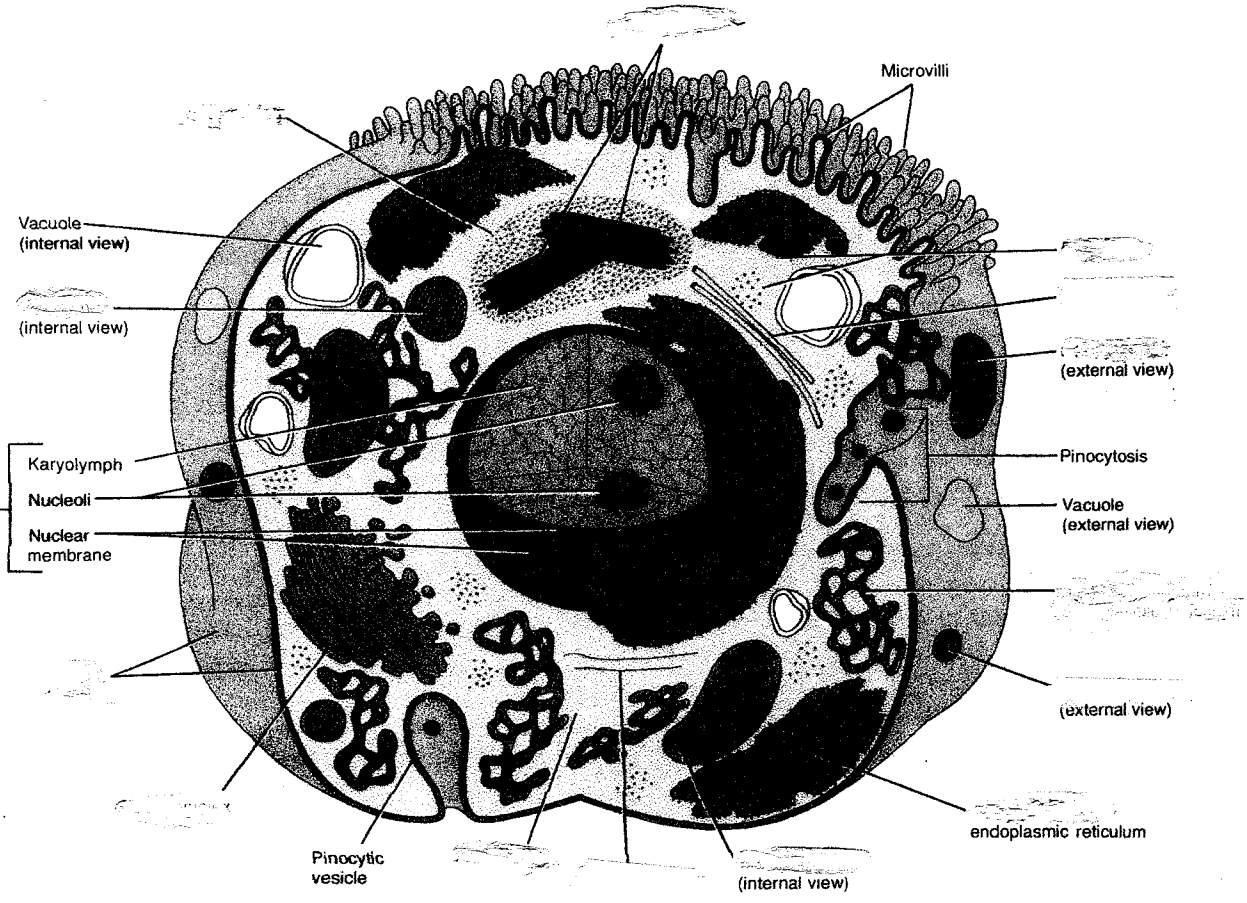
