Science Core Knowledge:

Physics; **Chemistry**; **Biology**

Year 3 – Forces & Magnets; Light; Plants; Animal nutrition; Rocks

Year 4 – Sound; Electricity; States of matter; Animals and digestion; Habitats

Year 5 – Forces; Earth & Space; Materials & Properties; Life Cycles; Human Development

Year 6 – Light; Electricity; Habitats; Evolution; Human Circulatory System

Each topic also comes with its own 'Concept Cartoon'. A question with four answers designed to get children (and parents) talking about, and interested in, scientific reasoning. Sometimes there is more than one right answer.

Year 3 – Magnets and Forces

1. What is a magnet made out of?
2. What are the two ends of a magnet called?
3. What word do we use when a magnet 'pushes' another magnet away?
4. What word do we use when a magnet 'pulls' another magnet towards it?
5. Do magnets need to be touching certain materials to pull them?
6. Can you name a material that won't be 'pulled' by a magnet?
7. Can you name a material that will be 'pulled by a magnet?
8. How do you change whether a magnet 'pushes' or 'pulls' another magnet?

How do you think magnets affect other materials at a distance?

I think magnets stick together because the two different sides really want to be next to each other.

I think magnets work because they have some sort of electrical charge. I've heard of things called electromagnets.

I think magnets work because they have some sort of gravity pull

I think magnets are linked into the Earth and the Moon and they circle each other like the Moon orbits the Earth.

Year 3 – Light

1. What object in space gives light to the Earth?
2. What is the posh, scientific word for when light bounces off something?
3. What causes darkness? For instance, at night-time.
4. When light gets blocked by an object, what can we see behind that object?
5. What is the posh, scientific name for an object that blocks light?
6. In what two ways can light be bad for you?
7. Why is it warmer when it is sunny?

Why, if space is full of stars, is it black?

I think that although it's full of stars, they are too far away from each other to give a lot of light.

I think that light can only be seen if there is oxygen/air. Because there is no air in space, we can't see the light.

The light is travelling but it needs to bounce off something to be seen. Because space is so empty, we can't see the light bouncing.

I think the light that travels possibly gets blocked by other planets and moons.

Year 3 – Plants

1. Name of the parts of a plant that keep it stuck in the ground?
2. How can plants take in water?
3. Why do plants have seeds?
4. Name at least three things a plant needs in order to live.
5. What is the word for when an insect spreads one plant's pollen onto another plant?
6. Name at least two ways in which plants disperse their seeds.
7. What is the difference between a flower and a leaf?
8. What does a leaf on a plant need to have hit it so it can make food for the plant?

Why do plants produce delicious nectar and have beautiful, sweet-smelling flowers?

Plants have beautiful flowers so that humans decide to grow them and look after them.

Plants have beautiful flowers and nectar so that they can attract bees and insects which will spread their pollen.

I think plants have beautiful flowers so they can attract other plants to them

I think that plants have beautiful flowers because they absorb different coloured light

Year 3 – Animal Nutrition

1. What is the posh, scientific word for the energy an animal gets from its food?
2. What is the posh, scientific word for the foods an animal eats? (Hint: begins with a 'd')
3. Why do all animals eat?
4. Does my cat eat the same food as my gerbil?
5. What is the word for ALL of the bones in your body?
6. What is the word for the strong things attached to your bones that move your arms, legs, mouth, fingers and so on?
7. Why do animals need to move around to get their food?

How do animals without bones move around?

They are full of air and can blast air out in different directions, moving them around.

Most animals without bones actually have them on the outside of their body. Rather than moving on the inside, they move on the outside.

They don't actually need the bones to move. Bones give us strength but it's other things that actually move us

All animals have bones, we just can't see them

Year 3 – Rocks

1. What are the three types of rock?
2. Which rock comes from volcanoes?
3. Which rock comes from being crushed or smoothed by the weather?
4. Which rock right out of the Earth itself?
5. What two things is soil made from?
6. How do we know that dinosaurs existed?
7. How are the answers from question 6 made?
8. What word do we have for animals, like dinosaurs or dodos, that aren't around anymore? (Hint: begins with an 'e')

Why does petrol come out of the Earth?

