Lesson-12: Force, Work and Energy

11 Periods (40 minutes each)

Learn Better (Main Coursebook), Stay Ahead (Workbook), Book of Holistic Teaching, Book of Project Ideas, CRM signs, Poster

Animation, Animated Activities, Concept Map, Dictionary, eBook, Experiment, I Explain, Infographic, Quiz, Slideshow, Test Generator

Affirming better
I can take up any challenge.

Curricular Goals and Objectives (NCF)

To enable the students:

- to understand different forces and how they affect objects.
- to explore simple machines and how they make work easier.
- to learn about various forms of energy and their uses.
- to recognise the importance of renewable energy and its role in sustainability.

Methodology

Period 1

SHOULD DO
5 MIN.

Teacher: Good morning, students. How are you all today?

Teacher: Great. Before we dive into our lesson, let us take a moment to relax and focus our minds with a short meditation. Ready?

Teacher: Sit comfortably in your chair, with your back straight and feet flat on the ground. Close your eyes gently and take a deep breath through your nose. Hold it for a moment, then slowly breathe out through your mouth.

Let us do these three more times. Breathe in and breathe out. As you breathe, imagine your mind becoming clear and ready to learn.

Open your eyes and smile at your friends. Let us start our lesson with positive energy.

Affirming better

Teacher: Before we start the class, let us all affirm together: 'I can take up any challenge.' Repeat after me: 'I can take up any challenge.'

Teacher: Alright. Today, we are going to begin a new chapter, 'Force, Work and Energy.' We use a KWL chart to help us organise our thoughts and learning. I have made a KWL format on the blackboard. Please take out your notebooks and draw the same format.

MUST DO
5 MIN.

K	W	L

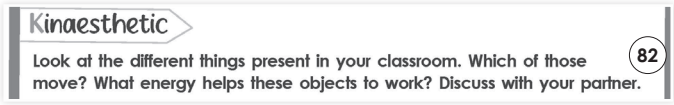
Teacher: Let us start by filling out the 'K' and 'W' columns. Take a few minutes to think and write. If you have any questions, feel free to ask.

Teacher: Before we start the chapter, we will do a quick Re-KAP, which involves revisiting our previous knowledge through creative activities using Kinaesthetic, Auditory and Pictorial methods to make our learning interactive and engaging.

Kinaesthetic

MUST DO
10 MIN.

Teacher: Let us start with the 'Kinaesthetic' activity. Look around the classroom. Can you see different things? Which of those things move when you use them? Think about what energy makes these objects move. Discuss this with your partner.



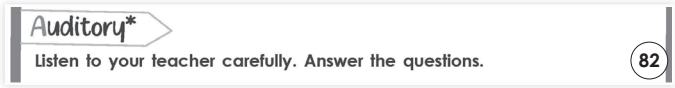
(Let the students finish the activity.)

Teacher: Very good. You are all exploring and thinking deeply about how the objects around you work. Keep observing and talking with your partners.

Auditory

MUST DO
10 MIN.

Teacher: Let us now move on to our 'Auditory' activity. Listen to me carefully. I will ask you a few questions. I want you to pay attention to every detail before answering. Are you ready?



Teacher: Rohan is riding a bicycle. He reaches a village. He sees a thirsty cow. He asks an adult, who was coming on a motorbike, to help him. They draw water from a well. They pull out a bucket of water from the well by the help of a well pulley.

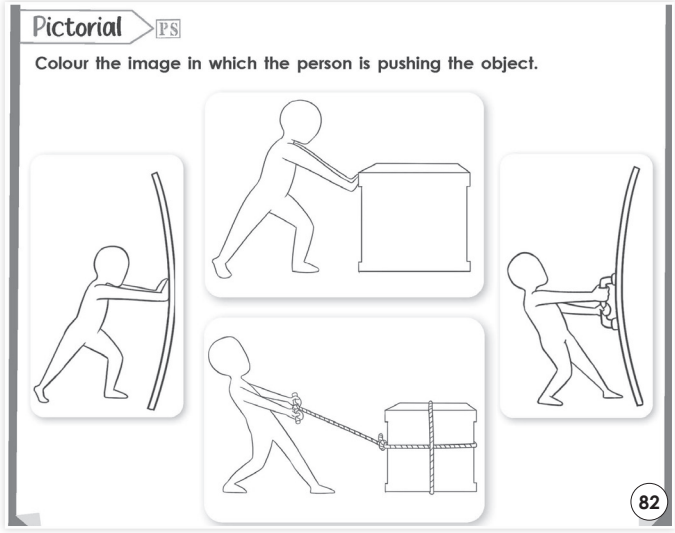
1. Name two machines that are used in the above story.
2. Which machine helps in drawing water from the well? (Waits for student responses.)

Teacher: Wonderful responses. You all are listening carefully. Now, let us continue with our next exciting activity.

Pictorial

MUST DO
10 MIN.

Teacher: Let us look at the 'Pictorial' section. Here are some pictures of people interacting with objects.



Teacher: Your task is to colour the image where the person is pushing the object. Can you identify which one it is?

Teacher: Take your time to choose and colour carefully.

Teacher: Great work. You are paying close attention and using your observation skills.

Differentiated Activities

110 km/hr

What type of energy helps objects move when a force is applied to them?

80 km/hr

What is the force that makes objects move when you push or pull them?

40 km/hr

What is used to make objects move in space, like a rocket?

Home Task

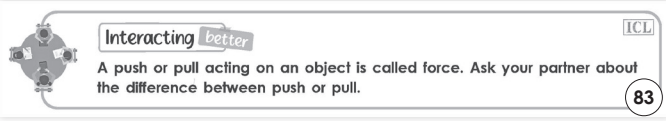
Draw one object from your classroom that moves and label the energy it uses to move. Write one sentence explaining how the energy helps the object move.

Period 2

Interacting better

MUST DO
10 MIN.

Teacher: Good morning, students. How are you all today?



Teacher: Great. Let us look at the 'Interacting better' section. A push or pull acting on an object is called force. Explain to your partner the difference between a push and a pull.

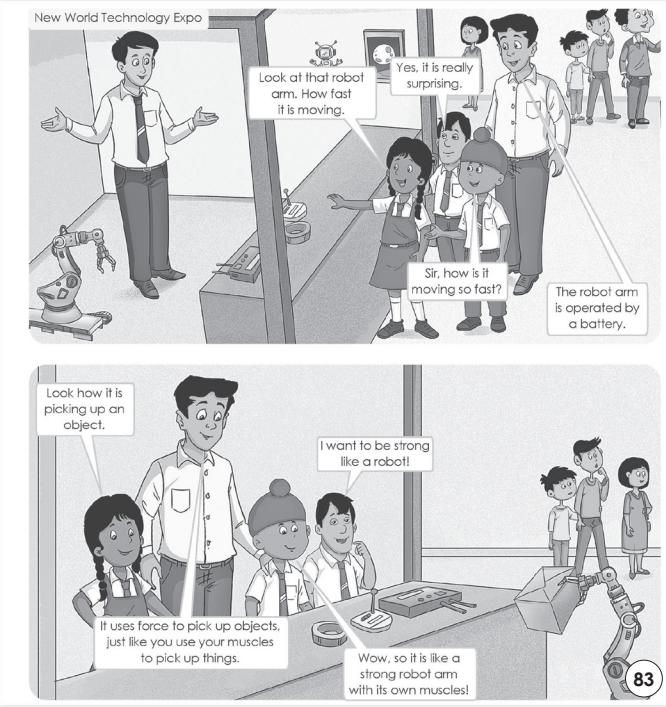
Teacher: Think about when you push a door to open it or pull a drawer to close it. What happens in each case?

(Let the students think and discuss push and pull.)

(Use CRM signs to settle the class.)

Teacher: Great work. I can see that you are explaining well and learning from each other.

Teacher: Let us now move on to the next activity.



