DAN
YOUR DIVE SAFETY ASSOCIATION

Emergency Oxygen for Scuba Diving Injuries

INSTRUCTOR GUIDE

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Emergency Oxygen for Scuba Diving Injuries Provider Course

Overview

The Emergency Oxygen for Scuba Diving Injuries course teaches participants to recognize common presentations of diving injuries and how to provide emergency oxygen first aid for these situations. This course is specifically designed as lay-provider training to educate participants to recognize diving-related injuries and to properly use emergency oxygen for that purpose.

The individual skills are outlined for easy delivery based on the skill presentation outline from the CORE instructor Manual. This includes skill objective, rationale and key points. Key points to be addressed during each skill are referenced in green in the Talk-Through Demonstration Skill Description and then itemized at the end of each skill to facilitate the debriefing after the skill practice.

Scenarios included in each skill are only suggestions and may be altered to more closely reflect the environment where the course is conducted.

The time needed to teach the course varies and depends on many factors, including the number of students and their ability to process the educational components of the program. Instructors who want to include subjects or training beyond the course requirements may do so only before or after the course. Any additional training must not be required for completion of course requirements.

Standards and Procedures

This Instructor Guide is for instructors who are authorized to conduct the Emergency Oxygen for Scuba Diving Injuries course. It is to be used in conjunction with the General Standards and Procedures section of the Instructor Manual, which will provide general course guidelines, equipment-configuration descriptions and ratios. The appendix of the Instructor Manual provides additional information on teaching courses.

This course is intended for anyone who might come in contact with divers or diving-related injuries. It is written to meet the 2015 American Heart Association Guidelines Update for Cardiopulmonary Resuscitation and Emergency Cardiovascular Care.

Standards Summary

Course prerequisites: Current full CPR certification (ventilations and compressions)

Age: No minimum age requirement

> ***Note:*** *Some countries, states and local municipalities may have minimum age stipulations.*

Student-to-instructor ratio: 12:1 during skill-development sessions

Recommended classroom hours: Four (4) hours

- Review Question discussion = 0.5 hours
- Skill development (practice) = 3.5 hours

Required student materials:

- *Emergency Oxygen for Scuba Diving Injuries* online module
- *Emergency Oxygen for Scuba Diving Injuries* Student Handbook
- Oronasal resuscitation mask with oxygen inlet (one for each student)
- Nonrebreather mask (one for each student)

Required instructor materials:

- *CORE Instructor Manual*
- *Emergency Oxygen for Scuba Diving Injuries Instructor Guide*
- *Emergency Oxygen for Scuba Diving Injuries* Student Handbook
- *Emergency Oxygen for Scuba Diving Injuries* slate

Required audiovisual materials:

- *Emergency Oxygen for Scuba Diving Injuries* Online Module
  - To be completed by students before attending class session

Required equipment and supplies:

- DAN oxygen unit or equivalent as noted in General Standards and Procedures
- Nonlatex medical gloves
- Adult CPR manikin
- Manually triggered ventilator and/or bag valve mask (both preferred)

Recommended audiovisual materials:

- *Emergency Oxygen for Scuba Diving Injuries* PowerPoint® presentation and video playlist for use during Review Question discussions as needed

Final assessment:

- A minimum score of 80 percent (29 Correct) on the final written assessment is required for certification.

The instructor must review with each participant any missed questions on the assessment or any information that is unclear to ensure 100 percent understanding of the material.

Retraining required: Every 24 months

Curriculum Subject Areas and Objectives

Students participating in this course will be able to answer the following questions at the end of the knowledge-development section:

1. Atmospheric Gases
    - What is oxygen (O_2)?
    - How much oxygen is in both inhaled and exhaled air as we breathe?
    - How is oxygen transported to body tissues?
    - What is carbon dioxide, and how is it eliminated from the body?
    - What is nitrogen gas?
    - What is carbon monoxide, and why is it dangerous?

2. Respiration and Circulation
    - What is hypoxia?
    - Why is oxygen necessary for life?
    - Where does gas exchange occur in the body?
    - What body structures comprise the respiratory system?
    - What body structures are included in the cardiovascular system?

3. Decompression Illness
    - What are the most important initial actions in responding to diving accidents?
    - What is decompression illness (DCI)?
    - What is the primary cause of decompression sickness (DCS)?
    - What are the primary symptoms of DCS?
    - What is arterial gas embolism (AGE)?
    - What is the primary risk factor for AGE?
    - Why is it important to seek medical evaluation when DCI is suspected?
    - What are the most prevalent symptoms of DCI?
    - What are the typical onset times of DCS and AGE symptoms?

4. Oxygen and Diving Injuries
    - What are the benefits of providing a high concentration of oxygen to an injured diver?
    - How does establishing a gas gradient help the injured diver?
    - What is the primary goal of emergency oxygen for injured divers?
    - What critical factors affect the percentage of oxygen delivery when using a demand valve?
    - What is the initial flow rate for constant-flow oxygen delivery systems?
    - What is the priority for oxygen delivery in remote areas?
    - What are the concerns for oxygen toxicity when delivering emergency oxygen first aid?
    - What are the symptoms of nonfatal drowning?
    - What is the first responder's role in a nonfatal drowning?
5. Handling Oxygen Safely
    - What is the fire triangle, and how is oxygen involved?
    - What two steps should be implemented to reduce the risks of handling oxygen?
    - What safety precautions should be implemented when using oxygen equipment?
    - What grade of oxygen should be utilized for diving first aid?
    - What documentation is required to receive an oxygen fill?
    - How should an oxygen unit be stored?
    - When should an oxygen unit's components and cylinder pressure be checked?
    - When and how should reusable oxygen masks and removable plastic oxygen-system parts be cleaned?
6. Oxygen Delivery Systems and Components
    - What are the components of an oxygen delivery system?
    - What are the hydrostatic testing requirements for an oxygen cylinder?
    - What two factors influence what cylinder size is appropriate?
    - When should the oxygen provider switch to a full cylinder?
    - Which oxygen regulator is preferred for diving first aid?
    - How often and by whom should an oxygen regulator be serviced?
    - Why is a demand valve the first choice for delivering oxygen to an injured diver?
    - What are the advantages and disadvantages of the following?
      a) manually triggered ventilator (MTV)
      b) bag valve mask (BVM)

