



THE FEARNHILL

SCIENTIST

YEAR 7

The Fearnhill scientist

“The important thing is not to stop questioning. Curiosity has its own reason for existence. One cannot help but be in awe when he contemplates the mysteries of eternity, of life, of the marvellous structure of reality. It is enough if one tries merely to comprehend a little of this mystery each day.” **Albert Einstein**

Getting better at science means knowing more science. We have developed an ambitious and wide-ranging curriculum designed to foster a love of learning science as well as a natural curiosity about the scientific world.

We have identified a collection of scientific facts and ideas that we think a student should know by the time they reach year 11. These form the Fearnhill scientist.

The knowledge contained within the Fearnhill scientist provides a solid grounding for taking the GCSE exams at the end of year 11. It also helps prepare our students for life after school ensuring that they are equipped with the knowledge needed to understand the modern world.

The Fearnhill scientist has been split into four editions. Each addition represents the knowledge that students should have learned by the end of each year.

This is the year 7 edition. It contains all the powerful knowledge we expect students to have learned by the end of year 7.

The Fearnhill scientist is split into 11 themes that match our teaching modules

CELLS

1. Animal cells contain the following structures:
 - a. Nucleus (contains the DNA / controls the cell)
 - b. Cell membrane (controls what can enter the cell)
 - c. Cytoplasm (jelly like site of chemical reactions)
 - d. Ribosomes (site of protein synthesis)
 - e. Mitochondria (site of respiration (releasing energy from food))
2. Plant cells contain the same structures but also three additional ones:
 - a. Chloroplast (site of photosynthesis)
 - b. Cell wall (supports the cell)
 - c. Permanent vacuole (stores cell sap)
3. A tissue is a group of similar cells working together to perform a function.
4. An organ is a group of different tissues working together.
5. Diffusion is the movement of particles from a region of high concentration to a region of low concentration

HUMAN BIOLOGY

6. The main structures of the male reproductive system are:
 - a. Penis (delivers sperm into female)
 - b. Testes (produce sperm)
 - c. Glands (produces seminal fluid)
 - d. Scrotum (skin sac that holds testicles)
7. The main features of the female reproductive system are:
 - a. Vagina (muscular canal ending in the cervix)
 - b. Uterus (where the baby develops)
 - c. Ovary (produces the eggs)
 - d. Fallopian tubes (delivers the egg to the uterus)
 - e. Cervix (the neck of the uterus)
8. The male human gamete is the sperm cell.
9. The female human gamete is the egg cell.
10. Ovulation is the release of the egg from the ovary
11. Fertilisation occurs when the sperm cell fuses with the egg cell forming a zygote.
12. The role of the placenta is to bring the maternal and foetal blood close together without them mixing
13. Puberty is the name given to the series of physical and emotional changes that occur during adolescence
14. In males the main changes are:
 - a. Sperm production begins.
 - b. Pubic hair grows.
 - c. Voice breaks.
 - d. Growth spurt
15. In females the main changes are:
 - a. Menstrual cycle starts.
 - b. Breasts develop.
 - c. Growth spurt
 - d. Pubic hair grows
16. The menstrual cycle lasts approx. 28 days and includes the following events:
 - a. Menstruation (period)- the loss of the uterine lining
 - b. Ovulation- the release of an egg from the ovary

ENVIRONMENT

17. Classification is the process of grouping organisms which have similar characteristics.
18. Vertebrates have spinal cords;
19. Photosynthesis is an endothermic reaction involving plants and algae absorbing light energy and using it to produce glucose.
20. Plants obtain their raw materials via:
 - a. stomata for carbon dioxide
 - b. roots for water and minerals
21. Leaves are broad to absorb maximum light; thin to provide a short diffusion distance for gases; contain veins for transporting substances and support; contain chloroplasts filled with chlorophyll which absorbs the light energy for PS
22. Food chain: Part of a food web, starting with a producer, ending with a top/apex predator.
23. Arrows represent the flow of energy through a food chain which decreases at each trophic level.
24. Producer: Green plant or algae that makes its own food using sunlight.
25. Consumer: Animal that eats other animals or plants. Food chains can contain primary, secondary, tertiary and quaternary consumers.
26. A predator is an animal that is adapted to eating other animals.
27. Prey are animals that are eaten by other animals
28. Organisms in a food web (decomposers, producers and consumers) depend on each other for nutrients. So, a change in one population leads to changes in others.
29. Ecosystem: The living things in a given area and their non-living environment
30. A pesticide is any chemical used to kill, repel, or control certain forms of plant or animal life that are considered to be pests

MATTER

31. In solids the particles are close together, in a regular pattern and vibrate on the spot.
32. In a liquid the particles are close together, are arranged randomly and move around each other.
33. In gases the particles are far apart, are randomly arranged and move quickly in all direction
34. Changes of state are reversible changes as they can be undone.
35. Melting is the process of turning a solid into a liquid.
36. Freezing is the process of turning a liquid into a solid
37. Boiling is the process of turning a liquid into a gas.
38. Condensing is the process of turning a gas into a liquid
39. Boiling requires an energy input - whereas evaporation is the release of the molecules with the highest energy
40. A mixture consists of two or more different substances, not chemically joined together.
41. A solvent is a liquid that can dissolve a solute.
42. A solute is a solid that will dissolve in a solvent.
43. A solution is formed when a solute dissolves in a solvent
44. Filtration is used to separate an insoluble solid from a solvent
45. Distillation can be used to separate liquids that have different boiling points.
46. Chromatography is used to separate mixtures of soluble substances.

