Cellular organization pdf

A cell is the smallest unit of a living organism, capable of self-reproduction. A bacterium consists of a single cell that can reproduce by itself. However, the virus does not contain enough material to form as a cell. It can replicate only within its host cell. Although a nerve cell looks completely different from a red blood cell (Figure 1-A-1), their organizations are largely the same. Plant cells and animal cells also share significant similarity in the overall organization. Figure 1-A-1. Comparison between a nerve cell and a red blood cell. Classification of cells and organisms All cells are divided into two categories: prokaryotic cells and eukaryotic cells: The prokaryotic cell has no nucleus. The eukaryotic cell contains a nucleus. Eukaryotes are the organisms that consist of eukaryotic cells. They include protista, fungi, animals and plants. Prokaryotes are single-celled organisms including bacteria and archaea. Archaea lives in extreme environments. Methanogens live in anaerobic environment like swamps. They produce methane and do not tolerate exposure to oxygen. Extreme halos live in very high concentrations of salt (NaCl), e.g. Extreme thermophiles live in warm, sulphur-rich and low pH environments, such as hot springs, geyers and fumaroles in Yellowstone National Park. Basic cellular components All cells share four common components: Plasma membraneis the cell membrane that separates the cell's interior from its surrounding environment. It consists of a phospholipid bilayer, proteins and carbohydrates. The phospholipid bilayer is also the basic component of other biomembranes. The cytoplasm includes all components inside the plasma membrane excluding the nucleus. The word cytosol refers to the cytoplasm excluding all organelles (the membrane-bound structures inside the cell). DNA (deoxyribonucleic acid) is the genetic material. A eukaryotic cell contains several DNA molecules, located in the nucleus and mitochondria that are membrane-bound organelles. A prokaryotic cell contains a single DNA molecule, which has no specific limit with the cytoplasm. Ribosomes are the places of synthesizing proteins. Updated May 29, 2019 By Maria Cook With the exception of single-celled organisms and very simple life forms, living things have complex bodies containing many functional parts. You can organize these parts into different levels of complexity or cellular organization. They range from the smallest, simplest functional units of living things to the largest and most complex. Most organisms have functional parts with five levels: cells, tissues, organs, organ systems and whole organisms. Cells hold genetic material and absorb external energy. Tissues make up the bones, nerves and connective fibers of the body. Organs work to perform specific bodily tasks, such as blood filtration. Organ systems are groups of organs that perform a specific type of function together, such as Together, these smaller systems form an entire living organism, which can grow, using energy and reproducing. Both plant and animal cells carry genetic material in the form of DNA. Without DNA, living things would not be able to pass on their individual characteristics or the properties of the species to the next generation. There are four main kinds of tissues found in animal carcasses. Epithelial tissues line the body cavities and surfaces, such as the inside of the stomach and the outermost layer of the skin. Connective tissue supports, protects and binds certain parts of the body, such as muscles, together. Senor, ligaments and cartilage are examples of connective tissue. Muscular tissue forms the muscles of the body. This tissue can contract and expand on specific ways to produce movement. Nerve tissue, such as that found in the central nervous system, can receive stimuli and conduct electrical impulses. Plants also have tissues. Dermal tissue forms the outer coatings of plants. Vascular tissue moves water and nutrients through the plant. Soil tissue makes up most of the plants' bodies and performs the majority of bodily functions, such as photosynthesis. Organs are structures, consisting of specific types of tissue, which perform specialized tasks in the body. For example, in many animals, the stomach breaks down food, and the heart pumps blood. In most animals, organs could not function properly without the brain, which regulates the activity of all organs in the body. Plants also have organs. Vegetative organs, such as roots and leaves, help maintain the life of the plant. Reproductive organs, such as cones, flowers and fruits are temporary structures that help facilitate either sexual