

Science

Intent:

At Linby cum Papplewick C of E Primary School, we strive for all pupils to

- show a strong understanding of the world around them whilst teaching specific skills and knowledge to think scientifically
- understand scientific processes and see how science links to them now and in the future
- embrace curiosity and have the confidence to self-challenge to gain a deeper understanding of scientific knowledge

We endeavor to deliver a high quality science curriculum which allows our pupils to recognise the significance of science in their everyday lives. We explicitly teach pupils the skills and knowledge they need to become methodical, analytical and inquisitive scientists. A high quality science education provides the foundations for understanding the world and stimulates the inquisitive minds necessary for the future. With a focus on developing skills in biology, chemistry and physics, each underpinned by scientific enquiry, pupils are able to experiment and discover just how important science is in the world today.

Implement:

The acquisition of key scientific knowledge is an integral part of our weekly science lessons. Linked knowledge organisers, which include scientific diagrams and key vocabulary, enable pupils to learn and retain the important, useful and powerful vocabulary and knowledge contained within each unit. The progression of skills for working scientifically are developed through the year groups and scientific enquiry skills are of key importance within lessons.

At Linby cum Papplewick Primary, teachers create a positive attitude to science learning within their classrooms and reinforce an expectation that all pupils are capable of achieving high standards in science. We use the 'Developing Experts' scheme of learning. This ensures our curriculum is sequential, progressive and challenging.

Our whole school approach to the teaching and learning of science involves the following:

- Science will be taught in planned and taught in unit blocks by the class teacher. Our strategy is to enable all learners to achieve through adapted planning suited to their abilities
- Our curriculum is progressive. We build upon the learning and skill development of the previous years, which is tested through our 'start of unit quizzes' where teachers can identify misconceptions that need addressing.
- 'Working Scientifically' skills are embedded into lessons to ensure these skills are being developed throughout the pupils' time at Linby, and new vocabulary and challenging ideas are introduced through direct teaching. This is developed through the years, in keeping with the topics.
- Teachers demonstrate how to use scientific equipment, and the various 'Working Scientifically' skills in order to embed scientific understanding. Teachers find opportunities to develop pupils' understanding of their surroundings by accessing outdoor learning and workshops with experts.
- Through enrichment days, such as 'science day' and educational visits, we promote the profile of science and allow time for the pupils to freely explore scientific topics.

EYFS:

Science in the foundation stage is addressed through free-flow learning and exploring the world. EYFS teachers will encourage children to explore a chosen scientific area through the set up of specific stations in the unit. Pupils in foundation stage are encouraged to use and discover a variety of materials, tools and techniques, whilst making observations and exploring similarities and differences of objects and living things around them. It is important for EYFS pupils to show awareness of their own health and hygiene from a young age, including healthy eating habits and sleeping well.

Assessment and Recording of Learning:

Assessment in science is carried out by teachers through a variety of formative and summative methods. Start of unit quizzes allow teachers to identify misconceptions prior to the lesson input. End of unit quizzes allow teachers to assess pupil's progress and attainment in science. Knowledge organisers are used during every science lessons to aid knowledge retention.

Learning in science is recorded in a variety of ways, which are appropriate to the age of the pupil and their individual needs. This may include teacher observations, photographs, drawings, tables, graphs, written accounts and formal write ups. It is expected that all recorded science work is to be presented to a high standard. The balance of practical activity and length of recording tasks is carefully planned to maintain a scientific emphasis.

Impact:

The successful approach to the teaching of science at Linby cum Papplewick Primary results in a fun, engaging, high quality science education, that provides pupils with the foundations for understanding the world. Much of science lends itself to outdoor learning, and we are fortunate here at Linby cum Papplewick Primary that we are surrounded by woodland and nature. Therefore, we provide pupils with opportunities to experience science in the outdoors where possible.

Pupil voice and books looks are used to further develop the science curriculum, through questioning of pupils' views and attitudes towards science, to assess the children's enjoyment of science and to motivate learners.

Key Concepts in Science

Pupils build substantive knowledge of the main concepts, models, laws and theories across the three disciplines of science: biology, chemistry and physics.