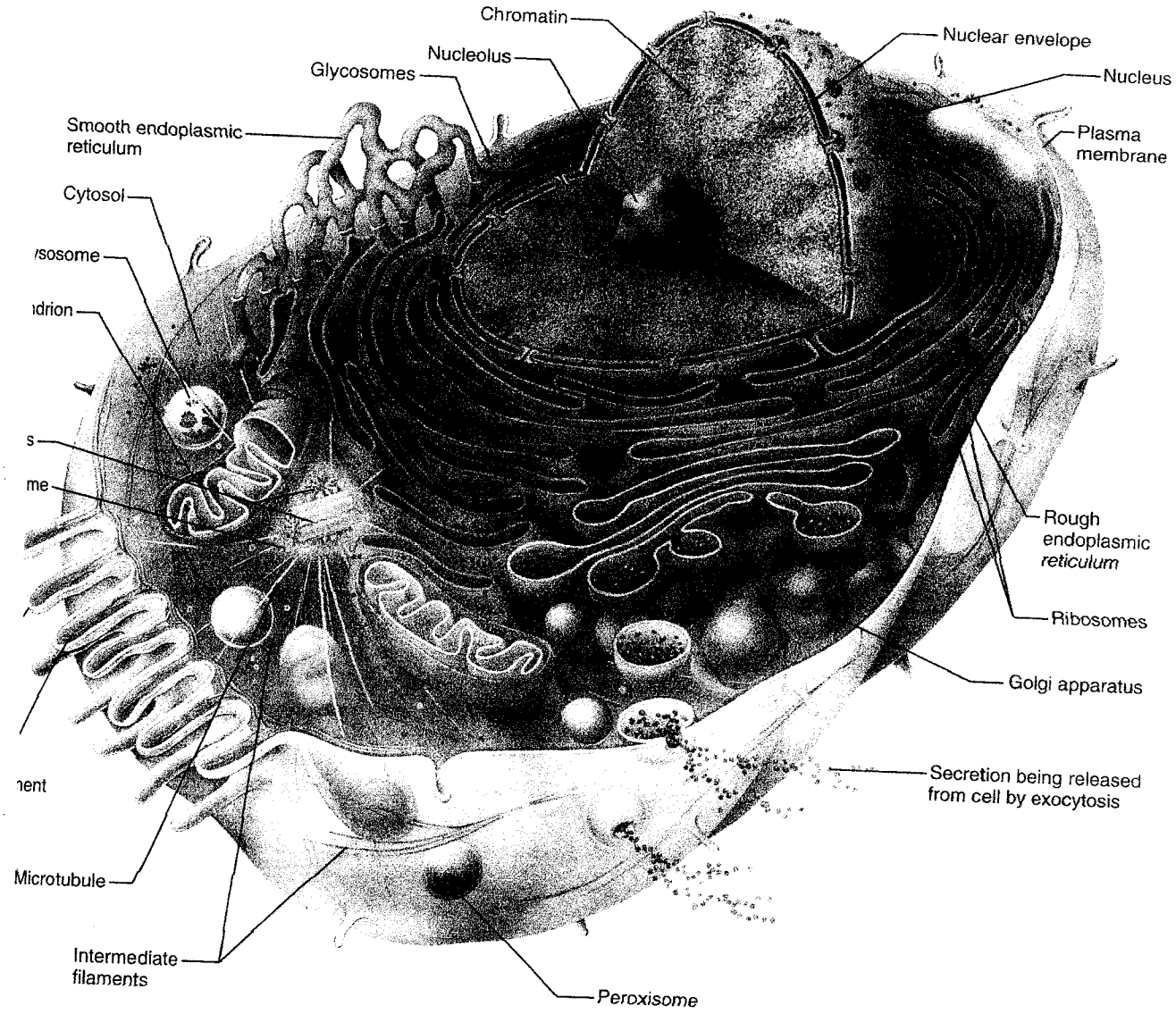