or asexual reproduction. Organ systems are groups of two or more organs that work together to perform a specific function. People have 11 systems in their bodies. Among these are the digestive system (which consists of organs such as the stomach, colon and colon) that digest food, and the respiratory system (which consists of organs such as the nose, lungs and larynx) that makes breathing possible. Plants contain only two organ systems. The bulkhead system covers all parts above the ground, such as leaves and stems, while the root system covers all parts underground, such as roots and tubers. Organisms are whole, complete living things. Organisms can differ dramatically from one another in size and shape. For example, elephants and flowers are both organisms. But all organisms have some features in common. All living things have cells. They can reproduce and are capable of growth. They absorb nutrients, produce waste and can react to stimuli in their environment. These properties are true for both complex and simple living things and for both plants and animals. About the author Maria Cook is a freelance and fiction writer from Indianapolis, Indiana. She has an MFA in Creative Writing Butler University in Indianapolis. She has written about science in terms of environmentally friendly methods, conservation and the environment for green issues. Life exhibits varying levels of organization. Atoms are organized into molecules, molecules into organelles and organelles in cells, and so on. According to cell theory, everything living is composed of one or more cells, and the functions of a multicellular organism are a consequence of the types of cells it has. Cells fall into two broad groups: prokaryotes and eukaryotes. Prokaryotic cells are smaller (as a general rule) and lack much of the internal union enrollment and complexity of eukaryotic cells. No matter what type of cell we are considering, all cells have certain functions in common, such as a cell membrane, DNA and RNA, cytoplasm, and ribosomes. Eukaryotic cells have a large variety of organelles and structures. Cell size and shape | Back to top the forms of cells are quite variable with some, such as neurons, being longer than they are wide and others, such as parenchyma (a common type of plant cell) and erythrocytes (red blood cells) are equidimensional. Some cells are enclosed in a rigid wall, which limits their shape, while others have a flexible cell membrane (and no rigid cell wall). The size of cells is also related to their functions. Eggs (or using the Latin word, ova) are very large, often the largest cells an organism produces. The large size of many eggs is related to the development process that occurs after the egg is fertilized, when the contents of the egg (now called a zygote) are used in a rapid series of cellular divisions, each requiring huge amounts of energy found in the zygote cells. Later in life, energy must be acquired, but first a kind of inheritance/fund of energy is used. Cells range in size from small bacteria to large, unfertilized eggs as of birds and dinosaurs. The realsize ranges of biological things are shown in Figure 1. In science, we use the metric system for measurement. Here are some measurements and convesrions that will help your understanding of biology. 1 meter = 100 cm = 1 000 mm = 1 000 000 µm = 1 000 000 000 nm 1 centimenter (cm) = 1/100 meter = 10 mm 1 millimeter (mm) = 1/1000 meters = 1/1000 meters = 1 /1/1000 meters 10 cm 1 micrometer (µm) = 1/1 000 000 meters = 1/10 000 cm 1 nanometer (nm) = 1/1 000 000 000 meters = 1/10,000,000 cm Figure 1. Sizes of viruses, cells and organisms. Images from Purves et al., Life: The Science of Biology, 4th Edition, by Sinauer Associates (www.sinauer.com) and WH Freeman (www.whfreeman.com), are used with permission. Cell membrane | Back to the top the cell membrane acts as a semi-permeable barrier, allowing a very few molecules over it while fencing the majority of organically produced chemicals inside the cell. Electron microscopic investigations of cell membranes have led to the development of the lipid bilayer model (also called the fluid-mosaic model). It is Common molecule in the model is phospholipid, which has a polar (hydrophilic) head and two nonpolar (hydrophobic) tails. These phospholipids are aligned tail to tail so the nonpolar areas form a hydrophobic region between the hydrophilic heads on the inner and outer surfaces of the membrane. This layering is called a bilayer because an electron microscopic technique called freeze-cracking can share the bilayer, shown in Figure 2. Figure 2. Cell membranes from Opposing Neurons (TEM x436,740). This