Unit 13 Physics Themed – Vocabulary and Equations – Work, Energy & Power in Rollercoasters

$E_i = E_f$ (conservation of energy)
GPE = mgh KE = ½mv²
ME = KE + GPE Wt = mg
W = Fd P = W/t
AMA = F_o/F_i IMA = d_i/d_o
Eff. = W_o/W_i Eff. = P_o/P_i
f = μN F_{net} = ma $a_c = v^2/r$
$F_c = ma_c$ (circ.) g's = $a_c/9.8$
x = circumference = 2πr
$v = \sqrt{(2g\Delta h)} = \sqrt{(19.6\Delta h)}$

$v = \frac{\Delta x}{\Delta t}$ $a = \frac{\Delta v}{\Delta t}$
$\Delta x = v_0 \Delta t + ½ at^2$
$v_f^2 = v_i^2 + 2a \Delta x$ $v_f = v_0 + a \Delta t$
$\Delta x = v_x \Delta t$
$v_{yi} = v \sin\Theta$ $v_x = v \cos\Theta$
$p = mv$ $p_i = p_f$
$(m_1v_1 + m_2v_2)_I = (m_1v_1 + m_2v_2)_f$
$I = \Delta p = m\Delta v = F\Delta t$

Equation	a	*t*	v_{yi}	v_{yf}	Δy
$v_{yf} = v_{yi} + at$	√	√	√	√	☹
$\Delta y = \frac{(v_{yi} + v_{yf})}{2} t$	☹	√	√	√	√
$\Delta y = v_{yi}t + ½at^2$	√	√	√	☹	√
$v_{yf}^2 = v_{yi}^2 + 2a\Delta y$	√	☹	√	√	√

1609 m = 1 mi | *60 mph = 27 m/s* | *1 hp = 746 W* | *1 lb = 0.4536 kg* | *1 mi = 1609 m* | *1 W-s = 1 J* | *1 ft = 0.3048 m*

Symbols:
PE, KE, GPE, m, g, h, v

Vocabulary:
Joule
Newton
Kinetic energy (KE)
Potential energy (PE), Work
Gravitational potential energy (GPE or PE)
Mechanical energy,
Elastic potential energy
Chemical energy, Nuclear energy, Electrical energy
Internal energy,
Deformation energy,
Sound energy
Light energy, Thermal energy,
Total energy, Mechanical energy (ME)
Efficiency, Friction, Frictionless
Conservation of energy
Pendulum, Perpetual motion machine

Unit Objectives - Williams

1. I understand all the vocabulary & math of this unit and all demos, videos, equations, and class assignments.
2. I remember objectives & vocabulary from previous units.
3. I understand that positive work requires a parallel force components and increases the energy of the object
5. I know that work can be negative and what this implies
6. I can compute work, power and various energy forms in absolute and relative terms based on speed, mass, height and force direction values or changes in these values
7. I know conservation of energy including ME & friction converts useful energy (ME) to internal energy
8. I know common forms of energy and can identify them
9. I am able to compute power and can explain how it differs from work
10. I have memorized the current cost of energy locally per kilowatt hour
11. Given information on work, power, time etc., I can compute energy cost using the factor label method
12. I understand the relationship between work, force, energy and distance for brakes
15. I understand what conservation energy means including common examples of real world exchanges of energy
16. I can to track the exchange energy for masses moving up and down hills while ME remains constant
17. Compute/graph energy totals & categories using GPE, KE, ME including using correct units and including how changes in mass, speed and height change the results
18. Compute weight/mass
19. Identify and understand other forms of energy in unambiguous situations
20. Follow energy flow in pendulums and rollercoasters including consequential changes in speed and position when heights are changed as well as novel situations; understand why first hill must be tallest
21. Conceptually, I can account for friction/thermal energy including the unavoidable energy flow in that direction

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401. I can identify if masses have kinetic and/or potential energy at a given instant.
402. I can identify potential energy as a function of position.
403. I can identify kinetic energy as a function of velocity.
404. I can calculate gravitational potential energy and kinetic energy.
405. I can identify an isolated system and analyze it.
406. I can identify that energy is transferred between different forms.
407. I can solve problems using conservation of mechanical energy.
408. I can apply the mathematical definition of work as the product of Force and displacement.
409. I can identify situations of positive work, negative work, zero work.
410. I can identify work as a change in energy.
412. I can analyze the rate of energy change of a system in terms of power.