

SYLLABUS FOR NSF ISC SCIENCE (Grade 4-5)
(Adapted from SCIENCE – A CLOSER LOOK, Books 4 and 5)

LIFE SCIENCES

- I. **Cells:**

What are the main components and functions of animal and plant cells? How are cells organized to form tissues, organs and organ systems?
- II. **Classification of Living organisms:**

Terms to understand: Kingdom, Phylum, Class, Order, Family, Genus and Species.
What are bacteria, fungi, protists, and viruses?
- III. **Plants:**
 - a. Vascular and non-vascular plants: What are the main parts of roots, stems, flowers and leaves? What is transpiration, photosynthesis, respiration? What are mosses and ferns?
 - b. Gymnosperms and Angiosperms: Terms to understand: pollination, fertilization and germination, budding, vegetative propagation. What are runners, bulbs and tubers?
- IV. **Animals:**
 - a. Invertebrates: What are the key features (with examples) of sponges, cnidarians, mollusks, echinoderms, arthropods, flatworms, roundworms and segmented worms?
 - b. Vertebrates: What are the key features (with examples) of mammals, birds, amphibians, reptiles and fish? What are warm-blooded versus cold-blooded animals (with examples)?
- V. **Life Processes:**
 - a. Human systems: What are the main parts and functions of skeletal, muscular, nervous, digestive, respiratory, excretory and circulatory systems?
 - b. Plant tropisms: Review examples
 - c. Terms to Understand: metamorphosis, inherited traits, instinct, learned behavior, dominant versus recessive traits.
- VI. **Ecosystems:**
 - a. Basics: What are biotic and abiotic factors? What are key features of the 6 major biomes? What are the key zones and organisms in an ocean biosystem? Terms to Understand: animal and plant adaptations (with examples), camouflage and mimicry.
 - b. Food Chains and Food Webs: How do food chains and food webs operate? What are producers, consumers, decomposers, energy pyramid, endangered versus threatened species, extinction, primary and secondary succession? Compare these terms: mutualism, commensalism, parasitism

EARTH SCIENCES

I. Geology:

- a. Earth: What are the key features of the main layers of Earth and of the ocean floor? What are the major landforms?
- b. Plates and faults: Terms to understand: plate tectonics, theory of continental drift. How do mountains form? What are faults and folds? What causes ocean floor spreading?
- c. Erosion: What is Weathering? Erosion? What are the major chemical and physical triggers? Terms to understand: terminus, moraine, till, cirque, deposition, river meanders, sandbars.
- d. Rocks: What is the rock cycle? What are Igneous, Sedimentary and Metamorphic rocks? Terms to understand: color, harness, luster, streak (Properties of minerals). What are key soil types and layers/horizons?
- e. Fossils: What are different the types of fossils – mold, cast, imprint, amber? What are their uses? How do you determine relative versus absolute age? What is an Era? What are fossil fuels? What are examples of renewable energy sources?

II. Earth and Space:

- a. Spin: How is Earth's rotation different from its revolution? How do gravity and inertia affect the orbit? What causes day and night? What causes seasons? What are Spring tides and Neap tides? What are the phases of the moon? What are lunar and solar eclipses?
- b. Probes and Objects: How do you differentiate an Optical telescope from a Radio telescope? What are space probes? What are the key features of the planets? What are dwarf planets, comets, asteroids, and meteoroids?
- c. Star: What is the Life Cycle of a star? What do the "colors" of stars represent? What are galaxies, constellations, and binary stars, star clusters? What is a light year? Terms to understand: The Big Bang Theory.

III. Weather:

- a. Atmosphere: What are the main layers of the atmosphere? How do you measure – air temperature, humidity, air pressure? What is insolation? What are the main types of clouds?
- b. Wind: What are global winds (easterlies, westerlies, trade winds)? What is the Coriolis effect? Sea breeze vs. Land breeze. What are air masses, warm front, and cold front?
- c. Currents and Climate: How do ocean currents affect climate? Terms to understand: El Nino, rain shadow.

