Q.U.I.N.N.

Quantum Understanding and Interactive Navigation for Newbies

Junior physics worksheet

Understanding:

1. Starter question:

Look at the different particle families (quarks, leptons, and bosons) in the model. Which family has the most members? Make a simple sketch showing how many particles are in each family.

2. Challenge question:

Scientists organise particles into different groups for a reason. Looking at the charges shown in the model, what pattern do you notice about the charges of particles in the same family? Form a hypothesis about why scientists might have grouped them this way.

Particle properties:

3. Starter question:

Find the electron in the model. List three facts about it that you can observe. Then, use these facts to explain why electrons are important in everyday life. Hint: think about electricity!

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4. Investigation question:

Design a simple experiment that could show evidence for the electron shown in The Standard Model. What materials would you need? What safety considerations would be important? Share your experimental design with your classmates.

5. Challenge question:

Using The Standard Model, find the mass of an electron and of a proton. Calculate how many electrons would have the same mass as one proton. Why do you think this difference in mass exists?

Science in action:

6. Starter question:

Scientists use special machines called particle accelerators to study these tiny particles. Research and draw a simple diagram of a particle accelerator. What questions would you ask a scientist who works with one?

7. Challenge investigation:

The Higgs boson was predicted to exist long before it was actually discovered. Working in groups, research:

- when it was predicted
- when it was discovered
- why it took so long to find it.

Present your findings as a timeline.

Think like a scientist:

8. Starter question:

Imagine you're trying to explain what quarks are to a year 5 student. Write a simple analogy comparing quarks to something from everyday life. Why did you choose this comparison?

9 Challenge question:

Scientists believe that every particle has an antiparticle. Using the model:

- What patterns do you notice about particles and their antiparticles?
- Create a hypothesis about what would happen if a particle met its antiparticle
- Design an experiment to test your hypothesis (even if you couldn't actually do it!).

Extension activities:

10 Inquiry project:

Choose one fundamental force (gravity, electromagnetism, strong force, or weak force) and create a presentation that:

- Explains how we experience this force in everyday life.
- Identifies which particles are affected by this force.
- Describes an experiment that demonstrates this force.
- Poses three questions you still have about this force.