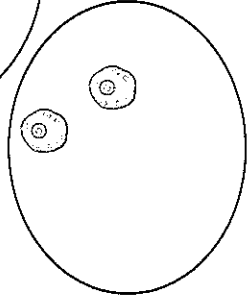
The 'plastic ruler' value is the first one highlighted in yellow.

MAGNIFICATION			FIELD OF VIEW	
OCULAR LENS (X)	OBJECTIVE LENS (X)	TOTAL (X)	mm	μm
10	4		3.3	
10	10			
10	40			
20	80			

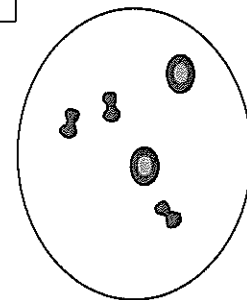
a. TOTAL MAG. =
1600X



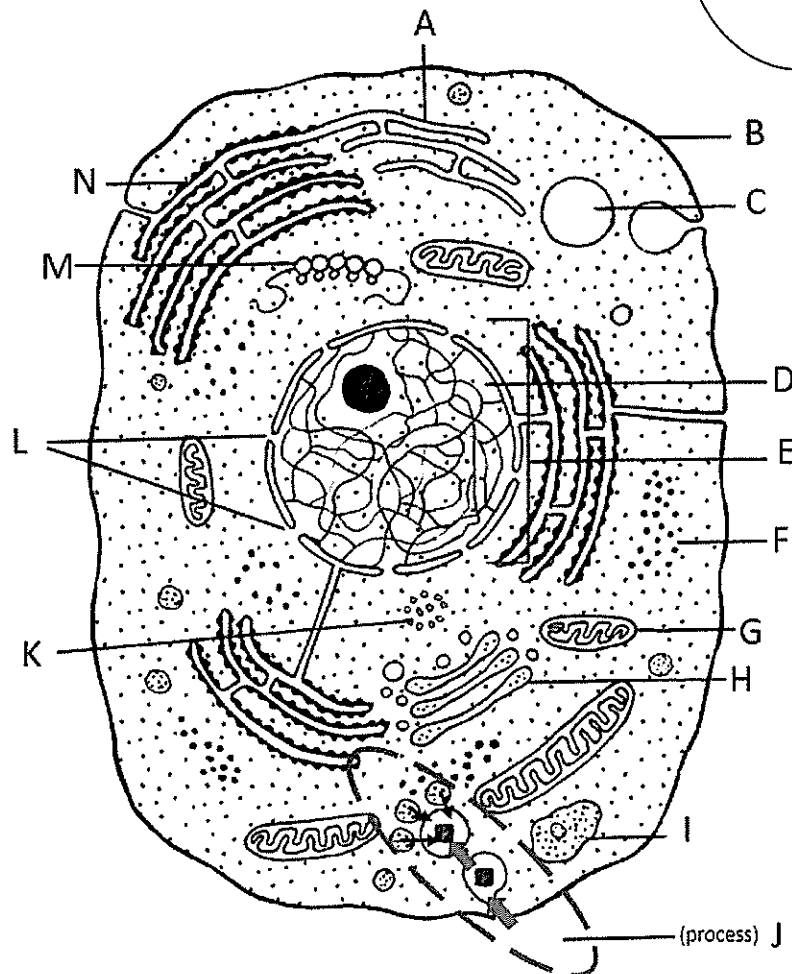
b. TOTAL MAG. =
40X



c. TOTAL MAG. =
100X



3. Label the parts of the following cell and give the functions of each organelle.



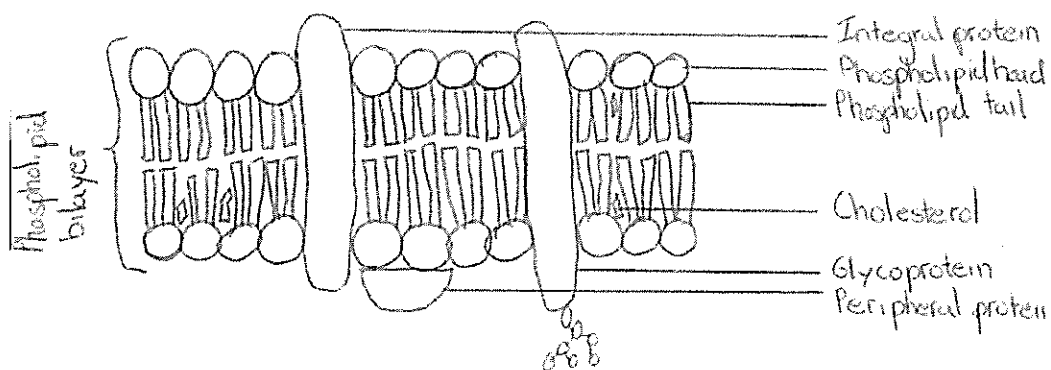
4. Is there anything missing from the diagram?

5.

- What is the problem with the following? systems, tissues, organs, cells, organelles
- Name five systems of the body and explain what they do.
- Can any one system shut down for a short amount of time (say 20 minutes) and have it NOT affect the other systems? Explain your answer whether it be yes, no, or I don't know...because it is a thinking question!!

6. The following diagram was drawn by a student to help them explain what the cell membrane looks like.