image is copyrightEd by Dennis Kunkel on www.DennisKunkel.com, used with permission. Cholesterol is another important component of cell membranes embedded in the hydrophobic areas of the inner (tail-tail) region. Most bacterial cell membranes do not contain cholesterol. Cholesterol aids in the flexibility of a cell membrane. Proteins, as shown in Figure 2, are suspended in the inner layer, although the more hydrophilic areas of these proteins protrude in the interior of cells as well as outside the cell. These proteins act as gateways that allow certain molecules to cross in and out of the cell by moving through open areas of the protein channel. These integrated proteins are sometimes called gateway proteins. The outer surface of the membrane tends to be rich in glycoids, which have their hydrophobic tails embedded in the hydrophobic region of the membrane and their heads are exposed outside the cell. These, along with carbohydrates attached to the integral proteins, are believed to work in the recognition of self, a kind of cellular identification system. The contents (both chemical and organelles) in the cell are referred to as protoplasm, and are further divided into cytoplasm (whole protoplasm except the contents of the nucleus) and nucleoplasm (all materials, plasma and DNA, etc., within the nucleus). Cell wall | Back to the Top Not all living things have cell walls, especially animals and many of the more animal-like protistans. Bacteria have cell walls containing the chemical peptidoglycan. Plant cells, as shown in Figures 3 and 4, have a variety of chemicals contained in their cell walls. Cellulose, a nondigestible (to humans anyway) polysaccharide is the most common chemical in the primary cell wall plant. Some plant cells also have lignin and other chemicals embedded in their secondary walls. The cell wall is outside the plasma membrane. Plasmodesmata are connections through which cells chemically communicate with each other through their thick walls. Fungi and many protists have cell walls even if they do not contain cellulose, rather a variety of chemicals (chitin for fungi). Animal cells, as shown in Figure 5, lack a cell wall, and must instead rely on their cell membrane to maintain cell integrity. Many protistans also lack cell walls, using various modified cell membranes o act as a limit to the inside of the cell. Figure 3. Structure of a typical plant cell. Image from Purves et al., The Science of Biology, 4th Edition, by Sinauer Associates (www.sinauer.com) and WH Freeman (www.whfreeman.com), is used with permission. Figure 4. Lily Parenchyma Cell (cross section) (TEM x7,210). Note the large nucleus and nucleoine in the center of the cell, the mitochondria and the plastides of the cytoplasm. This image is copyrightEd by Dennis Kunkel on www.DennisKunkel.com, used with permission. Figure 5. liver cell (TEM x9 400). This image is copyrighted By Dennis Kunkel. This image is copyrightEd by Dennis Kunkel on www.DennisKunkel.com, used with permission. Core | Back to the Top Nucleus, as shown in Figures 6 and 7, occurs only in eukaryotic cells. It is the site of most of the nucleic acids a cell makes, such as DNA and RNA. The Danish biologist Joachim Hammerling conducted an important experiment in 1943. His work (click here for a chart) showed the role of the core in controlling the shape and functions of the cell. Deoxyribonucleic acid, DNA, is the physical carrier of inheritance and with the exception of plastic DNA (cpDNA and mDNA, which is found in chloroplast and mitochondrial respectively) all DNA is limited to the nucleus. Ribonucleic acid , RNA, is formed in the nucleus using the DNA base sequence as a template. RNA moves out into the cytoplasm where it works in the assembly of proteins. The nucleus is an area of the nucleus (usually two nucleoli per nucleus) where ribosomes are constructed. Figure 6. Structure of the core. Note chromatin, uncooled DNA that occupies the space in the core envelope. Image from Purves et al., Life: The Science of Biology, 4th Edition, by Sinauer Associates (www.sinauer.com) and WH Freeman (www.whfreeman.com), used with permission. Figure 7. Liver cell nucleus and nucleol (TEM x20 740). Cytoplasm, mitochondria, endoplasmic reticulum, and ribosomes are also shown. This image is copyrightEd by Dennis Kunkel on www.DennisKunkel.com, used with permission. The core envelope, shown in Figure 8, is a double membrane structure. Many pores appear in the envelope, allowing RNA and other chemicals to pass through, but DNA does not pass. Structure of the nuclear envelope and nuclear pores. Image from Purves et al., Life: The Science of Biology, 