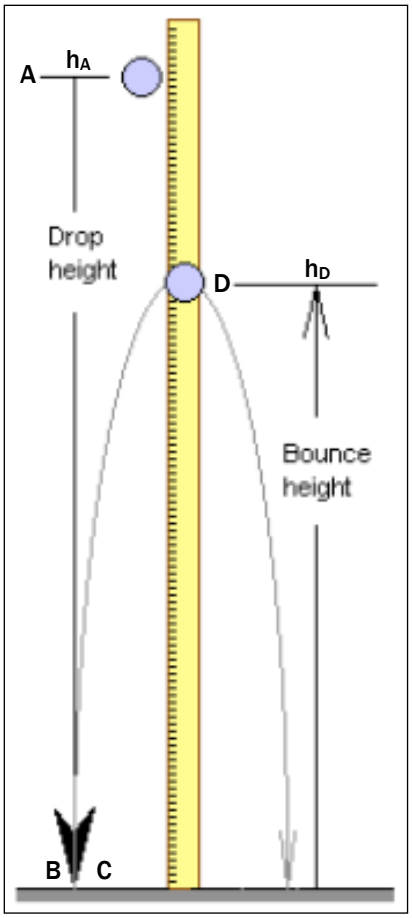
LAB QUIZ: ENERGY AND MOMENTUM

Answer each of the following questions using your clicker. If there are no multiple choices, the question is true/false or numeric. Please do not mark on the quiz paper. Each question is worth three points.

DROP HEIGHT h_A (cm)	BOUNCE HEIGHT h_D (cm)	DROP HEIGHT h_A (cm)	BOUNCE HEIGHT h_D (cm)
20	15	100	78
40	29	120	90
60	44	140	105
80	62	160	121

The data on the left were collected using the same method as you used in lab. The ball dropped was measured, and its mass is $m = 50\ grams$. Remember that the acceleration due to gravity is $980\ cm/s^2$.

1. When the ball is held 80 cm above the table (point A), what is its potential energy (let the tabletop be $h=0$)?
   A) $2.39\times10^6\ g{\cdot}cm^2/s^2$
   B) $2.93\times10^6\ g{\cdot}cm^2/s^2$
   C) $3.04\times10^6\ g{\cdot}cm^2/s^2$
   D) $3.92\times10^6\ g{\cdot}cm^2/s^2$
   E) $4.03\times10^6\ g{\cdot}cm^2/s^2$



2. *After* it bounces (point C), how much kinetic energy does it have?
   A) $2.39\times10^6\ g{\cdot}cm^2/s^2$
   B) $2.93\times10^6\ g{\cdot}cm^2/s^2$
   C) $3.04\times10^6\ g{\cdot}cm^2/s^2$
   D) $3.92\times10^6\ g{\cdot}cm^2/s^2$
   E) $4.03\times10^6\ g{\cdot}cm^2/s^2$

3. When the ball is released from rest from a height of 140 cm above the floor, how much kinetic energy does it have at the instant just before it strikes the ground (point B)?
   A) $1.55\times10^6\ g{\cdot}cm^2/s^2$
   B) $5.15\times10^6\ g{\cdot}cm^2/s^2$
   C) $5.51\times10^6\ g{\cdot}cm^2/s^2$
   D) $6.68\times10^6\ g{\cdot}cm^2/s^2$
   E) $6.86\times10^6\ g{\cdot}cm^2/s^2$

4. The ball is released from rest from 140 cm. What is the momentum of the ball at the instant just after it collides with the floor (point C)?
   A) $1.55\times10^4\ g{\cdot}cm/s$
   B) $2.27\times10^4\ g{\cdot}cm/s$
   C) $2.62\times10^4\ g{\cdot}cm/s$
   D) $2.72\times10^4\ g{\cdot}cm/s$
   E) $6.22\times10^4\ g{\cdot}cm/s$

5. When you prepare a graph of bounce height vs drop height, the points for the release at 40 cm and 120 cm are *exactly* on your best–fit line. What is the slope of this line?
   A) 0.76
   B) 0.65
   C) 0.55
   D) 0.45
   E) 0.35

6. What is your best prediction for the bounce height if the ball is released from rest from a height of 110 cm above the floor?
   A) 44 cm
   B) 54 cm
   C) 64 cm
   D) 74 cm
   E) 84 cm

7. True or false: As the ball falls from its release height (from A to B, just before it strikes the ground), it gains momentum.

8. True or false: As the ball falls from its release height (from A to B, just before it strikes the ground), it gains energy.

9. True or false: As the ball strikes the earth, the momentum of the system (ball + earth) is conserved.

10. True or false: Since you cannot feel the Earth's recoil velocity, it is safe to say that the golf ball transfers exactly zero momentum to the Earth.