

Activity #1: Solar System Collisions

Please go to the web site: <http://janus.astro.umd.edu/astro/impact/>

You will use Table 1 to investigate how size of a body affects a collision with Earth. Using the web site, complete Table 1, fill in blanks below table, and then answer the questions on the next page.

TABLE 1

Rocky asteroid hits Earth at velocity = 20 km/sec

Projectile Diameter	Result: what happens? Where?	Crater diameter	Energy released	Quake*** Magnitude	Frequency Once every...
100cm=1m					
10 m			*		
100 m			**		
1000m=1km					
10 km					
100 km					

* Hiroshima and Nagasaki atomic bombs released energy = _____

**Largest nuclear weapon released energy = _____

***Largest recorded earthquake, Richter scale = _____

1-1. Compare the frequency of impacts.

a) For each factor of 10 in diameter, by approximately what factor does the time for the next similar impact increase?

b) Offer a hypothesis for these dramatic increases.

1-2. Compare the crater diameters in Table 1. For each factor of 10 in projectile diameter, by what factor does the crater diameter increase (approximately)?

1-3. For each factor of 10 in projectile diameter, by what approximate factor does the energy released increase?

1-4. The energy released during an impact is given by the kinetic energy formula $E = \frac{1}{2} mv^2$, where m = projectile's mass and v = its velocity.

a) Since the velocity is kept constant in Table 1, which variable directly influences the increase in energy?

b) Think of the projectile as being approximately spherical. Compare the volume of a sphere 1 meter across to a sphere 10 meters across. (If you forgot the formula for the volume of the sphere—search for it on your computer.)

c) How do you account for the dramatic increase in energy released when the projectile's diameter is increased by a factor of 10?

1-5. Scientists have observations that support the hypothesis that the Earth was struck by a 10 km rocky object 65 million years ago. Re-visit the Solar System Collisions web site and re-examine the consequence of a collision of this magnitude.

a) How much energy is released?

b) How big is the crater? How does the Chixulub crater compare? Account for any differences.

c) What does the cartoon character (Marvin the Martian) mean by his statement about coldness and life ending?

d) Go to (<http://www.astrosociety.org/education/publications/tnl/23/23.html>) to investigate the mass extinction that included the dinosaurs. What happened according to this hypothesis?

e) Could it happen again? What is the frequency of a collision of this scale?