### ASSIGNMENT BOOKLET 4B

**SCN2285 Science 24**  
Module 4: Section 3 Assignment and Section 4 Assignment

<table>
<thead>
<tr>
<th>FOR STUDENT USE ONLY</th>
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| Date Assignment Submitted: | Assigned  
Teacher: ________________ |
| Time Spent on Assignment: | Assignment  
Grading: ________________ |
| Student’s Questions and Comments | Graded by: ________________ |
| Apply Module Label Here | Date Assignment Received: |

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**Student and teacher:** Use this cover sheet for mailing or faxing.

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INSTRUCTIONS FOR SUBMITTING
THIS DISTANCE LEARNING ASSIGNMENT BOOKLET

When you are registered for distance learning courses, you are expected to regularly submit completed assignments for correction. Try to submit each Assignment Booklet as soon as you complete it. Do not submit more than one Assignment Booklet in one subject at the same time. Before submitting your Assignment Booklet, please check the following:

• Are all the assignments completed? If not, explain why.
• Has your work been reread to ensure accuracy in spelling and details?
• Is the booklet cover filled out and the correct module label attached?

MAILING

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2. Put your Assignment Booklet in an envelope and take it to the post office and have it weighed. Attach sufficient postage and seal the envelope.

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FOR TEACHER’S USE ONLY

Summary

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Alberta Education acknowledges with appreciation the Alberta Distance Learning Centre and Pembina Hills Regional Division No. 7 for their review of this Assignment Booklet.

You may find the following Internet sites useful:


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- General Public
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ASSIGNMENT BOOKLET 4B
SCIENCE 24: MODULE 4
SECTION 3 ASSIGNMENT AND SECTION 4 ASSIGNMENT

This Assignment Booklet is worth 49 marks out of the total 100 marks for the assignments in Module 4. The value of each assignment and each question is stated in the left margin.

Read all parts of your assignment carefully and record your answers in the appropriate places. If you have difficulty with an assignment, go back to your Student Module Booklet and review the appropriate lesson. Be sure to proofread your answers carefully before submitting your Assignment Booklet.

Section 3 Assignment: The Physics of Collisions

For questions 1 to 5, read each question carefully. Decide which of the choices BEST completes the statement. Place your answer in the blank space given.

Use the following information to answer questions 1 and 2.

I. a 70-kg swimmer swimming 3 m/s
II. a 0.5-kg ball travelling 30 m/s
III. a 1000-kg car travelling 0.5 m/s
IV. a 0.010-kg bullet travelling 600 m/s

1. The item with the **least** momentum is

   A. I  
   B. II  
   C. III  
   D. IV

2. The item with the **greatest** momentum is

   A. I  
   B. II  
   C. III  
   D. IV

3. If the velocity of an object doubles and its mass triples, the object’s momentum increases

   A. 1.5 times  
   B. 2 times  
   C. 3 times  
   D. 6 times
4. A moving freight train takes a long distance to stop because of its
   A. velocity
   B. mass
   C. momentum
   D. force

5. Momentum of a car can be decreased by
   A. decreasing its speed
   B. increasing its speed
   C. increasing its mass
   D. decreasing its braking force

6. Calculate the momentum of a 2000-kg truck travelling 19 m/s. Show your work.

Return to page 58 of the Student Module Booklet and begin Lesson 2.

For questions 7 to 9, read each question carefully. Decide which of the choices BEST completes the statement. Place your answer in the blank space given.

7. A unit for impulse is
   A. kg·ms
   B. kg·m/s
   C. kg·s/m
   D. kg·m/s²

8. If you have double the force and half the time over which the force acts, the resulting impulse
   A. is halved
   B. doubles
   C. remains the same
   D. increases four times
9. To change the momentum of a moving object by a **greater** amount, exert
   A. the same force on the object over a longer period of time
   B. a smaller force on the object over the same time
   C. a smaller force on the object over a shorter time
   D. the same force on the object over a shorter period of time

10. A truck hits a brick wall with a force of 100 000 kg·m/s². The truck comes to a stop in 0.5 s. Calculate the impulse the truck experienced.

Return to page 61 of the Student Module Booklet and begin Lesson 3.

For questions 11 to 14, read each question carefully. Decide which of the choices BEST completes the statement or answers the question. Place your answer in the blank space given.

11. You can reduce the braking force required to stop a car by
   A. lengthening the braking time
   B. reducing the braking time
   C. increasing the friction between the tires and the road
   D. increasing the friction between the brake pads and drums

12. To decrease the forces experienced in an accident,
   A. decrease the time over which the change in momentum occurs
   B. increase the time over which the change in momentum occurs
   C. increase the change in velocity
   D. increase the mass of the vehicle
13. A car travelling 100 km/h comes to a stop in 100 m when the brakes are applied. An identical car travelling 100 km/h comes to a stop when it hits a bridge abutment. Which of the following statements is true?

A. The change in velocity when the car hits the bridge is greater.
B. The change in momentum for the car that braked is greater.
C. The impulse of the car hitting the bridge is greater.
D. The impulse is the same for both cars.

