Science Benchmark Achievements

Elementary Science

The Sixth Day: Physiology and Biology

Ages 8-12

Objectives at this age:

Begin student-created science textbooks for physiology
Discover the why and how behind God's creations
Introduction to basic science concepts and vocabulary
Introduction to famous scientists: Aristotle, Hippocrates, Galen, Andreas Vesalius, Robert Hooke, Louis Pasteur, Gregor Mendel

Beginning at age 8, children will begin creating a science textbook for each of the scientific disciplines. Even though the textbooks will not be completed until their senior years, students are encouraged to prepare a physics journal at this age to begin recording and illustrating their discoveries.

History of Anatomy and Physiology

- Ancient Egyptians (mummies)
- Ancient Hebrews (God's laws protect the people from germs)
- Ancient Greeks (Aristotle and Hippocrates)
- Ancient Rome (Galen)
- Middle Ages – Europe (Vesalius, Leeuwenhoek, Robert Hooke)

Cell Structure and Anatomy

- Cell membrane
- Cytoplasm
- Organelles (mitochondria, lysosomes, golgi bodies, endoplasmic reticulum, centrioles, vacuoles, ribosomes, nucleus, nucleolus, DNA and RNA)
- Body tissue (Nervous, muscular, connective, epithelial)

The Skeletal System

- Bones and marrow
- Skeleton (names of main bones)
- Ligaments
- Spinal column
- Joints (Hinge, ball-and-socket, saddle, sliding, pivot, ellipsoidal)

The Muscular System

- Skeletal muscles
- Cardiac muscle
- Smooth muscle
- Tendons
- Tongue
- Voluntary and involuntary muscles

The Digestive and Renal Systems

- The mouth, tongue, and saliva
- The esophagus
- The stomach
- The small intestine
- The liver and gallbladder
- The pancreas
- The large intestine
- The kidneys, bladder, ureter, urethra

Health and Nutrition

- Essential nutrients
- Water
- Carbohydrates (complex and simple)
- Proteins (amino acids, complete and incomplete proteins)
- Fats (fatty acids, essential fatty acids, saturated and unsaturated fats)
- Counting calories
- Vitamins (fat soluble and water soluble)
- Minerals (calcium, sodium, iron, iodine)

The Respiratory System

- Nasal and sinus cavity, Trachea, Lungs
- Vocal cords and Larynx
- Bronchi or bronchial tubes, bronchioles, and alveoli
- Asthma
- Dangers of smoking
- Lung capacity
- Diaphragm (Heimlich Maneuver)

The Circulatory and Cardiovascular System

- Arteries, Veins, Capillaries, Interstitial fluid

- Blood (Plasma, red blood cells, white blood cells, platelets)
- Wound care
- Making blood
- Blood types
- Heart anatomy (atrium, ventricle, pulmonary vein and artery, superior vena cava, inferior vena cava)
- Heart health (signs of a heart attack)
- Heart muscle (myocardium, pericardium, endocardium)
- Blood pressure

The Nervous and Endocrine System

- Central nervous system (brain and spinal cord)
- Brain (cerebellum, cerebral cortex, neurons, brain stem, Right and left hemisphere, Frontal, parietal, occipital, and temporal lobe
- Brain stem
- Spinal cord (24 vertebrae, reflexes, cerebrospinal fluid)
- Peripheral nervous system (cranial nerves, spinal nerves, thoracic nerves, lumbar nerves, sacral nerves)
- Neurons (dendrites, axon, myelin sheath, neurotransmitters, synapse, Sensory neurons and motor neurons
- Somatic Nervous system (voluntary movements)
- Autonomic nervous system (working automatically)
- Fight or flight response
- Endocrine system (hormones)
- Glands of the endocrine system (thyroid, pituitary, adrenal, thymus, hypothalamus)

Senses (sight, hearing, smell, taste, touch)

- Balance
- Smell (Olfactory system)
- Taste (taste buds, sweet, sour, salty, bitter, savory)
- Hearing (external ear, middle ear, inner ear, eardrum, cochlea, semicircular canals, vestibule, otoliths, cupula)
- Sight (eyeball, sclera, cornea, pupil, aqueous humor; colorblindness;
    - Nearsighted, farsighted, blind spot, double vision, tear ducts,
    - conjunctivitis)

The Integumentary system (skin)

- Hair (matrix, shaft, hard keratin, cuticle, cortex, medulla)
- Epidermis, Dermis, Hypodermis, adipose tissue, epithelial cells

- Melanin and carotene
- Bruising and blisters
- Sweat glands (heat exhaustion, body temperature control)

The Lymphatic and Immune System

- Pathogens and Infections (localized infection and systemic infection)
- Parasites, Bacteria, Fungi, worms, virus
- Cancer
- The Lymphatic system (lymph nodes, lymph vessels, spleen, lymph, lymphocytes)
- Thymus (T Lymphocytes or T cells)
    - Immunity (Innate, inflammation, histamines, B lymphocytes, and T lymphocytes, antibodies, antigens, killer T cells, allergies, autoimmune disease)
- Immunity modes (passive immunity and acquired immunity)
- Vaccinations and Antibiotics (penicillin)

The Reproductive System

- Sacred nature of the reproductive system
- Male and female anatomy and function
- Parenthood and Family life
- Morality

Growth and Development

- Dividing cells

Development in the womb (embryo, amniotic sac, fetus)