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YOUR GUIDE TO DISSECTION

Your expert guide

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Welcome to our expert guide on how to carry our dissection. As part of our mission, we're always looking at how to deliver you even better value, innovation and quality.

Our guide has been written by our resident, expert team here at Philip Harris. Our experts have over 20 years' experience, working in a school science environment. So when you speak to Philip Harris, you're not just speaking to a fellow scientist but someone who also understands the challenges you face on a daily basis...

Meet our **EXPERTS**

Meet Nadine Dyson and Jackie McKie, they are your Technical Experts



Nadine Dyson

Hi, I'm Nadine and I'm here to help you make the most of the resources you've bought from us.

Before joining Philip Harris, I enjoyed working as a Senior Science Technician for 10 years. This has given me the sound knowledge of the Science curriculum, how prep - rooms operate and everything else related to practical Science.

During my time as a Senior Science Technician I set up two brand new Prep Rooms and re-organised others. This means I have the knowledge and understanding to support you and your team to design your dream prep room.

Jackie McKie

Hi, I'm Jackie, a chemist, here to help with your technical queries.

I started my career as a Lab Technician in the Petrochemical industry, working in Technical Service and Quality Control before joining the research and development team as a Development Chemist.

Prior to joining the Philip Harris team, I spent the last 7 years working in a school as a Technician in both the Science and Design and Technology faculties.

I am here to offer advice and support when you need it.



Guide to **Dissection**

Why use dissection in the classroom

Nothing beats hands on practical science. Practical work is at the heart of science, and is used to support and consolidate scientific concepts. It also develops investigating techniques and helps build, and master practical skills.

The Nuffield Foundation quote 'The experience of dissecting real animal material adds an extra dimension to understanding the structure of organs and the relationship of structure to function.'

Issues with dissection

Dissection seems to be on the decrease in schools, with various reasons being given by teachers and technicians. Two of the most common reasons have been reported as:

Fears over Health & Safety.

Ethical issues.

Health & Safety

The perceived issues with dissection seem to be based on misconceptions. As long as the hazards are identified and effective control measures are applied, there is no reason dissection cannot be carried out in a school laboratory. Most schools subscribe to CLEAPPSS - A national organisation providing advice on practical work health and safety. Which enables them to access guidance on such matters, enabling them to work in safe and controlled environment, when using animal material.

Ethical issues

It is worth knowing that any material supplied by an abattoir or butcher must have been passed 'as being fit for human consumption'. And will not have been prepared for the purpose of the investigation. The organs used are a natural byproduct of the meat industry. Some products can even be supplied with Halal certification.

An interesting way of looking at the lungs, heart and liver together, is to dissect a full pluck. This consists of all three organs, and is useful to see how the three organs connect to each other, and investigate how they work together.



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Dissection of a Heart

By dissecting a heart you are able to practically investigate the general structure of the heart, and this can give students a better understanding of the way the various blood vessels, valves, muscles and tendons come together and help make the heart function. The Heart is a pump that sends blood rich in oxygen round the body, and oxygen poor in blood through the lungs.

Before commencing any kind of dissection on animal material, always read and implement any Health & Safety measures. Ensure all equipment and work surfaces are cleaned carefully and thoroughly after use.

Before starting the dissection, it is useful and informative for students to have a look and a feel of the heart, they can determine its size and mass, and also have a go at identifying the vessels entering and leaving the heart.

Arteries and veins look and feel different from each other. Arteries have thick rubbery walls, where veins have much thinner walls. If you feel inside the vessels you should be able to tell the difference. You can try looking inside these vessels to see if you can identify any structures.



Start by making a long cut through the Aorta and left ventricle and continue down to the tip of the heart.

Pull the ventricle apart, and look inside. You will now be able to see inside the Aorta, ventricle and locate the left atrium. Study all these structures and look at how they differ in appearance and texture, and think about how that difference may help their function. Carefully cut upwards into the left atrium, and look carefully at the texture and structure.

Once you have finished with left side of the heart you can study the right side in the same way. Once you have fully opened up the heart, you can examine the valves that separate the chambers, again thinking about structure and function.



Dissection of Lungs

By examining and dissecting a pair of lungs, students can gain a greater understanding of the structure of the organ, the texture and the way it connects and works in relationship to the heart. The lungs deliver oxygen and remove carbon dioxide from the blood.

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Let the students have a good look at the lungs and describe what they can see. They can take note of the colour and texture.