Biology



Chemistry



Physics

Science									
Working Scientifically	Animals including humans	Plants	Living things and their habitats	Evolution and inheritance	Materials	States of matter	Forces	Energy	Earth Science
	Biology				Chemistry		Physics		

Pupils will also learn about significant scientists and discoveries and the impact of these on our lives. Through each unit, pupils will develop their disciplinary knowledge as they learn how to work scientifically.



Biology:

Pupils will develop an understanding of living things and their environments through the study of animals, humans, plants and habitats. They will learn about reproductions, inheritance and evolution through the study of life processes and life cycles.



Chemistry:

Pupils will learn about states of matter through the study of solids, liquids and gases. They will look at the properties of materials including rocks and fossils and will study reversible and irreversible changes in materials.



Physics:

Pupils will develop an understanding of the concepts and laws that apply to physics. They will study the concept of energy by learning about light, sound and electricity. They will develop an understanding of forces by studying and investigating friction, air resistance, gravity and magnets. They will learn about Earth and space, studying seasons, day and night, the solar system and beyond.

Key Concepts in Science

Working Scientifically



This is embedded through all units. Pupils will learn how scientific enquiry is used to grow and develop knowledge in science. They will learn how scientists use a variety of enquiry strategies to answer scientific questions. Different questions lead to different types of enquiry and are not limited to fair testing. Pupils will learn to use these enquiry strategies confidently and know that different strategies may be needed at different times. Through different units of science, pupils will learn the following:

- **Observing over time:** (observing or measuring how one variable changes over time)
- **Identifying and classifying:** (identifying and naming materials/living things and making observations or carrying out tests to organise them into groups.)
- **Looking for patterns:** (making observations or carrying out surveys of variables that cannot be easily controlled and looking for relationships between two sets of data)
- **Comparative and fair testing:** (observing or measuring the effect of changing one variable when controlling others)
- **Answering questions using secondary sources of evidence:** (answering questions using data or information that they have not collected first hand)
- **Using models:** (Developing or evaluating a model or analogy that represents a scientific idea, phenomenon or process)

*These concepts are studied in all units of science

Science: Mapping of Key Concepts

Cycle A			
Class	Autumn	Spring	Summer
Ash (R, Y1)	Biology: Animals including humans Physics: Seasonal changes	Chemistry: Materials Biology: Plants Biology: Animals including humans	Physics: Seasonal changes Biology: Animals including humans
Elm (Y1, Y2)	Biology: Animals including humans Chemistry: Everyday materials	Chemistry: Everyday materials Biology: Living things and their habitat	Biology: Plants Biology: Animals including humans
Fir (Y3, Y4)	Physics: Forces and magnets	Chemistry: States of matter	Biology: Animals including humans (Y3) Biology: Animals including humans (Y4)
Oak (Y5, Y6)	Physics: Electricity Physics: Light	Physics: Earth and Space	Biology: Animals including humans (Y5) Biology: Animals including humans (Y6)
Cycle B			
Class	Autumn	Spring	Summer
Ash (R, Y1)	Biology: Animals including humans Physics: Seasonal changes	Physics: Seasonal changes Chemistry: Materials	Biology: Plants Biology: Animals including humans
Elm (Y1, Y2)	Biology: Animals including humans	Physics: Seasonal changes Biology: Animals including humans	Biology: Living things and their habitat Chemistry: Materials
Fir (Y3, Y4)	Chemistry: Rocks Physics: Sound	Biology: Living things and their habitat Biology: Plants	Physics: Electricity Physics: Light
Oak (Y5, Y6)	Biology: Living things and their habitat (Y5) Chemistry: Properties and changes of materials	Biology: Evolution and Inheritance Physics: Forces	Biology: Living things and their habitat (Y6)

Science: Biology



Living things and their habitat (NC Y6)

- Describe how living things are classified into broad groups according to common **observable characteristics** and based on similarities and differences, including **microorganisms**, plants and animals.
- Give reasons for classifying plants and animals based on **specific characteristics**.

Vocabulary:
classified, observable characteristics, microorganisms, specific characteristics

Animals including humans (NC Y6)

- Identify and name the main parts of the human **circulatory system**, and describe the functions of the **heart**, **blood vessels** and **blood**.
- Recognise the impact of **diet**, **exercise**, **drugs** and **lifestyle** on the way their **bodies function**.
- Describe the ways in which **nutrients** and **water** are **transported** within animals, including humans.

