2 The chemistry of living things

1. All mater consists of elements
    - *Atoms are the smallest functional units of an element*
    - *Isotopes have a different number of neutrons*
2. Atoms combine to form molecules
    - *Energy fuels life's activities*
    - *Chemical bonds link atoms to form molecules*
    - *Living organisms contain only certain elements*
3. Life depends on water
    - *Water is the biological solvent*
    - *Water helps regulate body temperature*
4. The importance of hydrogen ions
    - *Acids donate hydrogen ions, bases accept them*
    - *The pH scale expresses hydrogen ion concentration*
    - *Buffers minimize changes in pH*
5. The organic molecules of living organisms
    - *Carbon is the common building block of organic molecules*
    - *Macromolecules are synthesized and broken down within the cell*
6. Carbohydrates: Used for energy and structural support
    - *Monosaccharides are simple sugars*
    - *Oligosaccharides: More than one monosaccharide linked together*
    - *Polysaccharides store energy*
7. Lipids: Insoluble in water
    - *Tryglycerides are energy-storage molecules*
    - *Phospholipids are the primary component of cell membranes*
    - *Steroids are composed of four rings*
8. Proteins: Complex structures constructed of amino acids
    - *Protein function depends on structure*
    - *Enzymes facilitate biochemical reactions*
9. Nucleic acids store genetic information
10. ATP carries energy

⇒ CURRENT ISSUE: Functional foods and dietary supplements – Safe and effective?
⇒ MJ'S HUMAN BIOLOGY BLOG: I don't hear you…
⇒ MJ'S HUMAN BIOLOGY BLOG: Getting that caffeine buzz

3 Structure and function of cell

1. Cells are classified according to their internal organization
    - *Eukaryotes have nucleus, cytoplasm and organelles*
    - *Prokaryotes lack a nucleus and organelles*
2. Cell structure reflects cell function
    - *Cells remain small to stay efficient*
3. A plasma membrane surrounds the cell
    - *The plasma membrane is a lipid bilayer*
4. Molecules cross the plasma membrane in several ways
    - *Passive transport: Principles of diffusion and osmosis*
    - *Passive transport moves with the concentration gradient*
    - *Active transport requires energy*
    - *Endocytosis and exocytosis move materials in bulk*
    - *Information can be transferred across the plasma membrane*
    - *The sodium-potassium pump helps maintain cell volume*
    - *Isotonic extracellular fluid also maintains cell volume*
5. Internal structures carry out specific functions
    - *The nucleus controls the cell*
    - *Ribosomes are responsible for protein synthesis*
    - *The endoplasmic reticulum is the manufacturing center*
    - *The Golgi apparatus refines, packages and ships*
    - *Vesicles: Membrane –bound storage and shipping containers*
    - *Mitochondria provide energy*
    - *Fat and glycogen: Sources of energy*
6. Cells have structures for support and movement
    - *The cytoskeleton supports the cell*
    - *Cilia and flagella are specialized in cell dividion*
7. Cells use and transform matter and energy
    - *Glucose provides the cell with energy*
    - *Fats and proteins are additional energy sources*
    - *Anaerobic pathways make energy available without oxygen*

⇒ CURRENT ISSUE: The use of human stem cells
⇒ MJ'S HUMAN BIOLOGY BLOG: Stem cell therapy for Parkinson's?
⇒ MJ'S HUMAN BIOLOGY BLOG: Birth dating human cells

4 From cells to organ systems

1. Tissues are groups of cells with a common function
2. Epithelial tissues cover body surfaces and cavities
    - *Epithelial tissues are classified according to cell shape*
    - *The basement membrane provides structural support*
3. Connective tissue supports and connects body parts
    - *Fibrous connective tissues provide strength and elasticity*
    - *Specialized connective tissues serve special functions*
4. Muscle tissues contract to produce movement
    - *Skeletal muscles move body parts*
    - *Cardiac muscle cells activate each other*
    - *Smooth muscle surrounds hollow structures*
5. Nervous tissue transmits impulses
6. Organs and organ systems perform complex functions
    - *The human body is organized by organ systems*
    - *Tissue membranes line body cavities*
    - *Describing body position or direction*
7. The skin as an organ system
    - *Skin has many functions*
    - *Skin consists of epidermis and dermis*
8. Multicellular organisms must maintain homeostasis
    - *Homeostasis is maintained by negative feedback*
    - *Negative feedback helps maintain core body temperature*
    - *Positive feedback amplified events*

