SCIENCE

Physics

Forms of Energy

Year 8

Term 2
10 Weeks

Name:

Teacher:

faith
CHRISTIAN SCHOOL

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What to expect in Year 8 Science: Forms of Energy

Christian Worldview Energy is at the heart of God's creation. We all rely on being able to use energy, and the universe is governed by the conservation law of energy. "For in Him and through Him and to Him are all things. Glory be to God." Romans 11:36.

Unit Overview
To assist families in covering a busy Secondary curriculum, this Science unit allows students to study topics within a Christian worldview and develop inquiry skills whilst also fulfilling parts of the assessment criteria for Science.

Students will learn about how energy appears in different forms, including movement (kinetic energy) and potential energy. They will study energy transformations and transfers and learn about the forms of light and how it reflects and refracts. Students will learn about sound energy and investigate types of energy with practical activities.

Online Videos
Every effort has been made to only include YouTube videos that we can link in safe mode. However, for technical reasons this is not always possible. We ask that you monitor your child's activity closely when working online.
YouTube videos should be opened in a web browser NOT the YouTube app where possible.

Please note that assignments and exams will need to be completed and submitted by the due dates given. If a student wishes to apply for an extension they will need a doctor's certificate to accompany their request.

Time allocation:
10 weeks, 3 lessons per week, 3 hours per week

Week	Lesson Focus	Work Submissions
1 p. 6	**Lesson 1:** Christian Worldview & Prior Knowledge Test **Lesson 2:** Introduction to Energy **Lesson 3:** Experiment: Spinning Snake	
2 p. 15	**Lesson 1:** Kinetic Energy **Lesson 2:** Potential Energy **Lesson 3:** The Relationship Between Potential & Kinetic Energy	
3 p. 24	**Lesson 1:** Measuring Energy **Lesson 2:** The Law of Conservation of Energy + Types of Energy **Lesson 3:** Research Investigation: Identify a Claim	**Energy Research Investigation** Released Friday 5 May
4 p. 32	**Lesson 1:** Find & Cite Information + Analyse Data **Lesson 2:** Find & Cite Information + Analyse Data **Lesson 3:** Quality of Evidence	
5 p. 38	**Lesson 1:** Research Investigation: Putting it All Together **Lesson 2:** Energy Efficiency **Lesson 3:** Light Energy & Electromagnetic Spectrum	**Energy Research Investigation** **-** Formative assessment Due: Friday 19 May
6 p. 46	**Lesson 1:** Reflection **Lesson 2:** Refraction **Lesson 3:** Experiment: Refraction	
7 p. 53	**Lesson 1:** Sound Energy **Lesson 2:** Experiment: Seeing Sound Waves **Lesson 3:** Submit Final Research Investigation	**Energy Research Investigation** **-** Summative assessment Due: Friday 2 June
8 p. 59	**Lesson 1:** Revision **Lesson 2:** Revision **Lesson 3:** End of Unit Test	**End of Unit Test** - Summative assessment Due: Friday 9 June
9 p. 64	**Lessons 1&2:** Science as a Human Endeavour: Blue LED Light **Lesson 3:** Investigation: Making a Speaker	
10 p.66	**Lessons 1-3:** Introduction to Chemistry	

Resources & Additional Information

Notes for Home Educators:

What you need for the experiments and activities in this workbook:

- Protractor (grocery stores have them in the stationary section + cheap shops)
- Elastic / rubber bands the same size
- Chalk (or physical marker of some kind)
- Ruler
- Measuring tape
- Piece of paper
- Permanent marker
- A glass / tumbler
- A cardboard cylinder (such as a Pringles can or large toilet roll)
- Scissors or craft knife / Stanley knife
- 2 large alligator clips or foldback clips
- Masking tape
- Mobile phone
- Optional: coloured paper, stickers or paint to decorate your amplifier
- A balloon
- Optional activity: magnet, cardboard, paper clips
- Slinky (cheap shops often have them very reasonably priced)
- Empty tin
- String
- Broom handle or similar
- 2 chairs
- Candle
- Matches or lighter
- Small mirror (to fit inside a tumbler / glass)
- Cling wrap
- 100s and 1000s (or other kind of sprinkles / rice grains / sugar)
- Bowl
- Metal tray
- Wooden spoon

Submission icon | How to submit to Learning@Faith
When you see this icon, it is time to submit your work to **Learning@Faith**. Follow the instructions below to submit your work.

1. Check you are signed into the correct student user account on **Learning@Faith.**
2. On the student dashboard, click on the class you are submitting work for and go to Course Outline.
3. Click on the title of the work you are submitting.
4. Click on CREATE SUBMISSION.
5. Click on, or drag in your file to attach file.
6. Click submit. Congratulations, you have submitted your work!

