OUR WORLD OF SCIENCE

PAKISTAN EDITION

Book 4

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fidem
education network

first edition 2014
first impression 2014

ISBN 978-969-9705-43-4

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Acknowledgement
We are thankful to Faiza Asif for her contribution in developing the worksheets and answer keys.

Published by
fidem education network
D-69/1, Block-9, Scheme 5, Clifton, Karachi-75600, Pakistan
Printed at
Yaqeen Art Press (Private) Limited
Plot 150, Sector 23, Korangi Industrial Area, Karachi-74900, Karachi, Pakistan.

Contents

Introduction

This Teachers' Guide has been developed to accompany Our World of Science textbook series. The Guide has particularly been designed with an aim to help you put your valuable class time and resources to the best use.

The detailed lessons plans in this Guide may be used as they are, or followed loosely depending upon your teaching strategies, resources, time allotted to Science at your institution and very importantly, the needs of your students. Remember, these are not the only ways to transmit knowledge; you can come up with your own plans to tailor the activities given in the lessons and divide your time accordingly.

STRUCTURE OF THE TEACHERS' GUIDE

This Guide has been divided broadly into two main sections: Lesson Plans and Worksheets.

Lesson Plans consist of the following key features:

- **Objectives:** Every chapter lists the learning objectives of the lesson which you may refer to before, during, and as you conclude the teaching of the chapter to ensure that you have covered everything.
- **Vocabulary Bank:** The vocabulary bank includes the relevant vocabulary which the students will require to be familiar with. You should encourage them to use it during class discussions. Make sure that you prepare the class softboard with the words displayed prominently. Drill these words daily. You can prepare flashcards or use other techniques like a thematic word wall on the softboard.
- **Lesson:** The detailed procedure of the main teaching of the lessons has been structured in a way to include activities and their variations, multiple teaching strategies, extra information, hands-on activities and crafts to clarify concepts and give ideas a concrete shape. Each lesson is divided into Warm up, Main Lesson and Recap sections. Be judicious in your choice of activities and you can mix and match different sections. The plans may also be used as they are. You may also improvise and contextualize ideas, incorporating them into your own teaching design.
- **Links:** Weblinks to relevant topics have been given to enhance the teaching process for you and to ensure complete understanding of chapters taught.
- **Evaluation:** Evaluation exercises have been included at the end of every lesson to help you assess and ensure how far key objectives for particular teaching session have been met.
- **Safety**

  Specific safety measures have been included with activities in the Guide; however, exercise all necessary caution when conducting hands-on activities.

Some general ethical and safety precautions:

- In discussions involving a comparison of physical and cultural characteristics, be careful not to pass judgmental remarks or to let the students pass critical comments. Students come from different backgrounds and have varying intellectual and physical abilities. Similarly, cultural differences like dietary preferences may also vary. Exercise every caution not to offend their sensibilities. Be sure to emphasize that we are all different in our physical attributes, likes/dislikes, etc.

- Students may have various allergies from plants, animals, and edible items like pollen, dust, cats, and (pea)nuts. Try to find out any such instances from parents or the school nurse well in advance of any demonstration or field exercise.

- Make sure before tasting anything the students have clean hands.

- Ensure that students are under proper supervision when taking them four for a visit to the park or to the playground for observation.

- The students must never look at the Sun directly, or sunlight reflected in a mirror, microscope, or through a hand lens etc. Warn them of permanent damage including blindness.

- Be careful when handling apparatus: electrical appliances, mercury thermometers, microscopes, glass beakers, test tubes etc.

- Seeds may be poisonous. Make sure that children do not put them in their mouth.

- Candles should be supported firmly in their proper holders.

Remember to go through the plans well in advance to make the necessary preparations, especially for topics like plants, the solar system and weather which require ample time to record results intermittently.

Answers to exercises in the textbook have been provided for each chapter.

Worksheets for every lesson are provided at the end of the Guide. Tear out and photocopy the worksheets to use as a reinforcement exercise, homework or for assessment.

TEACHING STRATEGIES

The philosophy behind our books is to break away from the traditional pedagogical practice of lecturing and focusing on a learner-centred approach. Always demonstrate, discuss and then engage the students in reading the text. Do not initiate any lesson by directly reading from the textbook. We particularly emphasize on collaborative learning in the classroom and encourage you to use various cooperative and interactive teaching strategies.

We have taken meticulous care to include a variety of such strategies in our lesson plans. They include:

Pair/Group Work: Students work in pairs to think about work assigned to them and then discuss amongst themselves before sharing with the class. Two approaches for this are:

Think-Pair-Share: Assign the students a particular task or give them a topic/question to think about. In pairs, the pupils will discuss the question or task, and then share their ideas with each other. Finally, the pupils will discuss their answers with the class.

Jigsaw Technique: This cooperative learning approach where pupils teach there group members what they have learnt. It works like this:

a. Form 'home' groups where each member is assigned a different portion of a chapter to read. Also assign each student with a number, for example from 1–4. Each number denotes the portion assigned to them.

b. All students assigned a particular task in their home groups will then form a group with other pupils assigned the same task. For example, all number 1s from their respective home group will come together, as will all number 2s, 3s, and 4s. They will study and discuss the material and become 'experts' in it.

c. Now all the pupils will return to their respective home groups. They will teach each other what they have learnt about the material assigned to them.

d. Your job is to facilitate this process and evaluate what they have learnt by asking them to make a presentation before the class, or by taking a quiz.

Gallery Walk: An excellent way to start/conduct/revise the lesson. Divide the class into at least 3–4 groups. Each group will be assigned a topic, which they will discuss and write the salient points of on a paper/chart and paste it on the wall. Every chart will be pasted in the room far apart, preferably on all four corners of the room, like an art gallery. Each group will now be stationed in front of another group's poster.

The students in the group will read and discuss the points on the poster and write their observations on sticky notes which they will stick onto the poster. When the teacher claps or rings a bell, each group will rotate and move to the next poster and do the same. All groups will rotate in this manner until each group has had a chance to look at every group's poster. All the groups will then end when they have reached their own group's poster.

Loop cards: This is a popular educational game to keep students actively engaged. Prepare cards with a question on one side and answer on the other. The answer should be to a different question and not the one on the card. The number of cards you prepare should match the number of students in the class.

Distribute the cards, giving one card to each pupil. Begin by one student reading aloud the question on his/her card. The rest of their students will flip their cards to see who has the answer. The child bearing the correct answer will call out the answer and then it will be his her turn to read out the question on his/her card.

If the child with the correct answer written on his/her card does not know that it is the answer to the question, whoever answers correctly will be the next to read out the question on his/her card. The students can be divided into teams as well.

Loop cards can serve as an excellent revision/evaluation strategy. It keeps the students thoroughly attentive because the card they hold may come up in the loop. The idea is to have all the children participate by asking and answering questions in a way that you come back in a loop to the 'Start' person.

KWL: This is a comprehension strategy to evaluate what the students have learned using a chart. You can make a three column table on the board or a flip chart labelled K, W and L. Before reading, first find out what the children already know about a topic (K). List those points on the flip chart. Then ask what they want to know about the topic (W). List these as well. After the reading and discussion, ask what they have learned about the topic (L). Once you have completed the chart, analyse it to see what learning has taken place. KWL gives the students a purpose for learning the topic and keeps them engaged.

Here is what the KWL chart may look like:

K What I/we know	W What I/we want to know	L What I/we learned
Write the what the students already know in this column	Write what the students want to know in this column	After the completion of the lesson write whatever the students have learned in this column

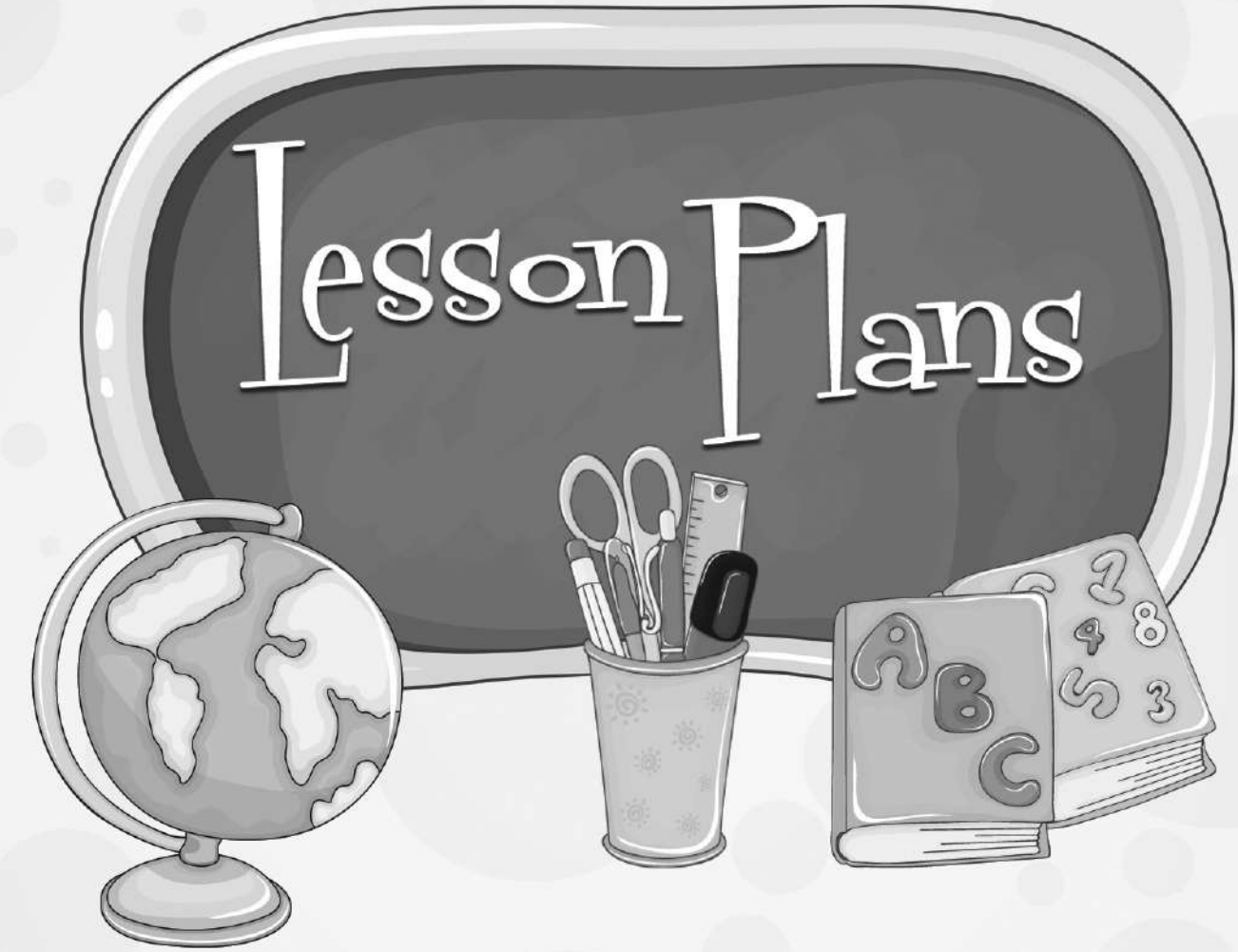
Circle Time: This is an excellent strategy to initiate discussions or use as part of your main lesson. Arrange the class in a fish bowl set-up or if there is enough room, ask them to sit in a large circle. This allows face to face interaction and helps in exchange of ideas, revision, and removal of misconceptions. This may be used in conjunction with any of the strategies above, for example the gallery walk. Each group can read out the comments left by other groups on their posters, leading to an interactive discussion.

Audio Visual Aids: Links to relevant websites have been provided in the lesson plans for different topics. Concepts are understood best only when they are seen or done practically. The children must experience phenomena in order to fully understand concepts like forces, electricity, materials, living things, etc.

Although every care has been taken to ensure that the lesson plans in this Guide will help facilitate learning through inquiry and practical activities, they are not necessarily to be followed rigidly. If you have trouble arranging the required resources for a lesson, feel free to improvise. Make the most of what you have readily available.

Science started with observation, and this is one of the first skills to be inculcated in children to foster the spirit of scientific enquiry, followed by collecting information, inference, experimentation, recording and analysing results to form a conclusion. A good teacher always tries to provide a variety of learning experiences to the students. Make every effort to connect phenomena to the experiences of the everyday lives of your learners. Take them to the playground or a nearby park, the music room, computer room, or any other place to engage them in a hands-on learning experience, encouraging them to observe and ponder over their findings.

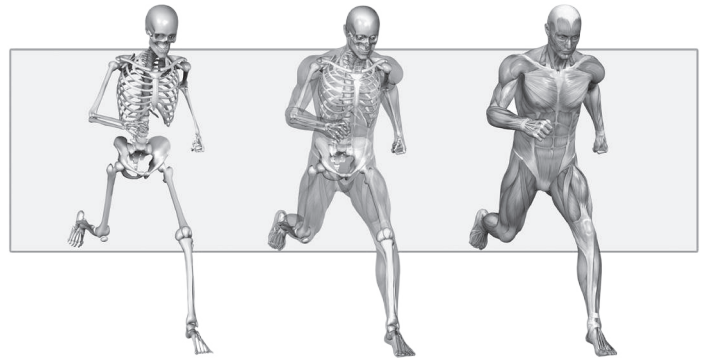
Lesson Plans



Unit 1

Chapter 1

Human body



Objectives	By the end of the chapter, students will be able to: • identify the features of the human body • understand the functions of different parts of the human body • illustrate body parts and systems • compare organs with organ system • describe the major functions of each organ • explore the cell, tissues and their functions • identify the types of muscles
Vocabulary Bank	cells, tissues, muscles, organs, microscopic, apparent, red blood cells (RBCs), white blood cells (WBCs), platelets, internal, organ systems, organism, clotting, stomach, lungs, liver, brain, digestive system, respiratory system, circulatory system, nervous system

LESSON 1: 40 mins

5 mins	**Warm up:** Take some random objects to the class, e.g. a toy car, a bowl, a comb, spoon, etc. Show the objects to the students. Ask them to compare their different shapes, materials used to make them and their use. *Explain that everything has a particular shape and structure, and each is different from the other. Similarly, the physical structure of humans is the human body. It has a particular structure. Its different parts, whether on the outside or inside of our bodies, which perform particular functions.*
30 mins	**Main Lesson:** Read out the following lines to the class. As you read, the students should point to the parts on their own bodies:

	Let's start with my (head). It is covered with (hair). On each side of my head, I have an (ear), so I can hear you. I also have two (eyes).They let me see you. My (nose) is for smelling. My (mouth) has two (lips) for licking and projecting my (teeth). They help me chew and I have a (tongue) for (tasting) my food . Discuss and explain the different parts of the body. *A computer has many parts: the mouse, key board, CPU, monitor, etc All these work together and support the computer system to work properly. Similarly, the human body is comprised of many parts. They all work together to make the body work properly.* (You can give the example of a car as well.) *Can you name some body parts? Record their answers on the board. Which of these parts can you see? These are called apparent structures. Apparent means something which can be seen clearly. Your ears, arms, hands, eyes, legs, etc are all seen. These are also called external parts.* *What about other internal parts?* Discuss brain, lungs and heart as vital internal organs performing duties. Discuss the composition of the human body by comparing it to a building. *The smallest building blocks in our body are known as cells. These are microscopic in nature and we cannot see them with our naked eye.* *Just like people in a factory all work together and make one organized system, the members of the body work together where each part has its own special job to do, As there are so many parts of our body, we group them into: apparent, internal and microscopic structures.* Read pages 8-10 and discuss the components of the body with reference to the discussion above.
5 mins	Recap: Summarize the main points discussed. *Our body has a physical form or structure. Its different parts perform different functions.* *Apparent structures of the body are the external body parts which we can see and feel. They are outside our body.* *Internal 'members' are the important parts of our body. There proper working ensures our survival. These are parts like the heart and lungs. They require special equipment to be seen.* *The smallest structures are the microscopic structures. As you can tell, we cannot see them with our naked eye but require a high powered microscope to see them*

LESSON 2: 40 mins

5 mins	**Warm up:** Ask random students to share information about the structure and composition of the human body discussed in the previous lesson. Keep prompting with questions to elicit answers. How does your body function properly? Types of parts? Give examples of apparent/ internal structures etc.
30 mins	**Main Lesson:** *Today we will learn about some more important parts of the body.* *What is a tissue?* *What do tissues do?* *How many types of tissues are there?* *What is the specific job of each type of tissue?* *What is a combination of two or more different types of tissues called?* *What is an organ system? Name four organ systems.* Now assign the reading task to the students in pairs. They will read and find out the required information. Ask them to share it with the class. Discuss the answers and clear any misconceptions. Be vigilant throughout this exercise and make sure that during the discussion, your input is provided by linking the idea of cells, tissues and organs as basic to larger building blocks and their examples. They will then complete Exercise 1 in class.
5 mins	**Recap:** Review the types and functions of tissues and organs. Ask them for examples of each.
	Evaluation: Exercise 2 on page 14 may be given to evaluate the students.

Answers

Exercise 1

a. body b. cells c. tissue d. organs e. two

Exercise 2

Cells

Major types: RBCs, WBCs, platelets

Functions:
RBSs carry oxygen to different parts of the body. WBCs shield against diseases and fight infections. Platelets help to clot blood when we bleed, or else all our blood will continue to flow.

Tissues

Major types: Nerve , Muscle, Connective and Epithelial Tissue

Functions:

- transmit messages from the brain to other parts of body (nerve)
- help in movement (muscle)
- give shape and supports body and inner structures (connective)
- cover and provide inner lining of organs to protect them

Organ

Names: Heart, Lungs, Liver

Functions:

- Heart: Circulation of blood throughout the body.
- Lungs: Respiration & purification of blood.