⇒ CURRENT ISSUE: Can lipodissolve melt away fat?
⇒ MJ'S HUMAN BIOLOGY BLOG: My mother's cells within me
⇒ MJ'S HUMAN BIOLOGY BLOG: Fat cells are replaced throughout life
⇒ HEALTH & WELLNESS: Suntans, smoking and your skin

5 The skeletal system

1. The skeletal system consists of connective tissue
    - *Bones are the hard elements of the skeleton*
    - *Bone contains living cells*
    - *Ligaments hold bones together*
    - *Cartilage lends support*
2. Bone development begins in the embryo
3. Mature bone undergoes remodeling and repair
    - *Bones can change in shape, size and strength*
    - *Bone cells are regulated by hormones*
    - *Bones undergo repair*
4. The skeleton protects, supports and permits movement
    - *The axial skeleton forms the midline of the body*
    - *The appendicular skeleton: Pectoral girdle, pelvic girdle and limbs*
5. Joints form connections between bones
    - *Joints vary from immovable to freely movable*
    - *Ligaments, tendons and muscles strengthen and stabilize joints*
6. Diseases and disorders of the skeletal system
    - *Sprains mean damage to ligaments*
    - *Bursitis and tendinitis are caused by inflammation*
    - *Arthritis is inflammation joints*
    - *Osteoporosis is caused by excessive bone loss*

⇒ CURRENT ISSUE: A black market in human bones?
⇒ MJ'S HUMAN BIOLOGY BLOG: A really costly drug
⇒ MJ'S HUMAN BIOLOGY BLOG: Is running hard on knees?
⇒ HEALTH & WELLNESS: Treating a sprained ankle
⇒ MJ'S HUMAN BIOLOGY BLOG: Treating "Pre-osteoporosis"

6 The muscular system

1. Muscles produce movement or generate tension
    - *The fundamental activity of muscle is contraction*
    - *Skeletal muscles cause bones to move*
    - *A muscle is composed of many muscle cells*
    - *The contractile unit is a sarcomere*
2. Individual muscle cells contract and relax
    - *Nerves activate skeletal muscles*
    - *Activation releases calcium*
    - *Calcium initiates the sliding filament mechanism*
    - *When nerve activation ends, contraction ends*
    - *Muscles require energy to contract and to relax*
3. The activity of muscles can vary
    - *Isotonic versus isometric contractions: Movements versus static position*
    - *The degree of nerve activation influences force*
    - *Slow-twitch versus fast-twitch fibers: Endurance versus strength*
    - *Exercise training improves muscle mass, strength and endurance*
4. Cardiac and smooth muscles have special features
    - *How cardiac and smooth muscles are activated*
    - *Speed and sustainability of contraction*
    - *Arrangement of myosin and actin filaments*
5. Diseases and disorders of the muscular system
    - *Muscular dystrophy*
    - *Tetanus*
    - *Muscle cramps*
    - *Pulled muscles*
    - *Fasciitis*

⇒ CURRENT ISSUE: Drug abuse among athletes
⇒ MJ'S HUMAN BIOLOGY BLOG: New drug test for athletes
⇒ HEALTH & WELLNESS: Delayed onset muscle soreness
⇒ MJ'S HUMAN BIOLOGY BLOG: Beating the Testosterone doping test
⇒ MJ'S HUMAN BIOLOGY BLOG: Stretching and sport injuries

7 Blood

1. The components and functions of blood
    - *Plasma consists of water and dissolved solutes*
    - *Red blood cells transport oxygen and carbon dioxide*
    - *Hematocrit and hemoglobin reflect oxygen-carrying capacity*
    - *All blood cells and platelets originate from stem cells*
    - *RBC's have a short life span*
    - *RBC production is regulated by a hormone*
    - *White blood cells defend the body*
    - *Platelets are essential for blood clotting*
2. Hemostasis: Stopping blood loss
    - *Vascular spasms constrict blood vessels to reduce blood flow*
    - *Platelets stick together to seal a ruptured vessel*
    - *A blood clot forms around the platelet plug*
3. Human blood types
    - *ABO blood typing is based on A and B antigens*
    - *Rh blood typing is based on Rh factor*
    - *Blood typing and cross-matching ensure blood compatibility*
4. Blood disorders
    - *Blood poisoning: Infection of blood plasma*
    - *Mononucleosis: contagious viral infection of lymphocytes*
    - *Anemia: Reduction in blood's oxygen-carrying capacity*
    - *Leukemia: uncontrolled production of white blood cells*
    - *Multiple myeloma: Uncontrolled production of plasma cells*
    - *Thrombocytopenia: Reduction in platelet number*

