**PHYSICS 2021 - 22 November 9, 2021**

**Today’s Agenda (Day 53)**

1. HOUSEKEEPING ITEMS

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1. HOMEWORK CHECK:

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1. CLASS ACTIVITY

🡪TEST: Chapter 8

 \*Go to [www.socrative.com](http://www.socrative.com) 🡪 enter room “MSBPHYSICS” 🡪 enter ID #

HOMEWORK:

* READ: Chapter 9 – Momentum and Conservation
* COMPLETE: Chapters 9 & 10 Vocabulary
* STUDY: Chapter 9 Test

<http://glencoe.mheducation.com/sites/0078807220/student_view0/self-check_quizzes.html>

Chapter 7 & 8 Vocabulary

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| --- | --- | --- | --- | --- | --- |
| Kepler’s first law | Kepler’s second law | Kepler’s third law | Gravitational force | Law of universal gravitation | Inertial mass |
| Gravitational mass | Radian | Angular displacement | Angular velocity | Angular acceleration | Lever arm |
| Torque | Moment of inertia | Newton’s second law of rotational motion | Center of mass | Centrifugal “force” | Coriolis “force” |

Chapter 9 & 10 Vocabulary

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| --- | --- | --- | --- | --- | --- |
| Impulse | Momentum | Impulse-momentum theorem | Angular momentum | Angular impulse-momentum theorem | Closed system |
| Isolated system | Law of conservation of momentum | Law of conservation of angular momentum | Work | Joule | Energy |
| Work-energy theorem | Kinetic energy | Translational kinetic energy | Power | Watt | Machine |
| Effort force | Resistance force | Mechanical advantage | Ideal mechanical advantage | Efficiency | Compound machine |

REMINDERS:

* **QUIZ: Chapter 7 & 8 Vocabulary 🡪 Nov. 10**
* Chapters 9 & 10 Vocabulary – Nov. 17
* **TEST: Chapter 9 🡪 Nov. 18**
* **TEST: Chapter 10 🡪 Nov. 23**
* **QUIZ: Chapter 9 & 10 Vocabulary 🡪 Nov. 24**
* **TEST: Chapter 11 🡪 Dec. 2**
* **TEST: Chapter 12 🡪 Dec. 9**
* **Midterm Exam:** Chapters 1 - 13

**PHYSICS 2021 - 22** CHAPTER REVIEW

**PRACTICE PROBLEMS 9.1**

1. A compact car, with a mass of 725 kg, is moving at 115 km/h toward the east. Sketch the moving car.
2. Find the magnitude and direction of its momentum. Draw an arrow on your sketch showing the momentum.
3. A second car, with a mass of 2175 kg, has the same momentum. What is its velocity?
4. The driver of the compact car in the previous problem suddenly applies the brakes hard for 2.0 s. As a result, an average force of 5.0 x 103 N is exerted on the car to slow it down.
5. What is the change in momentum, or equivalently, what is the magnitude and direction of the impulse on the car?
6. Complete the “before” and “after” sketches and determine the momentum and velocity of the car now.
7. A 7.0 kg object, moving at 2.0 m/s, receives two impulses (one after the other) along the direction of its motion. Both impulses are illustrated in Figure 2, p. 239 of the textbook. Find the resulting speed and direction of motion of the object after each impulse.
8. The driver accelerates a 240.0 kg snowmobile, which results in a force being exerted that speeds up the snowmobile from 6.00 m/s to 28.0 m/s over a time interval of 60.0 s.
9. Sketch the event, showing the initial and final situations.
10. What is the snowmobile’s change in momentum? What is the impulse on the snowmobile?
11. What is the magnitude of the average force that is exerted on the snowmobile?
12. A 0.25 m diameter circular saw blade in a workshop rotates at 5.0 x 103 rpm, as shown in Figure 7, p. 243 of the textbook. After the electrical power to the saw is turned off, it takes several seconds for the blade to slow to a complete stop. The moment of inertia of the blade is 8.0 x 10-3 kg•m2. Friction in the axle provides an average torque of 2.3 x 10-1 N•m to slow the blade. How many seconds does it take for the blade to stop?
13. A baseball pitcher can throw a 132 km/h (82 mph) curve ball that rotates about 6.0 x 102 rpm. What is the angular velocity of the thrown ball? The pitcher’s throwing motion lasts about 0.15 s, and the moment of inertia of the ball is 8.0 x 10-5 kg•m2. What average torque did the pitcher exert on the ball?
14. As a bowler releases the ball onto the alley, the ball does not roll but slides. Slowly the friction of the alley surface causes the ball to roll and have a final angular velocity of 7.00 x 101 rad/s. The moment of inertia of the ball is 0.0350 kg•m2, and the ball moves down the alley in 2.40 s. What are the angular impulse and the average torque that the alley surface exerts on the bowling ball?
15. A bicycle clamped upside down on a workbench for the bicycle repair woman to repair a front wheel axle. She gives the front wheel a spin with her hand, and the wheel rotates at 5.0 rev/s. What is the angular velocity of the wheel? If the moment of inertia of the wheel is 0.060 kg•m2 , what angular impulse did the repair woman give the wheel?

**PRACTICE PROBLEMS 9.2**

1. Two freight cars, each with a mass of 3.0 x 105 kg, collide and stick together. One was initially moving at 2.2 m/s and the other was at rest. What is their final speed? Define the system as two cars.
2. A 0.105 kg hockey puck moving at 24 m/s is caught and held by a 75 kg goalie at rest. With what speed does the goalie slide on the ice after catching the puck? Define the puck and the goalie as a system.
3. A 35.0 g bullet moving at 475 m/s strikes a 2.5 kg bag of flour at rest on ice. The bullet passes through the bag and exits at 275 m/s. How fast is the bag moving when the bullet exits?
4. The bullet in the previous problem strikes a 2.5 kg steel ball that is at rest. After the collision, the bullet bounces backward at 5.0 m/s. How fast is the ball moving when the bullet bounces backward?
5. A 4.00 kg model rocket is launched, expelling burned fuel with a mass of 50.0 g at a speed of 625 m/s. What is the velocity of the rocket after the fuel has burned? *Hint: Ignore the external forces of gravity and air resistance.*
6. A thread connects a 1.5 kg cart and a 4.5 kg cart. After the thread is burned, a compressed spring pushes the carts apart, giving the 1.5 kg cart a velocity of 27 cm/s to the left. What is the velocity of the 4.5 kg cart?
7. A 925 kg car moving north at 20.1 m/s collides with 1865 kg car moving west at 13.4 m/s. After the collision, the two cars are stuck together. In what direction and at what speed do they moved after the collision? Define the system as the two cars.
8. A 1345 kg car moving east at 15.7 m/s is struck by a 1923 kg car moving north. They stick together and move with a velocity of 14.5 m/s at ø = 63.5⁰. Was the north-moving car exceeding the 20.1 m/s speed limit?