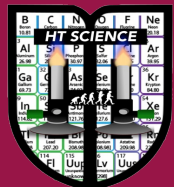


# Silent Starter

<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)

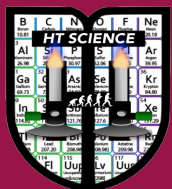
Learners must complete all components (01, 02, 03 and 04) to be awarded the OCR A Level in Physics A.

Content Overview	Assessment Overview	
<p>Content is split into six teaching modules:</p> <ul style="list-style-type: none"><li>Module 1 – Development of practical skills in physics</li><li>Module 2 – Foundations of physics</li><li>Module 3 – Forces and motion</li><li>Module 4 – Electrons, waves and photons</li><li>Module 5 – Newtonian world and astrophysics</li><li>Module 6 – Particles and medical physics</li></ul> <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><b>37%</b></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><b>37%</b></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><b>26%</b></p> <p>of total A level</p>
	<p>Practical Endorsement in physics (04)</p> <p>(non exam assessment)</p>	<p><b>Reported separately</b></p> <p>(see Section 5g)</p>

# Explanation

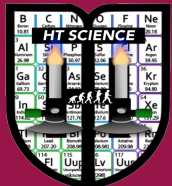
## Core Expectations for **Every Lesson**

1. Attend lessons on time and in professional attire
2. Be prepared for each lesson by ensuring you bring the appropriate equipment
3. Ensure all work is organised in the appropriate section of your subject folder
4. All deadlines must be met to avoid a 6 week “Risk of Failure” program
5. Respect the classroom, Replace chairs, Rubbish in bins
6. Speak to **ALL** members of the HT community with respect
7. No mobile phones/ear pods to be used in lessons or around the school
8. Starters are to be completed in silence
9. Be proactive and not reactive
10. Expect to work harder than you ever have before



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

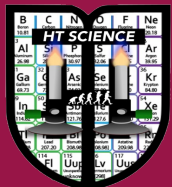
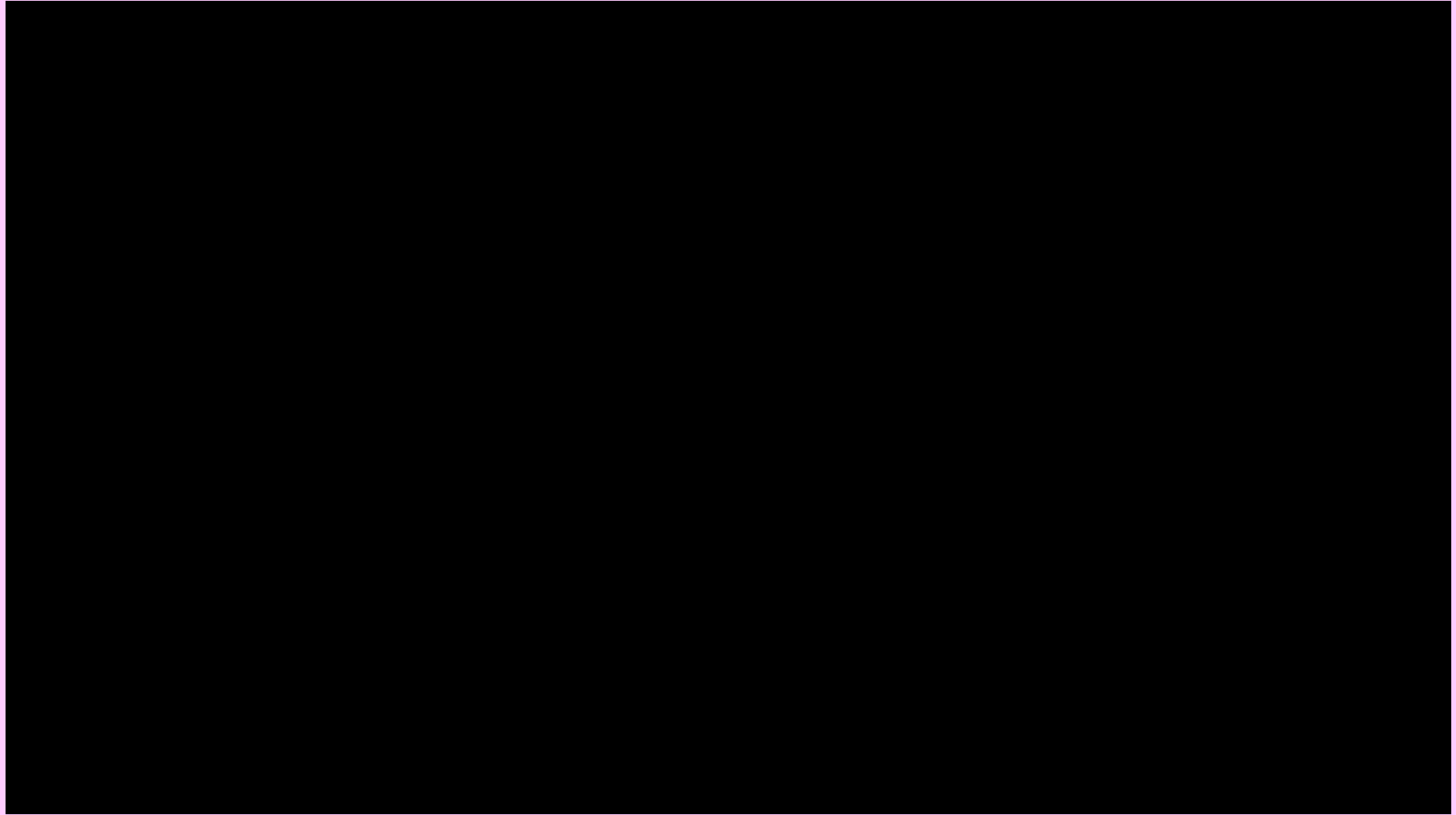
# Silent Starter



