IES ROCAGROSSA

C/ Rosa Sensat 1-11

17310 Lloret de Mar

b7006770@centres.xtec.es

CLIL project 2007-2010

✓**Physics & Chemistry**

4th ESO (15-16 years old)

3 levels

1 h/week

Robert Tormo (English Teacher**)**

Isa Pont (Science Teacher**)**

CLIL project 4th ESO

Aims and objectives

- First school year 2007/2008:
  - Compulsory Syllabus
  - Lab classes: Physics & Chemistry Experiments.
  - Qualitative CLIL assessment (attitude)
- Future 2008/2010:
  - Progressive Implementation of CLIL programme within the subject.
  - To involve other non linguistic teachers in the project.

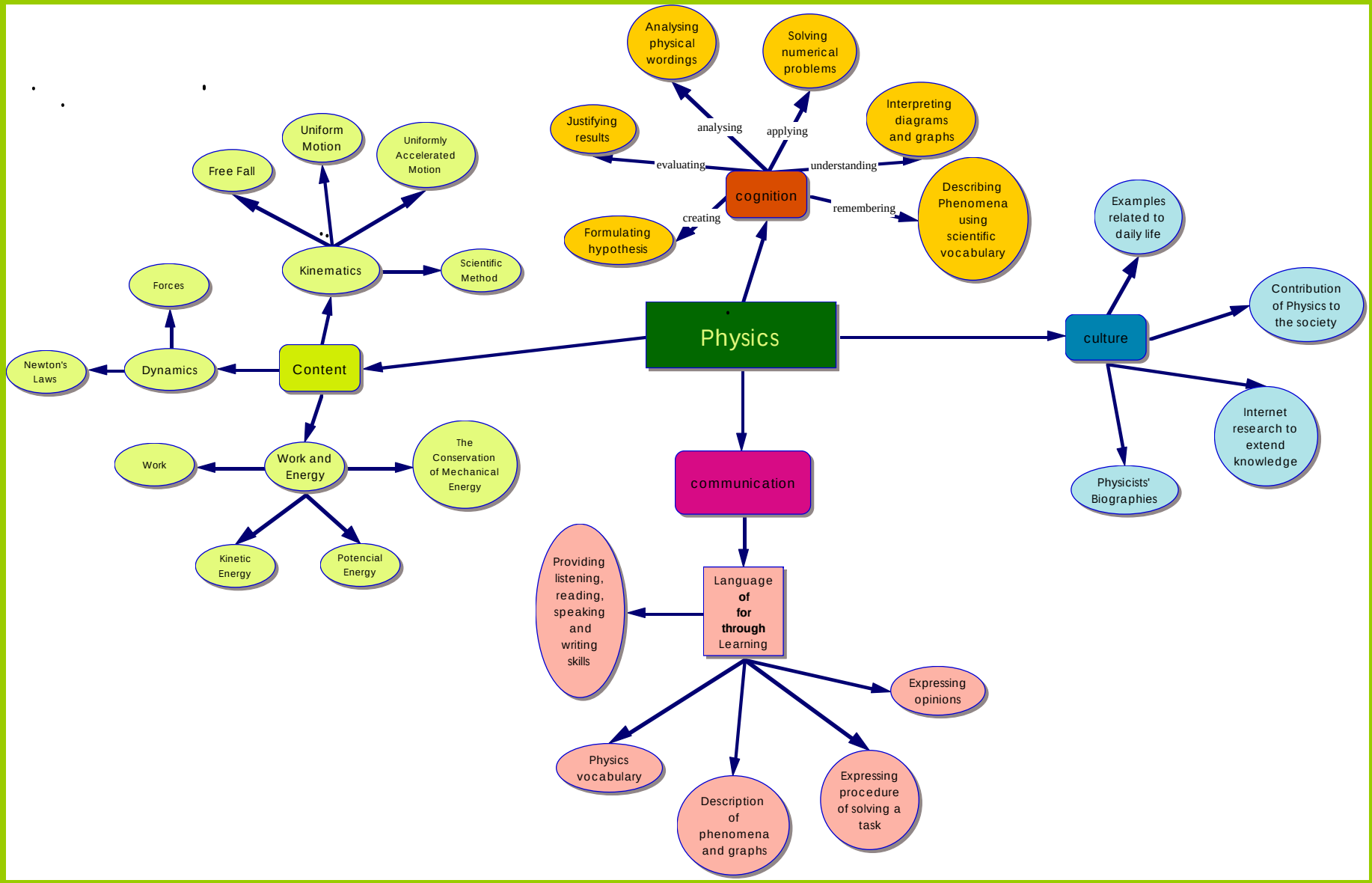
Principles of CLIL Pedagogy

- The **4C's Framework** (Coyle 1999)
  - Content (subject matter)
  - Communication (language)*
    'Leaning to use Language and using Language to Learn´.
  - Cognition (thinking)
  - Culture (awareness of self and 'otherness')

