Intro Activity

Lab Research to Engineer a Phosphorescent Bioplastic
Qualitative Observations of the Beads
Electromagnetic Spectrum

- **Gamma ray**: $10^{12}$
- **X-ray**: $10^{10}$
- **Ultraviolet**: $10^8$
- **Visible**: $0.5 \times 10^{-6}$
- **Infrared**: $10^{-5}$
- **Microwave**: $10^2$
- **Radio**: $10^3$

**Radiation Type**
- **Wavelength / m**
- **Approximate Scale of Wavelength**

**Penetrates Earth's Atmosphere?**

**Frequency / Hz**
- **Temperature of objects at which this radiation is the peak wavelength emitted**

- **10,000,000 K (~10,000,000°C)**
- **10,000 K**
- **100 K**
- **1 K**

*The surface of the sun is approximately 6000K.*
Electromagnetic Spectrum
What caused the beads to change colors?
What caused the powder to change colors?

Electromagnetic Spectrum Section (From UV to IR)

- Short Wavelengths
- Ultraviolet (UV)
- Visible Light
- Long Wavelengths
- Infrared (IR)
Definitions

**Fluorescent**
- When hit with UV radiation, it absorbs the UV radiation and emits visible light
- BUT the emission stops as soon as the UV radiation stops

**Phosphorescent**
- When hit by a short wavelength, it absorbs the waves and emits visible light (of a longer wavelength)
- The emission may continue after the waves have stopped
Is the powder...

- Fluorescent?
- Phosphorescent?
Research/Design Problem

Today, your challenge is to create a phosphorescent bioplastic using the following reaction scheme:

\[
\text{corn starch + water + vinegar + glycerin + phosphorescent} \rightarrow \text{phosphorescent powder bioplastic}
\]

...so that the bioplastic is structurally sound and gives off a high phosphorescent.

What reactant will you be manipulating?

~ problem step ~
Research Your Reactant

Ideas to research:

• What is your reactant?
• How is it commonly used?
• Is it commonly used in baking? If so, why?
• What does structural integrity mean to you?
• List your prior knowledge about the reactant.
Hypothesis

What is the *independent variable*?

What are the *dependent variables*?

Write a **hypothesis** that includes the variable and describes how the variables will change.

~ hypothesis step ~