

Knowing Energy: Tea at Home

Energy Revealed

Answer Key

Level 1-2: Grades 3-8

Level 3-4: Grades 9-12



Reminder:

- $\text{kWh} = (\text{Watts}/1000) \times \text{Time (hours)}$
- $1\text{kW} = 1000 \text{ W}$

Level 1 Questions/Activities:

1. How long does it take for the water to boil in hours?

(1 hour = 3600 seconds/3600 seconds per hour)

Using the video for reference for this question and the ones to follow, it took 4 min 4 seconds (244 seconds/3600, for hours) = 0.068 hours.

2. How many kW is your machine? See reminder above.

1500 Watts = 1.5 kW

3. How many kWh does the machine use per pot?

$\text{kWh} = (1500/1000) \times 0.068 = 0.102 \text{ kWh}$

4. If you make one pot a day, how many kWh are used in one year?

$0.102 \text{ kWh} \times 365 \text{ days} = 37.23 \text{ kWh}$

Level 2 Questions/Activities:

- **Note:** Complete level 1 questions/activities first if you haven't already done so.

1. How many pots of coffee would it take to consume 1 kWh of energy?

$1 \text{ kWh}/0.102 \text{ kWh} = 9.8 \text{ pots}$ which rounds up to 10 full pots.

2. Try the experiment with refrigerated water and then hot water. What are the results in time to boil water?

This is a common myth in energy, but warm water will boil faster since it is closer to the boiling temperature when you start, requiring less energy input to bring it to temperature. However, under certain conditions, hot water can freeze faster! Find more online about that!

3. Check to see if your kettle uses any phantom power. (Power used when water isn't being boiled).

Most newer models will have a small amount, but this is just to be aware of the issue.

Level 3 Questions/Activities:

- **Note:** Complete levels 1-2 questions/activities first if you haven't already done so.

1. How does the volume of water in the pot affect the energy used to boil?

Larger volumes will boil slower; however, this is not a linear relationship.

2. What other appliances in your home can you find that have phantom power as well?

Open-ended, no wrong answer.

Level 4 Questions/Activities:

- **Note:** Complete levels 1-3 questions/activities first if you haven't already done so.

1. What uses more energy; the kettle boiling water or the kettle sitting idle in a year? (Assume 5 Watts idle power or phantom power and one pot a day boiled)

One pot a day = 0.102 kWh from above

Phantom power is given at 5 Watts which needs to be in kW, so 0.005 kW and then multiple this by 8,760 hours (hours in a year) which gives you 43.8 kWh. So, the idle power is greater, compared to making just one pot a day for a year (37.27 kWh).

2. What other variables can you change to influence the time that it takes for the water to boil, assuming the volume is the same?

Some examples are ambient temperature, salt content, the shape of kettle and pressure inside based on the tightness of lid (like a pressure cooker).

3. BONUS: 1. Calculate how many kWh you could eliminate in your house with phantom power reduction (Tip: Phantom power is 24/7, 365).

Dependent on the individual, gaming systems are the biggest culprits.