IV. **Disasters:**

- a. What causes earthquakes, tsunamis, and volcanoes? Types of seismic waves. Measuring and locating earthquakes. What is lava versus magma? Recognize main types of volcanoes. What are hotspots? Island arcs? What is the Pacific Ring of Fire?
- b. What causes thunderstorms and Lightning? What are the key features of hurricanes and tornados? What are cyclones, landslides and avalanches? How are storms tracked?

V. **Resources:**

- a. What are the main events in the water cycle? Terms to understand: runoff, watershed, ground water, and aquifer. What are the carbon and the nitrogen cycles?
- b. Pollution: What are the main types of pollution? What are: ozone layer, smog, acid rain, Global warming? How can water and soil be conserved? What are the 3 Rs of resource conservation? What are landfills?

PHYSICAL SCIENCES

I. **Matter:**

- a. What are the Physical and chemical properties of matter? How do you measure density, weight, length, volume, etc.? What are the main features of solids, liquids and gases?
- b. Atoms: What are the key components of an atom? What do the columns and periods in the Periodic Table mean? What are the atomic number and the atomic mass? What are the common uses of different elements based on specific properties? What are metalloids and semi-conductors? What are molecules?
- c. State changes: What is physical versus chemical change? Terms to understand: compounds versus mixtures. What are solutions, suspensions, colloids and alloys? What is solubility? What happens during phase changes? What is sublimation? How can mixtures be separated?
- d. Acid-Base: What are acids, bases and salts? How is pH measured? What is neutralization? What are reactants and products in a chemical reaction? Terms to understand: The Law of Conservation of Mass.

II. **Forces:**

- a. Basics: What are forces? What are: Balanced versus unbalanced forces, push versus pull forces? Terms to understand: gravity, friction, thrust, lift, drag, air resistance. Newton's 3 Laws of forces and simple applications. What are speed, velocity, acceleration, inertia? Simple calculations.
- b. Work: What is "work"? Simple calculations. What are Potential and Kinetic forms of energy? How can you interconvert between different types of energy? Terms to understand: levers, wheel and axle, pulleys, wedge, inclined plane. What are simple and compound machines?

III. **Energy:**

- a. Light: What are waves in the Electromagnetic spectrum? What is Reflection versus refraction? What is a photon? What are lasers? Terms to understand: Transparent, translucent and opaque objects; Convex and concave lens and mirror; Prism and Light spectrum; Primary and Secondary colors.
- b. Electricity: What is electric current? What is a short circuit? Terms to understand: Open and closed circuits; Series and parallel circuits; Voltage, current and resistance. How do these work: switch, fuse, and circuit breaker?
- c. Magnetism: What are the key features of a magnet? What are magnetic fields? What is an electromagnet? Is Earth a magnet? How do you use a compass? Know the difference: Motors versus generators, direct current versus alternating current. Terms to understand: transformers, magnetic levitation.
- d. Heat: What are conduction, convection, radiation (with practical examples)? Terms to understand: Conductors, insulators, Heat capacity, Applications of thermal expansion/contraction, infrared rays.
- e. Sound: What are the features of sound waves (for example, frequency and pitch, amplitude and volume, wavelength)? What are SONAR, Doppler effect, and echolocation?

SCIENTIFIC ENQUIRY

- I. Recognize what these scientists are famous for: Isaac Newton; Thomas Edison; James Watt; Michael Faraday; Graham Bell; Wright brothers; Henry Ford; Guglielmo Marconi; Enrico Fermi; Charles Babbage; Charles Darwin; Louis Pasteur; Anton Leeuwenhoek; Jane Goodall; Jonas Salk; George Washington Carver; Barbara McClintock
- II. Understand what these terms mean in the Scientific Method: Dependent variable, independent variable, control variable, hypothesis, observation, gathering data, reaching conclusions and inference.
- III. Review the use of Line Graphs, Bar Graphs, Circle Graphs, and Pictographs.
- IV. Simple calculations involving distance, speed, mass, weight, volume, density, force, voltage and solubility.