⇒ CURRENT ISSUE: Should you bank your baby's cord blood?
⇒ MJ'S HUMAN BIOLOGY BLOG: The spleen store monocytes
⇒ MJ'S HUMAN BIOLOGY BLOG: Platelet-rich plasma therapy revisited
⇒ HEALTH & WELLNESS: Donating blood
⇒ MJ'S HUMAN BIOLOGY BLOG: Cleansing blood with magnets

8 Heart and blood vessels

1. Blood vessels transport blood
    - *Arteries transport blood away from the heart*
    - *Arterioles and pre-capillary sphincters regulate blood flow*
    - *Capillaries: Where blood exchanges substances with tissues*
    - *Lymphatic system helps maintain blood volume*
    - *Veins return blood to the heart*
2. The heart pumps blood though the vessels
    - *The heart is mostly muscle*
    - *The heart has four chambers and four valves*
    - *The pulmonary circuit serves the rest of the bod*
    - *The cardiac cycle: The heart contracts and relaxes*
    - *Heart sounds reflect closing heart valves*
    - *Cardiac conduction system coordinates contraction*
    - *Electrocardiogram records the heart's electrical activity*
3. Blood exerts pressure against vessel walls
    - *Measuring blood pressure*
    - *Hypertension: High blood pressure can be dangerous*
    - *Hypotension: When blood pressure is too low*
4. How the cardiovascular system is regulated
    - *Baroreceptors maintain arterial blood pressure*
    - *Nerves and hormones adjust cardiac output*
    - *Local requirements dictate local blood flows*
    - *Exercise: Increased blood flow and cardiac output*
5. Cardiovascular disorders: A major health issue
    - *Angina: Chest pain warns of impaired blood flow*
    - *Heart attack: Permanent damage to heart tissue*
    - *Heart failure: The heart becomes less efficient*
    - *Embolism; Blockage of a blood vessel*
    - *Stroke: Damage to blood vessels in the brain*
6. Reducing your risk of cardiovascular disease

⇒ CURRENT ISSUE: Comparative effectiveness research
⇒ MJ'S HUMAN BIOLOGY BLOG: Boosting cardiac repair mechanisms
⇒ HEALTH & WELLNESS: cholesterol and Atherosclerosis
⇒ MJ'S HUMAN BIOLOGY BLOG: A beating heart is created in the laboratory
⇒ MJ'S HUMAN BIOLOGY BLOG: Stress reduction and heart attacks

9 The immune system and mechanisms of defense

1. Pathogens cause disease
    - *Bacteria: Single-celled living organisms*
    - *Viruses: Tiny infectious agents*
    - *Prions: Infectious proteins*
    - *Transmissibility, mode of transmission and virulence determine health risk*
2. The lymphatic system defends the body
    - *Lymphatic vessels transport lymph*
    - *Lymph nodes cleanse the lymph*
    - *The spleen cleanses blood*
    - *Thymus gland hormones cause T lymphocytes to mature*
    - *Tonsils protect the throat*
3. Keeping pathogens out: The first line of defense
    - *Skin: An effective deterrent*
    - *Impeding pathogen entry in areas not covered by skin*
4. Nonspecific defenses: The second line of defense
    - *Phagocytes engulf foreign cells*
    - *Inflammation: Redness, warmth, swelling and pain*
    - *Natural killer cells target tumors and virus-infected cells*
    - *The complement system assists other defense mechanisms*
    - *Interferons interfere with viral reproduction*
    - *Fever raises body temperature*
5. Specific defense mechanisms: The third line of defense
    - *The immune system targets antigens*
    - *Lymphocytes are central to specific defenses*
    - *B cells: antibody-mediated immunity*
    - *The five classes of antibodies*
    - *Antibodies' structure enables them to bind to specific antigens*
    - *T cells: Cell-mediated immunity*
6. Immune memory creates immunity
7. Medical assistance in the war against pathogens
    - *Active immunization: An effective weapon against pathogens*
    - *Passive immunization can help against existing or anticipated infections*
    - *Monoclonal antibodies: Laboratory-created for commercial use*
    - *Antibodies combat bacteria*
8. Tissue rejection: A medical challenge
9. Inappropriate immune system activity causes problems
    - *Allergies: A hypersensitive immune system*
    - *Autoimmune disorders : Defective recognition of « self »*
10. Immune deficiency: The special case of AIDS
    - *HIV targets helper T cells of the immune system*
    - *HIV is transmitted in body fluids*
    - *AIDS develops slowly*
    - *The AIDS epidemic: A global health issue*
    - *Risky behaviors increase your chances of getting AIDS*
    - *Sex can be safer*
    - *New treatments offer hope*