Teacher: Everyone, please open your books and look at the picture story given on page 83 of your Main Coursebook. Observe what each character is saying and doing.

MUST DO
30 MIN.

(Give time to the students to read the story.)

Teacher: Now that you have read the story, let us begin our discussion.

Teacher: What is the robot arm doing in the picture? It is moving and performing a task, isn't it?

Teacher: Yes, the robot arm is moving to perform different tasks. It is an example of technology in action.

Teacher: How is the robot arm moving so fast? What is making it work?

Teacher: Well done. The robot arm is powered by a battery, which gives it the energy it needs to move. Batteries help machines and robots operate.

Teacher: What is the robot arm using to pick up objects? Can you compare it with something humans do?

Teacher: Yes, the robot arm uses force to pick up objects, just like how we use our muscles to lift things. You're thinking just like scientists.

Teacher: How does the robot arm's movement relate to muscles in your body?

Teacher: Great thinking. Both the robot arm and our muscles work by applying force to objects. Just like muscles help us move things, the robot arm uses force to move objects, too.

Teacher: What did one of the children in the story want to be like? Why do you think they wanted to be like the robot?

Teacher: Absolutely. The child wanted to be strong like the robot because robots are powerful and are amazed by how strong and quick the robot was. Excellent observation.

Teacher: Wonderful responses, everyone. You all understood the story very well. Keep up the good thinking.

You may show the **Dictionary** and **eBook** on the digital platform.

Differentiated Activities

110 km/hr

How does the robot arm use force to move objects?

80 km/hr

What powers the robot arm to make it move?

40 km/hr

What do muscles help us do in our bodies?

Home Task

Write about one machine or object that helps you do your daily work at home. How does it use energy or force to help you? Draw a simple diagram of this object and label the parts that help it work.

Period 3

SHOULD DO
5 MIN.

Teacher: Good morning, students. How are you all today?

Teacher: Great. Let us begin today's lesson with a quick game. I will ask some questions and you have to answer them. Ready?

Teacher: What do we call the action that makes an object move or stop? (Force)

Teacher: What kind of energy do we use when we push or pull something? (Muscular energy)

Teacher: Can you name one machine that helps us lift water from a well? (Pulley)

Teacher: What part of our body helps us lift or carry objects like a robot arm? (Muscles)

Teacher: What gives energy to a robot arm so it can move? (Battery)

Teacher: Excellent answers. Let us now start today's class.

(The teacher will read the first six paragraphs of page 84 aloud and provide explanations to ensure that the students understand the content.)

We know that to move an object, we apply force. Let us now learn more about force, work and energy.

FORCE

When we push or pull something, this push or pull exerts a force on the object. When force is applied, it can change the shape and direction of an object, stop a moving object, move a stationary object or change the speed of a moving object.

84

Teacher: Today, we are going to learn about force. Can anyone tell me what force is?

MUST DO
5 MIN.

Teacher: Yes, force is what happens when we push or pull an object. When we apply force, it can do many things. It can change the shape of an object, stop a moving object or even move a stationary object.

Teacher: Can anyone think of an example where force is used to stop a moving object?

Teacher: Exactly. When you catch a ball, your hand applies force to stop the ball.

Teacher: Now, what about an example where force is used to move a stationary object?

Teacher: Well done. When you push a door to open it, you are applying force to move it.

Discovering better

(Explain the word stationary mentioned in 'Discovering better' section.)

Teacher: Force can also change the speed of a moving object. Can you think of an example where force changes how fast something moves?

Teacher: Great. When you kick a ball, you apply force and the ball speeds up.

Teacher: Fantastic. You all understand how force works in different situations. Keep thinking about other examples where you use force.

You may show the **I Explain** on the digital platform.

Types of Forces

Different types of forces exist in nature.

Gravitational force: Every object that has some mass exerts force on another object. This is called the gravitational force. It is due to this force that an object thrown upwards always falls down. 84

Teacher: Now, let us explore the first type of force – gravitational force. Can anyone tell me what gravitational force is?

MUST DO 5 MIN.

Teacher: Great. Gravitational force is the force that every object with mass exerts on another object.

Teacher: Can anyone think of an example where we see gravitational force at work?

Teacher: Excellent. When you throw an object upwards, it always falls back down. This is because of gravitational force. It pulls everything towards the Earth.

Teacher: So, why do you think objects always fall back down after being thrown?

Teacher: Yes, it is because of the Earth's gravitational force, which pulls them down.

Teacher: Wonderful. You all have understood gravitational force very well. Keep observing how this force works around you in daily life.

Mechanical force: When there is a direct contact between two objects, mechanical force comes into play. When an object exerts mechanical force on another object, the state of the latter changes. For example, cutting a piece of paper, sharpening a pencil using a sharpener, and so on. 84

Teacher: Now, let us discuss mechanical force. This force occurs when there is direct contact between two objects. Can anyone explain what happens when two objects come into direct contact?

MUST DO 5 MIN.

Teacher: Yes, mechanical force comes into play. When an object exerts mechanical force on another, the state of the second object changes. Can anyone give me an example where mechanical force is used?

Teacher: Exactly. When you cut a piece of paper with scissors or when you sharpen a pencil using a sharpener, you are applying mechanical force. In both cases, the shape or condition of the object changes because of the force. So, in these examples, can you explain how the state of the objects changed?

Teacher: Great observation. In the case of cutting paper, the paper's shape is changed. And when we sharpen a pencil, we are changing its size and shape using mechanical force.

Teacher: Wonderful. You all understood how mechanical force works very well. Keep observing how this force is applied around you in everyday tasks.

Frictional force: Frictional force exists when two objects are in contact in such a way that they rub against each other. Such objects tend to oppose the motion of each other. For example, walking on the floor, writing on the board and so on. 84

Teacher: Let us now explore frictional force. Frictional force occurs when two objects are in contact in such a way that they rub against each other. Can anyone think of an example where you see objects rubbing against each other?

MUST DO 5 MIN.

Teacher: Exactly. When two objects rub against each other, they tend to oppose each other's motion. For example, when you walk on the floor, you are using friction to help you walk without slipping.

Teacher: Can anyone think of another example where frictional force is at work?

Teacher: Yes, when we write on the board, friction between the marker and the surface of the board helps the words appear. Without this friction, the marker would just slide across the surface.

Teacher: So, frictional force helps slow down or stop objects. What do you think would happen if there were no friction while walking?

Teacher: Excellent. Without friction, we would not be able to walk properly and everything would be slippery. Great understanding of how friction works.

You may show the **Animation** and **Experiment** on the digital platform.

Muscular force: Muscular force is exerted by the muscles of the body. This force occurs due to the movement of the body parts. For example, carrying a shoulder bag, chewing food and so on. 84

Teacher: Let us now discuss muscular force. This type of force is exerted by the muscles of the body. Can anyone explain what happens when we use our muscles to move something?

MUST DO 5 MIN.

Teacher: Yes, muscular force occurs due to the movement of our body parts. It helps us perform everyday tasks.

Teacher: Can anyone think of an example where you use muscular force in your daily life?

Teacher: Excellent. Carrying a shoulder bag or even chewing food are examples of muscular force at work. Your muscles help you do all these actions.

Teacher: What do you think would happen if we did not have muscles to help us move?

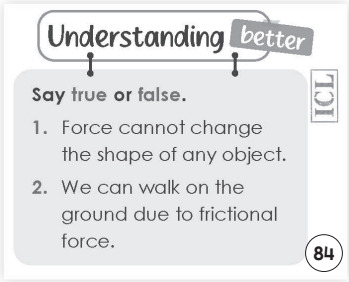
Teacher: Great thinking. Without muscles, we would not be able to move objects or even carry out basic tasks like walking or eating.

Teacher: You have understood muscular force very well. Keep observing how your muscles help you every day.

Understanding better

Teacher: Now, let us move to the 'Understanding better' section. I will give you two statements and you will have to decide if they are true or false. Are you ready?

