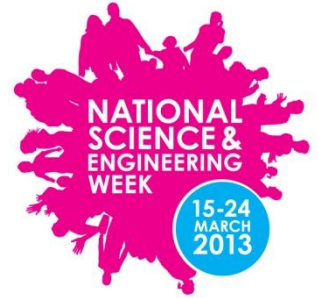


National Science & Engineering Week Quiz

Level 1 Answers



Round 1: Invention and Discovery

1) Which 19th Century invention is used by doctors to check for broken bones?

Answer: X-ray machine

X-Rays are a very powerful form of light which can travel through things that ordinary light waves can't.

Some materials, such as glass, allow ordinary light to pass through them very easily while other materials, such as wood, do not. In a similar way, there are materials that allow X-rays to pass straight through them (such as our skin) and materials that stop X-rays dead in their tracks (such as our bones). This enables Doctors to take an image of our skeleton, and check for broken bones.

The first X-ray image was taken by Wilhelm Roentgen in 1895, which showed an X-ray of his wife's hand.

2) Which 1970's invention is used by people across the world to send messages to each other using the internet?

Answer: E-mail

The first electronic mail (e-mail) was sent by Ray Tomlinson in 1972. Nowadays over 160 billion emails are sent all over the world every day.

The first e-mail from space was sent in 1991. The crew of STS-43 Atlantis used Apple's early AppleLink software to transmit the following message:

"Hello Earth, greetings from the STS-43 Crew! This is the first AppleLink from space. Having a GREAT time, wish you were here... send cryo and RCS! Hasta la vista, baby... we'll be back!"

3) In 1876, Alexander Graham Bell invented a device that could send a person's voice down a wire to a receiver on the other end. What was this invention?

Answer: Telephone

When speaking on the telephone, the voice travels through the air as sound energy, and into a small microphone. Here, vibrations from the voice are converted into electrical energy, which flows down the phone line and is converted back into sound when it reaches the handset at the other end.

"*Watson, come here, I want you!*" were the first words ever said over the telephone by Alexander Graham Bell to his assistant Thomas Watson in 1876.

Originally, Alexander Graham Bell suggested 'Ahoy' as the standard telephone greeting; however the word 'hello' was found to be a much more popular choice.

4) Which was invented first?

Answer: Typewriter

The first practical typewriter was invented in 1867 by Christopher Sholes, Carlos Glidden and Samuel Soule.

The first electronic typewriter was built by Thomas Edison in 1872; however the widespread use of electronic typewriters did not become common until the 1950s.

5) In 1903, the Wright brothers tested a machine that carried a man into the air, flew 120 feet and landed 12 seconds after take-off. Which mode of transport were they testing?

Answer: Aeroplane

The *Wright Flyer* was the first successful self-propelled aircraft, and was built using wood from a spruce tree.

Almost five years after this first experiment, the Wright brothers were the first to fly in an aeroplane for more than one hour. On Sept 9, 1908, Orville Wright flew for 1 hour, 2 minutes, and 15 seconds. On Sept 21, 1908, Wilbur Wright flew for 1 hour, 31 minutes, and 25.8 seconds. These experiments paved the way for the design of the modern aeroplanes that we know today.

Round 2: Physics and Space

1) Complete the sentence: The Sun is a source of....

Non-multiple choice answer: light, energy, heat

Multiple choice answer: All of the above

The Sun is centre of the Solar System and is just one of about 100 billion stars in our Galaxy. Light from the Sun reaches Earth in around 8 minutes. Apart from heat and light, the Sun also gives off a stream of charged particles called the solar wind, which produces the Aurora Borealis or 'Northern Lights.'

2) There is a story which says that whilst lying against a tree in an orchard, the scientist Isaac Newton was hit on the head by a falling apple. What is the name of the force that made the apple fall?

Answer: Gravity

Sir Isaac Newton (1642- 1727) was a scientist who is credited with discovering gravity. He described gravity as a force of attraction between two objects, which acts like a magnet pulling objects together.