FIGURE 2-1 Generalized animal cell based on electron microscope studies.



3.1 ***Structure of the generalized cell.*** No cell is exactly like this one, ɔmposite illustrates features common to many human cells. Note that not ɔrganelles are drawn to the same scale in this illustration.

Teacher Copy

Quiz 091705Cells

1. Name the four nucleotides that form the DNA strand

A._____
B_____
C_____
D_____

2. Which nucleotide pairs with thymine in the DNA strand?

A. guanine
B adenine
C cytosine

3. What is ATP?

a. Adenosine Triphosphate
b Adinomine tiphosphate
c.Adinophine tripotassium

4. What is the function of ATP in the sodium/potassium pump?

_____

_____

5. How are the organelles ***most*** like the organs of the body?

A They function just like the organs of the larger organism
B They look just like the organs of the body
C They float in the cell just like our organs float inside our bodies

6.Cytosol is the solvent of the cell **T** **F**

7. The lysosomes are the digestive organelles of the cell **T** **F**

8.Mitosis is the way we create new cells for the body, the cell reproduction in sexual reproduction is called_____.

9. Which chemical bonds are easiest to break? Circle one **Ionic** or **Covalent**

10.Name 3 birth defects caused by gene anomalies

_____,_____,_____

11. Which organelle contains the genetic code of the cell?

_____

12. Humans have chloroplasts. **T** **F**

13. For 20 points explain the difference between ionic and covalent bonds_____

_____

_____

_____

_____

14. For 20 points please explain why we need salts in the body. Please include information about electrolytes.

_____

_____

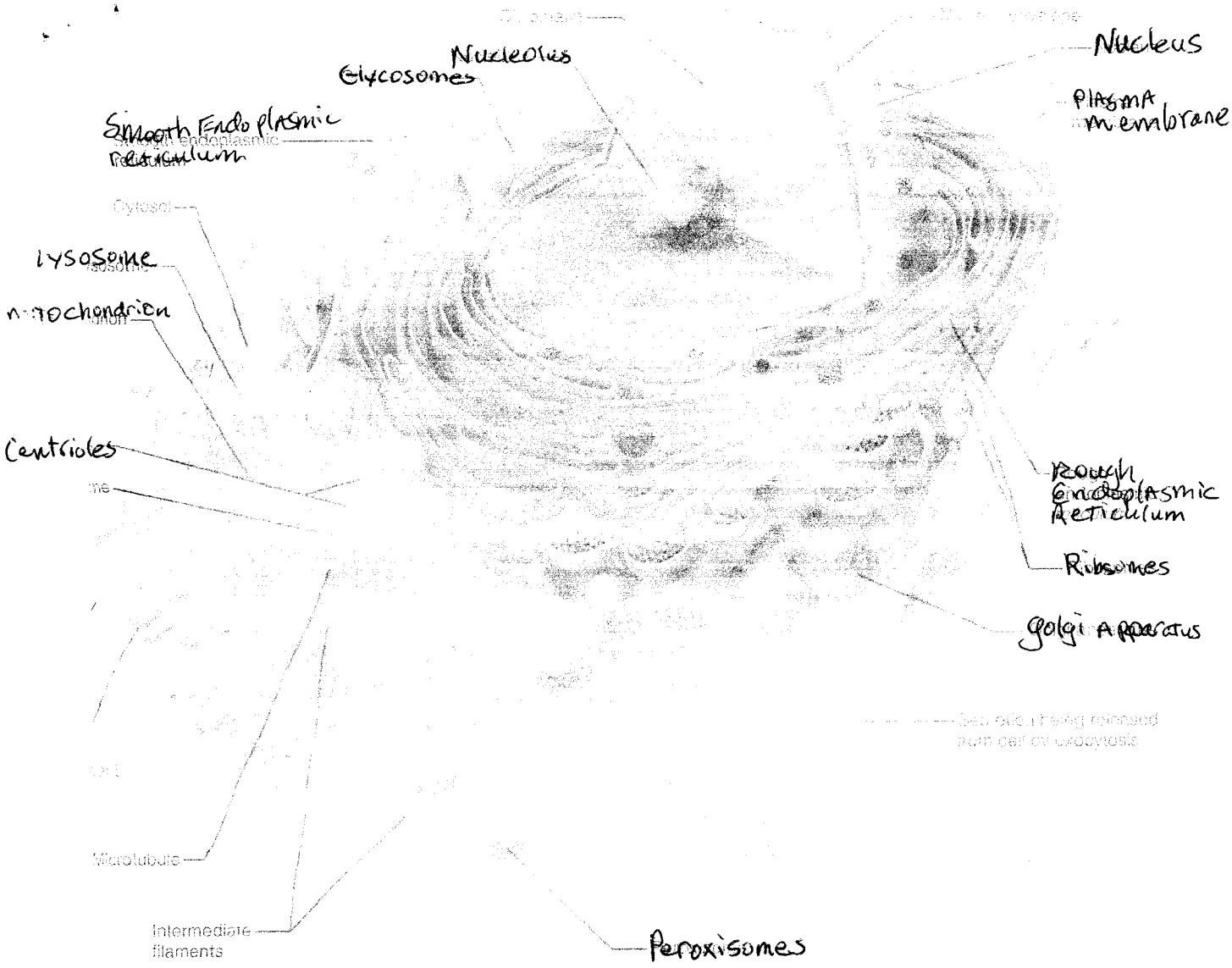
_____

_____

_____

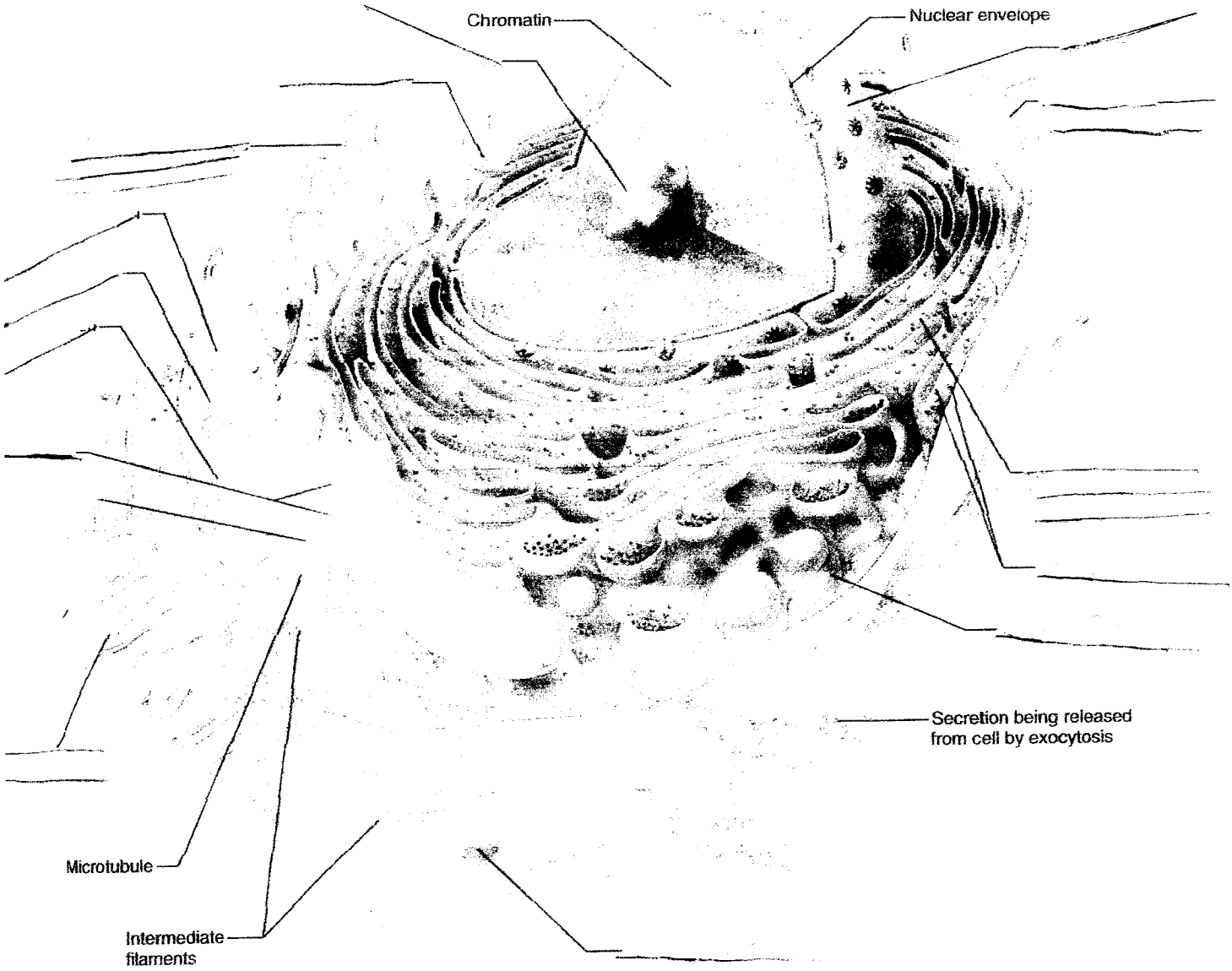