Vocabulary:
circulatory system, blood vessels, blood, diet, exercise, drugs, lifestyle, nutrients, water, transported

Evolution and inheritance (NC Y6)

- Recognise that living things have changed over time and that fossils provide information about living things that inhabited the Earth millions of years ago.
- Recognise that living things produce **offspring** of the same kind, but normally offspring vary and are not **identical** to their parents.
- Identify how animals and plants are adapted to suit their environment in different ways and that **adaptation** may lead to **evolution**.

Vocabulary:
adaptation, evolution, identical offspring



UKS2

Living things and their habitat (NC Y5)

- Describe the differences in the **life cycles** of a **mammal**, an **amphibian**, an **insect** and a **bird**.
- Describe the **life process of reproduction** in some plants and animals.

Vocabulary:
Life cycle, mammal, amphibian, insect, bird, reproduction

Animals including humans (NC Y5)

- Describe the changes as humans **develop** to old age.

Vocabulary:
adolescent, breeding, conception, dependent, develop, embryo, fertilisation, foetus, gestation, hormones, offspring, pregnant, prenatal, puberty, toddler

Living things and their habitat (NC Y4)

- Recognise that living things can be grouped in a variety of ways
- Explore and use **classification keys** to help **group**, **identify** and **name a variety** of living things in their local and wider environment
- Recognise that **environments** can change and that this can sometimes pose dangers to living things
- Develop ideas about **functions**, **relationships** and **interactions** between living things and familiar environments.

Vocabulary:
classification keys, group, identify, variety, environments, functions, relationships, interactions

Animals including humans (NC Y4)

- Describe the simple functions of the basic parts of the **digestive system** in humans.
- Identify the different types of teeth (**molar**, **premolar**, **incisor** and **wisdom**) in humans and their simple functions.
- Construct and interpret a variety of **food chains**, identifying **producers**, **predators** and **prey**.

Vocabulary:
functions, digestive system, molar, premolar, incisor, wisdom, food chain, producer, predator, prey

Animals including humans (NC Y3)

- Identify that animals, including humans, need the right types and amount of **nutrition**, and that they cannot make their own food; they get nutrition from what they eat.
- Identify that humans and some other animals have **skeletons** and **muscles** for **support**, **protection** and **movement**.

Vocabulary:
Nutrition, skeletons, muscles, support, protection, movement



LKS2

Plants (NC Y3)

- Identify and describe the functions of the different parts of flowering plants: **roots**, **stem/trunk**, **leaves** and **flowers**.
- Explore the requirements of plants for life and growth (**air**, **light**, **water**, **nutrients from soil**, and **room to grow**) and how they vary from plant to plant.
- Investigate the way in which water is transported within plants
- Explore the part that flowers play in the life cycle of flowering plants, including **pollination**, **seed formation** and **seed dispersal**.

Vocabulary:
roots, stem/trunk, leaves, flowers, air, light, water, nutrients, transported, pollination, seed formation, seed dispersal

Plants (NC Y2)

- Observe and describe how **seeds** and **bulbs** grow into mature plants using scientific language
- Research and recall how plants need **water**, **light** and **suitable temperature** to grow and stay healthy

Vocabulary:
seeds, bulbs, water, light, temperature

Animals including humans (NC Y2)

- Describe and compare a variety of common animals (**birds**, **fish**, **amphibians**, **reptiles** and **mammals**, including **pets**)
- Know what **carnivores**, **herbivores** and **omnivores** are and name animals from each group
- Know that the five senses are **smell**, **taste**, **touch**, **sight** and **hearing**
- Know the names of the basic parts of the **human body** and identify, draw and label which parts of the body is associated with each sense

Vocabulary:
Birds, fish, amphibians, reptiles, mammals, carnivores, herbivores, omnivores, smell, taste, touch, sight, hearing, human body

Living things and their habitat (NC Y2)

- Explore and compare the differences between things that are **living**, **dead**, and things that have **never been alive**
- Identify that most living things live in **habitats** to which they are suited and describe how different habitats provide for the basic needs of different kinds of animals and plants, and how they depend on each other
- Identify and name a variety of common animals and plants in their **habitats** and **microhabitats**
- Describe how animals obtain their food from plants and other animals, using the idea of a simple **food chain**, and identify and name different **sources of food**

Vocabulary:
living, dead, habitats, microhabitats, food chain, sources of food



KS1

Plants (NC Y1)

- Know what **deciduous** and **evergreen** trees are and identify them in the environment by **shape**, **leaf**, **fruit**
- Identify and describe the basic structure of a variety of common plants including **trees**.