For example, the Earth's tides are caused by the moon's gravitational pull on the oceans. Tides are the rise and fall of the ocean level which occurs over every 12 hours.

3) What takes about 27 days to orbit the earth?

Answer: The Moon

The Moon travels around the Earth in a circle, called an orbit. It takes about 27 days for the Moon to orbit the Earth, and it is visible because the light from the Sun reflects off its surface.

The first person to walk on the Moon was Astronaut Neil Armstrong on 21st July 1969.

4) Which planet is also known as the 'Red Planet'?

Answer: Mars

The planet's surface is covered in an iron oxide dust (thought to be rust). It is this dust that gives Mars its distinctive red colour.

Mars is the fourth closest planet to the Sun and is considered to be the planet that most resembles Earth. Evidence suggests that many years ago, Mars once had rivers, streams, lakes and even an ocean.

5) If an object is see through it is called...

Answer: Transparent

If an object is transparent, it means that light can pass easily through it (for example a clear glass window).

Round 3: Engineering

1) Why is steel a good material use when building tall buildings?

Answer: It is strong

Steel is a very strong material that can be used as a frame to hold a tall building together, and to support the weight of other heavy building materials such as bricks and concrete.

2) In which country is the Empire State building found?

Answer: United States of America

The Empire State Building was opened in 1931. It is 102 storeys high and held the title of the world's tallest building for 40 years. Today, the tallest building in the world is called the Burj Khalifa. It is found in Dubai and is over 160 storeys high.

3) Some Environmental Engineers design products that generate electricity through renewable energy sources. A solar panel generates electricity by using light from which source?

Answer: The Sun

Light (particularly sunlight) can be used to create heat or generate electrical power. This is referred to as *solar energy*.

Solar energy is a clean form of energy production, which means that it doesn't pollute the environment, as some other forms of energy production do (for example, burning coal).

A solar panel uses a material called a semiconductor that can convert light energy into an electrical charge.

- 4) Isambard Kingdom Brunel is a famous British engineer who built bridges, ships, stations and tunnels in Victorian times. Which fictional bear, with a liking for marmalade sandwiches, is named after one of his creations?

Answer: Paddington Bear

Paddington Station was designed by Isambard Kingdom Brunel and was opened to the public in 1854. Brunel also designed the Clifton Suspension Bridge and the Thames Tunnel.

The story goes that Paddington Bear arrived in London after stowing away on a boat from Peru. He was named Paddington after the station he was found in.

Round 4: Chemistry

- 1) An ice cube is in which state?

Answer: Solid

A material's state can be a solid, liquid or a gas. Materials are made up of lots of little particles, and how these particles are arranged determines their state.

When a liquid such as water freezes, the particles become tightly packed together and are fixed into place.

Solids can hold their own shape, liquids take on the shape of their container and gases are usually invisible and spread out to fill up spaces.

- 2) Name a material that conducts electricity (Multiple choice question)

Answer: Copper

- 2) True or False? Cotton wool conducts electricity (Non-multiple choice question)

Answer: False

Most metals are considered to be good conductors, meaning that electricity can flow through them easily.

3) Can you name something that dissolves in water?

Multiple choice answer: Sugar

Non multiple choice answer: sugar, salt, instant coffee, bicarbonate of soda

A material that dissolves in water is called soluble. When sugar dissolves in water, it creates a transparent liquid called a solution.

4) What is the boiling point of water?

Answer: 100 degrees centigrade

Water is made up of moving molecules that are very small (imagine small marbles that are free to roll around in a tray) When water reaches 100 degrees centigrade, the molecules gain energy and move around very quickly, which causes the water to bubble and move.

5) If you apply heat to chocolate, what will happen?

Answer: It will melt

As a solid, the particles that make up chocolate are tightly packed together and do not move. Applying heat to chocolate causes these particles to grow further apart, changing the solid chocolate into a liquid. This process can also be reversed by putting the melted chocolate into a fridge or freezer.

Round 5: Biology

1) Cows, sheep and horses are all examples of herbivores. What type of food wouldn't they eat?

