Science 20

Unit B: Changes in Motion

Assignment Booklet B2

Alberta
EDUCATION

FOR TEACHER'S USE ONLY

Summary

	Total Possible Marks	Your Mark
Chapter 2 Assignment	36	

Teacher's Comments

Science 20
Unit B: Changes in Motion
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Chapter 2 Assignment

This document is intended for	
Students	✓
Teachers	✓
Administrators	
Home Instructors	
General Public	
Other	

You may find the following Internet sites useful:

- Alberta Education, **http://www.education.gov.ab.ca**
- Learning Technologies Branch, **http://www.education.gov.ab.ca/ltb**
- Learning Resources Centre, **http://www.lrc.education.gov.ab.ca**

Exploring the electronic information superhighway can be educational and entertaining. However, be aware that these computer networks are not censored. Students may unintentionally or purposely find articles on the Internet that may be offensive or inappropriate. As well, the sources of information are not always cited and the content may not be accurate. Therefore, students may wish to confirm facts with a second source.

ASSIGNMENT BOOKLET B2
SCIENCE 20: UNIT B
CHAPTER 2 ASSIGNMENT

This Assignment Booklet is worth 36 marks out of the total 104 marks for the assignments in Unit B. 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 the textbook and review the appropriate lesson. Be sure to proofread your answers carefully before submitting your Assignment Booklet.

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Chapter 2 Assignment: Collisions

For questions 1 to 4, 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.

1

_____ 1. Which property of the quantity of motion affect(s) an object's impact when interacting with another object?

A. mass
B. velocity
C. both mass and velocity
D. none of the above

1

_____ 2. A hockey puck has a mass of 0.170 kg; a soccer ball has a mass of 0.425 kg; a baseball has a mass of 0.145 kg; and a table tennis ball has a mass of 0.0027 kg. For these objects to have the same momentum, which must have the greatest speed?

A. table tennis ball
B. hockey puck
C. soccer ball
D. baseball

1

_____ 3. A hockey puck has a mass of 0.170 kg; a soccer ball has a mass of 0.425 kg; a baseball has a mass of 0.145 kg; and a tennis ball has a mass of 0.0575 kg. Suppose these objects were approaching your knee with the same velocity. Based on the most relevant quantity of motion, you would least likely need protection from the

A. hockey puck
B. soccer ball
C. tennis ball
D. baseball

(1) _____ 4. A puck with a mass of 0.170 kg has a velocity of +90.0 km/h. The momentum of the puck is

A. 0.153 kg•m/s
B. 4.25 kg•m/s
C. 53.1 kg•m/s
D. 55.2 kg•m/s

(3) 5. An airplane has a momentum of 8.55×10^7 kg•m/s[S] and a velocity of 900 km/h[S]. Determine the mass of the airplane.

Return to page 14 of the Distance Learning Student Guide, and begin Lesson 2.2.

For questions 6 to 8, read each question carefully. Decide which of the choices BEST answers the question. Place your answer in the blank space given.

(1) _____ 6. A vehicle travelling along a street skidded on an icy patch and hit a roadside barrier. The time interval for the impact was 0.955 s, during which the barrier exerted a force of 505 N. What was the magnitude of the change in momentum for the vehicle?

A. 241 kg•m/s
B. 482 kg•m/s
C. 505 kg•m/s
D. 528 kg•m/s

(1) _____ 7. A group of students followed the procedure of the "Changes in Momentum" investigation on pages 248 and 249 of the textbook. The marble was released from the same height for the five trials. In discussing the design, the students stated the following as reasons for keeping the release height the same:

I. The change in momentum of the marble must be kept constant over the trials.

II. The initial velocity of the marble as it enters the cup must be the same over the trials.

III. The change in velocity of the marble while in the cup must be kept constant over the trials.

Which statement(s) is valid?

A. I
B. I and II
C. III
D. I, II, and III

(1) _____ 8. A 500-kg vehicle experiences a change in momentum of +356 kg•m/s over a time interval of 5.81 s. What is the force on the vehicle during this time?

A. 86.1 N[forward]
B. 29.1 N[forward]
C. +61.3 N
D. +35.6 N

(3) 9. A cart is pushed ahead for 3.5 s with a force of 360 N. Determine the change in momentum of the cart.

Return to page 15 of the Distance Learning Student Guide, and begin Lesson 2.3.

For questions 10 to 13, read each question carefully. Decide which of the choices BEST answers the question. Place your answer in the blank space given.

(1) _____ 10. A group of students listed the following expressions that are supposedly equal to impulse:

I. $\vec{p}_f - \vec{p}_i$
II. $\vec{F}\Delta t$
III. $\Delta\vec{F}\Delta t$
IV. $\Delta m\vec{v}$

Which expressions are actually equal to impulse?

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

(1) _____ 11. A passenger vehicle collided with a barrier of sand-filled barrels. During this collision, the change in momentum for the vehicle was -6.5×10^5 N•s, which occurred over 0.095 s. What force was exerted on the front of the vehicle during this time interval?

A. -6.8×10^3 N
B. -6.2×10^4 N
C. -6.2×10^5 N
D. -6.8×10^6 N

(1) _____ 12. How do shock-absorbing bumpers, collapsible frames, and crumple zones reduce injuries?

