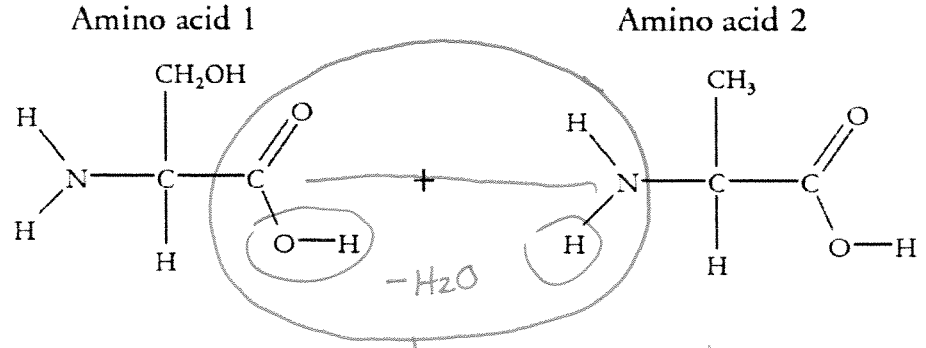
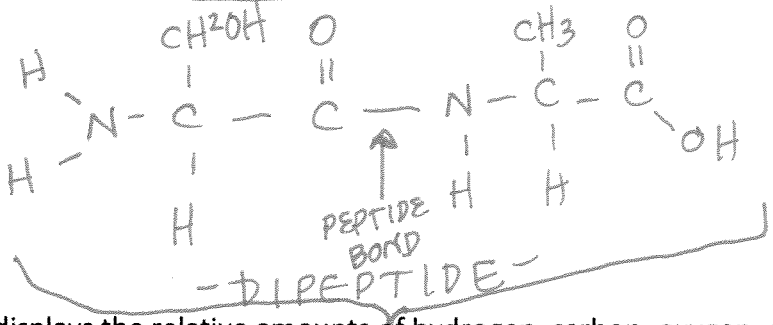
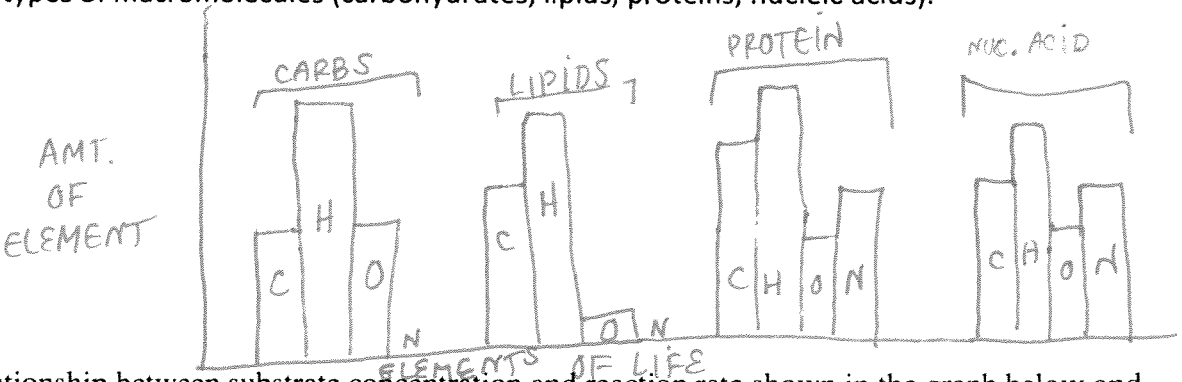
Thinking Practice

1. If the following molecules were to undergo a dehydration synthesis reaction, what molecules would result? **Circle** the parts of each amino acid that will interact and **draw** the resulting molecule.

