Lecture 3: Matter: What it is

Slide 2: What does it Matter?
What is a fundamental particle?
What is a composite particle?
What particles are protons and neutrons made of?

Slide 3, 4 & 5: Atoms
What do we mean by saying that atoms are the fundamental unit of matter?
What is the structure of atoms?
What are nucleons?
What are the electric charges of protons, neutrons, and electrons?
If an atom were expanded a billion times, how big is the nucleus? What is the radius of the electron orbit?

Slide 6:
What property of an atom determines what the element is named?
What is the atomic number?
What determines the number of electrons orbiting a given atom?

Slide 8: Isotopes
What is an isotope?
For a given element, which particle determines which isotope an element is?

Slide 9: The Electron Orbits
Can an electron orbit at any distance from the nucleus?
Why is the structure of the electron orbits in atoms important for astronomy?

Slide 10 & 11:
What property of electrons dictate where the electrons can orbit?
Explain "the key to electron orbits" and why only certain orbits can exist in atoms.
What does the number "n" refer to physically? (yes, it is an integer, but of what?)
How do the energies of the electrons in different orbits depend upon "n"?

Slide 12 & 13: The Hydrogen Atom and Different Elements
What is the Bohr radius?
How do the radii of the permitted orbits of hydrogen depend upon "n"?
Why do different elements each have a unique structure to their allowed orbits?

Slide 14: Ions
What is the process of ionization?
What are the two most common ionization processes?
How does the net charge of an atom change once it is ionized?
What does it mean for an atom to be "fully ionized"?
What are the three categories of gases?

Slide 15 & 16: Four States of Matter and Matter in the Universe
What are the four states of matter?
Can you list them from low temperature to high temperature?
Which state of matter is the most common in the universe?
Can you name some examples of each form of matter?

Slide 17: How Matter interacts with Matter
What are the four fundamental forces in the universe?
Which is strongest? Which is weakest?
Which ones can act over infinite distances?
Which can act only over distances smaller than an atomic nucleus?

Slide 18: Electromagnetic Force
What is the Coulomb force?
How does it depend on distance between charged particles?
Can a neutron experience the Coulomb force? Can an electron? A proton?
Will a neutron and a proton exert a Coulomb force on one another?

Slide 19: Strong Nuclear Force
Why is the strong nuclear force important in the universe?
How does the strong nuclear force work between protons and neutrons?
Why is it that atoms would not exist if the Strong nuclear force were not stronger than the Coulomb force on the scale of the size of an atomic nucleus?

Slide 20: Weak Nuclear Force
Is the weak force responsible for radioactivity?
What is transmutation? How does it occur when the weak force acts?

Slide 21: 3 Forms of Radiation
What are the three forms of radiation in the universe?
Be able to describe each form of radiation.
Which particle is thrown out of the atom for each form of radiation?