A. They increase the stopping time and the change in momentum so the force generated during the impact increases.

B. They decrease the stopping time and the change in momentum so the force generated during the impact decreases.

C. They increase the stopping time and maintain the change in momentum so the force generated during the impact decreases.

D. They decrease the stopping time and maintain the change in momentum so the force generated during the impact increases.

(1) _____ 13. A ball of putty with a mass of 0.250 kg is directly thrown toward a nearby wall with a velocity of +7.50 m/s. The putty sticks to the wall. What is the impulse on the putty as it comes to a stop?

A. −30.0 N•s
B. +30.0 N•s
C. +1.88 N•s
D. −1.88 N•s

Return to page 16 of the Distance Learning Student Guide, and begin Lesson 2.4.

For questions 14 to 16, read each question carefully. Decide which of the choices BEST answers the question. Place your answer in the blank space given.

(1) _____ 14. In which class(es) of collisions will the occupants of a vehicle likely be injured?

A. primary
B. secondary
C. tertiary
D. secondary and tertiary

(1) _____ 15. Which statement correctly expresses Newton's third law of motion?

A. An object will accelerate in the direction of the net force on the object.

B. Without a net force, an object in motion will tend to maintain its velocity and an object at rest will tend to remain at rest.

C. Whenever one object exerts a force on a second object, the second object exerts an equal but opposite force on the first object.

D. none of the above

(1) _____ 16. A group of students completed the "Newton's Laws and the Interaction of Objects" activity on pages 260 and 261 of the textbook. They wrote the following statements to describe the separating vehicles:

I. The magnitudes of the forces on both vehicles were the same.
II. The magnitudes of the acceleration of both vehicles were the same.
III. The magnitudes of the impulses on both vehicles were the same.
IV. The speeds of both vehicles were the same once the spring had spread out.

Which statements regarding the motion of the separating vehicles are correct?

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

(2) 17. A tow truck is pulling out a car that slid into a snow bank at the side of the road. The tow truck pulls the car with a force of 3750 N[E]. Describe the force the car is exerting on the tow truck while the tow truck is pulling the car.

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Return to page 17 of the Distance Learning Student Guide, and begin Lesson 2.5.

For questions 18 to 21, read each question carefully. Decide which of the choices BEST answers the question. Place your answer in the blank space given.

(1) _____ 18. In which type(s) of collision is both the total momentum before and the total momentum after the collision equal to zero?

A. explosion
B. hit and stick
C. hit and rebound
D. hit and stick and explosion

(1) _____ 19. In which type(s) of collision is the total momentum before the collision equal to the total momentum after the collision?

A. hit and stick
B. hit and rebound
C. explosion
D. all of the above

(1) _____ 20. A ball with a mass of 1.50 kg travelling +2.00 m/s collides with a stationary ball with a mass of 1.00 kg. After the collision, the velocity of the 1.50-kg ball is +0.40 m/s. What is the velocity of the 1.00-kg ball after the collision?

A. +2.4 m/s
B. +2.2 m/s
C. +2.1 m/s
D. −0.7 m/s

(1) _____ 21. An 18 000-kg freight car travelling 1.75 m/s[E] collides with a 27 000-kg freight car at rest. After the collision, the freight cars stick together. What is the velocity of the freight cars after the collision?

A. 2.00 m/s[E]
B. 1.50 m/s[E]
C. 0.70 m/s[E]
D. 0.50 m/s[E]

(2) 22. You investigated and compared the momentums before and after a collision for objects that can move freely. In other words, you considered objects interacting in an environment where the force of friction is negligible. Explain why the absence of friction is important when studying interacting objects.

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Return to page 18 of the Distance Learning Student Guide, and begin Lesson 2.6.

For questions 23 and 24, read each question carefully. Decide which of the choices BEST answers the question. Place your answer in the blank space given.

(1) _____ 23. An egg test dummy is fitted with a helmet, sealed in a plastic bag, and attached to a swing with a clamp. These items have a mass of 0.090 kg. This mass is pulled back to a height of 0.55 m. The mass is then released and allowed to swing down and collide with a cement block. What is the speed of the mass at the moment before impact?

A. 1.64 m/s
B. 3.28 m/s
C. 4.65 m/s
D. 10.8 m/s

(1)

_____ 24. A 0.080-kg egg test dummy is fitted with a helmet and attached to a swing. This egg test dummy is pulled back and released, allowing it to collide with a cement block. The impulse on the egg test dummy is −0.39 N•s over an interval of 0.050 s. What is the magnitude of the force on the egg test dummy during this time interval?

A. 2.0 N
B. 3.5 N
C. 7.8 N
D. 78 N

25. Match each description with the appropriate term listed. Place your answer in the blank space given.

i. energy
ii. gravitational potential energy
iii. work
iv. kinetic energy

(½) _____ a. the transfer of energy from one object or system to another when a force is applied over a distance

(½) _____ b. energy due to the position of an object above Earth's surface

(½) _____ c. energy due to the motion of an object

(½) _____ d. the ability to do work

(4) 26. Samantha wants her friend to wear a bicycle helmet when they go cycling. She wants to explain how a bicycle helmet is designed to provide effective protection from head injuries. Write a short explanation about the effectiveness of a bicycle helmet that will help Samantha convince her friend.

Submit your completed Assignment Booklet B2 to your teacher for assessment.
Then return to page 19 of the Distance Learning Student Guide,
and begin the Chapter 2 Summary.