Biology 12

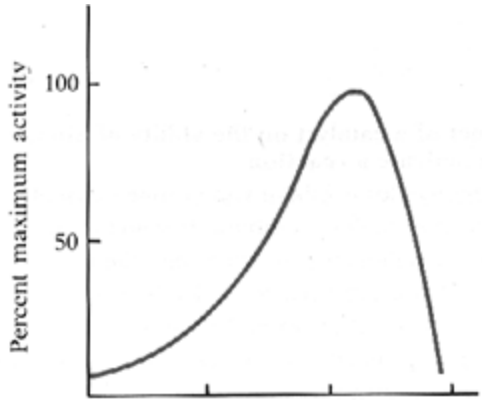
Cell Practice Test (Dec 2020)

Name: ★Key★

Learning Goals	*No Evidence 0*	*Beginning 1*	*Developing 2*	*Proficient 3*	*Sophisticated 4*
I can explain the role of enzymes in the body					
I can explain the structures and functions of the various parts of the cell and membrane					
I can explain the process of DNA Replication					
I can explain the process of protein synthesis and how it leads to mutations					

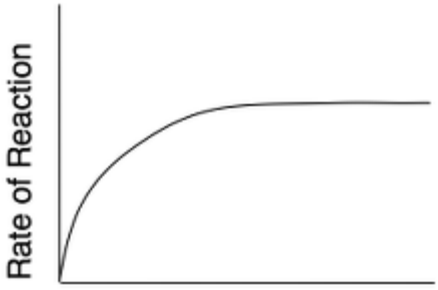
Learning Goal #1: I can explain the role of enzymes in the body

1. Which of the factors that can impact enzyme functioning is displayed in the graph below? Justify your answer.



- temperature or pH
- both have optimal value that the enzyme functions best
- enzyme will denature on the extremes which prevents substrate from finding the active site.

2. Which of the factors that can impact enzyme functioning is displayed in the graph below? Justify your answer.



- change in substrate concentration
- will eventually stabilize rate as there is a limit to enzyme # + speed of rxn.

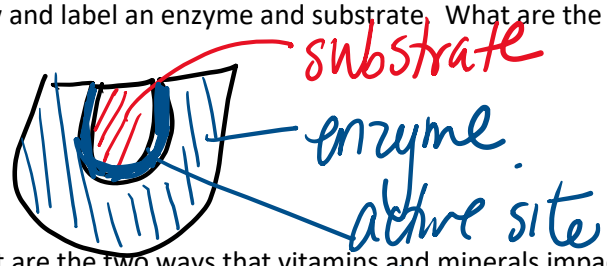
3. Why is a fever of 105 degrees too high? Why is it dangerous?

- our bodies are mainly proteins + enzymes which are very temperature sensitive. Too high of temperature (>104°C) and we risk denaturing

4. There is an enzyme pepsin that works in the stomach (pH 2) but not in the small intestine (pH 8). Why?

- enzymes have an optimal pH. Pepsin works from pH 2-3. It will denature once out of stomach, which means it will stop working.

