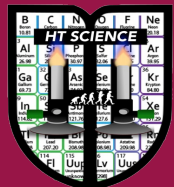


Silent Starter

<https://www.ocr.org.uk/images/171726-specification-accredited-a-level-gce-physics-a-h556.pdf>



Learning objectives:
Describe the standard model
Explain the structure of particles



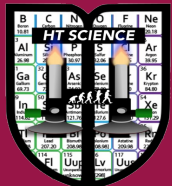
2 The specification overview

2a. Overview of A Level in Physics A (H556)

Learners must complete all components (01, 02, 03 and 04) to be awarded the OCR A Level in Physics A.

Content Overview	Assessment Overview	
<p>Content is split into six teaching modules:</p> <ul style="list-style-type: none">Module 1 – Development of practical skills in physicsModule 2 – Foundations of physicsModule 3 – Forces and motionModule 4 – Electrons, waves and photonsModule 5 – Newtonian world and astrophysicsModule 6 – Particles and medical physics <p>Component 01 assesses content from modules 1, 2, 3 and 5.</p> <p>Component 02 assesses content from modules 1, 2, 4 and 6.</p> <p>Component 03 assesses content from all modules (1 to 6).</p>	<p>Modelling physics (01)</p> <p>100 marks</p> <p>2 hours 15 minutes</p> <p>written paper</p>	<p>37%</p> <p>of total A level</p>
	<p>Exploring physics (02)</p> <p>100 marks</p> <p>2 hours 15 minutes</p> <p>written paper</p>	<p>37%</p> <p>of total A level</p>
	<p>Unified physics (03)</p> <p>70 marks</p> <p>1 hour 30 minutes</p> <p>written paper</p>	<p>26%</p> <p>of total A level</p>
	<p>Practical Endorsement in physics (04)</p> <p>(non exam assessment)</p>	<p>Reported separately</p> <p>(see Section 5g)</p>

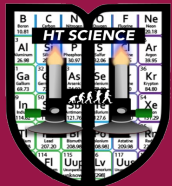
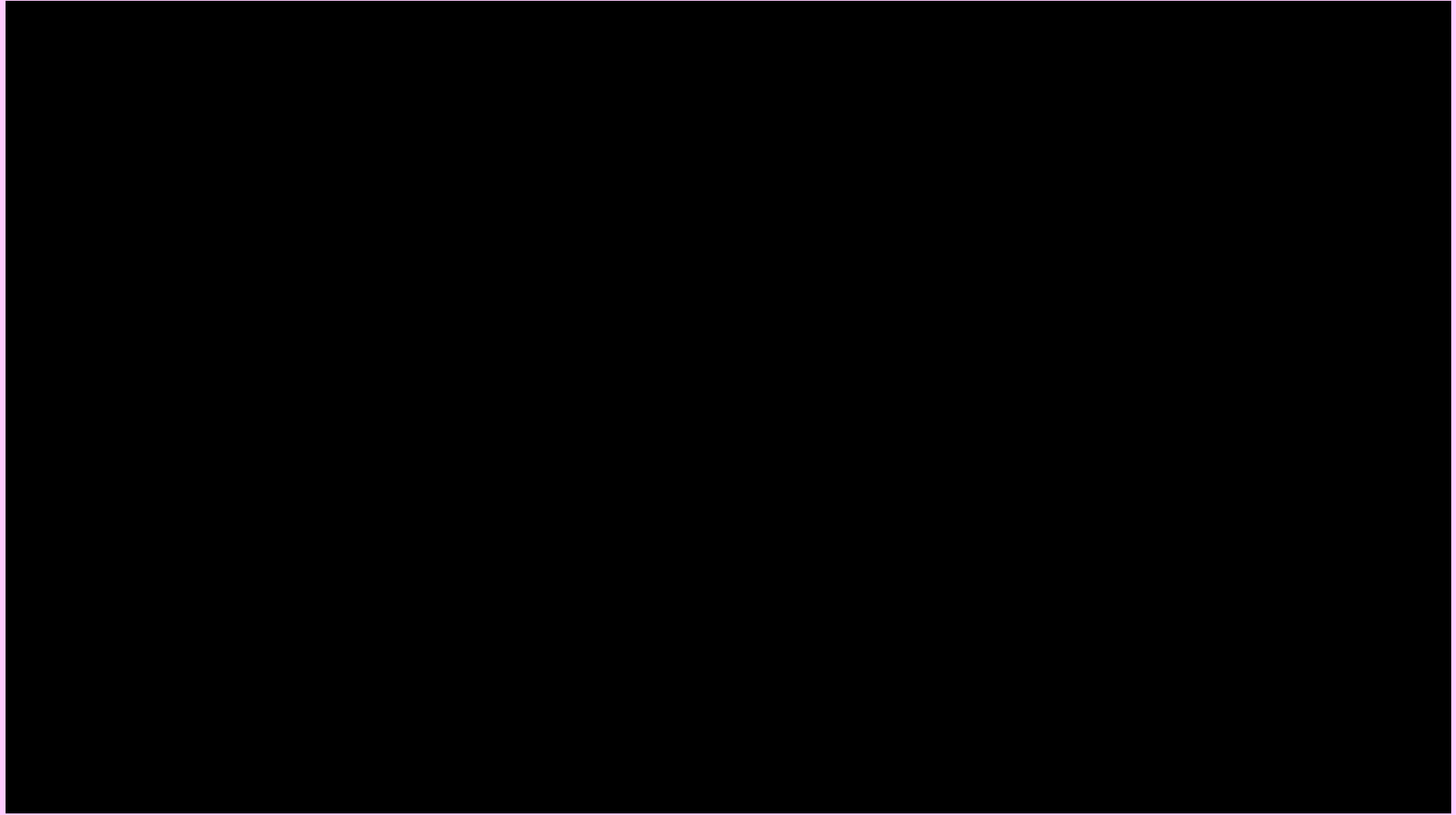
Silent Starter