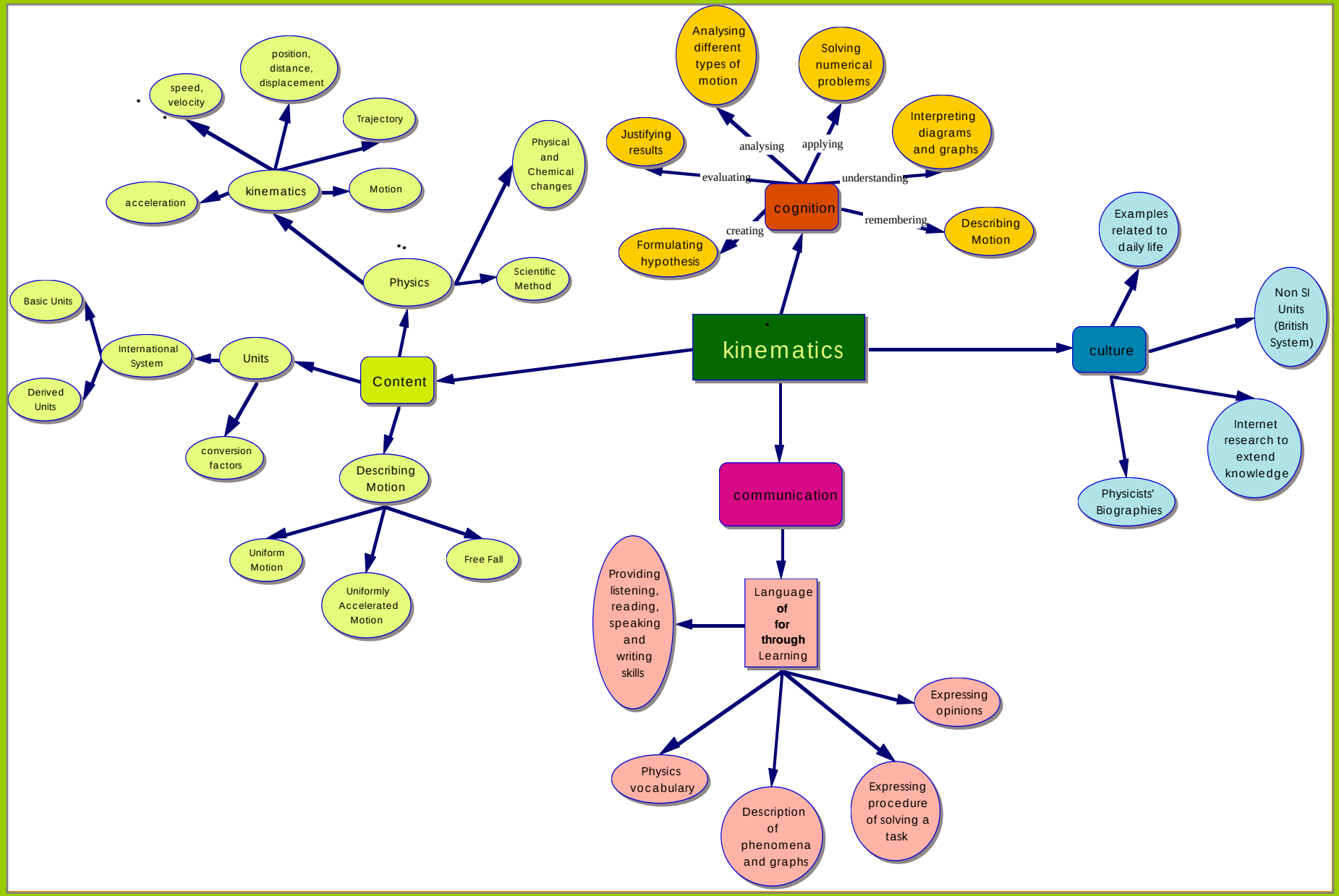
- *The **3A's** Planning Tool
  - Analyse (Language **of** Learning)
  - Add (Language **for** Learning)
  - Apply (Language **through** Learning)

- **CLIL Matrix** adapted from Cummins (Coyle 2005)
  - Relationship between cognition and language
  - Challenge:
    Tasks linguistically accessible and cognitively demanding.