⇒ CURRENT ISSUE: AIDS: A crisis in Africa, a challenge for the world
⇒ MJ'S HUMAN BIOLOGY BLOG: Prion-like activity in neurodegenerative disorders
⇒ MJ'S HUMAN BIOLOGY BLOG: A way to cure HIV infection?

10 The respiratory system: Exchange of gases

1. Respiration takes place throughout the body
2. The respiratory system consists of upper and lower respiratory tracts
    - *The upper respiratory tract filters, warms and humidifies air*
    - *The lower respiratory tract exchanges gases*
3. The process of breathing involves a pressure gradient
    - *Inspiration brings in air, expiration expels it*
    - *Lung volumes and vital capacity measure lung function*
4. Gas exchange and transport occur passively
    - *Gases diffuse according to their partial pressures*
    - *External respiration: The exchange of gases between air and blood*
    - *Internal respiration: The exchange of gases with tissue fluids*
    - *Hemoglobin transports most oxygen molecules*
    - *Most CO_2 is transported in plasma as bicarbonate*
5. The nervous system regulates breathing
    - *A respiratory center establishes rhythm of breathing*
    - *Chemical receptors monitor CO_2, H^+ and O_2 levels*
    - *We can exert some conscious control*
6. Disorders of the respiratory system
    - *Reduced air flow of gas exchange impedes respiratory function*
    - *Microorganisms can cause respiratory disorders*
    - *Lung cancer is caused by proliferation of abnormal cells*
    - *Pneumothorax and atelectasis: A failure of gas exchange*
    - *Congestive heart failure impairs lung function*

⇒ CURRENT ISSUE: Limiting exposure to secondhand smoke
⇒ MJ'S HUMAN BIOLOGY BLOG: Snus – Smokeless Tobacco Made Easy
⇒ MJ'S HUMAN BIOLOGY BLOG: Smoking and breast sagging
⇒ HEALTH & WELLNESS: Carbon monoxide: an invisible, odorless killer
⇒ MJ'S HUMAN BIOLOGY BLOG: Living with cystic fibrosis

13 The endocrine system

1. The endocrine system produces hormones
2. Hormones are classified as steroid or non-steroid
    - *Steroid hormones enter target cells*
    - *Non-steroid hormones bind to receptors on target cell membranes*
    - *Hormones participate in negative feedback loops*
3. The hypothalamus and the pituitary gland
    - *The posterior pituitary stores ADH and oxytocin*
    - *The anterior pituitary six key hormones*
    - *Pituitary disorders; hyper-secretion or hypo-secretion*
4. The pancreas secretes glucagon, insulin, and somatostatin
5. The adrenal glands comprise the cortex and medulla
    - *The adrenal cortex: Glucocorticoids and mineralocorticoids*
    - *The adrenal medulla: Epinephrine and norepinephrine*
6. Thyroid and parathyroid glands
    - *The thyroid gland: Thyroxine speeds cellular metabolism*
    - *Parathyroid hormone (PTH) controls blood calcium levels*
7. Testes and ovaries produce sex hormones
    - *Testes produce testosterone*
    - *Ovaries produce estrogen and progesterone*
8. Other glands and organs also secrete hormones
    - *Thymus gland hormones aid the immune system*
    - *The pineal gland secretes melatonin*
    - *Endocrine functions of the heart, the digestive system and the kidneys*
9. Other chemical messengers
    - *Histamine is important in inflammation*
    - *Prostaglandins: Local control of blood flow*
    - *Nitric oxide has multiple functions*
    - *Growth factors regulate tissue growth*
10. Disorders of the endocrine system
    - *Diabetes mellitus: Inadequate control of blood sugar*
    - *Hypothyroidism: Underactive thyroid gland*
    - *Hypothyroidism: Overactive thyroid gland*
    - *Addison's disease: Too little cortisol and aldosterone*
    - *Cushing's syndrome: Too much cortisol*