MUST DO
5 MIN.



Teacher: Here is the first statement: "Force cannot change the shape of any object."

Teacher: This statement is false because force can indeed change the shape of an object, like when you bend a piece of paper or stretch a rubber band.

Teacher: Now, here is the second statement: "We can walk on the ground due to frictional force." What do you think? True or false?

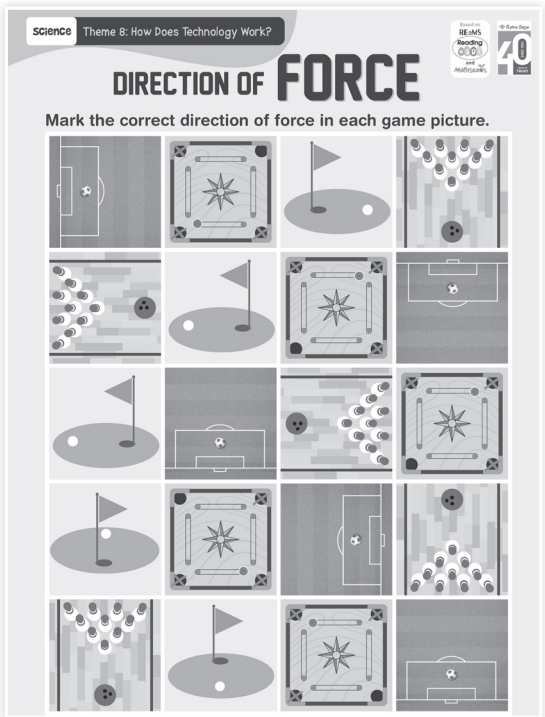
Teacher: Well done. This statement is true because frictional force helps us grip the ground when we walk, preventing us from slipping.

Teacher: Excellent understanding. You all did fantastic work in figuring out whether the statements were true or false.

Poster

Teacher: Let us take a moment to look at the poster on the wall.

MUST DO
5 MIN.



(Please display and discuss the posters prominently in the classroom to reinforce the learning about the direction of Force. Encourage students to observe the posters and mark the correct direction of force in each game picture.)

Teacher: Great observation, everyone.

Differentiated Activities

110 km/hr

How does frictional force help when you walk on the ground? Explain with an example.

80 km/hr

What kind of force helps us to pick up a bag?

40 km/hr

What is the force called that pulls objects down towards the Earth?

Home Task

Write about one situation where you used muscular force in your daily life. Explain how your muscles helped you complete the task.

Period 4

SHOULD DO
5 MIN.

Teacher: Good morning, students. How are you all today?

Teacher: Great. Let us begin today's lesson with a quick game. I will ask some questions and you have to answer them. Ready?

Teacher: What is the force that pulls objects towards the Earth? (Gravitational force)

Teacher: What type of force do we use when we walk? (Frictional force)

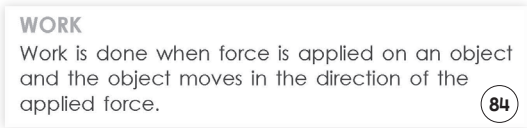
Teacher: What force is used when we push or pull an object? (Mechanical force)

Teacher: What helps us carry a heavy bag? (Muscular force)

Teacher: When you throw a ball up, what force makes it fall back down? (Gravitational force)

Teacher: Excellent answers. Let us now move on to today's lesson.

(The teacher will read the last four paragraphs of page 84 and the first paragraph of page 85 aloud and provide explanations to ensure that the students understand the content.)



Teacher: Today, we are going to discuss work. Work is done when force is applied to an object and the object moves in the direction of the applied force. Can anyone give me an example where work is being done?

MUST DO
5 MIN.

Teacher: Yes, when you push a box and it moves, that is work being done because you are applying force to the box and it is moving in the direction of that force.

Teacher: What happens if you push an object, but it does not move? Is work being done then?

Teacher: Exactly. If the object does not move, then work is not done. Well done.

SIMPLE MACHINES

Simple machines are used to make our work easier. The amount of force and energy we need to do any work is reduced by using simple machines. 84

Teacher: Now, let us discuss simple machines. Can anyone tell me what simple machines are?

MUST DO 5 MIN.

Teacher: Yes, simple machines are tools that make our work easier. They help us reduce the amount of force and energy needed to do a task.

Teacher: Can anyone think of any example of simple machines you use in your daily life?

Teacher: Well done. Simple machines like levers, pulleys and wheels all help us do work more easily by reducing the effort needed.

Lever

It is a bar-like simple machine used to cut things, open lids and lift weights. The point that helps turn or balance a lever is called fulcrum. Nail-cutters, scissors, tongs and pliers are some examples of levers used in our everyday lives.

pliers (lever) 84

Teacher: Now, let us discuss the lever. Can anyone describe what a lever is?

MUST DO 5 MIN.

Teacher: A lever is a simple machine that looks like a bar. We use it to cut things, open lids and lift weights. The point that helps the lever turn or balance is called the fulcrum.

Teacher: Can you think of any examples of levers we use every day?

Teacher: Great. Nail cutters, scissors, tongs and pliers are all examples of levers that we use in our everyday lives. These tools help us apply force to do tasks easily.

84 well (pulley)

Pulley

We can lift heavy objects with the help of a pulley. It consists of a wheel with a groove that carries a rope. Pulleys are used to fetch water from wells, lift cars with cranes, move lifts, etc.

Teacher: Now, let us learn about the pulley. Who can tell me what a pulley is?

MUST DO 5 MIN.

Teacher: A pulley helps us lift heavy objects. It has a wheel with a groove that carries a rope. Pulleys are useful for lifting things with less effort.

Teacher: Can anyone think of a situation where a pulley is used in real life?

Teacher: Excellent. Pulleys are used to fetch water from wells, lift cars with cranes and even move lifts. It makes work easier by reducing the amount of force needed to lift heavy objects.

Teacher: Can anyone describe how a pulley works when it is used to lift something?

Teacher: Very well. The rope goes over the wheel and when you pull on the rope, it helps you lift the object more easily. This is the force that helps in lifting heavy objects.

bicycle

Wheel and axle

This machine comprises a wheel attached to an axle. An axle is a rod that passes through the centre of the wheel. Examples of wheel and axle include car and bicycle wheels. 85

Teacher: Now, let us learn about the wheel and axle. Can anyone describe what a wheel and axle is?

MUST DO 10 MIN.

Teacher: A wheel and axle is a machine where a wheel is attached to a rod called the axle. The axle passes through the centre of the wheel.

Teacher: Does anyone know an example of where we use a wheel and axle in everyday life?

Teacher: Excellent. A bicycle wheel and the wheels of a car are examples of the wheel and axle. The wheel helps move the object and the axle supports it to rotate.

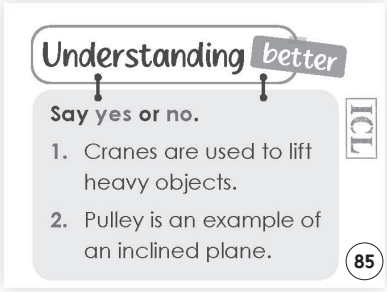
Teacher: Can anyone explain how the wheel and axle help us in moving things?

Teacher: Very well. When the wheel turns, the axle also turns and helps the object move, reducing friction and making it easier to move heavy things.

Understanding better

Teacher: Now, let us move to the 'Understanding better' section. I will read two statements and you have to tell me whether they are true or false.

MUST DO 5 MIN.



Teacher: First statement: Cranes are used to lift heavy objects. Is that true or false?

Teacher: Yes, that is correct. Cranes are indeed used to lift heavy objects. Well done.

Teacher: Now, for the second statement: Pulley is an example of an inclined plane. Is that true or false?

Teacher: That is false. A pulley is not an inclined plane. It is a separate, simple machine. Great work, everyone.