Vocabulary:
deciduous, evergreen, shape, leaf, fruit, trees

Animals including humans (NC Y1)

- Know that animals, including humans, have offspring which grow into adults
- Research and describe the basic **needs of animals**, including humans, for **survival** (water, food, air)
- Describe the importance for humans of **exercise**, eating the right amounts of different **food groups** (**protein**, **carbohydrates**, **dairy**, **fruit/vegetables**, **fats/oils**) and **hygiene**

Vocabulary:
needs of animals, survival, food groups, protein, carbohydrates, dairy, fruit/vegetables, fat/oils, hygiene

- Observe and distinguish between baby animals and those that are fully grown

Vocabulary:
baby, fully grown, animals

- Know that animals and plants are **living things**
- Investigate how to plant seeds, water them and talk about what they are doing
- Know the names of the **seasons** and discuss their impact on familiar animals and plants
- Observe closely and make **simple representations** of living things

Vocabulary:
living things, seeds, seasons, animals, plants

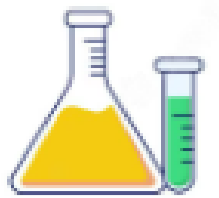
- Talk about and demonstrate care for **mini beasts** in their environment
- Describe and comment on things they have seen, including plants and animals

Vocabulary:
mini beasts, environment, plants, animals



EYFS

Science: Chemistry



Properties and changes of materials (NC Y5)

- Compare and group together everyday materials on the basis of their properties, including their **hardness, solubility, transparency, conductivity (electrical and thermal), and response to magnets.**
- Know that some materials will **dissolve** in liquid to form a **solution**, and describe how to recover a **substance** from a **solution**.
- Use knowledge of **solids, liquids and gases** to decide how **mixtures** might be **separated**, including through **filtering, sieving and evaporating**.
- Demonstrate that **dissolving, mixing and changes of state** are **reversible changes**.
- Explain that some changes result in the **formation** of new materials, and that this kind of change is not usually **reversible**, including changes associated with **burning** and the action of **acid** on **bicarbonate of soda**.

Vocabulary:

hardness, solubility, transparency, conductivity, electrical, thermal, solution, solids, liquids, gases, filtering, sieving, evaporating, dissolving, mixing, changes of state, reversible changes, formation, acid, bicarbonate of soda

States of matter (NC Y4)

- Compare and group materials together, according to whether they are **solids, liquids or gases**
- Observe that some materials **change state** when they are heated or cooled, and **measure** or **research** the **temperature** at which this happens in degrees **Celsius (°C)**.
- Identify the part played by **evaporation** and **condensation** in the **water cycle** and associate the rate of evaporation with temperature.

Vocabulary:

solids, liquids, gases, change state, measure, temperature, Celsius, evaporation, condensation, water cycle

Rocks (NC Y3)

- Compare and group together different kinds of rocks on the basis of their appearance and simple **physical properties**.
- Describe in simple terms how **fossils** are formed when things that have lived are trapped within rock.
- Recognise that soils are made from rocks and **organic matter**.

Vocabulary:

appearance, physical properties, fossils, organic matter

Uses of everyday materials (NC Y2)

- Ask questions about **materials** and suggest answers to them using prior and wider knowledge
- Know about the physical properties of a wider range of everyday materials such as **transparency, flexibility and absorbency**.
- Identify and compare the suitability of a variety of everyday materials including **wood, metal, plastic, glass, brick, rock, paper and cardboard** for particular uses
- Explore how the shapes of **solid objects** made from some materials can be changed by **squashing, bending, twisting and stretching**, and apply this knowledge to their own work

Vocabulary:

Material, transparency, flexibility, absorbency, wood, metal, glass, brick, rock, paper, cardboard, solid, squashing, bending, twisting, stretching

Everyday materials (NC Y1)

- Distinguish between an object and the materials from which it is made
- Identify and name a variety of everyday materials, including **wood, plastic, glass, water, wool and rock**
- Describe the simple **physical properties** of a variety of everyday materials
- Compare and group together a variety of everyday materials on the basis of their physical properties, explaining their reasoning