Organ system

Names: Nervous system, Circulatory system

Involved organs: Brain & spinal cord, Heart & lungs

Function:

- Circulatory system: to supply and purify blood.

Unit 1

Chapter 2

Bones and skeleton

Objectives	By the end of the chapter, students will be able to: • realize that vertebrates, including humans, have a bony internal framework called a skeleton • identify the main functions of the skeleton as providing support, movement, and protection to the human body • name the major bones in the skeletal system • explore the shapes and physical characteristics of bones • make and record relevant observations (functions and importance) of bones and skeleton • understand bones grow, change and regenerate throughout life • realize that invertebrates have exoskeletons or fluid skeletons • name invertebrates with exoskeletons/fluid skeletons
Vocabulary Bank	skeleton, skull, ribs, thigh bone (femur), knee cap, pelvis, upper arm bone, spine, backbone, femur, vertebrates, invertebrates, exoskeleton, fluid skeleton, movements, organs, x-ray, fluid, pelvis, vertebrae
Resources	model or chart of human skeleton, blank labels, computer/multimedia, flashcards/pictures of animal skeletons (horse, fish, snake, cat, goat, etc), clean bones (chicken/fish)

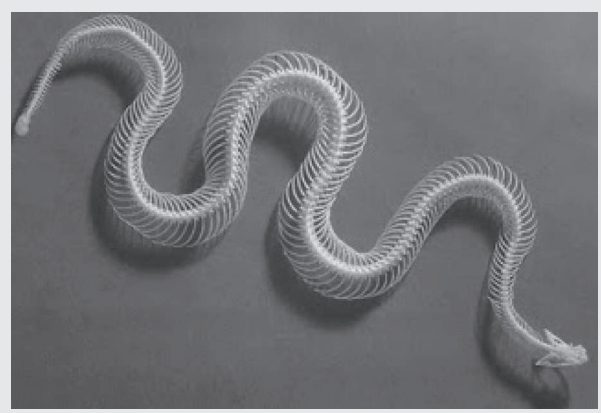
LESSON 1: 80 mins

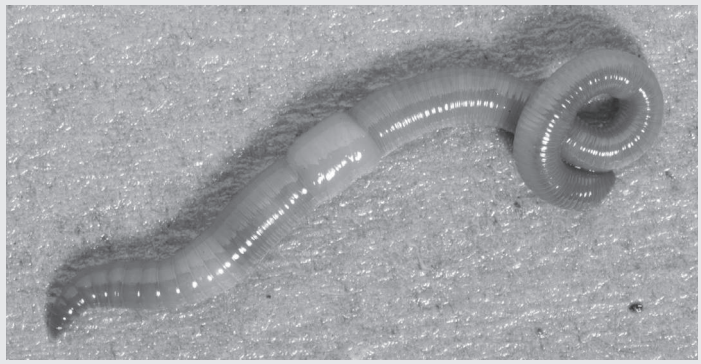
10 mins	**Warm up:** Ask the students to think of as many body parts as they can and list them. Meanwhile, draw an outline of the human body on the board. Now ask the students to share their answers, Each student will share one response each. When everybody has had their turn, ask them to identify which of these parts are bones. (arm , leg, knee, head, foot etc.)

	Why do we have bones? Are bones all the same size? *Where can you feel bones in your body?* *All our bones are connected to one another. Together, they form the skeleton.*
60 mins	Main Lesson: *The skeleton is the internal framework of the body. Why do you think we have a skeleton?* Elicit responses and read pages 16-17. Emphasize that the main function of the skeleton is to strengthen our body and to give it a fixed shape. If we only had muscles and skin, they would have nothing firm to be attached to, and in fact our body would be weak and fall like soft jelly. As you read, explain that the skeleton has three main functions: support, movement, and protection. Discuss the role of the skeleton in performing these three tasks. Refer to the list drawn on the board at the beginning of the lesson. Not all these parts are bones. Some like heart, brain etc, are parts inside our body which need to be safe from injury and harm or else they will be damaged. Discuss the main parts of the skeleton. On the model skeleton or chart, ask the students to identify the respective part. The students will touch that part on their own bodies. *Where is your skull? What does it feel like? What does it do?* Proceed in this manner for different parts of the skull like the jaw bone, cheek bones, and to other parts of the body like the ribs, pelvis, arm, leg, feet and hands. Now ask them to feel their spine. Explain that the spine or backbone is one of the most important part of our skeleton. It supports our the entire skeleton. Drill the important bones and their names several times to reinforce them. Discuss page 18 as you do so. Explain that our bones grow and develop with time so our skeleton grows larger in size. When we grow old, our bones become weaker. All vertebrates have a skeleton. Discuss the pictures of animal skeletons on page 19. OR If possible, bring reference books which show skeletons of animals. Talk about the skeletons with the children. Ask them to suggest questions about similarities and differences between skeletons and bones of humans and some other vertebrates. Divide the students in small groups and distribute the chicken and fish bones. Give magnifying glasses and ask them to observe the bones. They can feel them, bend them, rub them to understand their texture, shape, and strength.

	Ask them to use adjectives to describe the bones e.g. hard, strong, smooth, brittle (if chicken bones are used), long, thin, smooth, fragile, tough, hard, and to compare bones from different animals. Now ask them group wise what they have observed. Explain that bones are strong. Smooth and light. Bones may break after injury. Yet, as they are living, they can be mended. *Has anyone had an x-ray? Why did you have one? X-rays are performed by trained practitioners using a special x-Ray machine, which helps to see the structure of bones. It is useful because in case there is a fracture or deformity, it can be seen by the doctor.* Bones are made of minerals and lots of calcium. That is why it is important to have a healthy diet with lots of protein rich foods, especially milk, to ensure that we have strong bones, even when we become old. Explain that many diseases, like osteoporosis, where bones become brittle and hollow from inside, are caused from lack of proper nutrition for the bones. Bone store minerals and produce blood cells in the bone marrow. You can show them bone marrow of a cow. *Muscles are attached to bones which help us move.*
10 min	**Recap:** *What is a skeleton? What is it made of? Do all vertebrates have a skeleton? What are the three most important tasks of a skeleton? Name the most important bones in the human skeleton.* *Can you describe bones using 3 adjectives? Why are bones important?*

LESSON 2: 40 mins

5 mins	**Warm up:** Show them a picture of a skeleton of a snake. Now show them a picture of an earthworm. 

	 *They both appear the same but they are not similar at all. A snake is a vertebrate, It has a backbone. A worm is an invertebrate. It moves only with the help of its muscles.* *Its body is also very soft. It does not have an internal skeleton, but a fluid skeleton, or very soft skeleton. It helps them move and change their shape.*
30 mins	**Main Lesson:** Read and discuss page 19. Discuss that invertebrates do not have an internal skeleton made of bones, but a hard outer covering known as an exoskeleton. For example a spider, scorpion, or crab. *Exoskeletons do not grow like our skeletons. They fall off and the invertebrate creature grows a new one as its body grows in size.* Bring reference books to class, take the children to the computer room or library. Help them find more information on fluid or exoskeletons. They will all complete Let's Find out for Ourselves on page 20. Discuss their findings. Assign Exercises 1 and 2 for homework.
5 mins	**Recap:** Summarize the main points referring to: Skeletons in vertebrates. Exoskeletons in invertebrates.
	Evaluation and Activities The following exercises may be given for evaluation: 1. Exercise 3 page 21 2. The excellent activity and quiz on the following link: http://www.bbc.co.uk/schools/scienceclips/ages/8_9/moving_growing_fs.shtml

3. Worksheet **Bones and Skeleton** may be given.
4. Loop Card activity:

   Loop cards may be used to evaluate the students. The cards are distributed to the entire class. Each card has a question with the answer to another question on the back. The children will ask the question on their card. Each child will flip his/her card to see who has the right answer. The child with the correct answer will read the answer out and it will be his turn to ask the question written in his card. In case the child with the right answer does not read out his answer, any other child who does know the correct answer will get to read out the question on his card.

   Excellent loop cards may be found on:
   http://www.primaryresources.co.uk/science/science2b.htm

   (Moving and Growing Loop Cards)

Extension:

Ask the students to find out fun facts about bones and share it with the rest of the class.

You can share the facts on page 17 of the pdf:

http://www.brooklynkids.org/attachments/HumanSkeleton_31.pdf

This pdf has other interesting activities as well, such as a simple experiment to test the strength of bones by dipping them in vinegar. It is highly recommended that this experiment should be performed by the students.

The following is a very helpful link to help understand the skeletal system better.

http://hes.ucfsd.org/gclaypo/skelweb/skel01.html#baby

It has quizzes to reinforce the names and functions of important bones.

An excellent craft activity for making a mobile skeleton can be found at
http://voices.yahoo.com/halloween-crafts-poseable-skeleton-596838.html?cat=24

Another useful activity to put the skeleton back together can be found at
http://sv.berkeley.edu/showcase/pages/bones.html

Answers

Exercise 1

a. False b. True c. True d. True e. False

Exercise 2

Key functions: support, movement, protection

Longest bones: femur (thigh bone)

Important bones: skull, femur

Exercise – 3 – I

The bones give support to the body and also help us in movement. Some special bones also provide protection.

With the help of plaster cast, a fractured bone is mended. Bones are living things so they heal easily.

Some animals are invertebrates, like most insects, and so they do not have a skeleton. They have a hard outer covering called an exoskeleton.

Exercise – 3 – II

Food and hand bones

Vertebrae

Ribs

Unit 1

Chapter 3

Bones, muscles and movement

Objectives	By the end of the chapter, students will be able to: • learn that bones, muscles and joints are all very important to carry out various functions • recall that the bones in the skeleton support the body, provide a strong framework for attachment of muscles, help with movement, protect soft organs, store minerals and make new blood cells • recognize the importance of having a variety of bones in their body • learn that animals with skeletons have muscles attached to the bones • understand that a muscle has to contract (shorten) to make a bone move • understand that muscles act in pairs • make observations and comparisons relating to exercise and rest • conclude that when someone is exercising or moving fast, the muscles work hard. • recognize the importance of regular exercise to make their muscles fit and strong • make and record relevant observations of exercising their body in different ways • recognize voluntary and involuntary muscles • identify different types of bones
Vocabulary Bank	flexibility; stamina; joints: hinge, pivot, saddle, condyloid, ball and socket; contract; relax; vertebrate; pull; push; attach; protect; expand; lengthen; muscle; pairs; shorten
Note	It would be helpful to prepare a large diagram of human skeleton and its parts labelled to help students understand clearly.

15 mins

Warm up:

Begin the lesson by telling a story.

I am going to tell you a little story. There was once a tin man. Tin is a kind of metal.

He was a woodcutter. Every day, he would go to the woods to chop some trees. He was alright when it was nice and sunny. But one day, it started to rain. As the tin man was chopping wood, he suddenly felt that he could not move. His tin body froze in place and he became stiff. A little girl named Dorothy was passing through the woods. She saw the tin man frozen in place. She waited in a wooden shed until the rain stopped. Then she dried the tin man and put oil in all of his joints. The tin man was able to move, but was careful never to be out in the rain again.

Now ask the children to hold their pencils without bending their fingers. *Could you do it? Why was it difficult? Why?*

This is what the Tin Man must have felt like all over his body.

Ask the students to stand up and form a circle. Tell them to move their body at the wrists, ankles, move their arms, shoulders, and their head very gently in different directions.

While standing on one foot, ask them to move their other leg.

Do all your body parts move in the same direction?

What if they did?

Now review the previous lesson. *How many bones does an adult human have?*

How many do infants have? How do bones connect with one another?

Our bones are connected to each other at the joints. The Tin Man rusted in the rain. He could not move because his joints had become stiff. Just like when you tried to hold the pencil without bending your finger.

55 mins

Main Lesson:

Explain that our body is able to move and we are able to perform different activities with the help of our bones, muscles and joints.

An infant has around 350 bones. How many do we have as adults? 206. A child's bones connect with one another at the joints. Elbow, hip, ankle, knee, wrist and shoulder are places where the bones join together.

Chewing food, writing, swinging a cricket bat — these are all tasks that the bones, muscles, and joints help you do.

Read pages 22 and 23 and discuss how the body grows and becomes stronger. Explain that muscles help us make movements, and increase our strength, speed, flexibility and stamina. The more our muscles are used as we do exercises and other physical activity, the stronger and healthier they become.

Referring to the activity done at the beginning of the lesson, ask the students what sort of movement they could make with different joints. Backwards, forwards only, sideways, up, down back and forth? Were all joints able to move in the same direction? Why or why not? After listening to their responses, come to the point that different joints help us to move in specific directions.

Similarly, we have different types of bones. Read pages 24 and 25 and discuss the types of bones and joints and their specific characteristics.

Ask them to feel their ears and wiggle them. Ask them to do the same to their nose. Explain that our ears and nose have cartilage, not hard bones. Cartilage is a tough and flexible tissue which also covers the ends of bones at the joints, to keep our joints safe and protected from wear and tear.

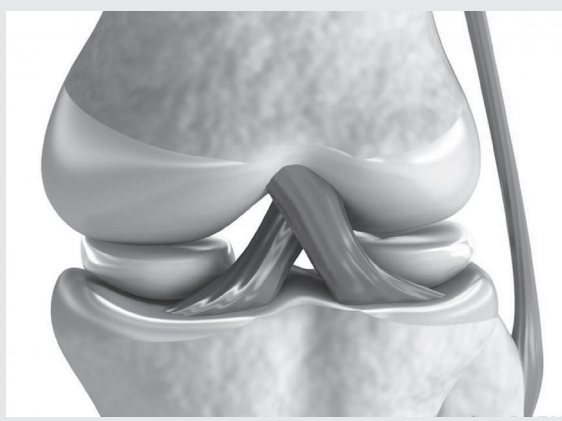
Ligaments connect bones and joints with one another.

What do you think would happen if we had all the same kinds of bones?

How would we look? Would our organs be protected? Would we be able to move?

What if we had the same types of joints?

Demonstrate with the help of a model skeleton or your own body. Move its/your shoulders, elbow up and down, legs at the hips and knees, neck , feet, wrists and ankles. Ask students to note the direction of movement at each part.



A knee joint with the ligaments shown
(Source: wisegeek.com)

	Show the students the ends of bones that form the joint. They are specifically shaped this way so that they fit properly and make movement smooth and easy. Explain that a hinge joint only allows bending and straightening. Demonstrate this by moving your fingers, toes, knees and elbows. Now show the ball and socket joint as below, explaining that it is found in the shoulders and hips. It allows movement forward, backward, sideways and can rotate. Demonstrate these directions with your own movements. Now call up random students in front of the class and assign each a joint type. They will move that body part and the rest of the class will try to guess which joint was assigned to the student.
10 mins	**Recap:** Recap the lesson in the form of a discussion: *What would happen if their shoulder had a hinge joint?* *Imagine what would happen if you had a different joint other than the one you have in your hands, hips, shoulders, arms, neck, etc.*

LESSON 2: 40 mins

5 mins	**Warm up:** Review the previous lesson. *Bones, muscles and joints all work together to help us move. Have you ever wondered how muscles work?* Ask them to bend their arms. Now ask them to extend them again. With the other hand, they will feel their muscles.
25 mins	**Main Lesson:** Review that the human body has a skeleton made of bones and joints. *But are bones and joints enough for movement? No, because bones alone cannot make us move without muscles.* *Muscles move with the help of bones that they are attached to. They pull the bones to create movement.* Read pages 25-27. Explain that as one muscle contracts, the other relaxes. Discuss the appearance of contracted and relaxed muscles and refer to the diagram of biceps and triceps on page 25. Ask the students to perform the movement. Discuss the three types of muscles: Smooth, cardiac (heart), and skeletal muscles.

	Explain the difference between voluntary and involuntary muscles. *When you moved arm, which type of muscles were involved? Was it a voluntary or involuntary movement?* Explain involuntary movement with the help of example of how we do not consciously control blinking of our eyes, the pumping of the heart, or the churning of food in our stomach. This is automatically done by involuntary muscles. Discuss the importance of exercise to build and make our muscles stronger, longer, and its effect on our overall health. Make it clear that when a muscle works harder, it contracts more, becomes stronger, and larger. You can show images of athletes, trainers, children playing in a park etc. Do exercises 1 and 2 on pages 28 and 29.
10 mins	**Recap:** Review the lesson by asking the following questions: *What is a muscle?* *What are the three types of muscles you have learnt about today.* *What is a voluntary muscle? Give an example* *What is an involuntary muscle? Give an example*

LESSON 3: 40 mins

5 mins	**Warm up:** Review that bones, joints and muscles all work together to help us move, support our body and protect our internal organs. We need to exercise our body to remain fit and to keep our muscles strong.
30 mins	**Main Lesson:** Take the children to the computer lab, or bring reference books, diagrams etc and complete Exercise 3 on page 29 in groups of 3. Move around and help them complete the table.
5 mins	**Recap:** Share their findings with the class.
	Evaluation: The following exercise can be given to evaluate the students:

1. True or False?

a. Bones and muscles work together to aid body movement. T or F

b. When using a hammer, a person makes use only of the bones and muscles in his/her arm. T or F

c. Muscles move bones. T or F

d. When a person moves one muscle, other muscles also move. T or F

e. A person does not need a skeleton to hold his/her body up. T or F

f. Cartilage joins to form muscle. T or F

2. Circle the letter of the best answer

Which of the following best explains the function of joints?

a. Joints are used to connect muscles together.

b. Joints are used to hold the body up.

c. Joints can be used to help the body move.

d. Joints connect bones and muscles.