Differentiated Activities

110 km/hr

What is the role of the fulcrum in a lever?

80 km/hr

How do simple machines like levers and pulleys make our work easier? Provide one example for each.

40 km/hr

What is a pulley used for?

Home Task

Write about one simple machine you use in your daily life. Explain how it helps you do work more easily.

Period 5

SHOULD DO 5 MIN.

Teacher: Good morning, students. How are you all today?

Teacher: Great. Let us begin today's lesson with a quick game. I will ask some questions and you have to answer them. Ready?

Teacher: What is a lever used for? (To cut, lift or open things)

Teacher: What is the point that helps balance a lever? (Fulcrum)

Teacher: What does a pulley help us do? (Lift heavy objects)

Teacher: Give an example of a machine that includes a wheel and an axle. (Car or bicycle)

Teacher: Give an example of a task where we use a pulley. (Fetching water from a well)

Teacher: Excellent answers. Let us now start today's lesson. (The teacher will read the second to the fifth paragraph of page 85 aloud and provide explanations to ensure that the students understand the content.)

Inclined plane

It is a type of surface that has one of its ends at a higher position than the other one. Inclined planes help load or raise any heavy object. Some common types of inclined planes are ramps, slides, ladders, etc.

85

MUST DO 10 MIN.

Teacher: Now, let us discuss inclined planes. Can anyone tell what an inclined plane is?

Teacher: Very good. An inclined plane is a type of surface that has one of its ends at a higher position than the other. It helps to lift or raise heavy objects. Can anyone give me an example of an inclined plane?

Teacher: Excellent. Ramps, slides and ladders are common examples of inclined planes. They help us do work easily by reducing the amount of effort needed to lift things. How do you think they work?

Teacher: Great thoughts. The inclined plane makes work easier by spreading the effort over a longer distance. For example, when you use a ladder to climb, it becomes easier than lifting yourself up straight. Well done.

Wedge

It is a triangular machine with at least one inclined surface. A wedge has a sharp edge towards its end. For example, knife, blade and axe.

85

MUST DO 5 MIN.

Teacher: Next, let us discuss wedges. A wedge is a triangular machine with at least one inclined surface. Can anyone think of something that is a wedge?

Teacher: Perfect. A knife, axe or even the edge of a blade are examples of wedges. Wedges are used to split or cut things. How do you think a wedge works?

Teacher: Well done. The sharp edge of the wedge helps it separate or cut objects by applying force to a small area. Keep it up, you are doing a great work.

ENERGY

Energy is the capacity to do work. We need energy to do different kinds of work such as reading, writing, climbing, walking and lifting things.

85

MUST DO 5 MIN.

Teacher: Now, let us discuss energy. Does anyone know what energy is and why it is important?

Teacher: Yes, energy is the capacity to do work. We need energy for many tasks like walking, writing, climbing and lifting things. How do you get energy?

Teacher: Wonderful. Our food gives us energy to do work. Just like machines need energy to work, we need energy to move and do things. Great job, everyone.

Sources of energy – the Sun, wind and water

The Sun is the most important source of energy. The energy derived from the Sun is known as solar energy. Plants make their food with the help of solar energy. Wind and water are two other sources of energy. The moving air is termed as wind. Wind is used to move windmills that are further used to produce electricity. Water stored in dams is also used to generate electricity.

85

MUST DO 10 MIN.

Teacher: Let us now explore the different sources of energy. Can anyone tell me what the most important source of energy is on Earth?

Teacher: Wonderful. The Sun is the most important source of energy. We refer to the energy from the Sun as solar energy. Solar energy is essential because it helps plants grow and provides warmth. Can anyone explain how plants use solar energy to make their food?

Teacher: Excellent. Plants use solar energy through a process called photosynthesis, where they convert sunlight into food. Now, besides the Sun, can anyone think of other natural sources of energy?

Teacher: Great. Wind and water are also vital sources of energy. Wind is used to generate power by turning wind turbines and water is stored in dams to generate electricity. How do you think the movement of water can be used to generate energy?

Teacher: That is right. When water flows through turbines in a dam, it produces electricity. This process is called hydroelectric power. Now, let us think about wind again. How does wind help produce energy?

Teacher: Fantastic. Wind turbines use the force of the wind to generate power. The blades of the turbine turn and this movement is converted into electricity. Water and wind are renewable sources of energy because they do not run out. Can anyone give me another example of how we use water for energy?

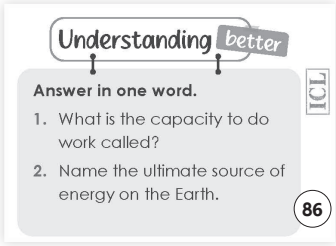
Teacher: Excellent thinking. Water is also used to power watermills, which help grind grain. Wind and water are incredibly useful in many ways, from generating electricity to powering machines. You are all doing a fantastic job today in understanding how these natural resources help provide energy.

You may show the **Infographic** on the digital platform.

Understanding better

Teacher: Let us revise our concepts through the 'Understanding better' section. I will ask two questions and I would like you to answer them in one word.

MUST DO
5 MIN.



Teacher: What is the capacity to do work called?

Teacher: Excellent. The capacity to do work is called energy. Great work.

Teacher: Now, here is the next question. Name the ultimate source of energy on the Earth.

Teacher: Correct. The ultimate source of energy on the Earth is the Sun. Well done, everyone.

Differentiated Activities

110 km/hr

What is the role of the Sun in the water cycle and energy production? Can you explain how energy from the Sun is converted into usable energy on Earth?

80 km/hr

What are two examples of simple machines that use inclined planes?

40 km/hr

What do we use to help us climb or lift objects easily?

Home Task

Find two examples of inclined planes at home or school and describe how they help make work easier. Draw a picture of a wedge and label its parts.

Period 6

SHOULD DO
5 MIN.

Teacher: Good morning, students. How are you all today?

Teacher: Great. Let us begin today's lesson with a quick game. I will ask some questions and you have to answer them. Ready?

Teacher: What type of machine helps lift heavy objects, like when you use a well? (Pulley)

Teacher: What energy source do plants use to make their food? (Solar energy)

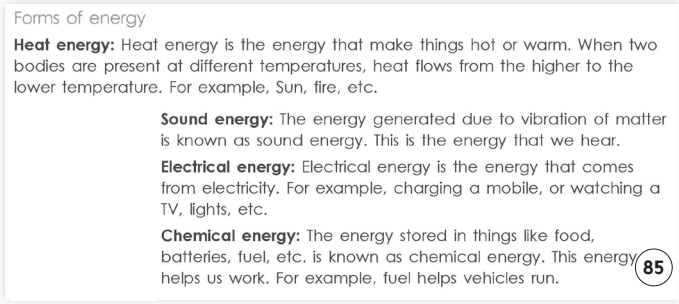
Teacher: Can anyone think of a machine that works like a lever? (Scissors)

Teacher: What helps us walk on the ground without slipping? (Frictional force)

Teacher: When you push a door, what type of force are you applying? (Mechanical force)

Teacher: Great job, everyone. Now, let us get ready for today's lesson.

(The teacher will read the last four paragraphs of page 85 and the first three paragraphs of page 86 aloud and provide explanations to ensure that the students understand the content.)


Forms of energy

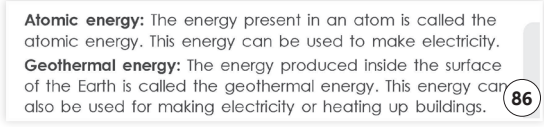
Heat energy: Heat energy is the energy that make things hot or warm. When two bodies are present at different temperatures, heat flows from the higher to the lower temperature. For example, Sun, fire, etc.

Sound energy: The energy generated due to vibration of matter is known as sound energy. This is the energy that we hear.

Electrical energy: Electrical energy is the energy that comes from electricity. For example, charging a mobile, or watching a TV, lights, etc.

