Projekt współfinansowany w ramach programu Unii Europejskiej Erasmus+

Pre-test – Oscillatory motion (before the lesson cycle)

Part A – Closed questions

1. **Mark the correct answer with an X. You may mark more than one answer.**

   Which of the following phenomena are examples of oscillatory motion?

   - a) A swing swinging back and forth
   - b) A car driving on the motorway
   - c) A guitar string set into vibration
   - d) Leaves falling from a tree

2. **Mark the correct answer with an X. You may mark more than one answer.**

   The amplitude in oscillatory motion is:

   - a) The time of one complete vibration
   - b) The maximum deviation from the equilibrium position
   - c) The centre of oscillatory motion
   - d) The speed of the body in motion

Part B – Open-ended questions / short answers

3. Draw a simple graph of the oscillatory motion of a pendulum and mark on it:

- the equilibrium position
- maximum deflections.

4. Give an example of oscillatory motion that you have observed in everyday life.

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Describe which position of the body in your example you consider to be the position of equilibrium.

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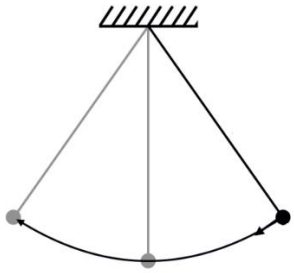
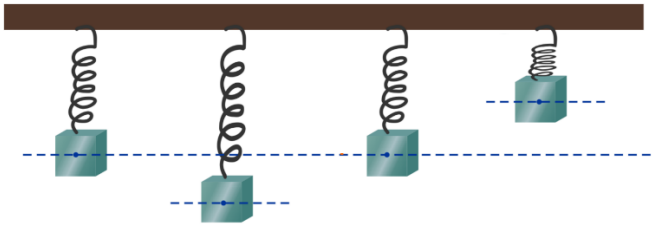
5. Below are two different pendulums.





Mark on each drawing where the following is located:

- maximum deflection
- the equilibrium position
- Can they be used to determine the value of gravitational acceleration?

  Mark the correct answer with an X

  - YES
  - NO

Briefly justify your answer.

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1. **Mark the correct answer with an X**.

   What is the speed of the pendulum at its maximum deflection?

   - a) It is maximum
   - b) It is zero
   - c) It is average
   - d) Cannot be determined

2. **Mark the correct answer with an X.**

The period of oscillation of a mathematical pendulum depends on:

- a) The mass of the pendulum
- b) The amplitude of the oscillations (for small deflections)
- c) The length of the pendulum
- d) Earth's acceleration/gravitational acceleration

Post-test – Oscillatory motion and data analysis (after the lesson cycle)

Part A – Closed questions

1. **Mark the correct answer with an X.**

   What is the speed of the pendulum at its maximum deflection?

   - a) It is maximum
   - b) It is zero
   - c) It is average
   - d) Cannot be determined

2. **Mark the correct answer with an X.**

   The period of oscillation of a mathematical pendulum depends on:

   - a) The mass of the pendulum
   - b) The amplitude of the oscillations (for small deflections)
   - c) The length of the pendulum
   - d) Earth/gravitational acceleration

Part B – Graph analysis

3. Based on the graph showing changes in the position of the pendulum over time, draw and:

   a) Mark the equilibrium position and maximum deflections
   b) Show how to read the period of oscillation and calculate the frequency of oscillation of this pendulum
   c) Describe in which position of the pendulum the velocity is greatest and in which it is zero

4. Why is the graph of the changes in the distance between the pendulum and the sensor shifted ("raised") and why is the equilibrium/rest position not on the X-axis?

Part C – Open-ended questions / short answers

Explain in a few sentences:

5. When can a pendulum be considered a mathematical pendulum?

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6. How does the speed of the pendulum change when it moves from its equilibrium position towards its maximum deflection and vice versa?

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7. How can the value of gravitational acceleration be determined if the length of the pendulum and its period of oscillation are known?

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8. You know the data from the sensor: the time and distance of the pendulum from the sensor.

   Draw a graph of the position and velocity of the pendulum as a function of time (you can use graph paper or a graphing programme).

Mark all characteristic points:

- equilibrium position,
- maximum deflections,
- zero velocity points,
- points of maximum velocity.
- The position of the pendulum when it has zero and maximum speed.