Driver Education
Classroom and In-Car Curriculum

Unit 10

Adverse Driving Conditions and Emergencies

Table of Contents

Overview, Objectives and Words to Know

Unit 10 Introduction
Lesson Content

Overview

Unit 10 will introduce students to the problems associated with driving under conditions of inclement weather, limited visibility and limited traction. Specific attention will be directed to vehicular factors and increased time/space needs under such conditions.

Technological advances in automotive design and their contribution to occupant safety in controlling consequences if a crash appears imminent will be reviewed. Information about vehicle system functions and malfunctions, and what to do if involved in a collision will be presented.

Objectives

The student will:

1. Demonstrate knowledge of the problems associated with reduced visibility such as driving at night, in fog, rain, snow, and glare conditions and describe conditions and strategies of driving in strong winds.
2. Demonstrate knowledge of technological advances in the design of motor vehicles that enhance occupant safety and ability to respond more effectively under conditions of limited time and space.
3. Demonstrate knowledge of weather, other physical conditions and driver actions that influence the level of traction or adhesion between tires, road surface and vehicle control.
4. Describe the characteristics of front wheel and rear wheel traction loss and run-off the road crashes and the actions to take in order to control the vehicle.
5. Demonstrate knowledge of actions necessary to better control the consequences if a crash appears imminent.
6. Describe the correct actions to take in response to driving emergencies caused by vehicle malfunction.
7. Describe the actions to take when involved in a collision.
8. Define key words associated with the unit objectives.

Words to Know

- ABS
- Accelerator failure
- Brake failure
- Collision reporting
- Countersteer
- Engine failure
- ESP
- Evasive action
- Front-wheel skid
- Glare
- Hydroplaning
- Off-road recovery
- Power steering failure
- Rear-wheel skid
- Sight distance rule
- Skidding
- Tire blowout
- Traction

Unit 10 Introduction		**Lesson Overview** Time Frame – 5 hours
Teacher Information and Resources 		
Slides	PowerPoint Slides 10.1 – 10.52	
Videos	10.1 Driving at Night (3 minutes 21 seconds) 10.2.1 Stomp, Stay, Steer (3 minutes, 4 seconds) 10.2.2 Electronic Stability Program (2 minutes, 28 seconds) 10.4.1 Skidding (2 minutes 21 seconds)	10.4.2 Run-off the Road Crashes: Recognize, React, Recover (3 minutes 51 seconds) 10.5 Evasive Maneuvers (4 minutes 49 seconds) 10.7 Handling Crashes (3 minutes 16 seconds)
Video Review	10.2 Driving at Night 10.2.1 Stomp, Stay, Steer 10.2.2 Electronic Stability Program 10.4.1 Skidding	10.4.2 Run-off the Road Crashes: Recognize, React, Recover 10.5 Evasive Maneuvers 10.7 Handling Crashes
Fact Sheets	10.1 Changing Weather and Conditions of Visibility 10.2 Advanced Automotive Technology 10.3 Changing Traction Conditions 10.4 Emergency Recovery	10.5 Controlling Consequences of a Crash 10.6 Vehicle Malfunctions 10.7 Collision Reporting 10.8 Words to Know Definitions Page
Worksheets	10.1 Changing Weather and Conditions of Visibility 10.6 Vehicle Failures	10.8 Words to Know Matchup
Learning Activities	10.0 Key Words – Word Wall	
Textbooks	**Preferred Textbook: AAA HOW to DRIVE Chapter 14** Other Textbooks: Drive Right: Chapters 12 and 13 Responsible Driving: Chapters 13, 14 and 16 Other Textbook: _____	
Unit 10 Test	Unit 10 Test – Adverse Driving Conditions and Emergencies – 10 questions	

Key Words	Unit 10 Activity Lesson Content

Unit Objectives:

Student will define the meaning of the key words in Unit 10.

Lesson Content	Materials and Resources
Key Words ➢ **Learning Activity 10.0** Throughout the instruction of Unit 10, conduct learning activity to help students with vocabulary and spelling of key words.	➢ Learning Activity 10.0 Key Words – Word Wall

Learning Activity 10.0 — Key Words – Word Wall

Topic	**Word Wall**

Information

Students begin to assimilate a new language in driver and traffic safety education. Some words are familiar, but others are new. The use of a word wall helps students with vocabulary and spelling as well as provides students with a tool for reference without "giving away" answers.

Materials Needed

1. Make word cards out of paper, poster board, or card stock cut in strips.
2. Markers in various colors.
3. A space to post words (i.e., bulletin board).
4. Tape or stapler and staples to affix cards on the word wall.

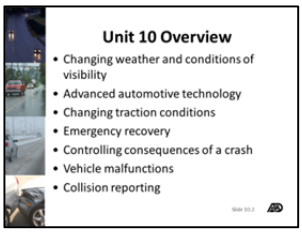
Learning Activity

1. As the instructor introduces new words in a unit, the instructor should post these words on the word wall.
   a. The instructor should remind students to use the words on the wall for recall and correct spelling.
   b. When an instructor poses a question and a student correctly answers the question, the instructor should allow that student to make a word strip and post the strip in the designated location on the word wall. Because this is new learning, recalling words are part of the learning process.
   c. Students often enjoy decorating their word with a particular flair, color, or design.
2. Words may remain posted for just the unit or remain posted throughout the course.

Unit Objectives, Changing Weather and Conditions of Visibility

Part 1
Lesson Content

Lesson Objective:
Student will demonstrate knowledge of the problems associated with reduced visibility such as driving at night, in fog, rain, snow, and glare conditions and describe conditions and strategies of driving in strong winds.

Lesson Content	Materials and Resources
Unit Objectives	
➢ **Slides 10.1 and 10.2** Give an overview of what students should know and be able to do by the end of this unit.	➢ Slides 10.1 and 10.2: Title and Overview  
Driving at Night	
➢ **Video Review 10.1** Duplicate and distribute Video Review 10.1. Students should complete the worksheet as they watch the video.	➢ Video Review 10.1 and Answer Key: Driving at Night
➢ **Slides 10.3 and 10.4 – Video 10.1** Discuss the topics covered in Video 10.1 Play Video 10.1 *Driving at Night* (Time: 3 minutes 21 seconds) After viewing, review Video Review 10.1 to gauge student understanding of the video.	➢ Slides 10.3 and 10.4: Video 10.1 *Driving at Night*  

Changing Weather and Conditions of Visibility — Video Overview 10.1

Video Overview 10.1: Driving at Night

Title

Driving at Night

Time

3 minutes 21 seconds

Topics Covered

1. How to use headlights at night.
2. How to check headlights to make sure they are working properly.
3. Overriding the headlights.
4. How to drive safely at night.

Video Review

1. Have students complete a video review worksheet as they watch the video.
2. After viewing the video, review the worksheet to gauge students' understanding of the video.

Instructor Notes

Changing Weather and Conditions of Visibility — Video Review 10.1

Video Review 10.1: Driving at Night

Name	Date

1. Dirt on the lens of headlights can reduce light by up to _____ percent?

2. How can you check to see if the lights are working properly?

   _____

   _____

   _____

3. How far do high beams let us see?

   _____

   _____

4. What is the sight distance rule?

   _____

   _____

   _____

5. When driving at night, drivers need to leave more _____ than they would in the daytime.

Changing Weather and Conditions of Visibility | **Video Review 10.1** ANSWER KEY

Video Review 10.1: Driving at Night ANSWER KEY

1. Dirt on the lens of headlights can reduce light by up to _____ percent?
   Answer: 90 percent

2. How can you check to see if the lights are working properly?
   Answer: Use the reflection when parked behind a car or in front of a garage door

3. How far do high beams let us see?
   Answer: More than 250 feet

4. What is the sight distance rule?
   Answer: We have to be able to stop in the distance we can see

5. When driving at night, drivers need to leave more _____ than they would in the daytime.
   Answer: Space

Changing Weather and Conditions of Visibility — Part 1 continued
Lesson Content

Lesson Content	Materials and Resources
Driving at Night ➢ **Fact Sheet 10.1** Duplicate and distribute Fact Sheet 10.1 for students to use as a resource and study guide. ➢ **Slides 10.5 through 10.7** Discuss the visual problems of night driving and strategies to reduce the effects.	➢ Fact Sheet 10.1: Changing Weather and Conditions of Visibility ➢ Slides 10.5 through 10.7: Driving at Night   

Changing Weather and Conditions of Visibility

Fact Sheet 10.1
Content Information

Driving at Night

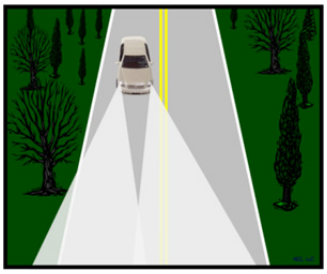
Driving at night:

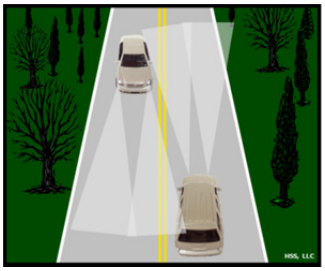
Reduced lighting results in reduced visibility at night. Not only can a driver not see ahead as clearly, he/she cannot see to the sides as well. Drivers have difficulty seeing objects approaching from their left or right into their path of travel.

Visibility deals with limitations placed on gathering and processing information when driving at night due to factors of reduced illumination and ability of the eyes to adjust to glare.

- Distance a driver can see ahead is limited
- Headlights provide limited illumination of off-road areas
- Glare from lights of oncoming and following vehicles and glare recovery time

Strategies for night driving include:





- **Use high-beam headlights** when safe and legal to do so, properly aligned high beams:
  - Illuminate roadway 300 to 350 feet ahead
  - Light area above road 500 to 1800 feet
  - Load, load distribution and vehicle height affect light beam distance
  - Allow for a maximum safe speed of 55 – 60 mph
- **Use low-beam headlights** in bad weather or when following or meeting another car at night, properly aligned low beams:
  - Illuminate roadway 100 to 150 feet ahead
  - Light area above road 300 to 500 feet
  - Load, load distribution and vehicle height affect light beam distance
  - Allow for a maximum safe speed of 40 – 45 mph
- **Adjust your speed to the reach of the headlights** – do not overdrive the headlights, compensate for reduced visibility by increasing following distance to four or more seconds and decreasing speed
- **Keep your eyes moving** – search the darkened roadway ahead and the edges of the lighted area, as well as the middle
- **Flash headlights once quickly** if an oncoming vehicle is using high beams at night
- **Protect your eyes from glare** – headlights at night can temporarily affect your vision

Changing Weather and Conditions of Visibility	**Part 1 continued** Lesson Content

Lesson Content	Materials and Resources
Visibility Limited by Rain and Snow ➢ **Slides 10.8 and 10.9** Discuss how to minimize the effects of reduced visibility from rain and snow and how to drive in rain and snow.	➢ Slides 10.8 and 10.9: Visibility Limited by Rain and Snow  

Changing Weather and Conditions of Visibility

Fact Sheet 10.1 continued
Content Information

Visibility Limited by Rain and Snow

These conditions deal with atmospheric conditions beyond control of the vehicle operator. Drivers should not drive knowingly in the conditions listed below.