Chemical energy: The energy stored in things like food, batteries, fuel, etc. is known as chemical energy. This energy helps us work. For example, fuel helps vehicles run.

85


Atomic energy: The energy present in an atom is called the atomic energy. This energy can be used to make electricity.

Geothermal energy: The energy produced inside the surface of the Earth is called the geothermal energy. This energy can also be used for making electricity or heating up buildings.

86

Teacher: Today, we will discuss different forms of energy. First, let us discuss heat energy. Can anyone tell me what heat energy is?

MUST DO
25 MIN.

Teacher: That is correct. Heat energy is the energy that makes things hot or warm. When two bodies are at different temperatures, heat flows from the higher to the lower temperature. For example, the Sun and fire both produce heat energy.

Teacher: Excellent. Now, let us move on to sound energy. Sound energy is the energy generated due to the vibration of matter. This is the energy that we hear. Can anyone tell me where we experience sound energy?

Teacher: Very good. When you hear music, talk or even the sound of a car honking, you are experiencing sound energy. Now, let us discuss electrical energy. Who can tell me what electrical energy is?

Teacher: Well done. Electrical energy is the energy that comes from electricity. For example, when we charge our mobile phones or watch TV, we are using electrical energy. What are some things in your house that use electrical energy?

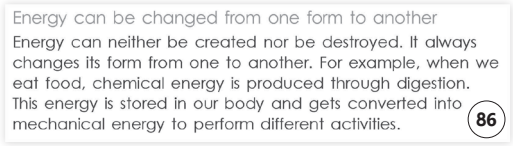
Teacher: Great. The things in your house that use electrical energy are the lights, refrigerator, television and fan. Now, let us talk about chemical energy. Chemical energy is the energy stored in substances like food, batteries and fuel. This energy helps us work. Can anyone think of an example where chemical energy is used?

Teacher: Excellent. Fuel used in cars and batteries in toys are great examples of chemical energy. Now, who can tell me what atomic energy is?

Teacher: Perfect. Atomic energy is the energy present in an atom. This energy can be used to make electricity. Can anyone think of how atomic energy is used?

Teacher: Great thinking. Atomic energy is used to generate electricity in nuclear power plants. Now, let us move on to geothermal energy. This energy comes from inside the Earth. Geothermal energy can be used to make electricity and heat buildings. Can anyone think of a place where we use geothermal energy?

Teacher: Excellent. In some countries, geothermal energy is used to heat homes. You all are doing a fantastic job today. Keep it up.


Energy can be changed from one form to another

Energy can neither be created nor be destroyed. It always changes its form from one to another. For example, when we eat food, chemical energy is produced through digestion. This energy is stored in our body and gets converted into mechanical energy to perform different activities.

86

Teacher: Let us now move on to how energy can be changed from one form to another. Can anyone tell me how energy changes from one form to another?

MUST DO

10 MIN.

Teacher: That is correct. Energy can neither be created nor destroyed. It always changes its form. For example, when we eat food, chemical energy is produced through digestion and this energy is used to perform different activities in our bodies. Can anyone think of another example where energy changes from one form to another?

Teacher: Excellent. When you use a fan, electrical energy is changed into mechanical energy to make the blades spin. You all are understanding the concepts very well today. Let us continue to the next topic.

Differentiated Activities

110 km/hr

How does the change in energy form help us in daily activities? Give two examples.

80 km/hr

What type of energy do we use to listen to music?

40 km/hr

What energy makes things warm?

Home Task

Find two examples of energy being changed from one form to another in your home. Write them down and explain how the energy changes.

Period 7

SHOULD DO

5 MIN.

Teacher: Good morning, students. How are you all today?

Teacher: Great. Let us begin today's lesson with a quick game. I will ask some questions and you have to answer them. Ready?

Teacher: What energy is used to heat food? (Heat energy)

Teacher: What energy do we use to listen to music? (Sound energy)

Teacher: What kind of energy is used when we charge our phones? (Electrical energy)

Teacher: What energy is stored in fuel? (Chemical energy)

Teacher: What energy is found inside the Earth? (Geothermal energy)

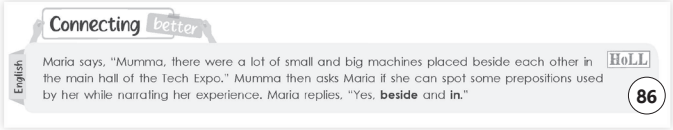
Teacher: Excellent answers. Let us move on to today's lesson.

Connecting better

Teacher: Today, we will discuss how science and English are connected. Maria is narrating her experience at the Tech Expo. She says, "Mumma, there were a lot of small and big machines placed beside each other in the main hall of the Tech Expo."

MUST DO

10 MIN.


Connecting better

English

Maria says, "Mumma, there were a lot of small and big machines placed beside each other in the main hall of the Tech Expo." Mumma then asks Maria if she can spot some prepositions used by her while narrating her experience. Maria replies, "Yes, **beside** and **in**."

HoLL

86

Teacher: What do you think are some important words Maria used to describe where the machines were placed?

Teacher: Well done. The words "beside" and "in" are prepositions. Can anyone tell me what a preposition does in a sentence?

Teacher: Fantastic. A preposition is a word that shows the relationship between two things, like direction, place or time. For example, "beside" shows the position of the machines in relation to each other.

Teacher: Now, let us look at "in." The word "in" is also a preposition, but it is used when we talk about something being inside a space or area. For example, in Maria's sentence, she says, "in the main hall of the Tech Expo." This means the machines were inside the hall.

Teacher: Can anyone give me other examples of how we use "in" to show where something is located?

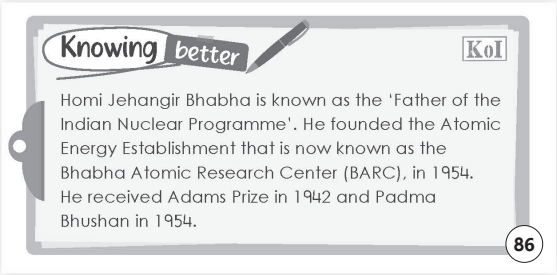
Teacher: Excellent. You might say, "The books are in the bag," or "The toys are in the box." "In" shows that something is inside a defined space or area.

Teacher: Well done, everyone. You all have understood the concept of prepositions well.

Knowing better

Teacher: Let us now learn about an important person in the field of science. Homi Jehangir Bhabha is known as the 'Father of the Indian Nuclear Programme.' Can anyone tell me why he is so important in the science world?

MUST DO
10 MIN.



Teacher: That is right. Homi Bhabha founded the Atomic Energy Establishment, which is now known as the Bhabha Atomic Research Centre (BARC). He received the Adams Prize in 1942 and the Padma Bhushan in 1954 for his outstanding contributions.

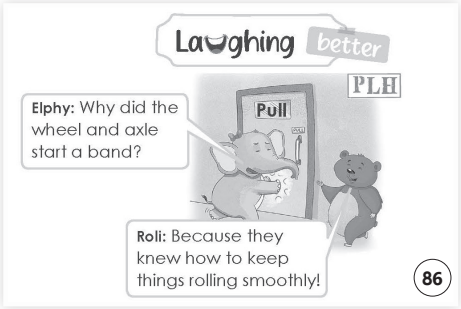
Teacher: Does anyone know what BARC does today?

Teacher: Excellent. BARC continues to contribute to India's nuclear energy and research, which makes it a key institution for science in India.

Laughing better

Teacher: Let us now have a little fun with a joke. Elphy asks, "Why did the wheel and axle start a band?"

MUST DO
5 MIN.



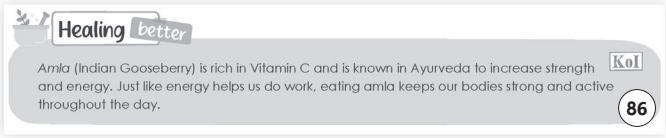
Teacher: I can see you are all curious. The answer is, "Because they knew how to keep things rolling smoothly."