Module (35hours)



Unit 1 (10h)


kinematics
Content
Physics
kinematics
Motion
position, distance, displacement
speed, velocity
Trajectory
acceleration
Physical and Chemical changes
Scientific Method
Units
Basic Units
International System
Derived Units
conversion factors
Describing Motion
Uniform Motion
Uniformly Accelerated Motion
Free Fall
cognition
analysing
applying
evaluating
understanding
remembering
creating
Analysing different types of motion
Solving numerical problems
Interpreting diagrams and graphs
Justifying results
Describing Motion
Formulating hypothesis
communication
Language of for through Learning
Providing listening, reading, speaking and writing skills
Expressing opinions
Physics vocabulary
Description of phenomena and graphs
Expressing procedure of solving a task
culture
Examples related to daily life
Non SI Units (British System)
Internet research to extend knowledge
Physicists' Biographies

UNIT 1 KINEMATICS

Lesson 1 **What is Physics**

Lesson 2 **Physical Magnitudes**

Lesson 3 **Language of Kinematics**

Lesson 4 **Describing Motion**

Lesson structure

- **PowerPoint**
  - to introduce the lesson
  - to support the lesson
- **Handout** contains both:
  - theoretical bases for the students
  - practical application
    - students' activities related to theory
    - Lab activities
    - Quizzes
    - ICT activity

Students work mainly in pairs to solve tasks and then in plenary to correct and get new ideas.

New concept →

What is the difference between a physical and a chemical change?

Visuals ↓

If the identity of the substance doesn't change, it is a **PHYSICAL** change.

Stimulate thought leading to learning

If the identity changes and new substances appear, it is a **CHEMICAL** change.

Different types of tasks

Table Filling

5. Use the help table to make your own definitions of PHYSICAL and CHEMICAL changes. Indicate with an X in the column whether the change described is physical or chemical.

	Physical change	Chemical change
It involves changes in the identity of substances.		
It does the change without changing the identity of substances.		
It produces new substances.		
It doesn't create anything new.		
It only changes the appearance not the chemical composition.		
It creates different substances.		
Change of state of a substance (such as solid to liquid).		
Physical deformation (cutting, denting, stretching, etc.)		
Burning something is a chemical reaction called combustion.		
It produces bubbles (gases), colour change or formation of a precipitation.		
Physical relocation (moving an object).		

Write a paragraph about the difference between a chemical and physical change. Give examples of each.

Producing language

7. In pairs think of a change (chemical or physical, it doesn't matter) and write a short description of it. Then read it aloud and let your classmates guess which kind of change it is.

We are going to describe .....

Description of the phenomenon

Hint

Object:
Egg water ice paper

Action:
Fry melt boil cut

It is a *physical/chemical* change because .....

Communication

Matching

6. Below are some examples of physical and chemical changes but they have suffered from a physical process of cutting and mixing up. Work with your partner to match a number with a letter. Then decide what kind of change they are.

A	If a piece of paper is cut up into small pieces, it is still paper.
B	If a piece of paper is burned, the substance (matter) from which paper was made gains new properties, and loses old ones (becomes an absolutely new substance: ash).
C	You can try to mix sugar with water to dissolve sugar in the water. It does not change what it is; it still has the same properties.
D	If we bake a cake with flour, water, sugar, and other ingredients, new substances would appear.

1	Burning is a change called combustion.
2	The substance remains the same, so this is a change in the shape and size of the paper.
3	Chemical reactions occur in the baking process.
4	The water could be evaporated and sugar crystals would reappear.

cognition →

Solving numerical problems

What is given?

Formula

Example 1

What is the velocity of an object, initially at rest, if it experiences a constant acceleration of 10m/s² to the right after a period of 3 seconds?

Data	Equation	(Diagram)
$V_0 = 0$	$v = v_0 + at$	
t = ...	Resolution	
a = ...		
v = ?		Result

What is being asked for?