Provider Skill Objectives

Students who have participated in the skill-development portion of this course will be able to perform the following skills:

1. Oxygen Equipment Identification, Disassembly and Assembly
   - Identify the component parts of the DAN Oxygen Unit.
   - Disassemble and reassemble with minimal assistance the DAN Oxygen Unit or equivalent.
2. S-A-F-E
   - List the steps in performing a scene safety assessment.
   - Perform a scene safety assessment in a scenario.
   - Use appropriate first-aid barrier devices in a scenario.
   - Demonstrate a caring attitude toward a simulated diver who has become ill or injured.
3. Initial Assessment with Basic Life Support (review only)
   - Establish the responsiveness of a simulated injured or ill diver.
   - Demonstrate the current sequence of providing care with proper ventilations and compression rates.
4. Demand Inhalator Valve
   - Provide emergency oxygen to a responsive breathing injured diver using the demand inhalator valve and oronasal mask.
5. Nonrebreather Mask
   - Provide emergency oxygen to a simulated unresponsive, breathing injured diver using a nonrebreather mask.
   - Discern when options for oxygen delivery are not working adequately, and switch to another as appropriate.
6. Resuscitation with a Bag Valve Mask (BVM)*
   - Provide emergency oxygen to a simulated nonbreathing or inadequately breathing injured diver using the bag valve mask on a CPR manikin.
7. Using a Manually Triggered Ventilator (MTV)*
   - Provide emergency oxygen to a simulated nonbreathing or inadequately breathing injured diver using an MTV and oronasal mask on a CPR manikin.

***Note:** Students must complete at least one of the two skills, BVM or MTV. Both skills are recommended, but only one is required for provider programs.*

8. Emergency Assistance Plan
    - List the components of an emergency assistance plan.
    - Develop an emergency assistance plan for the local diving area.

9. Assisting Two Injured Divers *(optional skill)*
    - Provide emergency oxygen simultaneously to two injured divers utilizing skills learned previously in this course.

Skill: Oxygen Equipment Identification, Disassembly and Assembly

Required Equipment:

1. DAN Oxygen Unit (or equivalent)
2. Clean sheet or towel

Objectives:

1. Identify the component parts of the emergency oxygen unit.
2. Disassemble and reassemble with minimal assistance the emergency oxygen unit.

Rationale:

Once the emergency oxygen unit is used to assist an injured diver, some of its components must be cleaned for future use. The equipment must then be reassembled to ensure that the equipment is ready for use before the next dive outing.

Conduct Real Time Demonstration.

Talk Through Demonstration Skill Description:

1. Identify standard oxygen unit components.
    - Oronasal resuscitation mask with oxygen inlet
    - T-handle
    - Handwheel wrench or mechanism for turning on the oxygen unit
    - Pressure gauge
    - Multifunction regulator
    - Constant-flow controller
    - Barbed constant-flow outlet
    - DISS threaded outlet
    - TruFit® mask
    - Demand inhalator valve or MTV
    - Intermediate pressure hose
    - Oxygen cylinder and valve
    - Nonrebreather mask

2. Disassemble and assemble emergency oxygen kit.
    - **Ensure the oxygen unit is depressurized and vented** by opening the constant-flow controller.
    - Check pressure gauge.
    - Remove multifunction regulator from the oxygen cylinder valve.
    - Secure oxygen cylinder.
    - Remove oxygen washer from multifunction regulator. **Discard and replace if damaged.**

        Note: This washer is different from a standard scuba O-ring.
    - Remove oxygen hose from multifunction regulator.
    - If the fitting is too tight, use handwheel/wrench to unscrew the hose.

        Note: Check valves; ensure oxygen does not flow from threaded ports.
    - Remove oxygen hose from demand inhalator valve.

        Note: Both ends of the oxygen hose are identical.
    - Unscrew the plastic mask adapter from the demand inhalator valve.
    - Remove diaphragm.
    - Following actual use, **disinfect diaphragm and plastic mask adapter by soaking for in 1:10 bleach solution for 10 minutes**, rinse thoroughly, and air dry before reassembly.
    - To assemble, repeat steps in reverse.
    - Yoke and hoses should **be tightened only finger tight**. (Do not use the handwheel wrench to tighten any fittings.)
    - Once reassembled, test the system for leaks.
        - Constant flow setting should be in the off position.
        - **Turn the pressure gauge away from people** before turning on the system.
        - **Turn system on slowly** one complete turn.

Set up practice groups, and provide scenario.

SCENARIO

After EMS personnel take over care for the injured diver, you must disassemble the oxygen unit for cleaning and then reassemble it before returning the unit to its protective case.

Instructor: Demonstrate one full disassembly/assembly cycle.
Student: Disassemble and reassemble the oxygen unit.

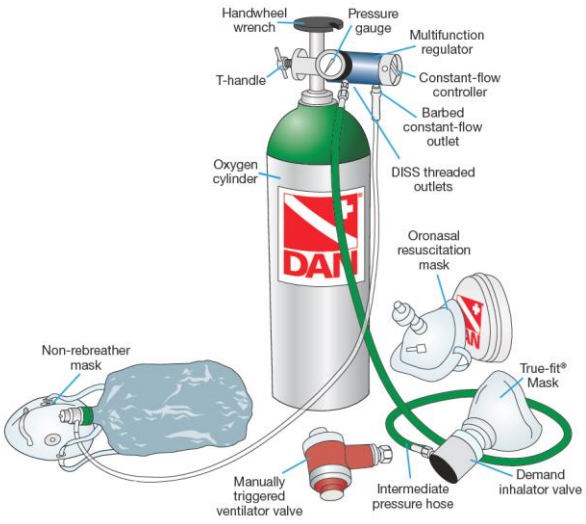
Each student must disassemble and reassemble the unit, identifying each part during the process.

Teaching Tip:
Place the system parts on a clean cloth during disassembly to avoid contamination. Have students name each part as they disassemble the unit and lay down the part. Have them name the part again as they pick it up to reassemble the unit.

Debrief skill.

Oxygen Equipment Identification, Disassembly and Assembly Key Points:

1. Verify that the pressure has been vented from the system before attempting disassembly.
2. Replace oxygen washer if it is damaged.
3. Disinfect diaphragm and plastic mask adapter by soaking it in a 1:10 bleach solution for 10 minutes. Rinse thoroughly, and air dry before reassembly.
4. Tighten regulator yoke and hoses only finger tight.
5. Turn pressure gauge away from yourself or bystanders when turning on the unit.



