**Unit 1 Invertebrates**

In the animal kingdom, there are two types of animals: vertebrates and invertebrates. Vertebrates are animals with a backbone, such as mammals, birds, and fish. Invertebrates are animals without a backbone, such as worms and insects. Surprisingly, invertebrates make up about 97% of our animal kingdom. There are many different types. Let’s take a look at some!

Earthworms have a long, soft body shaped like a tube. They have a head and a tail with no legs. They breathe through their skin. Their flexible body helps them move and live underground in the soil.

Snails have a soft body with a hard, spiral shell on their back. Their shell helps them hide from predators. On their head, they have two feelers and two long, flexible eye stalks.

Honeybees have a segmented body covered with a firm outer casing. On their head, they have two antennas. In the middle of their body, they have three pairs of jointed legs. At the end of their body, they have a stinger.

Jellyfish have a smooth, dome-shaped body. Their body is transparent. They have long tentacles with sting cells. Their tentacles hang down from their body and sting their predators or prey.

Starfish have a star-shaped body with spiny skin. The sharp spines on their skin protect them from predators. Most starfish have five arms, but some have 10, 20, or even more. Each arm has one eyespot on it.

**Unit 2 Head-Footed Animals**

Many people confuse octopuses and squids with each other because they look similar. They are similar in some ways, but they are very different in other ways.

Octopuses and squids are invertebrates living in the sea. They are “head-footed” animals. It means their body consists of a head and arms (or feet).

Octopuses and squids both have a large brain. People think they are some of the smartest invertebrates in the sea. Also, they both have blue blood. The copper in their blood makes it blue.

Octopuses and squids are different in their body shapes. Octopuses have a round head with no fins. Squids have a triangular head with two fins. The fins help squids steer when they swim. They both have eight arms, but squids have two more long tentacles. These arms and tentacles help them catch their prey and move around.

Octopuses and squids live in every ocean, but they live in different areas. Octopuses live in dens on the seafloor and hunt alone. However, most squids like open water and hunt in groups. Both octopuses and squids move using jet propulsion. This involves repeatedly squirting water into the sea. When in danger, they both release dark ink into the water. This blinds their predators and helps them escape.

Now you know octopuses and squids are similar but different. Still confusing? Here is a tip: What shape is their head?

**Unit 3 Ask NYPL**

How tall is the average giraffe? What year was Albert Einstein born? Nowadays, we can find answers to these questions in seconds. But it was not always this way.

Before the internet, it usually took a long time to find an answer. Most people had to look through books for hours. Then, one city’s library decided to do something about this.

In 1968, the New York Public Library created a public telephone service called Ask NYPL. The service allowed New Yorkers to call into the library and ask questions. A team of librarians were waiting to answer the questions. People called and asked all sorts of questions to the NYPL’s librarians. For example, “Why do 18th century English paintings have so many squirrels in them?” The knowledgeable librarians, with the help of the library’s archives, did their best to provide a quick and factual answer.

Amazingly, the Ask NYPL service is still used today. People call in with questions about all sorts of things. Some call to fact-check things that they heard on the news. Others ask basic questions about English grammar. And some simply call to find out what Twitter or Instagram is.

Although we can look up things on the internet, sometimes it is still nicer to ask a human. And, in New York City, that happens to be a librarian.

**Unit 4 Bookmobiles**

When people need books, they often go to their local library. Some people, however, live too far from a library. For them, bookmobiles can be very convenient.

Bookmobiles, or mobile libraries, deliver books and library services to people in remote areas. These remote areas usually do not have their own library. So a library must come to them. Almost any vehicle can be used as a bookmobile. From the 19th to early 20th century, horse-drawn vans and wagons were commonly used. Later on, cars and trucks became a more popular form.

Though more popular in the past, bookmobiles are still used in some parts of the world today. In Kenya, for example, there is the Mobile Camel Library. Camels carry books to school children in remote areas of the Kenyan desert. One camel can carry two boxes. Each box has up to 200 books! Each child can borrow two books for 14 days.

People that live in the remote islands of Sweden need books too. The book boat — the Bokbåten — visits the islands every spring and fall. The boat contains about 3,000 paper and audio books. When the boat arrives, local people hop aboard to browse and borrow books.

Books represent knowledge, wisdom, and imagination. Therefore, for some people, bookmobiles can be essential. Bookmobiles give them access to books, and all the wonderful things books represent.