Feedback
You are important and so is your opinion. Do you have any positive points or constructive criticism you want to share? Below is a link to provide feedback on this unit. NOTE: This feedback is reviewed at the end of term, for day-to-day questions or feedback, please contact your teacher.

PLEASE CLICK HERE TO OPEN LINK & SUBMIT FEEDBACK

Learning Intention: Students will consider a Biblical basis for the study of energy.
Success Criteria: I can use verses from the Bible to describe the wonders of energy and the laws of the universe.
Inquiry Question: What does the Bible have to say about energy and the laws of the universe?

Christian Focus

God is the source of all energy, and He is the one who set up all of the natural laws in the universe.
"*In the beginning God created the heavens and the earth.*" **Genesis 1:1**

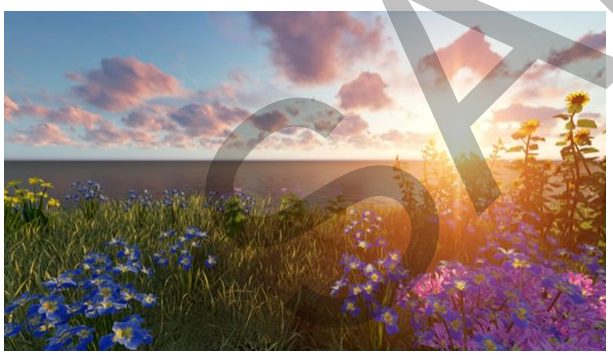
Click here *to watch the Weekly Intro video to start your week.*

Why would we want to study energy? This lesson gives some explanation of why this is important and how we might apply the principles learned in this unit.

Energy is God-given

- "*Of old you laid the foundation of the earth, and the heavens are the work of your hands.*" (**Psalm 102:25**)
- "*For in Him and through Him and to Him are all things. Glory be to God.*" **Romans 11:36**
- "*He is before all things and in Him all things hold together.*" **Colossians 1:17**
- "*God is light and in Him there is no darkness at all.*" **1 John 1: 5**

The Bible tells us that God not only created the Earth and the heavens but also that He is the one who holds everything together. We may say that the laws that govern the universe are God's laws and that He is the One who keeps the universe from breaking and coming apart. In Physics, there is a law that states that 'Energy can neither be created nor destroyed'. This means that the energy around us cannot be eliminated or disappear and also that we cannot create more energy than what we already have. Energy may not be destroyed, but it can change from one form to another.



In God's creation, energy is the key to understanding how the universe works. One of the most common forms of energy is light. Each ray of light that travels from the Sun carries a tiny, tiny amount of energy. The Sun releases energy as light by converting some of its mass into light. Every second, the Sun converts more than 4 million tonnes of matter every second to produce light.

A tiny fraction of this light reaches the Earth, where it is used to make plants grow, it warms our atmosphere making Earth suitable to live on. Light energy from the Sun is also what powers the weather on Earth.
Everything that grows depends on light for energy. And though the law of physics states "Energy can neither be created nor destroyed", God has provided us with a source of limitless energy in the Sun, that allows us to live in this amazing creation around us. And where mankind certainly cannot create energy out of nothing, this is God's world where He has shown us time and time again that He is Lord over all the energy and matter in this universe. Take for example the fact that Jesus could produce enough food for more than five thousand people, starting with only five loaves of bread and two fish. That is creating energy from nothing, because food is full of chemical energy - we eat it to get the energy we need for all our body does.

Week 1 Lesson 1 Continued…

In the table below, look up the verses and write down what God has created from nothing or almost nothing. Does what is created contain energy?

Bible verses	**What is created?**	**Is it created from nothing or if not, what is it created from?**	**Is there energy in what is created? (Did God create energy in this miracle?)**
e.g. Genesis 2:7	A man	dust	yes
Genesis 2: 21-22			
Exodus 16:14-18			
1 Kings 17: 7-16			
Jonah 4: 5-7			
Matthew 15: 32-38			

Going Further

God is a God who gives

As you study this unit on energy and all the different forms of energy there are in this world, which is God's creation, make it a desire in your heart to see all God has given us in everything you are learning. I love the respect that some of the amazing Biblical characters had for God, because they acknowledged that everything they have is from God.

Look up the following verses and see if you can match up the following men and women of God in the Bible with their acknowledgement that God gives them all they need:

Numbers 27:16 Psalm 68: 34-35
Joshua 1: 12-15 Luke 1: 46-55
Ezra 9: 8 Romans 4:17

Moses		God gives light to our eyes
Joshua		God calls into being things that were not
Ezra		God gives breath to all things
David		God gives rest
Mary		God gives power and strength
Paul (assumed)		God fills the hungry with good things

Week 1 Lesson 1 Continued…

Pre-test

This is a short test to find out what you already know before you begin this course.
It will give you a bit of a taste of what kinds of things you will be studying over the next few weeks.