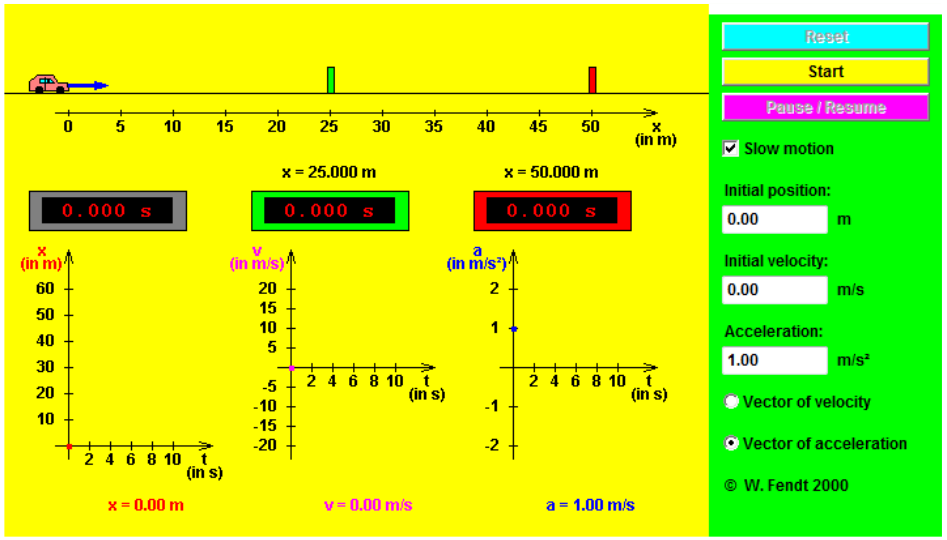
Calculation

Check the result

Culture
Internet as a tool to get information

ICT Activity

3. This Java applet shows a car moving with Constant Acceleration
http://www.walter-fendt.de/ph11e/acceleration.htm



▪Check you have the same data as shown below and draw the graphs you got. Report the results.

▪Then do the same changing data:
V_0= 10 m/s , a = -1m/s^2

Cognition
Interpreting and describing motion

LAB Activity

Lab Report

Title:

Aim:

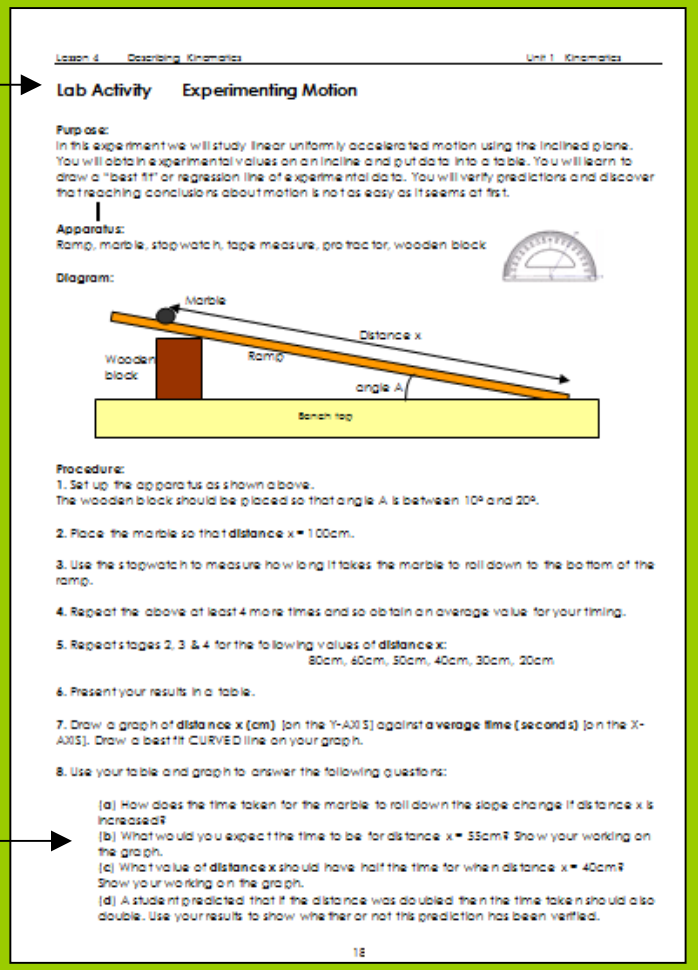
Material:

Procedure:

Results:

Conclusions:

Questions:



Lesson 4 Describing Kinematics Unit 1 Kinematics

Lab Activity Experimenting Motion

Purpose:
In this experiment we will study linear uniformly accelerated motion using the inclined plane. You will obtain experimental values on an incline and put data into a table. You will learn to draw a "best fit" or regression line of experimental data. You will verify predictions and discover that reaching conclusions about motion is not as easy as it seems at first.