15. Which ion aids removal of carbon dioxide from the body?_____.

16. The PH for human blood is between _____ **&** _____.



5.1 *Structure of the generalized cell.* No cell is exactly like this, but this composite illustrates features common to many human cells. Note that not organelles are drawn to the same scale in this illustration.

Teacher Copy


Chromatin
Nuclear envelope
Secretion being released from cell by exocytosis
Microtubule
Intermediate filaments

The Cell

September 16, 2005

In Coloring Book:	p3	Cell and Organelles

In A&P Book:	p66-7	Cell and Organelles
	p68	Cell Membrane and Fluid Mosaic Model
	p73	Simple Diffusion and Facilitated Transport
	p76-7	Sodium/Potassium Pump
	p80	Use of ATP by cell
	p97	Cell Cycle: Mitosis
	p98	DNA Structure
	p100-1	Stages of Mitosis
	p102-4	RNA (mRNA, rRNA, tRNA)

ATP

energy rich compound used to drive a variety of reactions in the cell

breakdown of glucose is called cellular respiration

ATP generation occurs on the mitochondria within the cell on the folds of cristae. The knobs of ATPsynthase are the actual sites of ATP generation

(*Mitochondria are found on p84 n the A&P Book*)

ATPase is what is activated by the sodium-potassium pump

(*How the cell uses ATP can be found on p80 in the A&P Book*)

Cellular Replication with DNA and RNA by Mitosis

(*The cell cycle can be found on p97 and 100-101 in the A&P Book*)

DNA is the informational macromolecule. Its subunits are nonrandom and highly significant to their function

DNA is the repository of all genetic information for the cell

DNA uses itself as the blueprint for replicating more DNA

DNA is made up of 4 components:Adenine and Guanine (the purines) and Thymine and Cytosine (the pyrimidines).