Answer: Meat

A herbivore is an animal that gets its energy from plants. Many herbivores have special digestive systems that let them digest all kinds of plants, including grasses.

Herbivores need a lot of energy to grow and stay alive. Many of them, like cows and sheep, eat all day long in order to get the energy that they need.

2) Which organ pumps blood around the body?

Answer: The heart

The heart is a muscle that pumps blood around the body. This is important because our blood carries oxygen and nutrients to the body's cells, and pick up waste materials to take out of the body. Our blood also contains antibodies which fight infections.

3) Which bird lays the largest eggs?

Answer: Ostrich

An average Ostrich egg weighs 3lb and is 8 inches tall. This is much larger than an average chicken egg, which is about 2 inches tall.

4) Can you name an animal that is not a mammal?

Multiple choice answer: Snake

Non-multiple choice answer: snake, crocodile, alligator, frog, lizard

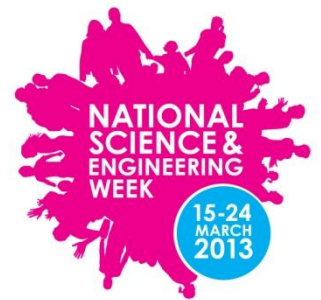
A snake is a reptile. Reptiles are cold-blooded, which means that they do not generate their own body heat. Reptiles rely on other sources, such as the sun, to warm up. One way to spot a reptile is by its scaly skin.

5) What does a caterpillar turn in to?

Answer: Butterfly

As soon as a caterpillar has finished growing, and it has reached its full length and weight, it will form itself into a pupa, also known as a chrysalis. Within the chrysalis the old body parts of the caterpillar undergo a remarkable transformation, called 'metamorphosis.' After one to two weeks, an adult butterfly will emerge.

National Science & Engineering Week Quiz Level 2 Answers



Round 1: Invention and Discovery

1) Which great painter was also a famous inventor?

Answer: Leonardo Da Vinci

Leonardo Da Vinci is perhaps most famous for his painting the 'Mona Lisa', however he is also known for his creative designs and ideas for remarkable inventions. Da Vinci conceived ideas vastly ahead of his own time, *conceptually* inventing a helicopter, a tank and the use of concentrated solar power. In practice, he greatly advanced the state of knowledge in the fields of anatomy, astronomy and civil engineering.

2) Name one of Thomas Edison's inventions

Multiple choice answer: The incandescent light bulb

Non-multiple choice answer: Incandescent light bulb, phonograph, motion picture camera, steel alkaline storage battery.

Although the idea of electric lighting was not new in the 1800's, Thomas Edison was the first person to design a light bulb that was practical for home use. Edison's achievement was inventing not just an incandescent electric light, but also an electric lighting system that contained all the elements necessary to make the incandescent light practical, safe, and economical. In his lifetime, Edison held a record 1,093 patents for his inventions.

3) In 1928, Alexander Fleming discovered that mould contained properties that could kill bacteria. This led to the invention of which lifesaving drug?

Answer: Penicillin

Penicillin is one of the earliest discovered and widely used antibiotic agents, derived from the *Penicillium* mold.

The manufacturing process for Penicillin was invented by Howard Florey (1898–1968) and Ernst Chain (1906–1979), enabling Penicillin to be sold as a drug for the first time. Fleming, Florey, and Chain shared the 1945 Nobel Prize for medicine for their work.

- 4) In 1786, Dr Edward Jenner discovered vaccination in its modern form. Which was one of the very first diseases that people were vaccinated against?

Answer: Small pox

The smallpox vaccine was the first successful vaccine to be developed. The idea of vaccination was explored by Edward Jenner, who observed that that milkmaids who caught the cowpox virus did not catch smallpox. Before widespread vaccination, mortality rates in individuals with smallpox were very high—up to 35% in some cases.

- 5) In 1922, the Egyptologist Howard Carter made one of the most important archaeological discoveries of the 20th Century whilst excavating a site in the Valley of the Kings. What did he discover?

