MULTIKEY LESSON PLAN

Subject: Physics

Topic: Forces in action

Age of students: 17

Language level: B1/ B2

Time: 45/ 60 minutes

Content aims:

After completing the lesson, the student will be able to:

Distinguish the properties of forces.

Determine the forces acting on a body.

Distinguish when forces have the same direction and sense and when they have opposite sense.

Define Newton's Laws.

Solve problems using the Newton's second law.

Apply the equations for constant acceleration

Apply Newton's relation between force and acceleration to analyse the motion of objects.

Language aims:

After completing the lesson, the student will be able to:

Use new vocabulary within the topics.

Analyse examples of daily life related to Newton's Laws.

Content-obligatory language	Content-compatible language
Dynamics, interaction, motion	Physics, Action, reaction, movement
Body, mass, inertia	Object, weight, resistance
To exert	to apply
Velocity, acceleration, force	speed
Tension, normal, resultant, gravity	friction
Magnitude, modulus, sense	parallel, perpendicular, direction
Normal, tangent, displacement, trajectory	distance, length, height
axis, axes, plane, pendulum	inclined, angle, slide
uniformly, equilibrium	



Materials:

- The presentation 'Forces in action'
- Student's worksheets 0 to 3.

Procedure:

0. Previous knowledge about Motion: work in pairs, Worksheet 0.

- Before starting the lesson, students review the main features of motion completing a questionnaire of the *Worksheet 0*.
- Then, working in pairs, students compare their answers.
- At the end of the lesson, we check the task all together.

1. 'Forces in action' presentation: work individually, Worksheet 1.

- Students have the *Worksheet 1* which provides students brief information about the presentation.
- Teacher introduces the lesson 'Forces in action' to students and explains them some of the main ideas about Dynamics as a part of physics that studies the actions exerted on a body and how these actions affect the movement thereof.
- Then, students listen teacher's presentation

2. 'Forces in action' tasks: teamwork (4), Worksheet 2.

After listening the teacher's presentation, students, in the same teams, connect the whole parts of the presentation with the main ideas of the 'Forces in action' lesson completing the following tasks of the *Worksheet 2*.

3. 'Forces in action' discussion: teamwork (4), Worksheet 3.

Students, in groups of four people, discuss the answers of a guided questionnaire of the Worksheet 3.

4. 'Forces in action': Worksheets

Teachers will provide students with the following worksheets 0 to 3



Worksheet 0	Worksheet 0Questionnaire: What do we know about motion?					
	Before starting the lesson					
0.1. When do we s	0.1. When do we say that a body is in motion?					
0.2. Why is a fram	e of reference needed?					
0.3. Indicate the sp	0.3. Indicate the speed at which circulates a car that runs 150 km in 1.5 hours:					
a) 150	km/h	c)	$\frac{1.5 \ h}{150 \ km} = 0.01 \ \frac{km}{h}$			
b) $\frac{150}{1,1}$	$\frac{bkm}{5h} = 100 \frac{km}{h}$	d)	$150 \text{ km} \cdot 1,5 \text{ h} = 450 \text{ km} \cdot \text{h}$			
0.4. Indicate what	is the trajectory of the fol	llowi	ng motions:			
a) A falling stone	e		2			
b) A runner of 10	b) A runner of 100 metres					
c) The carriage of	of a carousel					
0.5. A bus, which runs at constant speed, braking in front of a red light in 4 seconds:						
a) Before stopping, what kind of movement had the						
b) What kind of m braking?	otion has the bus when it is					
c) What is the sign of the acceleration?						



Worksheet 1	'Forces in action': brief information for presentation				
	While listening teacher's presentation				
Contents of prese	entation				
1. Why a body cha	anges its speed?				
1.1. Properties of	forces				
2. How can you de	etermine the forces acting on a body?				
2.1. Scheme to det	termine the forces acting on a body				
3. What happens is	3. What happens if more than a force acts on a body?				
3.1. Forces with the	3.1. Forces with the same direction and sense				
3.2. Forces with the	ne same direction and opposite sense				
3.3. Forces formin	g an angle with the direction of displacement				
3.3.1. Example 1:	Body sliding down an inclined plane (no friction)				
3.3.2. Example 2: Simple pendulum					
4. Newton's Laws					
4.1. Newton's Firs	t Law or The Law of Inertia				
4.2 Newton's Second law or The fundamental Law of dynamics					
4.2.1. The Newton					
4.3. Newton's Third Law or Law of Action-Reaction					
4.3.1. Example 1					
4.3.2. Example 2					
Contents of Task	S				
Worksheet 0: Questionnaire: What do we know about motion?					
Worksheet 1: 'Forces in action': Contents					
Worksheet 2: 'Forces in action' tasks					

Worksheet 3: 'Forces in action' discussion: guided questionnaire















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Worksheet 3

'Forces in action' discussion: guided questionnaire After listening teacher's presentation ...

- 1. Why a body changes its speed?
- 2. What kind of properties the forces present?
- 3. How can you determine the forces acting on a body?
- 4. Do you remember the special names given to Some forces?
- 5. What happens if more than a force acts on a body?

6. Which procedure do we follow to find the resultant force when forces with the same direction and sense come to scene?

7. And what about forces with the same direction and opposite sense?

8. Which procedure do we follow to find the resultant force when we have forces forming an angle with the direction of displacement?

9. According to the Newton's First Law or The Law of Inertia, what happens to the speed of a body if none force acts on it? And if all forces acting on it, giving a null result?

10. What states Newton on its Second law regarding the speed of a body when a resultant force acts on it?

11. Could you express in an equation the relation between applied force and produced acceleration?

- 12. Could you explain in your own words what is a Newton?
- 13. According to Newton's Third Law, explain his Law of Action-Reaction in your own words using examples.
- 14. Is it possible that action and reaction forces cancel themselves?

4. 'Forces in action': Self-assessment grid

Students assess themselves using the provided self -assessment grid.

CATEGORY	Beginning 1	Developing 2	Accomplished 3	Excellent 4	Score
Worksheet 0 - Questionnaire.	Only 25% correctly answered	Between 25 and 50% correctly answered	Between 50 and 75% correctly answered	All questions correctly answered	/ 8



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Worksheet 2 - Task 1	Only 25% correctly answered	Between 25 and 50% correctly answered	Between 50 and 75% correctly answered	All questions correctly answered	/ 8
Worksheet 2 - Task 2	Only answers correctly up to one box, but less than two	Only answers correctly two boxes, but less than three	Only answers correctly three boxes, but less than five	All questions correctly answered	/ 8
Worksheet 2 – Tasks 3 to 5	Only answers correctly up to one box, but less than two	Only answers correctly two boxes, but less than three	Only answers correctly three boxes, but less than four	All questions correctly answered	/ 8
Worksheet 2 – Task 6	Only answers up to one box, but the steps are not clearly explained	Only answers correctly up to two boxes, but the steps are not clearly explained	All questions answered, but some steps are not clearly explained	All questions correctly answered	/ 8
Worksheet 2 – Task 7	Only answers correctly up to one box	Only answers correctly up to three boxes	Only answers correctly up to five boxes	All questions correctly answered	/ 8
Worksheet 2 – Task 8	Only answers correctly up to one box	Only answers correctly up to two boxes	Only answers correctly up to three boxes, but less than five	All questions correctly answered	/ 8
Worksheet 3 - Questionnaire	Only 25% correctly answered	Between 25 and 50% correctly answered	Between 50 and 75% correctly answered	All questions correctly answered	/ 8

