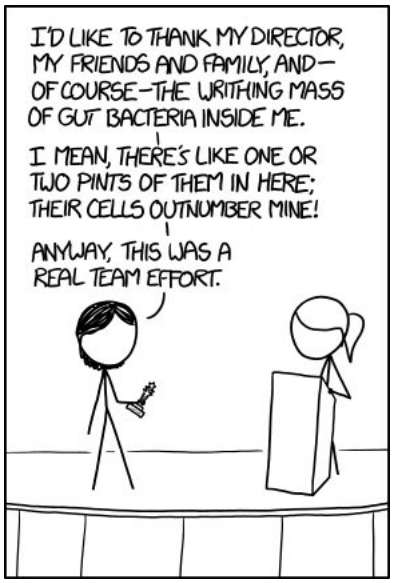
December 2, 2016 Physics 131 Prof. E. F. Redish

■ **Theme Music:**

The Pointer Sisters
Neutron Dance

■ **Cartoon:**

Randall Munroe
XKCD



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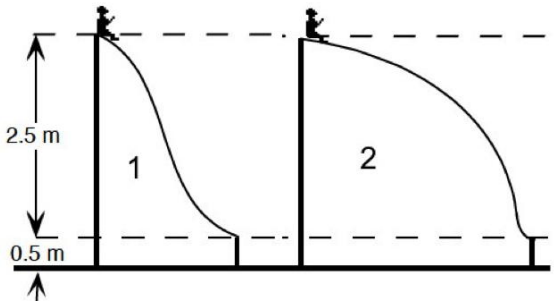
1. A young girl wants to select one of the (frictionless) playground slides illustrated below to give her the greatest possible speed when she reaches the bottom of the slide.
Which should she choose?



A. Slide 1 (18%)
B. Slide 2 (7%)
C. They will both be the same. (75%)
D. There is not enough info to decide.

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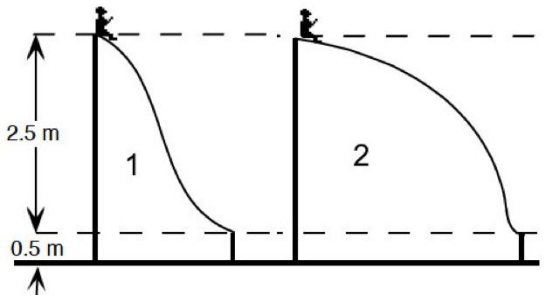
2. A young girl wants to select one of the slides illustrated below to give her the greatest possible speed when she reaches the bottom of the slide. Friction cannot be ignored. Which should she choose?



A. Slide 1 (76%)
B. Slide 2 (12%)
C. They will both be the same. (12%)
D. There is not enough info to decide.

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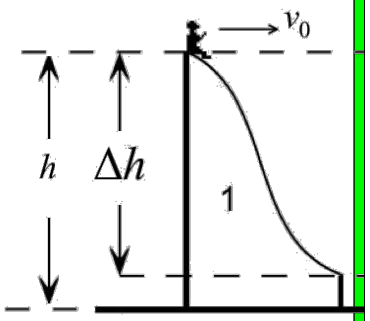
3. A young girl jumps onto the (frictionless) slide from the ladder (not shown) with a horizontal velocity v_0. What equation can be used to calculate her speed, v, at the bottom of the slide?



A. $mgh = \frac{1}{2}mv^2$ (11%)

B. $mg\Delta h = \frac{1}{2}mv^2$ (17%)

C. $\frac{1}{2}mv_0^2 + mgh = \frac{1}{2}mv^2$ (17%)

D. $\frac{1}{2}mv_0^2 + mg\Delta h = \frac{1}{2}mv^2$ **(53%)**

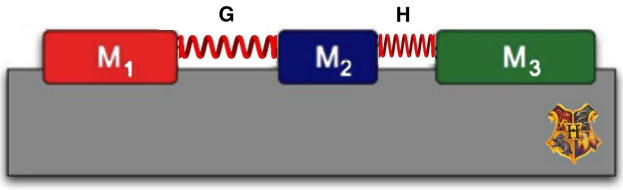
E. None of these will work.

5

4. Three carts move without friction on an air track. (Only part of the track is shown. It's actually much longer.) They are connected by springs whose mass can be ignored and have negligible internal friction. Carts 2 and 3 are held fixed, cart 1 is pulled to the left and all three carts are released at the same time.

For the **system** consisting of the 3 carts and 2 springs. In the **time interval** from just after the carts are released until just before the first cart hits the bumper at the end of the track: Is the mechanical energy conserved?

A. Yes (89%)
B. No (10%)
C. Not enough info to tell.



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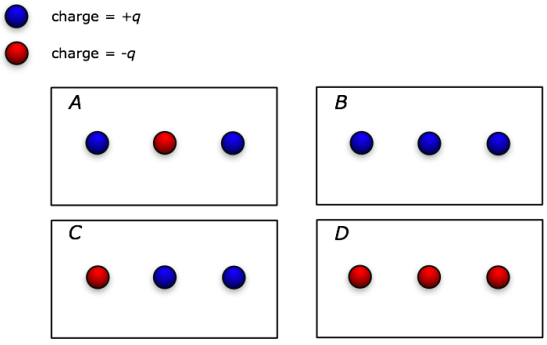
5. Which of these configurations has the largest electric PE?



1. A (11%)
2. B (4%)
3. C (18%)
4. D
5. A and C (6%)
6. **B and D (62%)**
7. other

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Foothold ideas: Kinds of Energy

- All energy is kinetic + potential (or field energy). But depending what we choose to pay attention to, we may group them in different ways and treat them differently.

Mechanical energy:
KE + PE of macroscopic objects due to their coherent motion (energy goes with momentum)

Thermal energy:
KE + PE due to random motion of atoms and molecules (energy goes with temperature but not momentum)

Chemical energy:
Internal KE + PE of electrons and nuclei (no momentum)

endothermic
exothermic
heat engine
dissipation

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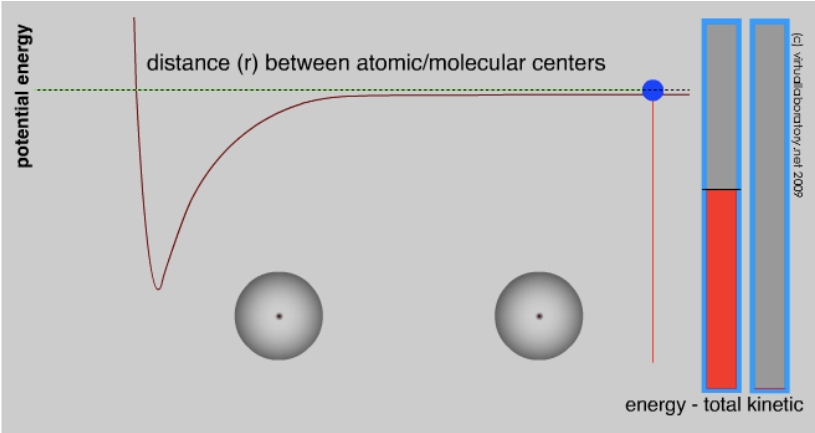
Molecular forces



http://virtuallaboratory.colorado.edu/CLUE-Chemistry/LondonDispersionForce/1.2-interactions-0.html

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