MARKHOR JUNIOR CONTEST

SCIENCE COURSE OUTLINE

BEGINNER LEVEL

(Applicable to Beginner I & Beginner II)

Chapter No.	Chapter Title	Topic No.	Topic Title	Concept Description
01	Working Scientifically	1	**Scientific Questions and Fair Testing**	Asking questions that can be tested, and planning a fair test by changing only one thing (the variable) while keeping everything else the same.
		2	**Making and Testing Predictions**	Making a prediction based on what is already known ("I think… because…") and checking it against the actual result.
		3	**Recording Observations**	Recording findings with labelled drawings, tally charts, simple tables and pictograms so results can be compared.
		4	**Measuring in Science**	Using rulers, measuring cylinders, thermometers and simple balances to measure length (cm), volume (mL), temperature (°C) and mass (g).
		5	**Interpreting Results and Drawing Conclusions**	Reading simple tables and bar charts, spotting patterns, and drawing a conclusion that is supported by evidence.
		6	**Classification Keys**	Using branching yes/no questions to sort and identify living things and objects step by step.
02	Characteristics of Living Organisms	1	**Life Processes**	The seven life processes shared by all living things: movement, respiration, sensitivity, growth, reproduction, excretion and nutrition.
		2	**Living, Once-Living and Never-Living**	Telling apart things that are alive, things that were once alive (wood, cotton, leather, paper) and things that were never alive (rock, glass, metal).
		3	**Microorganisms**	Tiny living things such as bacteria and fungi (mould, yeast). Some are helpful (making yogurt and bread, breaking down dead matter) and some cause disease.
03	Plants: Structure and Function	1	**Functions of Plant Parts**	Roots anchor the plant and absorb water and minerals, the stem supports it and carries water to the leaves, leaves make food, and flowers help in reproduction.
		2	**How Plants Make Food**	Green leaves use sunlight, water and carbon dioxide from the air to make food and release oxygen. This is an introduction to photosynthesis and the role of chlorophyll.
		3	**Flowers and Pollination**	Basic flower parts (petals, pollen) and how bees, birds and wind carry pollen between flowers so that fruits and seeds can form.

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		4	**Seed Dispersal**	Seeds spread by wind (dandelion), water (coconut), animals (burrs, eaten fruits) and bursting pods. Dispersal reduces crowding and competition.
		5	**Seed Structure and Germination**	The seed coat, stored food and baby plant inside a seed. Investigating how water, warmth and air affect germination.
		6	**Plant Adaptations**	Features that help plants survive in their habitats, such as the cactus's spines and water-storing stem, the water lily's floating leaves and the pine's needle-like leaves.
04	**Animal Classification**	1	**Vertebrates and Invertebrates**	Classifying animals by whether or not they have a backbone. Most animal species are invertebrates.
		2	**Vertebrate Groups**	Key features of mammals (hair, feed young on milk), birds (feathers, beaks), fish (gills, fins), reptiles (dry scaly skin) and amphibians (moist skin, life in water and on land).
		3	**Invertebrate Groups**	Insects (six legs, three body parts), spiders (eight legs, two body parts), worms, snails and crabs, and their distinguishing features.
		4	**Diets and Teeth**	Herbivores, carnivores and omnivores, and how teeth are shaped for diet: flat grinding teeth for plants and sharp pointed teeth for meat.
		5	**Animal Life Cycles Compared**	Comparing the life cycles of a mammal, a bird, a frog and an insect, including complete metamorphosis (egg → larva → pupa → adult).
05	**Animal Adaptations and Habitats**	1	**Habitats and Microhabitats**	Large habitats (forest, desert, ocean) and small microhabitats (under a log, inside a pond), and why particular animals are found in each.
		2	**Adaptations to Hot and Cold Places**	Survival features such as the camel's fat-storing hump, the fennec fox's large ears, the polar bear's blubber and the penguin's huddling.
		3	**Adaptations to Water**	Streamlined bodies and gills in fish, webbed feet in ducks, and blowholes in whales and dolphins, which breathe air with lungs.
		4	**Camouflage and Defence**	How colour, pattern and body features protect animals, such as the chameleon, stick insect, porcupine quills and tortoise shell.
		5	**Survival Behaviours**	Behaviours that help animals survive harsh conditions, including migration, hibernation and living in groups.
06	**Human Body Systems**	1	**Major Organs**	The location and main job of the brain, heart, lungs, stomach, intestines, kidneys and skin.
		2	**The Skeletal System**	Bones support the body, protect organs (skull protects the brain, ribs protect the heart and lungs) and allow movement at joints.
		3	**The Muscular System**	Muscles contract and relax, often working in pairs to move bones. The heart is a special muscle that never stops working.