Petrol is actually the juice left behind by dead animals; your car is powered by dinosaurs!

Petrol is a type of lava that comes out of the Earth. It's hot so powers things.

I think that petrol is melted crystals that we can take out of the Earth. These crystals can power things.

I think that petrol is juice from the sun which soaks into the ground.

Year 4 – Electricity

1.Name at least ten things that use electricity as energy
2.What is the posh, scientific word for the circle/track we make that allows electricity to flow?
3.What do we call the metal 'string' that links these electrical bits together?
4.What do we call the object we can press/move which breaks the circle, making the electricity stop and start?
5.What do we call a material which really easily allows electricity to flow through it?
6.What do we call a material that is really hard or impossible for electricity to flow through?
7.What do we call the object that houses the electrical energy (hint: you put them into remote controls)?
8.Is electricity completely safe?

Could humans use electricity to power themselves?

No! It's very, very dangerous and can hurt our bodies. A human should never even try it.

Our bodies actually do have electricity in them so actually we already are powered by electricity.

I think electricity could be used to power a human but we haven't found a way to use it safely yet.

I suppose if you can get electricity from lemons and humans can eat lemons, we already are eating batteries.

Year 4 – Sound

1.How does sound travel?
2.What is the posh, scientific word for the jiggling of the air particles?
3.Why can no-one hear you scream in space?
4.What is the posh, scientific word for the louder or quieter a sound is?
5.What is the posh, scientific word for when soundwaves get nearer together as you pull an elastic band tighter and tighter?
6.Why are things louder when you get nearer to them?
7.What is the Doppler Effect?
8.How do our ears allow us to hear?

Why is sound muffled underwater?

I think it's because our ears get blocked with water so it's harder to hear.

I think because sound travels through air and there is no air underwater, sound simply can't travel

Sound actually travels better underwater. It goes further and faster!

It's not quieter underwater – it's just that our ears are not designed to hear those sounds.

Year 4 – States of Matter

1.What are the three states of matter called?
2.What is the posh, scientific word for when a liquid turns into a gas?
3.What is the posh, scientific word for when a gas turns into a liquid?
4.What do you have to do to a liquid to make it turn into a gas?
5.What role does the Sun have in the water cycle?
6.What is a cloud?
7.What unit do we measure temperature in?
8.What happens to the soil when it rains?

Why do you think gargoyles or graves at churches look 'worn away'?

The materials that they are made of are old and pretty rubbish. They just fall apart over time.

Water has molecules so when it rains they pound into the rock. Over time, this pounding wears away the stone.

I think it's something to do with acid rain.

When you leave out old metal things they rust, I think stone acts the same way. When it gets wet, it can rust.

Year 4 – Animal Digestion

1. Name at least five parts inside our bodies that help us to eat food.
2. What is the posh, scientific word for when our bodies break down food into energy?
3. What is the difference between an incisor and a molar?
4. What do we call the individual parts of a body system (for instance; the stomach)? It begins with an 'o'.
5. What is the posh, scientific word for the 'journey' where plants are eaten by herbivores who are then eaten by carnivores/omnivores?
6. What do we call the animal that eats other animals? Begins with a 'P'
7. What do we call the animal which is eaten by other animals? Begins with a 'P'
8. What is the posh, scientific word for the plants that start the energy? Begins with a 'P'

Why is the answer from number 5 normally in the shape of a triangle?

I think that because the more you move along the 'journey', the harder it is to eat that animal so it becomes rarer

I think that because animals burn off energy, the other animals always need to eat more of the animals who are before them in the journey.

I think it's just because there are more plants than animals so obviously they'll be eaten more.

Because plants get their energy from the sun, they always are going to start off with more energy.

Year 4 – Habitats

1. What is the posh, scientific word for a place where plants and animals live? (Begins with an 'h')
2. What is the posh, scientific word for the relationship the plants and animals have with each other; mostly eating each other? (Begins with an 'e')
3. What is the posh, scientific word for the way in which we put animals into groups?
4. What are the differences and similarities between a dog, a cat, a tortoise and a snail?
5. What is the posh, scientific word for an animal with a backbone/spine?
6. What is the posh, scientific word for an animal without a backbone/spine?
7. Why do forests, woods, meadows and jungles have more animals than a desert?
8. How are humans affecting animals through deforestation?
9. Why is having too many animals in one place a bad thing?

