

# TCAP STUDY GUIDE: PART I

## Energy: Forms of Energy

1. There are two main types of energy: kinetic (motion) and potential (stored).

| <b>Kinetic</b>   | <b>Potential</b>  |
|--|---|
| <b>Thermal</b> energy = heat   | <b>Gravitational</b> - stored from its position (on shelf, on table, on mountain, up high)        |
| <b>Electrical</b> energy is energy carried by an electrical current. It can produce heat, sound, or light energy.  | <b>Chemical</b> - stored in matter (batteries, gasoline, candle wick, wooden log, etc)            |
| <b>Radiant</b> (light) and <b>sound</b> energy are types of energy that travel in the form of waves.               | <b>Nuclear</b> - stored in nucleus of atom (sun, nuclear power plant)                             |
| <b>Mechanical</b> energy is energy that results from movement (ex: machines, muscles, wind, waves, ocean currents) | <b>Elastic</b> - stored in stretched object (rubber band, stretched bow, compressed spring, etc.) |

2. The **law of conservation of energy** states that energy cannot be created or destroyed.

3. When thinking of energy transformations, think of the starting energy source. Is it battery powered (chemical) or plugged into an outlet (electrical)?

4. Then think of the end result of the device. Is it supposed to create a sound, light up (radiant), spin a fan (mechanical), etc?

### 5. **Example Questions:**

- Campers make a campfire with logs. Which is an energy transformation that takes place as logs burn?
  - A. Electrical energy is transformed into chemical energy.
  - B. **Chemical energy is transformed into light energy.**
  - C. Mechanical energy is transformed into electrical energy.
  - D. Light energy is transformed into heat energy.
- What describes the energy transformation of an iPod?
  - A. Mechanical to sound to electrical
  - B. Sound to chemical to electrical
  - C. **Chemical to electrical to sound** (*iPods are battery powered*)
  - D. Electrical to chemical to sound

## **Energy: Electricity and Circuits**

1. Energy cannot be created (added) or destroyed (lost), it can only change form (convert). The total amount of energy **STAYS THE SAME**.
2. A speaker, bell, or buzzer is added to a circuit for sound. A bulb is added for heat/light. A fan can be added for mechanical energy.
3. A battery provides chemical energy to a circuit.
4. A circuit's switch must be closed for an electrical circuit to work. If you do not have a switch, you can use a conductor to close a circuit.

- Conductors are metals, foil, copper, iron, etc.

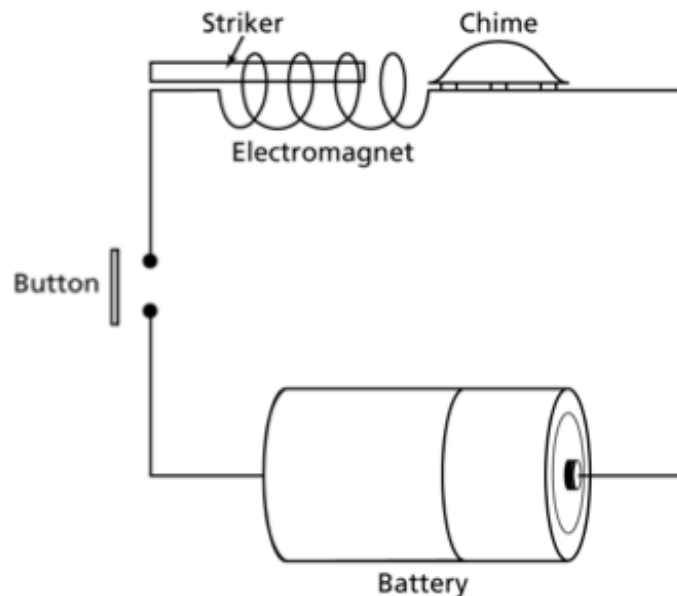
### **5. During an energy transformation, some energy is always converted into heat.**

6. A circuit with a battery **STARTS** with chemical energy, which transfers to electrical energy, and **ENDS** with the specific energy of the load (device for sound, light, etc.)

- *If the question asks about energy conversions and none of the answers start with chemical energy, look for the answer that starts with electrical energy and ends with the specific energy of the load.*
- Ex:

#### **Item # 11**

The diagram shows a simplified doorbell circuit. When the button is pushed, the electricity powers an electromagnet that moves a striker against a chime.

