Exit Level Science TAKS Study Guide

Science TAKS Objective	Number of Questions on the Exit Level TAKS
Objective 1: Nature of Science	17
Objective 2: Organization of Living Systems	8
Objective 3: Interdependence of Organisms	8
Objective 4: Structures and Properties of Matter	11
Objective 5: Motion, Forces, and Energy	11
Total	**55**

Objective 5: Motion, Forces, and Energy (11 questions)

- IPC 4.A calculate speed, momentum, acceleration, work, and power in systems such as in the human body, moving toys, and machines;
- IPC 4.B investigate and describe applications of Newton's laws such as in vehicle restraints, sports activities, geological processes, and satellite orbits; and
- IPC 4.D investigate and demonstrate [mechanical advantage and] efficiency of various machines such as levers, motors, wheels and axles, pulleys, and ramps.
- IPC 5.B demonstrate wave interactions including interference, polarization, reflection, refraction, and resonance within various materials.
- IPC 6.A describe the law of conservation of energy;
- IPC 6.B investigate and demonstrate the movement of heat through solids, liquids, and gases by convection, conduction, and radiation; and
- IPC 6.D investigate and compare economic and environmental impacts of using various energy sources such as rechargeable or disposable batteries and solar cells.

In order to successfully answer Objective 5 questions, students should:

- be able to solve for speed (velocity), momentum, acceleration, work, and power
- understand the concepts of Newton's Three Laws of Motion and be able to identify examples of each
- be able to solve for the efficiency of simple machines
- be able to determine the mechanical advantage of simple machines
- understand and be able to identify examples of interference, polarization, reflection, refraction, and resonance
- understand the meaning and relevance of the Law of Conservation of Energy
- understand and be able to identify examples of convection, conduction, and radiation
- understand the advantages and disadvantage of various energy sources

Speed and Velocity:

- speed (s) – the distance an object travels per unit of time
  - speed = distance/time
  - instantaneous speed – the speed at any one point in time
  - average speed – the total distance traveled divided by the total time of travel
- velocity (v) – speed in a given direction (60 miles/hour North or 5 m/s left)
- the standard unit for time is seconds (s)
- the standard unit for distance is meters (m)
- the standard unit for speed and velocity is meters per second (m/s)
  - there are many other units that may be used such as km/hr, mph, feet/s, km/s, and cm/yr
- examples of speed problems:
  - A football field is 100 meters long. If it takes Greg 20 seconds to run its length, how fast was he running?

    s = 100/20= 5 m/s
  - If you run at 12 m/s for 90 seconds, how far will you go?

    12 = d/90

    12 • 90 = d/90 • 90

    1,080 m = d or d = 1,080 m
  - Every summer Tasha drives to a lake that is 282 kilometers from her house. If she drives at a constant speed of 80 km/hr, how much time will she spend driving?

    80 = 282/t

    80 • t = 282/t • t

    80t = 282

    80t/80 = 282/80

    t = 3.525 s