5. Draw and label an enzyme and substrate. What are the various parts on an enzyme? What lands on an enzyme?

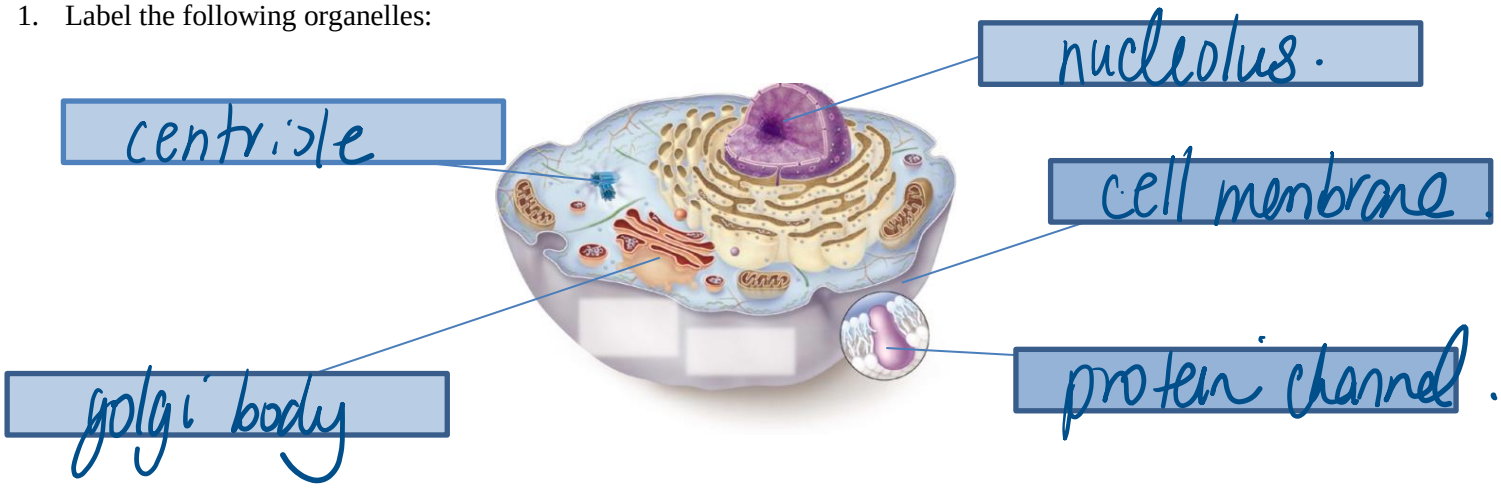


6. What are the two ways that vitamins and minerals impact an enzyme. Draw and explain this.

Co-enzymes (complete the active site)

Learning Goal #2: I will be able to label the various cell structures and their functions

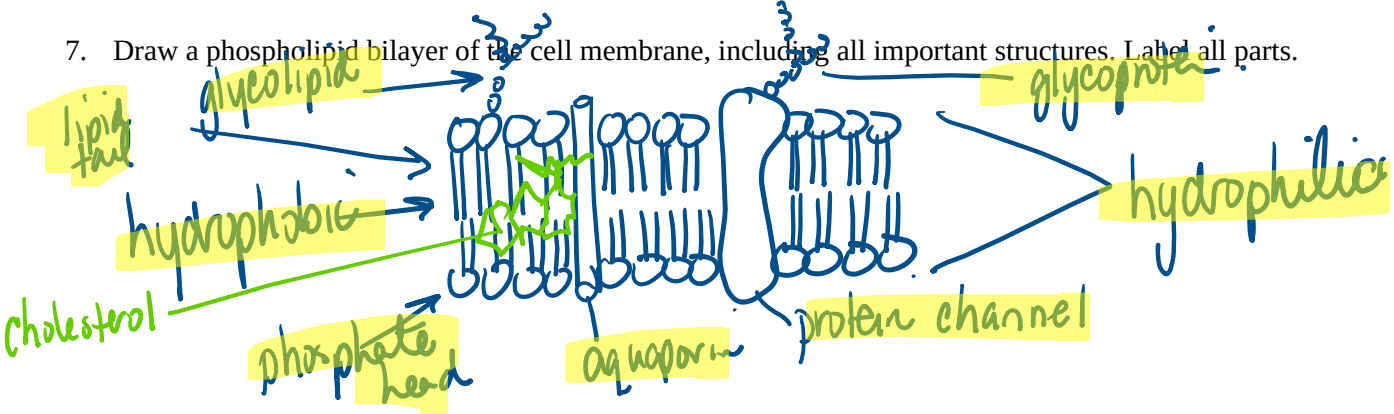
1. Label the following organelles:



3. Match the organelle name with the function

Organelle matching letter	Function of organelle	Organelles
B	The uncoiled genetic material in the nucleus	A = nucleus
C	The site of packaging of proteins for export of the cell	B = chromatin
A	The main control centre of the cell, because it holds the genetic material (DNA)	C = golgi body
D	The membrane bound organelle that holds water for the cell. It is a very large part of the plant cell	D = vacuole
E	The inner jelly of the cell that suspends the organelles inside the cell	E = cytoplasm

