



The sun is our primary source of energy and this energy is transferred to air, land and water. The sun is the ultimate cause of changing weather systems

### Kinetic Molecular Theory

**Temperature** is a measure of the average kinetic energy of the particles of a substance or how “hot” or “cold” something is

*The greater the temperature, the greater the average kinetic energy and thus the faster the particles move*

**Heat (Thermal Energy)** is the total kinetic energy of all particles of a substance and is transferred from a warm object to a cooler one due to a difference in temperature

### Methods of Heat Transfer

- 1) **Radiation** is the transfer of energy by means of waves that do not require a medium
- 2) **Conduction** is the transfer of energy through the collision of particles.
- 3) **Convection:** is the transfer of energy vertically by movement of particles in a fluid (water or atmosphere)
- 4) **Advection** is the transfer of energy horizontally by movement of particles in a fluid (water or atmosphere).

These four methods of energy transfer help to maintain Earth’s energy balance as well as distribute energy around the world

### The Energy of the Sun

The solar energy that reaches the Earth is either reflected or absorbed

30% is reflected : 27% by clouds and particles in the atmosphere  
3% by Earth’s Surface

70% is absorbed : 20% by clouds  
50% by water, land and ice

The solar energy absorbed drives the water cycle and weather systems

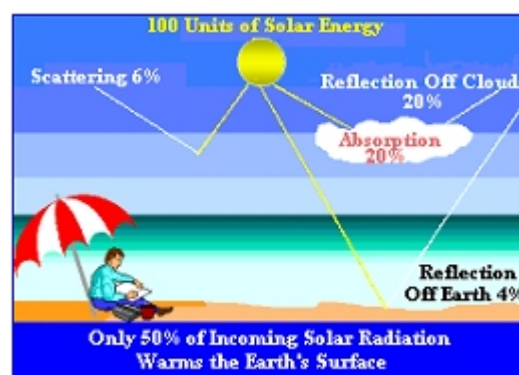
**Albedo** is a measure of the percentage of light an object reflects

High Albedo

Object that reflect a lot of light  
snow, clouds and light coloured areas (sand, pale rocks and deforested areas)

Low Albedo

Object that absorb more light than they reflect.  
Dark surfaces such as asphalt and dark soil



**Heat Sink** refers to any material that absorbs energy and becomes warmer.

**Heat Source:** any warm body such as water or land in contact with colder air. Heat is transferred from a warm object to a cooler object.

**Heat Capacity** is a measure of how much heat is required to increase the temperature of a substance or how much heat is released as the temperature decreases.

## **Latent Heat**

**Latent Heat** is a measure of the attraction between particles in a substance. 'Latent' means 'hidden'.

**Latent heat of vaporization (evaporation)** refers to the amount of energy that must be absorbed by substance to change from a liquid to a gas.

**Latent heat of fusion (melting)** refers to the amount of energy needed to change a substance from a solid to a liquid

### **PART A: Multiple Choice**

1. When Earth receives energy from the Sun, \_\_\_\_\_.
  - (A) some energy is reflected back into space
  - (B) some is absorbed by the atmosphere
  - (C) some is absorbed by land and water on Earth's surface
  - (D) All of the above
  
2. The interaction of air, water and \_\_\_\_ causes weather.
  - (A) Sun
  - (B) humidity
  - (C) wind
  - (D) land
  
3. The transfer of energy that occurs when molecules bump into one another is called \_\_\_\_\_.
  - (A) Conduction
  - (B) Radiation
  - (C) Condensation
  - (D) Convection
  
4. The transfer of heat by molecule-to-molecule contact is:
  - (A) advection.
  - (B) convection.
  - (C) conduction.
  - (D) radiation.
  
5. The horizontal transport of any atmospheric property by the wind is called:
  - (A) advection
  - (B) radiation
  - (C) conduction
  - (D) convection
  
6. A heat transfer process in the atmosphere that depends upon the movement of air is:
  - (A) conduction
  - (B) absorption
  - (C) convection
  - (D) radiation
  
7. Heat transferred outward from the surface of the moon can take place by:
  - (A) advection
  - (B) conduction
  - (C) convection
  - (D) radiation

8. Sunlight that bounces off a surface is said to be \_\_\_\_\_ from the surface.
- (A) radiated
  - (B) absorbed
  - (C) emitted
  - (D) reflected
9. On the average, about what percentage of the solar energy that strikes the outer atmosphere eventually reaches the earth's surface?
- (A) 5%
  - (B) 15%
  - (C) 30%
  - (D) 50%
10. The combined albedo of the earth and the atmosphere is approximately \_\_\_\_\_ percent.
- (A) 4
  - (B) 10
  - (C) 30
  - (D) 50
11. The albedo of the earth's surface is only about 4%, yet the combined albedo of the earth and the atmosphere is about 30%. Which set of conditions below best explains why this is so?
- (A) high albedo of clouds, low albedo of water
  - (B) high albedo of clouds, high albedo of water
  - (C) low albedo of clouds, low albedo of water
  - (D) low albedo of clouds, high albedo of water
12. Which of the following is the poorest conductor of heat?
- (A) still air
  - (B) water
  - (C) snow
  - (D) soil
13. The term "latent" means:
- (A) late
  - (B) hot
  - (C) light
  - (D) hidden
14. The heat energy absorbed to change a liquid into water vapor is called:
- (A) latent heat of vaporization
  - (B) latent heat of fusion.
  - (C) latent heat of fission.
  - (D) latent heat of condensation.
15. The cold feeling that you experience after leaving a swimming pool on a hot, dry, summer day represents heat transfer by:
- (A) conduction
  - (B) convection
  - (C) radiation
  - (D) latent heat