Learning objectives:
Describe the standard model
Explain the structure of particles

1 July 2024

Silent Starter



Learning objectives:
Describe the standard model
Explain the structure of particles

https://www.youtube.com/watch?v=XYcw8nV_GTs

Learning objectives

- ❑ Describe the standard model
- ❑ Explain the structure of particles

Key words:

Quark

Lepton

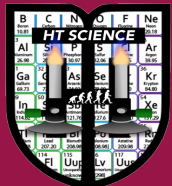
Hadron

Baryon

Proton

Neutron

Electron



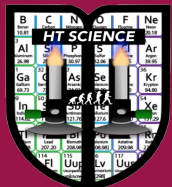
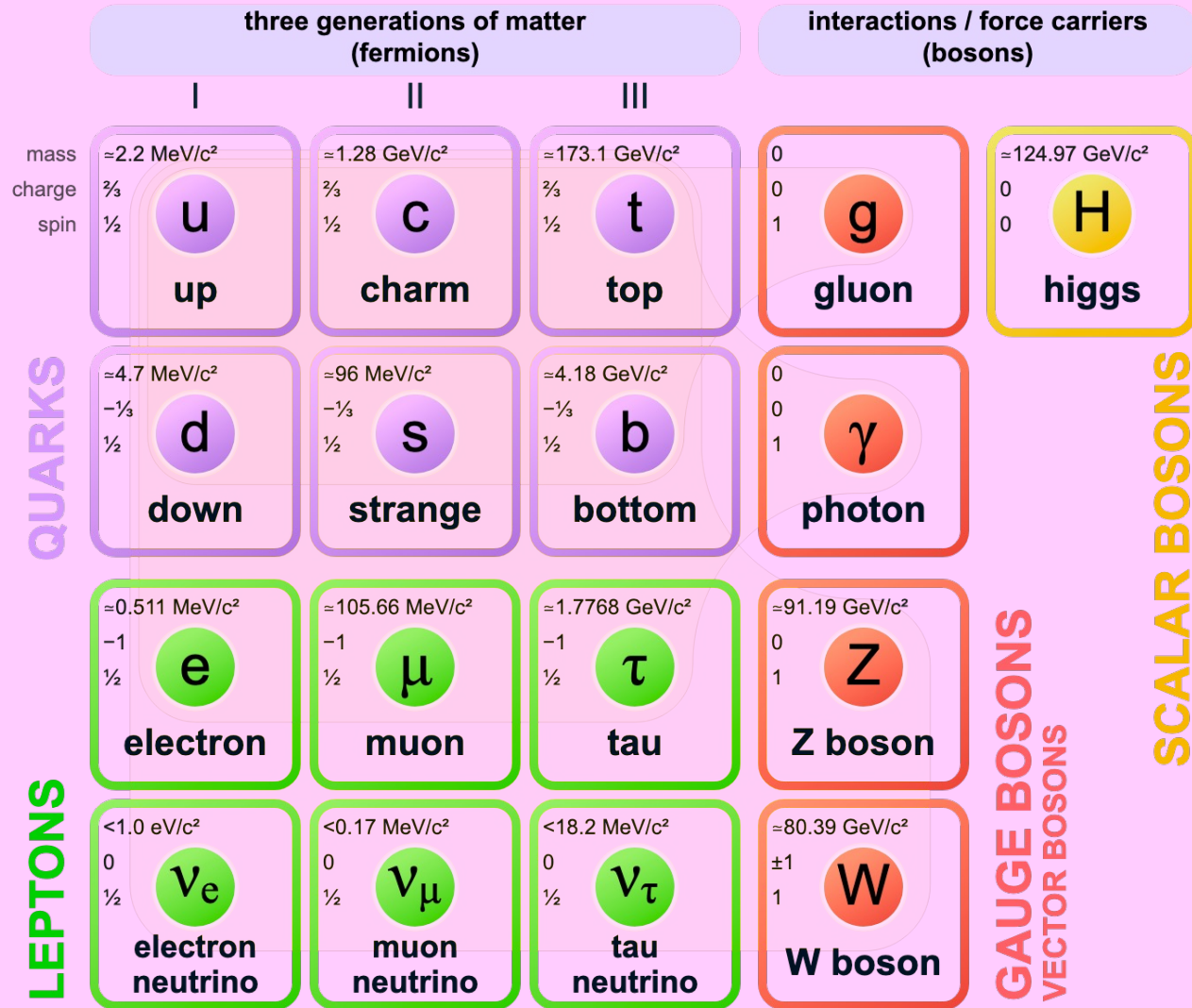
Learning objectives:
Describe the standard model
Explain the structure of particles