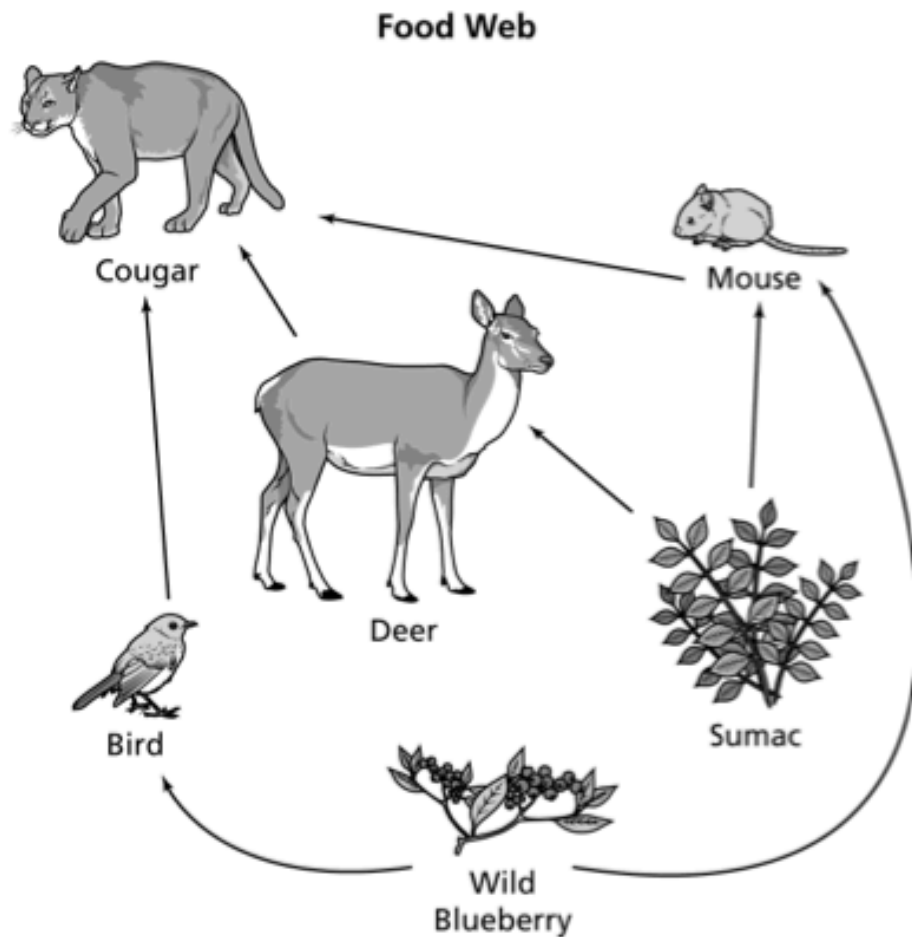


Which energy transformation occurs after the button is pressed?

- A chemical energy → mechanical energy → electrical energy
- B electrical energy → mechanical energy → sound energy
- C electrical energy → sound energy → chemical energy
- D sound energy → chemical energy → mechanical energy

## **Ecosystems: Food Chains and Food Webs**

1. Food chains start with the sun.
2. The sun gives energy to producers.
3. Producers give energy to consumers.
4. Scavengers get energy from plants and animals that have recently died.
5. Decomposers (ex: worm, bacteria, mushroom, fungi) break down the remains of dead organisms.
6. You will need to be able to look at a food web to determine who organisms give their energy to and who they get their energy from.



Which animal in this food web obtains energy from other consumers?

- A Bird
- B Deer
- C Cougar
- D Mouse

## **Ecosystems: Biomes**

1. There are 6 major land biomes.

- **Tundra**- cold desert, permafrost, little precipitation
- **Taiga**- cold, pine trees, mostly snow, little plant life
- **Temperate Deciduous Forest**- 4 seasons, various trees,
- **Rain Forest**- wet, rainy, diverse plant and animal life
- **Desert**- dry, hot days, cold nights, cactus, nocturnal animals
- **Grassland/ Savanna**- crops like wheat, corn, little rain, few trees, zebras, grazing animals like bison, elephants