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		4	**The Digestive System**	The journey of food through the mouth (teeth and saliva), food pipe, stomach, small intestine (absorbs nutrients) and large intestine.
		5	**Breathing and Blood Circulation**	Lungs take in oxygen and remove carbon dioxide. The heart pumps blood that carries oxygen around the body, which we can feel as a pulse.
		6	**The Nervous System and Senses**	Sense organs send messages through nerves to the brain, which decides how the body responds. Includes simple reflexes.
		7	**Teeth and Dental Care**	Milk and permanent teeth, the jobs of incisors, canines and molars, and how plaque and sugar cause tooth decay.
07	**Nutrition, Health and Disease**	1	**Nutrients and a Balanced Diet**	Carbohydrates, proteins, fats, vitamins, minerals, fibre and water, and the job each does in the body.
		2	**Food Hygiene and Safety**	Washing, covering, cooking and storing food properly, and recognising spoiled food.
		3	**How Diseases Spread and Are Prevented**	Germs spread through air, water, food, touch and insects. Handwashing, clean water, vaccination and covering coughs prevent illness.
		4	**Exercise and Healthy Habits**	How exercise affects heart rate, breathing and muscles, and why sleep, rest and an active lifestyle keep the body healthy.
08	**Matter and Its Properties**	1	**What Is Matter?**	Matter is anything that has mass and takes up space. Air is also matter even though we cannot see it.
		2	**Properties of Solids, Liquids and Gases**	Comparing shape, volume and flow. Particles are tightly packed in solids, close but free to move in liquids, and far apart in gases.
		3	**Changes of State**	Melting, freezing, evaporation and condensation as heating and cooling processes. Different materials melt at different temperatures.
		4	**Testing Properties of Materials**	Fair tests to compare materials for strength, flexibility, absorbency, transparency and waterproofing, and linking results to uses.
		5	**Reversible and Irreversible Changes**	Changes that can be undone (melting, dissolving) compared with changes that make new materials and cannot be undone (burning, cooking, rusting).
09	**Mixtures and Solutions**	1	**Mixtures**	Combining two or more substances that keep their own properties and can be separated, such as sand with pebbles or rice with lentils.
		2	**Dissolving and Solubility**	Soluble and insoluble substances, and the terms solute, solvent and solution. Stirring and warm water make dissolving faster.
		3	**Separating Mixtures**	Choosing a method based on properties: picking, sieving, filtering, using a magnet and evaporation.