The total number of A's and G's = the total number of C's and T's because they pair off to make up our genetic code

DNA is replicated during the "S" phase of Mitosis. Each daughter cell is an EXACT copy of the parent cell.

The DNA of mitochondria are specific to the mitochondria and are capable of replicating, transcribing and translating the info encoded by their own DNA

In a cell that is 35 micrometers in size, has enough DNA tightly coild within it to wrap itself around it's cell 15,000 times. To put that into english..... a cell 35 centimeters in size, has over 12 miles on DNA within it.

RNA is the cellular component that expresses DNA's information

Parts of the cell

Cytosol - a lot of water - all except the organelles.
Nucleus: The center and control of the cell, it is like the brain of the cell, it is where genetic material (DNA) is located, and RNA is transcribed.
Mitochondria - convert foods into usable energy. (ATP production) A mitochondrion does this through aerobic respiration. They have 2 membranes, the inner membranes shapes differ between different types of cells, but they form projections called cristae. The mitochondrion is about the size of bacteria, and it carries its own genetic material and ribosomes.

Cell Membrane protects the cell from the outside, it is like the skin and it also allows the cell self recognition, it recognizes like entities, other cells just like itself. The cell membrane is made of lipids with proteins floating about in it. This organ is critical for cellular function
Centrioles function in cell division, found only in animal cells, it is the sex organ of the cell
Lysosomes - Digestive sacks - the main point of digestion, these are only found in animal cells. They are the enzyme producing organs; if they burst they will destroy the cell or digest it from the inside out.
Ribosomes half are on the Endoplasmic Reticulum, the other half are 'free' in the cytosol, this is where the RNA goes for translation into protein, they are the organs that manufacture protein and are made of ribosomal RNA
Peroxisomes - Use oxygen to carry out catabolic reactions, in both plant and animals
Chloroplasts are the site for photosynthesis, - convert light/food into usable energy. (ATP production) Plants carry this animals don't
Endo plasmic reticulum Important for protein synthesis. It is a transport network for molecules destined for specific modifications and locations it is what fills the cell body, it has fibers that loop back & forth thru the cell it is where the ribosomes float in the cell. There are 2 types of ER, smooth and rough

> **Rough ER** - has ribosomes, and tends to be more in 'sheets'.
> **Smooth ER** - Does not have ribosomes and tends to be more of a tubular network.

The Golgi Body or Golgi Apparatus is the packager of the proteins of the cell it collects the proteins from the endoplasmic reticulum and sends it out into the cell body - important for glycosylation, secretion
There are other parts to cells but we will keep this very elemental because you do not need an extensive understanding of cells to perform massage.

DNA molecules consist of a double helix that resembles a twisted ladder. The uprights of the ladder are made of a chain of repeating nucleotides which are nitrogen based and also contain a sugar called dioxyribonose. The rungs of the ladder are comprised of connected pairings of the repeating nucleotides which are called Adenine, Cytosine, Thymine and Guanine. These will only pair up in certain sequences. These sequences are Guanine pairing to Cytosine and Thymine pairing to AdenineThese repeating nucleotides are also phosphates, and are the genes, or genetic code for reproduction

The cell pathology

Some birth defects are a result of genetic anomalies in the DNA. Some diseases and cancers are caused by genes that have gone haywire due to viruses implanting their own genetic codes into normal cells. Damaged genes can cause developmental problems in persons of all ages

Downs Syndrome, ,Angelmanns Syndrome and Prader Willie Syndrome are examples of a genetic misfiring which leaves out one gene or is represented as a damaged gene on just one side of the rung.

There are over 100 identified carcinogenic viruses.

The Epstein-Barr virus that causes mononucleosis has been linked to human cancers as has the Hepatitis B Virus (Liver Cancer) and the Herpes 2 Virus which is linked to cancer of the cervix and the uterus.