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

27 June 2023

# Silent Starter



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

[https://www.youtube.com/watch?v=XYcw8nV\\_GTs](https://www.youtube.com/watch?v=XYcw8nV_GTs)

## Learning objectives

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

## Key words:

Quark

Lepton

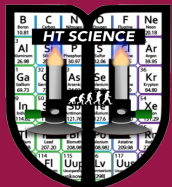
Hadron

Baryon

Proton

Neutron

Electron



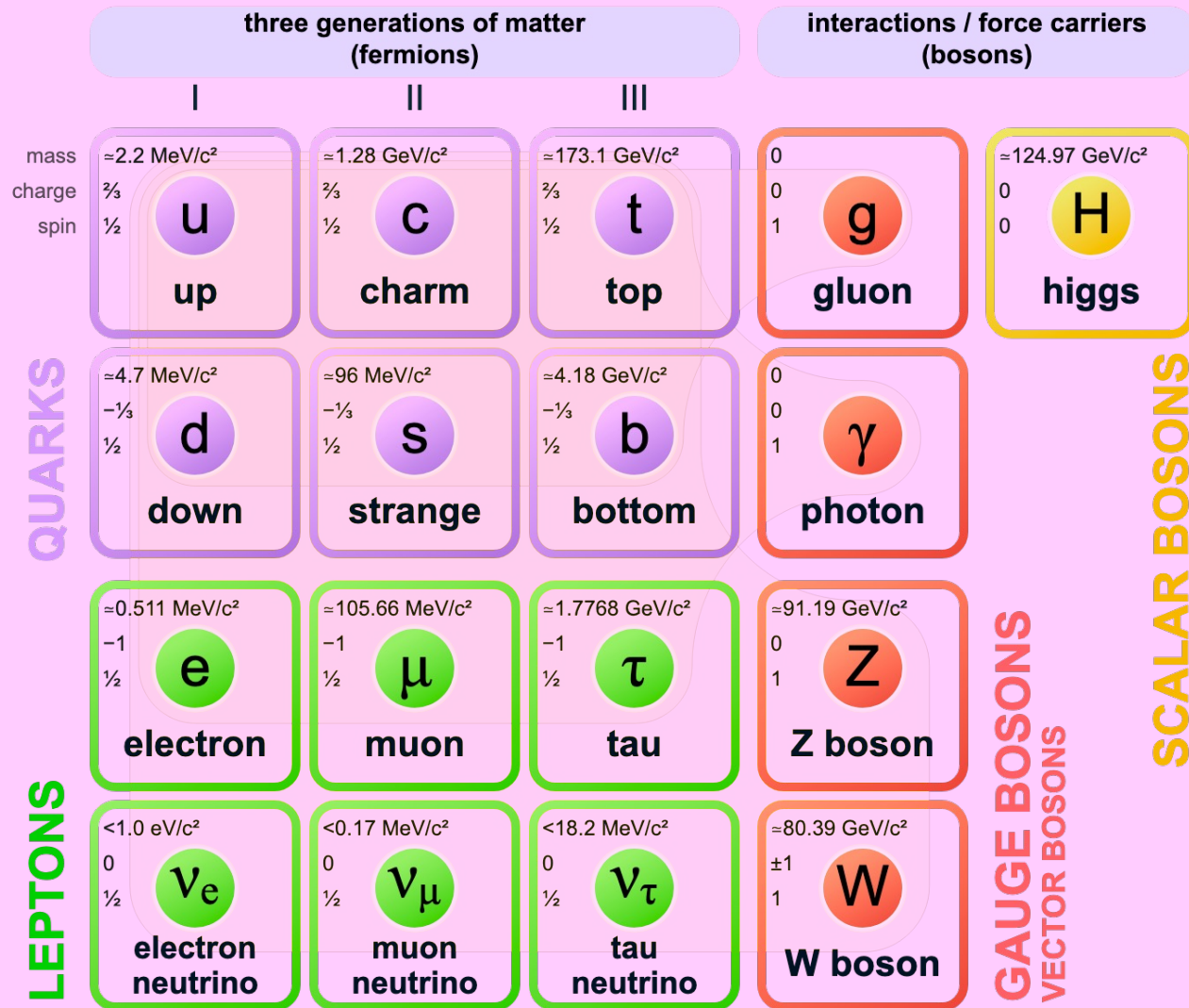
**Learning objectives:**  
Describe the standard model  
Explain the structure of particles

# Explanation

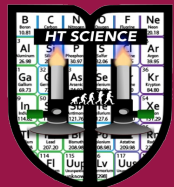
Any particle that contains quarks is a hadron.

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:

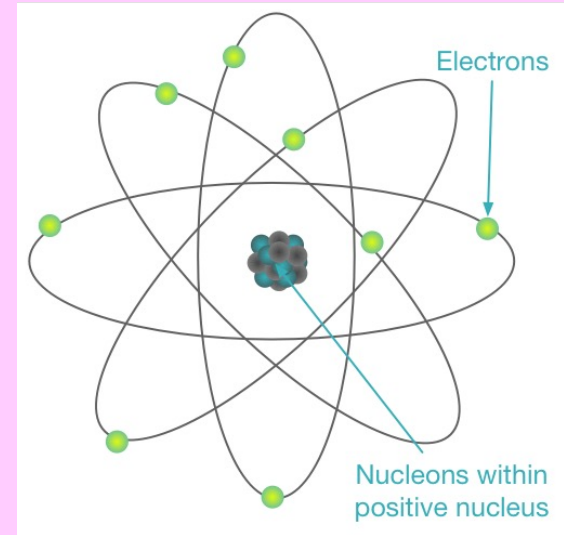
Mass Number or  
Nucleon Number



Element  
Symbol



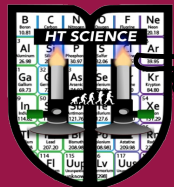
Proton Number or  
Atomic Number



## Learning objectives:

Describe the standard model

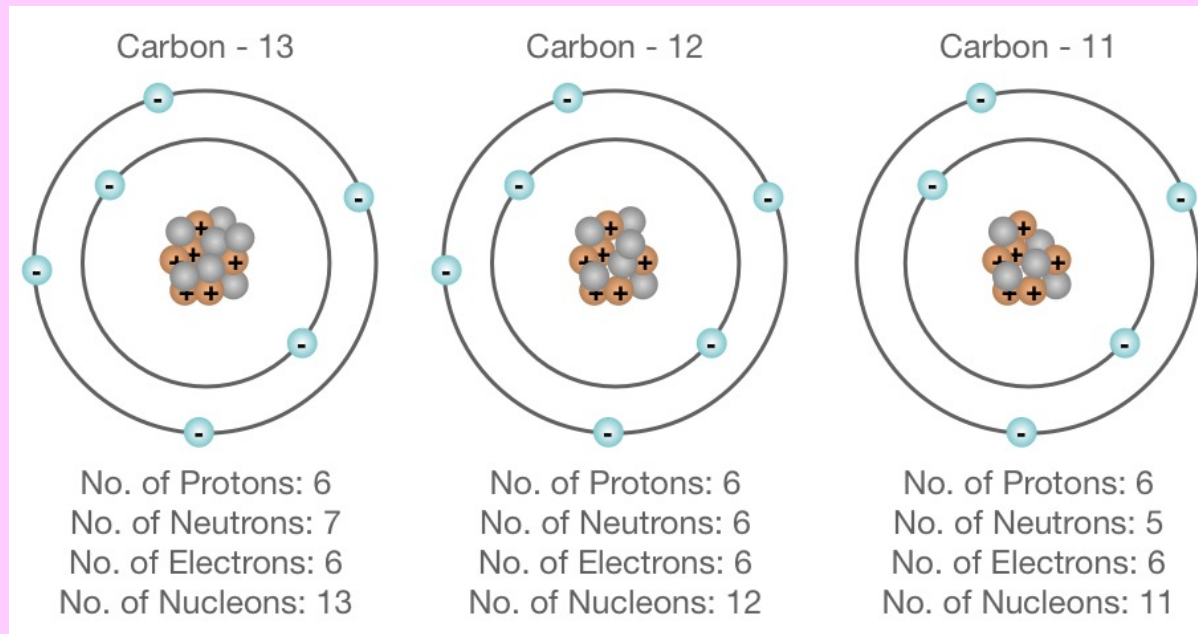
Explain the structure of particles



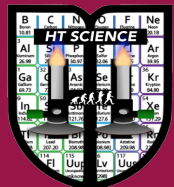
# Explanation

# 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

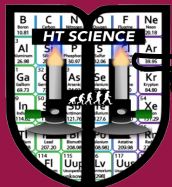
	Relative	SI Unit
Mass	1	$1.673 \times 10^{-27}$ kg
Charge	1	$1.6 \times 10^{-19}$ C

