

Practice for 7.3 - Energy and Momentum

Loss of KE in collisions:

1. A 230. gram air track glider going 0.210 m/s collides head on with a 450. gram glider going the other way at 0.780 m/s. The gliders then stick together. What is their post collision speed? How much kinetic energy is lost in the collision? (0.445 m/s, 0.0746 J)
2. A 370. gram air track glider going 0.980 m/s collides with a 450. gram glider going the same way at 0.120 m/s. The gliders then stick together. What is their post collision speed? How much kinetic energy is lost in the collision? (0.508 m/s, 0.0751 J)
3. A 460. gram air track glider going 0.320 m/s collides with a stationary 450. gram glider. The gliders then stick together. What is their post collision speed? How much kinetic energy is lost in the collision? (0.162 m/s, 0.0116 J)
4. A 160. gram air track glider going 0.150 m/s collides head on with a 230. gram glider going the other way at 0.540 m/s. The gliders then stick together. What is their post collision speed? How much kinetic energy is lost in the collision? (0.257 m/s, 0.0225 J)
5. A 480. gram air track glider going 0.520 m/s collides with a 630. gram glider going the same way at 0.180 m/s. The gliders then stick together. What is their post collision speed? How much kinetic energy is lost in the collision? (0.327 m/s, 0.0157 J)
6. A 4.25 gram bullet going 613 m/s strikes a 216 g block of wood and sticks in it without emerging. What is the velocity of the bullet and block of wood after the collision? What is the kinetic energy of the bullet before the collision? What is the kinetic energy of the bullet and block combo after the collision? How much kinetic energy goes missing? What happens to the missing kinetic energy? (11.8 m/s, 799 J, 15.4 J, 783 J, turns to heat)

COM and COE:

7. A 12.5 g bullet going 516 m/s horizontally sticks into a 1.625 kg block of wood hanging from a very long string. What is the velocity of the block right after the collision? To what height does the block rise on the string? (3.94 m/s, 0.791 m)
8. A 12.5 g bullet going horizontally sticks into a 1.625 kg block of wood at rest hanging from a very long string. It makes the block rise to a height of 0.426 m. What was the velocity of the bullet and block combo right after the collision? What was this bullet's original velocity? (2.89 m/s, 379 m/s)
9. A 2.85 g bullet going 523 m/s vertically upward strikes the bottom of a 517 g block of wood at rest and sticks in the block without emerging. What is the velocity of the bullet and block combo right after the collision? To what height above its original position does the block rise after the collision? (2.87 m/s, 41.9 cm)
10. A 2.90 g bullet going straight up at some speed strikes the bottom of a 170. g block of wood at rest, and sticks in it without going through. The bullet and block combo fly 11.4 m up into the air. What was the post collision speed of the combo, and what was the bullet's original speed? (15.0 m/s, 892 m/s)
11. A 5.20 g bullet going horizontally strikes a 810. g ballistic pendulum at rest and sticks in it, making it swing up to a height of 31.0 cm. What speed were the block and bullet going just after the collision, and what was the bullet's speed before the collision? (2.47 m/s, 387 m/s)
12. A 3.10 g bullet going horizontally at 630. m/s strikes a 930. g ballistic pendulum at rest, and sticks in it making it swing up to some height before going back down. What was the velocity of the bullet and block just after the collision? To what height did the bullet and block combo swing? (2.09 m/s, 22.3 cm)
13. Yet another 12.5 g bullet going 516 m/s goes right through the 1.625 kg block of wood hanging from a very long string, and is going 314 m/s after it goes through the block. What is the block's velocity after it passes through, and to what height does the block rise? (1.55 m/s, 0.123 m)