4th Edition, by Sinauer Associates (www.sinauer.com) and WH Freeman (www.whfreeman.com), used with permission. Figure 9. Nucleus with nuclear pores (TEM x73,200). The cytoplasm also contains several ribosomes. This image is copyrightEd by Dennis Kunkel on www.DennisKunkel.com, used with permission. Cytoplasm | Back to The Top Cytoplasm was previously defined as the material between the plasma membrane (cell membrane) and the core envelope. Fibrous proteins found in the cytoplasm, called the cytoskeleton, maintain the shape of the cell and anchor organelles, move the cell and control the internal movement of structures. Elements such as the competocyskeleton are shown in Figure 10. Microtubules work in cell division and act as a scaffolding for other organelles. Actin filaments are thin strands that work in cell division and cell motility. Intermediate filaments are between the size of the microtubules and the actinfilament. Figure 10. Actin and tubuline components of the cytoskeleton. Image from Purves et al., Life: The Science of Biology, 4th Edition, by Sinauer Associates (www.sinauer.com) and WH Freeman (www.whfreeman.com), used with permission. Vacuoles and vesicles | Back to Top Vacuoles are single membrane organelles that are essentially part of the outside located within the cell. The only membrane is known in plant cells as a tonoplast. Many organisms will use vacuoles as storage spaces. Vesicles are much smaller than vacuoles and function in transporting materials both within and to the outside of the cell. Ribosomes | Back to Top Ribosomes are the sites of protein synthesis. They are not membrane-bound and thus occur in both prokaryotes and eukaryotes. Eukaryotic ribosomes are slightly larger than prokaryotic. Structurally, the ribosome consists of a small and larger subunit, as shown in Figure 11. . Biochemically, the ribosome consists of ribosomal RNA (rRNA) and about 50 structural proteins. Often ribosomes cluster on endoplasmic reticulum, in which case they resemble a series of factories adjacent to a railway line. Figure 12 illustrates the many ribosomes attached to endoplasmic reticulum. Click here for Ribosomes (More than you ever wanted to know about ribosomes!) Figure 11. Structure of the ribosome. Image from Purves et al., Life: The Science of Biology, 4th Edition, by Sinauer Associates (www.sinauer.com) and WH Freeman (www.whfreeman.com), used with permission. Figure 12. Ribosomes and Polyribosomes - liver cell (TEM x173,400). This image is copyrightEd by Dennis Kunkel on www.DennisKunkel.com, used with permission. Endoplasmic reticulum | Back to Top Endoplamic Mesh, as shown in Figures 13 and 14, is a network of interconnected membranes that serves a function involving protein synthesis and transport. Coarse endoplasmic reticulum (Rough ER) is so-named because of its rough appearance due to the many ribosomes that occur along the ER. Rough ER connects to the core envelope through which the messenger RNA (mRNA) which is the blueprint for proteins travels to the ribosomes. Smooth ER; lacks the ribosomes characteristic of Rough ER and is believed to be involved in transport and a host of other functions. Figure 13. Endoplamic reticulum. Coarse endoplasmic reticulum is on the left, smooth endoplasmic reticulum is on the right. Image from Purves et al., Life: The Science of Biology, 4th Edition, by Sinauer Associates (www.sinauer.com) and WH Freeman (www.whfreeman.com), used with permission. Figure 14. Rough Endoplasmic Reticulum with Ribosomes (TEM x61,560). This image is copyrightEd by Dennis Kunkel on www.DennisKunkel.com, used with permission. Golgi Apparatus and Dictyosomes | Back to Top Golgi Complexes, shown in Figure 15 16, are flattened stacks of membrane-bound sacks. Italian biologist Camillo Golgi discovered these structures in the late 1890s, although their exact role in the cell was not deciphered until the mid-20th century. Golgi function as a packing plant, modifying vesicles produced by coarse endoplasmic reticulum. New membrane material is mounted in different cisternae (layers) of golgien. Figure 15. Structure of the Golgi apparatus and its function in vesicle-mediated transport. Images from Purves et al., Life: The Science of Biology, 4th Edition, by Sinauer Associates (www.sinauer.com) and WH Freeman (www.whfreeman.com), are used with permission. Figure 16. Golgi Apparatus in a plant parenchyma cell from Sauromatum guttatum (TEM x145,700). Note the many vesicles near Golgi. This image is copyrightEd by Dennis Kunkel on www.DennisKunkel.com, used with permission. Lysosomes | Back to Top Lysosomes, as shown in Figure 17, relatively large vesicles are formed