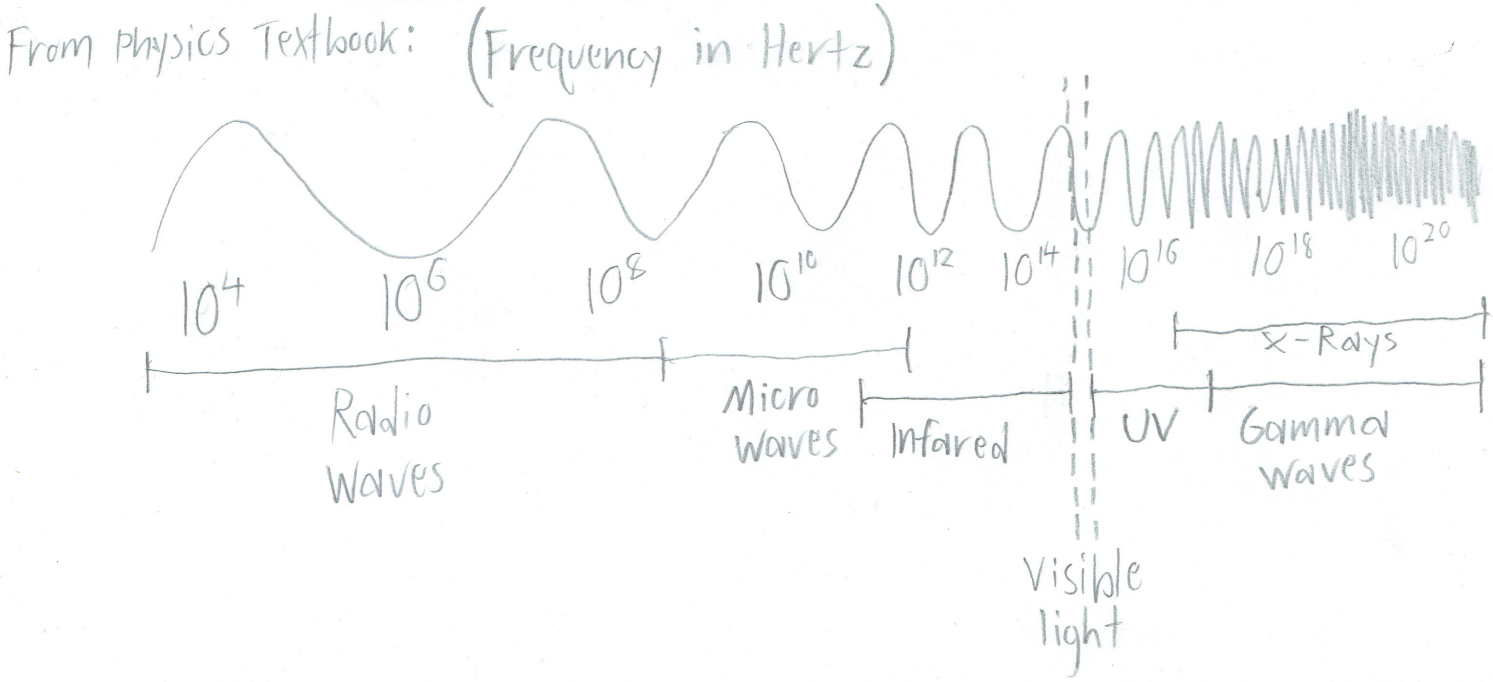
EDUCATIONAL ASSIGNMENT for JOSEPH JOHN WUNDERLICH for 11th grade

This assignment covers the following Educational Objectives (Subjects marked with a "■" are the main subject, and those marked with an "□" are secondary subjects):