REACTIONS

47. Bases are substances that can react with acids and neutralise them.
48. Alkalis are bases that can dissolve in water
49. Acids have a pH of less than 7.
50. Alkaline solutions have a pH greater than 7.
51. A neutral solution has a pH of 7.
52. A chemical reaction happens if you mix together an acid and a base. The reaction is called neutralisation.
53. Metal oxide + acid \rightarrow water + salt
54. Metal hydroxide + acid \rightarrow water + salt
55. Metal carbonate \rightarrow water + salt + carbon dioxide
56. Hydrochloric acid forms chloride salts
57. Sulphuric acid forms sulphate salts
58. Nitric acid forms nitrate salt

EARTH

59. Igneous rocks are formed when magma (below the Earth's surface) or lava (above the Earth's surface) cools
60. Sedimentary rocks are crumbly, have layers and may contain fossils.
61. Sedimentary rock formation involves weathering, erosion and transport, deposition/sedimentation, compaction and cementation
62. Metamorphic rocks have been subjected to tremendous heat and/or pressure, causing them to change into another type of rock.
63. Global warming is the gradual increase in surface temperature of the Earth.
64. Climate change is causing melting of ice caps, rising sea levels, loss of habitats, extinction of species, extreme weather, changes in seasons and migration patterns
65. Human activities such as transport and farming have an impact on the environment
66. As the human population expands the impact we are having on the environment is increasing

WAVES

67. The planets in order of increasing distance from the sun are Mercury, Venus, Earth, Mars (rocky planets), Jupiter, Saturn, Uranus and Neptune (gas giants).
68. Planets in the Solar System orbit the sun rather than the Earth because the sun has the largest mass and the strongest gravitational field.
69. Year length varies on different planets due to different durations to complete one orbit of the sun.
70. Earth rotates on its axis; one complete rotation is a day and takes 24 hours
71. Earth orbits the sun; one complete orbit is a year and takes 365.25 days
72. At different points in the orbit, each hemisphere is tilted towards the sun (summer) or away from it (winter)
73. A solar eclipse happens when the moon passes between the sun and the Earth;
74. A lunar eclipse happens when the Earth passes between the sun and the moon

FORCES

75. Forces can change the shape, speed and direction of objects.
76. Contact force: One that requires objects to be touching e.g. friction, air resistance, reaction force, upthrust, tension.
77. Non-contact force: One that acts without direct contact between objects e.g. magnetism, static electricity, gravity
78. Resultant force: Single force which can replace all the forces acting on an object and have the same effect.
79. When the resultant force on an object is zero, it is in equilibrium and does not move, or remains at constant speed in a straight line
80. Friction is a stopping force. It resists motion.
81. Friction can occur between two solids, a solid and a liquid and two and liquids.
82. When two surfaces rub together friction is caused. It generates heat
83. Air resistance occurs due to collisions between air molecules/particles and moving objects.
84. large, bulky shapes experience more drag than smaller, spherical or pointed shapes as the bulky shapes are less able to smoothly displace air molecules
85. Mass: The amount of matter/particles in an object (kg).
86. Weight: The force of gravity on an object (N).
87. Gravitational field strength, g : The force from gravity on 1 kg (N/kg).

ENERGY

88. Energy is measured in joules, J.
89. The law of conservation of energy states that energy cannot be created or destroyed, only transferred from one store to another
90. Thermal energy store: Filled when an object is warmed up;
91. chemical energy store: Emptied during chemical reactions when energy is transferred to the surroundings;
92. kinetic energy store: Filled when an object speeds up;
93. gravitational potential energy store: Filled when an object is raised;
94. elastic potential energy store: Filled when a material is stretched or compressed.
95. Temperature: A measure of the motion and energy of the particles, measured in °C.
96. When heated, particles gain kinetic energy, vibrate/move faster and spread further apart
97. Conduction: Transfer of thermal energy by the vibration of particles. Particles heat up, gain kinetic energy, vibrate more, collide with neighbouring particles and transfer the energy.
98. Convection: Transfer of thermal energy when particles in a heated fluid (liquid or gas) rise.
99. Renewable: An energy resource that can be replenished as it is used and will not run out. Examples are solar, wind, waves, geothermal and biomass.
100. Non-renewable: An energy resource that cannot be replenished as it is used and will run out. Examples are fossil fuels and nuclear power.