How is a camel 'designed' to live in the desert?

It isn't. It can't be – why would something that lives in a hot desert have a thick layer of hair?

Camels have light hair that not only camouflage it in the sand but reflect all the light from the sun away.

A camel needs thick hair to protect it from sandstorms and the cold at night.

A camel's hump is full of water.

Year 5 – Forces

1. If you throw an object into the air, it will come back down. What is this force called?
2. If the Earth is spherical, why do people on the bottom not fall off?
3. Which has more of this force: a heavy planet or a lighter moon?
4. What is the posh, scientific expression for air molecules hitting into a moving object and slowing it down?
5. What is the posh, scientific word for an object designed to slip through these air molecules?
6. What is the posh, scientific expression for when water molecules slow you down or make it hard to dive deeply?
7. What is the posh, scientific word for when the ground slows an object down or you 'burn' your knee on a carpet?
8. Name three simple machines that humans have invented which allows a small force to become stronger (like a catapult or car jack).

If you fire a bullet from a gun, why doesn't it keep travelling forever?

The force from question 1 pulls the bullet back down to Earth.

The force from question 4 slows it down and when it stops, it falls down.

Bullets are actually designed to come down. You can shoot up and then the bullet will come down again.

Who says it doesn't travel forever? Has anyone ever actually shot a bullet in a path that never hits anything?

Year 5 – Earth and Space

1. Name the eight planets of the solar system.
2. What is the name of the star in the middle of that solar system?
3. What is the difference between a planet and a moon?
4. Why doesn't the Moon crash into the Earth?
5. What shape are orbits of planets around stars; or moons around planets?
6. Why are the rules of movement different in space from Earth; why does the Earth or moon never slow down?
7. What causes daytime and night-time?
8. Why does the moon change 'shape' throughout a month?
9. What causes the seasons? Remember that the Earth is nearest our star in January yet that's winter in Britain.

Why is Earth the only planet in the solar system with life?

Who says we are the only planet with life? Maybe some of the other planets have life that we just haven't found yet.

Earth is the only planet with liquid water and you need water to drink and protect you from the sun.

Earth is the only planet with a magnet core and this protects us against the power of the sun.

Earth is the only planet in the Goldilocks Zone. If other planets moved into it, they might get life too.

Year 5 – Materials and their Properties

1. What is the posh, scientific word for an object which light can pass through and not create a shadow?
2. What is the posh, scientific word for 'heat'?
3. What is the posh, scientific expression for when an object allows heat to move through it?
4. What is the posh, scientific word for two different materials (solids or liquids) which are combined but don't dissolve; easily being sieved or separated without much effort?
5. If a solid **dissolves** in a liquid, what do we call this new thing?
6. How would you get the solid and liquid to separate out again?
7. What is the posh, scientific word for turning a solid into a liquid?
8. What is the posh, scientific word for turning a liquid into a solid?
9. How does adding or taking away heat (cold) change a material's state of matter?
10. What is the posh, scientific word for when you change an object chemically but can then change it back?
11. What is the posh, scientific word for when you change an object chemically but **can't** then change it back?

What is cold?

Cold is an energy like heat. There is heat energy and there is cold energy.

There actually isn't such a thing as cold. Cold is simply when there is no heat.

Cold is like heat but just lower down on the scale. This is why cold can 'burn' you.

Cold is the energy released when a solids turns into a liquid.

Year 5 – Life Cycles

1. What is the posh, scientific word for the reproduction in certain plants and bacteria where they can simply grow new 'babies'?
2. What is the posh, scientific word for the reproduction in certain plants and most animals where they need a female and male to have 'babies'?
3. Name the only type of animal that has gestates its babies inside their body (they don't lay eggs)
4. Name the type of animal that spends its 'childhood' in water and then changes its body completely to come out to live on land.
5. Name the type of animal that lays eggs in a nest, hatches blind and featherless young and takes care of them until they are developed enough to leave this nest.
6. Name **the type** of animal that sometimes change from a 'baby' to an adult by using a cocoon.
7. Why do frogs hang around near water sources?

Why do male birds have colourful feathers and sing beautiful songs?

