

Name: _____

Class: _____

Due Date: _____

B.2 Greenhouse Effect

Understandings

- The conservation of energy.
- Emissivity as the ratio of the power radiated per unit area by a surface compared to that of an ideal black surface at the same temperature as given by
$$\text{emissivity} = \frac{\text{power radiated per unit area}}{\sigma T^4}.$$
- Albedo as a measure of the average energy reflected off a macroscopic system as given by
$$\text{albedo} = \frac{\text{total scattered power}}{\text{total incident power}}.$$
- The Earth's albedo varies daily and is dependent on cloud formations and latitude.
- The solar constant S .
- The incoming radiative power is dependent on the projected surface of a planet along the direction of the path of the rays, resulting in a mean value of the incoming intensity being $\frac{S}{4}$.
- Methane CH_4 , water vapor H_2O , carbon dioxide CO_2 , and nitrous oxide N_2O are the main greenhouse gases and each of these has origins that are both natural and created by human activity.
- The absorption of infrared radiation by the main greenhouse gases in terms of the molecular energy levels.
- The augmentation of the greenhouse effect due to human activities is known as the enhanced greenhouse effect.

Equations

$$\text{emissivity} = \frac{\text{power radiated per unit area}}{\sigma T^4}$$

$$\text{albedo} = \frac{\text{total scattered power}}{\text{total incident power}}$$

The solutions can be found on the YouTube channel Go Physics Go:

<https://www.youtube.com/@gophysicsgo/playlists>

Part 1: Use your favorite sources to answer the following questions

1. State the law of conservation of energy.
2. State the definition, equation, and units for *emissivity*. What is the *emissivity* of a really dark colored object? What is the *emissivity* of a really light colored object?
3. State the definition, equation, and units for *albedo*. What is the *albedo* of a really dark colored object? What is the *albedo* of a really light colored object?
4. What is the mathematical relationship between the *albedo* and *emissivity* of an object?

5. What is the meaning, value, and units of the Sun-Earth *solar constant*?
6. Describe the equation $\bar{I} = \frac{P}{A} = \frac{S}{4}$.
7. Define the *greenhouse effect* and the *enhanced greenhouse effect*. What are the four major *greenhouse gases*? State their name and chemical formula.

Part 2: Browse these websites for more information on climate change

The world's most viewed site on global warming and climate change

www.wattsupwiththat.com

Climate Depot: Redefining Global Warming Reporting

<https://www.climatedepot.com/>

Climate Hustle

<https://www.climatehustle.org/>

Climate Hustle 2

<https://www.climatehustle2.com/>

Let's Review 50 Years of Dire Climate Forecasts And What Actually Happened

<https://www.zerohedge.com/political/lets-review-50-years-dire-climate-forecasts-and-what-actually-happened>

Let's Review 50 Years of Dire Climate Forecasts and What Actually Happened

<https://www.thestreet.com/mishtalk/economics/lets-review-50-years-of-dire-climate-forecasts-and-what-actually-happened>

Drought Reveals Medieval “Hunger Stones” in European Rivers

<https://www.odditycentral.com/news/drought-reveals-medieval-hunger-stones-in-european-rivers.html>

Part 3: Browse these websites for more information on renewable energy**Planet of the Humans**

<https://planetofthehumans.com/>

Are EVs Good For The Environment? ...Mostly Not

<https://www.zerohedge.com/technology/are-evs-good-environment-mostly-not>

The “Battery Fairy” & Other Delusions in the Race to Replace Gas-Powered Cars

<https://www.zerohedge.com/energy/battery-fairy-other-delusions-race-replace-gas-powered-cars>

Achtung Baby (It’s Cold Outside) – Germany’s “Green” Energy Fail Rescued By Coal and Gas

<https://www.zerohedge.com/technology/achtung-baby-its-cold-outside-germanys-green-energy-fail-rescued-coal-and-gas>

“Super Emitters”: 1% of People Cause Half of Global Aviation Emissions

<https://austrian.economicblogs.org/zerohedge/2020/durden-emitters-global-aviation-emissions/>

The 10 Most Insane Requirements of the Green New Deal

<https://thefederalist.com/2019/02/07/ten-most-insane-requirements-green-new-deal/>

California EV Mandate Could “Lead To Disaster” For State’s Already Fragile Electric Grid

<https://www.activistpost.com/2020/09/california-ev-mandate-could-lead-to-disaster-for-states-already-fragile-electric-grid.html>

The Holy Grail of Endless Energy: Harvesting Blackholes

<https://oilprice.com/Energy/General/The-Holy-Grail-of-Endless-Energy-Harvesting-Blackholes.html>