1. A boulder is 100. m above a canyon floor. The boulder has a mass of 800. kg. How much PE does the boulder have?

$PE = mgh = (800.\ kg)(9.8\ N/kg)(100.\ m)$
$= 784{,}000\ N\text{-}m$
$= 780{,}000\ J$

2. A 4.0 kg laptop computer is lifted to a height of 2.0 m. How much PE does the laptop now have?

$PE = mgh = (4.0\ kg)(9.8\ N/kg)(2.0\ m)$
$= 78.4\ N\text{-}m$
$= 78\ J$

3. The same laptop falls to the floor, tragically. How much KE does the laptop have in the instant before it hits the floor?

78 J

4. What happens to most of the KE that the laptop has (just before hitting the floor) after the laptop contacts the floor?

transformed to sound, heat, etc.

5. How much PE does the laptop have when it has fallen halfway to the floor? (assume air friction is so small that we can ignore it)

$78\ J / 2 = 39\ J.$

6. A 160. kg motorcycle is moving at 40. m/s. How much KE does the motorcycle have?

$KE = \frac{1}{2}mv^2 = \frac{1}{2}(160.\ kg)(40.\ m/s)^2$

$= 128{,}000\ kg \cdot m^2/s^2$

$= 130{,}000\ J$

7. If the motorcycle increases its speed to 80. m/s, how much KE does it now have?

$KE = \frac{1}{2}mv^2 = \frac{1}{2}(160.\ kg)(80.\ m/s)^2$

$= 512{,}000\ kg \cdot m^2/s^2$

$= 510{,}000\ J$

8. Does doubling the speed of the motorcycle double the KE it has? Why or why not?

NO - velocity is SQUARED

$2^2 = 4x$ KE @ 80. m/s

$(4 \cdot 128{,}000 = 512{,}000)$

9. How much longer would it take to stop the motorcycle moving at 80. m/s compared to the distance it would take to stop the motorcycle moving at 40. m/s?

4x longer distance b/c 4x more KE must be converted to another energy form

10. What happens to the KE of the motorcycle when it is braked to a full stop?

becomes heat @ brake pads

11. How much KE does a mouse have if it has a mass of 0.040 kg and is moving at 0.54 m/s?

$KE = \frac{1}{2}mv^2 = \frac{1}{2}(0.040\ kg)(0.54\ m/s)^2$

$= 0.005832\ kg \cdot m^2/s^2$

$= 0.0058\ J$