


SPH3U UNIVERSITY PHYSICS

FORCES
Introduction
(P.108-111)

Forces & Technology


People use their cars almost every day to get to work or school, or just to get around. Many of us take automotive technology for granted and assume that the car we are driving is safe and reliable. Yet there are many different types of cars, and the technology and safety features in them are quite different.



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Forces & Technology


Some safety features of a car are the headrest at the back of each seat, the seat belts, and the airbags. Did you know that many people put their headrest at the incorrect height? Did you know that older-style seat belts actually caused injuries? How do air bags work?



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Forces & Technology

Automotive technology is not the only type of technology involving forces. For example, why is it so easy to slide across ice and wet floors? What is near frictionless carbon, and where might it be used? How are forces involved with sports such as snowboarding, golf, and hockey? These are just a sample of the type of questions that could be asked. However, there are far too many applications of technology in the world to be covered in this unit alone.



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Overall Expectations

By the end of this unit, students will:

1. analyse and propose improvements to technologies that apply concepts related to dynamics and Newton's laws, and assess the technologies' social and environmental impact;
2. investigate, in qualitative and quantitative terms, net force, acceleration, and mass, and solve related problems;
3. demonstrate an understanding of the relationship between changes in velocity and unbalanced forces in one dimension.

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Big Ideas

Concepts that students should retain long after this course are:

- Forces can change the motion of an object.
- Applications of Newton's laws of motion have led to technological developments that affect society and the environment.

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Getting Started: Useful Concepts & Skills

CONCEPTS REVIEW

1. (a) What is a force?
 (b) Describe as many different types of forces as you can. Give one example of an object experiencing each type of force.

(a) any influence that causes an object to undergo a change in direction and/or velocity

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Getting Started: Useful Concepts & Skills

CONCEPTS REVIEW

2. Examine the velocity-time graph given.

(a) How can you tell that the acceleration of each object is uniform but the velocity is not uniform?

(a) slope of graph is constant (indicates acceleration is uniform)
 velocity values are changing (indicates velocity is not uniform)

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Getting Started: Useful Concepts & Skills

CONCEPTS REVIEW

2. Examine the velocity-time graph given.

(b) What is the acceleration of each object?

(b) A = 1.2 m/s²
 B = 0.8 m/s²
 C = 0.4 m/s²

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Getting Started: Useful Concepts & Skills

CONCEPTS REVIEW

2. Examine the velocity-time graph given.

(c) Which object travelled the greatest distance? Explain your reasoning.

(b) A – greatest area the under graph

Time (s)	Velocity (m/s) - A	Velocity (m/s) - B	Velocity (m/s) - C
0	4	4	4
2	6	5	5
4	8	6	6
6	10	7	7
8	12	8	7
10	16	12	8

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Getting Started: Useful Concepts & Skills

CONCEPTS REVIEW

3. Examine the following diagram.

(a) Name all the forces acting on the diver at position A; position B.

(a) A - force of diving board up
- force of gravity down
B - air resistance up
- force of gravity down

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Getting Started: Useful Concepts & Skills

CONCEPTS REVIEW

3. Examine the following diagram.

(b) Which of the forces you named are non-contact forces? Explain how you can tell?

(b) force of gravity down – free fall

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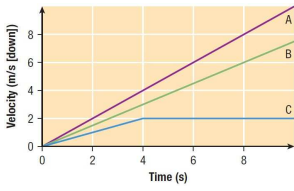
Getting Started: Useful Concepts & Skills

CONCEPTS REVIEW

4. You drop a golf ball, a heavy brass weight, and a coffee filter from a height of 2.0 m. A motion sensor is used to graph the motion of each object as it falls to the floor.

(a) Which line on the graph best represents the motion of each object as it falls toward the ground? Explain your reasoning.

(a) A = brass weight
 B = golf ball
 C = coffee filter



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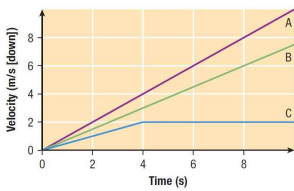
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CONCEPTS REVIEW

4. You drop a golf ball, a heavy brass weight, and a coffee filter from a height of 2.0 m. A motion sensor is used to graph the motion of each object as it falls to the floor.

(b) Why is the acceleration of the coffee filter different from the acceleration of the other objects?

(b) air resistance



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CONCEPTS REVIEW

5. A student makes the following accusation, "If you throw a penny off the top of the Empire State building the penny will either embed itself in the concrete or kill someone if it hits them in the head." Is this true?

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