3. Which of the following joints allow hips to move in any direction?

a. Saddle joint

b. Ball-and-socket joint

c. Hinge joint

d. Fixed joints

Extension:

Bones act as a protective body armour to shield your vital organs; they are the framework that support your body, and allow you to stand upright and move around. Bones are alive and repair themselves, and that they require calcium, vitamins, and exercise to build and maintain their strength.

Ask the children to prepare a project on the importance of bones, what their bones need to stay healthy and last a lifetime, and that it is never too early or too late to start taking care of your bones.

Vitamin D, and other minerals: how do these nutrients strengthen the bones? What foods contain these important nutrients, and how often do you consume them? List ways you can add these foods to your diet each day — whether it's part of a meal or as a healthy snack. Generate a list of foods that you can eat to help your bones remain healthy and strong.

Despite the fact that bones, muscles, and joints are strong, they can be damaged. Find out a list of injuries and diseases that may occur in the bones, muscles, and joints.

The following questions can be given to guide them:

1) How do they work together to help you move?

2) What other functions do the bones perform?

3) What are the bones made of?

4) What can we eat to help ensure that they'll grow healthy and strong?

5) Name other ways we can care for our bones, muscles, and joints.

Online Article :

http://www.bioedonline.org/tasks/render/file/index.cfm?fileID=1A80F5EA-A35F-BBBD-6126D9ADFDD428D1

Answers

Exercise – 1 – I

Move backward and forward: Saddle

Rotates on top of each other: Pivot joint

Ball and socket joint: Allows movement of the arm in all four directions.

Hinge: The bones move upward and downward.

Exercise – 1 – II

a. As the human body grows its parts become bigger, thicker and stronger. Muscles and bones develop abilities and humans perform better physically.

b. An infant has 350 bones. As a child grows bones join other nearby bones in order to develop a strong body. The bones in the wrist, ankle, hip, knee and elbow and shoulder join.

c. There are 4 types of bones in human body:

   Long bones, short bones, flat bones and irregular bones.

d. Joints are those parts of a body where most of the bones are connected. Their purpose is to allow bending; turning and twisting the various body parts which makes us move and do different tasks.

e. There are 3 types of muscles in the human body:

   Smooth muscles, heart muscles and skeletal muscles.

Exercise – 2

a. Involuntary

b. muscular

c. bending, turning and twisting of

d. irregular facial bones

e. (The) smooth

f. voluntary

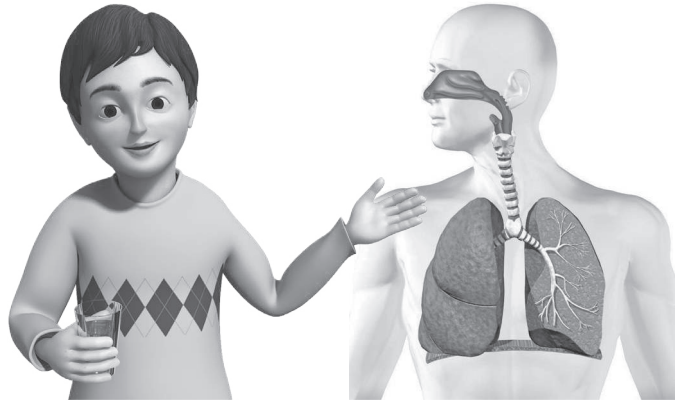
Exercise – 3

Encourage students to use names like biceps, triceps, hamstrings and simple descriptions like calf muscles, facial muscles.

Unit 1

Chapter 4

Organ system



Objectives	By the end of the chapter, students will be able to: • identify major organ systems in the human body • describe the basic structure and function of the major organs in the digestive system • identify interrelationships between body systems • design and build a model to demonstrate how organs or components of body systems in the human body work and interact with other components
Vocabulary Bank	organ system digestive, blood, oesophagus, bronchioles, trachea, alveoli

LESSON 1: 40 mins

5 mins	**Warm up:** Compare the human body with a machine like a car or a computer. Its various systems all work together to ensure that the body works properly. *We studied about organ systems in Chapter 1. Can you name some organ systems?* (Digestive, respiratory, circulatory and nervous systems). *How many organ systems does the body have? We will study about three of the most important organ systems: circulatory, digestive, and respiratory systems.*
30 mins	**Main Lesson:** *Which organ pumps blood throughout our body? Our heart is a very powerful muscular organ which works without stopping to provide blood to our body.* *How does so much blood travel around our body? Just like cars need roads and pathways to travel, blood from the heart is transported through passages called vessels.*

Read page 31 and explain that the there three major vessels are called arteries, veins and capillaries.

Explain their characteristics taking help form the chart.

Now explain the digestive system.

What did you eat for breakfast today? What do you think happens to the food you eat? It goes through a process called digestion in order for it to be useful for the body.

What do you understand by digestion? Digestion is the process of breakdown of food into smaller particles and their absorption and assimilation into our body.

It is a fascinating process. It is how we obtain nutrition from the food we eat and how the body is able to use the nutrients to help is perform different functions and remain healthy.

There are several steps in the digestive process, which begins from the mouth.

The smallest living part of our body is the cell. Cells require energy to work properly.

This energy is obtained through the process of food digestion.

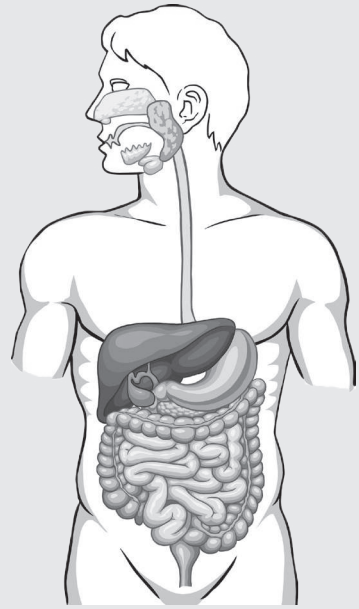
Divide the class in pairs.

Assign them page 31- 33 to read (Mouth, Oesophagus, Stomach, Small Intestine, Large Intestine, Rectum).

Now ask them to draw the following chart in their copies and complete it:

Body part	Function
Mouth	
Oesophagus	
Stomach	
Small Intestine	
Large Intestine	
Rectum	

Explain the process by taking help from the points below. Demonstrate with the help of a soaked sponge. The sponge is the food, now soak it in water. This now becomes bolus. Now soak it completely in water and say that food becomes a watery liquid in our stomach, then drain it explain that the water is reabsorbed, and the sponge with all the water squeezed out of it is the remaining waste, with all the goodness of food already reabsorbed in the body.



Source:
http://www.aboutgastro.com/digestive-system

Facts

Our body must digest food we have eaten.

1. When we chew the apple, it is crushed and mixed with saliva so it becomes soft. This is called bolus.
2. We swallow the bolus which travels through the **oesophagus**, a long tube that runs from the mouth to the stomach. Inside the **stomach** there are juices that mix and churn the food. The bolus now becomes a liquid, like soup.
3. Next, the food goes into the **small intestine**. It is a long tube folded up. Here, juices from the **liver** mush up the food even more, and nutrients from the food are absorbed into the blood, which transports them to parts of the body.
4. Now the food goes into the large intestine. Water from the food is reabsorbed into the blood.
5. By now, the body has taken all the things it needs from the food. What is left is waste that is not needed by the body.
6. It gets stored at the end of the large intestine inside the **rectum**. The waste material must be **excreted** from the body. Muscles push the waste out of the body through the anus.

Additional Teacher Input:

Digestion takes a long time.

Food can remain for 3-4 hours in the stomach. It can take up to 3 more hours as it moves through the intestine. It can stay in the large intestine for up to 36 hours. Depending on the type of food (as some are harder to digest) and the speed at which it moves the complete process of digestion may take 40 hours or more!

5 mins	**Recap:** Review the lesson by asking questions: *What is digestion? Why is digestion is important? Draw a diagram of the digestive system and ask them to label the parts.*

LESSON 2: 40 mins

5 mins	**Warm up:** Ask the students to put their hands on their ribs. Now ask them to take a deep breath in. Now slowly let it out. Repeat this a couple of times. *What did you feel in your chest as you breathed in? Could you feel it rise? What about when you breathe out? Why do you think this happens?* *Where does the air we breathe in go?*
30 mins	**Main Lesson:** *Just like our digestive and circulatory systems, another important organ system is our respiratory system.* *Respiration is the process of obtaining oxygen from air, and its use by our cells for energy and releasing carbon dioxide as a waste product. This process of exchange of gases is termed as respiration.* *Can you name the organ responsible for respiration? Our lungs are the main organ where respiration takes place. What are the other parts of the respiratory system?* Record their responses. Many will say mouth and nose. Explain that our lungs are also very important for the respiratory system. Show the pair of goat lungs, pointing out the bronchioles and alveoli. Explain that they are like tiny air-filled bags. *When we breathe in, the lungs expand because of the air which fills them, like balloons. When we breathe out, or exhale, the air moves out again. More than this simple exercise, a very important event occurs, which is the exchange of gases.* Explain this by reading the paragraph on page 33. That is why we breathe in oxygen and let out carbon dioxide. *You will be surprised to know that respiration also takes place in plants. Aren't they living things as well? Plants breathe out oxygen and take in carbon dioxide during the day. At night, this is reversed as plants give out carbon dioxide, which is harmful for our lungs.*

5 mins	**Recap:** Ask question to review the lesson.
	What is meant by inhale and exhale? *What is respiration?* *Which body parts are involved in respiration?* *Why is it healthy to go for a walk in the morning rather than in the evening?* **Evaluation:** The Worksheet **Organ System** or exercise below may be given for evaluation. Students can also be given Exercise 2 on page 35. **Exercise:** **Arrange the following in the proper order to show the correct path food takes through the digestive system.** oesophagus 1. _____ stomach 2. _____ large intestine 3. _____ mouth 4. _____ rectum 5. _____ small intestine 6. _____
	Extension: The following link has an excellent animation of the digestion process for different kinds of foods: http://kitses.com/animation/swfs/digestion.swf

Answers

Exercise 2

Digestive system

1. stomach
2. small intestine
3. large intestine
4. salivary glands
5. mouth
6. liver

Respiratory system

1. nasal tract
2. lungs
3. alveoli
4. nose

Circulatory system

1. heart
2. veins
3. arteries
4. RBCs

Unit 1

Chapter 5

The Diet

Objectives	By the end of the chapter, students will be able to: • understand the importance of food • identify foods as healthy/ unhealthy • classify foods in terms of their nutritional value. • predict the nutritional value of foods consumed at home. recognize different food groups from the food pyramid and foods that fit into each group. • identify sources of vitamins • apply basic knowledge of greater than and less than to numerically • compare nutritional information. • create their own definitions of "healthy" eating habits. • assess their own nutritional habits.
Facts	<u>Minerals:</u> Minerals are substances necessary for building bones, tissues, and other compounds as well as for regulating body processes. calcium, phosphorus, magnesium, sodium, potassium, and chloride. **Function:** Minerals perform a number of functions in the body: • Calcium is used to make the bones and teeth • Iron is used to make the hemoglobin in red blood cells • Minerals become part of tissue structure, like in bone and teeth • Minerals help maintain acid-base balance, to keep the body pH neutral • Minerals help regulate body processes, such as in enzyme systems • Minerals function in nerve impulse transmission and muscle contraction • Minerals help release energy from food

	Vitamins: Vitamins are organic compounds necessary for normal growth and maintenance of health. There are 13 vitamins currently identified as essential for maintaining good health. The body cannot survive without them. **Function:** Vitamins help the body convert carbohydrates and fat into energy and assist in the formation of bones and tissues. Vitamins are either fat-soluble or water-soluble. Fat-soluble vitamins cannot be dissolved in water, so they are stored in the body fat until they are transported to the cells by the blood. Because these vitamins can accumulate in the body, it is especially important for a person's regular daily nutrient intake of fat soluble vitamins.
Vocabulary Bank	nutrients, minerals, vitamins, balanced diet, food groups, grains, proteins, dairy, intake, energy, meal, activity, germs, hygiene, steam, boil, fry, raw, digestible, fats, nutrition deficiency, obesity, junk food, preserve, heart disease, development, carbohydrates, nourishment
Resources	food pyramid chart, separate photocopies for all students to paste in their notebooks, magazines with pictures of food, paper plates, chart paper, glue, colour pencils

LESSON 1: 40 mins

5 mins	**Warm up:** Begin the lesson by asking the children what their favourite food is. Ask them what they had for breakfast, lunch and dinner, and what they eat as snacks. You can list the most common responses they give on the board. Now say that we are going to see what Sameer and Maria are discussing. Turn to page 36 and assign students the roles to read aloud. Now turn to the board where you noted their responses. *By looking at your responses on the board, I can see that most of you may have questions like Sameer and Maria.* **[Make sure not to ridicule the children and be sensitive to the preferences of food and be sensitive to their personal preferences, cultural and ethnic backgrounds]**

30 mins	**Main Lesson:** *Why is it important to have food? Food is very important for our body. It provides energy. Remember how we compared our body to a machine in earlier lessons? Can your car run without petrol/ fuel? Similarly, our body needs nourishment from food. We feel fresh and alert, and our body does not tire easily. We go about doing our daily tasks and even hard physical (of the body) or mental (of the mind) work. We will feel tired, lazy and of course very hungry without food.* Introduce the term **nutrients**. *Food contains some very important nutrients. Nutrients help us to grow well, protect us from illnesses by making our body stronger to fight disease, and give us energy.* Read page 36 together. Ask them if they have heard about vitamins. Discuss their importance and explain that if the body does not receive the required amount of vitamins, it becomes weak because of this **deficiency**. Similarly, several minerals are also required. Let's look at some important vitamins and minerals. Discuss page 37 and 38. Make sure you go through the sources of vitamins and minerals. Vitamins and mineral tablets are also available in the market, but they should be taken when the doctor thinks we have a deficiency of any particular vitamin. We should always try to get these nutrients through a variety of foods. Explain that they food we eat needs to be prepared in a way that it still its nutrients are **preserved**. Several cooking processes, such as frying, can destroy the nutrients in the food. These foods harm to the body. *Overcooking also destroys nutrients in food. What do you think would happen if you ate nothing but fast food? Eating fast or 'junk' food is bad for the health. It makes people overweight and causes disease.* Read pages 38 and 39 on food preparation. Discuss ways of preparing meat, vegetables, fruits and grain so that they retain their nutritious value.
5 mins	**Recap:** Review the lesson. *Can you tell me three things we have learned today?* *What will happen if we did not eat food for many days? Why?* *What happens when we fry meat and vegetables on high heat?* *Name some important vitamins and their functions in our body.* *Name a few minerals.*

LESSON 2: 40 mins

5 mins	**Warm up:** Review the last lesson. *What do you know about nutrients? Can you name some important nutrients?*
30 mins	**Main Lesson:** Explain that different nutrients are not found in only one type of food. That is why we need you eat a variety of foods to fulfil the body's needs. But is you eat too much or too little of any food, we can become sick and the body would be unfit and unhealthy. So we need to keep a balance, or have a balanced diet. Explain that a balanced diet means eating the right variety of food in the correct amounts. This amount and type of food will be different for different people. For example, growing children and people who do lots of hard, physical work will require more food. How do we know what is the right amount and type of food for us? Refer to the food pyramid chart. You may refer to the pyramid on page 10. Explain that this is a guide which helps us know which food group we need to eat more of and which to cut down. Show them the food pyramid. Foods can be divided into five groups according to what they do. Explain that the basic food groups, dairy, protein, grain, fruit and vegetable are the basic groups. In addition, fats, oils, sugars, and water-based food are also necessary for a healthy body. Ask them to analyse the food pyramid chart, and discuss which is the largest group and which is the smallest. Grains need to be taken the most and fats and sugary foods the least. Divide the class into 8 groups. Assign one food group from page 41 to each group. Each group will read about the respective food group, and share with the class information about its nutrients, examples of foods, consequences of less or inadequate intake of the food group, etc. Make this an interactive session and encourage all students to participate and ask questions.
5 mins	**Recap:** Ask the pupils to write down what they had for breakfast, lunch and dinner. They will evaluate their meals according to the food groups. • Can you identify which food group each food they have listed belongs to? • Review the food record you had noted in the last session. Recall from memory if you did not keep a record of it, as most foods will be common. Select one of the meals and discuss it with the class. Which food group is dominant in these meals? What can we cut down or add to make it a balanced diet?

LESSON 3: 80 mins

10 mins	**Warm up:** Take the class into the computer lab. Write these lines on the board with the following instructions: Read this and find out what the underlined terms mean. Now explain in your own words what these lines mean: *Poor eating habits make children become overweight. Poor eating habits in childhood are also likely to continue into adulthood and increase the risk of developing heart disease, obesity and cancer.* Generate a discussion about healthy eating habits and a balanced diet.
65 mins	**Main Lesson:** **Multimedia Activities** The students should spend about 20 minutes doing activities based on planning a healthy meal, making right choices of food and evaluating energy levels obtained from foods of different groups. Show the students the following links: This is an excellent activity on how to prepare a healthy lunch box: http://www.foodafactoflife.org.uk/Activity.aspx?siteId=15&sectionId=64&contentId=56oups Here they will learn to make their plates based on healthy food groups: http://www.foodafactoflife.org.uk/Activity.aspx?siteId=15&sectionId=64&contentId=55 The following activity will help them understand how to maintain their energy balance of choosing the right foods for breakfast, lunch and dinner and activities http://www.foodafactoflife.org.uk/Activity.aspx?siteId=15&sectionId=64&contentId=214 Make sure that you move around to monitor the students and that every student gets a chance to do each activity. Encourage them to make notes. **Group Project** Now the students will come back to the class. Divide them into groups of eight. Ask them to prepare a project called **My Healthy Meals**.