## Neutron

	Relative	SI Unit
Mass	1	$1.675 \times 10^{-27}$ kg
Charge	0	0

## Electron

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



### Learning objectives:

Describe the standard model

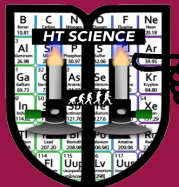
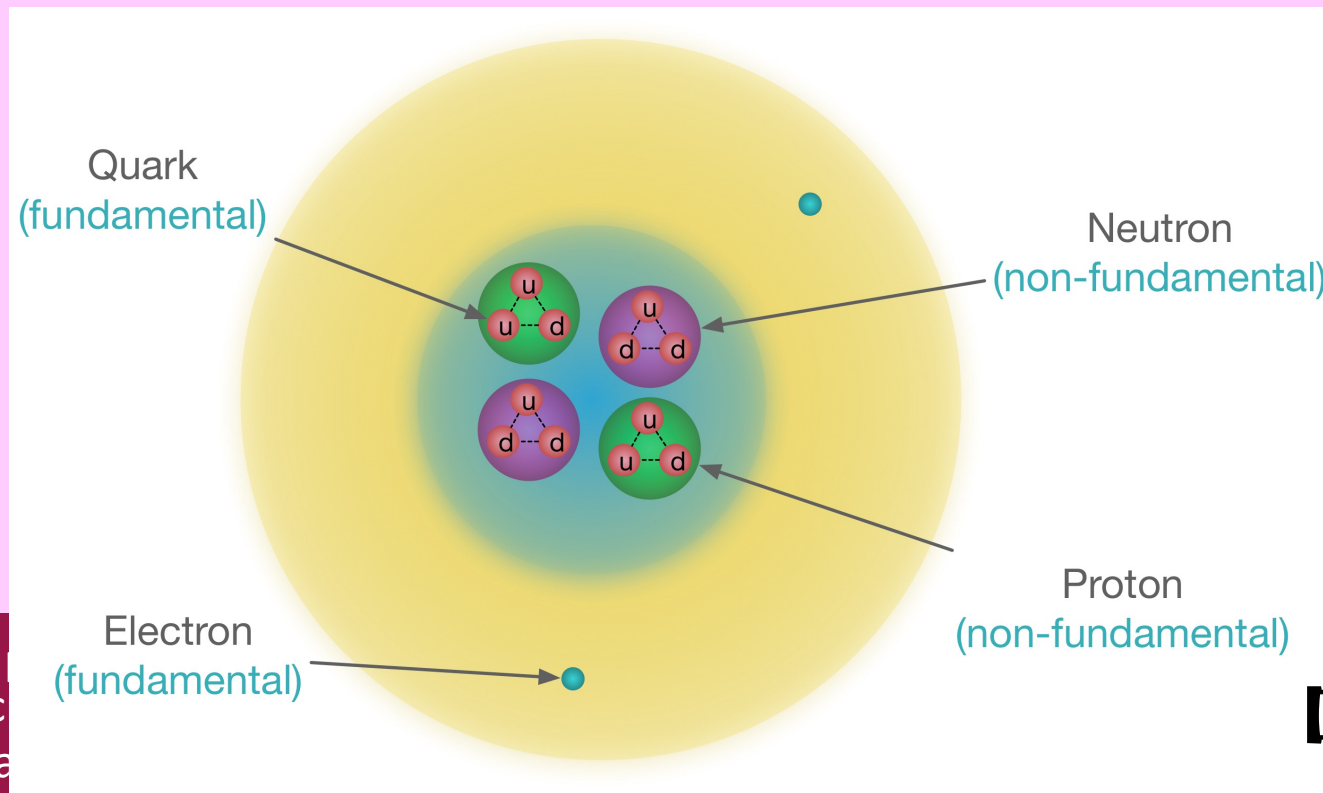
Explain the structure of particles