2. Biomes have biotic (living) and abiotic (nonliving) factors.

| <b>Biotic Examples</b>  | <b>Abiotic Examples</b>  |
|---|--|
| <ul style="list-style-type: none"><li>• GRASS</li><li>• TREES</li><li>• PLANTS AND FLOWERS</li><li>• BIRDS</li><li>• FISH</li><li>• ANIMALS</li><li>• CORAL</li><li>• INSECTS</li></ul> | <ul style="list-style-type: none"><li>• SNOW, RAIN, SLEET, HAIL</li><li>• TEMPERATURE</li><li>• WATER</li><li>• HUMIDITY</li><li>• ROCK, DIRT, SAND, SEASHELLS</li><li>• OXYGEN</li><li>• CLOUDS</li></ul> |

# TCAP STUDY GUIDE: PART 2

## Universe: Components of the Universe

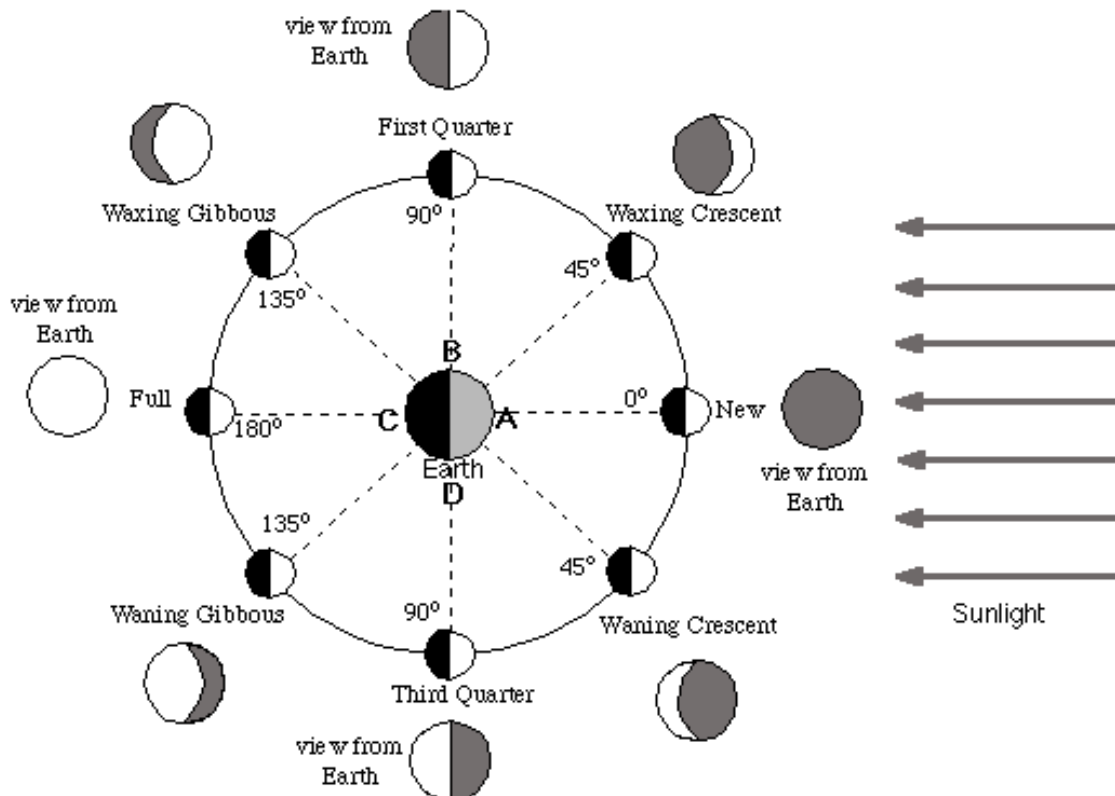
1. Star- Ball of gas that produces its own energy
2. Galaxy- Made up of billions of stars, gas, and dust held together by gravity
  - \* We live in a spiral galaxy called the Milky Way
3. Asteroids- huge chunks of rock that usually orbit between Mars and Jupiter
4. Comet- body made of frozen gas, dust, and rock that forms a tail as it nears the sun (like a boomerang)
5. Planet- Large ball shaped object that orbits a star (the sun)
6. Moon- a natural satellite that orbits a planet
7. Meteoroid- forms from a comets nucleus
8. Meteor- meteoroid that enters earth's atmosphere
9. Meteorite- meteor that strikes earth's surface

