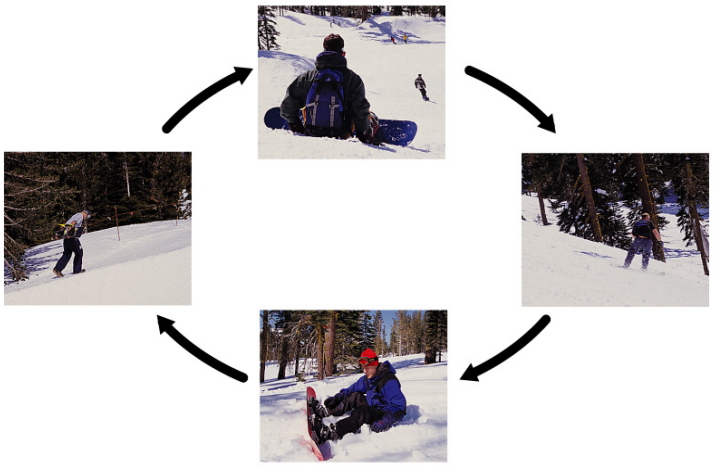
Bio 2; Chapter 5; The Working Cell

Basic concepts in energy



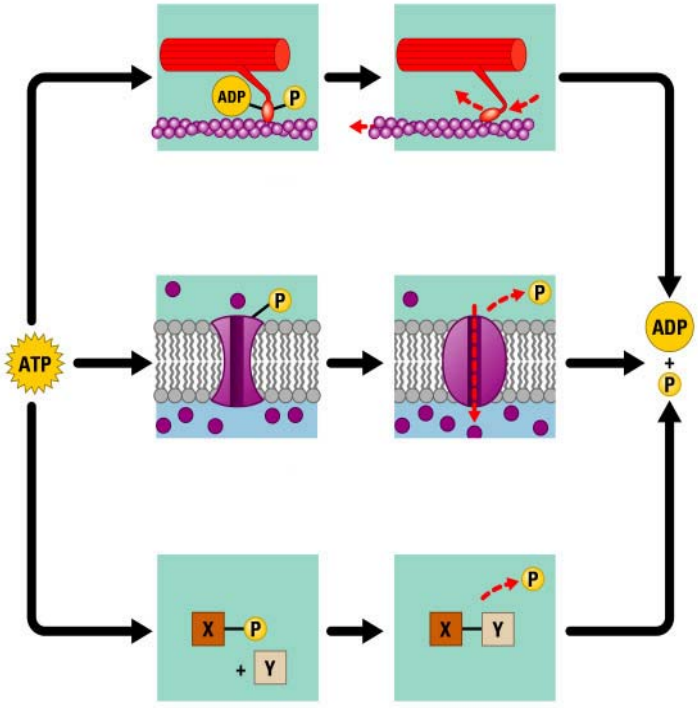
■Energy; capacity to do work

- _____ energy; energy stored (rock at top of hill, wound _____)
- _____ energy; energy of motion (rock _____)

■Chemical Energy

- A form of _____ energy
- The _____ from the bonds between the atoms in a _____ can be converted into other forms of _____
- Examples; _____
- Plants and other _____ convert inorganic molecules such as _____ and water (low _____ energy) into glucose (_____)
- When these _____ storing molecules are broken down (burned) the energy is _____