Minimizing the effects of reduced visibility

- **Keep headlights clean** – mud and dirt splashed by other cars can cover the driver's headlights, which can reduce headlight effectiveness. Clean them periodically to restore their effectiveness.
- **Clear the windshield and rear windows** – snow and sleet can collect and freeze on the windshield, which can restrict vision. Be sure to remove excess snow and sleet from the windows. Clean the outside and inside of the windshield at least once a week.
- **Turn on the defroster** – to help remove ice and condensation from the windshield and windows turn on the defroster and blowers, move the heat control to hot and allow the engine to warm up. Use the air conditioner to reduce the humidity level.

Driving in rain or snow

- Drizzle can turn into a downpour and obscure vision.
- Light snow can turn into a whiteout causing very limited vision.

Sight distance rule – the driver has to be able to stop in the distance s/he can see.

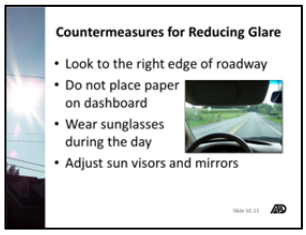
Precautionary measures should be taken as soon as any of the initial conditions become evident. In most instances torrential rains are of short duration. The snow storm-induced whiteout could cover a much greater area. In both situations:

- Continue to reduce speed to limits imposed by visibility, but do not stop in travel lane or on shoulder near road*
- Turn headlights to low beam
- Turn on emergency flashers
- Maintain center lane position
- Turn on windshield wipers**
- Be alert for vehicles stopped in roadway
- Be prepared for effects of gusting or strong steady crosswinds
- Make steering, acceleration and braking actions gently and smoothly

* For snow condition, look for exit from highway and turn on radio for weather report. If impossible to leave highway, stop beyond end outside of guardrail. If available, use cell phone to check road conditions once pulled over.

** Snow may require use of windshield washer.

Changing Weather and Conditions of Visibility — Part 1 continued
Lesson Content

Lesson Content	Materials and Resources
Visibility Limited by Glare ➢ **Slide 10.10** Discuss sources of glare.	➢ Slide 10.10: Sources of Glare 
➢ **Slide 10.11** Discuss glare recovery and how to minimize the effects of reduced visibility from glare.	➢ Slide 10.11: Countermeasures for Reducing Glare 

Changing Weather and Conditions of Visibility

Fact Sheet 10.1
Content Information

Visibility Limited by Glare

Glare is difficulty seeing in the presence of bright light such as direct or reflected sunlight or artificial light such as car headlights at night.

Sources of glare:

- Oncoming and following vehicle headlights
- Dirty windshield
- Paper on dashboard
- Snow-covered landscape
- The sun at dawn or dusk (ahead or behind)
- Flashing advertisement signs
- Rain amplifying glare
- Flood lights on businesses next to roadway
- Failure to dim own headlights in fog

Glare recovery – most people's eyes recover from glare within 3 to 5 seconds; however, recovery times of 7 seconds or longer is not uncommon. Typically the time to recover from glare increases with age.

Countermeasures:

- Keep all glass, lights and windows clean
- Do not place paper or other objects on dashboard
- Adjust sun visors and mirrors
- Sit as high in the seat as possible
- Wear sunglasses during the day
- Adjust speed to visibility conditions
- Look to the right edge of the roadway, away from headlights

Changing Weather and Conditions of Visibility

Part 1 continued
Lesson Content

Lesson Content	Materials and Resources
Visibility Limited by Fog ➢ **Slides 10.12 and 10.13** Discuss how to minimize the effects of reduced visibility when driving in drifting and heavy fog.	➢ Slides 10.12 and 10.13: Visibility Limited by Fog  

Changing Weather and Conditions of Visibility

Fact Sheet 10.1 continued
Content Information

Visibility Limited by Fog

Fog:

People involved in multi-vehicle crashes in fog often state that they had driven through patches of light, drifting fog in the area, but nothing serious and had continued to travel at the prevailing speed. Suddenly it was impossible to see, they had braked hard, only to run into a vehicle stopped in the road ahead or to be rear-ended. The correct response would have been to reduce speed as soon as they were aware of drifting fog.

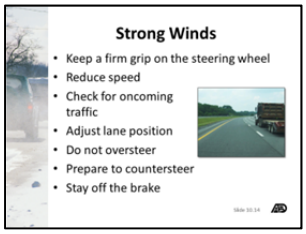
If driving in drifting fog:

- Reduce speed
- Make sure headlights are on low beam to reduce reflected glare
- Turn on windshield wipers
- Turn on defroster or air conditioner

If fog is heavy:

- Further reduce speed but do not stop in a travel lane
- Turn on emergency flashers
- Look for an exit from the highway
- If impossible to leave highway, stop beyond end of guardrail, check outside the guardrail, then back up outside of the guardrail, turn off all lights and wait for fog to lift

Changing Weather and Conditions of Visibility — Part 1 continued Lesson Content

Lesson Content	Materials and Resources
Strong Winds ➢ **Slide 10.14** Discuss the actions to take when the vehicle is affected by strong gusts of wind.	➢ Slide 10.14: Strong Winds 
➢ **Worksheet 10.1** Duplicate and distribute Worksheet 10.1. Have students take worksheet home and complete on their own or have them complete it after class discussion.	➢ Worksheet 10.1: Changing Weather and Conditions of Visibility

Changing Weather and Conditions of Visibility

Fact Sheet 10.1 continued
Content Information

Strong Winds

Strong winds can reduce your vehicle control and push lightweight vehicles out of the lane or even off the road. These conditions occur on bridges, through mountain passes and ravines, and when being passed by large trucks. These wind gusts and blasts can cause total loss of vehicle control. If your vehicle encounters strong gusts of wind, do the following:

- Keep a firm grip on the steering wheel
- Reduce speed
- Check for oncoming traffic
- Adjust lane position
- Do not oversteer when responding to the gust
- Prepare to countersteer
- Stay off the brake

When driving on a highway with steady, strong crosswinds a driver should be alert to prevailing wind direction and velocity, the terrain through which he/she is passing and the condition of the road surface. Driving out of a wooded area, from behind a long ridge or from under an overpass on an ice packed road and being struck by a strong wind gust can easily cause a vehicle to move one lane to the left or right or spin completely out of control.

Changing Weather and Conditions of Visibility — Worksheet 10.1

Changing Weather and Conditions of Visibility

Name	Date

For items 1 through 5, answer the following questions:

A. How can this condition affect a driver's ability to see?
B. What adjustment should a driver make to better cope with the problem?

1. Sun glare:
   a. _____
   _____
   b. _____
   _____
2. Driving at night:
   a. _____
   _____
   b. _____
   _____
3. Fog:
   a. _____
   _____
   b. _____
   _____
4. Rain:
   a. _____
   _____
   b. _____
   _____
5. Snow:
   a. _____
   _____
   b. _____
   _____

Changing Weather and Conditions of Visibility	Worksheet 10.1 ANSWER KEY

Changing Weather and Conditions of Visibility ANSWER KEY

Name	Date

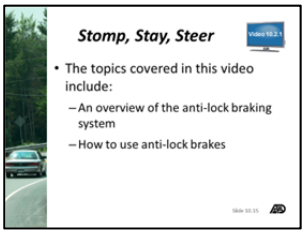
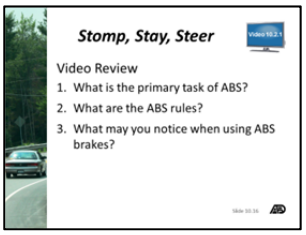
For items 1 through 5, answer the following questions:

A. How can this condition affect a driver's ability to see?
B. What adjustment should a driver make to better cope with the problem?

1. Sun glare:
    a. *Difficult to see because of bright light shining in eyes from direct or reflected sunlight or car headlights*
    b. *Adjust sun visors and mirrors. Sit as high in the seat as possible. Wear sunglasses. Adjust speed. Look to the right edge of the roadway, away from headlights*
2. Driving at night:
    a. *A driver not see ahead or to the sides as clearly. Drivers have difficulty seeing objects approaching from their left or right into their path of travel. The distance a driver can see ahead is limited.*
    b. *Use high-beam headlights when safe and legal to do so. Use low-beam headlights in bad weather or when following or meeting another car at night. Adjust headlights properly. Increase following distance. Keep your eyes moving.*
3. Fog:
    a. *A driver cannot see well ahead, to the sides or behind if fog is heavy. A driver's vision is limited because of fog.*
    b. *Reduce speed. Use low-beam headlights. Turn on windshield wipers, and turn on defroster or air conditioner. If fog is heavy use emergency flashers and/or look for an exit from the highway.*
4. Rain:
    a. *Rain can obscure vision making it difficult to see the road ahead.*
    b. *Keep headlights clean. Turn on the defroster. Reduce speed. Use low-beam headlights. Turn on emergency flashers if needed. Maintain center lane position. Turn on windshield wipers. Make actions gently and smoothly.*
5. Snow:
    a. *Snow can cause limited vision making it difficult to see the road ahead.*
    b. *Keep headlights clean. Turn on the defroster. Reduce speed. Use low-beam headlights. Turn on emergency flashers if needed. Maintain center lane position. Turn on windshield wipers. Make actions gently and smoothly.*

Advanced Automotive Technology	**Part 2** Lesson Content

Lesson Objective:
Student will demonstrate knowledge of technological advances in the design of motor vehicles that enhance occupant safety and ability to respond more effectively under conditions of limited time and space.