## Universe: Day, Lunar Cycle, and Year

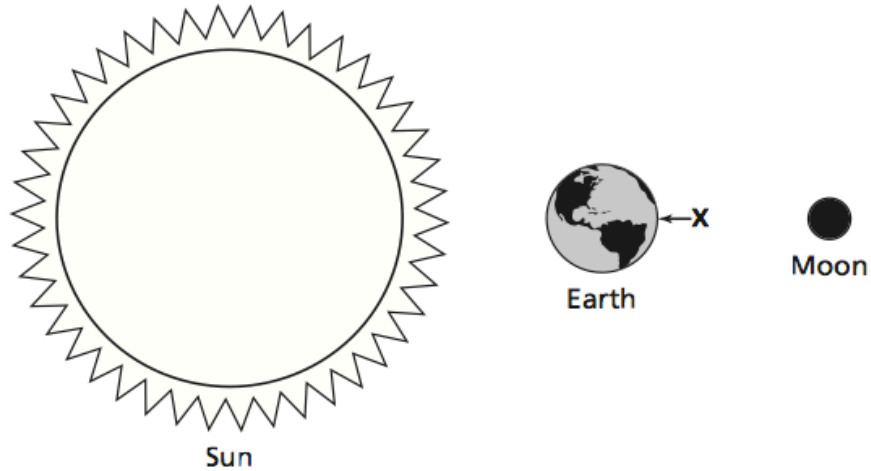
1. The Earth rotates on its axis every 24 hours.
2. Lunar Cycle- The moon orbits/revolves around the Earth every 28 days.
3. The Earth revolves around the sun every 365 days.

## Universe: Moon Phases, Eclipses, and Tides

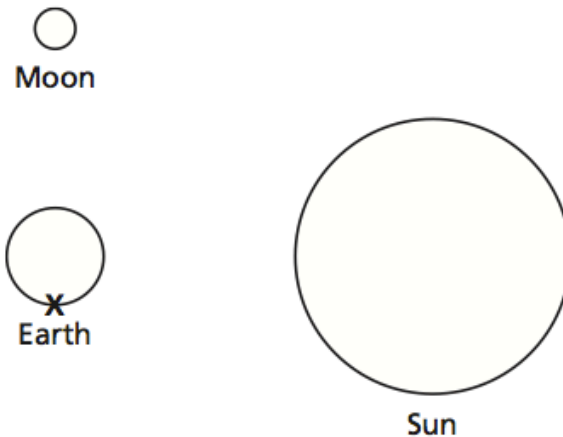
1.



2. A Spring Tide (highest tides) occurs when the Earth, moon, and sun form a straight line.



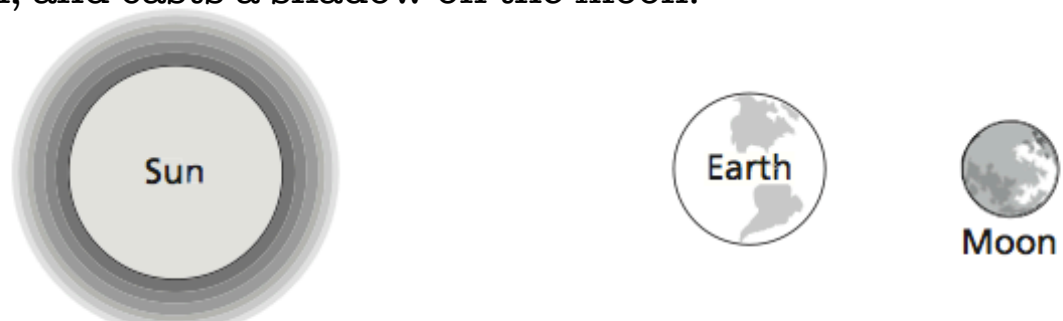
3. A Neap Tide (lowest tides) occurs when the Earth, moon, and sun form a right angle.