## Explanation

# Fundamental Particles

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



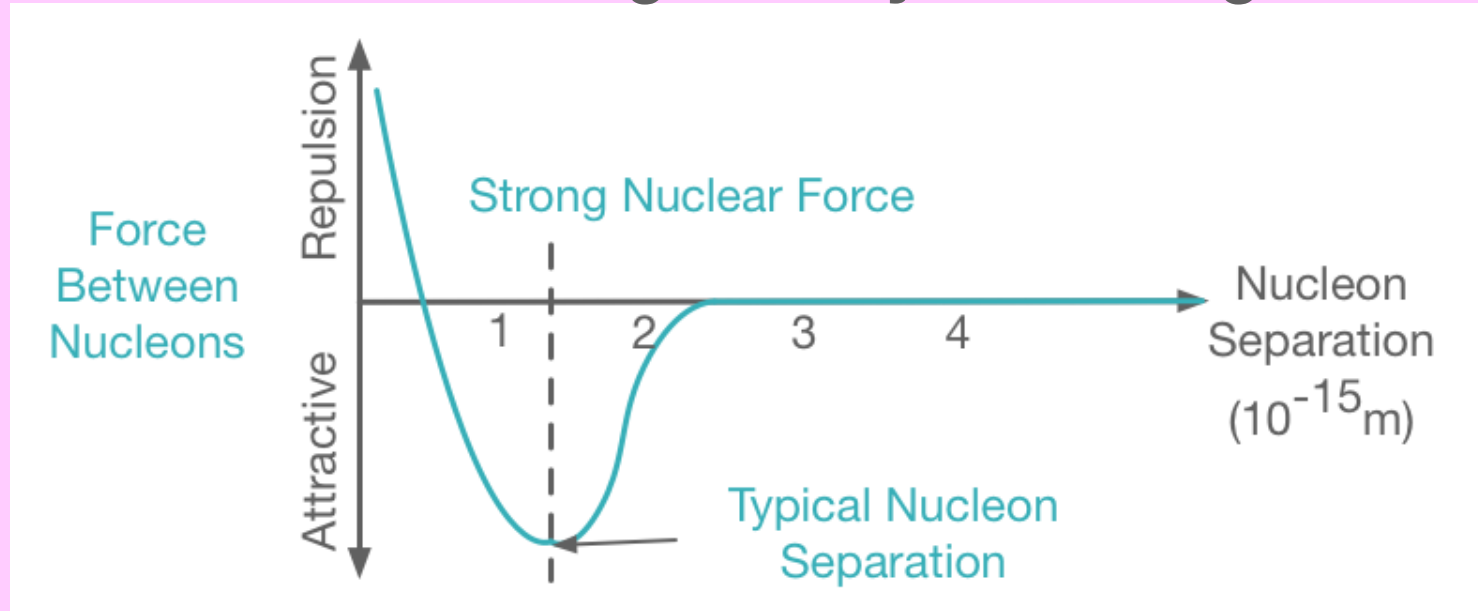
Learn  
Desc  
Explain



# Explanation

# Strong Force

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

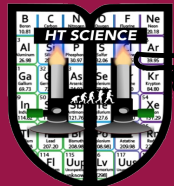


- Highly attractive between two protons within 1-2 femtometres
- Repulsive between two protons at smaller separations (cannot overlap)
- It is extremely short range and has no effect outside of the nucleus