Lesson Content	Materials and Resources
Automotive Technology	
➢ **Video Review 10.2.1** Duplicate and distribute Video Review 10.2. Students should complete the worksheet as they watch the video.	➢ Video Review 10.2.1 and Answer Key: Stomp, Stay, Steer
➢ **Slides 10.15 and 10.16 – Video 10.2.1** Discuss the topics covered in Video 10.2.1 Play Video 10.2.1 *Stomp, Stay, Steer* (Time: 3 minutes 4 seconds) After viewing, review Video Review 10.2.1 to gauge student understanding of the video.	➢ Slides 10.15 and 10.16: Video 10.2.1 *Stomp, Stay, Steer*  

Advanced Automotive Technology	Video Overview 10.2.1

Video Overview 10.2.1: Stomp, Stay, Steer

Title

Stomp, Stay, Steer

Time

3 minutes 4 seconds

Topics Covered

1. An overview of the anti-lock braking system.
2. How to use anti-lock brakes.

Video Review

1. Have students complete a video review worksheet as they watch the video.
2. After viewing the video, review the worksheet to gauge students' understanding of the video.

Instructor Notes

Advanced Automotive Technology	Video Review 10.2.1

Video Review 10.2.1: Stomp, Stay, Steer

Name	Date

1. What is the primary task of ABS? _____

   _____

   _____

2. What are the ABS rules?

   a. _____

   _____

   b. _____

   _____

   c. _____

   _____

3. What may you notice when using ABS brakes? _____

   _____

   _____

Advanced Automotive Technology	Video Review 10.2.1 ANSWER KEY

Video Review 10.2.1: Stomp, Stay, Steer ANSWER KEY

Name	Date

1. What is the primary task of ABS?
   Answer: accident avoidance

2. What are the ABS rules?
   Answer: Stomp on the brake pedal, stay on the brakes, steer where you want to go

3. What may you notice when using ABS brakes?
   Answer: You may hear a noise and feel the pedal vibrate

Advanced Automotive Technology	Part 2 Lesson Content
Lesson Content	**Materials and Resources**
<u>Automotive Technology</u> ➢ **Fact Sheet 10.2** Duplicate and distribute Fact Sheet 10.2 for students to use as a resource and study guide. ➢ **Slide 10.17** Discuss the technological advances in automotive design including construction and their contribution to occupant safety and enhancement of the ability to respond more effectively under conditions of limited time and space.	➢ Fact Sheet 10.2: Advanced Automotive Technology ➢ Slide 10.17: Automotive Technology 

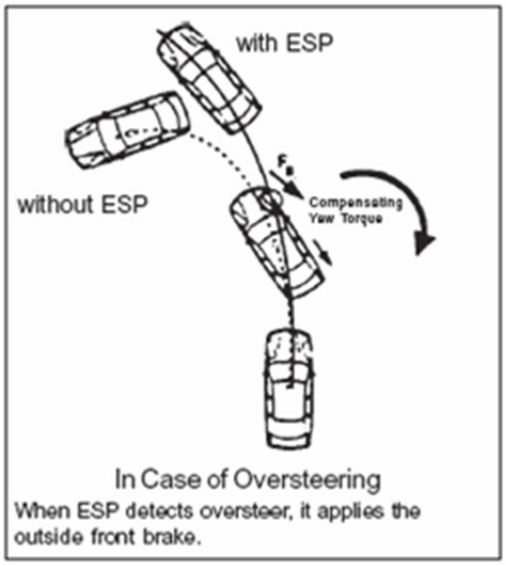
Advanced Automotive Technology

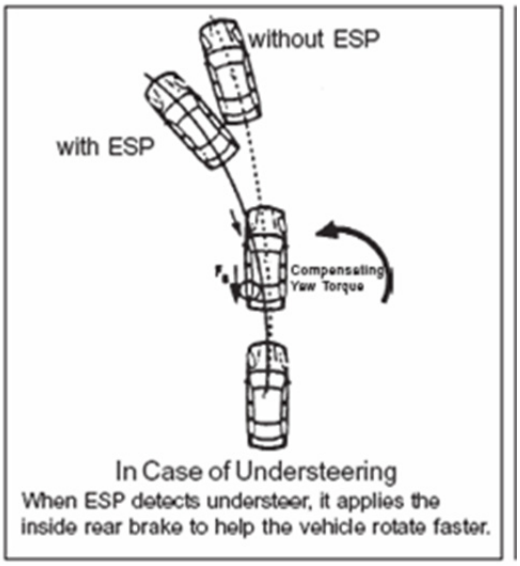
Fact Sheet 10.2
Content Information

Automotive Technology

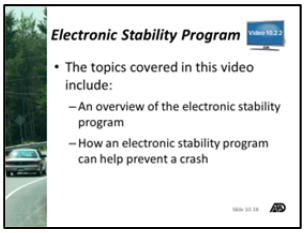
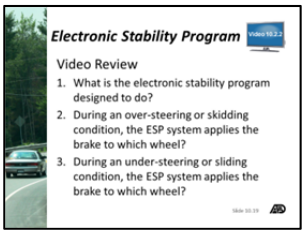
New vehicle technology aids the driver in maintaining vehicle control when performing avoidance maneuvers and increased protection should a crash occur. Enhanced control is provided through technologies such as the following:

- **Anti-lock brakes** which are designed to allow steering and simultaneous braking without losing vehicle balance. Anti-lock brakes do not necessarily shorten stopping distance on dry pavement, but generally shorten stopping distances on wet surfaces where traction loss can be a serious problem.
- **Traction control** is designed to activate brake sensors which do not allow the wheels to spin. The process is basically the reverse of anti-lock brakes. The device allows acceleration input without loss of vehicle balance.
- **Suspension control** adjusts vehicle balance at struts or shock absorbers through adjustment of fluid or air pressure when too much weight is suddenly transferred to a given shock or strut.
- **Electronic Stability Program (ESP)** compares where a driver is steering the vehicle with where the vehicle is actually going. When ESP senses a disparity between the two, it selectively applies any one of the vehicle's brakes to reduce the discrepancy and help the driver retain control and stability. This program can help prevent conditions that lead to a rollover.





Advanced Automotive Technology	**Part 2** Lesson Content

Lesson Content	Materials and Resources
Automotive Technology	
➢ **Video Review 10.2.2** Duplicate and distribute Video Review 10.2.2. Students should complete the worksheet as they watch the video.	➢ Video Review 10.2.2 and Answer Key: Electronic Stability Program
➢ **Slides 10.18 and 10.19 – Video 10.2.2** Discuss the topics covered in Video 10.2.2 Play Video 10.2.2 *Electronic Stability Program* (Time: 2 minutes 28 seconds) After viewing, review Video Review 10.2.2 to gauge student understanding of the video.	➢ Slides 10.18 and 10.19: Video 10.2.2 *Electronic Stability Program*  

Advanced Automotive Technology	Video Overview 10.2.2

Video Overview 10.2.2: Electronic Stability Program

Title

Electronic Stability Program

Time

2 minutes 28 seconds

Topics Covered

1. An overview of the electronic stability program.
2. How an electronic stability program can help prevent a crash.

Video Review

1. Have students complete a video review worksheet as they watch the video.
2. After viewing the video, review the worksheet to gauge students' understanding of the video.

Instructor Notes

Advanced Automotive Technology	Video Review 10.2.2

Video Review 10.2.2: Electronic Stability Program

Name	Date

1. What is the electronic stability program designed to do?

   _____

   _____

   _____

2. During an over-steering or skidding condition (rear-wheel lock-up), the ESP system applies the brake to which wheel?

   _____

   _____

3. During an under-steering or sliding condition (front-wheel lock-up), the ESP system applies the brake to which wheel?

   _____

   _____

Advanced Automotive Technology	Video Review 10.2.2 ANSWER KEY

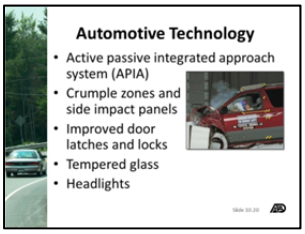
Video Review 10.2.2: Electronic Stability Program ANSWER KEY

Name	Date

1. What is the electronic stability program designed to do?
   Answer: Avoid accidents and prevent a vehicle from skidding and sliding

2. During an over-steering or skidding condition (rear-wheel lock-up), the ESP system applies the brake to which wheel?
   Answer: The outer front wheel

3. During an under-steering or sliding condition (front-wheel lock-up), the ESP system applies the brake to which wheel?
   Answer: The inner rear wheel

Advanced Automotive Technology	**Part 2 continued** Lesson Content
Lesson Content	**Materials and Resources**
<u>Automotive Technology</u> ➢ **Slide 10.20** Discuss the technological advances in automotive design including construction and their contribution to occupant safety and enhancement of the ability to respond more effectively under conditions of limited time and space.	➢ Slide 10.20: Automotive Technology 

Advanced Automotive Technology	Fact Sheet 10.2 continued Content Information

Automotive Technology

Other enhanced automotive technology includes:

- **Active passive integrated approach system (APIA)** combines both active and passive safety equipment to help drivers maintain control and avoid crashes. This system relies on data interchange between active and passive safety systems that collect information on the activities and inputs of the driver, the behavior of the vehicle, and the status of the driving environment.
  - For example, when a vehicle with APIA is not a safe distance away from a vehicle ahead, the system warns the driver with a visual message displayed on the instrument panel or a vibrating pedal. If the vehicles approach closer, seat belts are tightened and side windows are closed and the system actively applies light pressure on the brakes.
- **Crumple zones and side impact panels** protect occupants by allowing structures to collapse at different rates, reducing the risk of penetration into the passenger compartment or spreading forces over a wider area.
- **Improved door latches and locks** are designed to stay closed under the most severe conditions, unlike door fasteners of the early 1960s that resembled the fasteners found in the interior of the typical home, and generally flew open in a crash.
- **Tempered glass** in motor vehicles has literally eliminated the facial disfigurement associated with partial ejection through laminated plate glass formerly used in windshields.
- **Headlights** have undergone dramatic improvement in terms of level of illumination, focus and reliability over the past 15 years.

Changing Traction Conditions

Part 3
Lesson Content

Lesson Objective:

Student will demonstrate knowledge of weather, other physical conditions and driver actions that influence the level of traction or adhesion between tires, road surface and vehicle control.

Lesson Content	Materials and Resources
Traction and Slippery Conditions	
➢ **Fact Sheet 10.3** Duplicate and distribute Fact Sheet 10.3 for students to use as a resource and study guide.	➢ Fact Sheet 10.3: Changing Traction Conditions
➢ **Slide 10.21** Discuss traction and what happens when traction is reduced.	➢ Slide 10.21: Traction 
➢ **Class Discussion** Ask students to describe slippery conditions that can create reduced traction. Discuss slippery conditions that can create reduced traction.	➢ Chalkboard / Dry-erase board
➢ **Slide 10.22** Ask students, how can loss of traction on wet roads be prevented? Discuss how to prevent loss of traction	➢ Slide 10.22: Preventing Loss of Traction 

Changing Traction Conditions

Fact Sheet 10.3
Content Information

Traction and Preventing Loss of Traction

Traction

Traction or adhesion is the grip between the tires and the road surface that allows a vehicle to start, stop and/or change direction. Reduced traction increases the risk of skidding, loss of control and a collision.

