**10 Forms of Energy**

**(Grade 4 Science)**

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**Note:** This is a section of a larger, detailed Imaginative Education Unit on Forms of Energy and States of Matter\*\*

(Teachers: you can use *italicized* text to introduce topic to students)

*We all know the stories about superheroes, but this is a story about a real superhero. This superhero is so strong, so amazing, and so adaptable, that they cannot even be killed! WHAT?!?!? I know! This superhero is… immortal.*

*You can melt them, freeze them, evaporate them, turn them into plasma!... but nothing you do is going to kill them. What happens if we freeze? If we melt? If we evaporate! Augh! It’s not good! It’s gooey and messy and it smells bad and somebody has to clean up that mess our body will leave and geez!*

*We are mortal. But energy is not;* ***energy is immortal****. We change manipulate some forms of energy, but we cannot create energy, nor can we destroy it.*

*Not only is energy immortal, but it’s also pretty cool and diverse. Energy is that spectacular aunt or uncle that always seems to have the newest gadgets and visits the neatest places! Volcanoes, archery, guitars… energy has got it all covered! We are going to have a lot of fun with energy- looking at all the different forms and all the different states of matter!*

*Energy is like a good friend, it’s always going to be there. Because it’s immortal. Just hanging out. Waiting for us to find out even cooler stuff about it…*

[NOTE: Once students have a grasp of the 10 forms of energy (summarized in **Appendix 1**) then they can then be challenged to think about how each is heroic in some way.]

**Heroic Quality Activity—What is heroic about each form of energy?**

**Assessing & expanding understanding** (This activity meant to follow initial teaching about forms of energy):

First, ask students to define—using words/images—the 10 kinds of energy. (You might do this, in part, by using the RIDDLES in **Appendix 3**). Then, hand out “heroic qualities” handout (**Appendix 2**). Go over each heroic quality, citing real people/known characters for each quality eg. *Courage*: how did Rosa Parks show courage? Once students all understand what each quality means then in pairs or teams ask them to choose 1 heroic quality from the list that conveys an important aspect of each kind of energy. NOTE: Students should only use each quality once.

**Share out**: As a class, review the assigned qualities. Allow each group to share their choices. Challenge some of the qualities, ask students to elaborate, and draw out strong examples. To conclude the activity, vote on 2 to 4 of the ‘best’ qualities for each form of energy and start to generate as a class what that “person” (energy) would be like.

For example: Gravitational energy possess ***acumen*** because it draws people to the ground and helps them make wise decisions (‘keeps your head out of the clouds’), ***tenacity*** because gravity has been ‘around for a really long time’, and ***assertiveness*** because it never gets confused and always ‘just pulls my pencil to the floor’.

Teacher’s example: *Gravitational energy really seems like a pretty stoic person eh? They like making wise decisions, they never quit, and they like being heard! Gravitational energy is not a rash superhero, they make good solid decisions based on lots of scientific evidence! There’s not much fooling around with this superhero!*

The reasoning and examples students provide in this activity can give you a good sense of students’ levels of understanding and any possible misunderstanding. It would be wise to address these before moving to the next, individual activity:

**Individual Activity: Super Hero Creation**

Randomly assign students a form of energy and ask them to create a super hero that represents this kind of energy. You might give students a template for their super hero body and their super hero profile. The template might include categories like weaknesses, strengths, a crest, a sidekick, and an arch-nemesis.

Example: *This is ScorchaZam! What form of energy do you think she is? That’s right, thermal energy! Her crest on her super hero suit is a coil of red hot heat! Her super power is moving SO QUICKLY and heating things up! What do you think her weakness is? No, not water- but I know where you are going! Normally water puts out fire but ScorchaZam is so powerful she turns that water right into STEAM! What else could be her weakness? Who remembers what to do if there is a fire in the kitchen? That’s right! Baking soda! Oh ScorchaZam does not like baking soda! Now, her arch-nemesis, thankfully, doesn’t know this. ScorchaZam’s arch-nemesis is Arachnidude! Why do you think she might have issues with a spider? What happens when you get stuck in a spider web? What does ScorchaZam, or thermal energy, need to always be doing? Moving! Later on when we learn about ABSOLUTE ZERO (do spooky hands) we’ll find out more about what happens when to particles when they start to slow down too much! If ScorchaZam gets stuck in Arachnidude’s web she might stop moving and fall asleep! Oh no! ScorchaZam’s sidekick is Lucy the Conductor! She can amplify ScorchaZam’s power and transfer it to different places! I wonder what a battle between ScorchaZam and Arachnidude would look like?*

**Some Useful Resources**

**YouTube:**

Nuclear power in a nutshell

**Books**:

Change It! Solids, liquids, gases and you by Adrienne Mason

Solids, Liquids, and Gases *Starting with Science*

Matter (Scholastic)

Magic School Bus series

Bill Nye the Science Guy

**Websites**:

Sciencekids.co

Sciencedaily.com

Science.HowStuffWorks.com

**Appendix 1**

**Forms of Energy Cheat Sheet (for TEACHER)**

Light Energy: visible energy

Piece of paper with the sun, lightbulbs, moon, fireflies, candle, flashlight

Say: What does light give us? What is great about energy as light? What would happen to us without light?