- Explain what each of the labelled parts are and what function they have in the cell membrane. What type of model for the cell membrane does this diagram represent?



- Explain the following statement - "Cells have a 'wetttable' surface. Having water 'touch' their surface, they can get required materials from their environment AND remove wastes from inside the cell. However, not all parts of the membrane are wetttable!"

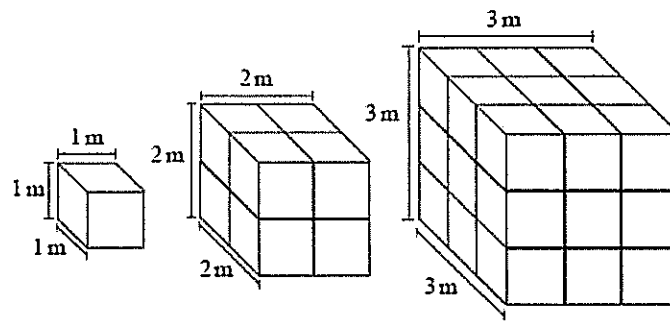
7. How are each of the following words similar, and different?

- Diffusion and Osmosis
- Endocytosis and Active Transport
- Exocytosis and Phagocytosis
- Diffusion and Facilitated Diffusion
- Secretion and Excretion

8. What 2 words in Q7 describe Vesicular Transport?

9.

- a. Complete the following calculations. (The cubes represent a cell increasing in size!)



surface area	
volume	
surface area: volume	

b.

- What is happening to the available surface area as the objects size increases? What does the cell risk if the size of the cell gets too great compared to its volume?
- What three things can the cell do to reverse this situation?