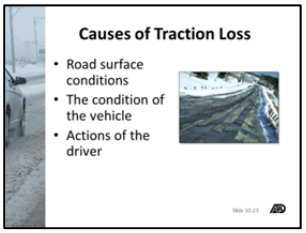
Slippery conditions

- Traction is reduced when there are any foreign substances on the road surface, such as water, snow, ice, gravel, sand, wet leaves, or loose dirt.
- The effects of limited traction are particularly dangerous in curves and turns.
- Some road surfaces lose some of their surface friction with wear, aggravating the loss of traction with slippery conditions. These roads often have a "slippery when wet" sign posted.
- Wet roads are most dangerous when the temperature is near freezing (30 – 34 degrees).
- On hot days, wet surfaces are most slippery just after a rain has begun to fall, especially if it hasn't rained recently.
- During the first 10 – 15 minutes of rain, water combines with oil and dirt to form a very slick mixture.
- Heavily traveled intersections are especially dangerous because some vehicles stopped for traffic signals leave oil drippings on roads.

Preventing loss of traction

To prevent loss of traction on wet roads a driver can:

- **Reduce speed** – compensates for limited surface friction to reduce stopping distance and reduce the chance of losing control when changing direction
- **Increase space –** increase following distance on slippery surfaces, stop well behind the vehicle ahead to prevent being pushed into it if struck from behind
- **Minimize changes in speed –** when a driver turns, accelerates, or brakes, the chance of losing traction increases, make changes gently and gradually
- **Minimize change in direction –** avoid abrupt changes in direction because this may cause the front tires to slide and result in loss of control
- **Find the best path –** avoid areas of limited traction or place tires in the tracks left by the tires of vehicles ahead, which have channeled some of the water away

Changing Traction Conditions	**Part 3 continued** Lesson Content
Lesson Content	**Materials and Resources**
<u>Traction Loss</u> ➢ **Class Discussion** Ask students to describe causes of traction loss and roadway conditions that can create traction loss. ➢ **Slide 10.23** Discuss road conditions, vehicle factors and actions which drivers take that affect traction loss.	➢ Chalkboard / Dry-erase board ➢ Slide 10.23: Causes of Traction Loss 

Changing Traction Conditions

Fact Sheet 10.3 continued
Content Information

Traction Loss

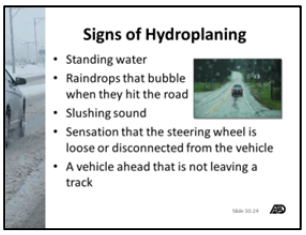
Traction loss

The causes of traction loss (skidding) can be divided into three categories:

1. **Generated by road surface conditions:**
   - Ice, snow or frost
   - Wet surface; particularly first 15 minutes of rain after a long dry period when drops of oil and rubber particles have collected on the surface
   - Standing water
   - Mud near farm entrances, construction sites and truck crossings
   - Wet leaves
   - Broken or uneven road surface
   - Sand or gravel frequently found on curves in rural areas

2. **Generated by the condition of the vehicle:**
   - Brakes unevenly adjusted. Brakes pulling in one direction or the other can cause a skid, as can wheels out of alignment when brakes are applied
   - Tires with worn tread, front and rear pairs not matched to size, tread depth or type
   - Different pressure on opposite sides have effects similar to uneven brake adjustment since one tire will drag more than others

3. **Actions of the driver:**
   - Sudden steering action on a slippery surface
   - Abrupt or sudden changes in vehicle speed
   - Panic stop or applying brakes too hard on hill, curves or slippery surfaces
   - Most skids are caused by excessive speed, coupled with excessive steering input and/or improper braking when turning, or the same actions at normal speed on ice/ snow or on roadways covered by sand, gravel or water

Changing Traction Conditions	**Part 3 continued** Lesson Content
Lesson Content	**Materials and Resources**
<u>Hydroplaning</u>	
➢ **Class Discussion** Discuss the term hydroplaning and the causes of hydroplaning.	➢ Fact Sheet 10.3: Changing Traction Conditions
➢ **Slide 10.24** Discuss the signs of hydroplaning, which is the most difficult loss of traction for a driver to recognize.	➢ Slide 10.24: Signs of Hydroplaning 
➢ **Slide 10.25** Discuss how to prevent hydroplaning and what to do if hydroplaning occurs.	➢ Slide 10.25: Preventing Hydroplaning 

Changing Traction Conditions

Fact Sheet 10.3 continued
Content Information

Hydroplaning

Hydroplaning is when a vehicle's tires lose contact with the road and ride on top of a film of water.

Causes of hydroplaning

- **Water on the road** – heavy rain causes water to gather on the roadway.
- **Excess speed** – at speeds faster than 35 mph, tires are less effect at channeling water from the road, tires can become overwhelmed by water and lose contact with the road at about 50 mph.
- **Under-inflated tires** – if tires are improperly inflated or worn, hydroplaning can occur well below 50 mph.

Signs of hydroplaning – this is the most difficult loss of traction for a driver to recognize

- Water standing on the roadway.
- Raindrops that bubble as they hit the surface of the road.
- A slushing sound made by tires on the pavement.
- A sensation that the steering wheel is loose, or has become disconnected from the front wheels of the vehicle. Drivers may not realize their car is hydroplaning until they try to turn or stop, and they find the car will not respond.
- A vehicle ahead that is not leaving a track is hydroplaning.

Preventing hydroplaning

- Slow down when there is water standing on the surface of the pavement.
- Tires should be properly inflated and have adequate tread.
- Increase following distance, particularly when behind a large truck.
- Drive in the tracks left by any vehicle ahead.

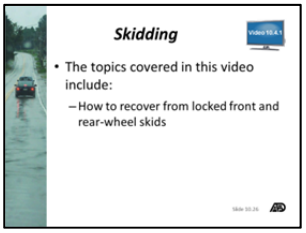
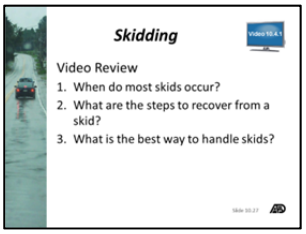
If hydroplaning occurs

- Ease off the accelerator gradually, decrease speed until your tires regain traction.
- Do not brake until traction has been restored.
- Steer no more than necessary, continue to look and steer where you want to go.

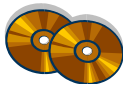
Emergency Recovery

Part 4
Lesson Content

Lesson Objective:
Student will describe the characteristics of front wheel and rear wheel traction loss and off-road recovery and describe the actions to take in order to control the vehicle.

Lesson Content	Materials and Resources
Emergency Recovery ➢ **Video Review 10.4.1** Duplicate and distribute Video Review 10.4.1. Students should complete the worksheet as they watch the video. ➢ **Slides 10.26 and 10.27 – Video 10.4** Discuss the topics covered in Video 10.4.1 Play Video 10.4.1 *Skidding* (Time: 2 minutes 21 seconds) After viewing, review Video Review 10.4.1 to gauge student understanding of the video.	➢ Video Review 10.4.1 and Answer Key: Skidding ➢ Slides 10.26 and 10.27: Video 10.4.1 *Skidding*  

Emergency Recovery — Video Overview 10.4.1



Video Overview 10.4.1: Skidding

Title

Skidding

Time

2 minutes 21 seconds

Topics Covered

1. How to recover from locked front and rear-wheel skids.

Video Review

1. Have students complete a video review worksheet as they watch the video.
2. After viewing the video, review the worksheet to gauge students' understanding of the video.

Instructor Notes

Emergency Recovery	Video Review 10.4.1

Video Review 10.4.1: Skidding

Name	Date

1. When do most skids occur?

_____

_____

_____

2. What are the steps to recover from a skid?

_____

_____

_____

_____

3. What is the best way to handle skids?

_____

_____

_____

_____

Emergency Recovery	**Video Review 10.4.1** ANSWER KEY

Video Review 10.4.1: Skidding ANSWER KEY

Name	Date

1. When do most skids occur?
   Answer: From braking too hard on a slippery surface, turning too quickly and trying to accelerate too rapidly

2. What are the steps to recover from a skid?
   Answer: Foot off brake or accelerator. Turn vehicle in desired direction. Before the car straightens out, counter-steer the other way. Continue doing so until the vehicle is straight ahead

3. What is the best way to handle skids?
   Answer: Avoid slippery surfaces. Adjust speed to conditions. Be gentle using brake, accelerator and steering wheel

Emergency Recovery	Part 4 Lesson Content

Lesson Content	Materials and Resources
Detecting Traction Loss ➢ **Fact Sheet 10.4** Duplicate and distribute Fact Sheet 10.4 for students to use as a resource and study guide. ➢ **Class Discussion** Discuss how to identify traction loss through the feel of the vehicle and how to respond if the driver failed to detect early warning signs.	➢ Fact Sheet 10.4: Emergency Recovery

Emergency Recovery

Fact Sheet 10.4
Content Information

Detecting Traction Loss

Traction loss identified through feel of the vehicle

The first indication of traction loss should be sensory stimulus generated by bodily movements and tensions, rather than sight. By the time a driver is visually aware that the vehicle is not headed in the desired direction or sliding rather than stopping, the situation is typically more difficult to correct.

Early detection begins with proper seating, safety belt snapped tightly and grasping the steering wheel firmly with fingers rather than the palms of the hands. This position allows the vehicle to more readily communicate changes in motion to the driver. When seated in this manner, employing an aggressive visual search to detect conditions that could reduce available traction should require minor corrections of accelerator, brake or steering wheel to bring the vehicle back to the intended path of travel.

What should drivers do when they realize they are skidding?

Look for an open path of travel and release the accelerator or brake pedal to regain vehicle balance.

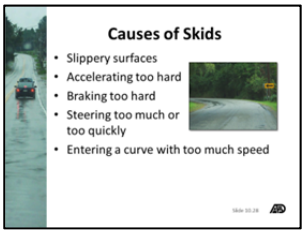
Having failed to detect early warning signals, how should the driver respond?