Notes:

Skill: Scene Safety Assessment

Required Equipment:

1. Nonlatex medical gloves
2. Oronasal resuscitation mask

Objectives:

1. List the steps in performing a scene safety assessment.
2. Perform a scene safety assessment in a scenario.
3. Use appropriate first-aid barrier devices in a scenario.
4. Demonstrate a caring attitude toward a simulated diver who has become ill or injured.

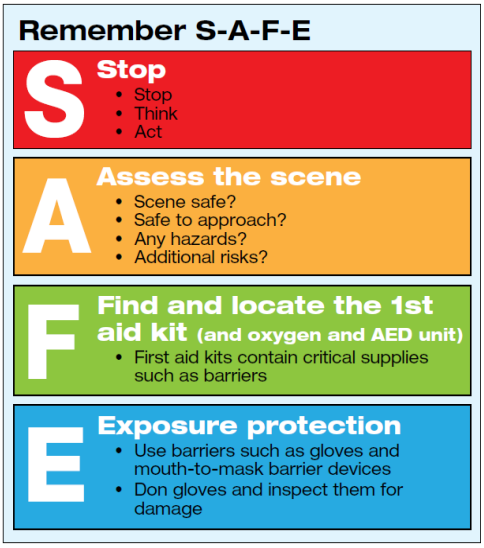
Rationale:

Protecting yourself is always your first responsibility. Rescuers cannot help anyone else if they are injured. Decide if the scene is safe to enter, and determine if there are any threats that may cause an injury or illness to the rescuer, bystanders or the injured diver, while preparing to lend assistance.

Conduct Real Time Demonstration.

Talk Through Demonstration Skill Description:

Use the mnemonic **S-A-F-E** to address each concern.



S — Stop.

- Stop.
- Think.
- Act.

A — Assess scene.

- Is the scene safe?
- Is it safe to approach the injured diver?
- Is the ventilation adequate for oxygen?
- Are any other hazards present?

F — Find and secure oxygen, first-aid kit and AED.

- First-aid kits contain critical supplies such as barrier devices.

E — Ensure exposure protection.

- Use barriers such as gloves and mouth-to-mask barrier devices.

Set up practice groups, and provide scenario.

SCENARIO

You surfaced about 20 minutes ago after your second dive off a local charter boat. The boat is currently repositioning to a new site for your third and final dive. Your buddy indicates he has pain in his left shoulder and his left hand is tingling.

Instructor: What should you do first?
Student: Complete a scene safety assessment using S-A-F-E.

Instructor: What special concern should you have checked in your safety assessment?
Student: Secure any loose scuba gear in the immediate area. Engage bystanders for assistance.

Debrief skill.

Scene Safety Assessment Key Points:

Stop.

Assess scene.

Find and secure oxygen unit, first-aid kit and AED.

Ensure exposure protection.

Skill: Initial Assessment with Basic Life Support (BLS)

Required Equipment:

1. Oronasal resuscitation mask with oxygen inlet
2. Nonlatex medical gloves
3. CPR manikins

Objectives:

1. Establish responsiveness of a simulated injured/ill diver.
2. Demonstrate current sequence of providing care with proper ventilations and compression rates.

Rationale:

At any time an injured or ill diver (or other individual in the area) can collapse and/or become unresponsive. This is a review of skills you should already know. Regular review is essential to be able to respond without hesitation when required.

Conduct Real Time Demonstration.

Talk Through Demonstration Skill Description:

- **Remember S-A-F-E.**
- Assess responsiveness.
- **State your name and training**, and **ask permission to help**.
- If the person is unresponsive:
  - Tap on the collarbone.
  - Shout, **"Are you OK?"**
  - If no response, call for help, and **activate emergency medical services (EMS).**
  - While assessing responsiveness, determine if the diver is breathing normally.
- **If he is not breathing normally, initiate CPR, beginning with 30 compressions.**
- Deploy an AED unit if one is available.
- If the diver is breathing normally and you suspect a diving emergency, initiate emergency oxygen first aid, and put your emergency action plan into motion.

***Set up practice groups, and provide scenario*.**

SCENARIO

You have just finished your first dive of the day. The water was clear, but there was a current. As you turn around to congratulate your buddy on a great dive, you notice a diver near the stern of the boat dropping his gear onto the rack and then slumping to the floor.

Instructor: After conducting a scene safety assessment, what is your next action?
Student: Check responsiveness, and conduct an initial assessment.

Instructor: What special concern should you have checked in your scene safety assessment?
Student: Security of gear

Teaching Tip:
This is not a full CPR training skill. Since CPR certification is a prerequisite for this course, use this time to ensure the students' CPR competency for later skills that require CPR. Refresh and review as needed.

Debrief skill.

Initial Assessment with Basic Life Support Key Points:

1. Remember S-A-F-E.
2. Identify yourself, and ask permission to assist.
3. Ask the injured diver if he is OK.
4. Activate EMS if indicated.
5. Initiate CPR if required.

Skill: Demand Inhalator Valve

Required Equipment:

1. DAN Oxygen Unit or equivalent
2. Oronasal mask
3. Nonlatex medical gloves

Objective:

1. Provide emergency oxygen to a responsive, breathing injured diver using the demand inhalator valve and oronasal mask.

Rationale:

Most injured divers are responsive and able to assist in their care. When it is determined a responsive diver may benefit from oxygen first aid, the demand valve provides the highest concentration of oxygen available and is the most efficient delivery system for this situation.

Conduct Real Time Demonstration.

Talk Through Demonstration Skill Description:

- **Remember S-A-F-E.**
  - Identify yourself, and **ask permission** to assist.
  - **Activate EMS** if indicated.
- Deploy the oxygen unit as completed earlier.
- Place the oronasal mask on the demand valve by gently rocking it into position on the plastic adapter.
- **Take a breath from the mask/demand inhalator valve, and exhale away from it.**
- Inform the injured diver that oxygen may help. **State: "This is oxygen, and it may make you feel better. May I help you?"** (This statement may be offered at any point in the process, but it must be said before placing the mask on the injured diver.)
  - If the diver is unresponsive, permission to help is assumed.
- **Place the mask over the injured diver's mouth and nose, ensuring a snug fit.**
  - Tighten the elastic strap.
  - **Check the mask for any leaks** around the injured diver's face.
  - Instruct the injured diver to hold the mask to help maintain a tight seal.