Teacher: That is a good one. Jokes make learning more enjoyable.

Healing better

Teacher: Now, we will discuss the importance of healing in our body. Can anyone tell me what vitamin is found in amla (Indian gooseberry)?

MUST DO
10 MIN.



Teacher: Yes, amla is rich in Vitamin C, which is very important for our body. Just like energy helps us do work, eating amla keeps our bodies strong and active throughout the day.

Teacher: How do you think Vitamin C helps our body stay healthy?

Teacher: Great answer. Vitamin C helps in strengthening our immune system, which helps fight off illnesses and keeps us active.

You may show the **Concept Map** and **Slideshow** on the digital platform.

Differentiated Activities

110 km/hr

Explain why Homi Bhabha's contributions to nuclear science are important for India today?

80 km/hr

What role does Vitamin C play in keeping our body strong?

40 km/hr

What is the name of the scientist known as the 'Father of the Indian Nuclear Programme'?

Home Task

Write a paragraph explaining how energy is important for our daily life, including at least two sources of energy you use every day.

Period 8

SHOULD DO
5 MIN.

Teacher: Good morning, students. How are you all today?

Teacher: Great. Let us begin today's lesson with a quick game. I will ask some questions and you have to answer them. Ready?

Teacher: What is the energy that helps plants make their food? (Solar energy)

Teacher: What do we call the energy that powers our homes? (Electrical energy)

Teacher: What is the energy stored in food called? (Chemical energy)

Teacher: What is used to power windmills? (Wind)

Teacher: What is the energy we get from the Sun called? (Solar energy)

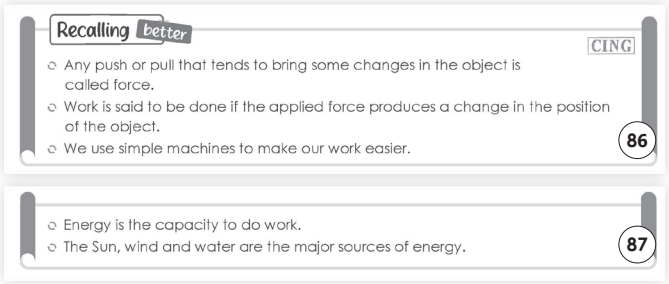
Teacher: Great job, everyone. Now, let us move on to today's lesson.

Recalling better

Teacher: Let us start the 'Recalling better' activity to refresh our memory. We will recall some important concepts. I will ask you questions. Try to remember all we have learnt so far.

MUST DO

15 MIN.



Teacher: Let us start with force. Can anyone remind me what a push or pull is called?

Teacher: Excellent. A push or pull that causes an object to move or change its position is called force. Force can be applied in various ways, such as pushing a cart or pulling a rope. Can anyone tell me how force affects objects in different ways?

Teacher: Fantastic. When we apply force to an object, it can change the object in different ways. Force can change the shape of an object, for example, when you squeeze a rubber ball and it changes shape. Force can also change the direction of an object, like when you kick a ball in a different direction. If the object is moving, force can stop it, like when you apply the brakes on a bicycle. And if the object is stationary, force can move it, such as when you push a box across the floor. Well done.

Teacher: Now, let us talk about work. When is work said to be done?

Teacher: Great. Work is said to be done when an applied force causes an object to move in the direction of the force. For example, if you push a chair across the room and it moves, you are doing work. But if you push against the chair and it does not move, then no work is done, even though you are applying force. Work only happens when there is movement.

Teacher: Can anyone give me another example of work being done? Think about something you did today.

Teacher: Wonderful. For example, if you lift a book from the table and place it on a shelf, work is done because the book moves in the direction of the force you applied. If you pull a cart and it starts moving, that is another example of work being done.

Teacher: Let us now move on to another important concept. We use simple machines to make our work easier. Can anyone tell me why we use simple machines?

Teacher: Well done. Simple machines help us perform tasks by reducing the amount of force and energy required. They make work easier by giving us an advantage in moving heavy objects or cutting things. For example, a pulley can help you lift heavy objects, a lever can help you lift or cut things with less effort and an inclined plane helps you move heavy objects up or down easily. Simple machines are tools that make our daily tasks less tiring.

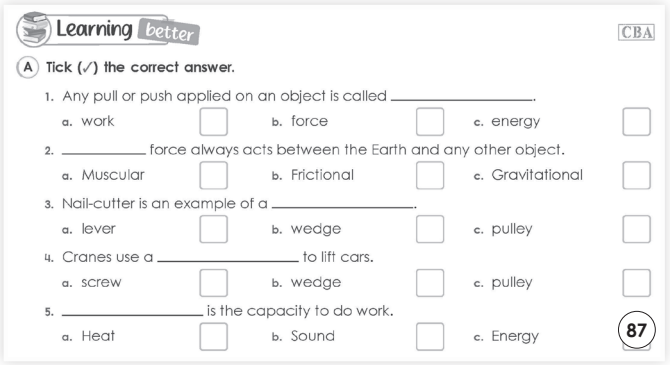
Teacher: Excellent. You all did a great job recalling these important concepts. Now, let us look at energy. Energy is essential for doing work. We need energy to move objects and that energy can come from various sources. Energy helps us perform work more efficiently and makes it easier to do our tasks.

Learning better

Teacher: Everyone, please open page 87 of your Main Coursebook. In Exercise 'A' of 'Learning better' you have to tick the correct answer. Are you ready to get started?

MUST DO

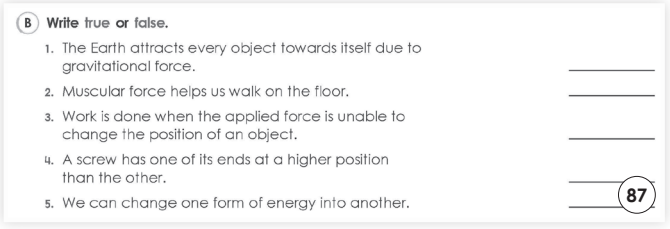
10 MIN.



Teacher: Great. Let us begin with the first question. Any pull or push applied on an object is called_____.

Teacher: The correct answer is force. Well done.

(Similarly, complete all five questions. And discuss the correct answers.)



Teacher: In Exercise 'B' of 'Learning better', you have to write true or false. Are you ready to get started?

MUST DO

10 MIN.

Teacher: Great. Let us begin with the first question. The Earth attracts every object towards itself due to gravitational force.

Teacher: Yes, that is correct. Gravitational force is the force that pulls objects towards the centre of the Earth. It is a natural force that acts on everything with mass. For example, when you drop a ball, it falls to the ground because of the Earth's gravitational pull.

(Similarly, complete all five questions. And discuss the correct answers.)

You may show the **Animated Activities** and **Quiz** on the digital platform.

Differentiated Activities

110 km/hr

What is the relationship between force and energy when we use simple machines, like levers and pulleys, to do work? Explain with an example.

80 km/hr

How does the use of simple machines reduce the effort required to do work? Can you give an example of a machine and explain how it makes work easier?

40 km/hr

What is a simple machine? Name one example and say how it helps in doing work.

Home Task

Write down one example of how a pulley is used in real life to lift a heavy object. Draw a picture of the pulley system and label its parts.

Period 9

SHOULD DO
5 MIN.

Teacher: Good morning, students. How are you all today?

Teacher: Great. Let us begin today's lesson with a quick game. I will ask some questions and you have to answer them. Ready?

Teacher: Which simple machine helps us lift heavy objects with less effort? (Pulley)

Teacher: What force pulls objects towards the Earth? (Gravitational force)

Teacher: What type of force is used to move a car or bicycle? (Mechanical force)

Teacher: Can you name a simple machine that we use to cut things like paper or open bottles? (Lever)

Teacher: What is the most important source of energy that plants use to make their food? (The Sun)

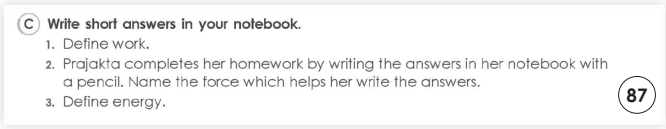
Teacher: Excellent answers. Let us now move on to today's lesson.