Cell Membrane: aka plasma membrane, permeable to exocytosis and endocytosis

True nucleus: comprised of nuclear envelope, nucleoplasm and nucleolus

Organelles: All the functional compartments within a cell such as: Smooth endoplasmic reticulum, Rough endoplasmic reticulum, Golgi complex, mitochondria, chloroplasts, lysosomes, peroxisomes, vacuoles, vesicles, centrioles, ribosomes

Microtubules and Microfilaments make up the cytoskeletal framework of the cell giving it its structure and elasticity

All cells:

1. Oxidize sugar for energy
2. Are surrounded by a selectively permeable membrane
3. Have ribosomes whose purpose is protein synthesis

Organelles: (*can be found on p66-68 in Anatomy and Physiology Book or p3 in the coloring book*)

plasma membrane: defines the cells boundary and retains its contents

nucleus: houses DNA and directs cellular activities

nucleoli: inside the nucleus, synthesizes subunits that make up ribosomes

mitochondrion: "powerhouse", chemical reactions involved in the oxidation of sugars and other cellular "fuel" occurs here

rough endoplasmic reticulum (RER): ribosomes make it rough, actively synthesizes proteins

smooth endoplasmic reticulum (SER): no ribosomes, synthesizes lipids, inactivates and detoxifies drugs etc that might be harmful to the cell

golgi complex: processing and packaging of secretory proteins and synthesizes complex polysaccharides, "processing station" of cell

lysosomes: stores enzymes capable of digesting specific biological molecules like proteins, carbohydrates or fats

peroxisomes: generates and degrades hydrogen peroxide which is toxic to the cell

vacuoles: frequently used for temporary storage or transport of different items that the cell has made

ribosomes: "workbench" for protein synthesis

cytoplasm: watery fluid that fills space between the plasma membrane and the nucleus

Semipermeable Membrane

membrane composed of a "sandwich" whose upper and lower buns are water loving.....but the guts of the sandwich hate water.....thus giving the cell some protection from everything passing thru "without permission"

passive transport (simple diffusion) of small things like oxygen, water and carbon dioxide allowed across the membrane without help

active transport is required for larger things like sodium, potassium, glucose, and proteins. This requires a carrier molecule.

The proteins protruding thru the cell membrane function as enzymes, transport molecules, electron carriers, and receptor sites for chemical signals

(*a diagram of simple diffusion and active transport is on p73 in our Anatomy and Physiology Book*)

Sodium-Potassium Pump

Sodium concentration is higher outside the cell and potassium concentration is higher inseide the cell

the equilibrium between the amount of sodium and potassium betwen the inside and the outside of the cell is VERY important.....the cell KEEPS it equal

the sodium-potassium pump stimulates the production of ATP (*figure 3.9 on p76 in A&P Book*)

mRNA (messenger RNA) provides the info that dictates the amino acid sequence

tRNA (transfer RNA) directs the correct amino acid to the next site

rRNA (ribosomal RNA) is the site of protein synthesis

RNA also uses DNA as the blueprint for replication, but substitutes uracil (a pyrimidine) in the place of thymine in its genetic code.

(*The structure of DNA can be found on p98 in the A&P Book, and info on RNA can be found on p102-104 in the A&P Book*)

Types of Cells

The major differences between Prokaryotic and Eukarotic cells are that prokaryotes don't have a nucleus and rarely have membrane bound organelles, (the only exception I have heard of is bacteria with vacuoles). The both do have DNA for genetic material, have a exterior membrane, have ribosomes, accomplish similar functions, and are very diverse. For instance, there are over 200 types of cells in the human body, that very greatly in size, shape, and function.

Prokaryotes:

- Prokaryotes are cells without a nucleus. They have genetic materials but are not enclosed within a membrane. These include bacteria and cyanophytes. The genetic material is a single circular DNA and is contained in the cytoplasm, since there is no nucleus. Recombination happens through transfers of plasmids (short circles of DNA that pass from one bacterium to another). They do not engulf solids nor do they have centrioles or asters.

Eukaryotes:

- These are cells with a nucleus, this is where the genetic material is surrounded by a membrane much like the cells membrane. Eucaryotic cells are found in humans and other multicellular organisms (plants and animals) also algae, protozoa. They have both a cellular membrane and a nuclear membrane, also the genetic material forms multiple chromosomes, that is linear and complexes with proteins that help it 'pack' and is involved in regulation.

Eukaryotes are composed of both plant and animal cells. Plants vary from animal cells in that they have large vacuoles, cell wall, chloroplasts, and a lack of Lysosomes, centrioles, pseudopods, and flagella or cilia. Animal cells do not have the chloroplasts, and may or may not have cilia, pseudopods or flagella, depending on the type of cell.

Meiosis is a process of nuclear division in cells that are reproductive cells. The second type of cell division is called mitosis. This is the process by which a single cell reproduces itself. Mitosis insures that each new daughter cell is an exact copy of its parent cell and that it has the same number of chromosomes and kind of chromosomes.

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Cell Biology

Cells are structural units that make up plants and animals, also there many single cell organisms. What cells all have in common is they are small 'sacks' composed mostly of water. The 'sacks' are made from a phospholipid bilayer. The membrane is semi-permeable (allowing some things to pass in or out of the cell and blocking others); there are also other methods of transport that we will get into later.