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10	**Air and Water**	1	**Properties and Composition of Air**	Air has mass, takes up space and exerts pressure. It is a mixture of mainly nitrogen and oxygen, with carbon dioxide and water vapour. Burning needs oxygen.
		2	**Floating, Sinking and Upthrust**	Water pushes up on objects (upthrust). Shape affects floating, which is why heavy steel ships float. Salt water gives more upthrust than fresh water.
		3	**Sources and Uses of Water**	Rain, rivers, lakes, glaciers and groundwater (wells), and how water is used in homes, farming and industry.
11	**Light**	1	**Light Sources and How Light Travels**	Luminous objects (Sun, bulb) give out light, while non-luminous objects (Moon, mirror) do not. Light travels in straight lines.
		2	**Transparent, Translucent and Opaque**	Materials that let all, some or no light pass through, and how this decides their uses.
		3	**Shadows**	Shadows form when opaque objects block light. Shadow size changes with distance from the light, and shadow length changes during the day.
		4	**Reflection and Mirrors**	Smooth, shiny surfaces reflect light. Mirror images are reversed, and mirrors are used in periscopes and vehicles.
12	**Sound**	1	**How Sound Is Made and Travels**	Sound is produced by vibrations and travels through solids, liquids and gases, but not through empty space.
		2	**Pitch and Loudness**	High and low pitch (shorter or tighter strings give higher notes) and loud and soft sounds (stronger vibrations give louder sounds).
		3	**Hearing, Echoes and Noise**	Sounds get fainter with distance, and echoes are reflected sound. Noise pollution can be harmful and the ears need protection.
13	**Heat and Temperature**	1	**Heat and Temperature**	Temperature measures how hot or cold something is in °C. Heat moves from hotter objects to colder ones.
		2	**Conductors and Insulators of Heat**	Metals conduct heat well, while wood, plastic, wool and air are insulators. Applications include pan handles, flasks and winter clothes.
		3	**Effects of Heat**	Heating can make materials expand, melt, cook or burn. Includes safe use of heat sources.
14	**Forces and Motion**	1	**Types of Forces**	Pushes, pulls and twists. Contact forces need touch, while non-contact forces (gravity, magnetism) act at a distance. Forces are shown with arrows.
		2	**Gravity and Weight**	Gravity pulls objects towards Earth, which is why things fall. Weight is the pull of gravity on an object.
		3	**Friction**	Friction slows moving objects and is greater on rough surfaces. It is useful in brakes and shoe grip but causes wear, which oil can reduce.

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		4	**Air and Water Resistance**	Air and water push against moving objects. Parachutes use air resistance, while streamlined shapes reduce resistance.
		5	**Simple Machines**	Levers, pulleys, wheels and axles, inclined planes, wedges and screws make work easier by changing the size or direction of a force.
15	**Magnetism**	1	**Magnetic and Non-Magnetic Materials**	Investigating which materials are attracted to magnets. Iron, steel, nickel and cobalt are magnetic, but most other metals (aluminium, copper) are not.
		2	**Magnetic Poles**	Every magnet has a north and a south pole. Like poles repel, unlike poles attract, and magnetic force can act through some materials.
		3	**Uses of Magnets and the Compass**	A compass needle points north. Magnets are used in fridge doors, scrapyard cranes and toys.
16	**Electricity**	1	**Sources and Uses of Electricity**	Mains electricity and batteries (cells) as sources, appliances that use electricity, and a simple introduction to static electricity.
		2	**Simple Circuits**	A cell, wires, a bulb and a switch form a circuit. The bulb lights only when the circuit is complete.
		3	**Electrical Conductors and Insulators**	Metals let electricity flow, while plastic, rubber and wood do not. Wires are metal coated with plastic.
		4	**Electrical Safety**	Dangers of mains electricity, water near appliances, damaged wires and overloaded sockets, and safe behaviour around electricity.
17	**Earth: Structure and Materials**	1	**Layers of the Earth**	A simple model of the Earth's layers: the thin crust we live on, the hot mantle and the very hot core.
		2	**Landforms and Water Bodies**	Mountains, plateaus, plains, valleys, deltas and islands, and how rivers and wind slowly shape the land.
		3	**Rocks and Minerals**	Rocks differ in hardness, texture and how they form. Introduction to igneous, sedimentary and metamorphic rocks, minerals and their uses.
		4	**Soil Types and Properties**	Sandy, clay and loamy soils compared by particle size, drainage and fertility. Humus and the role of earthworms.
		5	**Renewable and Non-Renewable Resources**	Resources that can be replaced (sunlight, wind, forests) compared with those that will run out (coal, oil, natural gas).
18	**Weather and Climate**	1	**Weather and Climate**	Weather is day-to-day conditions, while climate is the usual pattern of a place over many years. Examples are hot deserts and cold polar regions.