Apparatus:
Ramp, marble, stopwatch, tape measure, protractor, wooden block

Diagram:

Procedure:
1. Set up the apparatus as shown above.
The wooden block should be placed so that angle A is between 10º and 20º.

2. Place the marble so that **distance x** = 100cm.

3. Use the stopwatch to measure how long it takes the marble to roll down to the bottom of the ramp.

4. Repeat the above at least 4 more times and so obtain an average value for your timing.

5. Repeat stages 2, 3 & 4 for the following values of **distance x:**
80cm, 60cm, 50cm, 40cm, 30cm, 20cm

6. Present your results in a table.

7. Draw a graph of **distance x (cm)** [on the Y-AXIS] against **average time (seconds)** [on the X-AXIS]. Draw a best fit CURVED line on your graph.

8. Use your table and graph to answer the following questions:

(a) How does the time taken for the marble to roll down the slope change if distance x is increased?
(b) What would you expect the time to be for distance x = 55cm? Show your working on the graph.
(c) What value of **distance x** should have half the time for when distance x = 40cm? Show your working on the graph.
(d) A student predicted that if the distance was doubled then the time taken should also double. Use your results to show whether or not this prediction has been verified.

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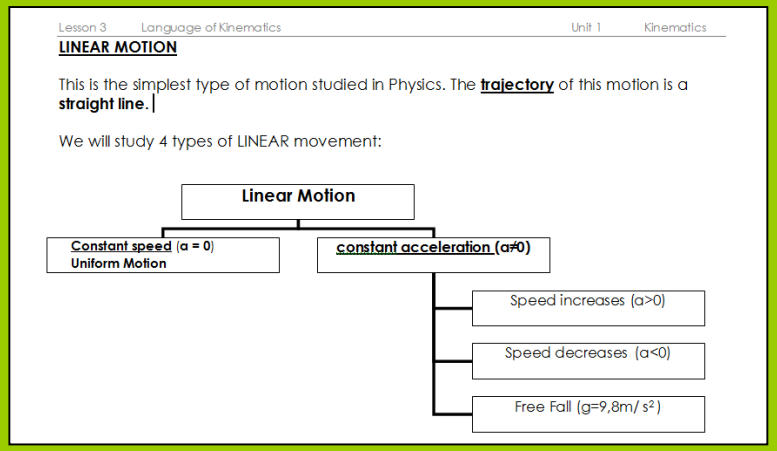
Patience is the key of Science

Experimenting by trial and error

How to assure effective learning?

Lesson 3



Lesson 3 Language of Kinematics Unit 1 Kinematics

LINEAR MOTION

This is the simplest type of motion studied in Physics. The **trajectory** of this motion is a **straight line.**

We will study 4 types of LINEAR movement:

- **Linear Motion**
  - **Constant speed** (a = 0) **Uniform Motion**
  - **constant acceleration (a≠0)**
    - Speed increases (a>0)
    - Speed decreases (a<0)
    - Free Fall (g=9,8m/ s²)

Lesson 4

2. Look at the diagram below and fill in the gap with the phrases on the box.

Free Fall , constant acceleration , **(a = 0)**, speed increases , Uniform Motion , (a<0)

- **Linear Motion**
  - **constant speed** .....
    - .....
  - ..... **(a≠0)**
    - **UNIFORMLY ACCELERATED**
      - ..... (a>0)
      - Speed decreases .....
      - ..... (g=9,8m/ s²)

Scaffolding

Lesson 4 Describing Kinematics Unit 1 Kinematics

Use the substitution table below to write sentences about motion:
(Work in pairs and the we will correct it in plenary)

If When	trajectory speed acceleration	is ..., are ..., increases, decreases, changes,	then that means that is because	it is ... the acceleration ... there is ...
We will study We won't study				

_____

_____

_____

Tell me and I forget.
Show me and I remember.
Involve me and I understand!