Answer: Tomb of Tutankhamun

In 1922 the discovery of the Tomb of Tutankhamun by Howard Carter amazed the world and was widely publicised because of its incredible contents. Inside, Carter found fine jewellery, weapons, trumpets, statues, ancient games and toys, and storage jars containing precious oils. The discovery of this untouched tomb gave historians a much greater understanding of royal burial practice and the beliefs in the role of royalty in the afterlife.

Round 2: Physics and Space

- 1) Why does a helium filled balloon float?

Answer: Because helium is less dense than air

Helium is one of the lightest elements, weighing just 0.1785 grams per litre. Nitrogen, which makes up 80% of the air we breathe, weighs 1.2506 grams per litre.

The lightest element is hydrogen which weighs a mere 0.08988 grams per litre. However, hydrogen is no longer used in balloons because it is extremely flammable, and the slightest spark would set off an explosion.

2) Name a renewable energy source

Answer: The Sun

Energy that comes from sources that are continuously replenished such as sunlight, wind and waves are known as renewable energy sources.

The energy from the Sun's heat and light can be used to heat water and generate electricity.

3) What is the name of the 2nd biggest planet in our solar system?

Answer: Saturn

Saturn is the least dense planet in the solar system, and is mostly made up of hydrogen and helium gas. The planet is orbited by rings of particles (mostly of made water ice) and 60 moons.

4) A magnifying glass is what type of lens?

Answer: Convex

A convex, or converging, lens is thicker in the middle than on the ends. When shone through a convex lens, parallel light rays will meet at a point beyond the lens.

5) The world's largest high energy particle accelerator can be found 175m below the earth's surface in Switzerland – what is it called?

Answer: Large Hadron Collider

The Large Hadron Collider is built to study the smallest known building blocks of the universe, known as particles. It has a circumference of 17 miles, and at full power trillions of protons whizz around the ring 11,245 times per second. When two beams of protons collide, they will generate temperatures more than 100,000 times hotter than the heart of the Sun.

Round 3: Engineering

1) In which city would you find the world's tallest building?

Answer: Dubai

The Burj Khalifa is the tallest man made structure in the world. Construction began on 21 September 2004, with the exterior of the structure completed on 1 October 2009.

At over 828 metres (2,716.5 feet) and more than 160 stories, Burj Khalifa holds the following records:

- Tallest building in the world
- Tallest free-standing structure in the world
- Highest number of stories in the world
- Highest occupied floor in the world
- Highest outdoor observation deck in the world
- Elevator with the longest travel distance in the world
- Tallest service elevator in the world

2) The London Underground, a triumph of engineering, is celebrating a landmark anniversary this year. For how many years has the London underground been open?

Answer: 150

The London Underground was opened in 1863.

Before electric powered trains were introduced, steam trains were a common sight in the London Underground.

An average of 2.7 million tube journeys are now made on the tube each and every day.

3) Which famous Victorian engineer built the Great Western Railway and the Clifton Suspension Bridge in Bristol?

Answer: Isambard Kingdom Brunel

Isambard Kingdom was born in 1806 and is known as one of Britain's most famous engineers. Brunel also designed Paddington Station, which opened to the public in 1854.

- 4) The world's first cast iron arch bridge can be found in Shropshire. Which river does it span?

Answer: The River Severn

The Iron Bridge crosses the River Severn in Shropshire. It was the first arch bridge in the world to be made of cast iron, a material which was previously too expensive to use for large structures. However, a new blast furnace nearby lowered the cost and encouraged local engineers and architects to solve a long-standing problem of creating a crossing over the river.

Abraham Darby III, who was the grandson of the first foundry owner and an ironmaster working at Coalbrookdale, was commissioned to cast and build the bridge. The iron for the new bridge was cast at his foundry, and opened in 1781.

- 5) The American Society of Civil Engineers has compiled a list of the seven wonders of the modern world. Name one of the wonders from this list.

Answer: Golden Gate Bridge

The Golden Gate Bridge is a suspension bridge spanning the Golden Gate, the opening of the San Francisco Bay into the Pacific Ocean. The structure links the city of San Francisco, on the northern tip of the San Francisco Peninsula, to Marin County. It is one of the most internationally recognized symbols of San Francisco, California, and the United States.

