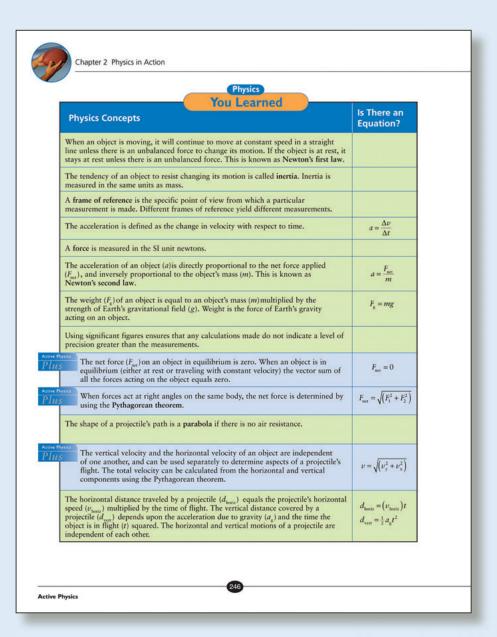
Chapter Assessment

Physics You Learned

This section is a useful resource that helps students to revise and recall prior learning. Important concepts that students investigated in *Physics in Action* are briefly summarized and related equations are listed across the summary. Students could use the *Physics You Learned* table throughout their reading of the chapter for a quick reference to an essential concept that they investigated earlier in a previous section.

To help students review all the equations and concepts, once they have reached the end of the chapter, consider posting a visual display of important equations on the walls of your classroom. Divide students into groups and ask them to take turns to make up a list of five questions relating to the concepts they have learned and have each team member answer those questions. This strategy is useful in having students evaluate their knowledge of the physics concepts they have learned in the chapter. A key function of this section is that it gives students an opportunity to review for their Physics Practice Test.



The maximum range of a projectile returning to the same height as the launch point occurs when it is launched at 45° degrees to the horizontal.	
When an object is projected at an angle to the horizontal, the motion may be analyzed after the velocity is broken into vertical and horizontal components.	8
Forces come in pairs. Whenever a force is exerted on a mass $b\left(F_{x\ cmb}\right)$, the mass b exerts an equal force in the opposite direction on the mass $a\left(F_{b\ cms}\right)$. This is known as Newton's third law.	$(F_{a \text{ on } b} = -F_{b \text{ o}})$
The normal force is a force that acts perpendicular to a surface.	
A free-body diagram is a sketch of all the forces acting on an object.	
The force of friction (F_i) equals the coefficient of friction (μ) multiplied by the normal force (F_{ij}) . Friction is a force acting between two bodies in contact that resists the relative motion of those bodies. It always acts parallel to the surfaces in contact.	$F_{\rm f} = \mu F_{\rm N}$
The coefficient of friction (μ) is a dimensionless constant.	
The coefficient of static friction (μ_s) on an inclined plane equals the tangent of the angle the plane makes with the horizontal ($\tan \theta$).	$\mu_s = \tan \theta$
An object's kinetic energy (KE) is proportional to the object's mass (m) multiplied by its velocity squared (ν^2). Kinetic energy is an object's energy of motion.	$KE = \frac{1}{2}mv^2$
Gravitational potential energy (GPE) is proportional to an object's mass (m) multiplied by its vertical height above Earth (Δb) and the acceleration due to gravity (g) . Gravitational potential energy is energy due to an object's vertical position above Earth's surface.	GPE = mg2
Elastic potential energy (EPE) is proportional to the spring constant of the material (k) multiplied by the material's change in length (x) squared. Elastic potential energy is energy stored in a material due to its compression or stretch.	$EPE = \frac{1}{2}kx$
Work (W) done on an object can increase its kinetic energy (ΔKE). When work is done on an object moving on a horizontal surface, the kinetic energy of the object increases.	$W = \Delta KE$ $= \left(\frac{1}{2}mv_i^2 - \frac{1}{2}n\right)$
Work (W) is the product of the force exerted on an object (F), and the displacement in the direction of the force (d). Work done on an object increases its energy and may change an object's kinetic or potential energy.	W = Fd
The law of conservation of energy states that energy may change its forms, but not its amount. The total amount of energy remains the same during any changes in form.	Energy _{behav} = En

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