- **Instruct the injured diver to breathe normally** from the mask.
  - Reassure and comfort the injured diver.
  - **Place injured/ill diver in position appropriate** for his level of consciousness.
- **Monitor the injured diver for changes** in level of consciousness.
  - Listen for the demand inhalator valve to open during inspiration.
  - Watch for the mask to fog during exhalation and clear with inhalation.
  - Watch the chest rise during inhalation and fall with exhalation.
- **Monitor the oxygen pressure gauge**.
  - Be prepared to switch oxygen cylinders if the pressure falls below 200 psi.
- **Activate emergency action plan**.
  - **Call EMS** or other appropriate medical facility.
  - Contact DAN for consultation and coordination of hyperbaric treatment.

Set up practice groups, and provide scenario.

SCENARIO

A group of divers from your local dive shop are working on deep diving skills, including several deep dives in preparation for a planned dive trip. After the last divers exit the water, everyone is enjoying a cookout. You notice one of the divers holding his arm and rubbing his shoulder and elbow.

Instructor: What should you do?
Student: Approach the diver discreetly to inquire how he is doing. Discuss the need for and benefits of emergency oxygen.

Instructor: After a few minutes, the injured diver begins to feel better and wants to remove the oxygen mask. How long should the injured diver continue breathing emergency oxygen? In what position should you place the injured diver? Why? Can the injured diver refuse the rescuer's assistance?
Students: Discuss answers.

Debrief skill.

Demand Inhalator Valve Key Points:

1. Always ask permission before putting an injured/ill diver on oxygen: State: "This is oxygen, and it may make you feel better. May I help you?"
2. Inhale from the mask, then exhale away from it to be sure it is functioning properly.
3. Ensure a snug fit and that there are no leaks around the mask.
4. Ask the injured diver to breathe normally.
5. Place the injured diver in the appropriate position.
6. Monitor the injured diver for changes in condition.
7. Monitor the pressure of the oxygen cylinder to avoid running out of oxygen while the diver is breathing from it. Know when to switch tanks if more oxygen is available.
8. Activate EMS, and call DAN.

Notes:

Skill: Nonrebreather Mask

Required Equipment:

1. DAN Oxygen Unit or equivalent
2. Nonlatex medical gloves
3. Oronasal mask with demand valve
4. Nonrebreather mask

Objective:

1. Provide emergency oxygen to an unresponsive, breathing injured diver using the nonrebreather mask.
2. Discern when options for oxygen delivery are not working adequately, and switch to another as appropriate.

Rationale:

Not every breathing diver can activate the demand valve or will tolerate it on his face. The nonrebreather mask is the second choice for oxygen delivery to an injured diver. Although it does not provide as high a concentration of oxygen, it provides a higher concentration than air alone and facilitates oxygen delivery that might otherwise not be provided to the injured diver. It can also be used when you have two injured divers.

Conduct Real Time Demonstration.

Talk Through Demonstration Skill Description:

- Remember S-A-F-E.
- Ensure airway and breathing.
- Deploy the oxygen unit as completed previously.
- Inform the injured diver that oxygen may help.
  - **State: "This is oxygen, and it may make you feel better. May I help you?"**
- If the diver is unresponsive, permission to help is assumed.
- Remove nonrebreather mask from bag.
  - **Stretch oxygen tubing to avoid kinks.**
  - Attach oxygen tubing to barbed constant-flow outlet on the multifunction regulator.
- **Set the constant-flow control to an initial flow rate of 10 liters per minute (lpm).**
- **Prime the mask reservoir bag.**
  - Place a thumb or finger inside the nosepiece, closing the nonreturn valve until the reservoir bag fully inflates.
- Place the mask over the injured diver's mouth and nose.

- Adjust the elastic band around the head to **ensure a snug fit**.
- Check the mask for any leaks around the injured diver's face.
- Squeeze the metal clip over the nose to improve the seal and minimize oxygen leakage.

- **Instruct the injured diver to breathe normally**.
  - Ensure that the reservoir bag remains inflated. **Adjust flow** as required.
    - If needed, **increase the flow rate incrementally** using the controller until the reservoir bag shows gentle inflation/deflation with the diver's breathing.
    - Flow may be decreased if the reservoir bag remains fully inflated during inhalation.
    - Look for the reservoir bag to slightly inflate and deflate and for movement of the nonreturn valves.
  - Reassure and comfort the injured diver.
  - Place the injured diver in the appropriate position.
- **Monitor the injured diver and the oxygen pressure gauge**.
  - Observe the mask fogging during exhalation and clearing with inhalation.
- **Activate the emergency action plan**, and **call EMS**.

Delivery Device	Flow Rate	Inspired Fraction+
Oronasal mask (no reservoir bag)	10 lpm	≤ 0.5–0.6 (50%–60%)*
Nonrebreather mask	10-15 lpm	≤ 0.8 (80%)**
Bag valve mask	15 lpm	≤ 0.9–0.95 (90%–95%)
Demand valve	N/A	≤ 0.9–0.95 (90%–95%)

*May vary with respiratory rate

**Less variation with changes in respiratory rate

+ Delivery fractions vary with the equipment and techniques used. This table summarizes various oxygen-delivery systems and potential values of inspired oxygen with their use.

Set up practice groups, and provide scenario.

SCENARIO

Just after surfacing, a diver in the water suddenly loses consciousness. After getting the diver on board the dive boat, you notice he is still breathing.

Instructor: What should you do?
Student: Provide emergency oxygen using the demand valve.

After 30 seconds, you realize the diver isn't breathing deeply enough.

Instructor: What is your next course of action?
Student: Switch to the nonrebreather mask starting at 10 lpm flow, increase if needed. Secure the nose clip, and check for leaks.

After a few minutes, the injured diver begins breathing deeply, deflating the reservoir bag of the mask.

Instructor: What should you do?
Student: Increase the flow rate on the regulator, and continue monitoring the injured diver.

Instructor: What other options do you have if the reservoir bag continues to deflate at a higher flow rate?
Student: Increase flow to a maximum of 25 lpm, or switch to the demand valve.

