

# KidWind STEM Design Challenge:

## Ohio Learning Standards

Grades 7-8

High School Physical Science, Physics, Environmental Science

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### **SCIENCE: Grade 7**

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#### Earth & Space

**7.ESS.1:** *The hydrologic cycle illustrates the changing states of water as it moves through the lithosphere, biosphere, hydrosphere and atmosphere.*

**7.ESS.2:** *Thermal-energy transfers in the ocean and the atmosphere contribute to the formation of currents, which influence global climate patterns.*

(a) Identify the general patterns of the Jet Stream and the Gulf Stream using a world map.

(b) Identify the factors that contribute to global climate.

**7.ESS.3:** *The atmosphere has different properties at different elevations and contains a mixture of gases that cycle through the lithosphere, biosphere, hydrosphere and atmosphere.*

(a) Identify the general properties of the different layers of the atmosphere.

#### Physical Science

**7.PS.3:** *Energy can be transformed or transferred but is never lost.*

(a) Analyze the data to determine patterns and trends. Formulate a conclusion about energy transformations

(b) Use everyday materials to design and construct a machine that performs a simple task in many steps. Test the machine as each additional component is added. Redesign to solve problems encountered during the testing and to reduce the loss of energy to the surrounding environment. Record any problems encountered as well as the changes made to the machine to overcome these problems.

(c) Trace all the energy transformations that occur as a machine performs its task

(d) Identify where energy has been dissipated to the environment.

(e) Describe two ways that energy can leave a system so it may appear to disappear.

(f) Identify where energy has been dissipated to the environment. Describe two ways that energy can leave a system so it may appear to disappear.

**7.PS.4:** *Energy can be transferred through a variety of ways.*

(a) Use an ammeter to measure the amount of electric current flowing through different positions of series and parallel circuits. Formulate a general rule about the current in series or parallel circuits.

## **SCIENCE: Grade 8**

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### Physical Science

**8.PS.1:** *Objects can experience a force due to an external field such as magnetic, electrostatic, or gravitational fields.*

**8.PS.2:** *Forces can act to change the motion of objects.*

(a) Investigate the relationship between the type of surface and the effects of kinetic friction on moving objects

### **Physical Science:**

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#### ENERGY & WAVES

**PS.EW.1:** *Conservation of energy*

**PS.EW.2:** *Transfer and transformation of energy*

**PS.EW.4:** *Thermal energy*

**PS.EW.5:** *Electricity*

- (a) Movement of electrons
- (b) Current
- (c) Electric potential (voltage)
- (d) Resistors and transfer of energy

#### FORCES AND MOTION

**PS.FM.1:** *Motion*

- (a) Introduction to one-dimensional vectors
- (b) Displacement
- (c) velocity (constant, average and instantaneous) and acceleration
- (d) Interpreting position vs. time and velocity vs. time graphs

**PS.FM.2:** *Forces*

- (a) Force diagrams
- (b) Types of forces (gravity, friction, normal, tension)
- (c) Field model for forces at a distance

**PS.FM.3:** *Dynamics (how forces affect motion)*

- (a) Objects at rest
- (b) Objects moving with constant velocity
- (c) Accelerating objects

## **Physics:**

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### **MOTION**

#### ***P.M.1: Motion Graphs***

- (a) Position vs. time
- (b) Velocity vs. time
- (c) Acceleration vs. time

#### **P.M.3: Projectile Motion**

- (a) Independence of horizontal and vertical motion Velocity vs. time

### **FORCES, MOMENTUM AND MOTION**

#### ***P.F.1: Newton's laws applied to complex problems***

#### ***P.F.2: Gravitational force and fields***

#### ***P.F.4: Friction force (static and kinetic)***

#### ***P.F.5: Air resistance and drag***

#### ***P.F.6: Forces in two dimensions***

- (a) Adding vector forces
- (b) Centripetal forces and circular motion

#### ***P.E.4: Conservation of energy***

### **ELECTRICITY AND MAGNETISM**

#### **P.EM.2: Coulomb's law**

#### **P.EM.3: Electric fields and electric potential energy**

#### **P.EM.4: DC circuits**

- (a) Ohm's law
- (b) Series and Parallel

## **Environmental Science:**

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### **EARTH SYSTEMS:**

#### ***ENV.ES.2: Atmosphere***

- (a) Atmospheric properties and currents

### **EARTH'S RESOURCES**

#### ***ENV.ER.1: Energy resources***

- (a) Renewable and nonrenewable energy sources and efficiency
- (b) Alternate energy sources and efficiency
- (c) Resource availability

#### GLOBAL ENVIRONMENTAL PROBLEMS AND ISSUES

**ENV.GP.3:** *Climate change*

**ENV.GP.4:** *Sustainability*

**ENV.GP.6:** *Air quality*

#### **Physical Geology:**

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#### EARTH'S RESOURCES

**PG.ER.1:** *Energy resources*

- (a) Renewable and nonrenewable energy sources and efficiency
- (b) Alternate energy sources and efficiency
- (c) Resource availability

**PG.ER.2:** *Air*

- (a) Primary and secondary contaminants
- (b) Greenhouse gases