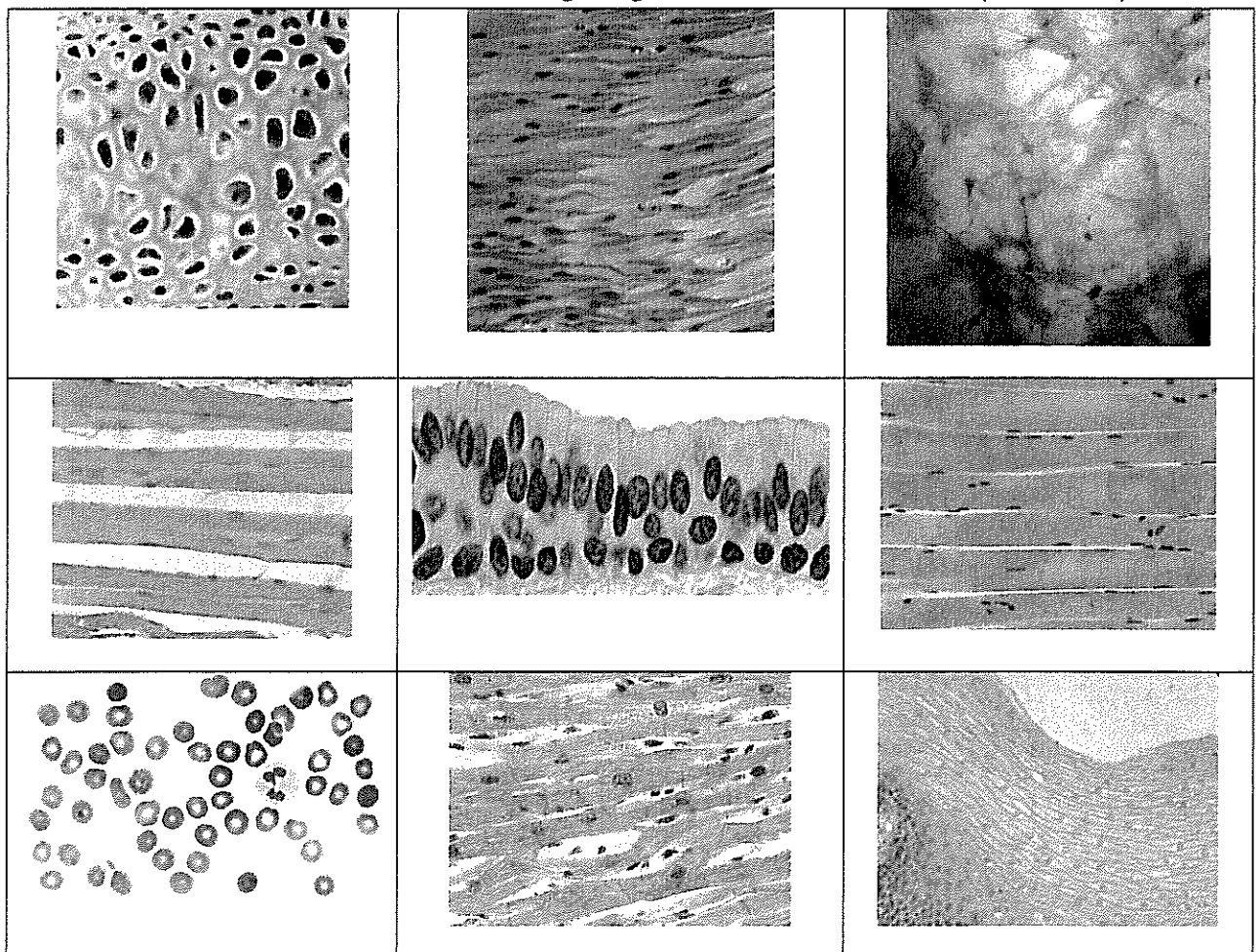
10.

- Besides surface area to volume ratio, what two other things can affect the movement of a substance into or out of the cell?
- A perfume poured into a petri dish, with the lid replaced, saturates the air above it.
 - What does SATURATION mean?
 - As the space above the perfume contains more and more gas molecules, what happens to the rate of diffusion?
 - There are two examples where 'saturation' occurs on/in the body given below. Explain how each has an effect on the body.
 - "On a very humid (saturated) day like last Saturday (9/3/2019)".
 - "A diabetic's blood becomes saturated with sugar to an extent that epithelial cells lining the kidney nephron cannot take back in every glucose molecule that passes - the process/ available cells are saturated, and some sugar molecules pass".

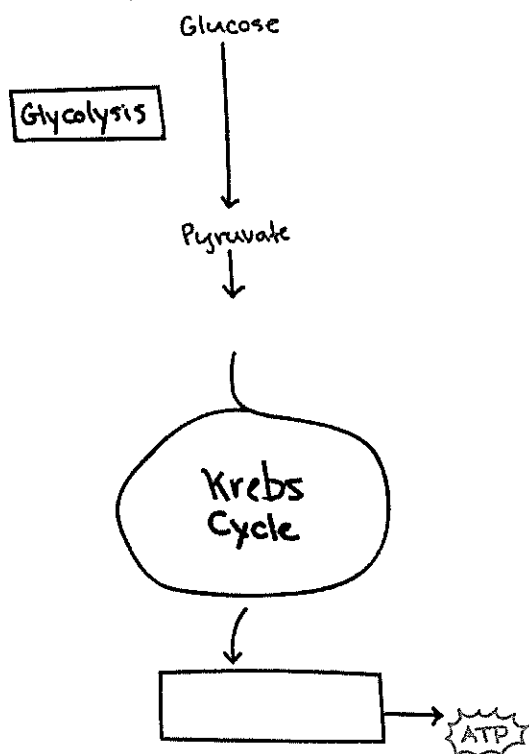
11. Fill in the following table of the 4 basic types of tissues.