Debrief skill.

Nonrebreather Mask Key Points:

1. Ask permission from the injured diver to administer oxygen.
2. Stretch tubing to remove kinks before attaching to oxygen regulator.
3. Set constant-flow control with an initial flow rate of 10 lpm for the nonrebreather mask.
4. Prime mask reservoir bag before securing it to the injured/ill diver's face, ensuring a snug fit.
5. Instruct the injured diver to breathe normally.
   - Increase flow as needed.
6. Monitor the following:
   - injured diver for changes
   - adequate inflation of the reservoir bag is maintained
   - cylinder pressure
7. Activate EMS.

Skill: Resuscitation with a Bag Valve Mask (BVM)

Required Equipment:

1. DAN Oxygen Unit or equivalent
2. CPR manikin
3. Nonlatex medical gloves
4. Bag valve mask (BVM)

Objective:

1. Provide emergency oxygen to a nonbreathing or inadequately breathing injured diver using the bag valve mask.

Rationale:

The BVM provides a high concentration of oxygen when resuscitating a nonbreathing diver. It is also less fatiguing than mouth-to-mask resuscitation efforts.

Conduct Real Time Demonstration.

Talk Through Demonstration Skill Description:

- Remember S-A-F-E.
- **Two rescuers are required** for this skill.
  - The first rescuer **begins single-rescuer CPR as soon as possible.**
  - The second rescuer is to do the following:
    - **Prepare the oxygen equipment,** and connect BVM tubing to the constant-flow barb on the oxygen regulator.
    - Turn on **constant flow to initial setting of 15 lpm**, and allow the reservoir bag to inflate.
    - Seal the mask in place using head-tilt, chin-lift method, pulling the diver's jaw up and into the mask.
    - **Maintain the airway.**
    - **Monitor the oxygen supply.**
  - The first rescuer is to do the following:
    - **Compress the ventilation bulb about one-third of the bag volume** to ventilate the injured diver.
      - Bag compressions should be slow and gentle, lasting about one second for the ventilation phase.
      - Allow the chest to fall completely before beginning each new ventilation. Deliver two ventilations.

    - **Watch the stomach for signs of expansion** to prevent regurgitation.
  - Continues to deliver chest compressions between ventilations.
- **Call EMS and DAN.**

Set up practice groups, and provide scenario.

SCENARIO

You hear somebody shouting for help. When you get to this person, you see that a diver is lying on the ground. After performing S-A-F-E, you determine the injured diver is not breathing.

Instructor: What is your next step?

Students: Begin CPR, and provide oxygen with the BVM by compressing the bag.

Instructor: After three minutes of resuscitation, you notice that the injured diver's stomach is distended. The injured diver begins vomiting.

Student: Clear, re-establish and maintain the airway, and provide ventilations using the BVM.

Instructor: A minute later the diver begins to cough and resumes breathing.

Student: Provide oxygen via a demand valve

Debrief skill.

Resuscitation with a Bag Valve Mask Key Points:

1. The BVM requires two rescuers.
2. Rescuer One performs chest compressions and compresses the ventilation bulb of the BVM during ventilations.
3. Rescuer Two sets up and monitors the oxygen equipment and maintains the airway and the seal of the resuscitation mask.
4. Use about one-third of the ventilation bulb's volume to ventilate the injured diver.
   - Watch the stomach for signs of distension and to prevent regurgitation.
5. Monitor the oxygen supply.
6. Activate EMS.

Skill: Using a Manually Triggered Ventilator (MTV)

Required Equipment:

1. DAN Oxygen Unit (or equivalent)
2. CPR manikin
3. Nonlatex medical gloves
4. Manually triggered ventilator
5. Oronasal mask

Objective:

1. Provide emergency oxygen to a nonbreathing or inadequately breathing injured diver using an MTV and oronasal mask.

Rationale:

A manually triggered ventilator valve can provide almost 100 percent oxygen (provided that a perfect seal is obtained with the mask). It is also less fatiguing than mouth-to-mask resuscitation efforts.

Conduct Real Time Demonstration.

Talk Through Demonstration Skill Description:

- Remember S-A-F-E.
- **Two rescuers are required** for this skill.
    - The first rescuer **begins single-rescuer CPR as soon as possible.**
    - The second rescuer is to do the following:
        - **Prepare the oxygen equipment.**
        - **Test the MTV** by depressing the ventilation button, then **cover the oxygen outlet** with the palm of his hand to verify that the safety mechanism is functioning.
            - **If the oxygen flow does not shut off, do not use** the MTV.
        - Connect the oronasal mask to the MTV adapter.
        - Position the mask over the nonbreathing diver's mouth and nose, sealing the mask in place by using the head-tilt, chin-lift method, pulling the diver's jaw up and into the mask.
        - **Maintain the airway, and seal** the mask in place.
        - **Monitor the oxygen supply**, and be prepared to resume rescue breathing if the supply is exhausted.

- The first rescuer should do the following:
  - **Press the button on the MTV** to ventilate the injured diver.
    - **Ventilations should only** last about **one second.**
  - Allow the chest to fall completely before beginning the second ventilation. Deliver two ventilations.
    - Leaving one hand gently on the center of the chest can help to assess if ventilations are adequate and not excessive.
  - **Watch the stomach** for signs of distension to prevent regurgitation.
  - Deliver chest compressions between ventilations.
- Activate your emergency action plan.
- **Call EMS and DAN.**

Set up practice groups, and provide scenario.

SCENARIO

You just finished your dive when you notice a diver towing her buddy to the boat. As you perform S-A-F-E, you grab your rescue equipment and assist the divers. The injured diver is not breathing, and his face appears bluish.

Instructor: What is your next step?
Students: Provide care by performing CPR with oxygen using the MTV.

Instructor: After three minutes of resuscitation, you notice that the injured diver's stomach is distended. He begins vomiting.
Students: Clear, re-establish and maintain the airway, and provide ventilations using the MTV.

Instructor: A minute later the diver begins to cough and resumes breathing.
Students: Continue to provide emergency oxygen using the MTV valve but without pushing the button. You don't need to change masks.

Debrief skill.