ATP and cellular work



■ATP stands for _____

- One _____ molecule bonded to 3 _____ groups

■Used to do all _____-requiring jobs in the _____

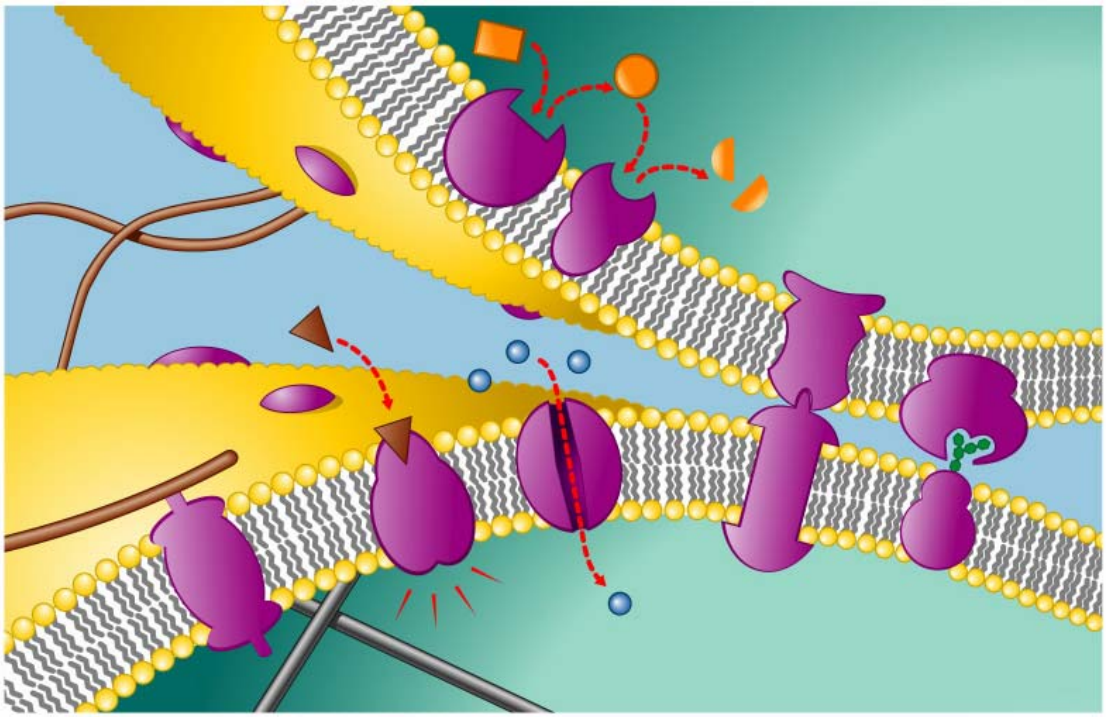
■When one of the _____ is removed, _____ is released, and work is done

- examples;
- mechanical work (_____)
- _____ work (movement across _____)
- _____ work (converting reactants into _____)

Selective Permeability

- Membranes of the cell are _____ permeable (sometimes called _____)
  - They allow some substances to _____ more _____ than others
  - They _____ passage of some substances _____
  - Without this _____, the cell could not _____

Membrane Protein Functions:



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Getting through the membrane: Diffusion

▪_____ is the movement of any particle from an area of higher relative concentration, to an area of _____ relative concentration.

▪The _____**- gradient** refers to how much difference there is between the two concentrations

▪The **net** _____ refers to the overall movement of molecules, not to _____

▪This process is what moves _____ into your lungs (from the blood) and _____ out of your lungs

▪Diffusion is _____ (does not require energy)

Getting through the membrane: Osmosis

▪_____ is the movement of water molecules from an area of _____ concentration (of _____), to an area of lower concentration, across a selectively permeable _____ (like the cell _____).

▪Key terms; _____**- permeable** means that some molecules can pass through (always _____) and most cannot, without the help of channel _____.

▪In biology, the _____ is always water, and the _____ is anything that is dissolved.

▪The key to remembering this is; "Water is always attracted to _____ (salts)"

■If a cell has more _____ (salts) than its environment it is said to be _____ to the water.

■If a cell has less solute, it is _____ (hypo- = _____)

■If a cell has the same amount of salt as its environment, it is _____ (iso- = _____)

Osmosis; its effects on cells

■If the environment is _____ relative to the cell, it will shrivel (the salt will "suck" the _____ out)

■If the environment is _____ to the cell, water will enter the cell and it will _____ up and possibly _____

■If a cell is _____ to its environment, it will maintain its shape (no net movement of _____).