14. If you lengthen the time during a car crash for the occupants of the car to come to a stop, the forces they experience

A. decrease and the impulse decreases
B. increase and the impulse stays the same
C. decrease and the impulse stays the same
D. increase and the impulse increases

15. A 2000-kg vehicle travelling 30 m/s takes 10 s to stop. What force did the vehicle experience? **Show your work.**

16. If the time it takes to stop a car doubles, the force the vehicle experiences is _______________.
For questions 17 to 21, read each question carefully. Decide which of the choices BEST answers the question. Place your answer in the blank space given.

17. Two vehicles with the same mass and travelling the same speed in opposite directions hit head on. What is the total momentum immediately after the collision?

A. zero
B. double that of each car
C. one half that of each car
D. four times that of each car

Use the following diagram to answer questions 18 and 19.

18. If Car A has a greater momentum than Car B, what will happen to both vehicles immediately after they collide?

A. They will travel to the right.
B. They will travel to the left.
C. They will stop immediately.
D. It cannot be determined from this information.

19. If both cars are travelling the same speed and Car B has a greater mass, what will happen to both vehicles after they collide?

A. They will travel to the right.
B. They will travel to the left.
C. They will stop immediately.
D. It cannot be determined from this information.
Use the following information to answer questions 20 and 21.

Two cars, each with a mass of 1000 kg, are travelling in opposite directions. The car travelling to the right is travelling 30 m/s, and the car travelling to the left is travelling 20 m/s.

20. What is the total momentum of the vehicles after they collide?
   A. \(-50000 \text{ kg}\cdot\text{m/s}\)
   B. \(50000 \text{ kg}\cdot\text{m/s}\)
   C. \(-10000 \text{ kg}\cdot\text{m/s}\)
   D. \(10000 \text{ kg}\cdot\text{m/s}\)

21. If the two vehicles collide and lock together, what is their velocity after the collision?
   A. \(-5 \text{ m/s}\)
   B. \(5 \text{ m/s}\)
   C. \(-10 \text{ m/s}\)
   D. \(10 \text{ m/s}\)

Return to page 70 of the Student Module Booklet and begin the Section 3 Review.
Section 4 Assignment: The Technology of Safety

For questions 1 and 2, read each question carefully. Decide which of the choices BEST completes the statement. Place your answer in the blank space given.

1. Safety features in a vehicle work to reduce forces in a collision by
   A. lengthening the time in which changes in momentum occur
   B. decreasing the time in which changes in momentum occur
   C. decreasing the time of the impulse
   D. increasing the change in momentum

2. Road safety features, such as crash cushions and modern guardrails, reduce the force of a collision by
   A. increasing the impulse
   B. decreasing the impulse
   C. increasing the time over which the impulse occurs
   D. decreasing the time over which the impulse occurs

3. Safety engineers use ________________ to see what will happen to people in a collision.

4. Decide whether each of the following statements is true (T) or false (F). Place your answer in the blank space provided.
   a. Restraining features operate continuously while you are driving.  
   b. Operational features hold vehicle occupants in place.  
   c. Brakes are an example of a structural feature.  
   d. Crumple zones are examples of operational features.  
   e. An air bag is an example of a restraining feature.

5. Crumple zones increase the ________________ of the collision between the occupants and the interior of the vehicle.
6. Identify the safety features shown in this automobile from the following list. Place your answers in the blank spaces given.

- bumper
- hood
- crumple zones
- roll cage
- side-impact beams

Return to page 75 of the Student Module Booklet and begin Lesson 2.

For questions 7 to 10, read each question carefully. Decide which of the choices BEST completes the statement or answers the question. Place your answer in the blank space given.

7. According to Transport Canada, how many Canadians owe their lives to seat belts between 1990 and 2000?

A. 690
B. 1690
C. 1960
D. 11 690

8. By what percent is the webbing of a seat belt designed to stretch to help absorb energy in a collision?

A. 0%
B. 5–10%
C. 10–15%
D. 15–20%

9. What is the level of seat belt use in Alberta?

A. 90%
B. 70%
C. 50%
D. 30%
10. A 3-point belt, when worn properly, should fit
   A. snugly across the pelvis and loosely across the chest
   B. snugly across the pelvis and snugly across the chest
   C. loosely across the pelvis and loosely across the chest
   D. loosely across the pelvis and snugly across the chest

11. A 4-point seat belt distributes forces more evenly across your
   ___________________________ and restrains both ________________________.

Return to page 79 of the Student Module Booklet and begin Lesson 3.

Read question 12 carefully. Decide which of the choices BEST completes the
statement. Place your answer in the blank space provided.

12. A modern air bag is designed to inflate in
   A. 0.330 s
   B. 0.300 s
   C. 0.030 s
   D. 0.003 s

13. State two things an air bag is designed to do.

14. Explain why infant seats or small children should not be in the front passenger
   seat if the vehicle is equipped with a passenger-side air bag.

Submit your completed Assignment Booklet 4B to your teacher for assessment.
Then return to page 83 of the Student Module Booklet and begin the Section 4 Review.