Q1. Which of the following is **not** true about energy?

A. Energy is constantly being used up
B. Energy can change form
C. Energy can be transferred
D. Energy can be stored

Q2. Which of the following is a form of energy?

A. Sound
B. Light
C. Heat
D. All of the above

Q3. Which of the following has potential (stored) energy?

A. an harmonica
B. a rubber band
C. a bowling ball once it has come to a stop
D. a bouncing ball at the top of its bounce

Q4. Which of the following does not have kinetic (moving) energy?

A. a roller coaster going downwards
B. a bouncing ball travelling upwards
C. a bowling ball hurtling down the lane
D. a bouncing ball at the top of its bounce

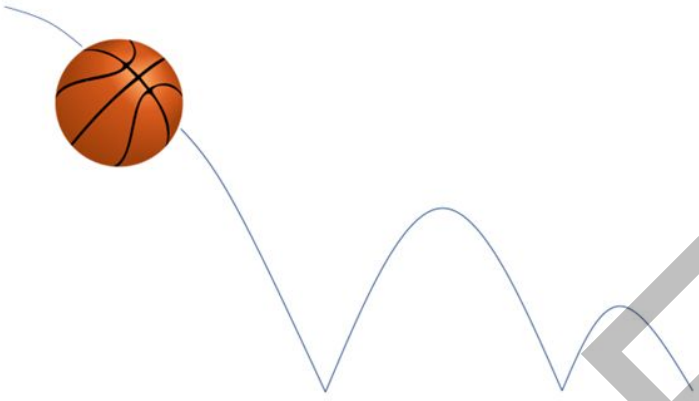
Q5. Which of the following is true about sound?

A. it can travel through space
B. it travels slowly through solids compared with air
C. it travels in waves
D. it travels at a speed of about 1200 km per second

Q6. Explain what is happening in the picture to the right. Is the straw broken?

Week 1 Lesson 1 Continued…

Q7. On the picture of a bouncing ball below, draw an arrow showing where the greatest kinetic energy of the ball is, and an arrow showing where the greatest potential energy of the ball is.



Q8. Does the ball have energy when it hits the ground? What sort of energy/energies is it?

What is Energy?

Lesson Title: What is Energy?
Learning Intention: Students will be able to describe what energy is.
Success Criteria: I can describe what energy is and name some types of energy.
Inquiry Question: What is energy and what are some types of energy?

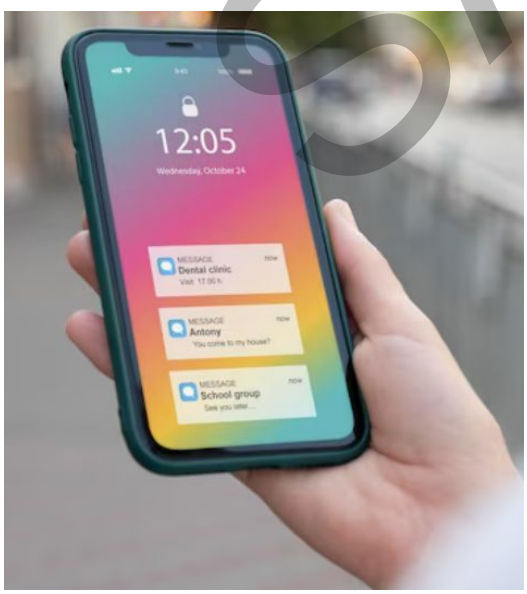
What is Energy?
Energy: The ability to do work.
Work: Making some observable change/making something happen.
Energy is one of the key fundamental constituents of the universe. It can be found in everything we see around us from the ground beneath our feet to the sky above us, we can find examples of energy.
In this unit, you will learn about the various forms that energy can take, how energy can be transformed from one form to another, and how humans have used energy in ingenious ways.

This section gives some explanation of why this is important and how we might apply the principles learned in this unit.

Energy in Daily Use
Think about a mobile phone. Answer the questions below:

1. Where does its energy to run come from? _____
2. Does it produce a sound? _____
3. Does it produce light? _____
4. Does it produce movement? _____
5. Does it produce heat? _____

In the table below is a list of different forms of energy. See if you can identify which of these forms of energy are present in the mobile phone, and put a tick or a cross next to it:



Form of energy	Presence in mobile phone?
e.g. Thermal (heat energy)	Yes
Nuclear energy	
Electrical energy	
Chemical energy	
Sound energy	
Light energy	
Magnetic energy	
Elastic energy	

Week 1 Lesson 2 Continued…

Energy transfer and transformation

When you swing a golf club at a ball and hit it, immediately the energy in that movement of the golf club produces movement energy in the ball as well. This is called **energy transfer**. We are not changing the form of the energy, movement energy has simply been passed from one moving object to another object.