4. A solar eclipse occurs when the moon passes directly between the Earth and sun, and casts a shadow on the Earth.



5. A lunar eclipse occurs when the Earth passes directly between the moon and sun, and casts a shadow on the moon.



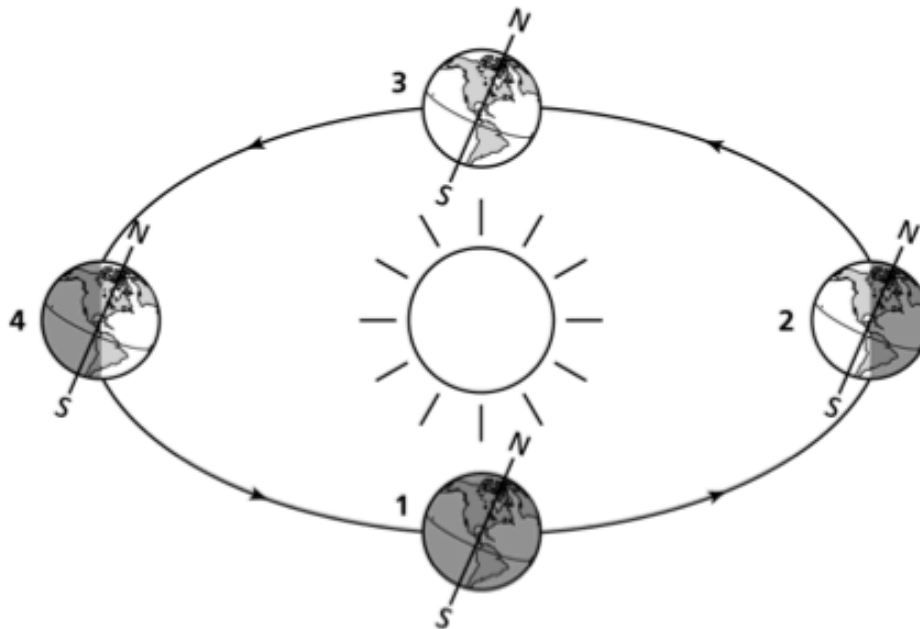
## **Universe: Seasons**

1. Be able to look at a diagram of the Earth's orbit and identify the season of a given point.

EX:

### **Item # 35**

The diagram shows Earth at four different locations as it orbits the sun.



Location 2: The North Pole is tilted away from the sun (out of circle), so it is winter in the Northern Hemisphere.

Which season begins in the Northern Hemisphere when Earth is at Position 3?

- A winter
- B spring
- C summer
- D fall

## **Atmosphere and Weather: Wind and Breezes**

1. Wind is the movement of air from an area of high pressure to an area of lower pressure. (Cold Fronts, Warm Fronts, etc)
2. The sun drives convection within the atmosphere and oceans as it heats up the air and the water through radiation.
3. Wind and breezes are named by the direction they are coming from.
4. A land breeze occurs at night when wind moves from the land to the sea
5. A sea breeze occurs during the day when wind moves from the sea to the land.
6. Warm air rises as cold air sinks.

## **Atmosphere and Weather: Ocean Currents**

1. Ocean currents are determined by temperature, density, and salinity.
2. Surface currents cover 10% of our oceans and move horizontally, or parallel to Earth's surface. They are powered by wind blowing over the ocean, as the wind forces the water to move in huge, circular patterns. (Coriolis Effect)
3. Cold currents come from the poles and warm currents come from the equator.
4. Gravity causes more dense, colder water to sink beneath less dense, warmer seawater and spread to the rest of the ocean.
6. Cold water is found deeper into the ocean and pushes warmer water upward.

## **Atmosphere and Weather: Predicting Weather**

1. When predicting the weather, meteorologists look at humidity, precipitation, temperature, air pressure, and wind.

| <b>Weather Factor</b> | <b>Definition</b>                                | <b>Weather Tool</b>        | <b>Predicting Weather</b>  |
|-----------------------|--|----------------------------|--|
| <b>Humidity</b>       | Amount of moisture in the air                    | Psychrometer or Hydrometer | Increasing humidity means there is more moisture in the air, which can result in cloud formation and precipitation.                            |
| <b>Precipitation</b>  | Rain, Snow, Sleet, Hail                          | Rain Gauge                 | Temperature determines type of precipitation   |
| <b>Air Pressure</b>   | Weight of earth's atmosphere                     | Barometer                  | A rapid drop in air pressure could mean precipitation or storms. High pressure means dry, fair weather.  |
| <b>Temperature</b>    | Determines how much water vapor the air can hold | Thermometer                | Evaporation happens more quickly at higher temperatures, which leads to more humidity...causing more cloud coverage and possibly precipitation |
| <b>Wind Speed</b>     | How fast the wind is blowing                     | Anemometer                 | Used to predict how damaging a coming storm might be.  |
| <b>Wind Direction</b> | Direction of wind                                | Wind Vane                  | Tells where a storm is coming from   |
| <b>Clouds</b>         | Condensed water vapor                            | N/A                        | Determine type and amount of precipitation   |