They will prepare a healthy meal for one whole day, breakfast, lunch and dinner, based on what they have learnt and practised. They will write down the food group each item belongs to as well. They will do this in a pictorial fashion where they will have three large paper plates, one for breakfast, lunch and dinner, and one small one for snacks.

Ask them to find pictures or draw, colour and cut them out, and stick them on the paper plates, which will be stuck on chart paper and displayed in class. About 45 minutes should be spent on this task.

5 mins

Recap:

The students will move around in their favourite groups and observe the projects made by other groups. Discuss with the class if any group can make improvements for a healthier meal plan.

Evaluation:

The worksheet **Diet** may be given for evaluation.

The chart below can be given as a handout and the students can be tested on it.

FOOD GROUP	MAIN NUTRIENTS	IMPORTANCE
Milk and Milk Substitutes	Calcium Protein Riboflavin	- builds strong bones and teeth - builds and repairs muscles and tissues - provides energy to the body
Meat, Fish, Birds and Eggs	Protein Iron B Vitamins	- builds and repairs muscles and tissues - helps build good blood - help the body have energy
Fruits and Vegetables	Vitamin A Vitamin C	- helps you stay healthy - gives you good sight - gives you good skin - helps keep your teeth and gums healthy - helps fight infection
Bread and Cereals	Carbohydrates Iron B Vitamins	- provide energy to work and play - helps produce healthy blood - help the body use energy properly

Answers

Exercise 1

a. Nutrients are nourishing substances like vitamins, minerals, proteins, fats and carbohydrates. They are extremely essential for the growth and development of our body.

b. Vitamins are organic compounds. There is a wide range of vitamins; each of them supplies energy to the body in a unique manner. (Give some examples)

c. Different foods contain different types of nutrients. Any one type of food cannot fulfill our body's requirement of nutrients. So we have to take food from different groups in certain amounts. We group foods together to form a balanced diet.

d. Before eating the food is prepared by washing, cleaning and cutting meat, cleaning it of fats and cooking it. We wash vegetables and cook them with other foods to retain their nutrients.

e. The dairy or milk group contain nutrients for bone development. Dairy foods contain lots of calcium, vitamin B1,vitamin B5, vitamin B2.

Unit 2

Chapter 6

Habitats

Objectives	By the end of the chapter, students will be able to: • understand and explain the concept of a habitat • realize that the conditions of a habitat are suited to an animals needs • identify which animals belong in which habitat • understand how animals and plants are adapted to the conditions of the habitats in which they live. • realize that adaptation to the habitat is necessary for survival • understand and identify ways animals adapt to their habitat
Vocabulary Bank	habitat, adaptation, mountain, desert, ocean, forest, rainforest, arctic, tundra, camouflage, organism, pond, meadow, woodland, forest, jungle

LESSON 1: 40 mins

5 mins	**Warm up:** Begin the lesson by asking the students what they understand by habitat. *What word does it sound like? 'Inhabit', which means to live. So habitat is a place where we live. Can you describe the place where you live? It is your home, and the area and the city that you live in. What does it have? Markets, roads, cars, methods to make the weather conditions ideal(fans and air conditioners,)a strongly built home, family, and everything to ensure that you get the best possible sources of energy and comfort to make sure that you grow and live well.* *Similarly, animals also require an ideal place that provides food, shelter, safety, companionship, and allows them the ideal environment to grow and raise their young.*
30 mins	**Main Lesson:** Read pages 44 and 45 in pairs. Give them time to discuss what they have read. Now ask each pair one by one to explain one thing they have read. It should be in order, i.e. the first pair should

	start at the beginning, the next pair should carry on from where the last pair stopped, etc. until all the main points have been discussed. Discuss adaptation and the example of the polar bear. Ask them to think of other examples of adaptation (e.g. fur coat of some animals becomes lighter in winter and brown in summer) etc. This is a very useful link followed by a quiz to help them understand animal habitats better: http://www.bbc.co.uk/schools/scienceclips/ages/8_9/habitats.shtml Introduce the term **camouflage**. Explain that **camouflage** is a method of hiding or remaining unnoticed by blending with its environment. Emphasize that by observing nature keenly we can apply useful phenomena in our life also (such as the use of **camouflage** by the military the world over). *A chameleon changes its colour and becomes the colour of whatever object it is on.* *A giraffe has spots and a long neck to blend in with the trees it eats.* Exercise 1 on page 47 and 4 on page 49 will be done in class. Students may refer to the other reference books/internet for Exercise 4 on page 49.
5 mins	**Recap:** *Can you write in your own words what a habitat is and why it is important for a living organism?* Discuss the questions in Exercise 3.

LESSON 2: 40 mins

5 mins	**Warm up:** *Name any three habitats. Do you know that a leaf, bush and ant hill are also habitats? We have several animal habitats around us.*
30 mins	**Main Lesson:** Take the children outside to the playground or to a nearby park. They may also go around the school. They will need to find four different habitats and note its conditions. They will record their observations in the table on page 46. They should try to note the living organisms found in that particular habitat.. If they cannot, they can visit the computer lab and find out. Discuss their findings in class.

5 mins	**Recap:** Show the students pictures of different animals, Ask them about their habitats. Ask them what features they have that help them adapt to their environment
	Evaluation: The worksheet **Habitats** may be given to evaluate the students. The quiz on the following link may be used as well: http://www.innovationslearning.co.uk/subjects/science/activities/habitats_quiz/quiz_home.htm **Extension:** Exercise 2 on page 47 can be assigned as a home assignment. The students will need to find information and present their findings to the class. The following activities may be given to evaluate the students: http://www.innovationslearning.co.uk/subjects/science/activities/habitats/habitats_home.htm This is an interesting activity about adaptation of particular animals to their environment: http://www.ecokids.ca/PUB/eco_info/topics/climate/adaptations/index.cfm This link has video on adaptation of animals. It is highly recommended that you show this video before or after the lesson: http://www.makemegenius.com/science-videos/grade_2/Adaptations-of-Animals-for-kids

Answers

Exercise 1

a. Two features that make a habitat favourable for living organisms are:

Environment (easily available food and water) and a suitable climate.

b. Elements that cause change in a habitat are:

Temperature and rainfall.

c. Animals adapt to changes in the environment by using their body parts to camouflage themselves and to use them in different ways. For example, a polar bear walks on snow in winter and it swims with its paws in summer when the ice melts. Other animals change the colour of their outer coat to blend with the environment.

d. Yes, drastic and extreme changes can be harmful for living organisms, for example, when too many trees are cut from a jungle, the animals that rely on them for food and shelter may not survive.

Exercise 3

1. a
2. c
3. a
4. c
5. a

Exercise 4

(Answers may overlap/vary)

1. cactus, snake, ants
2. octopus, fish, seals, whale, crab, snail, coral reefs,
3. seal, polar bear, penguins,
4. pine tree, eagle, sparrow, beetles, lion, reindeer, ladybird

Unit 2

Chapter 7

Grouping and identifying organisms

Objectives	By the end of the chapter, students will be able to: • understand the relation between an organism and its habitat • classify animals as vertebrates and invertebrates, animal families, etc • classify plants as non flowering plants and flowering plants; vascular plants and non vascular plants • realize the importance of the food chain and its function in nature • recognize the role plants, herbivores and carnivores and microorganisms in food chains • understand the importance of producers, consumers (primary and secondary) and decomposers in the food cycle • make simple food chains
Vocabulary Bank	inhabitants, vascular, backbone, flowering, food chain, producer, consumers, primary, secondary decomposer, prey , predator, topography

LESSON 1: 40 mins

5 mins	**Warm up:** Elicit previous knowledge on sorting and grouping living things. *We can group various living things because..?* They have similarities on the basis of which we can group them. Review their knowledge about vertebrates and invertebrates. *Feel the back of your neck. The bones at the back of your neck are connected to small bones all the way down the middle of your back. These bones make up your backbone. Similarly, there are animals with backbones and others without backbones.* Scientists place all animals into two large groups. One group is animals with backbones, called vertebrates. The other group is animals without backbones, called invertebrates. *Can you name some vertebrates and invertebrates?*

30 mins	**Main Lesson:** Scientists estimate that 97 percent of all animals are invertebrates. They are found almost every where on Earth, living in oceans or freshwater ponds, living above the ground or under the ground. Some Invertebrates can be very tiny, like the zooplankton, which are smaller than the head of a pin. Invertebrates can be very big like the giant squid, which can be over 30 feet long. Explain that a single habitat has many different kinds of inhabitants. These may be very different from each other, but may have many similarities. It is on the basis of these similarities that the animals may be grouped. For example, vertebrates are already divided into reptiles, birds, fish, mammals and amphibians. They may be further divided into smaller groups. For example, in mammals, there are certain animals which have a pocket to carry their babies in. They are called marsupials. This is known as one family. Refer to the pictures on page 51 as you explain this further. Plants can be grouped into flowering and non flowering plants. Read page 52 and discuss the grouping of plants and animals. Discuss the images and prompt with questions. Explain that flowering and non flowering plants may be sub-grouped into smaller groups, or on their system of transport of water. Explain this division with reference to page 53. Assign page 56 as a home assignment. Give them ample time of a couple of days to observe and collect samples of leaves. Help them with identifying their characteristics.
5 mins	**Recap:** Review the main points of the lesson. *Can you name the different ways animals and plants are grouped?* *Call on some children to write the responses on the board.*

LESSON 2: 40 mins

5 mins	**Warm up:** Review that there are many different kinds of living organisms in a particular habitat. That means that they all need a food and shelter within that habitat itself. *How do you think organisms get food in a habitat?* Bring their responses to the point that they are able to identify that animals depend on plants and other animals for food and thus, their survival. *Do you remember what carnivores, herbivores and omnivores are?* Note their responses.

30 mins	**Main Lesson:** Explain the idea of a food chain. Refer to the diagram on page 54. Explain the term **producer** as plants and **decomposer** meaning to break down into tiny parts. Refer to plants (producers), primary consumers (herbivore), secondary consumers (carnivore), and decomposers (microorganisms) that feed on decaying material, causing it to break down and return to the soil. Draw the food chain with the help of arrows to show who is consuming the food. Ask the children to think of their own food chain and draw it in their notebooks, clearly labeling the producer, primary and secondary consumers and decomposer. This link has an excellent activity and explanation of food chains. It is highly recommended that you let the students try this activity following the class discussion. http://www.ecokids.ca/PUB/eco_info/topics/frogs/chain_reaction/play_chainreaction.cfm
5 mins	**Recap:** Review the main points of the lesson.
	Evaluation: The worksheet **Grouping and Identifying Organisms** may be given for evaluation.

Answers

Exercise 1

1. c 2. b 3. c 4. a

Exercise 2

a. In order to make the study of animals easier through classification.

b. The population of living organisms and objects in a habitat form a community.

c. In a habitat, living organisms make their own food. Their interaction with each other as a community creates a cyclic process of food in form of a chain which is termed as the food chain. For example, plant rabbit fox

d. The producer may be different for example a rabbit can eat carrots of seeds, a consumer, like a lion can eat a zebra or a goat. This zebra may also be food for another consumer. So an animal may be a part of several food chains at the same time.

Exercise 2 (II)

1. Insects: ant, housefly
2. Mollusc: snail, oyster
3. Non-flowering plant: junipers, ferns
4. Flowering plants: daisy, pineapple sage

Unit 3

Chapter 8

Hot and cold

Objectives	By the end of the chapter, the students will be able to: • understand that temperature is a measure of how hot or cold things are • recognize that the sense of touch is not an accurate way of judging temperature • realize that measuring temperature accurately is very important in many situations • become aware that there are different scales of temperature • use a thermometer correctly • read correctly the temperature indicated on models or drawings of thermometers • recognize and explain situations where our feel of temperature is enough to guide us and where we need to use thermometers • conclude through investigation that hot things will cool down and cold things will warm up until they are at the same temperature as their surroundings
Vocabulary Bank	temperature , measurement , thermometer, scale, bulb, Celsius, Fahrenheit, Kelvin, mercury, alcohol, hot, cold, warm freezing, fragile, digital thermometer, colder than, warmer than, boiling, barometer, thermostat

LESSON 1: 40 mins

5 mins

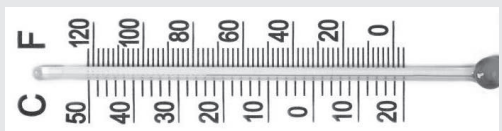
Warm up:
Begin the lesson by asking the children what the weather is like today. Elicit responses. *It is hot/cold/warm etc.*

Now draw this scale (on page 61) on the board.

Ask the students to look at this diagram. *What do you think it shows?* Elicit responses to the point that they answer that it shows how hot or cold something is.

	Can you give one example for each of these words? (Freezing: ice, Cold: Winter/water; Warm: blanket, Hot: cup of tea; Boiling: water) *How can you tell if something is hot or cold?* By feeling it. *How can you tell the exact temperature? What is the temperature outside?* We use a thermometer.
30 mins	**Main Lesson:** *Look at the pictures on page 60. What is the state of each object?* (cold-hot-freezing). *Can you tell the exact temperature of each object?* No, because feeling an object only tells us about its **state** of being warm, hot, cold etc. Read pages 60 and 61. *How do we measure how hot or cold something is?* Temperature describes how 'hot' or 'cold' something is. Link this with the idea of heat energy. Temperature shows how much **heat energy** an object or material has. *The faster the particles of matter move, the more heat energy is made. So warm objects have more heat energy than cold objects.* Show the students a thermometer. *Thermometers are the instrument we use to measure temperature accurately.* Write the proper definition of temperature on the board: **Temperature is the measurement of the hotness or coldness of an object or surroundings by using a thermometer.** *When have you used a thermometer?* They will respond that it was to check if they had fever.*We can also measure the temperature of our surroundings. We know exactly how warm or cold the weather is by a thermometer.* *Weather forecasters use special thermometers at meteorological (weather) stations to record the temperature. Can you name one place where the weather comes to freezing point? Or a place which is normally hot?* Read page 62 and talk about different types of thermometers and what they are used for. Explain that the thermometer is measured using a scale. Draw a model of a thermometer on the board or paste your prepared chart next to it. *The thermometer scale has markings on it just like your ruler. The scales are known as Celsius, Fahrenheit, and Kelvin scales.* *The clinical thermometers you usually use at home shows both scales.* Look at the diagram on page 63 and explain the following parts of a thermometer:

- **bulb** (the part that touches the material whose temperature is to be measured. It contains red or silver liquid.
- **column of mercury/red liquid** (this moves up or down in response to the temperature of the material.
- **Celsius scale**
- **Fahrenheit scale**



You can give the students this diagram to paste in their notebooks and label appropriately.

Explain how a thermometer works. The bulb is filled with liquid alcohol which is red or a shiny silver liquid called mercury. As it gets hotter, the liquid in the tube rises up.

Explain that to use a thermometer, they have to read the scale on the thermometer.

Point to your thermometer. Ask what are the hottest and coldest temperatures it can read. *What temperature is it currently showing? This is called room temperature; 24 degrees Celcius. Does anyone know what our average body temperature is?* 37 degrees Celcius.

Water boils at 100 degrees Celcius. Water freezes at 0 degrees Celcius.

Warn the students that a thermometer is a very dangerous piece of equipment. The glass is fragile and it can break very easily. Also, Mercury is poisonous liquid.

Study page 63 to understand how to hold a thermometer. You can pass around a few thermometers to the class so that they can have a look. Ask them to hold it gently in their hand. The liquid will slowly start to rise. When it stops, they should record the temperature. That is the temperature of their hand.

Exercise 1 on page 65-66 will be done in class.

5 mins

Recap:

Review th lesson by asking relevant questions.

What is the name of the instrument used to measure how hot or cold something is? Thermometer

What is temperature? Degree of how hot or cold something is.

What part of a thermometer is used to take the temperature? Bulb

What are the different temperature scales called? Celsius, Fahrenheit, Kelvin

How do you know when to read the temperature on a thermometer? When the liquid stops rising, we read the mark on the scale.

LESSON 2: 40 mins

5 mins	**Warm up:** *Who can predict what the temperature is today?* Review that room temperature is about 24 degrees Celsius. If it's a warm day , then the temperature is probably higher than that, or less if it's cold. Obtain the weather forecast the day and share with the class to see if they guessed correctly.
15 mins	**Main Lesson:** Now make small groups of three or four students. Explain the activity on page 64 and make sure the instructions are clear. Place three beakers on each groups' work station. Each one should have should have a label A, B and C. Fill A with water at room temperature, B with warm (not steaming) water, and C with icy cold water. The students will carry out the activity. Move around each work station and help them children in reading the temperature on thermometer accurately.
20 mins	**Recap:** Discuss their findings. *Were your predictions correct? What happened when you took the temperature again of Beaker B after 10 and 15 minutes?* Warm water's temperature lowered. *And beaker B?* Cold water's temperature rose. *What about A?* Remained unchanged. *Can you all use a thermometer now?*
	Evaluation: Exercise 3 and 4 on page 67 can be given to evaluate the students.
	Safety: Monitor the students when handling thermometers. Collect them immediately after the activity.

Answers

Exercise 1

1. c 2. c 3. b 4. a 5. a 6. c 7. a

Exercise 2

a. The state of an object or a body can be described by feeling it. It may be warm, hot, freezing cold etc.

b. We need scientific instruments to measure the things precisely and accurately.

c. Temperature is a term used to measure the hotness or coldness of a body or an object. Therefore, the statement mentioned above is incorrect as hotness or coldness are not only associated with the human body but certain other objects, including the weather as well.

d. We usually use the Celsius scale.

Exercise 4

Thermostat: used to control the temperature of heating/cooling appliances like air conditioner, refrigerator, etc.

Barometer: used to measure air pressure.

Lab thermometer: A laboratory thermometer is an instrument used by scientists in experiments to measure temperatures or temperature changes with a high degree of precision.