■_____

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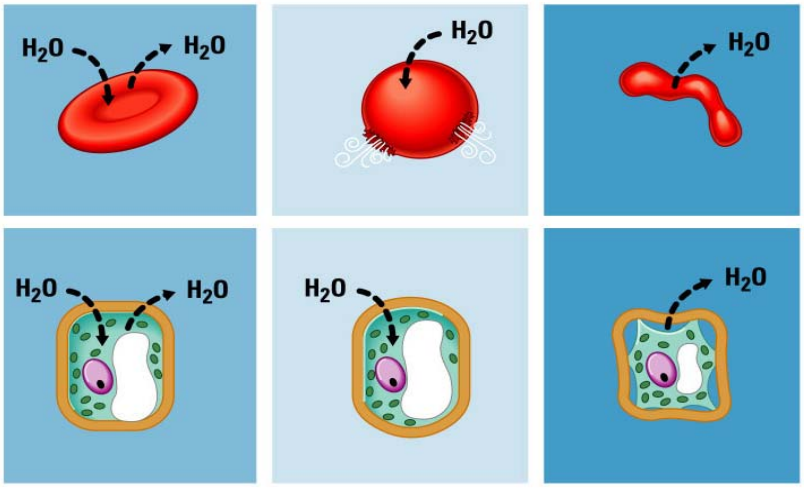


What is turgor pressure?_____

_____

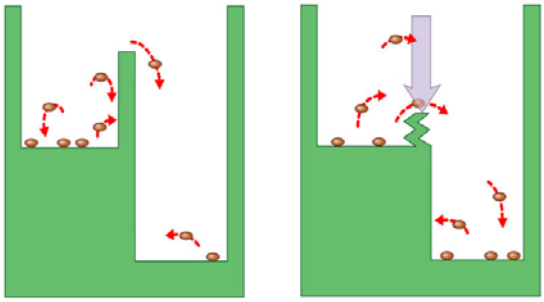
Reactions, Catalysts, and Enzymes

■All molecules in our bodies are constantly being built up (_____) or broken down (_____)

■These building and breaking processes are called _____**reactions**

■Most chemical reactions require an input of _____ before they will start, this is called _____ **energy**.

■Lowering Activation Energy (take notes; figure may be on next _____)



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Lowering Activation Energy

■To make chemical processes _____ up, you can increase the _____ of the reaction.

■Increasing temperature inside of a living thing (too high) can cause _____ and _____

■You can also speed chemical reactions using a _____.

■A _____ is a molecule that speeds up a chemical _____, without being _____ itself.

■A protein molecule that acts as a _____ is called an _____.

■Most of the _____ in the nucleus of all living things is used to make _____.

■_____ build all of the molecules that are in our cells and _____ down all of the molecules in our _____.

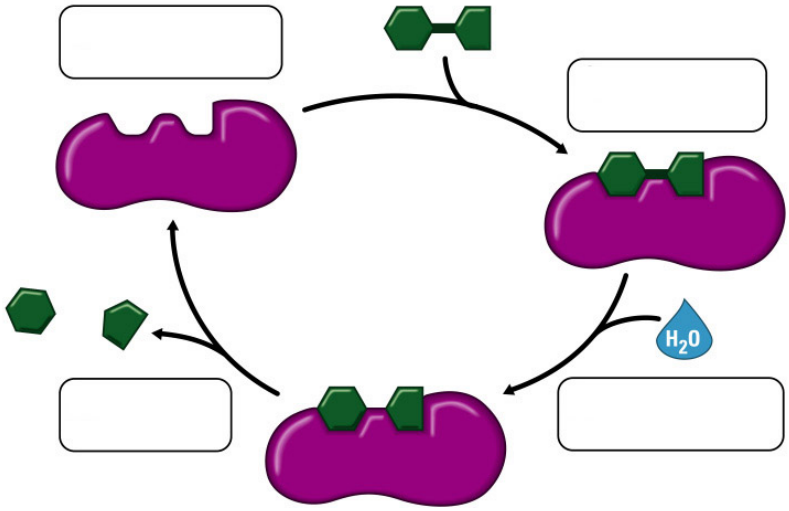
■_____

Enzymes; How they work

■Each enzyme is specifically designed to ____ together with the _____ molecule(s) that it will ____

■The place that the substrate fits into is called the _____ **site or** _____ **site**.

■If the active site changes shape, _____



Notes;_____
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■ Enzymes can function _____ and over again; _____

Naming Enzymes

■Enzymes are almost always _____ for what they _____.

■The _____ of an enzyme almost always ends in the suffix "_____"

■Examples: The enzyme that breaks down amylose is called _____

■The enzyme that synthesizes glycogen is called _____.

■The enzyme that helps DNA to form a polymer is called _____.