They have colourful feathers so they can attract birds and insects so they can spread their pollen.

They have colourful feathers so their babies can recognise them if they get separated.

They have colourful feathers and sing so they can attract female birds. The best ones get the best females.

They sing songs so they can be recognised. Every bird has a different accent and they can call their wives.

Year 5 – Human Development

1. What two things are inside the womb to help the embryo eat and breathe in the womb?
2. How do babies fit inside the womb?
3. Name at least two things which change as a new-born baby gets older into a toddler
4. What are the three-letters responsible for the 'recipe' of how you look, which you get from your mum and dad?
5. Why do we get wrinkled and grey as we get older?
6. How does a human develop in the womb?
7. What is the posh, scientific word for when human bodies change as they become teenagers (for instance more hair, stronger, voice changes)?

Why do human embryos have gills and a tail?

All animals on the planet have evolved from fish that came from the sea. This can be seen at the start of a baby.

Well the womb is full of liquid so of course they are going to have a tail and gills. They would drown otherwise!

They don't. It's just the legs haven't developed properly at the start.

This is so they can get exercise in the womb by swimming about.

Year 6 – Electricity

1. How could you make a bulb shine more brightly in an electrical circuit?
2. What happens to the electrical energy when it goes into a bulb?
3. What happens to the electrical energy when it goes into a buzzer?
4. Draw at least three symbols for some components of an electrical circuit.
5. Why do batteries run out?
6. What is the posh, scientific word for the electricity 'molecules'?
7. How can I create a fast circuit?
8. How does electricity move? Does it always need wires?
9. What kind of energy do you get in a battery before it turns into electrical energy? This is how lemons can act as batteries.

What is lightning?

It's Zeus in a bad mood, throwing lightning bolts at people.

Lightning is light from the sun which gets electrically charged as it comes through our atmosphere.

I think lightning is snow and ice in cold clouds rubbing together and making electricity.

I think lightning is when the gassy/water molecules within clouds rub together and make static electricity.

Year 6 – Light

1. In which direction does light travel?
2. What organ do animals have that takes in light?
3. How can we see the sun's light, even if we can't see the sun?
4. How does a sun-dial work?
5. Why are periscopes built at right-angles rather than looped?
6. Why do objects 'bend' when placed in water?
7. What's a rainbow?

If the universe is full of stars that we can see, why do we have dark at night?

The stars are so far away that the light still hasn't reached us yet.

The stars are tiny little bits of light and aren't powerful enough to light the air.

They are so far away that the light is angled in a way that it gets concentrated on a really tiny area.

The stars have a different kind of light that our eyes aren't designed to pick up.

Year 6 – Evolution and Inheritance

1. What scientific proof do we have in rocks that some animals have changed over time?
2. What is the posh, scientific word for animals changing their bodies over a very long period of time?
3. Why do I look a bit like my dad/mum?
4. What is the posh, scientific word for the DNA you get from your mum and dad?
5. What happens when a poodle and a Labrador have a baby?
6. Why do brothers and sisters not look exactly the same (apart from some twins!)?
7. Why do chaffinches in different parts of Madagascar have different beaks?
8. What is the posh, scientific word for animals' bodies changing to suit where they live?
9. Why will animals who are better at getting food and staying alive have more offspring?
10. Would an eye have developed overnight?

Why can't a yak and a slug have a baby?

They are not the same species so it is impossible to have a baby.

If a yak sent its DNA into a slug, the slug's immune system would think it was a germ and would kill it.

Who says they can't? You get ligers and mules.

That is the worst question I think I've ever been asked in my life.

Year 6 – Habitats

1. What is the posh, scientific word for the grouping of animals and plants?
2. What is the posh, scientific word for a single-celled animal?
3. What is the posh, scientific word for a multi-celled animal?
4. What is the posh, scientific word for animals we cannot see with the naked eye?
5. What are differences and similarities between a lobster and a scorpion?
6. What are the differences and similarities between a dog and a cat?
7. What are the difference and similarities between a salmon and a whale?

Why are there still germs? Why don't they get more advanced?

Why would they need to? They absolutely dominate the planet.

They would do but humans keep killing them just before they can move on.