So what is in a cell? The cell as we mentioned is a fluid like membrane that surrounds the contents of the cell. Each component will be discussed in more detail later. Cells are 90% fluid (cytoplasm) which consists of free amino acids, proteins, glucose, and numerous other molecules. The cell environment (i.e. the contents of the cytoplasm, and the nucleus, as well as, they way the DNA is packed) affect the gene expression/regulations, and thus are VERY important parts of inheritance, below are approximations of other components:

What is interesting about Cell biology?

What makes cell biology particularly interesting is that there is so much that is not understood. Cells are a complex system in and of themselves. And when you add to an individual cell its environment, whether that is the single celled organism or multicellular, there is complex web reactions. One organism, like the human, can have the same genetic material in every cell, yet, there are over 200 types of cells in the human that are different shapes, sizes and carry out very different functions. And ALL of these cells were developed from **1 (one)** cell.

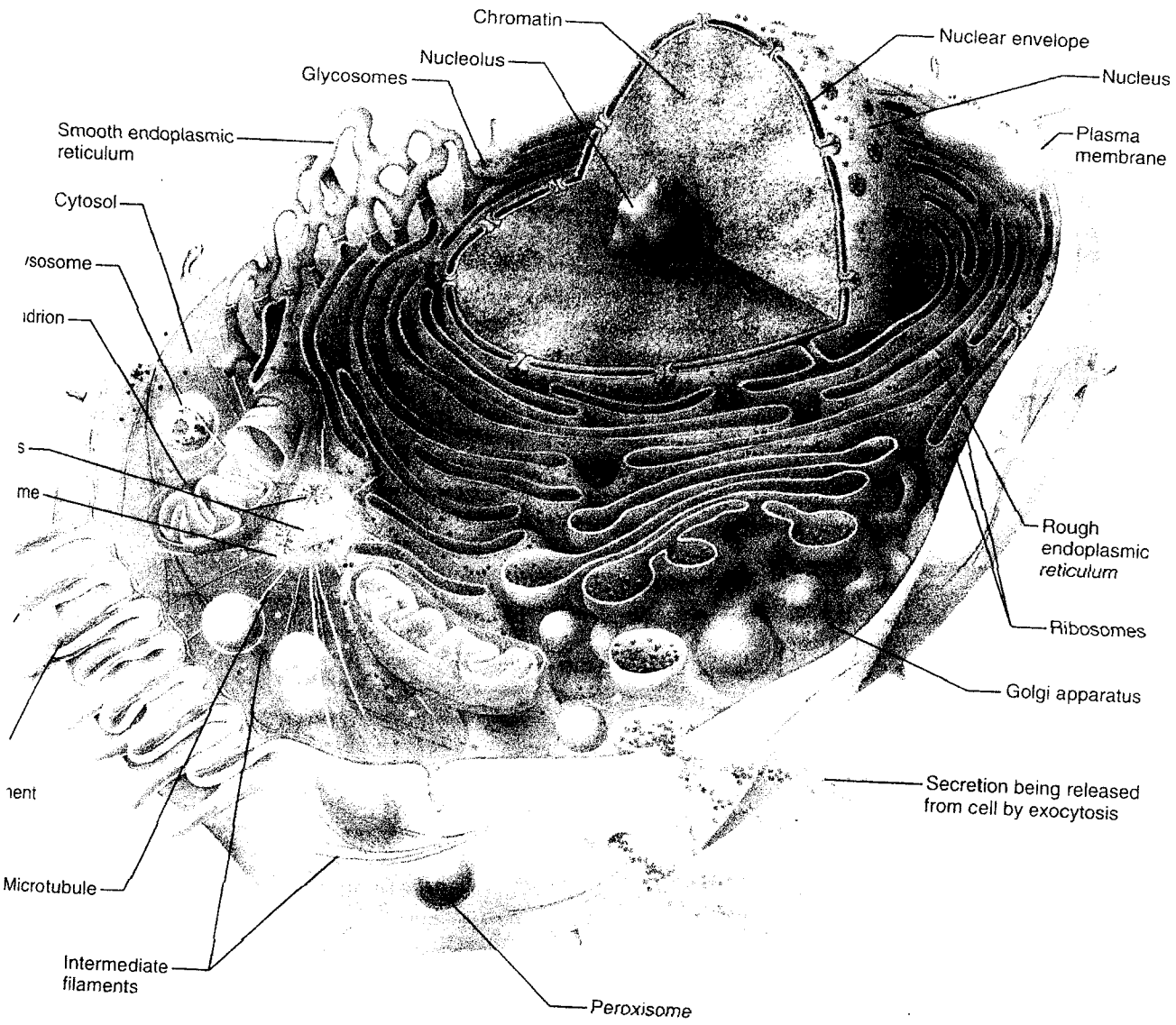
- Complexity
- Inter-relations of cells
- Intra-relations of cells
- The cell and its environment.
- Its ability to Live and reproduce.
- Its ability to grow and change.
- It is what makes up you and the food you eat.