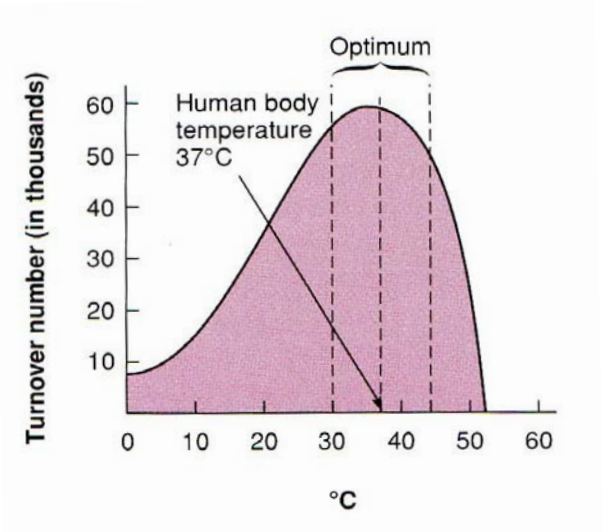
■What does Lactose Dehydrogenase do?_____

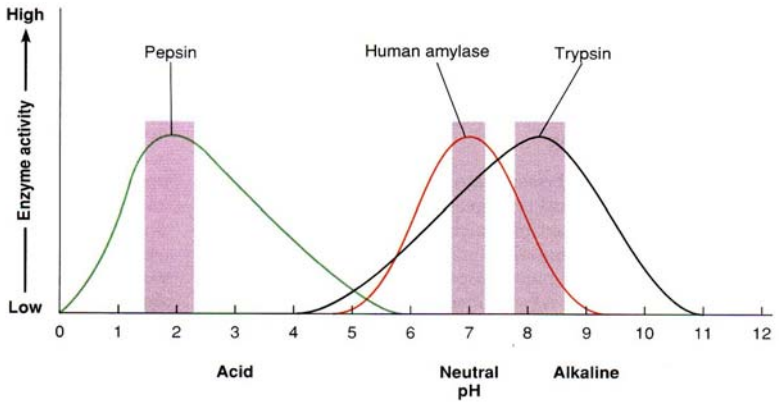
Environmental Effects on Enzymes

■Enzyme activity _____ with increasing _____.

■If enzymes are too cold, _____ happen too _____

■If the temperature goes too _____, the enzyme is permanently damaged (_____) and cannot _____.





Enzyme activity is also very specific for pH.

■If enzymes are exposed to excessive _____ or to _____, then they will become _____.

■What are these graphs (above) showing?(on next quiz)_____

_____

_____ _____

_____

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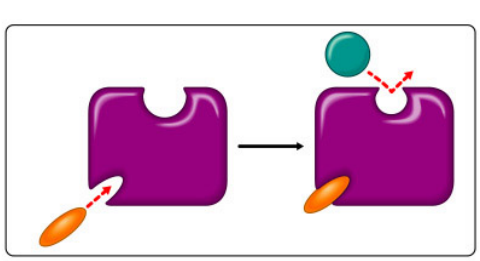
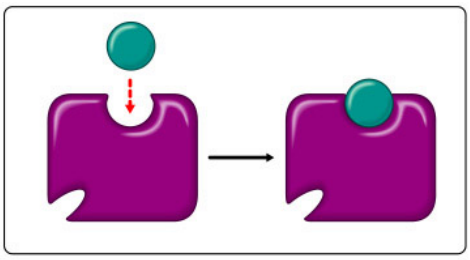
Enzyme Inhibitors

- ❑ Can inhibit a metabolic (_____) reaction
- ❑ Bind to the _____ site, as substrate _____ (competitive _____)
- ❑ Fill in figures on next page from slide (or textbook) Notes:

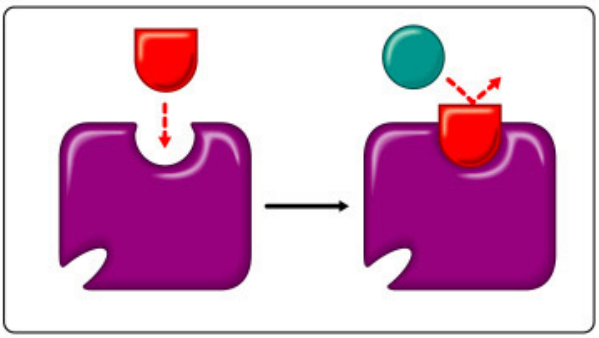




_____ _____

_____ _____

- Other inhibitors
  - Bind at a remote site, changing the enzyme's _____
  - In some cases, this is called feedback regulation (_____)
  - Fill in figure below from slide (or text)