Well germs started off as germs and humans started off as humans. Germs can't turn into humans!

Humans have their spaces and skills and so do germs. By being more simple, they can do their own thing in peace.

Year 6 – Human Circulatory System

1. What is the posh, scientific expression for the heart, blood and blood vessels in a human?
2. Why is the heart mostly made of muscle?
3. Why do red blood cells have no nucleus?
4. How does blood help us to get energy and nutrients?
5. What happens if you eat more food than you expend energy?
6. What is a drug?
7. Which drugs can we legally eat or drink?

Why, if blood is red, do our blood vessels in our arms look blue?

When blood has oxygen it's red, when it doesn't have oxygen it's blue.

The oxygen thing is nonsence; it's just that only blue light can get into our skin.

The blood is red but the actual vein coating is blue. The veins are not see-through.

Veins are blue and arteries are red. They help show which way the blood is travelling.

Year 3 Answers:

Magnets: 1. Metals, normally iron and nickel 2. Poles 3. Repels 4. Attracts 5. No 6. Anything other than metal (and some metals) 7. Metals, specifically iron and nickel 8. Change which pole is pointing at the other; if they're the same they'll repel, if they're different they'll attract.

Light: 1. The Sun 2. Reflect 3. When there is no light 4. A shadow 5. Opaque 6. It can damage your eyes and the heat can burn or damage your skin 7. The energy from the sun gives off heat

Plants: 1. Roots 2. Through the stem (trunk in trees) 3. That's how they spread more plants 4. Three out of light, water, carbon dioxide, oxygen, nutrients from soil, nutrients from animals (if plant is carnivorous) and room to grow 5. Pollination 6. Two from fruit, exploding seeds, sticky seeds, seeds carried by wind and seeds carried by water 7. A flower has pollen and attracts insects, a leaf makes 'food' from sunlight 8. Sunlight

Animal Nutrition: 1. Nutrition 2. Diet 3. To get energy 4. No. Different animals have different diets. 5. Skeleton 6. Muscles 7. They cannot make their own food so need to go and find it.

Rocks: 1. Igneous, metamorphic and sedimentary 2. Igneous 3. Sedimentary 4. Metamorphic 5. Rock and organic matter 6. From their fossils 7. Animals die and leave behind their bones. Soil layers over the bones leaving a 'cast'. Eventually the bones rot away leaving hollow shapes inside the rock. 8. Extinct.

Year 4 Answers

Electricity: 1. Parents' discretion 2. Circuit 3. Wire 4. Switch 5. Conductor 6. Insulator 7. Battery 8. No, it can be harmful, even deadly.

Sound: 1. It collides with air particles, crashing from one to another 2. Vibrate 3. There are no air molecules so nothing to vibrate 4. Volume 5. Pitch 6. The vibrations haven't spread out as much so there are more that will hit your ears 7. As sound particles come toward you they bunch up into a 'mmmmMMMEEEE', as they move away they spread out in a 'EEEEEEMMMMmmm'. Like a racing car. 8. The outside of your ear 'catches' the sound waves and channels them into the ear where they strike your ear drum.

States of Matter: 1. Solid, liquid and gas 2. Evaporation 3. Condensation 4. Heat it 5. The sun's light also gives heat which evaporates water 6. Water molecules which have become a gas, risen up but then started to cool down and condense into water 7. Degrees Celsius 8. It can erode/weather due to the water molecules striking it.

Animal digestion: 1. Any five from tongue, teeth, throat/oesophagus, stomach, small intestine, large intestine and mouth 2. Digestion 3. An incisor is sharp and designed to cut and rip meat; a molar is flat and rough, designed to crush and chew plants 4. Organs 5. Food chain 6. Predator 7. Prey 8. Producer

Habitats: 1. Habitat 2. Ecosystem 3. Classification 4. Parent's judgement 5. Vertebrate 6. Invertebrate 7. There are more plants in those regions and these provide more food at the start 8. Humans remove animals' 'homes' and food 9. They will eat too much of a certain type of food and run the risk of wiping out that plant/animal. If this starts to happen, the large number of animals will either begin to leave or starve, reducing their number.