While there is no one way to handle a particular skid, there are guidelines that can be applied to help control skidding. Basic rules include:

- Determine which wheels, front or rear, have lost traction.
- Visually target an open path of travel, do not look at object toward which the vehicle is sliding.
- Release accelerator or brake pedal, whichever the driver is applying, to regain vehicle balance.
- Steer toward open path of travel as long as vehicle is in motion.
- Jabbing brake may be necessary to aid in case of front wheel loss of traction, but only after rolling traction has been reestablished.
- Progressive acceleration may aid a rear wheel loss of traction to allow rolling traction to regain control.

Emergency Recovery

Part 4 continued
Lesson Content

Lesson Content	Materials and Resources
Skidding ➢ **Slide 10.28** Discuss skidding and the causes of skidding. ➢ **Slide 10.29** Discuss how to prevent and respond to skids.	➢ Slide 10.28: Causes of Skids  ➢ Slide 10.29: Preventing Skids 

Emergency Recovery

Fact Sheet 10.4 continued
Content Information

Skidding

Skidding is a situation in which the driver's tires lose all or part of their grip on the road. As the tires lose traction, they will begin to slide, and can cause the vehicle to deviate from its intended path of travel.

Causes of skids

- Slippery surfaces
- Accelerating too hard
- Braking too hard
- Steering too much or too quickly
- Entering a curve with too much speed

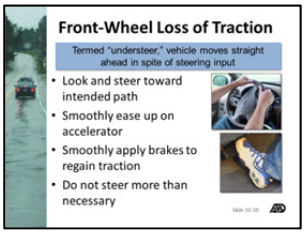
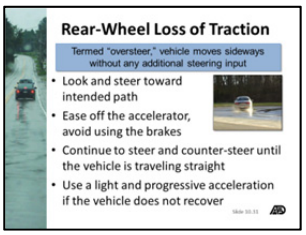
Preventing skids

- Apply the brakes in a smooth and progressive manner
- Make smooth, precise steering wheel movements
- Slowing down well in advance of curves
- Maintaining speeds appropriate for conditions

Responding to skids

- Driver needs to recognize s/he is experiencing a skid
- As soon as a skid is detected, s/he needs to take corrective action
- Once the driver responds to a skid s/he should not stop trying to regain traction

Emergency Recovery	**Part 4 continued** Lesson Content

Lesson Content	Materials and Resources
Types of Skids and Recovery Techniques	
➢ **Slide 10.30** Discuss the characteristics and recovery techniques of traction loss to the front wheels.	➢ Slide 10.30: Front-Wheel Loss of Traction 
➢ **Slide 10.31** Discuss the characteristics and recovery techniques of traction loss to the rear wheels.	➢ Slide 10.31: Rear-Wheel Loss of Traction 

Emergency Recovery

Fact Sheet 10.4 continued
Content Information

Types of Skids and Recovery Techniques

Front-wheel skid

- Termed "understeer"
- Vehicle moves straight ahead in spite of steering input

To regain traction:

- Continue to look and steer toward the intended path of travel.
- Smoothly ease up on the accelerator to regain traction.
- Smoothly apply brakes to regain enough traction to turn the vehicle toward the intended path of travel, which may take some rapid readjustments as the vehicle responds to the driver's initial steering input.
- Do not steer more than necessary to keep the vehicle directed toward the path of travel. Being able to respond with the steering wheel demands constant attention until the vehicle is safely back on the desired path of travel.

Rear-wheel skid

- Termed "oversteer"
- Vehicle moves sideways without any additional steering input

To regain traction:

- Continue to look and steer toward the intended path of travel
- Ease off the accelerator, avoid using the brakes
- As the rear tire regains traction, continue steering toward the intended path of travel and continue to steer and counter-steer until the vehicle is traveling straight
- Use a light and progressive acceleration if the vehicle does not recover

Counter-steer – once the car starts turning, it will continue past the intended direction. Turn the steering wheel back in the opposite direction just before the vehicle lines up with the intended path.

Emergency Recovery	Part 4 Lesson Content

Lesson Content	Materials and Resources
Run-Off the Road Crashes	
➢ **Video Review 10.4.2** Duplicate and distribute Video Review 10.4.1. Students should complete the worksheet as they watch the video.	➢ Video Review 10.4.2 and Answer Key: Run-off the Road Crashes: Recognize, React, Recover
➢ **Slides 10.32 and 10.33 – Video 10.4.2** Discuss the topics covered in Video 10.4.2 Play Video 10.4.2 *Run-off the Road Crashes: Recognize, React, Recover* (Time: 3 minutes 51 seconds) After viewing, review Video Review 10.4.2 to gauge student understanding of the video.	➢ Slides 10.32 and 10.33: Video 10.4.2 *Run-off the Road Crashes: Recognize, React, Recover*  

Emergency Recovery	Video Overview 10.4.2

Video Overview 10.4.2: Run-off the Road Crashes: Recognize, React, Recover

Title

Run-off the Road Crashes: Recognize, React, Recover

Time

3 minutes 51 seconds

Topics Covered

1. Causes of run-off the road crashes.
2. How to recover from a run-off the road crash.
3. How rumble strips can help you recover safely.

Video Review

1. Have students complete a video review worksheet as they watch the video.
2. After viewing the video, review the worksheet to gauge students' understanding of the video.

Instructor Notes

Emergency Recovery	Video Review 10.4.2

Video Review 10.4.2: Run-off the Road Crashes: Recognize, React, Recover

Name	Date

1. What are some reasons run-off the road crashes occur?

_____

_____

_____

2. What increases the risk of being in a run-off the road crash?

_____

_____

3. What is the #1 tip from America's best drivers when it comes to run-off the road crashes?

_____

_____

_____

4. What steps should you take if you run-off the road?

_____

_____

_____

Emergency Recovery	**Video Review 10.4.2** ANSWER KEY

Video Review 10.4.2: Run-off the Road Crashes: Recognize, React, Recover
ANSWER KEY

Name	Date

1. What are some reasons run-off the road crashes occur?
   Answer: Driving too fast for conditions, not paying attention, driving in rural areas

2. What increases the risk of being in a run-off the road crash?
   Answer: Driving at night

3. What is the #1 tip from America's best drivers when it comes to run-off the road crashes?
   Answer: Don't overreact

4. What steps should you take if you run-off the road?
   Answer: Keep a firm grip on the steering wheel. Stay off the brake and gas. Check for traffic. Reduce speed. Align off road wheels with the road (straddle the road). Steer back onto the road with small inputs.

Emergency Recovery	**Part 4 continued** Lesson Content

Lesson Content	Materials and Resources
Run-Off the Road Crashes ➢ **Slide 10.34** Discuss the causes of run-off the road crashes. ➢ **Slide 10.35** Discuss the steps to take in an off-road recovery and what to do if the driver must return to the road quickly because the roadside is blocked.	➢ Slide 10.34: Causes of Run-off the Road Crashes  ➢ Slide 10.35: Off-Road Recovery 

Emergency Recovery

Fact Sheet 10.4 continued
Content Information

Run-Off the Road Crashes

Many run-off the road crashes occur when a driver drifts off the roadway onto the shoulder due to inattention, nodding or falling asleep or steers onto the shoulder to avoid a collision and tries to return to the roadway.

Crashes may occur because:

- As the driver steers back toward the road, the left-side "climbs" onto the pavement"
- As the driver continues turning the wheel, the right-side tires suddenly "climbs" the pavement
- Before the driver can respond, the vehicle has already crossed into the next lane
- The vehicle may collide with a vehicle in the next lane, or drive off the far side of the road

To return to the pavement safely:

- Keep a firm grip on the steering wheel
- Slow down, ease off the accelerator and allow the vehicle to slow gradually, avoid braking
- Straddle the edge of the pavement, after speed is reduced and there is a gap in traffic steer back to the road with small inputs, do not oversteer
- Return to the pavement two wheels at a time, as soon as the front tire is back on the roadway, counter-steer quickly left or right as necessary to stay in the correct lane

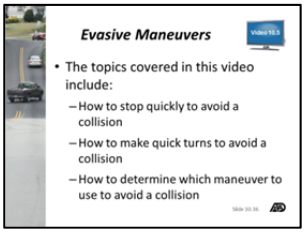
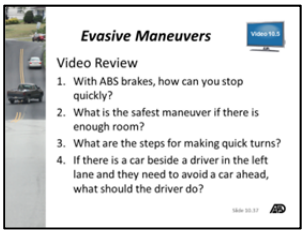
Blocked roadside – if an object beside the road such as a tree, bridge abutment or pedestrian forces the driver to return to the road quickly, s/he has little time to slow down, to do this the driver should:

- Steer left or right so the off-road wheels are about 12 inches away from the edge of the pavement
- Remove his/her foot from the accelerator and stay off the brakes. Turn the steering wheel quickly about one-eighth turn toward the roadway
- Immediately, as the outer wheel makes contact with the edge of the pavement, counter-steer about a quarter turn and make steering corrections to straighten vehicle

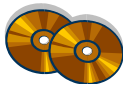
Controlling the Consequences of a Crash

Part 5
Lesson Content

Lesson Objective:
Student will demonstrate knowledge of actions necessary to better control the consequences if a crash appears imminent.

Lesson Content	Materials and Resources
Evasive Maneuvers	
➢ **Video Review 10.5** Duplicate and distribute Video Review 10.5. Students should complete the worksheet as they watch the video.	➢ Video Review 10.5 and Answer Key: Evasive Maneuvers
➢ **Slides 10.36 and 10.37 Video 10.5** Discuss the topics covered in Video 10.5 Play Video 10.5 *Evasive Maneuvers* (Time: 4 minutes 49 seconds) After viewing, review Video Review 10.5 to gauge student understanding of the video.	➢ Slides 10.36 and 10.37: Video 10.5 *Evasive Maneuvers*  

Controlling the Consequences of a Crash — Video Overview 10.5



Video Overview 10.5: Evasive Maneuvers

Title

Evasive Maneuvers

Time

4 minutes 49 seconds

Topics Covered

1. How to stop quickly to avoid a collision.
2. How to make quick turns to avoid a collision.
3. How to determine which maneuver to use to avoid a collision.

Video Review

1. Have students complete a video review worksheet as they watch the video.
2. After viewing the video, review the worksheet to gauge students' understanding of the video.