## Learning objectives:

Describe the standard model

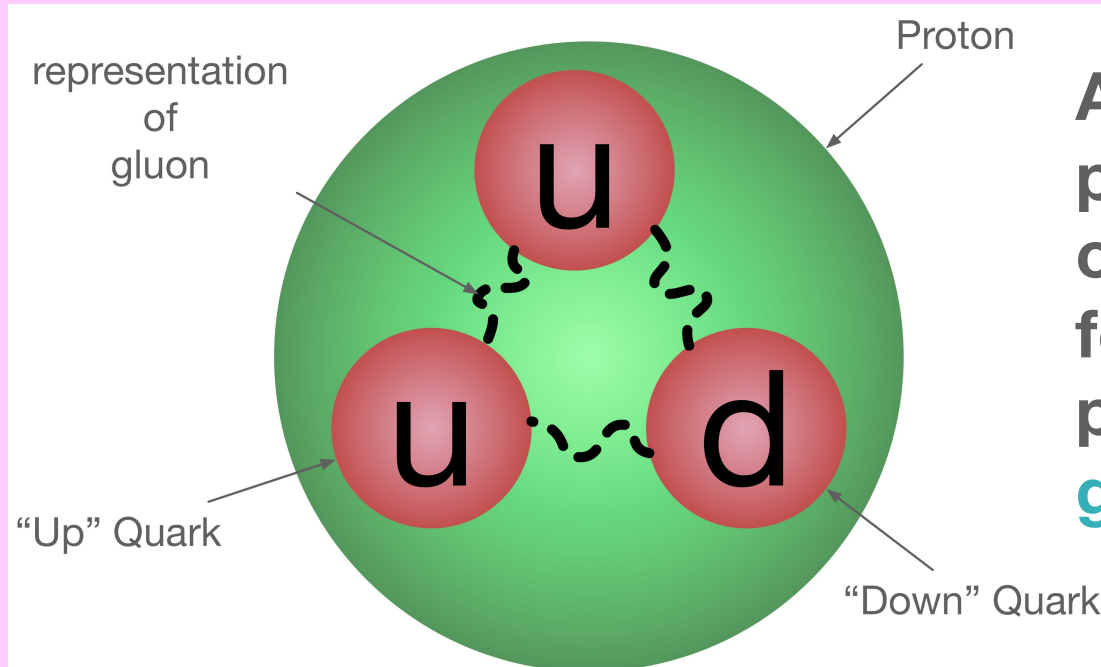
Explain the structure of particles



## Explanation

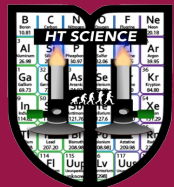
# Exchange Particles

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

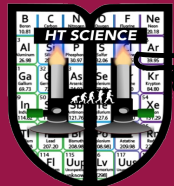
There are four fundamental forces that act within a nucleus. Each is thought to have their own set of exchange particles, which “carry” the force:

