

TEACHER'S GUIDE

SCIENCE KEY CONCEPTS SERIES:

HUMAN BODY SYSTEMS

15 minutes, Video

Chapters:

- 1. The Lungs 5'*
- 2. The Heart 5'*
- 3. The Skeleton 4'*

Distributed by BENCHMARK MEDIA

FOR USE IN: Biology

LEVEL: Grades 9-12

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EDUCATIONAL OBJECTIVES:

To help the student understand these key concepts:

- the structure of the lungs
- exchange of gas in the lungs
- ventilation of the lungs
- the structure of the heart
- how the heart works as a pump
- the different structure of arteries and veins
- the role of the skeleton in providing support, protection and anchorage for muscles
- the importance of bone marrow
- the importance of calcium in giving strength to bones.

CONTENT

Chapter 1. The Lungs 5 min

The lungs allow us to take in oxygen from the air and get rid of carbon dioxide. A dissection of a sheep's lung shows the appearance and structure of the lungs, trachea, bronchi and bronchioles. An endoscope explores the tubes from the inside and we see a plastic injection mould of a lung.

A graphic animation shows the structure of an alveolus with the blood capillaries that surround it. We see the oxygen diffusing into the capillary and carbon dioxide

passing into the alveolar air space. The alveoli provide a large surface area for diffusion.

The lungs are protected from infection by mucus and cilia. We see cilia beating to remove dust and bacteria from the lungs.

A graphic animation and x-ray film demonstrate the role of the ribs and diaphragm in ventilating the lungs. A bell jar model is used to explain the changes in volume and pressure that result in air moving in and out of the lungs.

Chapter 2. The Heart 5 min.

A computer graphic of the heart reveals the four inner chambers. The left and right sides of the heart are indicated.

The pumping action of the heart is demonstrated using an animation. The role of valves is explained and the important blood vessels connected to the heart are identified.

A dissection of a sheep's heart is used to describe the features of the four chambers in detail. The structure of the heart valves and their tendinous cords is illustrated and the thickness of the muscular walls of the chambers is compared.

The thickness and elasticity of the walls of arteries and veins is compared. A demonstration shows that a piece of artery will stretch further when loaded with masses.

Which blood vessel is more elastic? Why?

Answer: The artery is more elastic. When blood leaves the heart it is at high pressure and the walls of the artery need to stretch and then recoil causing the blood to move forward along the artery. When blood returns to the heart in veins it has a lower pressure.

Chapter 3. The Skeleton 4 min.

An X-ray film and a reconstructed human skeleton illustrate the number and variety of bones in the body.

The skeletons of a range of vertebrates are used to illustrate the elements that are found in all of these animals. The spine has a crucial role in support and the skull, ribcage and pelvis are important for the protection of important and vulnerable organs.

Where bones meet a joint is formed. Ligaments hold the bones together. A graphic animation shows the difference between hinge joints and ball and socket joints.

Some bones are hollow and contain marrow, a tissue which makes red and white blood cells.

Calcium gives bones their strength. A demonstration shows how a bone left in dilute acid loses its calcium. The bone can be bent easily.

AFTER VIEWING THE VIDEO

These are some questions to stimulate classroom discussion.

1. Why do we need oxygen?
2. Why do we need to get rid of carbon dioxide?
3. Can you trace the path that an oxygen molecule will follow from your nose into your blood? And a waste carbon dioxide molecule from your blood to exhalation?
4. The trachea has rings of cartilage. Some plastic drinking straws have similar rings. What are they for?
5. Blood flows over the surface of each alveolus in capillaries. How does the blood change as it passes over the alveolus?
6. Oxygen passes from the air in an alveolus to the blood in a capillary. What speeds this process up?
7. Carbon monoxide in cigarette smoke stops the movement of cilia. How can this make you ill?
8. Which heart chamber has the thickest wall?
9. Which side of the heart pumps oxygenated blood to the body?
10. How is a one-way flow of blood ensured?
11. Why do the atria have thinner walls than the ventricles?
12. Why does an artery have a thicker and more elastic wall than a vein?
13. What three characteristics do the skeletons of all vertebrates have in common?
14. How does a shoulder joint differ, from an elbow joint, from a semi-movable vertebrae?

USEFUL LINKS

<http://sln.fi.edu/biosci/heart.html> The Heart an Online Exploration: A comprehensive online encyclopaedia. This site has well presented information, a gallery of fascinating images and excellent animations.

<http://www.bhf.org.uk/> The British Heart Foundation: A great source for free resources. The site has a useful section on the causes of heart disease.

<http://www.breathingline.co.uk/> Breathingline: Asthma Resources and Information. Clear information online, downloadable resources and a great 'Beat the Dust Mite' game.

<http://www.ash.org.uk/> Action on Smoking and Health: Campaigning organisation with information about the effects of smoking. There's a long list of fact sheets and advice about how to quit.

<http://www.medtropolis.com/VBody.asp> Columbia Virtual Body: Interesting information on bones and a great 'build a skeleton' game.

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