	FUNCTION	SUBSETS	EXAMPLES
EPITHELIAL			
CONNECTIVE			
MUSCULAR			
NERVOUS			

12. Give the best name for each of the following images - remember to be as specific as possible!



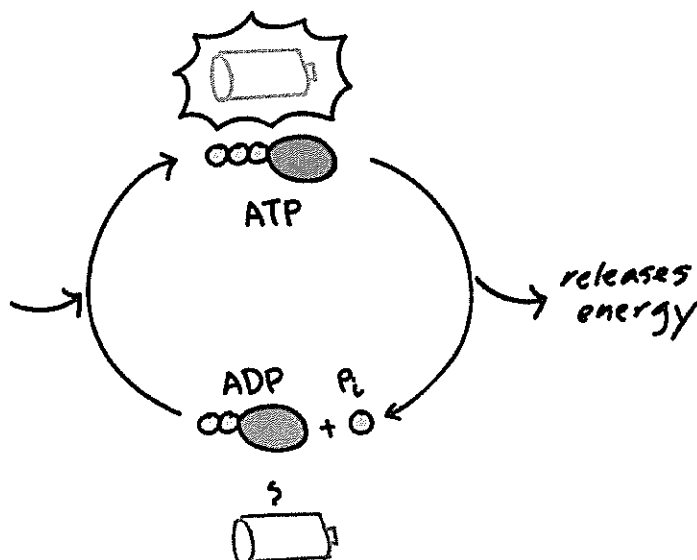
13. The following schematic diagram of aerobic cellular respiration was done by a student. Some information is missing.



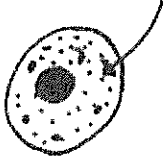
Use the following words to complete the diagram. [6-carbon molecule, 3-carbon molecule, NADP/electron carrier, ATP/Adenosine Triphosphate, Mitochondria, Electron Transport Chain, Aerobic Respiration, Anaerobic Respiration, Alcohol and CO_2 , Lactic Acid.]

14. Why is ATP used as an energy source and not the glucose itself seeing that the body spends so much time and energy mechanically and chemically digesting food (carbohydrates) down into glucose so that they are absorbed into the blood?

15. Complete the following image of the ATP cycle. What is the energy released from the ATP breakdown used for?



16. Complete the following table comparing Aerobic and Anaerobic Respiration processes.

<p>Aerobic ↓ Oxygen</p>	<p>Anaerobic ↓ Anti oxygen</p>
- Oxygen	- Oxygen <u>absent</u>
- Release <u> </u> energy (molecules of ATP) or 2898kJ	- Release <u>less</u> energy (molecules of ATP) (or 150kJ (muscle cells), 210kJ (yeast))
- Produces <u>carbon dioxide, water & energy</u>	- Produces <u> </u> & <u>energy</u> (muscle cells) or <u>ethanol, carbon dioxide & energy</u> ()
- Glucose <u>completely</u> broken down	- Glucose completely broken down
- Occurs in	- Occurs in
↓	