7. Draw a phospholipid bilayer of the cell membrane, including all important structures. Label all parts.



8. What are the five ways that a material can move across the cell membrane? Describe the various methods and give an example of what type of molecule needs to move in that method:

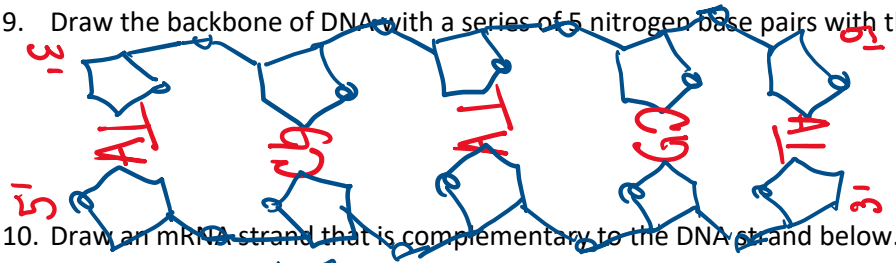
Type of Movement	Description	Example molecule
Diffusion	- thru bilayer (high→low)	O_2, CO_2
Facilitated Transport	- thru protein channel	$C_6H_{12}O_6$ (glucose)
Active transport	- needs ATP / against gradient	K^+ and Na^+ reset
Pinocytosis	cell mem. dimples back	small molecules (cell drink)
Phagocytosis	cell mem. reaches out	large protein (cell eat)

passive transp

low→high

Learning Goal #3: I can explain the structure, role, and replication of DNA

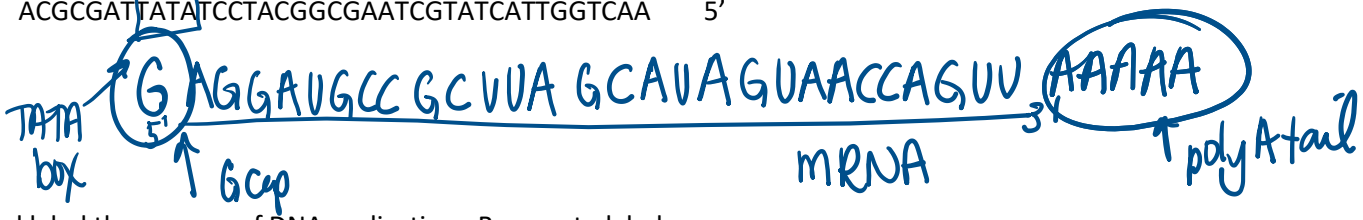
9. Draw the backbone of DNA with a series of 5 nitrogen base pairs with the proper complimentary pairings