**Unit 5 The Mysterious Street Artist**

Banksy is one of the most mysterious street artists in the world. His images are simple but very powerful. They make people stop and think about the world. Everyone gets excited when a new Banksy artwork is discovered.

Banksy is a graffiti artist. He creates art on things like public walls and trains. He began creating graffiti in his hometown Bristol, England. Graffiti is illegal in most places, so he did it in secret. In fact, no one knows Banksy’s true identity. He is anonymous. Even his parents do not know their son is Banksy!

Banksy’s main art style is stencil graffiti. A stencil is a cut-out design that can be used multiple times. Using stencils with spray paint, Banksy can create his art and disappear quickly. It allows him to remain a mysterious artist.

Banksy’s art often tells us powerful messages about life and our world. Girl with Balloon is one of his most famous works. It was painted on the wall of Waterloo Bridge. The image is of a young girl and her red heart-shaped balloon. Her hand is stretched out and her balloon is floating away. Next to the image, Banksy wrote, “THERE IS ALWAYS HOPE.”

People continue to try to solve the mystery of Banksy’s identity. But the greatest mystery of all is, what will Banksy do next?

**Unit 6 Graffiti That Grows**

When people hear the word “graffiti,” they usually think of spray paint and bad words on walls. Moss graffiti, or eco graffiti, is a different type of graffiti art. It is used to create images and words in a safe and positive way.

Traditional graffiti art is created with spray paint. However, spray paint usually has harsh and toxic chemicals. It is harmful to people and to the environment. Most graffiti is created on walls without permission. So many building owners get angry about it.

Moss graffiti is safe for people and the environment. It is safe because the paint is made with moss. Moss is a type of green plant that has tiny leaves. It usually grows on rocks, tree bark, or wet grounds. Making the moss paint is easy. It is a simple mix of moss, yogurt or buttermilk, water, and cornstarch. Once moss graffiti is made, the moss grows thicker over time. Eventually, it will have a beautiful, 3D effect.

Some artists create moss graffiti to spread positive messages. For example, one artist used moss graffiti to encourage people to be more environmentally friendly. The graffiti asked, “How green are you?”

Moss graffiti is an eco-friendly way of creating art. It is very easy to make, and anyone can do it. But before you make it, make sure you get permission to paint on the walls!

**Unit 7 The Long Road to Steel**

Steel is the most important engineering material in modern civilization. It is in everything from cars and trains, to bridges and skyscrapers. But humans did not always have steel. The historical road to steel was long.

In 3300 BC, the Bronze Age began. During this ancient era, humans started working with metals for the first time. The main material was bronze. It is a combination of two metals, copper and tin. Bronze was widely used to make weapons and tools. However, the problem was that tin was often hard to find. So, humans searched for a new metal to work with.

Around 1200 BC, the Iron Age began. Iron is one of the most common elements found on Earth. Therefore, it was a great replacement for bronze. The problem, however, was that iron weapons and tools were not strong or durable enough. So, once again, humans searched for a superior metal to use.

Then, around 400 BC, steel was finally invented. The combination of about 98% iron and 2% carbon made steel. People were amazed at how incredibly strong this new material was. For a long time, however, steel remained difficult and expensive to produce. Mass production only started in the mid-1800s during the Industrial Revolution. Its use has skyrocketed ever since.

Nowadays, steel is everywhere. But history tells us that it will eventually be replaced. What material might humans rely on next?

**Unit 8 Stainless Steel**

Whether you are in the kitchen, on the road, or at the doctor’s office, you will likely see something made of stainless steel. In today’s world, it is a highly useful material.

Stainless steel is similar to regular steel. Both are iron metal alloys. That means they are both made by combining iron with other elements. The key difference is that stainless steel contains a metal called chromium. Due to the presence of roughly 11% chromium, stainless steel is extremely rust-resistant.

Rust occurs when iron is exposed to oxygen and water. Chromium, however, creates a protective layer on the surface of stainless steel. This protective layer blocks the iron from oxygen and water, and prevents rusting or staining. This is how it got the name “stainless” steel.

When steel is rusting, it is dissolving. That means, over time, it will fall apart. But when steel is rust-resistant, it keeps its original condition. Because of its rust-resistant nature, stainless steel is ideal for making many things. It is the material of choice when making cookware, home appliances, car parts, and surgical tools. It makes products durable and long-lasting.