17. Discuss the inconsistencies in this statement - "Glycolysis is part of the Anaerobic Respiration process only!"

18. Describe the differences between Anabolism and Catabolism. Give examples of each.

19. What is metabolism?

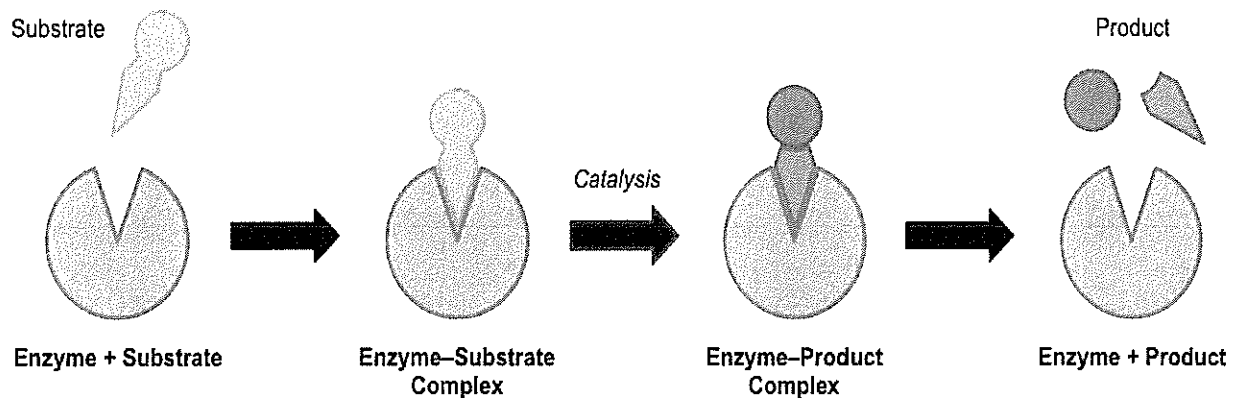
20. What is the function of each of the following food groups? [Carbohydrates, Proteins, Lipids, Vitamins, Minerals, Dietary Fibre, Water]

21. Complete the following table:

Selected nutrient-deficiency diseases		
disease (and key nutrient involved)	symptoms	foods rich in key nutrient
xerophthalmia (vitamin A)		liver, fortified milk, sweet potatoes, spinach, greens, carrots, cantaloupe, apricots
rickets (vitamin D)		fortified milk, fish oils, sun exposure
beriberi (thiamine)	nerve degeneration altered muscle coordination, cardiovascular problems	pork, whole and enriched grains, dried beans, sunflower seeds
pellagra (niacin)	diarrhea, skin inflammation, dementia	
scurvy (vitamin C)	delayed wound healing, internal bleeding, abnormal formation of bones and teeth	
iron-deficiency anaemia (iron)		meat, spinach, seafood, broccoli, peas, bran, whole-grain and enriched breads
goitre (iodine)	enlarged thyroid gland, poor growth in infancy and childhood, possible mental retardation, cretinism	
Folate (folic acid) (B-group vitamin)		

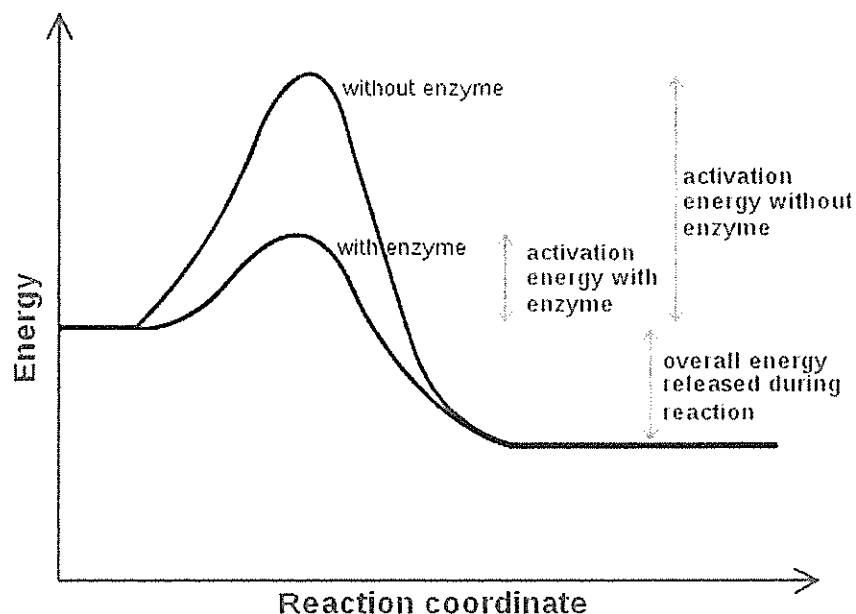
22.

a. What does the following diagram show? (Complete it by adding any parts missing)



b. Redraw the image so that it shows a simple case of the Induced Fit model of enzyme functioning.

23. How do you explain the difference in the energy required for a reaction with and without an enzyme present? Use the following image if needed. (Reaction Coordinate means 'the stage of the reaction during the progression of time')



24. Explain how each of the following affect the rate of an enzyme-controlled reaction.

Temperature, pH, (limited) enzyme concentration, (limited) substrate concentration, co-enzymes, and co-factors.