Instructor Notes

Controlling the Consequences of a Crash	Video Review 10.5

Video Review 10.5: Evasive Maneuvers

Name	Date

1. With ABS brakes, how can you stop quickly? _____

2. What is the safest maneuver if there is enough room?

3. What are the steps for making quick turns?

4. If there is a car beside you in the left lane and you need to avoid a car ahead, what should you do?

Controlling the Consequences of a Crash	**Video Review 10.5** ANSWER KEY

Video Review 10.5: Evasive Maneuvers ANSWER KEY

Name	Date

1. With ABS brakes, how can you stop quickly?
   Answer: Press down hard on the brake pedal

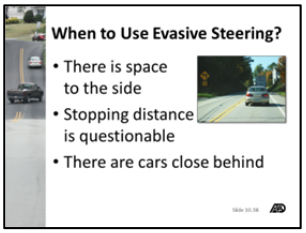
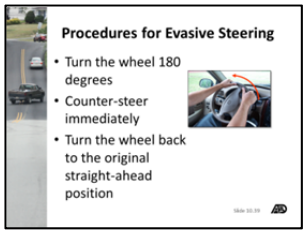
2. What is the safest maneuver if there is enough room?
   Answer: Braking

3. What are the steps for making quick turns?
   Answer: Turn the wheel ½ circle, full circle in the other direction and back to the middle

4. If there is a car beside you in the left lane and you need to avoid a car ahead, what should you do?
   Answer: Stop quickly or swerve to the right

Controlling the Consequences of a Crash

Part 5 continued
Lesson Content

Lesson Content	Materials and Resources
Evasive Maneuvers ➢ **Fact Sheet 10.5** Duplicate and distribute Fact Sheet 10.5 for students to use as a resource and study guide. Explain how to decide which evasive maneuver to use when avoiding a collision.	➢ Fact Sheet 10.5: Controlling the Consequences of a Crash
➢ **Slide 10.38** Discuss when it is preferable to use quick turns.	➢ Slide 10.38: When to Use Evasive Steering? 
➢ **Slide 10.39** Discuss the procedures for making quick turns.	➢ Slide 10.39: Procedures for Evasive Steering 

Controlling the Consequences of a Crash

Fact Sheet 10.5
Content Information

Evasive Maneuvers

Avoiding a collision

To avoid a collision, you may have to make a sudden change in the vehicle's speed and direction.

Deciding which maneuver to use

It is usually better to use evasive steering than braking because a driver can steer the vehicle quicker than s/he can stop it. Although to use evasive steering, the driver must have identified an alternate path of travel.

Evasive steering

Quick steering is often preferable to a stop when:

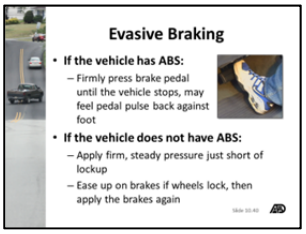
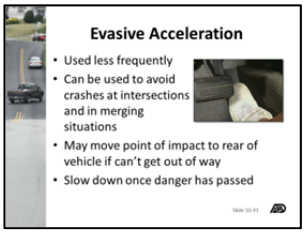
- There is space to the side – a paved shoulder is safest
- Stopping distance is questionable
- There are cars close behind

The driver should have a good grip with both hands on the steering wheel at the 9 and 3 o'clock or 8 and 4 o'clock hand position. Drivers need to:

1. Turn the wheel 180 degrees (a half circle) in the direction of the turn.
2. Counter-steer immediately by turning the wheel as much as possible in the opposite direction to turn the vehicle back toward the original lane.
3. Turn the wheel back to the original straight-ahead position as the vehicle begins to return to the intended lane. These three movements must be made as one continuous, smooth steering response.

Controlling the Consequences of a Crash

Part 5 continued
Lesson Content

Lesson Content	Materials and Resources
Evasive Maneuvers ➢ **Slide 10.40** Discuss the procedures for making quick stops for vehicles with ABS and without ABS.	➢ Slide 10.40: Evasive Braking 
➢ **Slide 10.41** Discuss how evasive acceleration can be used in some instances to avoid a crash.	➢ Slide 10.41: Evasive Acceleration 

Controlling the Consequences of a Crash

Fact Sheet 10.5
Content Information

Evasive Maneuvers

Evasive braking

If there is no space to the side or the driver has not identified a space, a driver must brake to avoid a collision. In many cases, the best action is a combination of braking and evasive steering.

If the vehicle has ABS:

- Firmly press the brake pedal until the vehicle stops or the proper speed is reached.
- If a driver puts on the brakes hard enough to engage the ABS, he/she will feel the brake pedal pulse back against his/her foot. This sensation is normal and indicates the system is working properly.
- The driver should not pump the pedal or remove their foot from the brake.

If the vehicle does not have ABS:

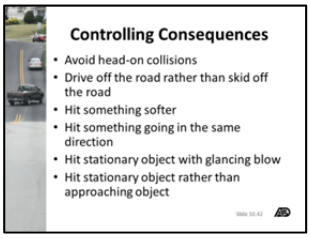
- The driver can cause the vehicle to skid if s/he brakes too hard.
- Apply firm, steady pressure on the brake pedal just short of lockup – the point at which the wheels stop turning.
- If the wheels do lock, the driver must ease up on the brake pedal slightly and quickly to get the wheels to begin rolling again, then apply the brakes again, just short of lockup.
- As soon as the vehicle stops skidding, push down on the brake pedal again. Keep doing this until the vehicle has stopped.

Evasive acceleration

This emergency technique is used less frequently mainly because the dangerous event that drivers have to respond to is in front of them. However, the accelerator can be used to avoid crashes at intersections and in merging situations.

The driver may not be able to get completely out of the way, but acceleration may move the point of impact to the rear of the vehicle, away from the passenger compartment. Be sure to slow down once the danger has passed.

Controlling the Consequences of a Crash	**Part 5 continued** Lesson Content

Lesson Content	Materials and Resources
Minimizing the Consequences of a Crash ➢ **Slide 10.42** Discuss ways to keep from being hit in a collision and to try to lessen any injuries that could result from the crash.	➢ Slide 10.42: Controlling Consequences 

Controlling the Consequences of a Crash

Fact Sheet 10.5 continued
Content Information

How to Minimize the Consequences of a Collision

Controlling consequences

- Avoid head-on collisions
- Drive off road rather than skid off road
- Hit something soft rather than something hard
- Hit something going your way rather than something stationary
- Hit stationary object with glancing blow or at an angle
- Hit stationary object rather than an approaching object
- Steer to avoid oncoming traffic
- Avoid direct impact

Hit from the rear

If a driver is about to be hit from the rear, the driver should press him-her-self against the back of the seat and put his/herhead against the head restraint to avoid being thrown forwards. The driver should be ready to apply his/her brakes so s/he will not be pushed into another vehicle.

Hit from the side

If a driver is about to be hit from the side, the driver should get ready to steer or brake to prevent the vehicle from hitting something else.

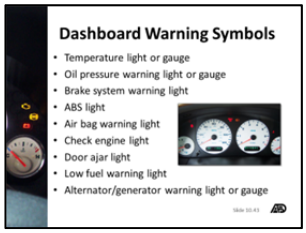
Hit from the front

If a driver is about to be hit from the front it is important to try to have a "glancing blow" rather than being struck head on. If a collision is about to happen the driver should try to turn the vehicle. At worse, the vehicle will be hit with a glancing blow or might miss it.

Vehicle Malfunctions

Part 6
Lesson Content

Lesson Objective:
Student will describe the correct actions to take in response to driving emergencies caused by vehicle malfunction.

Lesson Content	Materials and Resources
Vehicle Malfunctions ➢ **Fact Sheet 10.6** Duplicate and distribute Fact Sheet 10.6 for students to use as a study guide and resource. ➢ **Slide 10.43** Discuss the various warning lights that may activate while driving and what to do if a light activates.	➢ Fact Sheet 10.6: Vehicle Malfunctions ➢ Slide 10.43: Dashboard Warning Symbols 

Vehicle Malfunctions

Fact Sheet 10.6
Content Information

Dashboard Warning Symbols

It is essential to know what the warning lights and gauges on the instrument panel mean and where they are located. Become familiar with a vehicle by reading the owner's manual. This will help prevent the driver from being caught "off-guard" should a problem arise

Warning symbols – Red color means stop as soon as possible and have the problem repaired. Yellow color means have the problem repaired within a reasonable time

- **Temperature light or gauge** – warns when the coolant in the engine is too hot or too low. Stop as soon as possible and repair. Caution: never attempt to remove the radiator cap when the engine is hot as there is the risk of severe burns.
- **Oil pressure warning light or gauge** – warns when the oil is not circulating at the proper pressure or there is not enough oil. Repair in a reasonable time.
- **Brake system warning light** – shows the parking brake is set before moving the vehicle and alerts that part or all of the braking system is not working properly or the brake fluid is too low. Stop as soon as possible. Have the vehicle towed and the vehicle repaired.
- **Anti-lock braking system (ABS) light** – indicates whether the ABS is functioning properly. If it comes on while driving there is a problem with the system. Repair in a reasonable time.
- **Air bag warning light** – indicates the air bags are not in proper working condition. Repair in a reasonable time
- **Check engine light** – monitors operation of fuel, ignition, and emission control systems. This light should come on when the ignition is on, but the engine is not running. If the light does not come on, have the system fixed right away. If the light stays on or it comes on while driving, the computer is indicating there is a problem. Repair in a reasonable time.
- **Door ajar light** – comes on if a door(s) is not closed properly. Check all doors immediately, but do not check while driving.
- **Low fuel warning light** – tells how much fuel remains when the ignition is on. When the low fuel light activates, it means approximately two galloons remain. Get fuel as soon as possible.
- **Alternator/Generator warning light or gauge** – the vehicle's electrical system is in trouble if this light comes on or the gauge shows "discharge" while the engine is running. Discharge occurs when the alternator is not generating enough electricity to charge the battery. Be aware that if this happens, the engine must use electricity stored in the battery. Turn off as many electrical devices as possible (i.e., the radio, heater/AC, etc.). Caution: Have this checked without delay. If the battery is drained, the car can shut off.

Vehicle Malfunctions	Part 6 continued Lesson Content
Lesson Content	**Materials and Resources**
<u>Vehicle Malfunctions</u> ➢ **Worksheet 10.6** Duplicate and distribute Worksheet 10.6. Have the students complete the worksheet during discussion on the procedures for handling vehicle failures.	➢ Worksheet 10.6: Vehicle Malfunctions

Vehicle Malfunctions — Worksheet 10.6

Vehicle Malfunctions

Name	Date

List the procedures for each vehicle failure in the space provided below.