Notes:

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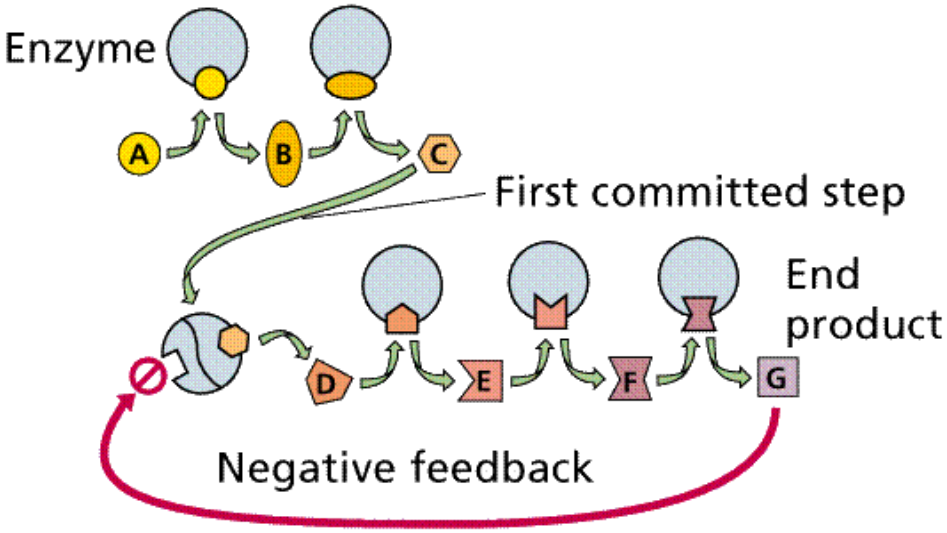

- What can stop the second half of this series?_____
- How does an icemaker shut itself off?_____

Review Questions;

Multiple Choice

1. How do plants store chemical energy?
   A. In the form of sunlight
   B. In the form of chemical bonds in food molecules
   C. In their batteries
   D. They don't
   E. None of the above are correct

2. What happens when ATP becomes ADP?
   A. Energy is released
   B. The organism dies
   C. Work is done
   D. Both A and C above are correct
   E. None of the above are correct

3. When molecules in our bodies are being built up this is called
   A. Anabolism
   B. Catabolism
   C. Metabolism
   D. Digestion
   E. None of the above are correct

4. What type of energy is energy in motion?
   A. Kinetic
   B. Potential
   C. Bond
   D. Static
   E. None of the above are correct

5. Glucose has a high level of chemical energy stored in it; True (A) or False (B)

6. When energy-storing molecules are burned or broken down, energy is released; True (A) or False (B)

7. What does ATP stand for?
   A. Action Triathlon Person
   B. Adenosine Diphosphate
   C. All Terrain Porpoise
   D. Adenine Terraphosphate
   E. None of the above are correct

8. What is are energy-storing molecules that plants produce (think about it; ask)?
   A. Glucose
   B. Starch
   C. Oil
   D. All of the above are correct
   E. None of the above are correct

9. How many phosphate molecules are found in ATP?
   A. 1
   B. 2
   C. 3
   D. 4
   E. None of the above are correct

10. What is ATP used for in the body?
    A. Flexing muscles
    B. Moving materials across a membrane
    C. Building biomolecules
    D. All of the above are correct
    E. None of the above are correct

11. In chemical energy, where (exactly) is the energy stored?
    A. Inside the carbon atoms
    B. In the bonds between atoms
    C. At the top of the hill
    D. Outside of the body
    E. None of the above are correct

12. How is energy released from ATP?
    A. When the ADP becomes ATP
    B. When the ATP is burned and converted into carbon dioxide
    C. Energy cannot be released from ATP only ADP
    D. When one of the phosphate groups is removed
    E. None of the above are correct

13. What type of energy is stored and not in motion?
    A. Kinetic
    B. Potential
    C. Bond
    D. Static
    E. None of the above are correct