anti-parallel

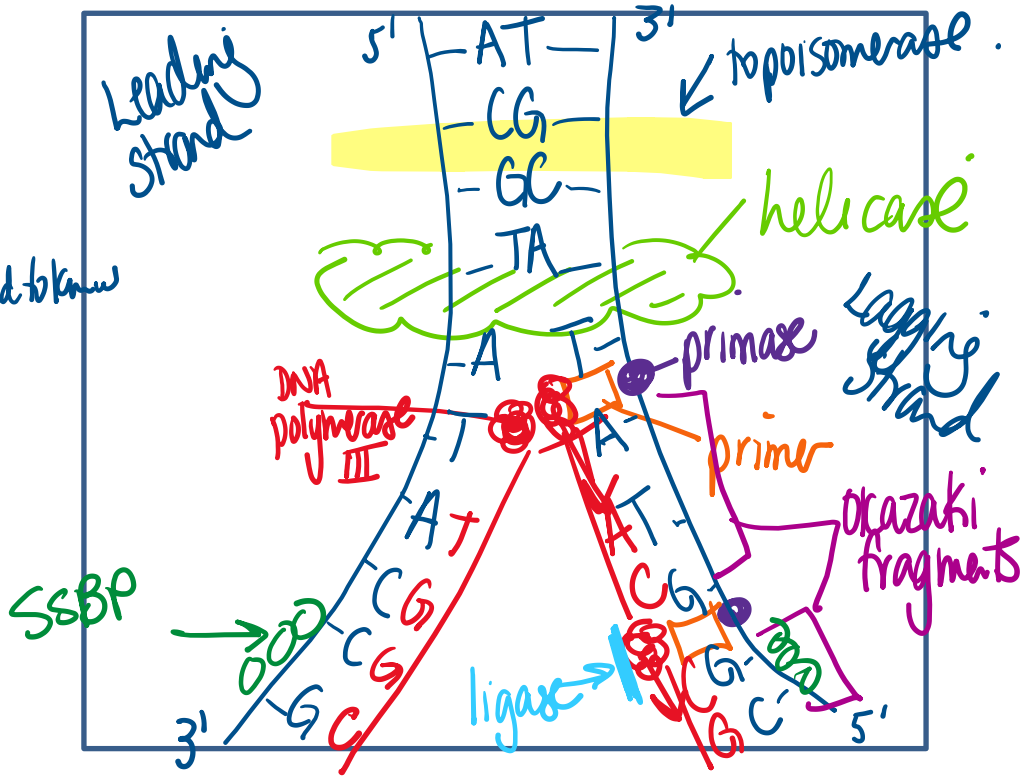
10. Draw an mRNA strand that is complementary to the DNA strand below.

3' ACGCGATTATATCCTACGGCGAATCGTATCATTGGTCAA 5'



11. Draw and label the process of DNA replication. Be sure to label:

- **a.** Leading strand
- **b.** Lagging strand
- **c.** Okazaki fragments
- **d.** Helicase
- **e.** DNA polymerase III
- **f.** DNA polymerase I ← don't need to know
- **g.** Single stranded binding proteins
- **h.** Ligase
- **i.** Nitrogen base pairs
- **j.** 3' and 5' ends
- **k.** topoisomerase



Learning Goal #4: I will be able to explain the process of protein synthesis and mutations

12. Below is a "normal" gene and a mutated gene. Write out the mRNA strand and predict the polypeptide that is formed (5 marks). Use the chart on the back page.

Second Position

First Position (5' end)	U	C	A	G	Third Position (3' end)
U	UUU Phe, UUC Phe, UUA Leu, UUG Leu	UCU Ser, UCC Ser, UCA Ser, UCG Ser	UAU Tyr, UAC Tyr, UAA Stop, UAG Stop	UGU Cys, UGC Cys, UGA Stop, UGG Trp	U C A G
C	CUU Leu, CUC Leu, CUA Leu, CUG Leu	CCU Pro, CCC Pro, CCA Pro, CCG Pro	CAU His, CAC His, CAA Gln, CAG Gln	CGU Arg, CGC Arg, CGA Arg, CGG Arg	U C A G
A	AUU Ile, AUC Ile, AUA Ile, AUG Met	ACU Thr, ACC Thr, ACA Thr, ACG Thr	AAU Asn, AAC Asn, AAA Lys, AAG Lys	AGU Ser, AGC Ser, AGA Arg, AGG Arg	U C A G
G	GUU Val, GUC Val, GUA Val, GUG Val	GCU Ala, GCC Ala, GCA Ala, GCG Ala	GAU Asp, GAC Asp, GAA Glu, GAG Glu	GGU Gly, GGC Gly, GGA Gly, GGG Gly	U C A G

a) "Normal" Gene

DNA Strand 3'CTATACGTACATAAGCCTGACTGG5'

mRNA Strand 5' GCAUGUAUUCGGACUGACC 3'

Amino acid chain = start – tyr – ser – asp – stop

b) "Mutated" Gene

DNA Strand 3'CTATACGTACATAAGCCTGACAGG5'

mRNA Strand 5' GCAUGUAUUCGGACUGUCC 3'

Amino acid chain = start – tyr – ser – asp – cys ……

What type of mutation was shown here? What is the repercussion of a mutation like this?

This is a nonsense mutation where the stop codon is altered. This will prevent the protein from being the length it is supposed to be, which could greatly alter its functioning.