Learning better

MUST DO
15 MIN.

Teacher: Everyone, please open page 87 of your Main Coursebook. Let us explore some short-answer questions.

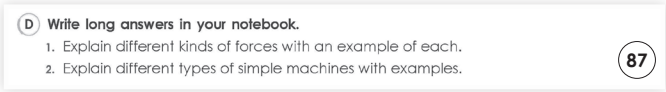
In Exercise 'C' of the 'Learning better' section, you have to write a short answer. Are you ready to get started?


C Write short answers in your notebook.
1. Define work.
2. Prajakta completes her homework by writing the answers in her notebook with a pencil. Name the force which helps her write the answers.
3. Define energy.
87

Teacher: Great. Let us begin with the first question. Define work.

(Students have to write the answers for the given questions in about 40 to 50 words in their notebook. Wait for the students to write the answers.)

(Similarly, complete all three questions and discuss the correct answer with the class.)


D Write long answers in your notebook.
1. Explain different kinds of forces with an example of each.
2. Explain different types of simple machines with examples.
87

MUST DO
20 MIN.

Teacher: Let us explore some long-answer questions. In Exercise 'D' of the 'Learning better', you have to write a long answer. Let us begin with the first question. Explain different kinds of forces with an example of each.

(Students have to write the answers for the given questions in about 100 to 150 words in their notebook. Wait for the students to write the answers.)

(Similarly, complete the second question and discuss the correct answer with the class.)

(Instruct the students to bring their Little Book in the next class.)

Differentiated Activities

110 km/hr

How does the force applied on an object change its motion in different types of forces, such as gravitational, mechanical and frictional? Explain with examples of each.

80 km/hr

When you apply force to an object, how does it change the position or motion of the object? Explain with an example of using a lever or a pulley.

40 km/hr

What is frictional force? Can you name one activity where you experience frictional force in your daily life?

Home Task

Complete the 'Creating better' activity given on page 88 of the Main Coursebook.

Period 10

SHOULD DO
5 MIN.

Teacher: Good morning, students. How are you all today?

Teacher: Great. Let us begin today's lesson with a quick game. I will ask some questions and you have to answer them. Ready?

Teacher: What type of machine would you use to lift a bucket of water from a well? (Pulley)

Teacher: What is it called when force is applied to change the position of an object? (Work)

Teacher: When you use a hammer to drive a nail into a wall, what type of force are you applying? (Mechanical force)

Teacher: Can anyone think of a situation where you experienced frictional force when walking? (Walking on the floor)

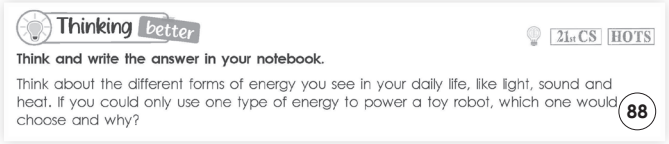
Teacher: Why do we need energy to do work? (To move or change the position of objects)

Teacher: Great work, everyone. Let us now get ready for today's lesson.

Thinking better

Teacher: Let us begin today's lesson with an activity that helps us think more deeply. I want you to think about the different forms of energy you encounter in your daily life, such as light, sound and heat.

MUST DO
10 MIN.



Teacher: Now, imagine you have a toy robot and you can choose only one type of energy to power it. Which energy would you choose and why? Write about your thoughts in your notebook.

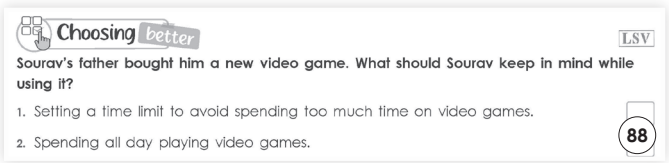
(Let the students think and write in their notebook.)

Teacher: Great thinking.

Choosing better

Teacher: Now, let us look at a scenario. Sourav's father has bought him a new video game. What do you think Sourav should keep in mind while using it?

MUST DO
5 MIN.



Teacher: Should he set a time limit to avoid spending too much time on video games or should he spend all day playing them?

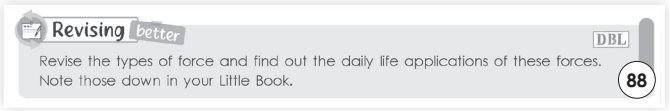
(Let the students choose.)

Teacher: Well done. Setting a time limit helps in balancing work and play. It is important to manage time and use energy wisely. Great thinking, everyone.

Revising better

Teacher: Let us now revise the types of forces we have learned so far. Can anyone think of the forces we encounter in our daily lives?

MUST DO
5 MIN.



Teacher: Think about how these forces help us in activities like lifting objects, riding a bicycle or even walking. How do these forces change the movement or the position of objects? Make a note of these examples in your Little Book.

(Let the students revise and write in their Little Books.)

Teacher: Fantastic.

Pledging better

Teacher: As we know, energy is precious and we must all do our part to use it responsibly.

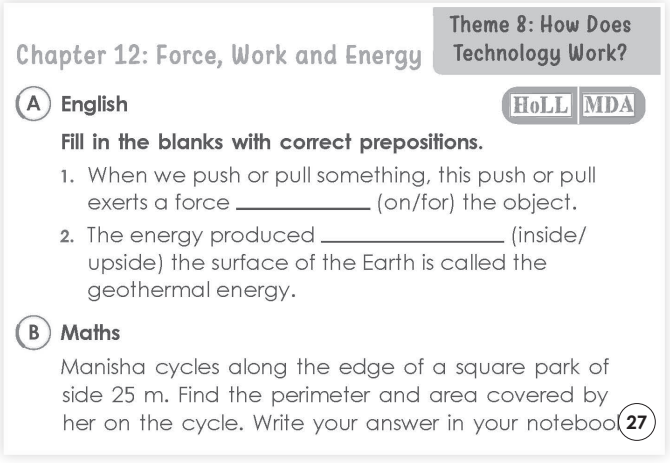
MUST DO
5 MIN.

Teacher: Now, repeat after me: In my own little way, I pledge to switch off appliances when not in use.

Teacher: Great. Now, think about other ways you can save energy at home and make a difference.

Teacher: Well done, everyone. Every small effort to save energy counts. Keep making a difference by using energy efficiently and supporting SDG 7, which is about ensuring access to affordable, reliable, sustainable and modern energy for all.

Book of Holistic Teaching



C Social Studies

Write the names of any three machines that are commonly used in different industries. (27)

COULD DO

10 MIN.

Refer to the Book of Holistic Teaching, page number 27 under the title 'Force, Work and Energy.' Complete the activities mentioned in this section and ensure that the students complete them. These activities are designed to enhance their holistic understanding and engagement with the topic. Provide any necessary support and materials to help the students successfully finish the activities.

(Instruct students to bring their workbooks to their next class.)

Differentiated Activities

110 km/hr

How does energy conservation help in protecting our environment? Explain how simple actions, such as switching off unused appliances, make a big impact.

80 km/hr

Why is it important to limit the time spent on energy-consuming activities, such as video games or watching TV?

40 km/hr

Can you name one thing in your house that uses electrical energy?

Home Task

The Project Idea, given in the book of Project Ideas, page 17 under the title 'Force, Work and Energy.' This project should be assigned to the students as a home task. Ensure that the students understand the project requirements and provide any necessary guidance or materials they might need.

Period 11

SHOULD DO

5 MIN.

Teacher: Good morning, students. Let us refresh our minds before we begin today's lesson. Ready for some quick questions?