by Golgi. They contain hydrolytic enzymes that can destroy the cell. The contents of the lysosome function in the extracellular degradation of the materials. Figure 17. Role of Golgien in forming lysosomes. Image from Purves et al., Life: The Science of Biology, 4th Edition, by Sinauer Associates (www.sinauer.com) and WH Freeman (www.whfreeman.com), used with permission. Mitochondria | Back to Top Mitochondria contains its own DNA (called mDNA) and is believed to represent bacteria-like organisms incorporated into eukaryotic cells over 700 million years ago (perhaps even as far back as 1.5 billion years ago). They act as the sites of energy release (after glycolysis in the cytoplasm) and ATP formation (through chemiosmosis). Mitochondria have been called the cell powerhouse. The mitochondria are separated by two membranes. The inner membrane is folded into a series of cristae, which are the surfaces on which adenosine triphosphate (ATP) is generated. The matrix is the area of mitochondria surrounded by the inner mitochondrial membrane. Ribosomes and mitochondrial DNA are found in the matrix. The significance of these features will be discussed below. The structure of the mitochondria is shown in Figures 18 and 19. Figure 18. Structure of a mitochondrial. Note the various infoldings of mitochondrial internal membranes that produce cristae. Image from Purves et al., Life: The Science of Biology, 4th Edition, by Sinauer Associates (www.sinauer.com) and WH Freeman (www.whfreeman.com), used with permission. Figure 19. Muscle cell mitochondria (TEM x190,920). This image is copyrightEd by Dennis Kunkel on www.DennisKunkel.com, used with permission. Mitochondria and endosymbiosis In the 1980s, Lynn Margulis proposed the theory of endosymbiosis to explain the origins of the mitochondria and chloroplasts from permanent resident prokaryotes. According to this idea, a larger prokaryot (or perhaps early eukaryote) engulfed or surrounded a smaller prokaryote about 1.5 billion to 700 million years ago. Steps in this illustrated in Figure 20. Figure 20. The basic events of endosymbiosis. Image from Purves et al., Life: The Science of Biology, 4th Edition, by Sinauer Associates (www.sinauer.com) and WH Freeman (www.whfreeman.com), used with permission. Instead of melting the smaller organisms the large and the smaller into a type of symbiosis called mutualism, in which both organisms benefit and neither are damaged. The larger organism received excess ATP provided by protomitochondrion and excess sugar provided by protochloroplast, while maintaining a stable environment and the raw materials required. This is so strong that now eukaryotic cells cannot survive without mitochondria (likewise photosynthetic eukaryotes cannot survive without chloroplasts), and the endosymbionts cannot survive beyond their hosts. Almost all eukaryotes have mitochondria. Mitochondrial division is remarkably similar to the prokaryotic methods that will be studied later in this course. A summary of the theory is available by clicking here. Plastids | Back to Top Plastids are also membrane-bound organelles that occur only in plants and photosynthetic eukaryotes. Leucoplasts, also known as amyloplasts (and shown in Figure 21) store starch, as well as sometimes protein or oils. Chromoplasts store pigments associated with the bright colors of flowers and / or fruits. Chloroplasts, illustrated in figures 22 and 23, are the locations of photosynthesis in eukaryotes. They contain chlorophyll, the green pigment required for photosynthesis to occur, and associated accessory pigments (carotenes and xanthophylls) in photosystems embedded in membranous sacs, thylacoids (collectively a stack of thylacoids is a granum [plural=grana]) floating in a liquid called stroma. Chloroplasts contain many different types of accessory pigments, depending on the taxonomic group of the organism being observed. Figure 22. Structure of chloroplasten. Image from Purves et al., Life: The Science of Biology, 4th Edition, by Sinauer Associates (www.sinauer.com) and WH Freeman (www.whfreeman.com), used with permission. Figure 23. Chloroplast from red alga (Griffthsia spp.). x5,755--(Based on a 1-inch image size in the narrow dimension). This image is copyrightEd by Dennis Kunkel on www.DennisKunkel.com, used with permission. Chloroplasts and endosymbiosis Like mitochondria, chloroplasts have their own DNA, called cpDNA. Chloroplasts of green algae (Protista) and plants (descendants of some of the green algae) are believed to have originated in endosymbiosis of a prokaryotic alga similar to living Prochloron (the only genus found in Prochlorobacteria, shown in Figure 24). Chloroplasts of red algae (Protista) are very similar biochemically to cyanobacteria (also known as blue-green bacteria [algae to chronologically improved people staunchly improved people that I myself :)]). Endosymbiosis is also cited for this similarity, perhaps indicating more than one endosymbiotic event occurred. 