Using a Manually Triggered Ventilator Key Points:

1. The MTV requires two rescuers.
2. Rescuer One performs chest compressions and presses the button of the MTV to ventilate the injured diver
3. Rescuer Two sets up and monitors the oxygen equipment and tests the MTV for function before using.
    - **REMINDER:** if the valve does not shut off when tested, do not use it.
4. Rescuer Two maintains the airway and the seal of the resuscitation mask.
5. Ventilations should only last one second.
    - Watch the stomach for signs of distension and to prevent regurgitation.
6. Monitor the oxygen supply.
7. Activate EMS.

Notes:

Skill: Emergency Assistance Plan

Required Equipment:

1. Emergency Oxygen for Scuba Diving Injuries Student Handbook
2. The Emergency Action Plan and Injury Report Summary slates are recommended as a resource for emergency planning.

Objectives:

1. List the components of an emergency assistance plan.
2. Develop an emergency assistance plan for the local diving area.

Rationale:

Although diving incidents are rare, being prepared can facilitate prompt action by knowing whom to call and at what number. A good emergency plan also provides a format for collecting the necessary information.

Talk Through Demonstration Skill Description:

- Key elements of an emergency assistance plan include the following:
  - identifying local resources and emergency phone numbers (including the DAN Emergency Hotline number: +1-919-684-9111
  - identifying communications equipment and how it is used (e.g., marine or CB radios)
  - directions to the dive site location if it will be required to assist emergency services
  - a method to record information about the injured person, his dive profile and the first aid rendered
- Place the emergency assistance plan in a place easily accessible by anyone during the dive outing.

Set up practice groups, and provide scenario.

SCENARIO

There's a seriously injured diver at your local dive site. What and where is your emergency assistance plan? What do you do? Whom do you call? Why? Does the type of injury determine whom you call and when you call? What role do you have in the management of a scuba diving emergency?

Instructor: Talk students through completing an emergency assistance plan for a local dive site. Encourage all course participants to continue their dive education, particularly first aid and diving accident management skills.

Students: Complete an emergency assistance plan for a favorite dive site or for an upcoming dive trip.

Emergency Assistance Plan

Diver information

Name:_____ Age: _____

DAN Member #_____

Address: _____

_____

Emergency contact phone: _____

Current complaint: _____

_____

Significant past medical history (medications, allergies, previous injuries, etc.):

_____

Dive Profile Depth Time Safety Stops/Deco Surface Interval

Dive #1 _____

Dive #2 _____

Dive #3 _____

Dive #4 _____

Dive #5 _____

Exit water time: _____AM/PM Breathing gas: air/nitrox/mix _____%

Emergency assistance plan

Initial contact information: _____

Emergency medical assistance: _____

Nearest medical facility directions: _____

_____

Phone: _____

Diving medical consultation information:

Divers Alert Network (DAN): +1-919-684-9111*

** This number may be called collect in an emergency.*

Other important information: _____

Phone: _____

Notes:

Optional Skill: Assisting Two Injured Divers

Required Equipment:

1. DAN Oxygen Unit or equivalent
2. Nonlatex medical gloves
3. Oronasal mask with oxygen inlet
4. Nonrebreather mask
5. BVM (optional)

Objective:

1. Provide oxygen simultaneously to two injured divers.
    - Establish the airway, and provide ventilations for a nonbreathing injured diver using an oronasal resuscitation mask or BVM with supplemental oxygen.
    - Provide oxygen for a breathing injured diver using the nonrebreather mask.
    - Provide oxygen for a breathing injured diver using the demand inhalator valve with oronasal mask.

Rationale*:*

Since divers typically dive in buddy teams, there are situations in which an Emergency Oxygen provider will need to provide oxygen to two injured divers simultaneously.

Talk Through Demonstration Skill Description:

- Remember S-A-F-E.
- Activate EMS if indicated.
- Ensure the airway and breathing for both divers.
- Deploy the oxygen unit as completed previously.
- Utilize skills developed in previous exercises to provide care simultaneously to two injured divers.
- Remember to activate the emergency assistance plan and to monitor the oxygen supply.

Set up practice groups, and provide scenario.

SCENARIO

As a divemaster, you are leading a group of eight divers on a wreck dive in 90 feet (30 meters) of water. You turn around to check on the group, and you see one of the divers rapidly take off for the surface. The diver's buddy tries to slow him down by holding onto the diver. You signal the group to ascend, and you go to assist the distressed buddy team. When you and the buddy team get to the surface, the panicked diver is not breathing, and the second diver is out of breath. You and the captain get the dive team out of the water.

Instructor: What is the immediate course of action?
Students: Begin CPR with supplemental oxygen for the unresponsive diver.

SCENARIO

After two minutes of CPR, the injured diver begins vomiting.

Instructor: What action should you take as the rescuer?
Students: Clear, re-establish and maintain the airway.

The diver begins to spontaneously breathe without assistance.

Instructor: What adjustment to care can be made at this point?
Students: Provide oxygen via a demand valve and oronasal mask.

SCENARIO

Thirty minutes after the dive, as the boat is headed back to shore to meet with EMS, the second diver in the buddy team begins to complain of numbness in the lower extremities.

Instructor: What care should be provided to the dive buddy?
Students: Provide oxygen via the nonrebreather mask. Monitor both injured divers, and ensure the reservoir bag stays inflated.

Instructor: What are the priorities for providing oxygen to two injured divers?
Students: Provide the highest concentration of oxygen to the diver with the worst condition. If both divers have similar signs and symptoms, simply do your best, and provide oxygen to both divers.

Emergency Oxygen for Scuba Diving Injuries Final Assessment

The following questions have only one correct answer.