Let the students have a good look at the trachea, let them describe what they can see, get them to answer questions what does the wall look like? How does it feel? Cut a piece of the trachea off and take a good look at it, can students explain why the trachea doesn't collapse? Cut down the trachea and take a good look, students should be able to see two tubes, bronchioles. That enter the lungs.

Look at the tubes that enter the lungs. How do they divide? Using a tube, connected to some form pump, try and inflate the lungs.

Students can touch the lung, and describe what they can feel, the lungs will have a soft spongey texture. Carefully, cut a piece of lung tissue, have a look at the surface, describe what you can see.

Drop a piece of the lung tissue into some water, watch what happens. Why does this happen?

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Dissection of a Liver

By examining and dissecting the Liver, students can gain a greater understanding of the structure of the organ, and see for themselves how the structure and the texture of the organ help it to function inside the body. The Liver disposes of toxins from the body, regulates blood sugar and produces bile. Bile is required in order to digest fat. It is the largest organ in the body.

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The liver is made up of 4 distinct lobes, with the right and left lobes being the largest, and the right lobe is larger than the left. If you cut a section of the left lobe, you can examine the internal structure of the liver. The portal vein and the hepatic artery should be identifiable, by the difference in their appearance. The artery should have a thick rubbery wall, and the vein should have a much thinner wall.

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Dissecting a Kidney

By examining and dissecting a kidney, students can gain a greater understanding of the structure of the organ, the texture of the components and the way it connects and works within the body. The Kidneys produce urine from waste products and excess water.

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Look carefully at the kidney, examine the outside carefully. The Ureter, Renal Artery and Renal Vein should all be identifiable.



With the Kidney lying flat on the work surface. Cut the Kidney in half, lengthways. Once pulled apart the internal structure of the Kidney will be revealed.

Let the students try to identify the internal parts of the kidney. They can feel the different textures of the internal parts to the Kidney. Can they relate the structures to the function of the Kidney?

The Renal Capsule, is the thin outer membrane, which protects the kidney. The Cortex, the lightly coloured outer region.

Medulla, darker, reddish, brown inner region, which contains the renal pyramids, it in these pyramids that you will find the basic unit of the kidney, the nephron, which is a long, thin tube that filters the blood.

Dissecting an Eye



Before dissection, allow the students to a have a good look at the Eye and see if they can identify any parts of the Eye.

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Before making the first incision, cut away any fat or muscle on the outside of the eye. Make your first incision into the cornea and cut until the clear liquid is released underneath. Use the scalpel to continue the incision through the sclera. Then use scissors to cut around the middle of the Eye, so that the Eye is cut in half.

Next pull out the iris, this is located between the cornea and the lens. It may be still attached to the cornea, or have stayed with the back of the Eye. Once located, pull the iris out, it should stay in one piece. You will see a hole in the centre of the iris, this is the pupil. The back of the Eye is filled with a liquid mixture of protein and water.

The next stage is to remove the lens. This should be a clear lump, which feels soft on the outside and hard in the middle.

Now examine the back half of the eye, you should be able to see some thin blood vessels that are part of a thin fleshy film, this film is the retina. The retina should be attached only at one point of the Eye. This spot is the blind spot.

Turn the back of the Eye over, and by looking at the other side of the back of the Eye you should be able to locate the optic nerve.

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Dissecting a Fish

By dissecting a fish, students get to learn about the internal and external anatomy of a fish. They get to see inside a fish, first hand, and gain invaluable hands on experience of dissection.

Before commencing any kind of dissection on animal material, always read and implement any Health & Safety measures. Ensure all equipment and work surfaces are cleaned carefully and thoroughly after use.



To start the dissection, begin with the head. The first thing to do is place the fish on its side and locate the boney plate which protects the gills. Lift the plate up and look at the gills. Cut the plate away from its base to expose the gills. In order to remove the gills you need to cut them at the upper and lower attachments.

Next remove the eye, cut through the cornea and remove the lens. The students should notice that the lens is relatively large in size, and relate this to the importance of the eye to the fish.

Now you can begin the dissection of the main body of the fish, and let the students explore and examine the internal organs.

To begin, carefully cut the fish, preferably with a pair of scissors, from the tail end up to the bottom of the jaw. Be careful not damage any of the organs.

First examine the fish to see how everything connects and fits together. Look for the swim bladder, located in the upper cavity and remove it.

Examine the digestive tract, students can follow the route food would take using their finger, tracing the tract from the mouth, through the stomach and intestines.

Locate the Liver, usually found in front of the stomach, the gall bladder should be recognized as a mass of darker tissue on the Liver. Students should also be able to find and identify the spleen, which should be reddish in colour, by lifting the stomach of the fish. Carefully remove the digestive organs.