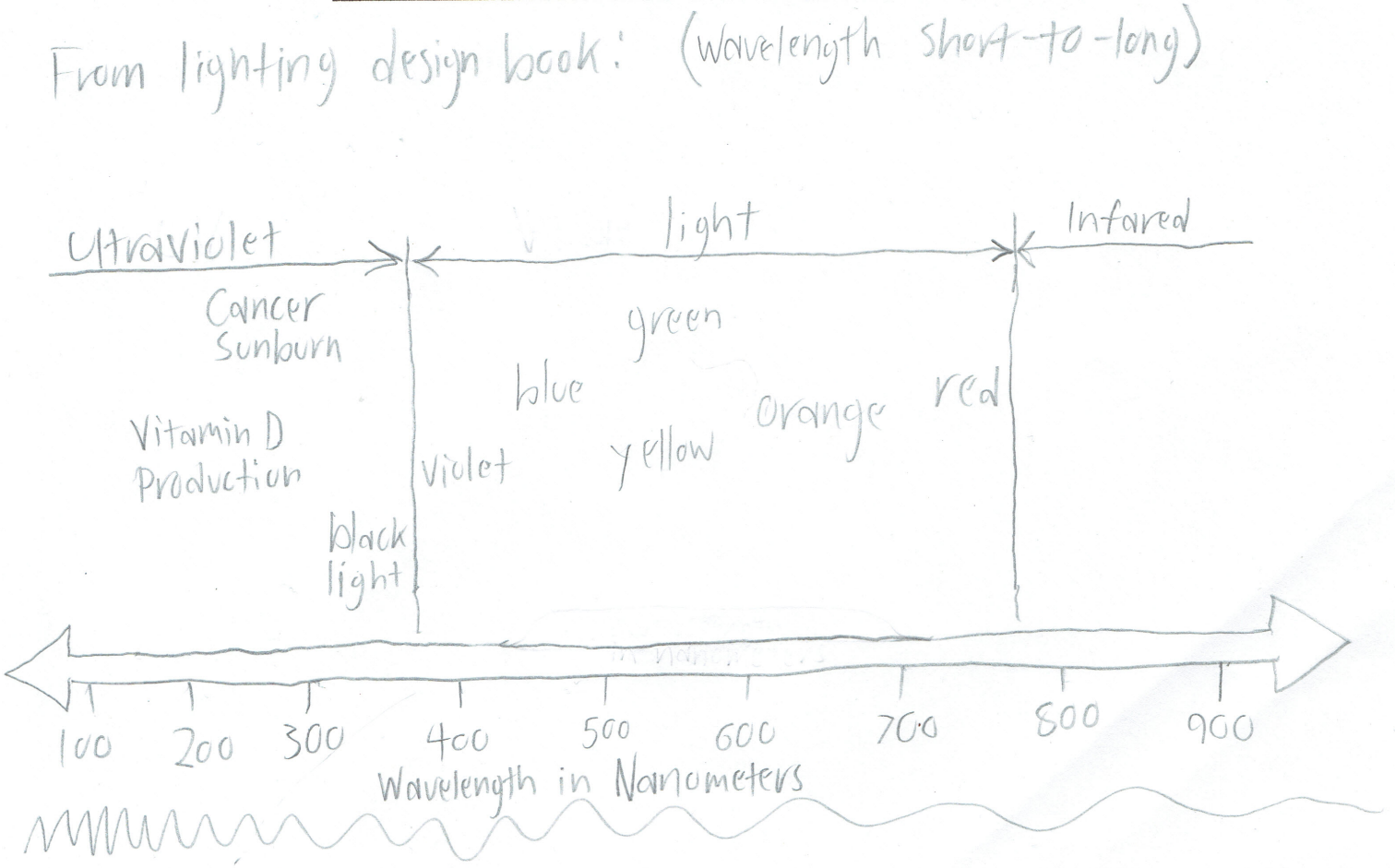
- ■ PHYSICS
- □ ARCHITECTURE
- □ ENGINEERING

Using your Physics Textbook, and Lighting Design book, answer the following problems. Write in Pencil

1. Sketch and label **ALL OF THE ELECTROMAGNETIC SPECTRUM** and indicate which part is visible light



2. Sketch and label **THE VISIBLE LIGHT PART OF ELECTROMAGNETIC SPECTRUM** *(i.e., zoom in and add detail)*



3. Define each of the following (add sketches if you would like):

a. **LUMEN**
and compare it for **INCANDESCENT**, **FLUORESCENT**, and **HIGH-PRESSURE** sodium lamps (bulbs)

One lumen is the measurement of luminous flux, or the rate at which a source emits light energy.


Incandescent
1740 lumens @ 100 watts


Fluorescent
7800 Lumens @ 100 watts


Sodium
9500 lm @ 100w

b. **EFFICACY**
and compare it for **INCANDESCENT**, **FLUORESCENT**, and **HIGH-PRESSURE** sodium lamps (bulbs)

Efficacy is the ratio of light-to-energy output of a source.

$$\frac{\text{light out}}{\text{energy in}} = \frac{\text{lumens}}{\text{watts}} = \text{efficacy}$$

In. : $\frac{1740\text{ lm}}{100\text{ w}} = 17.4$

Fl. : $\frac{7800\text{ lm}}{100\text{ w}} = 78$

So. : $\frac{9500\text{ lm}}{100\text{ w}} = 95$

c. **CANDLEPOWER**
and compare it a **SPOT LAMP (bulb) to a FLOOD LAMP (bulb)**

Candlepower is measured in candelas and describes the intensity of the light source.

A spotlight at 2000 lm with a 20° width has a candlepower of 7400. A floodlight at 2000lm with a 110° is only 1100 candelas.

d. **ILLUMINANCE**

Illuminance is equal to the number of lumens falling on each square foot. It is measured in footcandles or the abbriviation (lux).

e. **BRIGHTNESS/LUMINANCE**

The percieved brightness the eye sees.