1. The atmosphere is comprised of what percentages of oxygen, nitrogen and inert gases?

   a. 21% O_2, 78% N_2, 1% inert gases
   b. 15% O_2, 65% N_2, 20% inert gases
   c. 25% O_2, 74% N_2, 1% inert gases
   d. 33% O_2, 33% N_2, 34% inert gases

2. The primary cause for decompression sickness (DCS) is

   a. dehydration and cold water
   b. heavy exertion before diving
   c. heavy exertion after diving
   d. inert gas bubbles in the body

3. Gas exchange takes place at the

   a. trachea and intrapulmonary bronchi
   b. long bone joints
   c. alveolar-capillary membrane
   d. muscle-nerve junctions

4. Symptoms of decompression illness (DCI) may include

   a. dizziness/vertigo
   b. motor weakness
   c. pain, numbness or tingling
   d. all of the above

5. A diver with suspected DCI may benefit from breathing 100 percent inspired oxygen before medical treatment because

   a. symptoms may be relieved and results of recompression treatment may be enhanced
   b. it may make recompression treatment unnecessary
   c. oxygen stimulates breathing
   d. all of the above

6. When faced with a fellow diver who presents with symptoms that might be related to DCI, the correct course of action may include

   a. placing the diver on oxygen
   b. alerting local emergency medical services first and calling DAN
   c. getting the diver to a medical facility
   d. all of the above

7. The delivery system that provides the highest possible concentration of inspired oxygen to a breathing injured diver is the
   a. nasal cannula
   b. oronasal resuscitation mask with supplemental oxygen
   c. nonrebreather mask
   d. demand inhalator valve and mask

8. Before providing oxygen to an injured diver using a nonrebreather mask, the mask must be
   a. cleaned with a 10 percent bleach solution to prevent contamination
   b. primed by inflating the reservoir bag
   c. attached to the primary threaded DISS outlet by the clear oxygen tubing
   d. none of the above

9. When choosing an oxygen cylinder for use in a diving emergency, what should you consider?
   a. type of oxygen delivery device or mask
   b. cylinder capacity
   c. time and distance to the next level of emergency response
   d. all of the above

10. A breathing injured diver who is in danger of vomiting should be placed
   a. in the supine position (on his or her back)
   b. in someone else's boat
   c. in the recovery position (on his or her side with head supported)
   d. in a litter and made ready for helicopter evacuation

11. While the immediate first aid for AGE and DCS is emergency oxygen, symptoms of these conditions often occur at which different times following decompression?
   a. DCS symptoms typically occur within 6 hours.
   b. AGE symptoms occur within 15 minutes.
   c. AGE symptoms may be delayed up to 24 hours.
   d. both a and b

12. The dive boat is three hours from shore, and your emergency oxygen unit has a single full oxygen cylinder that will last only one hour. When providing oxygen first aid to a breathing injured diver with suspected DCI, you should use the
    a. demand inhalator valve continuously for as long as the oxygen supply lasts
    b. nonrebreather mask at a reduced flow rate so that the oxygen will last
    c. oronasal resuscitation mask at a minimum continuous flow rate of 10 lpm
    d. demand inhalator valve only until the injured diver feels better
13. In an emergency, it is not necessary to distinguish between DCS and AGE.
    a. True
    b. False
14. The primary reason to provide the highest concentration of oxygen possible is to speed inert gas washout/removal and to slow symptom progression.
    a. True
    b. False
15. Effective oxygen administration may result in symptom resolution. In such cases divers should still receive medical evaluation and potentially hyperbaric oxygen therapy.
    a. True
    b. False
16. The initial oxygen flow rate for the nonrebreather mask is
    a. 2-4 lpm
    b. 10-15 lpm
    c. 20-25 lpm
    d. the rate the injured diver will tolerate
17. As a first responder to a nonfatal drowning, your primary role is to
    a. monitor vital signs
    b. provide supplemental oxygen
    c. facilitate transport to the nearest medical facility
    d. all of the above
18. Oxygen should be provided only to injured divers in or around
    a. confined areas without ventilation
    b. petroleum products
    c. open, well-ventilated areas
    d. burning materials or other ignition sources

19. The pin indexing system is one method used to
    a. prevent the use of nonoxygen-compatible regulators with oxygen cylinders
    b. prevent oxygen from flowing from an open threaded DISS outlet
    c. hold oxygen-compatible washers in place
    d. hold one-way valves on the nonrebreather mask

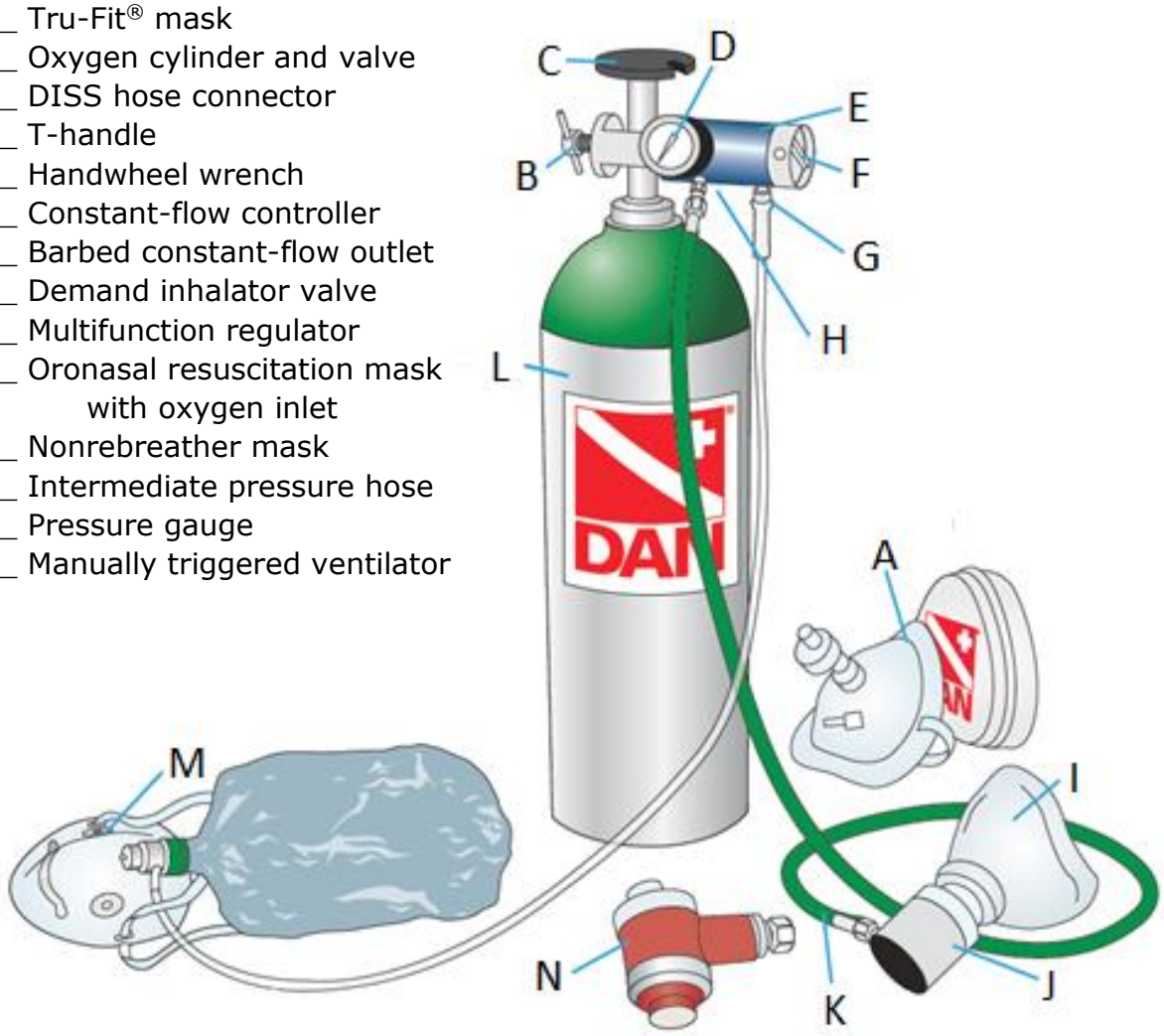
20. A BVM can also be used to ventilate an inadequately breathing diver.
    a. True
    b. False