Sound Energy: Energy associated with vibrations of matter

Images: Siren, someone talking, musical instrument, wind, ipad

Say: What do we get from sound? How does sound change our life?

Thermal Energy: energy generated and measured by heat

Images: Fire, oven, iron, lava, sun, blow dryer, melted crayon art

Say: Thermal energy is very important to us. Where would we be without thermal energy?

Elastic Energy: energy that occurs when objects are compressed or stretched

Images: muscles, tribuchets, angry birds

Say: Does this present us with any great things? STRETCH your brain and try to come up with a heroic quality!

Nuclear Energy: Energy in the nucleus of an atom

Images: Nuclear waste, nuclear plant, anti-coal sign

You tube Video- nuclear energy explained: How does it work? Part 1 of 3

Say: This poor form always gets a bad rep- but what do you see in the photos that is important about nuclear energy?

Chemical energy: energy stored in bonds of chemical compounds released during chemical reactions

Images: glow sticks, diet coke and mentos, rust, pop rocks

Say: Woah! Watch out! Put on your safety goggles!

Magnetic Energy: Energy stored in magnetic fields

Images: Magnetic poles of the earth, mri machine, magnets

Say: Think big. Bigger. Even bigger.

Mechanical Energy: energy associated with position and motion (potential and kinetic)

Images: riding a bike, lifting things

Say: We expend this energy a lot! There are so many examples! Challenge yourself and don’t go the easy route on this on!

Gravitational Energy: Potential energy held by an object because of its high position compared to a lower position

Images: minion floating out in space, someone jumping

Say: This form of energy is pretty easy to answer. Can you come up with even more things about what gravity is important? What do astronauts need to worry about when they don’t have gravity?

Electrical Energy: the flow of electrical power or charge

Images: lightening, batteries, outlight, light bulb

Where would you be without electrical energy? What joy does this bring into your life?

**Appendix 2: Heroic Qualities**

**Accountability** – you can count on them, you know they will do what they say they will do

**Humour** – makes you laugh

**Fairness** – treats everyone equally

**Friendship** – is a friend to everyone and seeks for others to be friends as well

**Hard work** – works without complaint and stays on task, does their best effort

**Honesty** – tells the truth

**Acumen** – ability to think clearly and make wise decisions

**Creativity** – thinks of unique ways of doing a job or solving a problem

**Adaptability** – can change themselves to new environments or to solve a challenging problem

**Generosity** – shares a lot with others and seeks to give to others who do not have what they need

**Courage** – brave and takes risks, will stand up for others

**Encouragement** – supports other to make wise decisions and do their best

**Peaceful** – seeks to keep everyone happy and safe; always wants a solution that means safety for all

**Wisdom** – intelligent and thoughtful

**Love** – wants to care for everyone and show everyone love

**Loyalty** – will always stick by you no matter what, you can trust them with all your secrets

**Organization** – everything is in its right place, always know where things are and what they need

**Self-Sacrifice** – will suffer for the well-being of others

**Strength** – strong

**Tenacity** – determined, never going to quit

**Teamwork** – works well with others and seeks a group consensus

**Thrift** – saves wisely and doesn’t spend more than it has to

**Appendix 3—Riddles**

(**Light Energy)**

Only energy you can see

Travels at 300,000 km/s

Plants use this to make food

**(Chemical Energy)**

Will often result in heat energy and sometimes sound energy

This energy is stored in the bonds of atoms and molecules

Hard to go back or un-do

**(Magnetic Energy)**

Iron filings can be used to show this type of energy

Can attract or push things away

Used to help with directions when traveling

**(Thermal Energy)**

Makes particles move faster and faster

Measured in joules

Can be transferred via conduction, convention, or radiation

**(Mechanical Energy)**

Work

Kinetic energy plus potential energy

One object supplies a force for another object to be displaced

**(Sound Energy)**

Energy moves in longitudinal waves

A very low-energy type of energy, produces less force than others

Measured in decibels

**(Gravitational Energy)**

A waterfall is an example of this

This is the energy that archers use to get a target far, far away

Rollercoasters use this on the way down a hill

**(Electrical Energy)**

Concerns electrons and protons

Batteries can transfer this energy

Lightning is an example of this energy

**(Nuclear Energy)**

Concerns the nuclei of an atom

Uses fusion or fission to create electricity

Isn’t deadly but creates a substance that is

**(Elastic Energy)**

Compression or stretching of objects creates this energy

A bouncy ball is an example of this energy

Angry Birds require this form of energy