# Category 2: Force, Motion & Energy

# A. Energy Transformations

## **Law of Conservation of Energy** – energy cannot be created or destroyed, it only changes its form

R Energy

E Energy

C Energy

T Energy

M Energy

P Energy

K Energy

A Energy

N Energy

Alternative Energy = Wind, Solar, Geothermal, Hydroelectric, Biomass/Biofuels, etc.

## **Energy Conversions**

### Photosynthesis in a plant

#### **\_\_\_\_\_\_\_\_\_\_ energy** from sun converted to **\_\_\_\_\_\_\_\_\_\_ energy** (glucose) in leaf

### Fuel conversion in a moving car

#### **\_\_\_\_\_\_\_\_\_\_** energy to **\_\_\_\_\_\_\_\_\_\_** energy

### Stored energy in a battery

#### **\_\_\_\_\_\_\_\_\_\_** chemical energy to **\_\_\_\_\_\_\_\_\_\_** energy

## **Energy Resources**

### **\_\_\_\_\_\_\_\_\_\_ =** plants, animals, soil

### **\_\_\_\_\_\_\_\_\_\_ =** Fossil fuels (use the word CONserve for C-coal, O-oil, N-natural gas)

## **\_\_\_\_\_\_\_\_\_\_** energy

* **\_\_\_\_\_\_\_\_\_\_** is the source of all energy on Earth (it also drives the water cycle).
* Energy is not recycled**,** but it **\_\_\_\_\_\_\_\_\_\_** through systems (like food chains).

B. Motion, Forces & Energy

## Identify examples of kinetic and potential energy - know maximum locations

### Example: pendulum, roller coaster, objects falling over a waterfall, etc.

### Example: roller coaster physics: \_\_\_\_\_\_\_\_\_\_ of the track (the \_\_\_\_\_\_\_\_\_\_) is the point possessing the highest “potential energy” for the rollercoaster, and the highest “kinetic energy” is the point at the \_\_\_\_\_\_\_\_\_\_ of the track (the \_\_\_\_\_\_\_\_\_\_).

### In summary, potential energy is being built up as roller coaster moves \_\_\_\_\_\_\_\_\_\_. It gains stored energy due to a change in its position. The force of gravity converts the potential energy to kinetic energy as the coaster rolls \_\_\_\_\_\_\_\_\_\_.

**Newton’s Laws**

## State and apply Newton’s Laws of Motion. Review inclined plane, pulley, etc.

### **Law of Inertia** (object at rest will remain at rest; an object in motion will remain in motion, at a constant velocity unless acted upon by an \_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_.

### \_\_\_\_\_\_\_\_\_\_ why a small car gets better gas mileage than a big car.

### For every \_\_\_\_\_\_\_\_\_\_, there is an equal and opposite \_\_\_\_\_\_\_\_\_\_. Forces come in pairs.

## Define balanced and unbalanced forces.

### Example: During a game of tug of war, if the rope does not move, then forces are \_\_\_\_\_\_\_\_\_\_, with the net force equal to \_\_\_\_\_\_\_\_\_\_.

## Forces are \_\_\_\_\_\_\_\_\_\_ if the net force does NOT add up to \_\_\_\_\_\_\_\_\_\_.

## Describe how forces act upon the motion of an object. Which way will the object move?

## Demonstrate than an object will remain at rest or move at a constant speed unless acted upon by an unbalanced force.

## Time-distance graph

### interprets motion, with time being measured on the \_\_\_\_\_\_\_\_\_\_ axis and distance on \_\_\_\_\_\_\_\_\_\_ axis.

### When time continues, but distance does not change, the object is NOT in motion, or rather, it stopped moving.

### Displayed on a line graph, \_\_\_\_\_\_\_\_\_\_ would be a plateau or flat line.

## Time-positiongraphs(walk to school, take a rest – flat line, walk back home)

### Interpret graphs and analyze patterns.

### A line graph best shows a change in \_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_.

### A bar graph best shows a \_\_\_\_\_\_\_\_\_\_ of two or more dependent variables.

### A pie graph or pie chart is a comparison of several parts to the whole (\_\_\_\_\_\_\_\_\_\_ or \_\_\_\_\_\_\_\_\_\_).

## Joule **(**\_\_\_\_\_\_\_\_\_\_**) -** used to measure work **(**\_\_\_\_\_\_\_\_\_\_**).**

### 1\_\_\_\_\_\_\_\_\_\_ = amount of work done moving 1N a distance of 1 meter

## 

## Practice the work formula: **W = F x d** (Work = Force x distance)

### If the force applied to an object has not moved the object, \_\_\_\_\_\_\_\_\_\_ **work** has been done! The distance moved (if there is one) is usually on the \_\_\_\_\_\_\_\_\_\_ on the test.

## Practice calculating force formula: **F = m** X **a** (Force = \_\_\_\_\_\_\_\_\_\_ x \_\_\_\_\_\_\_\_\_\_) (can be rewritten using weight)

## Newton’s 2nd Law:

## Weight = m x *g* (Weight = mass x *g*ravity constant = 9.8 m/sec/sec)

### Weight is a measure of the forceof gravity.

### Understand the difference between \_\_\_\_\_\_\_\_\_\_ **(a constant)** and\_\_\_\_\_\_\_\_\_\_, using Newtons (\_\_\_\_\_\_\_\_\_\_).

### Example: The force of gravity on the moon is 1/6 of the Earth’s gravity.

### \_\_\_\_\_\_\_\_\_\_is important in determining an object’s weight, but **NOT** its mass.

## Force is measured in units called \_\_\_\_\_\_\_\_\_\_ (N).

## One \_\_\_\_\_\_\_\_\_\_is the force on a 1 \_\_\_\_\_\_\_\_\_\_mass that will accelerate that mass to 1\_\_\_\_\_\_\_\_.

### Demonstrate that acceleration occurs when an object \_\_\_\_\_\_\_\_\_\_, \_\_\_\_\_\_\_\_\_\_, or changes its \_\_\_\_\_\_\_\_\_\_ of motion. It only occurs when an unbalanced net force acts on an object.

### The \_\_\_\_\_\_\_\_\_\_ must be large enough to overcome the object’s motion.

## FORCES to living organisms - Plant & Animal Responses

### Plant Roots - \_\_\_\_\_\_\_\_\_\_ pulls roots downward - Gravitropism

### Heart – exerts a\_\_\_\_\_\_\_\_\_\_ force to pump blood around body

### Seedlings – As seeds germinate or sprout, seedlings\_\_\_\_\_\_\_\_\_\_ up through soil.

### Plants - Phototropism – plants bending toward light (the shaded side of stem grows faster)