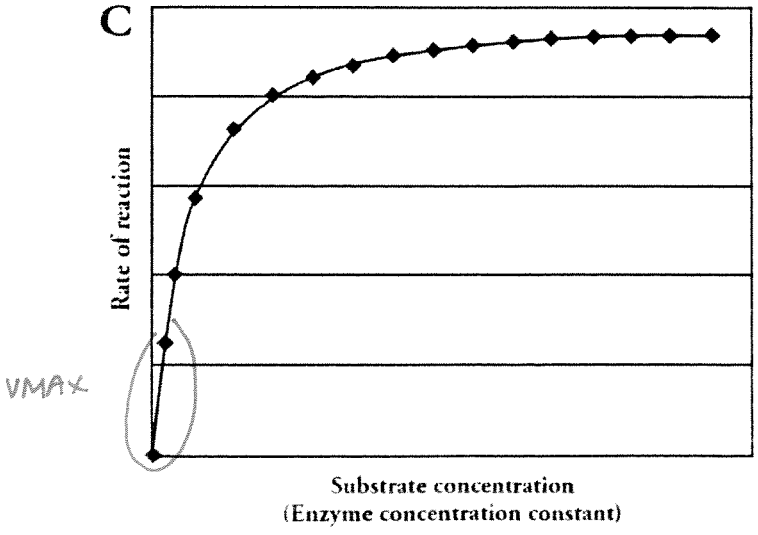




2. Construct a bar graph that displays the relative amounts of hydrogen, carbon, oxygen, and nitrogen in each of the four types of macromolecules (carbohydrates, lipids, proteins, nucleic acids).



3. Describe the relationship between substrate concentration and reaction rate shown in the graph below and propose an explanation for it.



REACTION RATE INCREASES WITH SUBSTRATE UNTIL IT REACHES VMAX... WHICH IS THE MAXIMUM RATE OF REACTION FOR A GIVEN ENZYME AT A PARTICULAR CONCENTRATION.

4. DNA polymerase from *T. aquaticus (Taq)* is used in PCR (polymerase chain reaction). PCR is a technique where millions of copies of DNA can be made from one original copy. In this method, the target DNA molecule is subjected to temperatures over 95 °C to make the double-stranded DNA separate. The temperature is then lowered slightly to allow primers to anneal before the *Taq* polymerase catalyzes the reactions to incorporate new nucleotides into the complementary strands. The cycle is then repeated over and over until there are millions of copies of the target DNA.

a. Predict why this bacterial polymerase is used instead of a human polymerase.

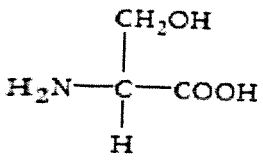
Taq IS FUNCTIONAL (IN ITS NATIVE CONFORMATION) IN EXTREMELY HIGH TEMPS. IT IS TAKEN FROM ARCHAEBACTERIA THAT LIVE IN HOT GEYSERS

b. What would happen if you used a human polymerase in a series of PCR reactions?

IT WOULD DENATURE AND NOT FUNCTION AFTER HEATING IT TO 95°C

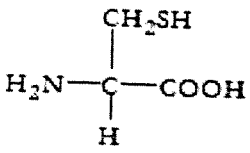
5. Imagine a protein chain that includes the following amino acids among several others.

POLAR



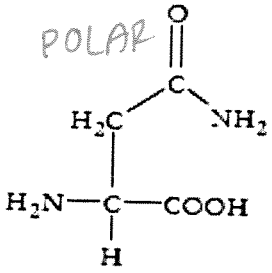
Serine

POLAR



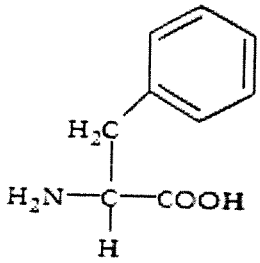
Cysteine

POLAR



Asparagine

NONPOLAR



Phenylalanine

a. Which of the amino acids could form a hydrogen bond with another amino acid in the chain to stabilize the secondary structure of a β-pleated sheet?

ALL OF THE ABOVE aa's COULD PARTICIPATE IN H-BONDING FOR SECONDARY STRUCTURE. THE GROUPS INVOLVED ARE ON THE N AND C OF ALL aa's. 2ND

b. Which of the amino acids could form disulfide bonds with another amino acid in the chain to stabilize the tertiary structure of the protein?

CYSTEINE – CYSTEINE

c. Which of the amino acids could participate in hydrophobic interactions with another amino acid in the chain to stabilize the tertiary structure of the protein?

PHENYLALANINE – R GROUP IS NONPOLAR.

Biochemistry – Short Free Response (4 points)

Water is important t for all living organisms. The functions of water are directly related to its physical properties. Describe how the properties of water contribute to TWO of the following:

- Transpiration
- thermoregulation in endotherms
- plasma membrane structure

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(a) **Describe** how the properties of water contribute to TWO of the following.

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- thermoregulation in endotherms
- plasma membrane structure

(a) 4 point maximum

2 points for each process / one point per category in the context of linking property to contribution

Process	Property	Contribution to Process
Transpiration	polarity/cohesiveness	water movement
	high heat of vaporization	reduces water loss
	water potential	water movement
Thermoregulation	high heat of vaporization	evaporative cooling
	high specific heat	heat buffer
Plasma membrane	polarity	arrangement of phospholipids