Explanation

Any particle that contains quarks is a hadron.

A lepton is a fundamental particle

Standard Model of Elementary Particles



Learning objectives:
Describe the standard model
Explain the structure of particles

Explanation

The Nucleus

The nucleus consists of protons and neutrons, which are collectively known as nucleons.

The following notation represents the nucleus of the atom:

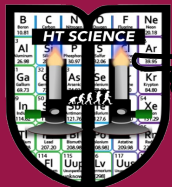
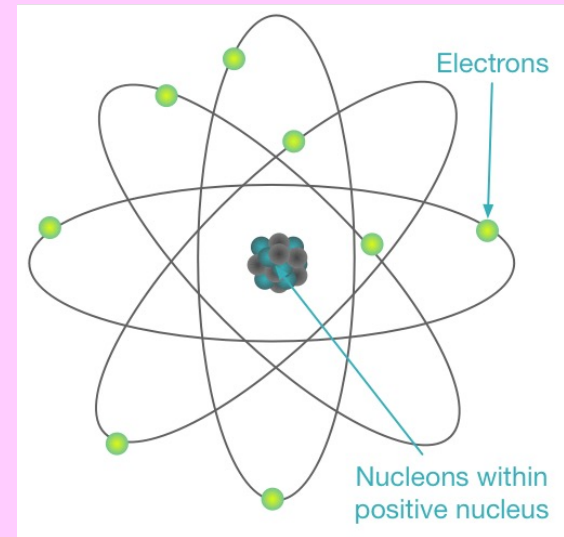
Mass Number or
Nucleon Number



Element
Symbol



Proton Number or
Atomic Number



Learning objectives:

Describe the standard model

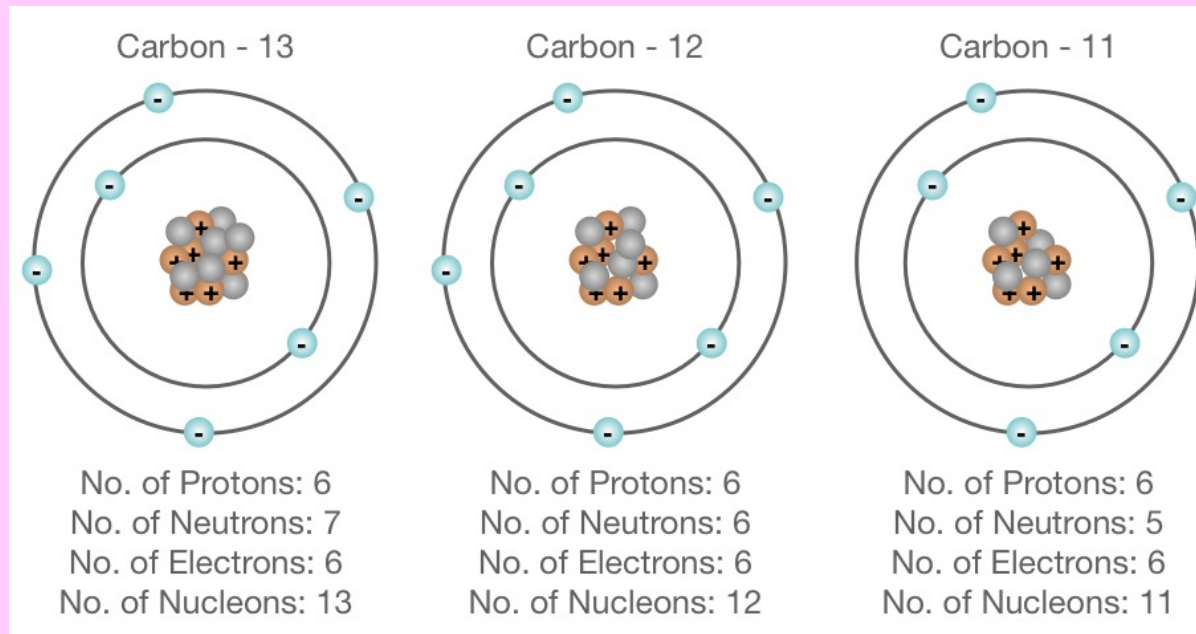
Explain the structure of particles



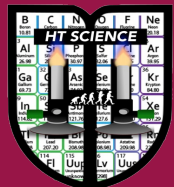
Explanation

Isotopes

An isotope is any of two or more forms of a chemical element. They have the same number of protons in the nucleus, but have different numbers of neutrons.



Learning objectives:
Describe the standard model
Explain the structure of particles



Explanation

Constituents of the Atom

Proton

	Relative	SI Unit
Mass	1	1.673×10^{-27} kg
Charge	1	1.6×10^{-19} C

Neutron

	Relative	SI Unit
Mass	1	1.675×10^{-27} kg
Charge	0	0

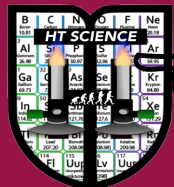
Electron

	Relative	SI Unit
Mass	0.0005	9.11×10^{-31} kg
Charge	-1	-1.6×10^{-19} C

Learning objectives:

Describe the standard model

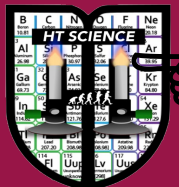
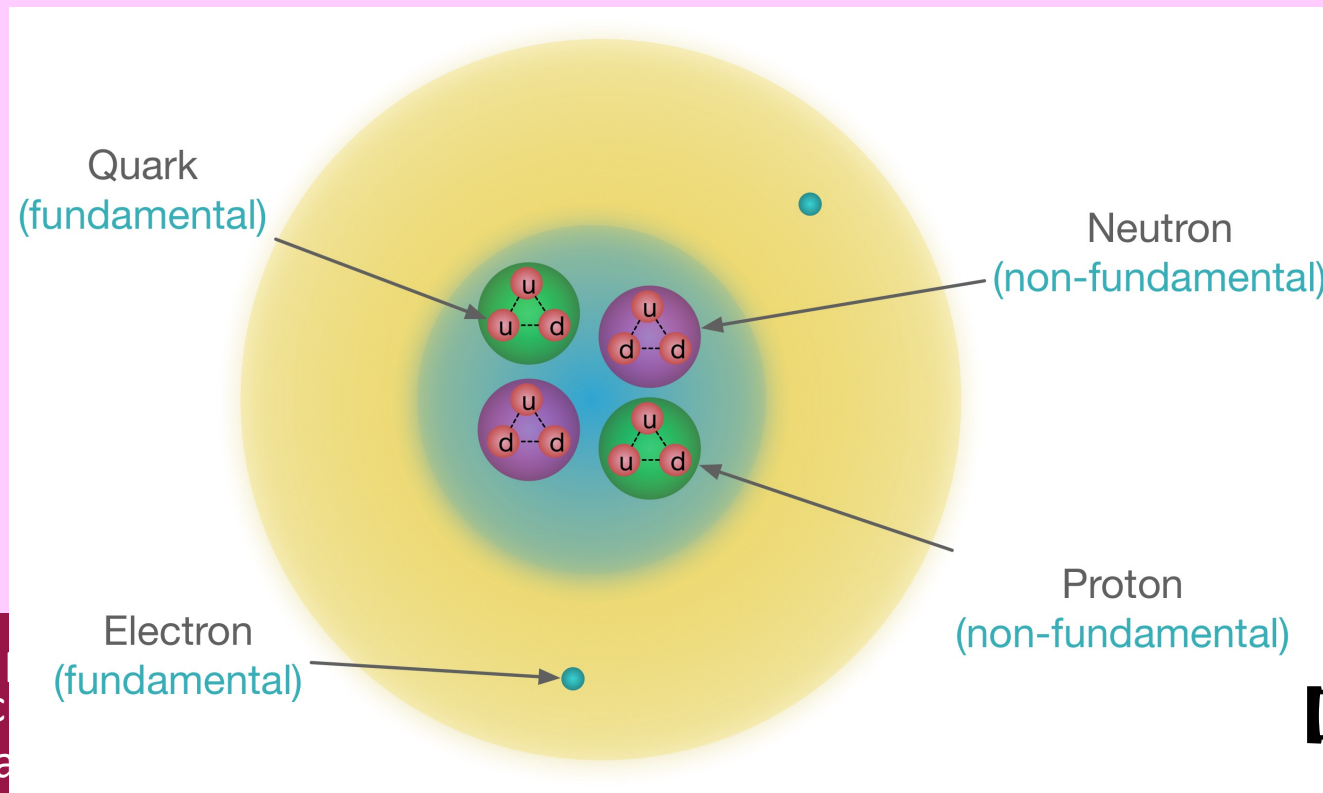
Explain the structure of particles