14. When molecules in our bodies are being broken down, this is called
    A. Anabolism
    B. Catabolism
    C. Metabolism
    D. Digestion
    E. None of the above are correct

15. Examples of great amounts of chemical energy stored in biomolecules are carbon dioxide and water; True (A) or False (B)

16. The movement of muscles is an example of what type of work?
    A. Mechanical
    B. Chemical
    C. Transport
    D. All of the above are correct
    E. None of the above are correct

17. The movement of molecules across a membrane, against the gradient, is an example of what type of work?
    A. Mechanical
    B. Chemical
    C. Transport

D. All of the above are correct
E. None of the above are correct

18. When reactants are converted into products, this is an example of what type of work?
A. Mechanical
B. Chemical
C. Transport
D. All of the above are correct
E. None of the above are correct

19. When enzymes cause a chemical reaction to happen, they are finished and must be destroyed True (A) or False (B)

20. When a molecule binds to a remote site, changing the shape of the active site, this is called;
A. Competitive inhibition
B. Non-competitive inhibition
C. Allosteric inhibition
D. Both B and C are correct
E. None of the above are correct

21. Any molecule that speeds up chemical reactions without being changed itself is called a;
A. Enzyme
B. Catalyst
C. Protein
D. Substrate
E. None of the above are correct

22. A catalyst that is made of protein is called a;
A. Enzyme
B. Catalyst
C. Protein
D. Substrate
E. None of the above are correct

23. When a molecule binds to the active site of the enzyme, preventing the substrate from binding, this is;
A. Competitive inhibition
B. Non-competitive inhibition
C. Allosteric inhibition
D. Both B and C are correct
E. None of the above are correct

24. What is most of the DNA in your body used for?
A. To code for the production of proteins
B. To code for the production of lipids
C. To code for the production of carbohydrates
D. To code for the production of Teflon
E. None of the above are correct

25. The molecule that will be changed by an enzyme is called the;
A. Enzyme
B. Catalyst
C. Protein
D. Substrate
E. None of the above are correct

26. One enzyme can work well with many different types of substrates True (A) or False (B)

27. The part of the enzyme that the substrate fits into is called the;
A. Enzyme
B. Catalyst
C. Protein
D. Substrate
E. None of the above are correct

28. How are enzymes usually named?
A. By their size
B. By where they can be found in the cell
C. By their color
D. By their function; what they do
E. None of the above are correct

29. What happens to the rates of chemical reactions as you increase temperature?
A. It increases up to a maximum of unlimited temperature
B. It decreases
C. It increases up to a certain degree, and then starts to become denatured above a maximum temperature
D. No change
E. None of the above are correct

30. What suffix is usually added to sugar names?
A. “-ose”
B. “-oxide”
C. “-enzyme”
D. “-ase”
E. None of the above are correct

31. Most chemical reactions require an input of what before they will start?
A. Sunlight
B. Energy
C. Sugar
D. Money
E. None of the above are correct

32. What happens to enzyme activity as you gently increase temperature, but stay below maximum temperature?
A. Increases
B. Decreases
C. Denatures
D. No effect
E. None of the above are correct

33. When any molecule blocks the function of an enzyme by binding to it, the molecule is called a(n);
A. Denaturer
B. Killer
C. Inhibitor
D. Coenzyme
E. None of the above are correct

34. Why would you expect enzymes not to function well in cold?
    A. They become denatured
    B. They move too slowly to produce enough product
    C. They cannot find the substrate molecule because of inhibition
    D. The active site is blocked
    E. None of the above are correct

35. What may happen in a living thing if you increase the temperature too high?
    A. No effect
    B. Fever and death
    C. Denaturing of enzymes
    D. Both B and C above are correct
    E. None of the above are correct

36. What suffix is usually added to enzyme names?
    A. "-ose"
    B. "-oxide"
    C. "-enzyme"
    D. "-ase"
    E. None of the above are correct

37. What happens to enzymes when their temperature goes too high?
    A. They become denatured
    B. Their shape is permanently changed
    C. They cannot function correctly
    D. All of the above are correct
    E. None of the above are correct

38. The input of energy into a chemical reaction to help it start is called;
    A. Input energy
    B. Enzyme energy
    C. Activation energy
    D. Bogus energy
    E. None of the above are correct