The next step is to locate and identify the reproductive organs, and try to sex the fish. The male reproductive organs are usually white or orange in colour and are found near the intestine. Depending on the age of the fish, eggs may be present in female fish.

Lie the fish on its back, and locate the kidney, this should be a thin, dark organ, which runs along the body of the fish. The next organ to look at is the heart, it can be found near the mouth and gills area. Remove the heart and have a good look at it, the different chambers of the heart should be visible.

The last step of the dissection, involves looking at the muscles and the skeleton of the fish. To expose the muscles and skeleton, carefully lift the skin and pull the scalpel along the backbone of the fish. Remove the muscle and examine the skeleton of the fish.

Dissection of a Rat

The dissection of a rat, is the perfect way to give students first- hand experience of the position, and relationship between the different organs and system within the body of a mammal.

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Place the rat on its back, on a dissection pad, and stretch out and pin the four limbs to the pad. Start the dissection by removing the skin. Using forceps to lift the skin, carefully cut away with the scissors, take care not to cut too deep. Start at the top of the chest and cut towards the tail end, avoiding the genital area. Remove the skin from the muscle.

Firstly, you can take a look at the bones in the hind leg of the rat. Peel the muscles away from the leg and you will be able to see the bones of the leg, Tibia, Fibula and femur.

Move up to the head end of the rat, you should not need to cut too deep into muscle, the salivary glands are near the side of the neck, the glands appear as soft, spongey tissue. Look behind the salivary glands, you should be able to locate the lymph glands, they are dark and circular and are near to the jaw muscle. Pull the neck muscle away and find the Trachea.

Next move on to the chest and stomach cavity, cut through the abdominal wall, again taking care not to cut too deep. The diaphragm and the heart are in the centre of the cavity, and the spongey lungs are either side of the heart. Carefully push the ribs to one side to locate the diaphragm, this will look like a thin sheet muscle, just below the heart and above the liver.

The liver is a dark coloured organ, and students can have a go at looking at the different lobes of the liver. Below the liver is the stomach, this appears as a curved organs and the esophagus should be attached to the stomach. Lifting the stomach should reveal the pancreas. The spleen is the same



colour as the liver and is attached to the curve at the bottom of the stomach.

Moving down the cavity, look at the small intestine, this is the thin coil leading to the larger colon, which leads down to the rectum. Then locate the kidneys, these are towards the back of the cavity, see if students can locate the ureters, the tubes connecting the kidneys to the bladder. Carefully remove one of the kidneys and dissect it. Take note and see if students can identify any of the structures within the kidney.

Finally look at the reproductive organs of the rat. In the male rat are the testes, these are contained in the scrotal sac. Cutting through the sac will reveal the testes. In a female rat you will see two uterine horns going towards the kidneys. Mammals commonly have what is known as a duplex uterus, which allows the rat to carry more than one embryo, thus producing litters, rather than one offspring.

Dissection of a Frog

Frog dissection is a great way for students to learn about organ function and position. The organs of a frog are similar in lay out to those of humans, and by using hands-on dissection students gain a greater knowledge and understanding of how the body works.

Before commencing any kind of dissection on animal material, always read and implement any Health & Safety measures. Ensure all equipment and work surfaces are cleaned carefully and thoroughly after use.



To start the dissection, place the frog on its back, on a dissection pad, and stretch and pin the four limbs.

Using a scalpel, start to cut down the middle of frog from the bottom of the frog moving up towards the head. Make two further horizontal cuts across the body of the frog, firstly between the arms, and then between the two legs. Carefully pull the muscle away from the abdominal wall. If you have a female frog, they could have eggs present, and these would need removing before you can see any of the organs.

Look at the frog's heart first, this is a triangular structure, containing three chambers, the left and right atrium and one lower ventricle. The lungs can be found underneath the heart and are spongey in texture.

The Liver is the largest organ in the frog, and appears brown in colour with three distinct lobes. Under the liver you will find the gall bladder. The spleen is found in this area of the cavity and is dark red in colour and spherical in shape.

The stomach is a curved structure, and will have the esophagus attached to the smaller top end. At the bottom end of the stomach is the small intestine, which in turn widens into the large intestine.

The kidneys, often dark in colour, can be found in the lower back of the frog, near the spine. The kidneys of a frog are bean shaped but are quite flat.

The bladder can be found at the lowest point of the body cavity.

The male reproductive organs, the testes, are roundish in shape, pale in colour and can be seen at the top of the kidneys.

The female reproductive organs, the oviducts, are a curly structure, and are found around the kidney.

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