Explanation

Fundamental Particles

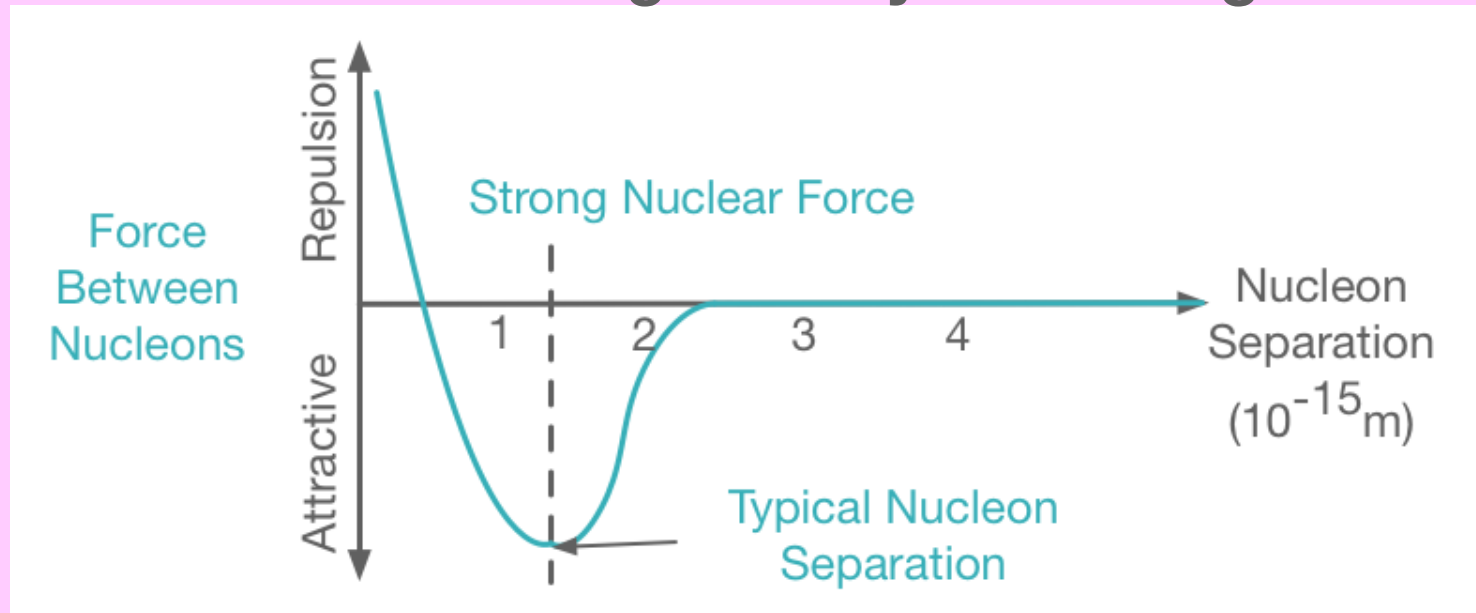
Fundamental (elementary) particles are those which are not composed of other particles. The atom consists of fundamental and non-fundamental particles



Learn
Desc
Explain



The **nucleus** is held together by the strong force.

