1. S\_IV\_GE:1: **Linearity and superposition principle:**

Linearity is the property of a mathematical relationship or function which means that it can be graphically represented as a straight line. Examples are the relationship of voltage and current across a resistor (Ohm’s law), or the mass and weight of an object.

In physics, linearity is a property of the differential equations (i.e. an equation that relates one or more functions or physical quantities and their derivatives) governing many systems, for example, the Maxwell equations.

Linearity of a differential equation means that if two functions ‘f’ and ‘g’ are solutions of the equation, then any linear combination (af +bg) is, too. (A linear combination is an expression constructed from a set of terms by multiplying each term by a constant and adding the results, e.g. a linear combination of x and y would be any expression of the form ax+by, where a and b are constants).

The ‘superposition principle’ , also known as ‘superposition property’ states that, for all linear systems, the net response caused by two or more stimuli is the sum of the responses that would have been caused by each stimulus individually. So that if input ‘A’ produces response ‘X’ and input ‘B’ produces response ‘Y’, then input (A+B) produces response (X+Y).

In the case of waves, the principle of superposition states that, when two or more waves of the same type cross at some point, the resultant displacement at that point is equal to the sum of the displacements due to each individual wave.