Tire Blowout

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____
8. _____

Accelerator Failure

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____

Brake Failure

1. _____
2. _____
3. _____
4. _____
5. _____

Engine Failure

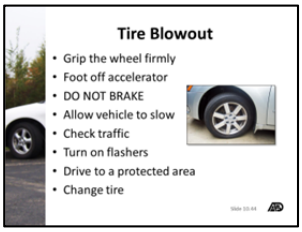
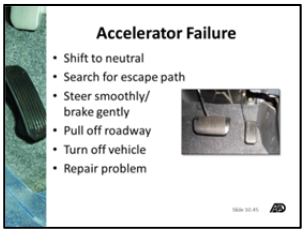
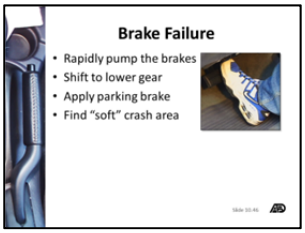
1. _____
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____

Power Steering Failure

1. _____
2. _____

Vehicle Malfunctions

Part 6 continued
Lesson Content

Lesson Content	Materials and Resources
Vehicle Malfunctions ➢ **Slides 10.44 through 10.46** Discuss each action or procedure to follow when responding to driving emergencies caused by tire, accelerator or brake failure.	➢ Slide 10.44: Tire Failure  ➢ Slide 10.45: Accelerator Failure  ➢ Slide 10.46: Brake Failure 

Vehicle Malfunctions

Fact Sheet 10.6 continued
Content Information

Vehicle Failures

Tire failure can be caused by the gradual wear on the tires through hard braking and/or acceleration. They also need periodic balancing and alignment. Look for wear bars appearing across the tire as a sign that tires need to be replaced.

A tire blowout is a rapid deflation of air from the tire. If a front tire blows out, the vehicle will pull sharply in the direction of the blowout. If a rear tire blows out, the vehicle will wobble and shake and pull some in the direction of the blowout. In either case:

1. Grip the steering wheel firmly
2. Remove foot from accelerator
3. DO NOT BRAKE
4. Allow the vehicle to slow on its own or brake gently if necessary
5. Check traffic around you
6. Turn on emergency flashers
7. Drive to a protected location and pull off the roadway
8. Have the tire changed and replaced

Accelerator failure could be caused either by a broken spring or the pedal getting stuck in the down position. In either case:

1. Shift to "neutral" (the engine may race but no harm will be done)
2. Search for an escape path
3. Steer smoothly and brake gently
4. Pull off the roadway
5. Turn off the vehicle
6. Have the pedal repaired at a service center before driving again

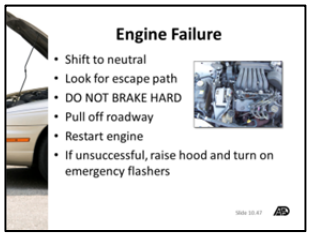
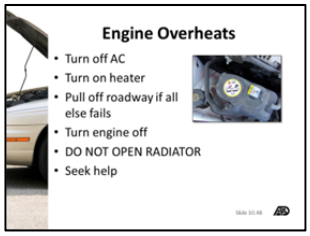
Brake failure could be complete loss of brakes or only failure of the power brakes. If the brakes quit working:

1. Rapidly pump the brakes (may regain brakes)
2. Shift to a lower gear
3. If pumping the brakes doesn't work, apply the parking brake
4. Release the brake if the wheels lock. Reapply the parking brake if needed.
5. Find a "soft" crash area

If power brakes fail, the car can still be stopped with more pressure on the brake pedal.

Vehicle Malfunctions

Part 6 continued
Lesson Content

Lesson Content	Materials and Resources
Vehicle Malfunctions ➢ **Slides 10.47 and 10.48** Discuss each action or procedure to follow when responding to driving emergencies caused by engine failure or overheating.	➢ Slide 10.47: Engine Failure  ➢ Slide 10.48: Engine Overheats 

Vehicle Malfunctions

Fact Sheet 10.6 continued
Content Information

Vehicle Failures

Engine failure could happen when the engine quits running completely or becomes flooded or overheats. If the engine just shuts off while driving:

1. Shift to neutral
2. Look for an escape path
3. DO NOT BRAKE HARD
4. Pull off the roadway (brake gently but with more pressure on the pedal)
5. Stop, try to restart the engine
6. If unsuccessful, raise hood and turn on emergency flashers

If the engine becomes flooded, there will usually be a strong odor of gasoline.

To start the engine:

1. Push the accelerator pedal to the floor and hold it there
2. Turn the key for up to five seconds
3. If it does not start, wait several minutes and try again
4. Once started, release the accelerator pedal

If the engine overheats while driving:

1. Turn air conditioner off if it is on
2. Turn on the heater to draw heat off the engine
3. If these fail, move to a safe location off the roadway
4. Turn engine off
5. Do not open the radiator cap
6. Seek help

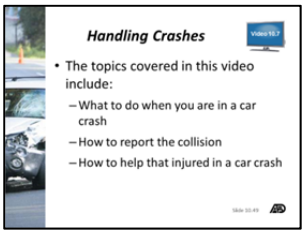
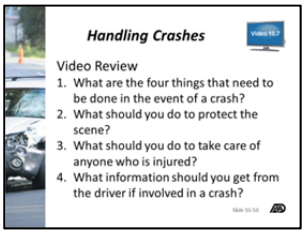
Power steering failure:

1. The vehicle can still be steered.
2. It will require much more effort on the driver's part.

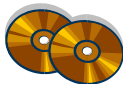
Collision Reporting

Part 7
Lesson Content

Lesson Objective:
Student will describe the actions to take when involved in a collision.

Lesson Content	Materials and Resources
Collision Reporting	
➢ **Video Review 10.7** Duplicate and distribute Video Review 10.7. Students should complete the worksheet as they watch the video.	➢ Video Review 10.7 and Answer Key: Handling Crashes
➢ **Slides 10.49 and 10.50 – Video 10.7** Discuss the topics covered in Video 10.7 Play Video 10.7 *Handling Crashes* (Time: 3 minutes 16 seconds) After viewing, review Video Review 10.7 to gauge student understanding of the video.	➢ Slides 10.49 and 10.50: Video 10.7: *Handling Crashes*  

Collision Reporting — Video Overview 10.7



Video Overview 10.7: Handling Crashes

Title

Handling Crashes

Time

3 minutes 16 seconds

Topics Covered

1. What to do when you are in a car crash.
2. How to report the collision.
3. How to help those injured in a car crash.

Video Review

1. Have students complete a video review worksheet as they watch the video.
2. After viewing the video, review the worksheet to gauge students' understanding of the video.

Instructor Notes

Collision Reporting	**Video Review 10.7**

Video Review 10.7: Handling Crashes

Name	Date

1. What are the four things that need to be done in the event of a crash?

   a. _____

   b. _____

   c. _____

   d. _____

2. What should you do to protect the scene? _____

   _____

   _____

   _____

3. What should you do to take care of anyone who is injured?

   _____

   _____

   _____

4. What information should you get from the other driver if involved in a crash?

   _____

   _____

   _____

   _____

Collision Reporting	**Video Review 10.7** ANSWER KEY

Video Review 10.7: Handling Crashes ANSWER KEY

Name	Date

1. What are the four things that need to be done in the event of a crash?
   Answer: Protect the scene, call for help, take care of injured, report the accident

2. What should you do to protect the scene?
   Answer: Get cars off the road, if possible, warn approaching drivers

3. What should you do to take care of anyone who is injured?
   Answer: Try to make them as comfortable as possible, see if there is someone with medical experience around, keep injury from getting worse, move the person no more than is necessary to avoid danger from traffic or fire

4. What information should you get from the other driver if involved in a crash?
   Answer: Name, address, phone number, driver's license #, vehicle tag number, insurance company, name and telephone number of witnesses

Collision Reporting

Part 7 continued
Lesson Content

Lesson Content	Materials and Resources
Collision Reporting	
➢ **Fact Sheet 10.7** Duplicate and distribute Fact Sheet 10.7 for students to use as a study guide and resource.	➢ Fact Sheet 10.7: Collision Reporting
➢ **Slide 10.51** Discuss post-collision procedures to take when involved in a collision.	➢ Slide 10.51: Collisions 
➢ **Class Discussion** Discuss any additional state procedures the driver is responsible for at the scene of a collision.	➢ Fact Sheet 10.7: Collision Reporting

Collision Reporting

Fact Sheet 10.7
Content Information

Crash Scene

Typically, there are certain duties to be performed when a driver is involved in a crash.

If a collision with another vehicle, a pedestrian or someone's property occurs, IT IS LEGALLY REQUIRED TO FOLLOW SPECIFIC PROCEDURES. These five steps should be taken in addition to anything required by your state law:

1. Stop immediately
2. Aid the injured (if qualified, otherwise call for help)
3. Prevent further damage
4. Send for police
5. Exchange Information/Reporting

Take these additional steps after a collision:

1. Record witnesses' names and addresses
2. Make a sketch of the collision scene
3. Take a photograph
4. Record such facts as time, date, location, weather and driving conditions
5. Note the name of the hospital to which any injured persons were taken
6. Note the name and the identification number of the police officer at the collision scene

Give police the facts. Provide honest, accurate facts and never argue about who was to blame. Do not admit fault. Stay at the scene until all information has been recorded. Produce proof of financial responsibility by showing a card that lists current insurance or a bond card. Also, notify appropriate insurance agent promptly.

Collision Reporting	**Part 7 continued** Lesson Content
Lesson Content	**Materials and Resources**
<u>Collision Reporting</u> ➢ **Class Discussion** Discuss any additional state procedures the driver is responsible for at the scene of a collision.	➢ Fact Sheet 10.7: Collision Reporting

Collision Reporting

Fact Sheet 10.7
Content Information

Your State's Vehicle Laws

Instructors should provide information about their state's vehicle laws as they apply to this Unit. In addition to state specific information, include information about collision reporting, and accident scene behavior.

Unit Review and Test	Part 8 Lesson Content

Lesson Objective:

Student will evaluate their knowledge of the content presented in Unit 10 through review questions, key word matchup worksheet and unit test.

Lesson Content	Materials and Resources
Review Questions ➢ **Review Questions** Ask review questions to summarize discussion on Unit 10.	➢ Unit 10 Review Questions

Unit 10 Review Questions

1. High beam headlights allow for a maximum safe speed of?
   Answer: 55 – 60 mph

2. Low beam headlights allow for a maximum safe speed of?
   Answer: 40 – 45 mph

3. What can you do to reduce the effects of glare?
   Answer: Keep all glass clean. Do not place objects on dashboard. Adjust sun visors and mirrors. Sit as high in the seat as possible. Wear sunglasses during the day. Adjust speed to visibility conditions. Look to the right edge of the roadway, away from headlights.