Teacher: What is the energy that helps us see things? (Light energy)

Teacher: What type of energy is used in a windmill to produce electricity? (Wind energy)

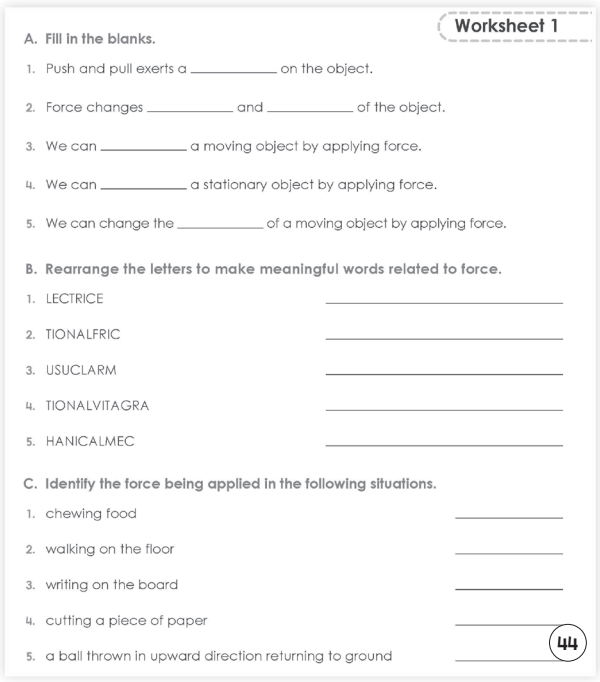
Teacher: What kind of energy makes your phone or TV work? (Electrical energy)

Teacher: What energy is used when we eat food to make our body move? (Chemical energy)

Teacher: What happens when we apply heat energy to water? (It boils or evaporates)

Teacher: Excellent answers. Let us now move on to today's lesson.

Worksheet 1



Worksheet 1

A. Fill in the blanks.

1. Push and pull exerts a _____ on the object.
2. Force changes _____ and _____ of the object.
3. We can _____ a moving object by applying force.
4. We can _____ a stationary object by applying force.
5. We can change the _____ of a moving object by applying force.

B. Rearrange the letters to make meaningful words related to force.

1. LECTRICE _____
2. TIONALFRIC _____
3. USUCLARM _____
4. TIONALVITAGRA _____
5. HANICALMEC _____

C. Identify the force being applied in the following situations.

1. chewing food _____
2. walking on the floor _____
3. writing on the board _____
4. cutting a piece of paper _____
5. a ball thrown in upward direction returning to ground _____

44

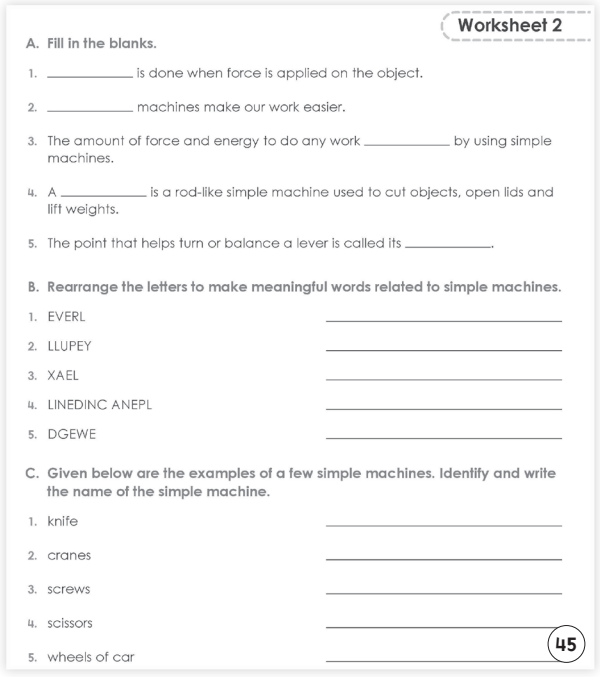
MUST DO

10 MIN.

Teacher: Let us do some activities from the workbook. Everybody, please open page 44 of your workbook and answer the questions given in worksheet - 1.

(Let the students answer the questions on their own. Then discuss the answer by writing the correct answer on the blackboard.)

Worksheet 2



Worksheet 2

A. Fill in the blanks.

1. _____ is done when force is applied on the object.
2. _____ machines make our work easier.
3. The amount of force and energy to do any work _____ by using simple machines.
4. A _____ is a rod-like simple machine used to cut objects, open lids and lift weights.
5. The point that helps turn or balance a lever is called its _____.

B. Rearrange the letters to make meaningful words related to simple machines.

1. EVERL _____
2. LLUPEY _____
3. XAEL _____
4. LINEDINC ANEPL _____
5. DGEWE _____

C. Given below are the examples of a few simple machines. Identify and write the name of the simple machine.

1. knife _____
2. cranes _____
3. screws _____
4. scissors _____
5. wheels of car _____

45

MUST DO

10 MIN.

Teacher: Let us do some activities from the worksheet - 2. Everybody, please open page 45 of your workbook and answer the questions given in worksheet – 2.

(Let the students answer the questions on their own. Then discuss the answer by writing the correct answer on the blackboard.)

You may generate additional practice worksheets using the **Test Generator** given on the digital platform.

Book of Project Ideas

Chapter 12: Force, Work and Energy

Theme 8: How Does Technology Work?

Sustainable sources of energy ICT PRO 21st CS

Materials required: notebook, pen, coloured paper, markers, crayons, glue, a pair of scissors

- Gather information regarding the sustainable sources of energy using Internet*.
- Write down key points and interesting facts about each type of sustainable energy source.
- Create sections in your notebook for solar, wind, hydro and geothermal energy.

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- For each energy source, create a page with a title, description and diagrams.
- Put your pages together and add a cover page and with the title "Sustainable Sources of Energy" and your name.
- Practice presenting your report in class.
- Share the information you learned about each energy source with your classmates.

21

Discuss the project assigned as the home task in the tenth period, focusing on helping students understand the objectives and addressing any challenges they face.

COULD DO

10 MIN.

Teacher: Now, let us complete the 'KWL' activity.

Teacher: Take out your notebook and fill in the 'L' column. Write what you have learned in this chapter. (Wait for students to fill in the chart.)

SHOULD DO

5 MIN.

Teacher: Let us all give a huge round of applause to everyone for their hard work and creativity. Great work, everyone. See you in the next class. Have a wonderful day ahead.

Differentiated Activities

110 km/hr

Can you explain how energy is converted from one form to another? Provide two examples from daily life.

80 km/hr

What are two ways energy can be used in daily life? Can you think of one example each for light and mechanical energy?

40 km/hr

What is energy used for in our daily life? Give one example of how we use energy.

Home Task

Write a paragraph explaining how the Sun provides energy for plants to make their food.

Learning Outcomes

The students will:

Domain	Learning Outcome
Physical Development	• improve physical coordination and fine motor skills through guided experiments and hands-on activities to explore the effects of gravity, mechanical force and friction on the movement and position of objects, including the use of simple machines.
Socio-Emotional and Ethical Development	• describe the importance of conserving energy and commit to responsible energy use in daily life by identifying at least two sustainable practices they can follow, in line with SDG 7.
Cognitive Development	• identify and classify different forms of energy such as heat, sound, electrical, chemical, atomic and geothermal and explain one practical use for each in everyday contexts.
Language and Literacy Development	• improve their ability to describe scientific concepts using correct terminology, enabling clear communication of energy, work and force in both written and spoken forms.
Aesthetic and Cultural Development	• develop an understanding of the cultural significance of energy sources, fostering creativity and innovation in problem-solving through the use of energy and simple machines in everyday life.
Positive Learning Habits	• develop the ability to think critically about energy conservation and apply simple machines in practical situations to make tasks easier, fostering a habit of problem-solving and efficiency.

Starry Knights

How do you feel after teaching the lesson — exhausted or energetic? Share reasons.

Reward yourself with a STAR.