1. Circular motion, especially uniform circular motion.
   Centripetal acceleration, centripetal force.
   Understand the concept and the calculation.

2. Force from the spring: Hooke's law.

3. Work and Energy:
   A. Definition of work, power and kinetic energy. What are their units? Are they scalar or vector?
   B. Work-energy theorem: $W = \Delta K = K_f - K_i$
   C. How do we calculate work and kinetic energy?
      Work done along by constant force only.
      Work done by a force which is not at the same direction of the displacement
      Special case, work done by gravitational force.
      What about the work done by the normal force or friction?
   D. Conservation of mechanical energy.
      1. In what situation, the mechanical energy is conserved?
      2. What are the potential energy of gravity and potential energy of spring?
   F. Applications of work-energy theorem:
      Using work-energy theorem to find out velocities, height, etc.

4. Fluids:
   Pressure: definition, units, unit conversion,
   Pressure of fluids.
   Buoyant force
   Equation of continuity of fluids.
   Pascal's principle
   Archimedes' principle
   Bernoulli's equation

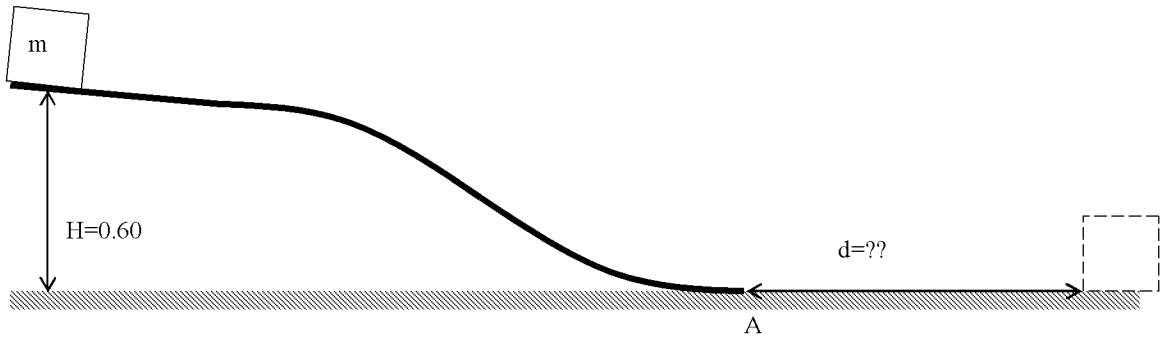
1. A racecar is traveling at constant speed around a circular track. What happens to the centripetal acceleration of the car if the speed is doubled?
(a) it remains the same.
(b) it increases by a factor of 2.
(c) it increases by a factor of 4.
(d) it is decreased by a factor of one-half.
(e) it is decreased by a factor of one-fourth.

Answer: c

2. which one of the following statements concerning the buoyant force on an object fully submerged in a liquid is true?
(a) the buoyant force depends on the mass of the object.
(b) the buoyant force depends on the weight of the object.
(c) the buoyant force is independent of the density of the liquid.
(d) the buoyant force depends on the volume of the object.
(e) the buoyant force will increase with depth if the liquid is incompressible.

Answer: d

3. A small object, whose mass is 0.050 kg, is sliding down a ***frictionless*** track. The height of the track is .60 m. At the end of the track, shown as point A in the graph, the object keeps sliding on the ground whose coefficient of friction is $\mu_k = 0.20$. How far does the object slide on the ground beyond point A?



Solution:

When the object is on the track, only gravity does the work, the normal force doesn't do the work. We can apply the work-energy theorem.

$W_{total} = \Delta KE$ *where*

$$W_{total} = W_{mg} + W_N + W_{friction} = mg(h_i - h_f) + 0 + F_{friction} \cdot d \cdot \cos(\theta)$$

(What is θ here???)

and $f = N \cdot \mu_k = (0.050kg)(9.8m/s^2)(0.20) = 0.098\ N$

Plug in $\Delta KE = KE_f - KE_i = 0 - 0$

we have d = 3.0 m