

Geothermal Energy Lab

Classroom worksheet · Interactive simulation: <https://lkforge.com/tools/physics/geothermal/>

Name: _____ Date: _____

Learning objectives

- Explain how geothermal energy is extracted.
- Relate output to the underground temperature gradient.
- Describe heat transfer from rock to fluid.

Variables to change

- Well depth
- Rock temperature gradient
- Flow rate

Procedure

1. Set a depth and note the temperature of the extracted fluid.
2. Increase the depth and observe the temperature rise.
3. Change the flow rate and observe the effect on extracted power.

Observations

Record extracted temperature and power versus depth and flow rate.

Questions

1. Where does geothermal energy come from?
2. How does temperature change with depth?
3. Why does deeper drilling generally help?

4. How is the heat carried to the surface?

5. Is geothermal energy renewable?

Answer key (instructors)

- **1.** Heat stored in the Earth's interior, conducted up through the crust.
- **2.** It rises with depth (the geothermal gradient, $\sim 25\text{--}30\text{ }^{\circ}\text{C}$ per km on average).
- **3.** Deeper rock is hotter, so the extracted fluid carries more usable heat.
- **4.** A working fluid (water/steam) is heated by contact with hot rock and pumped up.
- **5.** Effectively yes, if heat is extracted no faster than it is replenished from below.

Geothermal energy taps the Earth's internal heat, which increases with depth along the geothermal gradient. A working fluid heated by hot rock carries energy to the surface; drawing heat sustainably keeps it renewable.