However, you may have noticed that another thing happens when a golf club hits a ball. There is a nice thwack sound of a well-hit ball! Maybe you know that sound or maybe you don't 😊. Either way, when a sound is produced, the movement of the club hitting the ball has also created an **energy transformation**. Some of the movement, or kinetic, energy has become sound energy - a transformation of energy from movement to sound.

Optional video: click here to watch the short video **Energy Transfer and Transformation by Moo Moo Math.**

Questions

What different energy types are produced in a bonfire?

What energy types are produced when a plate smashes on a tiled floor?

When you strike a match it produces a spark and a sharp scraping sound. Is this an energy transfer or transformation? Why?

When you strike a ball with a snooker cue, the ball moves. Is this an energy transfer or transformation? Why?

Week 1 Lesson 2 Continued…

Going Further

In the following table, a number of scenarios are given. Decide if they involve energy transfers or transformations or both, and if they involve transformations, explain what the before and after energy types are.

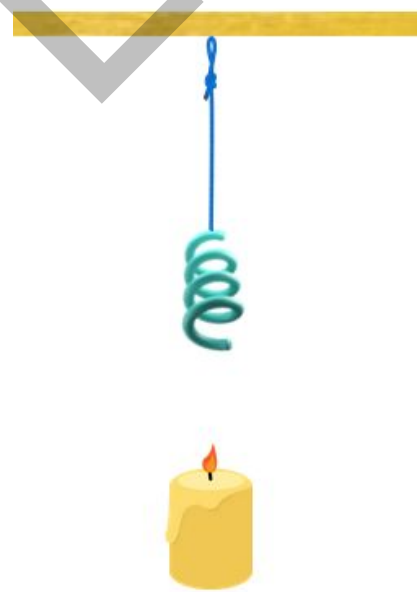
Scenario	Energy transfer	Energy transformation	Before and after energy types
e.g. angle grinder cuts through metal	no	yes	Electrical energy → Mechanical energy → light energy, sound energy, heat energy
a) Making a stir fry on a stove			
b) Hammering a nail			
c) Mowing the lawn			

Experiment: Spinning Snake

Lesson Title: Experiment: Spinning Snake
Learning Intention: Students will explore heat and kinetic energy through an experiment.
Success Criteria: I can observe heat energy transferring into kinetic energy.
Inquiry Question: What evidence can I observe when energy transforms from one type to another?

Risk Assessment: Experiment: Spinning Snake experiment			
Last updated by: Jenny Thornton		Date: Monday, 21st of February, 2021	
Item/ Procedure	Hazards	Consequences / Likelihood	Risk Minimisation
Scissors	Cutting self or others	Consequences: Moderate Likelihood: rare	Carrying scissors with blade closed and handle facing away from carrier Adult supervision of experiment
Open flame	Burning self or others	Consequences: Mild Likelihood: rare	Adult supervision of experiment Experiment done in open, uncluttered area

Aim: To investigate how one type of energy, heat energy, can be transformed into another type of energy, kinetic energy. Kinetic energy is the energy behind movement.
Hypothesis: Heat energy can be transferred into kinetic energy.



Materials needed:
String
Broom handle or similar
2 chairs
Spiral snake cut out of paper - see template provided
Scissors
Candle
Matches or lighter

Method:
1. Read the risk assessment guidelines above before beginning the experiment.
2. Print out the picture of the spiral snake in Appendix 1 (at the end of the workbook) and cut it out so that the snake forms a spiral.
3. Poke a hole into the tip of the snake's tail, where the dot is. Feed the string through the hole and knot it so that the snake can be hung by the string.
4. Set up the broom handle or a ruler or something of a reasonable length between the backs or seats of 2 chairs and tie the snake to the broom handle so that the snake hangs 10 cm above the candle. Refer to the picture shown.
5. Carefully light the candle, making sure the flame does not come in contact with the snake. Observe what happens to the snake and write observations below.

Week 1 Lesson 3 Continued…

Results:
What happened to the snake when the heat from the flame was coming from the candle?

Conclusion:
Did heat energy change into another form of energy? Justify your answer.

Through this experiment, you have just demonstrated an example of thermodynamics. Thermodynamics is the relationship between heat energy and other different types of energy. This experiment is an example of thermodynamics through the transfer of heat energy into the movement of the snake.