Stainless steel is a popular material for a reason. It is strong and keeps things looking new for a long time. Plus, since it is usually recyclable, it is environmentally friendly. That is a win-win!

**Unit 9 Esports**

When we think about professional sports, we usually imagine a game of soccer, baseball, or golf. However, a new sport has gained lots of popularity and respect in recent years. That sport is called esports.

In esports, esports athletes compete against each other by playing video games. They compete in teams or as individuals. Esports athletes are highly skilled video game players. Fans usually call them professional gamers or “pro gamers.” Pro gamers earn money when their teams win. However, they also earn money through product sponsorship. Companies pay successful pro gamers lots of money to advertise their products.

There are hundreds of millions of esports fans around the world. Esports became very popular in the late 2000s. Games like Fortnite, League of Legends, and Overwatch are played during esports tournaments. Fans can watch the competitions in person, on cable television, or on online streaming platforms. Fans of esports usually enjoy playing video games themselves. They like watching pro gamers compete because they can learn game strategy from them. Some pro gamers have become celebrities. These celebrities even have their own fan clubs!

Even though pro gamers spend a lot of time sitting in chairs, they are professional athletes. And now many young people grow up with dreams of becoming pro gamers too.

**Unit 10 How Pro Gamers Train**

Being an esports pro gamer is not all fun. It takes discipline and hard work to compete at the highest level. Pro gamers have to keep their bodies and minds healthy.

People might think pro gamers are lazy and weak. The truth is that many pro gamers exercise daily. They do cardio in order to build strength for long matches. They build up their back muscles too. This is because they spend lots of time sitting in front of computers. They also need to do hand exercises. This is because they use their hands to compete for long periods of time.

Pro gamers eat healthy diets because it improves their performance. By eating healthfully, they avoid sugar crashes and brain fog during long matches. There are other ways pro gamers improve their mental health. They do meditation to control stress. And they make sure they get enough sleep each night. Sleep helps their brains recover from stressful matches.

Playing video games is probably the most important thing pro gamers do every day. They spend six or more hours each day playing games. They practice as teams and individually. When they are not training, pro gamers review videos of past matches. This helps them spot weaknesses in their games and improve their overall skills. Being a pro gamer is hard work!

**Unit 11 Sugar in Our Body**

Health experts often say that sugar is bad for our bodies. They say it causes many health problems. But did you know that, without sugar, your body and brain will not function properly?

Sugar is actually a natural substance. It is in all kinds of foods we eat such as fruits, vegetables, bread, rice, and cakes. When we digest these foods, the sugar breaks down into glucose. Then, through our blood, the glucose can go into our cells. There, it can immediately be used for energy. This is why glucose is called our primary source of energy. Just like other cells in our body, our brain cells depend on glucose for energy.

Sugar is important. Our body needs it to function properly. However, eating too much sugar can cause negative health effects. If we eat too much sugar, too much glucose is produced in our body too fast. Too much glucose in our blood will cause serious health problems like diabetes. Also, leftover glucose stays in our liver and eventually turns into fat. That will cause other health problems like various liver diseases. We also know what eating too many candy bars will do to our teeth.

Sugar is essential. We cannot live or function properly without it. However, we must remember that life is all about balance.

**Unit 12 Choosing the Right Juice**

Not all juices are the same. Some are healthier than others. So when we drink juice, we need to make the best choices possible.

The worst choice is juice labeled “cocktails” or “drinks.” Usually, this kind of juice contains almost no real fruit. Instead of real fruit, it mostly consists of artificial colors and flavors, and lots of added sugar. So it is high in sugar, but low in nutrients.

A better choice is 100% fruit juice. This kind of juice is made exclusively from real fruits like oranges, pineapples, and grapefruits. Everything is natural. That means it contains lots of vitamins and minerals. One problem with this kind of juice, however, is that it usually contains lots of fruit sugar. So it is high in nutrients, but also high in sugar.

Perhaps the best choice then is 100% vegetable juice. This kind of juice is made from vegetables like beets, tomatoes, and carrots. Like 100% fruit juice, it naturally contains lots of vitamins and minerals. Unlike 100% fruit juice, however, it usually contains lots of fiber and very little sugar. So it is high in nutrients, but low in sugar. That is a healthy combination.

So the next time you want to drink juice, choose wisely. Or eat a whole apple or carrot with a glass of water instead. That is even healthier!

