Name _____

The Particle Adventure Internet Activity – I

Directions:

1) Proceed to: **http://particleadventure.org**
2) Once at the site, click on ***Start Here***
3) You should find yourself on the ***What is Fundamental? Eternal Questions*** page. Look at the nice picture of the famous sculpture. If you don't remember the name of this work of art and/or the sculptor who created it, now would be a good time to click on ***(Answer)*** below the picture.
4) Click on the **>** icon at the top right of the page to advance to the next page, ***What is Fundamental? The Search for the Fundamental***. Answer the questions below, then advance to the next page, and so on. Read each page, and then answer the corresponding questions in this packet. Have fun.

What is the Fundamental? The Search for the Fundamental

1. In order for a particle to be considered fundamental, what must be true about it? _____

   _____

   _____

   (Proceed to next page >)

What is the Fundamental? The Atom

1. No questions here. Just read and proceed (hey, that rhymes…)

What is the Fundamental? Is the Atom Fundamental?

1. Why is the term "atom" a misnomer? _____

   _____

   _____

What is the Fundamental? Is the Nucleus Fundamental?

1. Well, is it? _____

What is the Fundamental? Are Protons and Neutrons Fundamental?

1. What two fundamental particles are made of quarks? _____ and _____
2. Do quarks appear to have volume? _____
3. Are quarks considered to be fundamental? _____

What is the Fundamental? The Modern Atomic Model

1. Draw a sketch of the modern model of the atom:

2. Is this sketch a scale representation of the atom? _____
3. What % of the atom is empty space? _____

What is the Fundamental? The Scale of the Atom

1. How many times smaller than the atom is the nucleus? _____
2. What is the maximum size (in meters) of electrons and quarks? _____ m
3. Is it possible that electrons and quarks could be made up of smaller particles? _____

What is the Fundamental? What are We Looking For?

1. Approximately how many particles have been discovered so far? _____
2. Are most of these particles fundamental? _____
3. What do scientists use to name particles?

_____

What is the Fundamental? The Standard Model

1. According to the Standard Model, what accounts for all of the subatomic particles and the interactions between them?

_____

_____

2. What is the most famous lepton? _____
3. Is the Standard Model a perfect theory? _____
4. What important force cannot be explained by the Standard Model? _____

What is the Fundamental? Standard Model Quiz

1. Check out the trivia quiz question and answer. What subatomic particle was discovered on the 1930's? _____

What is the World Made of? Quarks and Leptons

1. So, what is the world and everything else made of?

_____

What is the World Made of? Matter and Antimatter

1. In what way is a particle different from its antiparticle?

_____

2. What is the antiparticle to the proton called? _____
3. What is the charge on this particle? _____
4. What happens when a particle and its antiparticle meet?

_____

What is the World Made of? What is Antimatter?

This webpage shows a bubble chamber photograph. Fast-moving subatomic particles passing through the gas in the chamber leave trails of tiny droplets behind.

1. Which direction do positive particles curl in the bubble chambers magnetic field? _____
   How about negative particles? _____
2. Do photons leave a trail in the bubble chamber? _____
3. How do we know that the two particles that left the highlighted trails are antiparticles? _____
   _____

What is the World Made of? What is Antimatter?

1. How many different kinds of quarks are there? _____
   How many antiquarks? _____
2. What is the unusual characteristic of quarks?
   _____
3. List the name of each of the six quarks and its corresponding charge:

Name	Charge
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

4. What turned out to be the most elusive quark, and when was it finally discovered? _____

The Particle Adventure – I

What is the World Made of? Naming Quarks

1. From what literary work is the word quark taken?

   _____

2. What are the names given to the two lightest quarks?

   _____

3. When was the charm quark discovered? _____
4. When **and** where was the bottom quark discovered?

   _____

5. Which is the most massive quark? _____

What is the World Made of? Hadrons, Baryons, Mesons

1. Are quarks ever found alone? _____
2. What are composite particles made from quarks called?

   _____

3. Do these composite particles have net fractional charges (like Individual quarks) or net integer charges? _____
4. What are baryons made from?

   _____

5. What combination of quarks makes a proton?

   _____

6. What combination of quarks makes a neutron?

   _____

7. What are mesons made from?

   _____

8. Are most mesons stable or unstable? _____