Round 4: Chemistry

- 1) What colour does an acid turn litmus paper?

Answer: Red

When an acid is dissolved in water, it creates an acidic solution, and alkalis create alkaline solutions. If a solution is neither acidic nor alkaline, it is called neutral. Pure water is neutral, and so is paraffin. Litmus paper can be a useful tool in helping to determine what different types of solutions are.

- 2) K is the chemical symbol for which element?

Answer: Potassium

Potassium is a soft silvery-white alkali metal that oxidizes rapidly in air and is very reactive with water. When in contact with water, potassium generates sufficient heat to ignite and burns with a lilac flame.

3) At room temperature, what is the only metal that is in liquid form?

Answer: Mercury

Mercury is the only metal that is known to exist in liquid form naturally. The discovery of mercury was made thousands of years ago, and traces of the element can even be found in Egyptian tombs that date back to the year 1500 B.C. Mercury is used in thermometers, and is toxic to human beings.

4) Which allotropic element connects graphite with a diamond?

Answer: Carbon

Graphite and diamonds are allotropes of carbon. They have different atom structures, but are made up of the same element.

Graphite is formed from layers of carbon atoms. It's used in pencil leads because it slips easily off the pencil onto the paper and leaves a black mark. Graphite is also a good conductor of electricity.

A diamond is one giant molecule of carbon atoms. Diamond is extremely hard and has a high melting point. For this reason it's very useful in cutting tools. Heavy-duty drill bits, like those used in the oil exploration industry to drill through rocks, are made with diamonds so that they stay sharp for longer.

5) What does an atom consist of?

Answer: A nucleus surrounded by electrons

The atom consists of a central, positively charged core (the nucleus) and negatively charged particles (called electrons) that orbit the nucleus.

Round 5: Biology

1) Name the process where plants convert light energy into chemical energy

Answer: Photosynthesis

Both directly and indirectly green plants generate most of the world's chemical energy. Wood and fossil fuels - coal, oil and natural gas formed from plants and animals that lived millions of years ago - provide much of our electricity and heat.

Biochemists have been researching ways of duplicating the process of photosynthesis, with the aim of converting sunlight directly into chemical energy. However, until this is achieved, we remain dependent on green plants to sustain life.

2) Which famous scientist introduced the idea of natural selection?

Answer: Charles Darwin

Charles Darwin was born in Shrewsbury, England, on 12th February, 1809. In 1831, he embarked on a five-year survey voyage around the world on the HMS *Beagle*. His studies of specimens from around the globe led him to formulate his theory of evolution and his views on the process of natural selection. In 1859, he published *On the Origin of the Species*. He died on 19th April, 1882, in London.

3) What is the human body's biggest organ?

Answer: Skin

The skin is the human body's largest organ (an organ is a group of tissues that work together to perform functions in the body). Skin performs a range of different functions which include physically protecting our bones, muscles and internal organs, protecting our bodies from outside diseases, allowing us to feel and react to heat and cold and using blood to regulate our body heat.

4) What does an Entomologist study?

Answer: Insects

Entomologists study insects. The insect world is vast and incredibly diverse, so most Entomologists focus their research on a specific family of insects. Careers in Entomology are very varied, ranging from Forensic Entomology (using insects to learn more about victims of crime) to Agricultural Entomology (studying the way in which insects interact with agricultural sites and animals).

5) Mammals generate heat to maintain their body temperature, meaning that they are warm blooded. What is another term for this process?

Answer: Endothermic

Endothermic animals burn energy within their cells to generate heat and keep their temperature steady. If they get too hot, endothermic animals can sweat or pant to cool off.

Exothermic animals don't warm up or cool down from inside their bodies. They use the surrounding environment to regulate their body temperature. Exothermic animals often lie in the sun to warm up, and they may burrow, find shade, or swim to cool off. When an exothermic animal is cold, its entire body slows down.