Units: Often times the defined SI units of measure may be inappropriate to describe the system of interest, either because they are too big or too small. Due to this, often times prefixes are applied to the basic units in order to denote standard powers of ten.

1. For each prefix shown in the table below, denote the symbol and the corresponding power of ten. Pay particular attention to the prefixes that highlighted, as they are used ***very often***.

Prefix	Symbol	Power
atto	a	10^{-18}
femto		
pico		
nano		
micro		
milli		
centi		
deci		
deka		
hecto		
kilo		
mega		
giga		
tera		

2. For each of the following values, rewrite them in terms of the desired unit.

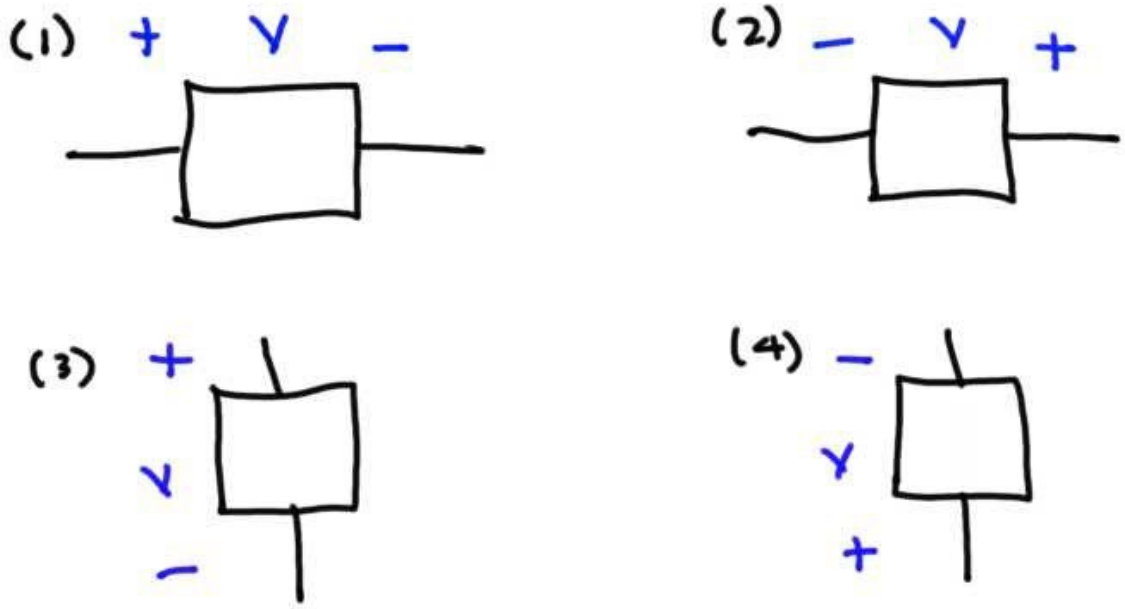
Beginning Value	New Unit
1.0 kg	1000.0 g
100 nF	μF
23.56 mW	W
120 kΩ	Ω
120 kΩ	MΩ
0.100 µF	nF
10000 pH	nH

Ideal Basic Circuit Elements:

1. What are the three attributes of ideal basic circuit elements?

2. In your own words, what is the passive sign convention? (This is one of the most important, yet underrated, conventions in all of electrical engineering. If you understand and can apply this convention to various important equations then you will be ahead of the curve.)

3. For each of the following diagrams of ideal basic circuit elements, draw an arrow in the direction of the voltage rise.



Power:

1. What is the definition of power from physics? Write it as an equation using derivatives.

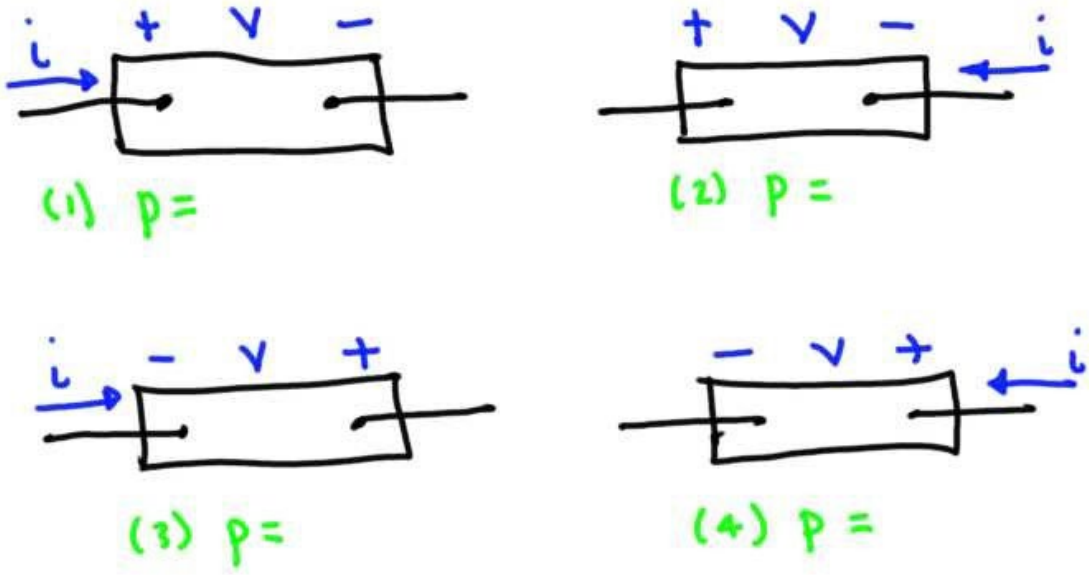
2. What is the power equation for ideal basic circuit elements? This equation relates the voltage and current to the power. How is this obtained based on the definitions of current and voltage?

3. a) What does it mean when the calculated power is positive?

   b) What does it mean when the calculated power is negative?

4. Suppose you find that the power associated with an ideal basic circuit element is calculated using the equation $p = -vi$. Does the negative sign in the equation guarantee that the element will be delivering power? Why or why not?

5. For each of the circuit diagrams below, write down what the equation for the power in terms of the voltage and current. Make sure to take the passive sign convention into account.



6. Two electric circuits, represented by boxes A and B, are connected as shown below. The reference direction for the current *i* in the interconnection and the reference polarity for the voltage *v* across the interconnection are as shown in the figure. For each of the following sets of numerical values, calculate the power in the interconnection and state whether the power is flowing from A to B or vice versa.
   a) $i = 100\ mA$, $v = -15\ V$
   b) $i = 25\ A$, $v = 50\ V$
   c) $i = -30\ mA$, $v = -3\ kV$
   d) $i = -2\ A$, $v = 60\ V$