Vocabulary:

material, wood, plastic, glass, water, wool, rock, physical properties

Understanding the world - Materials

- Observe and use all their senses to explore **natural** and **manufactured** materials
- Talk about and describe what they notice about different materials
- Investigate and sort materials by given criteria
- Observe and talk about changes to materials caused by (e.g.) **heating or cooling**
- Investigate and talk about what **floats** and what **sinks**
- Know some words that describe materials (e.g. **hard or soft, rough or smooth**)

Vocabulary:

material, natural, manufactured, heating, cooling, float, sink, hard, soft, rough, smooth



UKS2



LKS2

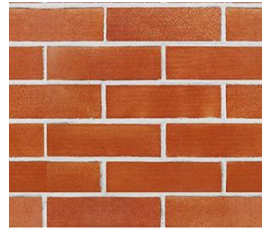


KS1

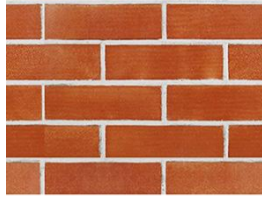


EYFS

Science: Physics



UKS2



Electricity (NC Y6)

- Compare and group materials based on their properties (e.g. hardness, solubility, transparency, conductivity, [electrical & thermal], and response to magnets
- Compare and give reasons for why components work and do not work in a circuit
- Draw circuit diagrams using correct symbols
- Know how the number and voltage of cells in a circuit links to the brightness of a lamp or the volume of a buzzer

Vocabulary:

appliances, battery, bulb, buzzer, cell, circuit, component, conductor, current, device, energy, fuel, insulator, switch

Light (NC Y6)

- Know how light travels
- Know and demonstrate how we see objects
- Know why shadows have the same shape as the object that casts them
- Know how simple optical instruments work, e.g. periscope, telescope, binoculars, mirror, magnifying glass etc.
- Know that white light is made up of a mix of spectrum colours

Vocabulary: angle, light, light source, mirror, opaque, optical, reflected, rotate, spectrum, sunshade, transparent, variable

Forces (NC Y5)

- Explain that unsupported objects fall towards the Earth because of the force of gravity acting between the Earth and the falling object.
- Identify the effects of air resistance, water resistance and friction, that act between moving surfaces
- Recognise that some mechanisms including levers, pulleys and gears allow a smaller force to have a greater effect

Vocabulary:

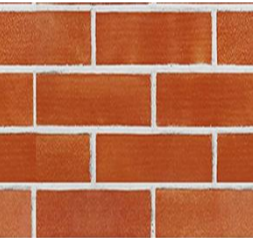
air resistance, force, friction, gears, gravity, levers, mass, pull force, pulleys, push force, water resistance

Earth and Space (NC Y5)

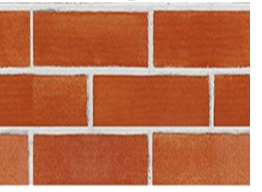
- Describe the movement of the Earth, and other planets, relative to the Sun in the solar system.
- Describe the movement of the Moon relative to the Earth.
- Know that our solar system is around 4.571 billion years old
- Know which planets are known as the rocky planets (Mercury, Venus, Earth and Mars) and which are known as the gas planets (Jupiter, Saturn, Neptune and Uranus)
- Describe the Sun, Earth and Moon as approximately spherical bodies.
- Use the idea of the Earth's rotation to explain day and night and the apparent movement of the sun across the sky.
- Know that the Sun is so big that the Earth could fit inside it 1.3 million times over

Vocabulary:

astronomer, axis, geocentric model, heliocentric model, Moon, orbit, planet, rotate, satellite, sphere, spherical body, star, Sun



LKS2



Sound (NC Y4)

- Know how sound is made associating some of them with vibrating
- Know how sound travels from a source to our ears
- Know the pattern between pitch and the object producing a sound
- Know the pattern between the volume of a sound and the strength of the vibrations that produced it
- Know what happens to a sound as it travels away from its source

Vocabulary:

absorb sound, amplitude, eardrum, pitch, soundproof, sound wave, vacuum, vibration, volume

Electricity (NC Y4)