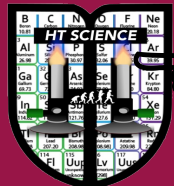


- Highly attractive between two protons within 1-2 femtometres
- Repulsive between two protons at smaller separations (cannot overlap)
- It is extremely short range and has no effect outside of the nucleus

Learning objectives:

Describe the standard model

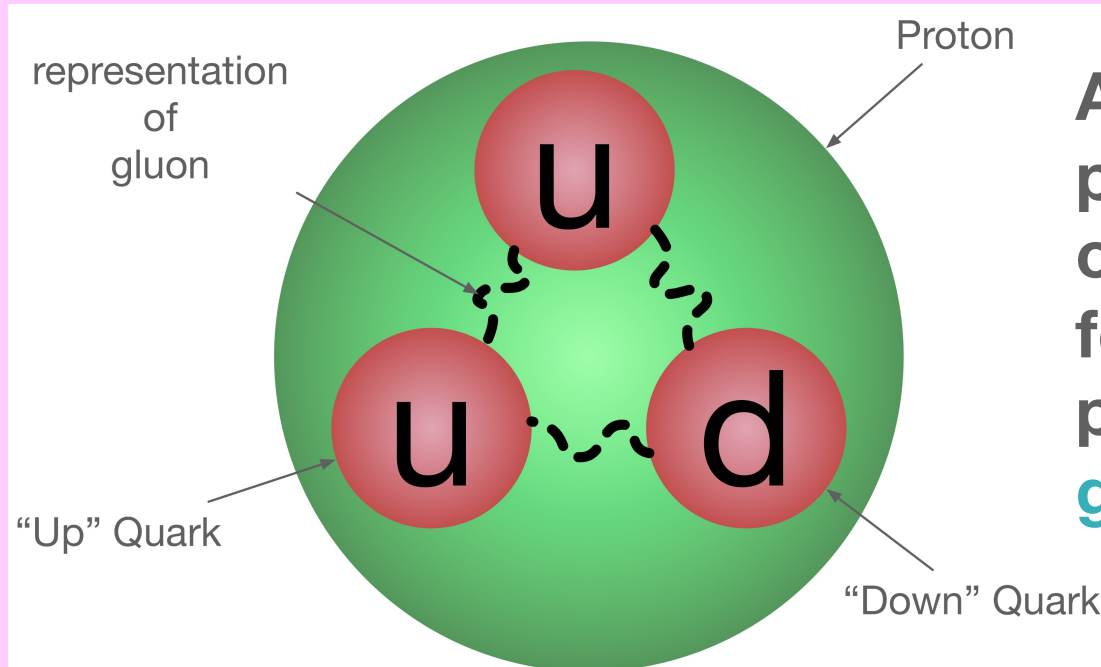
Explain the structure of particles



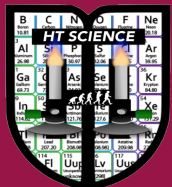
Explanation

Exchange Particles

It is thought that exchange particles, called **gluons**, are responsible for the Strong Force. They act between the quarks in a neutron or proton.



A gluon is a particle within the category of force-carrier particles called **gauge bosons**.



Learning objectives:
Describe the standard model
Explain the structure of particles

Four Fundamental Forces

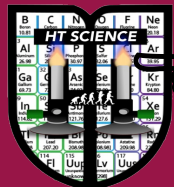
There are four fundamental forces that act within a nucleus. Each is thought to have their own set of exchange particles, which “carry” the force:

Fundamental Force:	Acts On:	Exchange particles (gauge boson):
Strong	Quarks	Gluons
Gravitational	All particles with mass	Gravitons (not yet observed)
Electromagnetic	All particles with charge	Photons
Weak	Leptons	W and Z Bosons

Learning objectives:

Describe the standard model

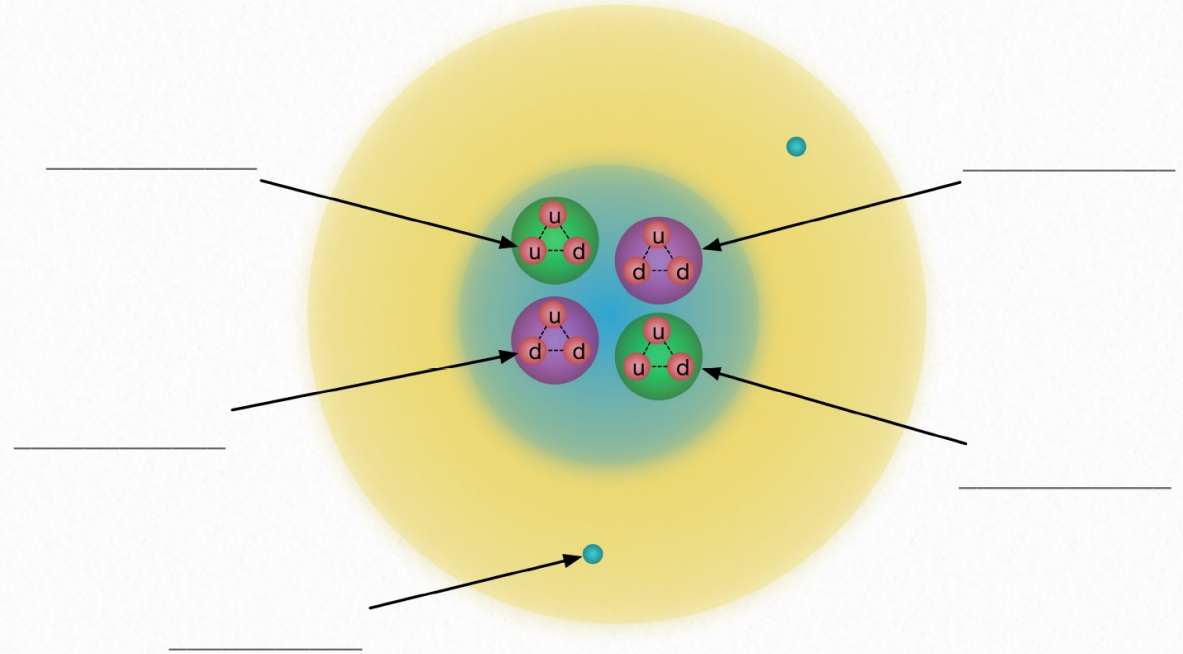
Explain the structure of particles



Explanation

Particle Physics

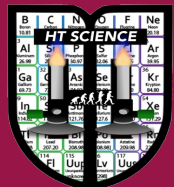
1. Label the diagram of the particles within the atom below:



2. State what is meant by a fundamental particle

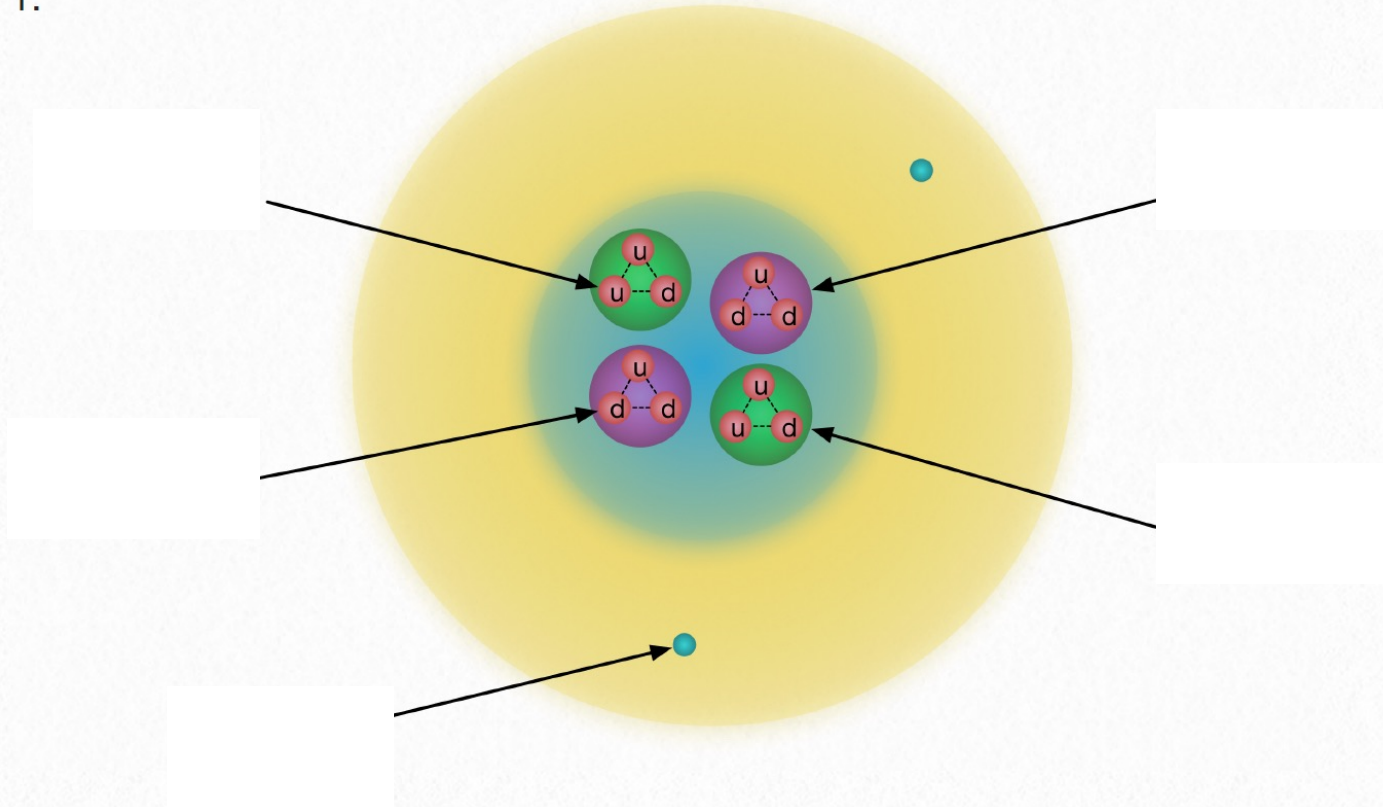
Complete the Questions

Learning objectives:
Describe the standard model
Explain the structure of particles



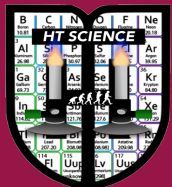
Particle Physics

1.



2. State what is meant by a fundamental particle

Fundamental (elementary) particles are those which are not composed of other particles.



Learning objectives:
Describe the standard model
Explain the structure of particles

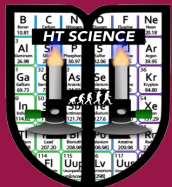
3. The particles within an atom can be divided into fundamental particles and non-fundamental particles.

a) Give two examples fundamental particles:

3. a) Quark, any lepton (e.g. electron)

b) Give two examples of non-fundamental particles:

b) Proton, neutron (any baryon or meson)



Learning objectives:
Describe the standard model
Explain the structure of particles

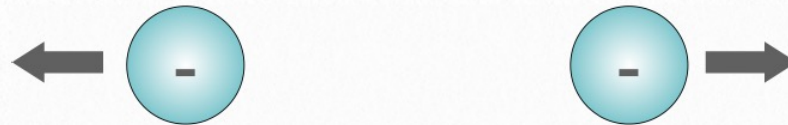
Questions Continued

Particle Physics

4. Name the four fundamental forces.

4. Strong, Weak, Electromagnetic and Gravitational

5. Two electrons approach each other but do not collide. They exert a force on each other and move apart.



a) Which of the four fundamental forces is involved in this process.

5. a) Weak

b) Name the exchange particle that plays a role in this interaction.

b) Photon (Gauge Boson)

6. State the quark composition of:

a) The proton

6. a) uud

b) The neutron

b) udd

7. A π^0 particle is classed as a meson. It has a charge of 0 and a baryon number of 0. Using the quark table below, which of the following combinations could correspond to a π^0 meson.

A. $s\bar{u}$

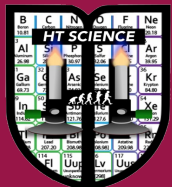
B. udd

C. $d\bar{d}$

D. $u\bar{d}$

7. C

Quark	Charge
u	+2/3
d	-1/3
s	-1/3



Learning objectives:
Describe the standard model
Explain the structure of particles

End & send

Expectations



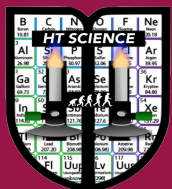
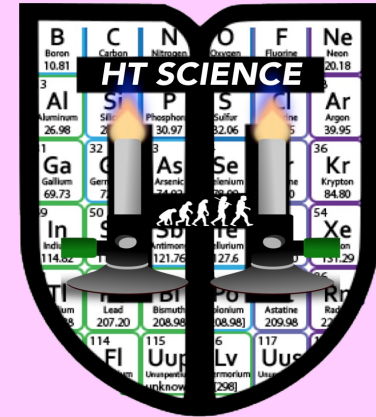
1. Put the borrowed equipment back.

2. Bin all rubbish.

3. Put your belongings in your bag.

4. Double check 1 to 3 has been done.

5. Stand and stay behind your chair silently.



Learning objectives:
Describe the standard model
Explain the structure of particles