Unit 3

Chapter 9

Heat on the move

Objectives	By the end of the chapter, students will be able to: • understand the concept of how heat travels • understand the concept of conduction and insulation • recognize materials as being insulators and conductors • identify through investigation which materials are better at retaining heat • students will predict difference of food coloring disperses more quickly in hot, cold, or room temperature water.
Vocabulary Bank	heat transfer, thermal conductors, thermal insulators, metals, plastic, absorb, steam

LESSON 1: 40 mins

5 mins	**Warm up:** Begin the lesson by asking questions. *When you are served food which is too hot to be eaten, what do you do?* Wait for it to cool down. *What about when you take ice cream out of the freezer?* It will melt. *Why do hot objects cool down? Why do cool objects become warm easily, like the ice cream?* *This is because heat travels.*
30 mins	**Main Lesson:** *Heat travels from hotter to colder objects.* HOT ⟶ COLD *The surrounding environment is cooler than the temperature of your cup of tea. The heat moves out from the cup to the surroundings. The temperature of the tea drops and it becomes cooler.*

	Ice cream is cold. The surrounding air is hotter. The heat moves into the ice cream, raises its temperature, and the ice cream melts. Read pages 68 and 69. Explain that heat can also travel through different materials. *Metal spoons become very hot, so hot that they can burn our fingers. This is because steel and aluminium, the metals most spoons are made out of, are good conductors of heat. Anything which allows heat to travel through is a conductor.* *That is why we should use a wooden spoon for cooking. Wood does not let heat pass trough it easily. It is an insulator.* Can you think of examples of conductors and insulators? Discuss their responses with reference to page 70. Explain that thermopore is used in lunchboxes is to insulate them and to keep the food inside from becoming cold too quickly. *Why are pots and pans for cooking made of metal? What about their handles? Wool and fluffy fabrics are also good insulators, because they trap air and keep you warm.* *Why do you think furry animals and feathery birds fluff up in winter–it is because they trap air in their fur or feathers to keep warm!* Look at Exercise 2 on page 73. Use this to think-pair-share. Discuss their answers with the class.
5 mins	**Recap:** Recap the lesson with a simple demonstration. In a cup, preferably transparent, add a tea bag and pour steaming water. Ask the children to describe what happens. *The colour from the tea bag quickly moves out of the bag and mixes very quickly in the water. This shows how quickly heat travels and moves to cooler surroundings. We cannot see heat travel but because of the colour, it was easy to see how fast it moves.* *What if we had used cold water instead? What do you think will happen? Try it at home and tell me the result.*

LESSON 2: 40 mins

5 mins	**Warm up:** Review the last lesson. *What can you tell me about heat?* Heat travels from hotter to colder objects. *What are conductors?* *What are insulators?*

30 mins

Main Lesson:
Explain the Let's Find Out for Ourselves activity on page 71.

Make sure that everybody understands. Divide the class in groups of 3.

Give :

- group 1 and 6 a bubble sheet
- group 2 and 7 a sponge/formic sheet
- group 3 and 8 aluminium foil
- group 4 and 9 thin fabric
- group 5 and 10 a towel

Give each group 3 ice cubes, and tell them to wrap two of them up in the material you have provided them with. Each material should be large enough to completely wrap 2 ice cubes in it. One ice cube will remain unwrapped.

Time the activity. After 7 minutes, tell the children to open the wrapped cubes and observe. Tell them to wrap them up again quickly and again after 7 minutes, observe what has happened. Tell them to note their observations in the table below, which they will draw in their notebooks.

Material used	After 7 mins	After 14 mins	After 21 mins
Bubble sheet			
Sponge sheet			
Aluminium foil			
Thin fabric			
Towel			

The groups will fill in their observations for their own materials, and complete the table based on the class discussion following the experiment.

5 mins

Recap and discussion:
Allow for a class discussion on their findings. When all findings have been discussed, conclude with the question that fulfills the objective of the experiment:

Which material is the best at insulating the cubes?

Evaluation

The worksheet **Heat on the Move** may be given for evaluation. Exercise 1 parts 1 and II can also be used to evaluate learning.

This link has a very good activity and quiz on heat and materials preventing heat travel:

http://www.bbc.co.uk/schools/scienceclips/ages/8_9/keeping_warm.shtml

Answers

Exercise – 1 – I

- Heat travels from hotter objects to colder objects. When heat moves in, temperature rises and when heat moves out, the temperature falls.
- By using insulators, heat transfer can be stopped.

Exercise – 2

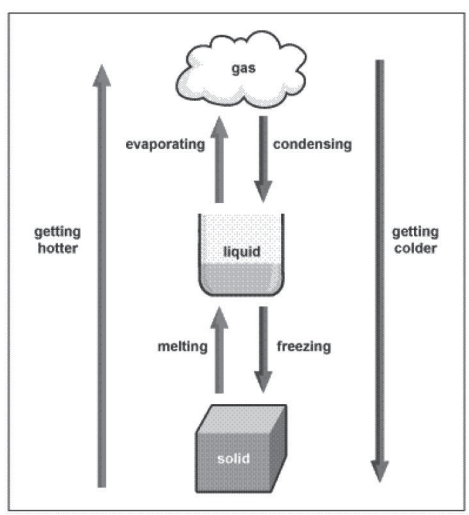
1. Occasionally, winter boots have a lining of fluffy or foamed materials to keep feet warm even while walking in the snow.
2. A steel spoon will be too hot to handle after it has been left in hot water for five minutes as it is a good conductor of heat.
3. Yarn A would be better than Yarn B for making cloth to keep warm as yarn A is wool and woollen clothes keep us warm during winter season.
4. These jackets are made up of leather and lined with thick warm material and in the summer season we wear clothes made from light fabric which does not make us feel hot.

Unit 3

Chapter 10

Solids and liquids

Objectives	By the end of the chapter, the students will be able to: • understand and define matter • differentiate between states of matter: solids, liquids and gases • realize how temperature affects and brings about change in the states of matter • recognize the characteristics of solids, liquids and gas • identify solids with different shape. strength and size • identify liquids with different density, temperature and flow • realize that the freezing and melting temperatures of different substances varies • identify properties that can be used to sort and describe solids and liquids • differentiate between physical and chemical changes • recognize melting and freezing as physical changes • recognize burning, mixing, heating and cooking as chemical changes
Vocabulary Bank	matter, solids, liquids, gases, volume, strength, density, organic liquids, natural liquids, chemical liquids,
NOTE	Put up the facts about solids, liquids and gases given on page 75 on the soft board prior to the lesson. The diagram below may also be put up.



Source:http://kgortney.pbworks.com/w/page/28715420/Class%20Notes

5 mins	**Warm up:** Elicit previous knowledge by asking what the students understand by matter. *Matter is all around us.* Point to your hair. *This is matter. These walls, furniture, pencils- all are matter. What about the air around us? It is also matter, although it is invisible.* *Matter can be a solid, liquid or gas. Can you name some examples of each?*
30 mins	**Main Lesson:** Matter is anything which takes up space and has weight. Read page 74. Discuss the pictures given for each of the states of solids, liquids and gases. Some materials may not be completely solids or liquids, such as clay, or thick whipped cream. Point to the properties of solids, liquids and gases on the soft board. Discuss each property (volume, shape, how it is carried, strength and density) for solids, liquids and gases. Illustrate with simple everyday examples. Divide the class into 6 groups of four. Each assign each group a section from Solids and Liquids from pages 76- 79. Give them 10 minutes to read and discuss in groups what they have understood. Facilitate their discussions by providing your input where required. Each group will come before the class and present what they have understood. Make sure that every member in a group gets a chance to speak. Encourage the students to ask questions. Make sure they are able to give examples of their own, other than those given in the pictures. When all the groups are done review the main points and take them to the computer lab. They will conduct the activity on changing states of solids liquids and gases as well as answer the very interesting '**Who am I?**' quiz at the following link: http://www.bbc.co.uk/schools/scienceclips/ages/8_9/solid_liquids.shtml
5 mins	**Recap:** Do Exercise 1 on page 83 as a review of the lesson. Assign Exercise 2 on page 83 for homework.

LESSON 2: 40 mins

5 mins	**Warm up:** *What happens when you fill an ice tray with water and freeze it?* *What happened to the ice cube you left unwrapped in the previous lesson?* Elicit responses so that the students understand freezing and melting. *When ice melts into water, what change in their state takes place?* Solid turns into liquid.
30 mins	**Main Lesson:** Explain that matter can change state, like when water if frozen to form ice. *Similarly, what happens when you continue heating water? It starts to boil. The water turns to steam. Do you know that steam can be cooled down again to form water?* *This kind of change is called a physical change., A physical changes the appearance of the substance. The material remains the same. Ice and water vapour are two states of the same material: water.* Explain that physical changes are those which do not change the material. It is often a reversible change. Freezing and melting are two processes of physical change. Discuss the freezing and melting points of solids on pages 80 and 81. *There is another kind of process which can change the shape of matter. It is called a chemical change. In a chemical change, a material is treated in a way so that a new material is formed. If we freeze milk, it will not form cheese. If we treat milk through a process of adding lemon and salt to it, it will form cheese. Most importantly, cheese cannot be melted again to make milk. Chemical changes are often irreversible.* In pairs, do Let's Find Out for Ourselves on page 82. Decide what type of change is taking place, physical or chemical, and name the material formed at the end of the change. Alternatively, the following link has a video on the states of matter. You can use the ideas to make a few demonstrations in your own class. http://www.neok12.com/video/States-of-Matter zX580a7d6f5a60717d50560a.htm
5 mins	**Recap:** Review the lesson by asking relevant questions.

Answers

Exercise 1

- Gas-air
- Fixed volume-definite shape
- Liquid-water

Exercise – 2

a. They can be sorted according to the source they are found from, which may be organic, mineral or artificial.

b. The difference between a physical and chemical change is that:

A physical change no mew material is formed. Physical changes can be reversed and there is no change in the material. In a chemical change, the object cannot be changed back into its original form, and a new substance is formed.

c. Freezing temperatures of liquids:

1. Coconut oil = 25ºC
2. Corn oil = -20ºC
3. Sunflower oil = -17ºC
4. Vinegar = -2ºC
5. Water = 0ºC

Melting temperatures of solids:

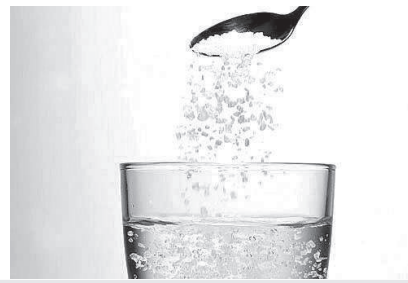
1. Ice = 100ºC
2. Plastic = 115ºC
3. Stone (lava) = 800ºC
4. Gold = 1063ºC
5. Iron = 1535 ºC

d. Children will answer this question on their own. Encourage them to take help from reference books and the internet for varied answers in their lists.

Unit 3

Chapter 11

Separating solids and liquids



Objectives	By the end of the chapter, students will be able to: • recognize how solids are mixed and sifted • distinguish between a mixture and a solution • combine and separate solids of different particle sizes • observe and describe what happens when solids are mixed with water • understand how to separate substances from a homogenous solution • identify different methods of separating solids and liquids from mixtures and solutions • state the uses of separating solids and liquids • acquire the vocabulary associated with the properties of solids and liquids
Vocabulary Bank	separation, solution, mixture, mixing, filtering, sieving, particles, evaporation, soluble, insoluble, magnetic, solute, solvent, homogenous solution
Resources:	beakers, sugar, marbles, sand, teaspoons, hot water

LESSON 1: 40 mins

5 mins	**Warm up:** Ask the student to predict what would happen if they mixed: a. marbles with sand and water? b. sugar in water? c. sand in water? Write their responses on the board.

30 mins	Main Lesson: Divide them in groups and provide each group 3 beakers, sand, sugar, and marbles. Ask them to prepare the three mixtures. Discuss their observations. *The marbles remained the same and settled at the bottom of beaker A. The sand also settled at the bottom of the beaker. In the second beaker, B, the sugar has disappeared. The sugar granules cannot be seen anymore. It has dissolved in the water but not disappeared from the mixture. We know this because the water tastes sweet now. This is now a homogenous mixture. A homogenous mixture is one where all the particles of a substance are distributed evenly in a liquid and they cannot be seen floating separately. In beaker C all the sand has settled at the bottom of the beaker.* *Whenever we combine two or more things in a way that they may be separated, it is called a mixture. They can be separated because the substance used is* ***insoluble*** *i.e. it does not dissolve. The marbles, sand and water and sand and water are mixtures. We can separate the marbles and sand from water. We can separate the sand from water by* ***filtering*** *it.* *The sugar is* ***soluble*** *in water. It is not a sugar and water mixture, but a* ***solution****. If materials dissolve or combine together in a way that they cannot be separated easily, it is called a solution.* Explain that stirring and heating can help substances combine easily. If we had used hot water, the sugar would have dissolved quickly. (You can demonstrate this yourself.) Explain that a mixture contains at least two different substances. They can be solids, liquids or gases. *When a solid dissolves in a liquid, it makes a solution. A solution is made up of a solute and a solvent. Which was the solute and solvent in the mixture of sugar and water you made?* • The **solid** that dissolves is called the **solute** e.g. sugar • The **liquid** it dissolves in is called the **solvent** e.g. water • If a substance does not dissolve in another substance, it is said to be **insoluble**. Sand is insoluble, therefore, when sand and water are mixed, they do not form a solution. • Substances such as sugar and salt, when dissolved in water, produce clear solutions: they are said to be soluble in water. Read pages 84-86. Exercise 2, I and II will be done in class.
5 mins	Recap: Quiz the students on the meaning of the following words, with an example of each: mixture, solution, solvent, solute, soluble and insoluble substances.

LESSON 2: 80 mins

5 mins	**Warm up:** *Have you ever made a cup of tea? To separate the tea (which is a solution) from the leaves, a strainer is used. The tea passes through the holes in the strainer, but the tea leaves remain trapped because they are larger than the holes.* *A salad is a mixture of different fruits and vegetables.* Ask the students if they were given a large bowl of salad, would they be able to separate all the pieces of fruits and vegetables? *Mixtures can be separated by physical methods. These may be filtering, using tongs, sieving and decanting.* [Decanting is a method of separating mixtures of solids and liquids or two liquids which do not dissolve or mix with one another, like oil and water. Decanting means 'to pour'. Gold is obtained by this method. In this process the heavier particles (like gold) settle at the bottom and the water and is poured off the top to obtain the solid gold particles.]
70 mins	**Main Lesson:** Scientists often want to separate mixtures. This means that they want to split the mixture into the things that it is made up of. They use different methods to separate different types of mixture. Read page 87 and discuss. The students will do Exercise 1 on page 90 and discuss in pairs. Then discuss the answers together. Divide the class into small groups and the investigation on page 88 carried out. They will record their observations in the table. They will sort the solids as being soluble/insoluble (mixture/solution). Discuss the results in class. [An alternate/additional investigation at http://www.mrcollinson.ca/2%20science/solids%20&%20liquids/2_science_solid_liquid_solids_in_liquids.pdf may be carried out by students. Make printouts of the worksheet. Guide them how to use filter paper.]
5 mins	**Recap:** Review the main points of the lesson and drill the vocabulary.
	Evaluation: Evaluate the students by asking them to respond to the following questions: *Why might you want to separate two types of solids?* If you were or farmer you might want to remove stones from your soil. If you grind wheat to make flour you need to separate the husks from the flour.

How can a mixture of an insoluble solid and a liquid be separated using the filtration method?

A mixture of an insoluble solid and a liquid can be separated using the filtration method.

What method could you use to separate tea leaves if you did not have a strainer?

The decantation method will be used to separate the tea leaves from the tea.

How can metal be detected from a pile of rubbish?

The magnetic method of separation may be used to separate the metals from rubbish. We see the use of this method in scrap yards.

What would have happened if we had used a mixture of iron filings, salt and sand? Explain how you would have separated the substances

First, we would use a magnet to separate the iron filings. Then we would stir the mixture of sand and salt in water to dissolve the salt. The sand would them be filtered. It could also be washed to remove any salt residue remaining in it. Finally, to separate salt from the water, we would evaporate the solution by heating it very carefully. The crystallised salt would be left. All the water will evaporate.

The worksheet **Separating Solids and Liquids** may also be given.

Extension:
Make your own sieve by making holes in the bottom of a plastic margarine tub. The holes must be big enough to let the particles of the smallest solid through, but too small for the bigger bits of the other solid.

Try separating some of the examples in your book using a sieve. Try separating sand from water by decanting. Try separating cooking oil and water, and rice or lentils from water using a sieve. Sometimes solids are mixed into liquids, for example dirt in water or the bits floating in real orange juice. Try separating these mixtures.

Answers

Exercise – 1

1. f 2. j 3. e 4. k 5. l 6. a,b,c,d

Exercise – 2 – I

1. Difference between mixture and solution

Mixture	Solution
The composition of solids and liquids when the items used can be separated is known as a mixture.	The composition of solids and liquids when the items used cannot be separated is known as a solution.
The items used cannot be dissolved.	The items used are dissolved easily.
Example: mixture of sand and water, from which sand can be easily separated by filtration.	Example: When salt is mixed with water to make solution. The salt cannot be separated by filtration.

2. Sedimentation:

   It is the process of mixing solids with water, as heavy particles settle down to the bottom and separate in layers. The liquid can be easily poured out from the mixture.

   Example: settling down of stones in a bowl of water.

   Filtration:

   It is the process to separate insoluble solid particles with the help of filters.

   Example: The granules of tea are separated by pouring the tea through tea strainer.