24. Prochloride, a photosynthetic bacteria, reveals the presence of many thylacoids in the transmission electron micrograph on the left. Prochloride is found in long filaments, as shown by the light micrograph on the right below. Image from wilsonkg/bot191/mouseth/m19p32.jpg. Cell movement | Back to Top Cell movement; is both internal, called cytoplasmic fluid, and external, called motility. Internal movements of organelles are controlled by actinfilaments and other components of the cytoskeleton. These filaments make an area where organelles like chloroplasts can move. Internal motion is called cytoplasmic streaming. External movement of cells is determined by special organelles for movement. The cytoskeleton is a network of connected filaments and tubules. It extends from the nucleus to the plasma membrane. Electron microscopic studies showed the presence of an organized cytoplasm. Immunofluorescence microscopy identifies protein fibers as a major part of this cellular function. The cytoskeleton components maintain the cell shape and allow the cell and its organelles to move. Actin filaments, as shown in Figure 25, are long, thin fibers about seven nm in diameter. These filaments occur in bundles or meshlike networks. These filaments are polar, which means that there are differences between the ends of the string. An actin filament consists of two chains of globular actin monomers twisted to form a helix. Actin filaments play a structural role, forming a dense complex web just below the plasma membrane. Actin filaments in the microvilli of intestinal cells act to shorten the cell and thus to pull it out of the intestinal lumen. Similarly, the filaments can lengthen the cell in the intestine when food is to be absorbed. In plant cells, actinfilaments form tracts along which chloroplasts circulate. Actin filaments move by interacting with myosin, the myosin combines with and parts ATP, thus binding to act and change the configuration to pull the actin filament forward. Similar actions account for the pinch of cells during cell division and for amoeboid movement. Figure 25. Skeletal muscle fiber with exposed intracellular actin myosin filaments. The muscle fiber was cut perpendicular to its length to expose the intracellular actin myosin filaments. SEM X220. This image is copyrightEd by Dennis Kunkel on www.DennisKunkel.com, used with permission. Medium filaments are between eight and eleven nm in diameter. They are between actin filaments and microtubules in size. The intermediate fibers are rope-like assemblies of fibrous polypeptides. Some of them support the core envelope, while others support the plasma membrane, forming cell-to-cell junctions. Microtubules are small hollow cylinders (25 nm in diameter and from 200 nm-25 µm in length). These microtubules are composed of a globular protein tubulin. The assembly brings together the two types of tubules (alpha and beta) that dim, which arrange in rows. In animal cells and most protists, a structure called a centrosome occurs. Centrosome contains two centriols that are at right angles to each other. Centrioles are short cylinders with a 9+ 0 pattern of microtubules triplets. Centrioles act as basal organs for cilia and flagella. Plant and fungal cells have a structure equivalent to a centrosome, although it does not contain centrioles. Cilia are short, usually many, hair-like projections that can move in an undulating way (e.g. protzoan Paramecium, the cells lining the upper airways of man). Flagella is longer, usually fewer in number, projections that move in whip-like fashion (e.g. sperm). Cilia and flagella are similar except length, cilia are much shorter. They both have the characteristic 9+ 2 arrangement of microtubules as shown in Figure 26. Figure 26. Cilia from a cross-sectional epithelial cell (TEM x199 500). Note the 9 + 2 arrangement of cilia. This image is copyrightEd by Dennis Kunkel on www.DennisKunkel.com, used with permission. Cilia and flagella move as microtubules glide past each other. Both oif these locomotion structures have a basal body at the base with the same arrangement of microtubules as centrioles. Cilia and flagella grow by adding tubulin dimers to their tips. Flagella work as whips pull (as in Chlamydomonas or Halosphaera) or pressing (dinoflagellates, a group of single-celled