⇒ CURRENT ISSUE: Dealing with type 2 diabetes
⇒ MJ'S HUMAN BIOLOGY BLOG: Athlete caught doping with GH
⇒ MJ'S HUMAN BIOLOGY BLOG: Glucose monitoring devices are inaccurate
⇒ MJ'S HUMAN BIOLOGY BLOG: Inhaled insulin (Who cares?)

14 The digestive system and nutrition

1. The digestive system brings nutrients into the body
    - *The walls of the GI tract are composed of four layers*
    - *Five basic processes accomplish digestive system function*
    - *Two types of motility aid digestive processes*
2. The mouth processes food for swallowing
    - *Teeth bite and chew food*
    - *The tongue positions and tastes food*
    - *Saliva begins the process of digestion*
3. The pharynx and esophagus deliver food to the stomach
4. The stomach stores food end protein, and regulates delivery
    - *Gastric juice breaks down proteins*
    - *Stomach contractions mix food and push it forward*
5. The small intestine digests food and absorbs nutrients and water
6. Accessory organs aid digestion and absorption
    - *The pancreas secretes enzymes and $NaHCO_3$*
    - *The liver produces bile and performs many other functions*
    - *The gallbladder stores bile until needed*
7. The large intestine absorbs nutrients and eliminated wastes
8. How nutrients are absorbed
    - *Proteins and carbohydrates are absorbed by active transport*
    - *Lipids are broken down, then reassembled*
    - *Water is absorbed by osmosis*
    - *Vitamins and minerals follow a variety of paths*
9. Endocrine and nervous systems regulate digestion
    - *Regulation depends on volume and content of food*
    - *Nutrients are used or stored until needed*
10. Nutrition: You are what you eat
    - *MyPyramid plan offers a personalized approach*
    - *Carbohydrates: A major energy source*
    - *Lipids: Essential cell components and energy sources*
    - *Complete proteins contain every amino acid*
    - *Vitamins are essential for normal function*
    - *Minerals: Elements essential for body processes*
    - *Fiber benefits the colon*
11. Weight control: Energy consumed versus energy spent
    - *BMR: Determining how many calories we need*
    - *Energy balance and body weight*
    - *Physical activity: An efficient way to use calories*
    - *Healthy weight improves overall health*
12. Disorders of the digestive system
    - *Disorders of the GI tract*
    - *Disorders of the accessory organs*
    - *Malnutrition: Too many or too few nutrients*
    - *Obesity: A worldwide epidemic?*
13. Eating disorders: Anorexia nervosa and bulimia

⇒ CURRENT ISSUE: Is "overweight" overstated?
⇒ MJ'S HUMAN BIOLOGY BLOG: Is being overweight a health risk?
⇒ MJ'S HUMAN BIOLOGY BLOG: Obesity in close mutual friends
⇒ MJ'S HUMAN BIOLOGY BLOG: California bans *trans* fats

15 The urinary system

1. The urinary system contributes to homeostasis
    - *The kidneys regulate water levels*
    - *The kidneys regulate nitrogenous wastes and other solutes*
2. Organs of the urinary system
    - *Kidneys: The principal urinary organs*
    - *Ureters transport urine to the bladder*
    - *Urinary bladder stores urine*
    - *Urethra carries urine from the body*
3. Nephrons produce urine
    - *The tubule filters fluid and reabsorbs substances*
    - *Special blood vessels supply the tubule*
4. Formation of urine: Filtration, reabsorption, and secretion
    - *Glomerular filtration filters fluid from capillaries*
    - *Tubular reabsorption returns filtered water and solutes to blood*
    - *Tubular secretion removes other substances from blood*
5. The kidneys can produce dilute or concentrated urine
    - *Producing dilute urine: Excreting excess water*
    - *Producing concentrated urine: conserving water*
6. Urination depends on a reflex
7. The kidneys maintain homeostasis in many ways
    - *ADH regulates water balance*
    - *Aldosterone regulates salt balance*
    - *The renin-angiotensin system controls blood volume and blood pressure*
    - *Atrial natriuretic hormone protects against blood volume excess*
    - *Kidneys help maintain acid-base balance and blood pH*
    - *Erythropoietin stimulates production of red blood cells*
    - *Kidneys activate vitamin D*
8. Disorders of the urinary system
    - *Kidney stones can block urine flow*
    - *Urinary tract infections are often caused by bacteria*
    - *Acute and chronic renal failure impair kidney function*
    - *Dialysis cleanses the blood artificially*
    - *Kidney transplants are a permanent solution to renal failure*

⇒ CURRENT ISSUE: How should we allocate scarce kidneys?
⇒ MJ'S HUMAN BIOLOGY BLOG: Using urine to diagnose disease
⇒ MJ'S HUMAN BIOLOGY BLOG: Buying/selling kidneys
⇒ MJ'S HUMAN BIOLOGY BLOG: Encouraging organ donations

16 Reproductive systems

1. The male reproductive system delivers sperm
    - *Testes produce sperm*
    - *Accessory glands help sperm survive*
    - *Sperm production requires several cell divisions*
    - *Testosterone affects male reproductive capacity*
2. The female reproductive system produces eggs and supports pregnancy
    - *Ovaries release oocytes and secrete hormones*
    - *The uterus nurtures the developing embryo*
    - *The vagina: Organ of sexual intercourse and birth canal*
    - *Mammary glands nourish the infant*
3. Menstrual cycle consists of ovarian and uterine cycles
    - *The ovarian cycle: Oocytes mature and are released*
    - *The uterine cycle prepares the uterus for pregnancy*
    - *Cyclic changes in hormone levels produce the menstrual cycle*
4. Human sexual response, intercourse, and fertilization
    - *The male sexual response*
    - *The female sexual response*
    - *Fertilization: One sperm penetrates the egg*
5. Birth control methods: Controlling fertility
    - *Abstinence: Not having intercourse*
    - *Surgical sterilization: Vasectomy and tubal ligation*
    - *Hormonal methods: Pills, injections, patches and rings*
    - *IUDs are inserted into the uterus*
    - *Diaphragms and cervical caps block the cervix*
    - *Chemical spermicides kill sperm*
    - *Condoms trap ejaculated sperm*
    - *Withdrawal and periodic abstinence*
    - *Pills that can be used after intercourse*
    - *Elective abortion*
    - *The future in birth control*
6. Infertility: Inability to conceive
    - *Infertility can have many causes*
    - *Enhancing fertility*
7. Sexually transmitted diseases
    - *Bacterial STDs: Gonorrhea, syphilis and chlamydia*
    - *Viral STDs: HIV, hepatitis B, genital herpes and HPV*
    - *Other STD's: Yeast infections, trichomoniasis and public lice*
    - *Protecting yourself against STDs*

⇒ CURRENT ISSUE: Would you like a boy or a girl?
⇒ MJ'S HUMAN BIOLOGY BLOG: The dark side of gender preference
⇒ MJ'S HUMAN BIOLOGY BLOG: Infertility patients favor stem cell research
⇒ MJ'S HUMAN BIOLOGY BLOG: Is she a woman?
⇒ HEALTH & WELLNESS: Erectile dysfunction and Viagra abuse
⇒ MJ'S HUMAN BIOLOGY BLOG: Birth control method failures

17 Cell reproduction and differentiation

1. The cell cycle creates new cells
2. Replication, transcription and translation: An overview
    - *Replication: copying DNA before cell division*
    - *Mutations are alternations in DNA*
    - *Mechanisms of DNA repair*
    - *Transcription: Converting a gene's code into mRNA*
    - *Translation: Making a protein from RNA*
3. Cell reproduction: One cell becomes two
    - *Mitosis: Daughter cells are identical to the parent cell*
    - *Cytokinesis divides one cell into two identical cells*
    - *Mitosis produces diploid cells and meiosis produces haploid cells*
    - *Meiosis: preparing for sexual reproduction*
    - *Sex differences in meiosis: Four sperm versus one egg*
4. How cell reproduction is regulated
5. Environmental factors influence cell differentiation
    - *Differentiation during early development*
    - *Differentiation later in development*
6. Cloning an organism requires an undifferentiated cell
    - *Embryo splitting: Producing identical offspring*
    - *Somatic cell nuclear transfer: cloning an adult*
7. Therapeutic cloning: Creating tissues and organs

⇒ CURRENT ISSUE: Should we clone humans?
⇒ MJ'S HUMAN BIOLOGY BLOG: DNA mutations between generations
⇒ MJ'S HUMAN BIOLOGY BLOG: Re-creating undifferentiated cells

18 Cancer: Uncontrolled cell division and differentiation

1. Tumors can be benign or cancerous
2. Cancerous cells lose control of their functions and structures
3. How cancer develops
    - *Mutant forms of proto-oncogenes, tumor suppressor genes and mutator genes contribute to cancer*
    - *a variety of factor can lead to cancer*
    - *the immune system plays an important role in cancer prevention*
4. Advances in diagnosis enable early detection
    - *Tumor imaging: X-rays, PET and MRI*
    - *Genetic testing can identify mutated genes*
    - *Enzyme tests may defect cancer markers*
5. Cancer treatments
    - *Conventional cancer treatments: Surgery, radiation and chemotherapy*
    - *Magnetism and photodynamic therapy target malignant cells*
    - *Immunotherapy promotes immune response*
    - *"Starving" cancer by inhibiting angiogenesis*
    - *Molecular treatments target defective genes*
6. The 10 most common cancers
    - *Skin cancer: Look for changes in your skin*
    - *Lung cancer: Smoking is leading risk factor*
    - *Breast cancer: Early detection pays off*
    - *Prostate cancer: Most common after age 50*
    - *Cancers of colon and rectum: Tests can detect them early*
    - *Lymphoma: Cancers of lymphoid tissues*
    - *Urinary bladder cancer: Surgery is often successful if done early*
    - *Kidney cancer: Detected during examination for a renal-related problem*
    - *Cancer of the uterus: Unusual bleeding is major symptom*
    - *Leukemia: Chemotherapy is often effective*
7. Most cancers can be prevented

⇒ CURRENT ISSUE: Voluntary breast and ovary removal
⇒ MJ'S HUMAN BIOLOGY BLOG: Human gene patents invalidated
⇒ HEALTH & WELLNESS: Breast self-examination and routine mammograms
⇒ MJ'S HUMAN BIOLOGY BLOG: The PSA test for prostate cancer
⇒ MJ'S HUMAN BIOLOGY BLOG: A DNA test for cervical cancer

21 Development and aging

1. Fertilization begins hen sperm and egg unite
    - *The journeys of egg and sperm*
    - *One sperm fertilizes the egg*
    - *Twins may be fraternal or identical*
2. Development: Cleavage, morphogenesis, differentiation, and growth
3. Pre-embryonic development: The first two weeks
4. Embryonic development: Weeks three to eight
    - *Extra-embryonic membranes*
    - *The placenta and umbilical cord*
    - *The embryo develops rapidly*
5. Gender development begins at six weeks
6. Fetal development: Nine weeks to birth
    - *Months three and four*
    - *Months five and six*
    - *Months seven through nine*
7. Birth and the early postnatal period
    - *Labor ends in delivery*
    - *Cesarean delivery: Surgical delivery of a baby*
    - *The transition from fetus to newborn*
    - *Lactation produces milk to nourish the newborn*
8. From birth to adulthood
    - *The neonatal period: a helpless time*
    - *Infancy: Rapid development and maturation of organ systems*
    - *Childhood: Continued development and growth*
    - *Adolescence: The transition to adulthood*
9. Aging takes place over time
    - *What causes aging?*
    - *Aging welll*
10. Death is the final transition

⇒ CURRENT ISSUE: Who should make life and death decisions for you?
⇒ HEALTH & WELLNESS: Prenatal diagnostic techniques
⇒ MJ'S HUMAN BIOLOGY BLOG: Caloric restriction and longevity
⇒ MJ'S HUMAN BIOLOGY BLOG: Hormone replacement therapy revisited

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Chapter 15

table **Pg.**

figure **Pg.**

Chapter 16

table **Pg.**

figure **Pg.**

Chapter 17