3. The two common methods of creating a solution are stirring and heating.

Unit 4

Chapter 12

Force and friction

Objectives	By the end of the chapter, students will be able to: • review forces and their types • understand that force can be measured using a spring scale/force meter • state newton as the unit of measuring of force • recognize gravity and friction as two types of forces • recognize the importance of friction • realize the significance of friction in their daily lives • understand air and water resistance as two forms of friction • understand the effect of force and different surfaces on increasing or reducing friction • understand the effect of a streamlined body shape in reducing air and water resistance • investigate the effects of mass and friction on speed and motion • understand that friction and other forces have an effect on speed and motion
Vocabulary bank	friction, force, surface, newton, force meter, gravity, texture, grooves, water resistance, air resistance, streamlining
Resources	toy car, elastic band, paper sheets, small plastic bags, rectangular pieces of cloth, string

LESSON 1: 40 mins

10 mins	**Warm up:** Begin the lesson by eliciting previous knowledge about forces. Take a toy car and push it forward gently on the table. *What kind of a force did I use?* Push Now from pull a chair out from the desk *This is a ..?* Pull Now stretch a rubber band and wrap it around a rolled sheet of paper. *Here I have stretched the band and twisted it around the paper.*

	All these are examples of forces. Can you think of some examples in our daily life where you use different forces like push, pull, bend, twist, press, etc.?
70 mins	Main Lesson: *Most of the activities we perform each day involve moving things. For an object to move, a force—a push or a pull—must act upon it.* Push the car again very gently. *How far did it go?* Now push it hard. *How far did it go?* *The stronger the total force, the farther and faster an object will move. Likewise, the heavier the object, the more force will be required to move it.* Read pages 92 and 93. Discuss the importance of force in making objects change shape, making things move, stop, change direction, speed up or slow down. *Force is measured in newtons.* Explain that two very important types of forces are gravity and friction. *Have you ever seen images of astronauts in space? They float in air. This is because the force of gravity does not act on them in outer space. But we on Earth, remain firmly on the ground. The Earth is like a giant magnet holding us down. That is why we do not fall of the edge of the Earth, as early explorers believed!* Take a ball and throw it up in the air. It comes back down. *Even when you jump up, you come down. This is all because of gravity. Gravity is s force of attraction.* *Now look at the second picture on page 94. Why do you think Sameer is finding it hard to skate?* *If I were to push this toy car on a carpeted floor, do you think it would move fast or slow? This is because the force of friction acts on the surface of the cars wheels and the carpet and slows down the movement. Friction occurs whenever two surfaces come into contact with one another. Friction depends on the surface of the materials and the force pressing the objects together.* Read pages 94 and 95. Explain that forces are acting on objects all the time. *Regardless of how it may feel, no surface is perfectly smooth.* ***Friction is a force that opposes motion when two surfaces come in contact with each other.*** *Rub your hands together. Can you feel the heat? Friction produces heat. The heat produced from friction can make objects slow down and eventually break down.* *Sometimes, when we do not oil machines for a long time, like the chain on a bicycle, it produces friction and does not move smoothly. Oiling machines to make the move smoothly is called lubrication.* Students can practice this activity with an object moving on various surfaces and the amount of friction produced: http://www.bbc.co.uk/schools/scienceclips/ages/8_9/friction.shtml
5 mins	Recap: Review the main points of the lesson.

5 mins	**Warm up:** Begin the lesson with the following questions: *Friction is useful in many ways. Can you think of any ways in which friction is useful?*
30 mins	**Main Lesson:** *Look at the soles of your P.E. shoes. Why do you think they have these designs and grooves? It helps to create friction so that you do not slip. What about the tyres in cars? They help the car from skidding and having an accident. The rougher the surface, the greater the friction.* *Imagine if you slide down a newly painted smooth slide? How fast would you go? If there is lots of sand on the slide, what would happen?* Read pages 96 and 97. *Friction has two main types. One is called water resistance and the other is air resistance. Read about water and air resistance on page 97. How do you think they may be useful?* Ask them if they have seen professional cyclists. *Why do they have these fish shaped helmets? This is to reduce air resistance. The special shape is called streamlining. Streamlined bodies, like those of fish, make movement in water and through air easy as their shape allows them to glide smoothly without being slowed down by friction.*  Students will do exercises 1 and 2 on page 100-102 in pairs. Discuss their responses with the whole class and clarify any misconceptions. For homework, ask them to draw and describe the soles of different pairs of shoes around their homes. Which shoes have more grip and which will they be likely to slip in? Which will produce more friction and which will produce greater friction?

5 mins	**Recap:** Review the main points of the lesson. What is friction and how is it produced? What are the types of friction? What are some advantages of friction? How can friction be reduced?

LESSON 3: 80 mins

5 mins	**Warm up:** Review air and water resistance by a simple demonstration. Drop a plasticine ball with force in a beaker of water and note the speed. Run against the wind holding a paper card, one large and then one small, and ask them what they observed/ felt. When was movement fast? When was it slow?
70 mins	**Main Lesson:** Divide the class in groups of 5. Each group will make 3 parachutes: one of paper, one of a plastic bag, and one of cloth. Explain the instructions on page 99 and make sure the students understand. Help them draw a table to record their observations in, for example the type and size of the material used, the height from which it was dropped from and the time taken for it to drop. Help them make the parachutes and monitor their investigation. Discuss the results in the light of the questions given on page 99. Another example with pictures of how to construct a parachute is given on this link: http://www.wikihow.com/Make-a-Paper-Parachute
5 mins	**Recap:** Review the main points of the investigation: Air and wind resistance can be increased depending on the shape of the object and the material interacting with the air/water because it increases friction.

Answers

Exercise – 1 - I

a. B

Reason: The fruit basket in picture B, contains less fruits, it weighs less so less amount of force is required to carry it. Whereas Basket A contains many fruits and is heavier than basket B.

b. B

Reason: The bus is smaller and has fewer wheels than the train. Thus less surface area of the wheels is in cotract with the road, so there is less friction and the bus will stop more easily.

c. B

Reason: By using oil, force of friction and heat produced is reduced and engine is saved from break down. The oil lubricates the parts of the engine rubbing together.

d. A

Reason: The grooves on tyres shown in picture A help the vehicle grip the road and avert skidding, so the tyres with grooves are more appropriate to drive on a steep mountainous terrain.

Exercise – 1 – II

a. 2nd picture

The tyre does not have grooves that are necessary to have road grip. Without road grip the vehicle can skid which is extremely dangerous.

b. The tyres have good road grip as we can see the marks on this dirt track as shown in the picture.

c. Yes, these gloves will minimize the chances of dropping the ball from wicket keeper's hands. Their rough surface will create friction between them and the ball.

d. The wide tyres prevent the cars from skidding

e. No. 1 (the smoothest surface)

II. Real life bites (Answers will vary)

Exercise – 2 – I

a. True

b. False

c. True

d. True

e. True

Exercise – 2 – II

a. direction and shape

b. force meter

c. force

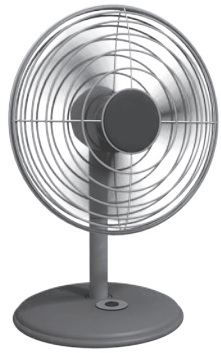
d. opposite

e. air and water

Unit 4

Chapter 13

Electricity, mains and batteries



Objectives

By the end of the chapter, students will be able to:

- recall that electricity is a kind of energy and electrical appliances are used to produce heat, light, sound and movement
- identify the resources of electricity as being renewable and non-renewable
- recognize that mains circuit are needed by devices that use a lot of electricity
- recognize the importance of following safety rules whether using mains electricity or batteries
- realize that a circuit needs a power source
- realize that a complete circuit is needed for a device to work
- understand that circuits powered by batteries and not mains can be used for investigation and experiment
- understand that some materials are better conductors of electricity than others
- learn how to find out which materials allow electricity to pass through them
- to use results to draw conclusions about which materials conduct electricity
- realize that metals are good conductors of electricity, most other materials are not
- identify that metals like copper are used for cables and wires, plastics are used to cover wires, plugs and switches for insulation
- realize that batteries and battery cells come in different shapes, sizes and strengths
- understand that a battery is two or more identical cells wired cells together
- realize that batteries and battery cells contain chemicals and conductors inside
- check that the wires in a circuit must be connected to both the positive (+) and negative (-) ends of the battery understand the important to dispose used batteries carefully because they contain chemicals and conductors

	• understand that a switch can be used to make or break a circuit to turn things on or off (using both batteries or mains) • make predictions about the effect of including additional batteries in a circuit • realize that care needs to be taken when batteries are added in a circuit to ensure bulbs/motors do not burn out • identify reasons why a certain circuit would or would not work
Vocabulary Bank	electricity, supply, battery, switch, capacity, power, renewable/non-renewable resources of electricity, appliances, mains electricity, switch, battery, names of appliances which use electricity, handled safely

LESSON 1: 40 mins

5 mins	**Warm up:** Ask the students if they can name objects that require electricity to work. Write their responses on the board. *Which of these use the mains and which use batteries?* Remind the students that mains electricity is the electricity made at the power station. It travels along large wires called cables to your house, office, etc.
30 mins	**Main Lesson:** Look at the picture on page 104. Read the dialogue. Talk about batteries as a source of electricity. Batteries store electricity in the form of chemicals. Batteries cannot power all the electricity used in our homes. That is why the mains is required. The mains electricity obtains energy from different natural resources. Ask the students to read pages 104 and 105. Explain that electricity is made or generated by different methods. *Electricity can be made by using energy from the Sun, wind, and water.* *It may also be made by using energy from the natural sources of the Earth, nuclear, natural gas, biomass. Explain these terms briefly, highlighting that some of these are non-renewable sources because they cannot be used again, They will eventually run out. Renewable sources are those which can be used again and again such as energy from the Sun, wind or water.* Explain why we use batteries in some appliances. *Mainly it is because they are easy to move and carry around, like a car, mobile phone, watch, torch etc. (refer to examples at the beginning of the lesson.* Make it clear that batteries only store electricity in cells, and do not produce electricity.

	*The force that supplies electricity is called **voltage**. What happens when there is low voltage in your homes? Think of voltage as the pressure of electricity flowing through a wire. Think of voltage as the pressure of water flowing through a hose. The greater the voltage, the higher will be the pressure, and more current will flow.* *The actual electricity flowing in the wires is called current. It is measured in amperes (amp). Think of it as the rate of water as it flows through the hose.* *Watts is the total amount of water that comes out of the hose per second.* Students will read pages 106 and 107 and 108 in pairs and work out the answers to Exercise 1. Discuss these in class.
5 mins	Recap: Review the lesson by asking relevant questions. *Name some sources of electricity. Which of these are renewable and which are non-renewable? What is voltage? What is current? What is the unit of power?*

LESSON 2: 40 mins

5 mins	Warm up: Review that the mains electricity and batteries provide electricity for appliances to function. Review that batteries store a certain amount of electricity. This amount may be different in different batteries. Elicit previous knowledge about circuits.
30 mins	Main Lesson: *Today we will investigate how many bulbs can be lighted by one pen size or AA battery.* Divide the class in groups of 3 and give each group one AA battery, 5 LED bulbs, and copper wires, and a stopwatch. Clearly explain the purpose of the investigation and the directions described on page 109. They can time how long the bulbs were lit for when the maximum number were connected. Help the students by first demonstrating what they are supposed to do.
5 mins	Recap: Discuss their observations and share the conclusion.

Evaluation:
The following exercise or the worksheet **Electricity, Mains and Batteries** may be given for evaluation.

Exercise

Electricity first is generated/made at a _____then it travels all the way to your house.

How does electricity get from the power plant to your house?

Electricity moves through the wires. What is the pressure that pushes the electricity called?

You can measure milk by the cup. You can measure sugar by a teaspoon. How is the flow of electricity measured?

How do you use electricity in your everyday life?

Answers

Exercise – 1

Difference between batteries and mains:

Batteries	Mains
Batteries are containers that store electricity in the form of chemicals. They come in different shapes and sizes according to the requirement of electronic devices. They are used in electrical appliances that are portable (move about) and use comparatively less power than mains.	Mains are the installments to receive supply of electricity at homes and offices etc. The electric power stations supply electricity to mains power stations. Electric appliances using the mains electricity need to be connected to the socket.

Button cell, AAAA cell, AAA cell and AA cell.

Answer will vary. See answer to question 1 for points to be covered.

Yes. (Ask students to find out about other conductors)

Exercise – 2

a. AA battery electric capacity= 2500 ma
Required ma capacity of toy car = 2400 ma

Since the available load is greater than the required load, therefore, yes, the toy car will work. It will work for one hour and a few seconds.

b. Required load = 200 amperes
OR
200 x 1000 = 200,000 milliamperes
1 AA battery requires 2500 miliamperes

$\frac{200,000}{2500}$ = **80 AA batteries will be required.**

c. Electric power required by computer = 300 watts per hour

Daily usage = 3 hours
No of days = 30

Total watts = 300 x 3 x 30 = 27,000 watts

1 KW = 1000 watts
27 KW = 27,000 watts

The car will need 27 KW if it has to be used for 3 hours daily for 30 days.

d. Capacity of battery = 80 amperes per hour
Charging rate= 6 amperes per hour

In one hour, charge = 6 amperes

So, 80 amperes will be charged in = $\frac{80}{6}$ = 13.3 hrs

Unit 4

Chapter 14

Changing circuits

Objectives	By the end of the chapter, students will be able to: • understand the process of how electricity is conducted • name the components of an electrical circuit • recognize the role of conductors and insulators in transmission of electricity • identify conductors and insulators of electricity distinguish between series and parallel circuits • design and build simple series and parallel circuits by using components such as wires, batteries, bulbs, and switches • predict the outcomes of the effect of adding batteries to a circuit
Vocabulary Bank:	circuit, series circuit, parallel circuit, load, power,

LESSON 1: 80 mins

5 mins	**Warm up:** *What do you already know about electricity?* Write their responses on the board. They will remember from the last lesson mains, battery, sources, supply of electricity from mains. Link with how electricity travels what they think wires are made of.
70 mins	**Main Lesson:** *How do you think electricity travels or is conducted?* Explain that for a current to flow, we need a power source and a complete path for the current to flow along. *The circuit is formed through a particular arrangement of certain components like the electricity source, wires, a switch and an electrical appliance A circuit is the pathway or network along which electricity travels.* *In a circuit, the flow of electricity is one way, from a power source to the appliance.*

But in circuits powered by a battery, the current flows in one direction only and forms a complete circle. This means that the path along which electricity flows is complete.

The switch helps us to turn the current on or off.

There are two ways of connecting an electrical circuit.

Now demonstrate a series setup to the students using a buzzer and then with three bulbs. Switch one bulb off. *What happens? This is called a series circuit.*

Outline the main features of a series circuit:

- Each electrical unit is connected one after the other, in a series
- The electric current flows straight through each electrical unit (in this case, the bulb)
- If we break the circuit anywhere, the entire circuit stops working. None of the bulbs light up.

Remember your experiment in the last lesson?

That was a series circuit. What happened when you increased the number of bulbs? The light got dimmer because the flow of energy became less as we added more bulbs. So in a series circuit, the voltage drops across each component (bulbs) in the circuit.

Now make a parallel circuit. Switch one bulb off. *What happens?*

Outline the main features of a parallel circuit:

- In a parallel circuit, each component is connected individually to the power source.
- The current is distributed equally from the power sources to each component.
- If one component stops working, the others will continue to work properly.

Each component receives equal amount of voltage. Which kind of circuits are used in our homes? Why?

Now discuss conductors and insulators by referring to what they have studied earlier. *Conductors and insulators are not only used for heat, but for electricity as well.*
Conductors are objects that allow heat and electricity to easily pass through them
*Insulators are objects that **do not** allow heat and electricity to easily pass through them.*
Wires have to be made of a material that conducts electricity very easily. Copper is one such material. Show the students the wires. Pass them around to show them the rubber insulation covering them. *This insulation protects us and our appliances from damage and us from an electric shock.*

Explain the concept of load. Since different appliances have a different amount of load which they put on the source of electricity is more than what the source can provide.

Read and discuss page 115 and 116.

5 mins	**Recap:** The quiz and activity on the following link may be used to recap the lesson and evaluate the students: http://www.bbc.co.uk/bitesize/ks3/science/energy_electricity_forces/electric_current_voltage/revision/5/

LESSON 2: 80 mins

10 mins	**Warm up:** *What are two types of electric circuits?* *What are the characteristics of series circuits?* *Characteristics of parallel circuits?* *We will how to make a parallel and series circuit. We will also test the effect of increasing the power supply on the working of the components, the bulbs.*
60 mins	**Main Lesson:** **Making parallel and series circuit:** The students will conduct the parallel and series circuits experiment mentioned on page 117. Divide the class into groups of two or three. Move around the class to help them make the circuits correctly and record their results. You may ask them to repeat the procedure a few times to check the results, At the end, discuss the results and ask them why. They should be able to explain in the light of what they know about series and parallel circuits.
10 mins	**Recap:** Review the main points of the lesson. Ask the students why they think series circuits are important and where they are used.
	Evaluation: The following questions can be given to evaluate the students: 1. If you were to add more bulbs to the series circuit, what would happen? Why? 2. If you were to add more bulbs to the parallel circuit, what would happen? Why? 3. Choose one circuit to write about. Clearly explain how this circuit works. What are its advantages and disadvantages compared to the other type of circuit? The worksheet **Changing Circuits** may also be given to evaluate the students.

Answers

Exercise – 1

1. a
2. b
3. c
4. b

Exercise – 2

a. Power source, wires to transfer the power source and flow of power are essential components of a circuit.

b. The drawback of series circuit is that if circuit breaks anywhere in the middle the entire circuit stops working and the whole system is affected.