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

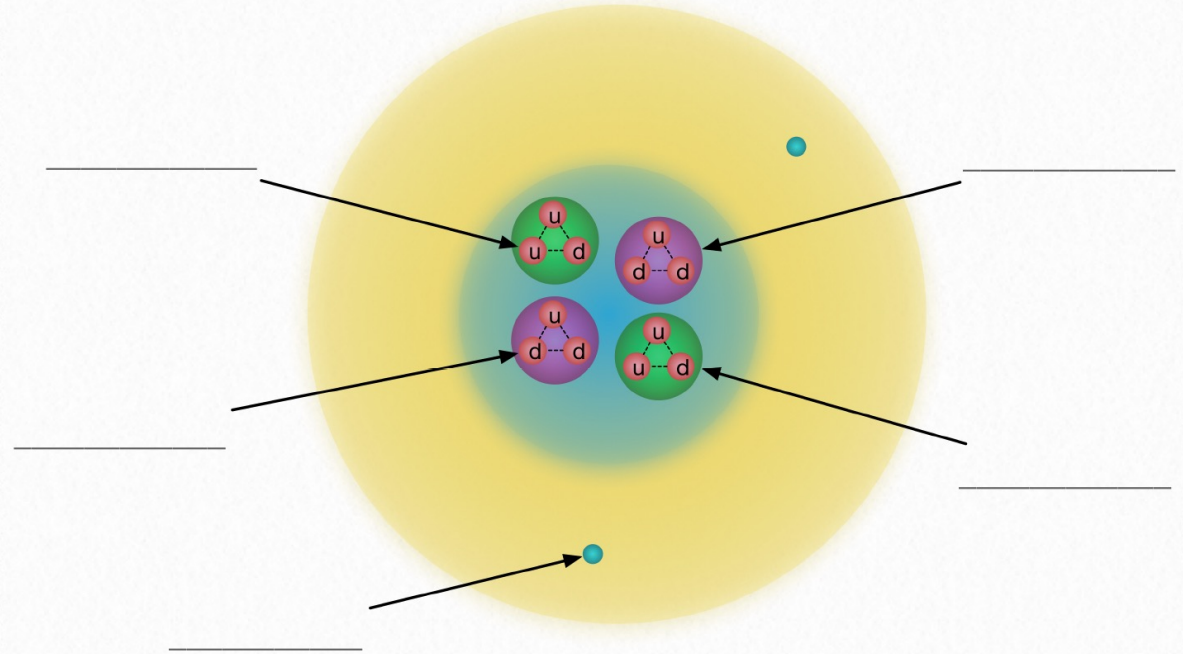
Explain the structure of particles



# Explanation

## Particle Physics

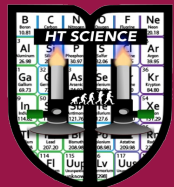
1. Label the diagram of the particles within the atom below:



2. State what is meant by a fundamental particle

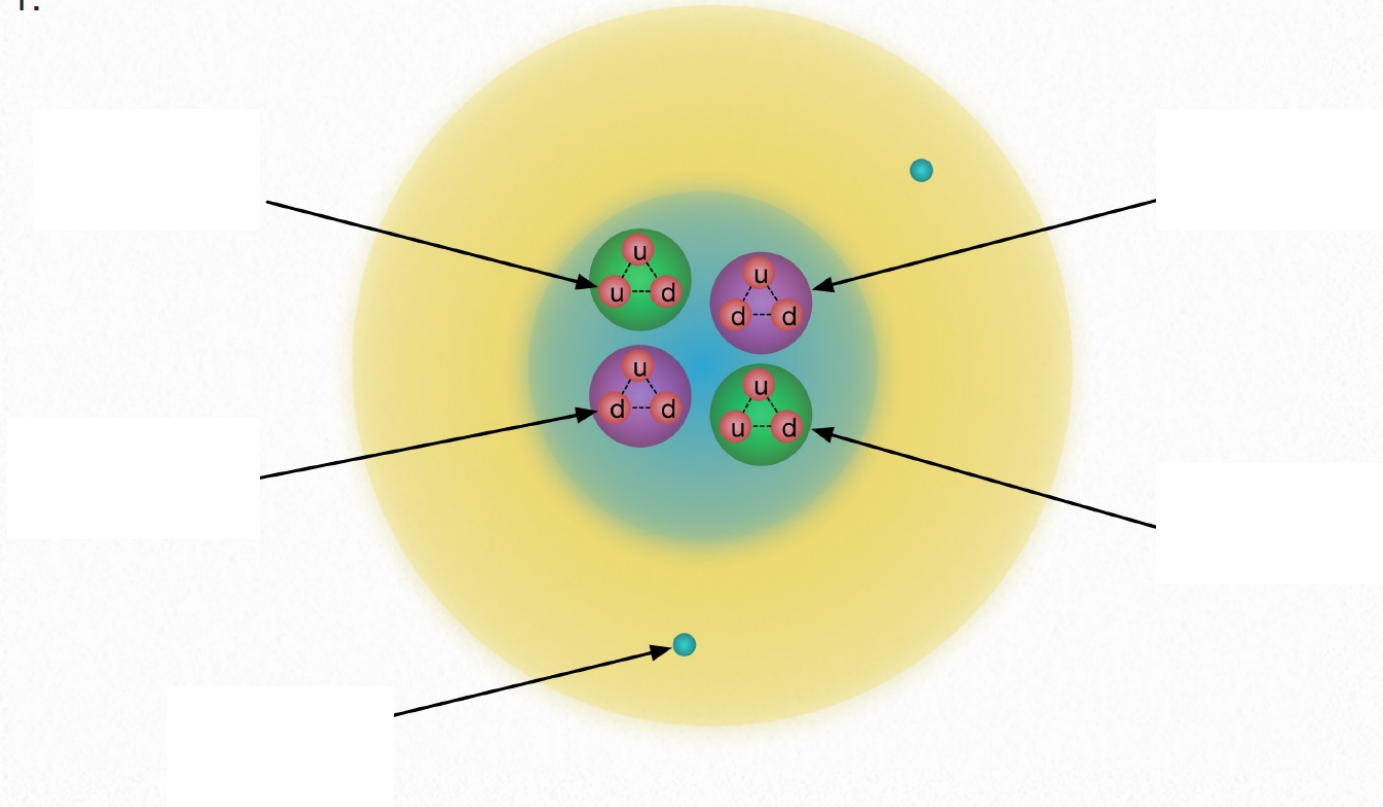
Complete the Questions

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



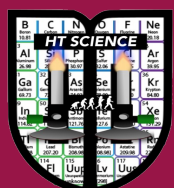
# Particle Physics

1.



2. State what is meant by a fundamental particle

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



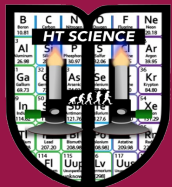
**Learning objectives:**  
Describe the standard model  
Explain the structure of particles

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



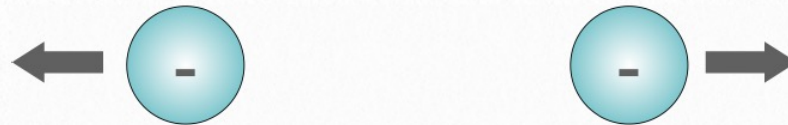
# Questions Continued

## 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  $\pi^0$  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  $\pi^0$  meson.

A.  $s\bar{u}$

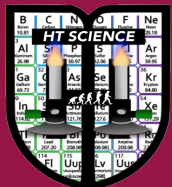
B.  $udd$

7. C

C.  $d\bar{d}$

D.  $u\bar{d}$

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



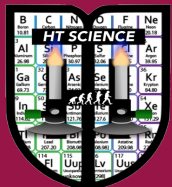
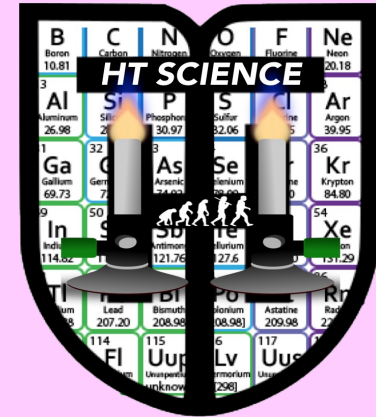
1. Put the borrowed equipment back.

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