Protista) organism through the water. Cilia work as oars on a Viking longship (Paramecium has 17,000 such oars covering its outer surface). The movement of these structures is shown in Figure 27. Figure 27. Movement of cilia and flagella. Image from Purves et al., Life: The Science of Biology, 4th Edition, by Sinauer Associates (www.sinauer.com) and WH Freeman (www.whfreeman.com), used with permission. Not all cells use cilia or flagella for movement. Some, such as Amoeba, Chaos (Pelomyxa) and human leukocytes (white blood cells), employ pseudopodia to move the cell. Unlike cilia and flagella, pseudopodia are not structures, but rather associated with actin near the moving edge of the cell. The formation of a pseudopod is shown in figure 28. Figure 28. Formation and function of a pseudopod of an amoeboid cell. Image from Purves et al., Life: The Science of Biology, 4th Edition, by Sinauer Associates (www.sinauer.com) and WH Freeman (www.whfreeman.com), used with permission. Learning outcomes | Back to The Top Give the function and cellular location of the following basic eukaryotic organelles and structures: cell membranes, nucleus, endoplasmatic reticulum, Golgi organs, lysosomes, mitochondria, ribosomes, chloroplasts, vacuoles, and cell walls. A micrometer is one millionth of a meter long. A nanometer is one billionth of a meter long. How many micrometers are you? Describe the function of the core envelope and nucleose. Describe the details of the structure of chloroplast, the location of photosynthesis. living plant cells often have a large, fluid-filled central vacuole that can store amino acids, sugars, ions, and toxic waste. Animal cells generally lack large vacuoles. How do animal cells perform these functions? Microtubules, microfilaments, and intermediate filaments are all main components of the cytoskeleton. Flagella and cilia push eukaryotic cells through their environment; microtubules in these organelles is a 9+2 array. Conditions | Back to Top Review Questions | Back to top There are ____ microns (µm) in one millimeter (mm). (a) (a) (a), (b) 10, (c) 100, (d) 1000; e) 1/1000 Human cells have a size range between ___ and ___ microns (µm). a) 10-100; b) 1-10; c) 100-1000; d) 1/10-1/1000 Chloroplasts and bacteria are ___ in size. (a) similar, (b) at different ends of the size range, (c) exactly the same, (d) none of them. The plasma membrane does all of these except ______. a) contains the hereditary material; b) acts as a limit or limit of the cytoplasm, c) regulates the passage of material in and out of the cell; d) functions in the recognition of self Which of these materials is not an important component of the plasma membrane? (a) phospholipids; (b) glycoproteins; c) proteins; d) DNA cell walls are found in members of these kingdoms, with the exception of ___, all of which lack cell walls. (a) plants, (b) animals, (c) bacteria; d) fungi The polysaccharide ___ is an important part of flat cell walls. a) chitin; b) peptidoglykan; c) cellulose, (d) mannitol, (e) cholesterol Plant cells have ___ and ___, which do not occur in animal cells. (a) mitochondria, chloroplasts, (b) cell membranes, cell walls; (c) chloroplasts, core; d) chloroplasts, cell wall The ___ is the membrane enclosed structure of eukaryotic cells containing DNA in the cell. (a) mitochondria, (b) chloroplasts, (c) nucleolus; d) nucleus Ribosomes are constructed in the ___. (a) endoplasmic reticulum, (b) nucleoid; c) nucleolus; d) nuclei Rough endoplasmic reticulum is the area of a cell where ___ is synthesized. a) polysaccharides, b) proteins, c) lipids; d) DNA The smooth endoplasmic reticulumist is the area of a cell where ___ is synthesized. a) polysaccharides, b) proteins, c) lipids; d) DNA Mitochondria works in ____. a) lipid storage; b) protein synthesis; c) photosynthesis; d) DNA replication; e) ATP synthesis The thin extensions of the inner mitochondrial membrane are known as _____. a) cristae; (b) matrix, (c) tylakoids; (d) stroma Chloroplast features in

____. a) lipid storage; b) protein synthesis; c) photosynthesis; d) DNA replication; e) ATP synthesis Which of these cellular organelles has its own DNA? (a) chloroplast, (b) core; (c) mitochondrial; d) all these theory of ___ was proposed to explain the possible origin of chloroplasts and mitochondria. a) evolution, (b) endosymbiosis; c) endocytosis; d) cells Long, whiplike microfibrils that facilitate movement through cells are known as ___. (a) cilia, (b) flagella, (c) leather; (d) pseudopodia Links | to Top References | Back to Top Text Back to Table of Contents | Go to TRANSPORT IN AND OUT OF CELLS Email: Last modified: The URL of this page is: is: is: