The chemistry of living things

1. All matter 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
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 division
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
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
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”
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
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
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 through the vessels
   - The heart is mostly muscle
   - The heart has four chambers and four valves
   - The pulmonary circuit serves the rest of the body
   - 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
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?
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 CO₂ is transported in plasma as bicarbonate
5. The nervous system regulates breathing
   - A respiratory center establishes rhythm of breathing
   - Chemical receptors monitor CO₂, H⁺ and O₂ 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?)
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 NaHCO₃
   - 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
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
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
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
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 factors 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 detect 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 a 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 a major symptom
   - Leukemia: Chemotherapy is often effective
7. Most cancers can be prevented
Development and aging

1. Fertilization begins when 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 well
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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