39. Enzymes can still function well after they are denatured True (A) or False (B)

40. What happens to enzymes in solutions that are excessively acid or basic?
    A. They become denatured
    B. Their shape is permanently changed
    C. They cannot function correctly
    D. All of the above are correct
    E. None of the above are correct

41. What term means allowing some substances to cross a cell membrane while blocking others?
    A. Selectively permissable
    B. Selective permeability
    C. Selective service
    D. Osmosis
    E. None of the above are correct

42. Selective permeability is necessary for any cell to remain alive; True (A) or False (B)

43. What is defined as the movement of any particle from an area of higher relative concentration, to an area of lower relative concentration?
    A. Diffraction
    B. Differentiation
    C. Active transport
    D. Phagocytosis
    E. None of the above are correct

44. If there is a salt concentration of 10% on one side of a membrane and 20% on the other, the difference between these two concentrations would be called;
    A. Osmosis
    B. Concentrated graduation
    C. Concentration gradient
    D. Diffusion
    E. None of the above are correct

45. What term refers to the overall movement of molecules from one area to another?
    A. Diffusion
    B. Net movement
    C. Net gain
    D. Net worth
    E. None of the above are correct

46. If there is no net movement of particles during diffusion, that means that no particles are moving; True (A) or False (B)

47. Net movement means the number of particles that can move through a net and not be caught; True (A) or False (B)

48. What process moves gases into and out of your blood in your lungs?
    A. Osmosis
    B. Concentrated graduation
    C. Concentration gradient
    D. Diffusion
    E. None of the above are correct

49. What is not required for noticeable diffusion to occur?
    A. ATP energy
    B. Particles to diffuse
    C. A medium in which diffusion occurs
    D. A concentration gradient
    E. None of the above are correct

50. What term is used to describe how water moves across a selectively permeable membrane?
    A. Osmosis
    B. Concentrated graduation
    C. Concentration gradient
    D. Diffusion
    E. None of the above are correct

51. In osmosis, which way does water always move?
    A. Toward the side with the most water
    B. Toward the side with the most salt (least water)
    C. Toward the side with no salt
    D. Always into the cell
    E. None of the above are correct

52. Selectively permeable means that all molecules can move across a membrane, but some move faster; True (A) or False (B)

53. In biological systems, what is almost always the solvent?
    A. Gasoline
    B. Turpentine
    C. Paint thinner
    D. Milk
    E. None of the above are correct

54. What term means that a material can be dissolved in water?
    A. Solvable
    B. Soluble
    C. Diffusible
    D. Divisible
    E. None of the above are correct

55. If a cell is in pure water, it will always burst due to osmosis; True (A) or False (B)

56. What is the key to remembering which way water will move across a membrane?
    A. Water always moves into cells, never out
    B. Water always moves out of cells, never in
    C. Water is always attracted to salt; where the greater salt concentration is, that is where the water will want to move
    D. Water is always repelled by salt; where the greater salt concentration is, that is where the water will not want to move
    E. None of the above are correct

57. If a cell has 10% total salts and the environment in which it lives has 25% total salts, is the cell hyper-, hypo-, or isotonic to its environment?
    A. Hyper-
    B. Hypo-
    C. Neither
    D. Impossible to tell
    E. None of the above are correct

58. If a cell is in pure water, it must always be hyper-, hypo-, or isotonic to its environment?
    A. Hyper-
    B. Hypo-
    C. Neither
    D. Impossible to tell
    E. None of the above are correct

59. What will happen to a cell that is in a hypertonic solution?
    A. It will shrink and die
    B. It will swell up and explode
    C. It will swell up and rupture if it has no cell wall
    D. Nothing
    E. None of the above are correct

60. What prevents plant cells from bursting due to osmotic pressure?
    A. Nucleus
    B. Osmosis
    C. Cell wall
    D. Water pumps
    E. None of the above are correct

61. If a cell is isotonic to its environment, then that means that water does not move into or out of the cell; True (A) or False (B)

Essays:

All of the figures in the notes above

1. Be able to describe what is happening in the picture showing the plant cells and blood cells. Why are the plant cells not rupturing while the blood cells are?

2. Why are enzymes so important? What do they do?