**Unit 13 The Origin of the Metric System**

Long ago, people based measurements on parts of the human body. For example, a “foot” was the length of a man’s foot. And a “handful” was the amount a human hand could hold at one time. However, these types of measurements were not consistent because everyone’s body parts are different sizes. Gradually, people wanted a measurement system that was based on consistent standards.

During the 17th and 18th centuries, French scientists developed a new measurement system. It was called the metric system. Two of the basic units were the meter (length) and the kilogram (weight). To make them consistent, the units were based on unchanging measures in nature.

To determine the length of a meter, French scientists looked to planet Earth. After much debate, they decided to use the distance from the North Pole to the equator. And to get a small enough unit, they divided that distance by ten million. That unit became the “meter.” So one meter was one ten-millionth of the length from the North Pole to the equator.

To determine the weight of a kilogram, French scientists looked to water. They based the measurement on the weight of one liter of water. One liter was 1,000 cubic centimeters.

Today, almost every country in the world uses the metric system. Everyone can rely on its consistent standards to measure things accurately.

**Unit 14 Calendars Then and Now**

People have tried to track time ever since they noticed the changing of the seasons. They first looked to the Moon and stars for answers.

Around 2500 BC, the Egyptians created a calendar based on the changing location of the star Sirius. In the Egyptian calendar, a year was divided into three seasons of four months each. But, in fact, an Egyptian year consisted of 12 months of 30 days and one month of five days. It was 365 days in total. However, it takes 365.24 days for Earth to travel around the Sun. So the Egyptian calendar was short by 0.24 days.

The Roman Republic used the Roman calendar with 12 months. But it was changed countless times and became inaccurate. In 46 BC, Julius Caesar made a reform to replace the Roman calendar with the Julian calendar. In the new calendar, each month was between 28 and 31 days. Also, most importantly, a day was added every four years. The year with the added day was called a leap year. However, it made a year 365.25 days.

Today, most countries use the Gregorian calendar which was created in 1582. It is the same as the Julian calendar except for one key difference. The Gregorian calendar skips a leap year three times every 400 years. That makes each year exactly 365.24 days. Finally, humans have a calendar that accurately tracks time.

**Unit 15 The Smog Free Project**

Unfortunately, air pollution is a reality today. Thick, dark smog covers the skies of many cities and harms billions of people’s health. The Smog Free Project is doing something about this serious problem.

The Smog Free Project is a campaign for clean air. It was started by Dutch designer Daan Roosegaarde. Its goal is to help clean the air in big cities. It uses a new device called a Smog Free Tower.

A Smog Free Tower is a 7-meter-tall outdoor air purifier. Placed in city parks, the towers function as giant smog vacuum cleaners. Instead of dust on the floor, they suck up and purify smoggy air. Each tower can purify 30,000 m3 of smoggy air per hour. That is the air of about 10 hot-air balloons! Smog Free Towers have been installed in countries like South Korea, China, Poland, and the Netherlands.

When purifying the air, Smog Free Towers filter out smog dust. The Smog Free Project uses the smog dust to make Smog Free Rings. Each ring contains one cube of compressed smog dust inside a clear, shiny case. The cube is made by purifying 1,000 m3 of smoggy air. Sales of the rings support the Smog Free Project.

In the future, hopefully air pollution will not be a serious problem. Until then, the Smog Free Project is one way to help people breathe cleaner air.

**Unit 16 The Zero-Waste Movement**

For many years, people have tried to reduce waste through recycling. However, the world still produces about two billion tons of waste each year. The Zero-Waste Movement is a campaign against waste. People in the movement try to create zero waste in their life. For most people, it is a completely new lifestyle. A zero-waste lifestyle prevents waste before it happens. Recycling is not even necessary.

To follow a zero-waste lifestyle, “zero-wasters” mainly do two things. One, they use less. And two, they reuse more. How do they do these two things?

To use less, zero-wasters live simply. Usually, they cook at home instead of eating out. They shop at secondhand stores instead of buying new items. They own one pair of shoes instead of owning five. In other words, they do not live luxurious lives. By living this way, zero-wasters produce less waste.

To reuse more, zero-wasters take various actions in their daily lives. When shopping, they use reusable cloth bags. When getting takeout at restaurants, they use reusable containers. After eating, they compost their leftover food. When cleaning their houses, they use reusable cloth towels. And if something breaks, they fix it instead of buying a new one.

Each year, more people join the Zero-Waste Movement. Do you want to join? You can start small and reduce your waste more and more each day.