4. When driving in fog is it best to use your low beam or high beam headlights?
   Answer: Low beam

5. What is the purpose of the electronic stability program (ESP)?
   Answer: Helps prevent conditions that lead to a rollover and regain control and stability

6. At what temperature are wet roads most dangerous*?*
   Answer: When the temperature is near freezing (30 – 34 degrees)

7. What can you do to prevent hydroplaning?
   Answer: Slow down when there is water standing on the surface of the pavement. Make sure tires are inflated properly and have adequate tread. Increase following distance, particularly when behind a large truck. Drive in the tracks left by any vehicle ahead.

8. What should a driver do to regain traction in a front-wheel skid?
   Answer: Continue to look and steer toward the intended path of travel, smoothly ease up on the accelerator to regain traction, smoothly apply brakes to regain enough traction to turn the vehicle toward the intended path of travel, which may take some rapid readjustments as the vehicle responds to the driver's initial steering input

9. What are some reasons why run-off the road crashes occur?
   Answer: A driver drifts off the roadway onto the shoulder due to inattention, nodding or falling asleep or steers onto the shoulder to avoid a collision and tries to return to the roadway

10. If the brake system warning light comes on while driving what should you do?
    Answer: Stop as soon as possible, have the vehicle towed and repaired

Unit Review and Test	Part 8 continued Lesson Content
Lesson Content	**Materials and Resources**
<u>Words to Know Review</u> ➢ **Fact Sheet 10.8** Duplicate and distribute Fact Sheet 10.8. Use the definitions page as a resource for teaching and for the students as a resource and study guide. ➢ **Worksheet 10.8** Duplicate and distribute. Have students complete the worksheet. Review the answers.	➢ Fact Sheet 10.8: Unit 10 Words to Know Definitions Page ➢ Worksheet 10.8 and Answer Key: Unit 10 Words to Know Matchup

Unit 10 Words to Know Definitions Page

Fact Sheet 10.8
Content Information

ABS – anti-lock braking system designed to keep a car's wheels from locking when the driver brakes hard or abruptly, or applies the brakes on a slick surface

Accelerator failure – when the gas pedal does not work properly. Could be caused either by a broken spring or the pedal getting stuck in the down position.

Brake failure – when the brake pedal does not work properly. Could be complete loss of brakes or only failure of the power brakes.

Collision reporting – duties to perform when a driver is involved in a crash

Countersteer – to turn the steering wheel back in the opposite direction in order to maintain or regain directional control of the vehicle

Engine failure – could happen when the engine quits running completely or becomes flooded or overheats

ESP – electronic stability program, a system that helps prevent loss of traction and aids a driver in maintaining directional control

Evasive action – a quick change in speed or direction to avoid a collision

Front-wheel skid – termed "understeer," a type of skid where the vehicle moves straight ahead in spite of steering input

Glare – difficulty seeing in the presence of bright light such as direct or reflected sunlight or artificial light such as car headlights at night

Hydroplaning – when a vehicle's tires lose contact with the road and ride on top of a film of water

Off-road recovery – returning to the road from the shoulder

Power steering failure – when the vehicle loses power steering. The vehicle can still be steered, but it will require much more effort on the driver's part.

Rear-wheel skid – termed "oversteer," a type of skid where the vehicle moves sideways without any additional steering input

Unit 10 Words to Know Definitions Page

Fact Sheet 10.8 continued
Content Information

Sight distance rule – the driver has to be able to stop in the distance s/he can see

Skidding – loss of traction by the front, rear, or all tires, generally resulting in a deviation from the desired path of travel

Tire blowout – a rapid deflation of air from the tire. If a front tire blows out, the vehicle will pull sharply in the direction of the blowout. If a rear tire blows out, the vehicle will wobble and shake and pull some in the direction of the blowout.

Traction – the grip between the tires and the road surface that allows a vehicle to start, stop and/or change direction

Instructor Notes

Unit 10 Words to Know Matchup — Worksheet 10.8

Name	Date

Directions: Match the clues on the left with the words in the list on the right. Place the matching letter in the blank to the left of the number.

_____1.	Difficulty seeing in the presence of bright light such as direct or reflected sunlight or artificial light such as car headlights at night	A.	ABS
_____2.	Termed "oversteer" where the vehicle moves sideways without any additional steering input	B.	Countersteer
_____3.	When a vehicle's tires lose contact with the road and ride on top of a film of water	C.	ESP
_____4.	Loss of traction by the front, rear, or all tires, generally resulting in a deviation from the desired path of travel	D.	Front-wheel skid
_____5.	A system that helps prevent loss of traction and aids a driver in maintaining directional control	E.	Glare
_____6.	The grip between the tires and the road surface that allows a vehicle to start, stop and/or change direction	F.	Hydroplaning
_____7.	To turn the steering wheel back in the opposite direction in order to maintain or regain directional control of the vehicle	G.	Off-road recovery
_____8.	Termed "understeer" where the vehicle moves straight ahead in spite of steering input	H.	Rear-wheel skid
_____9.	Returning to the road from the shoulder	I.	Skidding
_____10.	Designed to keep a car's wheels from locking when the driver brakes hard or abruptly, or applies the brakes on a slick surface	J.	Traction

Unit 10 Words to Know Matchup

Worksheet 10.8
ANSWER KEY

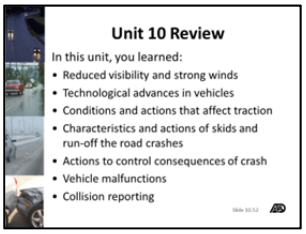
ANSWER KEY

Directions: Match the clues on the left with the words in the list on the right. Place the matching letter in the blank to the left of the number.

____E____1.	Difficulty seeing in the presence of bright light such as direct or reflected sunlight or artificial light such as car headlights at night	A. ABS
____H____2.	Termed “oversteer” where the vehicle moves sideways without any additional steering input	B. Countersteer
____F____3.	When a vehicle’s tires lose contact with the road and ride on top of a film of water	C. ESP
____I____4.	Loss of traction by the front, rear, or all tires, generally resulting in a deviation from the desired path of travel	D. Front-wheel skid
____C___5.	A system that helps prevent loss of traction and aids a driver in maintaining directional control	E. Glare
____J___6.	The grip between the tires and the road surface that allows a vehicle to start, stop and/or change direction	F. Hydroplaning
____B___7.	To turn the steering wheel back in the opposite direction in order to maintain or regain directional control of the vehicle	G. Off-road recovery
____D___8.	Termed “understeer” where the vehicle moves straight ahead in spite of steering input	H. Rear-wheel skid
____G___9.	Returning to the road from the shoulder	I. Skidding
____A__10.	Designed to keep a car’s wheels from locking when the driver brakes hard or abruptly, or applies the brakes on a slick surface	J. Traction

Unit Review and Test

Part 8 continued
Lesson Content

Lesson Content	Materials and Resources
Unit Review and Test	
➢ **Slide 10.52** Discuss what the students have learned by the end of this unit.	➢ Slide 10.52: Unit Review 
➢ **Reading Assignment** Assign students the reading material for the next unit. Students might begin reading after they have completed the Unit 10 Test.	➢ Textbooks **Preferred Textbook:** **HOW to DRIVE** Chapter 12 • Other Textbooks: – Drive Right: Chapter 7 – Responsible Driving: Chapters 2 and 18 – Other Textbook: _____ _____
➢ **Unit 10 Test**  Duplicate and distribute the Unit 10 Test. Collect and grade the test. After returning tests to the students, review the answers and clarify any confusion.	➢ Unit 10 Test, page 10-94

Unit 10 Review

Unit 10 Review

In this unit, you learned:

- Reduced visibility and strong winds
- Technological advances in the design of motor vehicles
- Conditions and driver actions that affect traction
- Characteristics of front wheel and rear wheel traction loss and run-off the road crashes and the actions to take in order control the vehicle
- Actions necessary to better control the consequences if a crash appears imminent
- Correct actions to take in response to driving emergencies caused by vehicle malfunction
- Actions to take when involved in a collision
- Key words associated with the unit objectives

Adverse Driving Conditions and Emergencies — Unit 10 Test

Select the best answer and place the appropriate letter (A, B, C, or D) on the line provided.

_____1. Due to a sudden change in direction, the rear end of your vehicle skids left or right. The first action to take is:

A. Ease off brake or accelerator:
B. Pump brakes rapidly
C. Accelerate slightly
D. Brake and accelerate lightly

_____ 2. If the vehicle you are driving starts to hydroplane, you should:

A. Pump brakes to slow the vehicle
B. Ease off accelerator, do not brake, steer where you want to go
C. Increase speed slightly
D. Steer sharply toward shoulder

_____ 3. The best way to control consequences if you cannot avoid a collision is to:

A. Throw yourself to the floor
B. Lock brakes and steer hard right
C. Lock brakes and turn off engine
D. Control brake and steer to collide at an angle with object

_____ 4. Automotive technology improvements have improved the safety of car occupants. Some of these improvements are:

A. Anti-lock brakes, safety glass and better headlights
B. Breakaway signposts and buried guardrails
C. Crash barrels and rumble strips
D. Turn lanes and delayed green signals

_____ 5. Night driving poses special problems for a driver because:

A. There is reduced lighting
B. Objects ahead are harder to see
C. Objects to the side are harder to see
D. All of the above

Adverse Driving Conditions and Emergencies	Unit 10 Test Page 2

_____ 6. When driving in heavy rain, which of the following should a driver **NOT** do?

A. Turn on low beam headlights
B. Continue driving at the posted speed limit
C. Be alert for vehicles stopped on the roadway
D. Make steering and braking changes smoothly and gently

_____ 7. When driving on a highway, sudden strong cross wind gusts:

A. Always cause severe dust problems
B. Affect large cars more than small cars
C. Can move a car sideways into another lane
D. Do not affect a car as much as a strong head wind

_____ 8. If the temperature light comes on while you are driving:

A. Ignore it and it will go out
B. Stop soon, check and repair the problem
C. Keep driving until you can have it repaired
D. Expect an explosion

_____ 9. If any tire blows out while you are driving, DO NOT:

A. Grip the steering wheel firmly
B. Take your foot off the accelerator
C. Allow the vehicle to slow gradually and safely
D. Brake hard

_____ 10. If you are making a turn and your engine shuts off in the middle of the intersection, the first thing you should do is:

A. Stop in the intersection and restart the vehicle
B. Shift to "neutral," complete the turn, then pull off and restart the engine
C. Pull over immediately and stop
D. Look for a service center to help restart the vehicle

Adverse Driving Conditions and Emergencies | **Unit 10 Test** ANSWER KEY

Unit 10 ANSWER KEY

1	A	6	B
2	B	7	C
3	D	8	B
4	A	9	D
5	D	10	B