Elements:

- 59% Hydrogen (H)
- 24% Oxygen (O)
- 11% Carbon (C)
- 4% Nitrogen (N)
- 2% Others - Phosphorus (P), Sulphur (S), etc.

As far as molecules that make up the cell:

- 50% protein
- 15% nucleic acid



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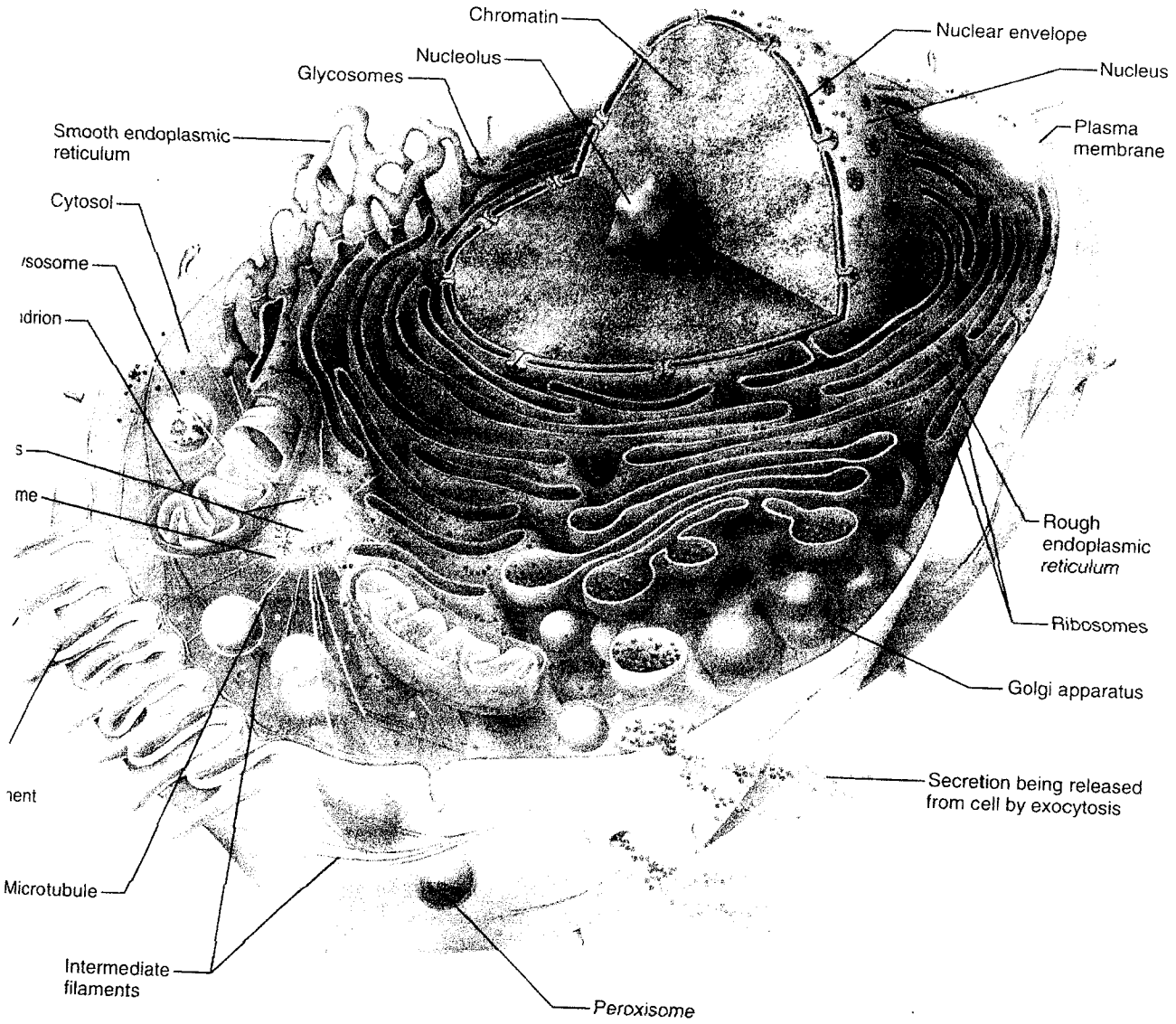

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