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		2	**Measuring Weather**	Using a thermometer, rain gauge, wind vane and anemometer to measure and record weather.
		3	**The Water Cycle**	Evaporation, condensation, precipitation and collection as connected processes that move water continuously through nature.
		4	**Seasons and Seasonal Change**	Seasons occur because Earth is tilted as it travels around the Sun. Seasonal changes affect day length, plants and animals.
		5	**Natural Disasters and Safety**	What causes earthquakes, floods, storms and volcanic eruptions, and basic safety actions for each.
19	**Earth and Space**	1	**Earth's Rotation: Day and Night**	Earth spins once on its axis about every 24 hours, causing day and night and making the Sun appear to rise in the east and set in the west.
		2	**Earth's Revolution: The Year**	Earth travels around the Sun in about 365 days, which gives us one year.
		3	**The Moon and Its Phases**	The Moon orbits Earth in about a month. Its phases (new, crescent, half, gibbous, full) depend on how much of its sunlit side we see.
		4	**The Solar System**	The Sun and its eight planets in order. Inner planets are rocky and outer planets are giant planets made mostly of gas and ice.
		5	**Stars and Constellations**	The Sun is our nearest star. Other stars are much farther away, and groups of stars form patterns called constellations, used for navigation in the past.
20	**Ecosystems and the Environment**	1	**Ecosystems**	An ecosystem is made of living things and non-living parts (water, soil, air, sunlight) interacting in one place, such as a pond or forest.
		2	**Food Chains**	Energy passes from the Sun to producers (plants), then to consumers, while decomposers break down dead matter.
		3	**Interdependence and Biodiversity**	Living things depend on each other for food, shelter and pollination. Losing one species can affect many others, so biodiversity matters.
		4	**Pollution: Air, Water and Land**	Causes and effects of each type of pollution, and practical ways to prevent it.
		5	**Conserving Water and Energy**	Saving water and electricity, and renewable energy sources such as solar and wind power.
		6	**Waste Management**	Biodegradable and non-biodegradable waste, composting, and how Reduce, Reuse and Recycle lowers waste.
		7	**Human Impact and Conservation**	Deforestation, habitat loss and endangered species, and how tree planting and protected areas help species such as the markhor.

CURRICULUM SUMMARY

- **Total Chapters:** 20
- **Total Topics:** 91
- **Life Science Coverage:** 30 topics (Chapters 02–07): life processes, microorganisms, plant structure and function, animal classification, adaptations, human body systems, nutrition and disease prevention.
- **Physical Science Coverage:** 33 topics (Chapters 08–16): matter, mixtures, air and water, light, sound, heat, forces, simple machines, magnetism and electricity.
- **Earth and Space Science Coverage:** 15 topics (Chapters 17–19): Earth's layers, rocks and soil, resources, weather and climate, the water cycle, natural disasters, the Solar System and the Moon's phases.
- **Environmental Science Coverage:** 7 topics (Chapter 20): ecosystems, food chains, biodiversity, pollution, conservation, waste management and human impact.
- **Scientific Investigation and Thinking Coverage:** 6 topics (Chapter 01). Fair testing, prediction, measuring and evidence-based conclusions are also applied throughout the later chapters.
- **Overall Academic Focus:** The outline moves from what to why and how. Students explain relationships, classify with reasons, carry out simple fair tests and apply ideas to everyday situations.

ACADEMIC PROGRESSION

At Toddler Level, children recognised and named things: plant parts, states of matter, animals and their homes. At Beginner Level, the same areas become explanations: what each plant part does and how plants make food, particle-based differences between states, and adaptations that explain survival. The level also adds new fields such as electricity, simple machines, the Solar System and food chains. This prepares students for Learner Level, where these ideas extend into deeper systems, quantitative investigation and more formal scientific terminology.