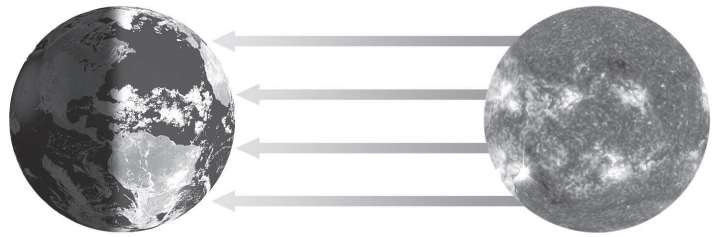
c. If there are no insulators in a device, the free flow of current can cause irreparable damage to the device.

d. The function of a switch in a circuit is to control the flow of electricity in the circuit and appliance. A switch can stop the flow of electricity or turn it on.

Unit 5

Chapter 15

Planets



Objectives	By the end of the chapter, students will be able to: • recognize the planets and their characteristics that exist in the solar system • understand that all the planets revolve around the Sun • realize that the Sun is the force that provides energy and pull of gravity that keeps all the planets on their orbits • identify and describe the composition of the Earth and its place in the solar system • become aware of how the Earth rotates on its axis and revolves around the Sun • understand how rotation of the Earth around the Sun causes day and night • realize that the revolution of the Earth around the Sun causes years • distinguish between the terms revolution and rotation • recognize the axis and the Earth's tilt in causing seasons • understand that life exists only on Earth, the blue planet • comprehend how day and night form
Vocabulary Bank	solar system, orbit, revolution, rotation, spin, axis, planets, stars, atmosphere, crust, core, mantle, layers, poles, tilt, gravity, inhabitance, revolution
Resources	flip charts with fact cards about the Sun and all the planets in the solar system

LESSON 1: 80 mins

5 mins	**Warm up:** Begin the lesson by asking a few questions: *Which country do we live in? Which continent is it located in?* *What is the name of the planet we live on?* Talk about cities, countries and then ultimately, planet Earth.

70 mins	**Main Lesson:** Talk about the solar system and the planets, referring to Earth's position. *The Earth is a planet in the solar system. Solar means Sun. Every planet in our solar system moves around the Sun. Explain that the Earth is the third planet from the Sun.* *There are eight plants that orbit the Sun. Orbit is the circular path that an object moves on when circling a planet or moon. The Sun is a bright luminous ball. It is a gigantic ball of gas. It is not a planet but very, very hot star.* Refer to the diagram on page 120 and explain that there are 8 planets in our solar system. *Pluto was classified by scientists as the ninth planet, but now it is one of many dwarf planets. Mercury, Venus, Earth and Mars are the planets closest to the Sun, called inner planets. They are made of rock and metal.* Read pages 121 and 122. Fact cards for the Sun should be prepared based on the information given. Go through the information about all the planets. Discuss the characteristics of planet Earth, the blue planet. Explain that it has the ideal atmosphere and composition for living things to survive on. Explain that the Earth is composed of three layers: crust, core and mantle. The children will read in pairs till page 124 about composition of the Earth and explain what they have understood. The students should do the following activity to help them easily learn about the solar system and the characteristics of the different planets: http://www.scholastic.com/magicschoolbus/games/space/index.htm Exercises 2 and 3 on page 128 will be done in class. Assign the following worksheet for homework: http://www.superteacherworksheets.com/space/planet-riddles_WMTZD.pdf It has excellent riddles on the different planets. **Make sure that the planet facts are put up on flip charts or on the class board.**
5 mins	**Recap:** Discuss the answers to Exercises 2 and 3 and offer explanations where required to remove misconceptions. Ask the following questions to reinforce the material learnt. *The Earth is the _____ planet from the Sun. It is made of three layers called _____ _____ and _____. There are __ planets in our solar system.* *Can you name all of them?* *Why is Earth called the blue planet?*

LESSON 2: 80 mins

5 mins	**Warm up:** *What do the planets move around in the solar system?* Around the Sun. *How do they move?* In circular motion. *What is this called? Orbit.* Call two children to the front of the class. One child is the Sun. *The Sun is at the centre of the Solar System. All other planets revolve around the Sun.* The child who acts as the Earth will now revolve around the Sun. *The Earth also spins on its axis.* The child will spin and you will help him revolve around the Sun. *The Earth continuously spins on its own axis and moves along its orbit, or circular path, around the Sun.*
70 mins	**Main Lesson:** Show them a globe and make it clear that the Earth moves on two ways: by spinning on its axis and revolving around the Sun. *Why do you think this spinning is necessary? Because it causes day and night to occur.* Now taka a medium sized ball. Mark a cross any one place on the ball. Pretend that the cross is Pakistan. The lamp is the Sun. Hold the ball in front of a lamp. Slowly rotate the ball so that the cross directly faces the light. *Is this day or night?* Day Now slowly rotate the ball to the right so that the light does not fall on the cross. *It is night now.* Now rotate the ball further so that the light begins to appear slightly on the right of the cross. *What do you think is happening? This is sunrise, early morning.* Now spin the ball so that the cross is directly in front of the light. *This is noon. The Sun is the brightest at this time.* Now spin the ball slowly to the right so that the light falls to the left of the cross. *This is evening.* Spin it further. *This is night again.* *This is how day and night occur. They are caused by the rotation of the Earth around its axis. It takes 24 hours for the Earth to make one rotation around the Sun. That is why we have 24 hours in a day.* *The Earth also revolves around the Sun. This causes the years. It takes 365 days for the Earth to make one rotation.* *The axis, the imaginary line running through the Earth on which our planet spins, is not straight, but tilted. These two factors cause the change in seasons.* You can demonstrate this with the help of a globe and a child pretending to be the Sun. Read pages 124 -126. Let them do the following activity in the computer lab and attempt the quiz which follows: http://www.bbc.co.uk/schools/scienceclips/ages/9_10/earth_sun_moon.shtml The following link is also very informative: http://www.childrensuniversity.manchester.ac.uk/interactives/science/earthandbeyond/dayandnight/

	Facilitate this activity with proper prompts, explanations and questions. Assign Let's find Out for Ourselves (a) on page 127 for homework.
5 mins	**Recap:** Review the main discussion of the lesson. The Earth spins on its axis and revolves around the Sun. The spinning causes night and day to occur and a full day is 24 hours long. The Earth's rotation around the sun in its orbit and the tilt of the axis cause seasons to occur. One rotation takes about 365 days, which makes one year.
	Evaluation: The students can do the worksheet **Planets** or answer the following question: *Imagine what would have happened if the Earth did not revolve around the Sun.* **Extension:** The students can do a write up or short story about their life on one of the planets.

Answers

Exercise – 1

a. space b. distance c. Earth d. axis e. cold, Saturn

Exercise – 2

a. true b. false c. true d. true e. true

Exercise – 3

Atmosphere → nitrogen, oxygen, water vapor, carbon dioxide and small amounts of other gases → protective layer, rays of the sun

Water → crust and mantle → inner, layers

Exercise – 4

a. The solar system refers to the collection in space of a big luminous body, the Sun and eight other rocky, gaseous and icy planets. All planets revolve around the Sun.

b. Orbit is the circular path on which objects move around a planet or a star e.g. the Earth orbits the Sun.

c. The two neighbouring planets of the Earth are Venus and Mars.

d. Earth is the only planet to have life on it because it has water.

Unit 5

Chapter 16

Changing skies

Objectives	By the end of the chapter, students will be able to: • observe and describe weather conditions • discover how weather systems develop • determine what information is recorded on weather instruments • identify instruments used to measure weather conditions
Vocabulary Bank:	tropical, continental, e-polar, flood, tsunami, tornado, hurricane. meteorologist, weather forecast, storms, atmosphere, wind vane, rain gauge, barometer
Resources	newspaper cuttings of weather forecasts

LESSON 1: 40 mins

5 mins	**Warm up:** Write 'weather' on the board. Ask the children to brainstorm what comes to their mind. Write their responses on the board. Encourage descriptive words like hot, sunny, cloudy, rain, snow, seasons, etc. Ask of they have ever seen or read a weather report. A weather report makes prediction of the expected weather for the next few days.
30 mins	**Main Lesson:** Before beginning the lesson, clarify the difference between weather and climate. *Weather is the state of the atmosphere over short period of time, whereas climate is the condition of the atmosphere for longer periods of time. For example, a place may have a warm climate, but the weather on any particular day there may be cloudy and cool. What is the weather like today?* Encourage them to use adjectives. *The world is classified into certain climatic regions.* Now read pages 130 and 131. Discuss the different climatic regions, their characteristics.

	Explain that people who study weather are called **meteorologists** and they work at meteorological (or met) stations. They use special instruments to measure the humidity, rainfall, air pressure, etc to determine and predict what the weather will be like. This prediction is called **weather forecasting.** Discuss how the weather changes and what causes storms. Exercises 1 and 2 on page 135 and 136 will be completed in class.
5 mins	**Recap:** Review the lesson by asking questions. *What is the difference between weather and climate?* *What do you call people who study and analyse weather?* *How are weather predictions made?*
	Extension and activities: Use the following links to help students understand weather reporting and prediction, and this factors affecting changes in weather: http://edheads.org/activities/weather/frame_loader.htm http://teacher.scholastic.com/activities/wwatch/sim/game.htm http://www.powertolearn.com/games/weatherflash.html The students can also prepare a weather report and role play, being the 'weatherman'.

Answers

Exercise – 1

a. The conditions of the atmosphere that occur according to climatic regions are known as weather conditions. Such as: rainy, sunny, windy, snowy etc…

b. We get to know about the weather conditions by weather forecasts made by meteorologists. They use special instruments to predict the weather as well as to determine present weather conditions.

c. The instruments used for observation of weather conditions are:

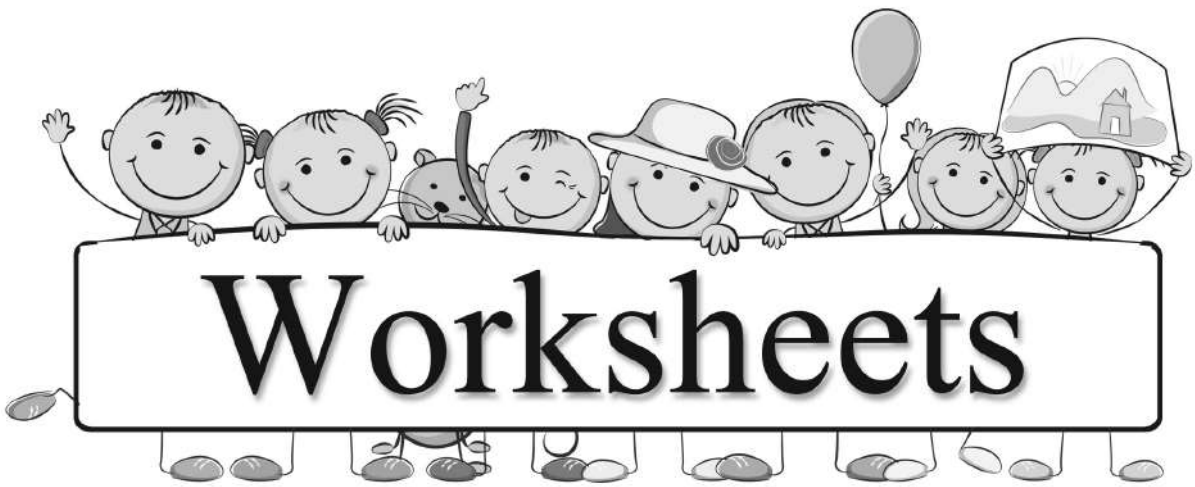
   Weather radars, weather buoys, weather balloons, dropsondes, hurricane hunters and weather satellites.

d. Violent disturbances of the atmosphere with strong winds and usually rain, thunder, lightning, or snow are termed as storms.

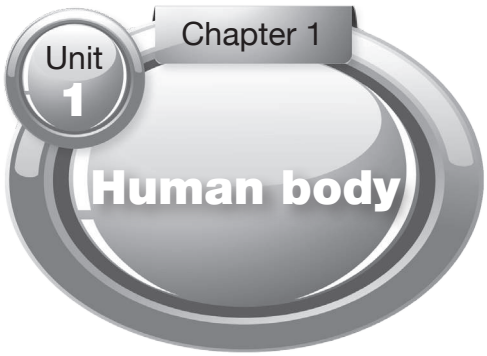
e. The meteorologists at the department use instruments in order to monitor, understand and follow the weather conditions that are happening around us.

Exercise – 2

Storm – hurricane	Storm – floods
Weather condition –wind and rain	Weather condition – rain
Storm – thunder storm	Storm – cyclone
Weather condition – rain	Weather condition – wind
Storm – tsunami	Storm – dust storm
Weather condition – sea waves	Weather condition – wind



Worksheets



Name: _____

Class: _____

Date: _____

brain	stomach	oesophagus	arteries
heart	kidneys	trachea	bones
lungs	small intestine	skin	muscles
liver	large intestine	veins	

1. We filter your blood and clean it. We pass the liquid waste from your blood into your bladder.

   What are we?_____

2. I am outer the covering of your body. I let sweat escape from my pores. My nerves help you to sense and feel things around you.

   What am I? _____

3. I perform many important functions in your body. I make bile to help digest the food. I store important nutrients your body requires and help it to fight against disease.

   What am I?_____

4. I am always moving, even when you sleep. I am a very strong muscle just behind your lungs. I pump blood to all parts of your body. When I stop moving, you may die.

   What am I? _____

5. We take oxygen from the air and put it in your bloodstream. We remove carbon dioxide from your blood and remove it from your body.

   What are we?_____

6. We work in pairs to pull your bones in different directions. Food and blood also moves through your body because of us. You can move only because of us.
   What are we?_____

7. I mix the food that you eat with chemicals produced by your body and then churn it into smaller parts for it to be digested easily.
   What am I? _____

brain	stomach	oesophagus	arteries
heart	kidneys	trachea	bones
lungs	small intestine	skin	muscles
liver	large intestine	veins	

8. I control all important functions of your body. I help you make voluntary and involuntary movements. I ensure that your heart beats, you breathe automatically, and blink your eyes. All organs of your body are controlled by me. I help you think and your memories are stored in me.

   What am I?_____

9. I am a long tube in your throat. I carry food and drink to your stomach when you swallow.

   What am I?_____

10. I absorb nutrients that your body needs from your food and put it in your bloodstream so that they can be used by your body.

    What am I?_____

11. I dry out the waste material of your food so that it can leave your body.

    What am I? _____

12. We are blood vessels. We carry blood back to your heart. The blood does not have much oxygen left in it.

    What are we? _____

13. We are blood vessels that carry blood away from your heart to different parts of your body. This blood is rich in oxygen. Our walls are large and thick.

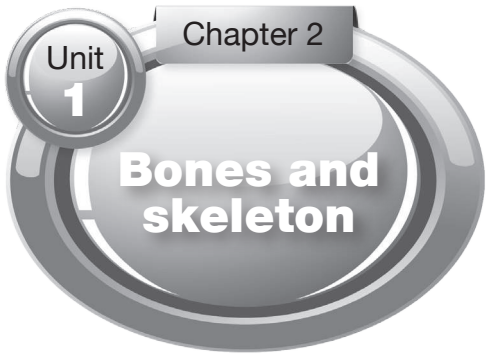
    What are we? _____

14. We are strong and support your body. We provide the framework for your body and give it shape. We protect your important organs like brain, liver and lungs form damage. We are filled with a very important substance called marrow.

    What are we? _____

15. I help air travel to your lungs when you breathe. You probably know me by my more common name, 'windpipe'.

    What am I? _____



Name: _____

Class: _____

Date: _____

Why do we need our skeleton? Name three very important reasons why we have a skeleton inside our body. Provide some more information about each one. The first one has been done for you.

1. Support

3.

2.

