

CP Mid-Year Basic Concepts

Linear Motion

1. If you speed up at a constant rate of 4 m/s/s, what is your acceleration?
2. If you have a constant speed of 4 m/s, what is your acceleration?
3. If you are accelerating in the same direction as your velocity, what is happening?
4. If you are accelerating in the opposite direction of your velocity, what is happening?
5. Imagine anything is launched straight up in the air:
 - a. What is its velocity when it is at its maximum height?
 - b. What is its acceleration when it is at its maximum height?
 - c. How does the time it take to go up compare to the time it takes to come down?
 - d. Does its acceleration change at all or is it constant? Why?

Projectile Motion

6. Imagine a ball rolling along a table with a speed of 3 m/s when it gets to the end of the table and rolls off and becomes a projectile:
 - a. What is its initial horizontal velocity?
 - b. What is its initial vertical velocity?
 - c. What happens to both of those velocity components as it falls?
 - d. If it were rolling twice as fast, what would happen to the time it took the ball to hit the ground?
 - e. If it were rolling twice as fast, how much farther would it travel sideways?
7. Are projectiles an example of motion with a constant acceleration?

Newton's Laws

8. If you have a constant velocity, what **MUST** be true about the net force on you?
9. If you have an acceleration of 0, what **MUST** be true about the net force on you?
10. If an object is accelerating to the right, in what direction must the net force be?
11. If the net force on an object is down, in what direction must it be accelerating?
12. If the net force on something is zero, what is its acceleration?
13. Can you be moving, yet have a net force of zero on you? Explain.
14. Can you have a constant velocity, yet have multiple forces acting on you? Explain.
15. Which is the same everywhere in the universe, mass or weight?
16. Which depends on your location, mass or weight?
17. Which is a force: mass or weight?
18. What are the units of mass: kg or N?
19. What are the units of force: kg or N?

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20. Which is the same as inertia: mass or weight?
21. Why don't action/reaction pairs of forces cancel each other out?

Momentum

22. Is it possible for a small child to have more momentum than a big truck?
23. What is an impulse?
24. What are the units for momentum?
25. What does it mean to say momentum is conserved?
26. You jump off a lab stool. Explain why you bend your knees when you land.
27. Does bending your knees when you land decrease the impulse on you?
28. A really big thing and a really tiny thing have a collision:
- Who experiences the bigger acceleration? big thing or tiny thing?
 - Who experiences the greater change in velocity? big thing or tiny thing?
 - Who experiences the bigger force? big thing or tiny thing?
 - Who experiences the greater change in momentum? big thing or tiny thing?
 - Who experiences the bigger impulse? big thing or tiny thing?
 - Who experiences the longer collision? big thing or tiny thing?

Energy

29. Does an object at rest have energy? Explain.
30. If something is falling, what happens to its PE? KE? TE?
31. If something has been tossed up in the air, what happens to its PE? KE? TE?
32. What is meant by the term "Conservation of Energy?"
33. What does work have to do with energy?
34. What does friction do to energy?
35. List several types of energy.