Physics: SS1 First Term

WEEK 4 – Motion(i)

Definition of Motion

Motion by definition is a change in the position of a body with time with respect to a reference point. Motion exists in various forms and occurs in all the three states of matter (solids, liquids and gases). These various forms are; random, translational, rotational and oscillatory motion.

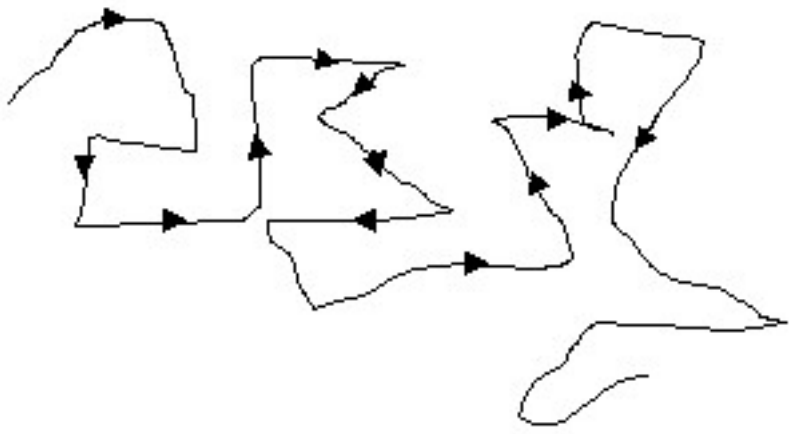
Some examples of motion are;

1. The movement of the earth round the sun
2. The rotation of the earth about its axis
3. An aeroplane flying in the sky
4. A boy walking or running

Types of Motion

A. Random motion

Random motion is the movement of a body in a zigzag or disorderly manner with no specific direction as shown in the diagram below. Some examples of this kind of motion are; the motion of dust particles in the air, the motion of smoke particles, the motion of butterfly e.t.c.



Random Motion

Random Motion

B. Translational motion

This is motion performed by a body in a straight line from point 'P' to another point 'Q'. if you walk from one end of the classroom to the other, you have performed translational motion. Translational motion can also be called rectilinear motion. Another example of translational motion is the dropping of a fruit from a tree to the ground.

Translational Motion

C. Rotational motion

When a body moves in a circular path about an axis, it has performed rotational motion. In other words, rotational motion is the motion a body performs in a circular path about an axis. The rotation of the blades of a fan, the rotation of a wheel about an axis, the rotation of the earth about its axis, the motion of a moving vehicle wheel are all examples of rotational motion.

D. Oscillatory motion

This is the motion of a body in a to and fro manner about a fixed point. When a body moves to and fro about a fixed point, we say, the body is oscillating. One complete oscillation is a circle. Examples of oscillatory motion include, the motion of the balanced wheel of a wrist watch, the motion of a simple pendulum, the motion of a loaded test tube inside water, e.t.c.

Note: It is possible for a body to perform two types of motion at the same time. For example a rolling football performs both rotational and translational motion at the same time.

Class activity

1. Set up a simple pendulum as shown above
2. For a length (L) of the pendulum say, 80.0cm, push the bob through a small angle to oscillate to and fro
3. Using a stop watch, determine and record down the time (t) it will take the bob to complete 20 oscillations
4. Calculate the period (T) of oscillation of the bob i.e t/20

5. Repeat the experiment for four other values of L= 70.0cm, 60.0cm, 50.0cm and 40.0cm. in each case determine the period (T) and its square.
6. Tabulate your results. Plot a graph of T^2on the vertical axis against L on the horizontal axis
7. Determine the slope S of the graph
8. Given that $4\pi^2/g = S$, calculate the value of g.

E. Relative motion

Relative motion is the motion of a body with respect to another. Put in another way, it is the motion of a body with respect to a reference point. All motions are relative.

EVALUATION

1. Mention 2 other examples each of random motion, translational motion, rotational motion and oscillatory motion apart from the ones in this e-note.
2. Mention two examples of bodies that perform two motions at the same time. State the two motions. Do not include the example given in the e-note.

Causes and Effects of Motion

Sir Isaac Newton's works on motion reveals that an object will remain in its state of rest (inertia) unless an external force acts on it. This means that if an object is kept on a table, the object will remain in that state of rest or on the table unless something touches it. This leads to the conclusion that the cause of motion is force which can either be a push or a pull.

A pull or push will make the object to move to point B from point A. this means that force is a vector quantity because it has both magnitude and direction.