Name: _____

Class: _____

Date: _____

1. What is a skeleton?

_____

2. What would happen if we had no bones?

_____

3. How many bones are there in the human body?

_____

4. What is the bone in our head called? What does this protect?

_____

5. What do our ribs protect?

_____

6. Which part of a bone is hard?

_____

7. What is the inside of a bone called?

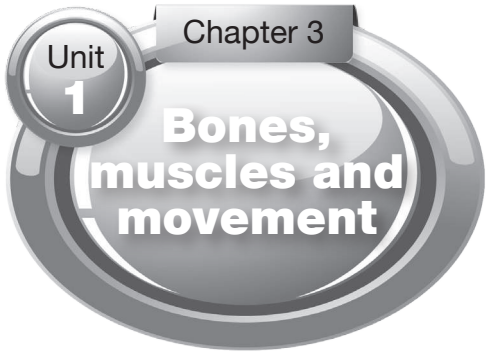
_____

8. What is another name for the backbone?

_____

9. Which of our bones make a sort of cage?

_____



Name: _____

Class: _____

Date: _____

Answer the following questions:

1. What are muscles used for?

_____

_____

2. How many parts of muscles are there in our body?

_____

_____

3. What are these muscles called?

_____

_____

4. Name 5 parts of your body that depend on voluntary muscles?

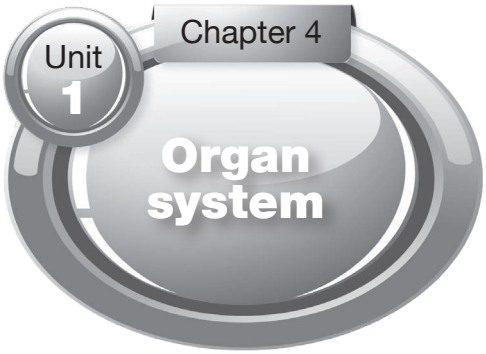
_____

_____

5. List 5 things that you do in a day that require you to use your muscles.

_____

_____

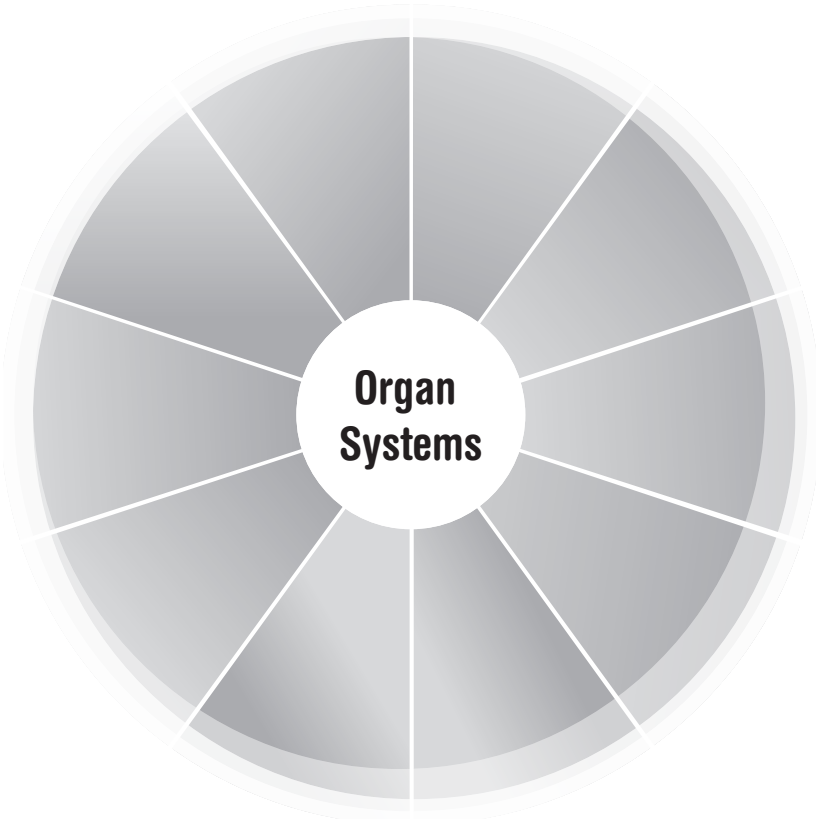


Name: _____

Class: _____

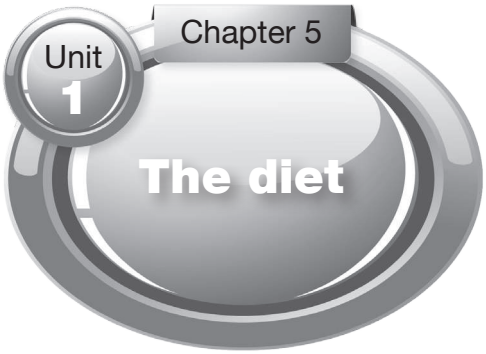
Date: _____

1. Write the names of the different organ systems in the chart below:



2. Can you name some organs that are present in the following organ systems:

Digestive system	Respiratory system	Circulatory system



Name: _____

Class: _____

Date: _____

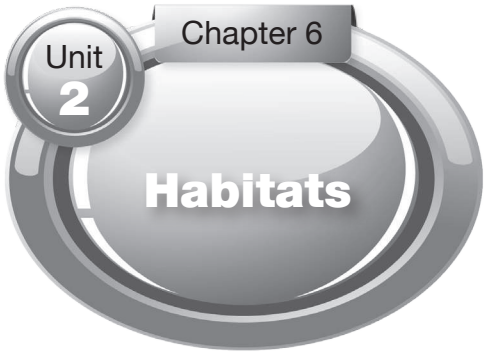
How does each food group help to keep us healthy? Draw some examples in the box for each food group and write how they help us to remain healthy in the lines below.

Bread, Cereals and Potatoes _____ _____	Meat and Fish _____ _____
Milk and Dairy Foods _____ _____	Fruit and Vegetables _____ _____

Fatty and Sugary Foods

_____

_____



Name: _____

Class: _____

Date: _____

Look at the five habitats in the table below. In which habitat do the animals belong?

snail	ladybird	owl	oak tree
flower	squirrel	deer	lobster
seaweed	dandelion	pigeon	shark
camel	woodlouse	rat	worm

sea/deep water	forest/wood	garden	urban/city	desert

Now choose one plant or animal from each habitat and find out how it is adapted to its environment.

Sea/deep water

_____

_____

_____

Forest/wood

_____

_____

_____

Garden

_____

_____

_____

Urban/city

_____

_____

_____

Desert

_____

_____

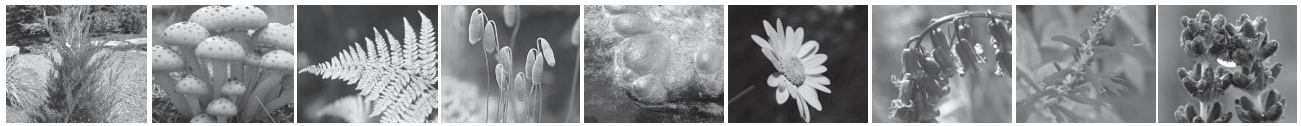
_____

WORKSHEET (I)

Name: _____ Class: _____ Date: _____

Sorting Plants

Look carefully at the plants you have been given. Sort them into 2 different sets and give a good reason why you have sorted them into these 2 different sets.



Why are these plants in this set?

_____

_____

_____

_____

_____

Why are these plants in this set?

_____

_____

_____

_____

_____

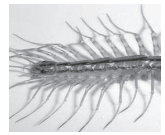
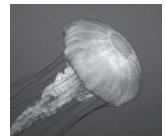
Name: _____ Class: _____ Date: _____

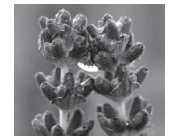
Sorting animals

Look carefully at the animals you have been given. Sort them into 2 different sets and give a good reason why you have sorted them into those 2 different sets.








Why are these animals in this set? Where do they live?

_____

_____

_____

_____

_____

Why are these animals in this set? Where do they live?

_____

_____

_____

_____

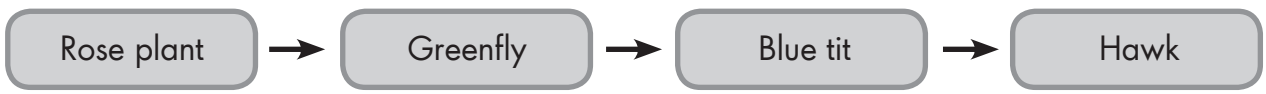
_____

Name: _____

Class: _____

Date: _____

Study the food chain.



- Which is the producer?_____
- Which are the consumers? _____
- Is there a herbivore? Which one is it? _____
- Name a carnivore in the food chain. _____
- What would happen to each part of the food chain if lots of greenfly got a disease and died?

_____

Look at the sentences below. Match each sentence to a word from a box below.

- A living thing that feeds on meat
- Several food chains combined together.
- Living things existing together in a certain habitat.
- A living thing that does not feed on another living thing to survive.

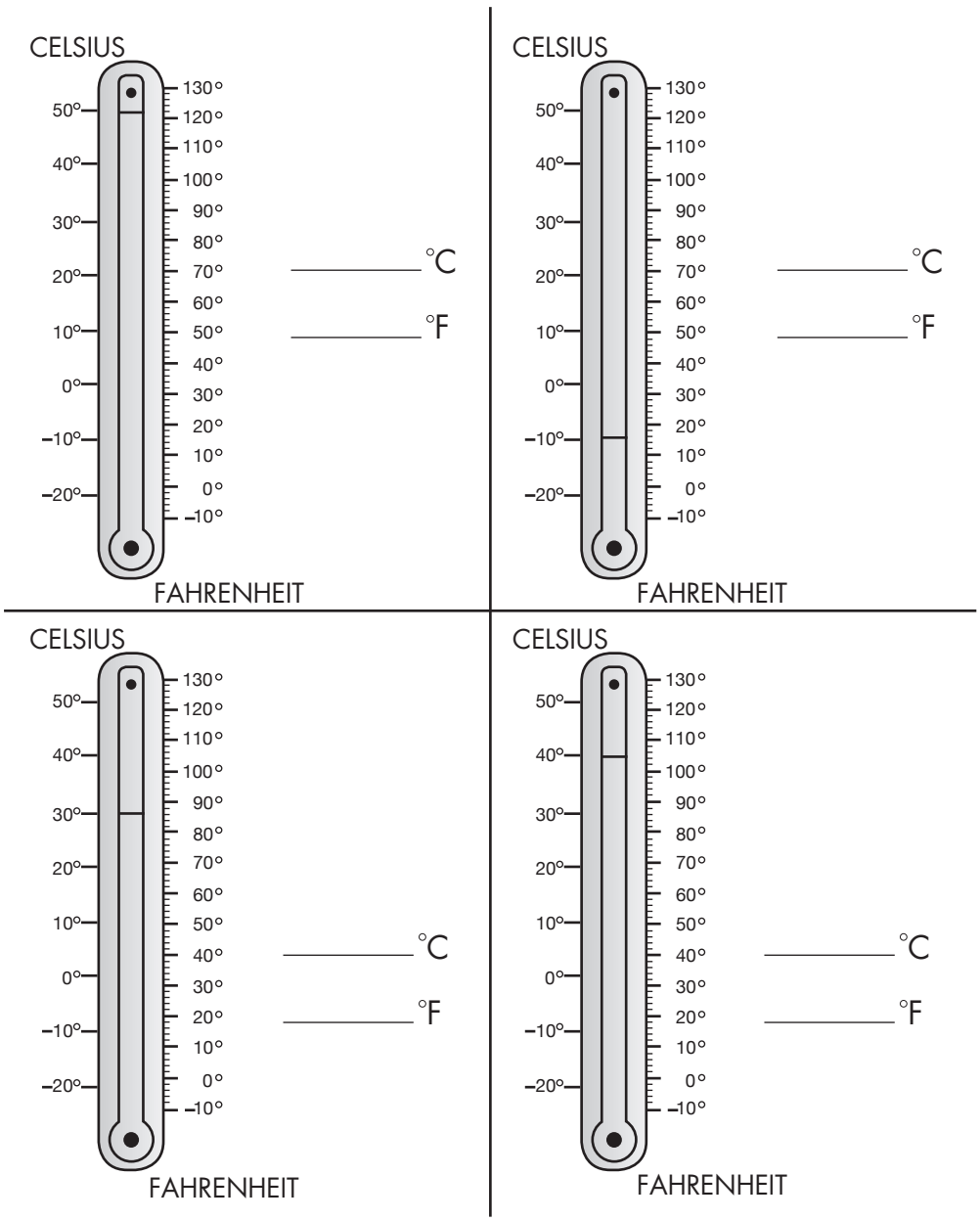
Food web | Ecosystem | Carnivore | Producer

Name: _____

Class: _____

Date: _____

What is the Temperature?



Unit 3

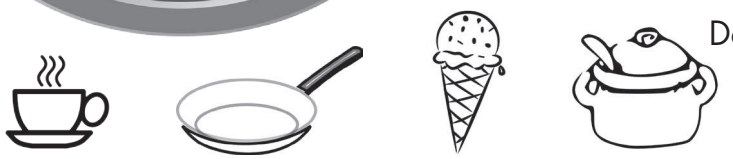
Chapter 9

Heat on the move

Name: _____

Class: _____

Date: _____



State whether the statement given below is true (T) or false (F). Correct the false statements only.

1. Heat travels from hotter objects to colder objects. ( )

Correct Statement: _____

2. When heat moves out, the temperature rises. ( )

Correct Statement: _____

3. The thermos flask can keep tea or coffee hot for hours. ( )

Correct Statement: _____

4. Materials which block the heat to pass through are called conductors. ( )

Correct Statement: _____

5. Water is a good insulator. ( )

Correct Statement: _____

6. Wood is a good conductor of heat. ( )

Correct Statement: _____

7. Thermal insulators make hot things cold and cold things hot. ( )

Correct Statement: _____

8. We cannot see, but heat does move about. ( )

Correct Statement: _____

Chapter 10

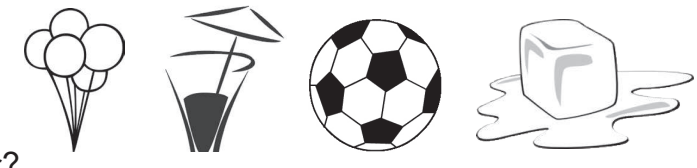
Unit 3

Solids and liquids

Name: _____

Class: _____

Date: _____



Answer the following questions:

1. What do you understand by matter?

_____

_____

2. Define freezing.

_____

_____

3. Define melting.

_____

_____

4. Can a solid convert into liquid? Give an example.

_____

_____

5. Explain the properties of the following states of matter:

Solids		Liquids		Gases	
Volume		Volume		Volume	
Shape		Shape		Shape	
Strength		Strength		Strength	
Density		Density		Density	

Separating solids and liquids

Name: _____

Class: _____

Date: _____

Maria has mixed up these solids. Can you help her separate them? Try them out yourself to see.

Materials	Apparatus I will use to separate the solids	Success?
Golf balls Sand Small stones Paper clips		
Large pebbles Dried peas Rice Bulb holders		

Unit 4

Chapter 12

Force and friction

Name: _____

Class: _____

Date: _____

1

The porter pushes his cart on the tile floor and it moves easily. When he pushes his cart on the carpet, it is harder because there is more friction on the carpet.
So, he must _____

a. leave the cart outside and take a nap.
b. use less force to push the cart when he's on the carpet.
c. use more force to push the cart when he's on the carpet.

2

The driver has to be more careful when driving in the winter as compared to the summer, as the road becomes very slippery. This means that the friction on the road during winter is_____ the friction in the summer.

a. more than b. less than c. the same as

3

Maple wood is easier to saw than oak because:

a. there is less friction on the maple wood than on the oak.
b. there is more friction on the maple wood than on the oak.
c. the carpenter was lazy.

Can you give 3 more examples of two surfaces rubbing together?

1. Skis on the snow
2. _____
3. _____
4. _____

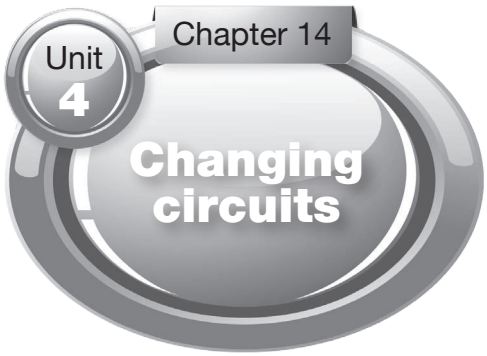
Name: _____

Class: _____

Date: _____

Look at the pictures below. Which source of electricity do these appliances need? Why?

Appliance	Uses mains, battery or both?	Why?
		
		
		
		
		
		
		
		



Name: _____

Class: _____

Date: _____

Which of the following are good conductors of electricity conductors of electricity? Find any five.

piece of card sewing thread a piece of wire a plastic spoon aluminium foil
computer disc pair of scissors rubber band drinking straw piece of wood
key strip of leather thermopore nail

1. _____
2. _____
3. _____
4. _____
5. _____

Why are insulators important?

_____

_____

_____

_____

Draw a series circuit and a parallel circuit in the space given below:

How much power is required by each of the following electrical appliances?

Air conditioner :_____

Iron: _____

Television : _____

Ceiling fan: _____

Microwave oven : _____

Refrigerator : _____

Computer : _____

Hair dryer : _____

From your answers above, which of appliance requires the most power?

_____

Unit 5

Chapter 15

Planets

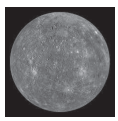
Name: _____

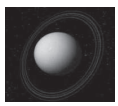
Class: _____

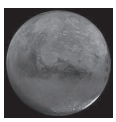
Date: _____

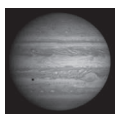
Numbers the planets in sequence. The planet nearest to the Sun will be number 1.

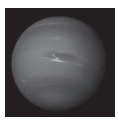
 Earth ☐

 Mercury ☐

 Uranus ☐

 Mars ☐

 Jupiter ☐

 Neptune ☐

 Venus ☐

 Saturn ☐

Answer the following questions:

1. What planet do we live on? Why is it called the blue planet?

_____

2. Which planet is called the red planet?

_____

3. Which planet is closest to the Sun?

_____

4. Which planet is farthest from the Sun?

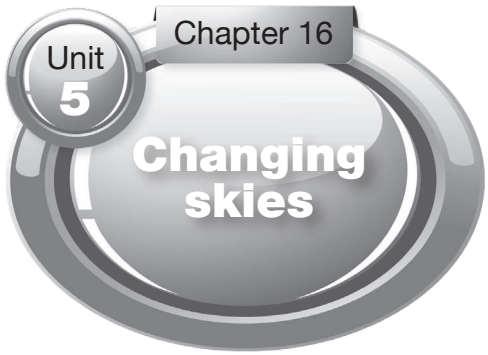
_____

5. Which planet has rings around it?

_____

6. Which is the biggest planet?

_____



Name: _____

Class: _____

Date: _____

Fill in the blanks with the correct word. You may use your textbook to help you.

1. Every place on Earth is going through its own _____.

2. Weather conditions occur _____ throughout the world.

3. Weather conditions occur according to _____.

4. The world is classified into _____ different groups of climatic regions.

5. Scientists who monitor and interpret weather conditions are known as _____.

6. The meteorologists use instruments to determine weather conditions to make _____.

7. Predicting the occurrence of weather is known as weather _____.

8. The tilted position of our planet causes _____ change.

9. Weather changes from _____ to _____.

10. _____ affects weather and often changes it rapidly.