Year 5 answers

Forces: 1. Gravity 2. The Earth's gravity pulls objects towards its centre 3. A heavy plant (it's not about the size of an object, it's about the mass/density of it) 4. Air resistance 5. Aerodynamic 6. Water resistance 7. Friction 8. Lever, pulley and cogs (other exist such as wedges and inclined planes)

Earth and Space: 1. (In order from nearest to Sun) Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus and Neptune 2. The Sun 3. A planet's movement is <u>only</u> affected by stars; a moon's movement can be affected by other planets, large objects and so on (this is why Pluto was de-listed as a Planet) 4. The moon is always falling into the Earth but because of the lack of air resistance and friction in space, it never slows down. The gravity of the circular Earth always changes where 'down' is 5. Circular (or elliptical) 6. No air resistance nor friction 7. The Earth's rotation means the Sun's light only hits us 'half' the time 8. The moon is in the darkness of space and the 'shape' of the moon results from the angle of the Sun's light striking it from where we can see it on Earth 9. The Earth is tilted slightly on its axis and the UK is towards the top, at an angle. When the tilt is facing the Sun, we get more light (longer days) and heat. When the tilt is facing away from the Sun we get less light (short days) and less heat.

Materials and their Properties: 1. Transparent 2. Thermal energy 3. Conductor 4. Mixture 5. Solution 6. Heat the solution so the water and solid molecules separate from each other 7. Melting 8. Freezing 9. It gives the molecules energy so they jiggle around and break apart from each other. The more heat, they spread out into gas. When there isn't much heat, there isn't much energy and they bunch together into a solid. 10. Reversible 11. Irreversible.

Life Cycles: 1. Asexual 2. Sexual 3. Mammal 4. Amphibian 5. Bird 6. Insect 7. Because they need the water to lay their eggs and have their young develop.

Human Development: 1. Placenta and umbilical cord 2. They grow from single-celled life to many-celled. They squeeze into the foetal position 3. Some of their bones fuse together, they lose their brown fat, their hair-colour and eye-colour can change, their muscles strengthen, they lose some of their reflexes 4. DNA (deoxyribonucleic acid) 5. Every time our cells copy themselves they get weaker and weaker, losing colour and strength 6. Puberty.

Year 6 answers

Electricity: 1. You add more batteries (or take away another component of the circuit) 2. It changes into heat/thermal and light energy 3. It changes into sound energy 4. Check on internet 5. The stored energy in the battery is lost through heat, light and sound until it runs out 6. Electrons 7. Increase batteries, decrease components, have better conductors for wires 8. Electrons move through the circuit, carrying a charge. Electricity can move without 'solid' conductors such as lightning and static electricity. 9. Chemical energy

Light: 1. A straight line 2. Eyes (of varying designs) 3. Light reflects off surfaces so can 'bounce' around until we see it 4. The angle of the sun in relation to the opaque dial moves the shadow around 5. Light reflects in straight lines so a periscope needs to be straight with right-angled mirrors 6. The water molecules refract the light, causing an illusion 7. The sun's white light broken into the six constituent parts (red/orange/yellow/green/blue and indigo; there is no real difference between indigo and violet) by air and water molecules in the atmosphere.

Evolution and Inheritance: 1. Fossils 2. Evolution 3. You get your DNA from both of your parents so will share similarities to both 4. Genes 5. They will have a mixture between the two; a cockapoo. All dogs are the same species and can have mixed babies. 6. The genes we get from our parents is not always exactly the same each time so one child may have a nose like their mum and the other child like their dad 7. They have adapted to get to different food sources 8. Adaptation 9. They are much more likely to mate and will be more desirable to a partner 10. No; it would have taken millions of years.

Habitats: 1. Classification 2. Prokaryote 3. Eukaryote 4. Micro-organism 5., 6. And 7. Adults' discretion.

Human Circulatory System: 1. Circulatory system 2. It needs to be strong to pump all that blood 3. To maximise the amount of oxygen and carbon dioxide they carry 4. Blood cells carry oxygen and take away waste gases. The plasma delivers glucose energy from our food. 5. The body stores this energy as fat 6. A drug is a substance which affects/changes your body in some way when it gets into your circulatory system 7. Adults' discretion but likely to be medicines, caffeine, alcohol and nicotine (although the last two are obviously age-related). Chocolate potentially.