- Identify and name appliances that require electricity to function
- Construct a series circuit
- Identify and name the components in a series circuit (including cells, wires, bulbs, switches and buzzers)
- Predict and test whether a lamp will light within a circuit
- Know the function of a switch in a circuit
- Know the difference between a conductor and an insulator, giving examples of each

Vocabulary:

appliance, battery, bulb, buzzer, cell, circuit, conductor, electricity, energy, insulator, motor, switch, wire

Light (NC Y3)

- Know what dark is the absence of light
- Know that light is needed in order to see and is reflected from a surface
- Know and demonstrate how a shadow is formed and explain how a shadow changes shape
- Know about the danger of direct sunlight and describe how to keep protected

Vocabulary:

dark, light, light ray, light source, opaque, reflect, shadow, translucent, transparent



KS1

Seasonal Changes (NC Y1)

- Observe changes across the four seasons
- Observe and describe weather associated with the seasons and how day length varies

Vocabulary:

day, Earth, night, nocturnal, orbit, seasons, Sun, temperature, thermometer, weather

Weather

- Name and identify different types of weather

Vocabulary:

sunny, windy, rainy, snowy

Forces

- Explore how things work e.g. toys
- Explore pushes and pulls
- Talk about forces and concepts such as floating and sinking, magnetism and light

Vocabulary:

push, pull, float, sink

EYFS

Science: Working Scientifically



Observing over time Using observations and data to draw conclusions

I use a range of scientific equipment to take accurate and precise measurements or readings, with repeat readings where appropriate.

I ask my own questions about the scientific phenomena that I am studying, and select the most appropriate ways to answer these questions including observing changes over different periods of time.

I draw conclusions, explain and evaluate my methods and findings, communicating these in a variety of ways.

I am evaluate the degree of trust in results.

Identifying/Classifying

I can classify materials and identify why they are / are not fit for purpose.

I ask my own questions about the scientific phenomena that I am studying, and select the most appropriate ways to answer these questions, recognising and controlling variables and grouping and classifying things.

Looking for patterns

I ask my own questions about the scientific phenomena that I am studying, and select the most appropriate ways to answer these questions, recognising and controlling variables where necessary and carrying out comparative and fair tests.

I draw conclusions, explain and evaluate my methods and findings, communicating these in a variety of ways.

Comparative and fair testing

I ask my own questions about the scientific phenomena that I am studying, and select the most appropriate ways to answer these questions, recognising and controlling variables where necessary and carrying out comparative and fair tests.

I draw conclusions, explain and evaluate my methods and findings, communicating these in a variety of ways.

Using secondary sources of evidence

I describe and evaluate my own and others' scientific ideas related to topics in the national curriculum (including ideas that have changed over time), using evidence from a range of sources

I ask my own questions about the scientific phenomena that I am studying, and select the most appropriate ways to answer these questions including finding things out using a wide range of secondary sources

Using models

Understand how models about space and the solar system explain processes that cannot be observed.

Observing over time Using observations and data to draw conclusions

I make careful and systematic observations and take accurate measurements using standard units

I can use results to draw simple conclusions, make predictions for new values, suggest improvements and raise further questions

I can record findings using bar charts keys, tables and labelled diagrams

Identifying/Classifying

I can gather, record, classify and present information in a variety of different ways to help me answer questions.

Looking for patterns

I can identify differences, similarities or changes related to simple scientific ideas and processes.

Comparative and fair testing

I can ask relevant questions and use different types of scientific enquiry to answer them, including comparative and fair tests.

I can record findings and present data using simple scientific language, explanations, diagrams, pictures, keys, bar charts and tables.

Using secondary sources of evidence

I can identify scientific evidence that has been used to support or refute ideas or arguments.

Using models

I understand how models can explain progresses that can't be fully observed eg: how light/sound travel, magnetism, the water cycle.

I understand how models explain how molecules behave when substances change shape.

Observing over time Using observations and data to draw conclusions

I can observe changes over time.

I can ask questions about what I notice.

Identifying/Classifying

I can group and classify things

Looking for patterns

I can use different types of scientific enquiry to gather and record data, using simple equipment I notice patterns in my observations or data.

Comparative and fair testing

I can carry out simple comparative tests.

Using secondary sources of evidence

I can find things out using secondary sources of information.

Observing over time Using observations and data to draw conclusions

I can make observations and explain what I can see.

Identifying/Classifying

I can sort objects into groups.



Understanding
the world

EYFS