21. Before using an MTV, its function should be checked by
    a. connecting the hose to a barbed outlet
    b. setting the constant flow to 10 lpm
    c. testing the safety shut off against the palm of your hand
    d. priming the unit with several breaths

22. If symptoms of possible DCI occur following a dive, DAN advises that in addition to emergency oxygen to
    a. go to the nearest emergency facility for evaluation
    b. refrain from proceeding directly to the closest known chamber, which may not be open, available or have staff on duty
    c. contact DAN early so we may assist you and medical personnel who may not be familiar with diving medicine
    d. all of the above

On your answer sheet, identify the component parts of the DAN Oxygen Unit:

23._____ Tru-Fit® mask
24._____ Oxygen cylinder and valve
25._____ DISS hose connector
26._____ T-handle
27._____ Handwheel wrench
28._____ Constant-flow controller
29._____ Barbed constant-flow outlet
30._____ Demand inhalator valve
31._____ Multifunction regulator
32._____ Oronasal resuscitation mask with oxygen inlet
33._____ Nonrebreather mask
34._____ Intermediate pressure hose
35._____ Pressure gauge
36._____ Manually triggered ventilator

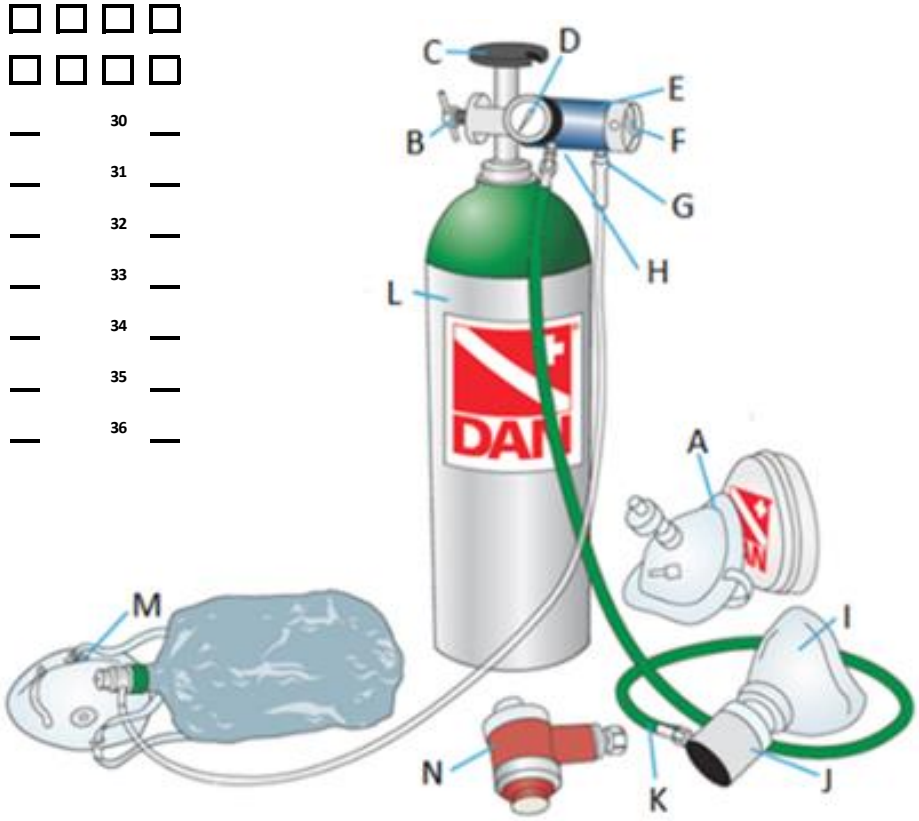


Emergency Oxygen for Scuba Diving Injuries Answer Sheet

The final assessment may be administered in written or oral form. The instructor must review every question with each student to ensure 100 percent comprehension of the materials. Questions have only one correct answer.

	A	B	C	D
1	☐	☐	☐	☐
2	☐	☐	☐	☐
3	☐	☐	☐	☐
4	☐	☐	☐	☐
5	☐	☐	☐	☐
6	☐	☐	☐	☐
7	☐	☐	☐	☐
8	☐	☐	☐	☐
9	☐	☐	☐	☐
10	☐	☐	☐	☐
11	☐	☐	☐	☐
12	☐	☐	☐	☐
13	T	☐	F	☐
14	T	☐	F	☐
15	T	☐	F	☐
16	☐	☐	☐	☐
17	☐	☐	☐	☐
18	☐	☐	☐	☐
19	☐	☐	☐	☐
20	T	☐	F	☐

	A	B	C	D
21	☐	☐	☐	☐
22	☐	☐	☐	☐
23	___		30	___
24	___		31	___
25	___		32	___
26	___		33	___
27	___		34	___
28	___		35	___
29	___		36	___



I have reviewed this assessment with the course instructor, and I understand the correct responses as indicated by my initials.
Any questions regarding this assessment and the contents of this course have been answered to my satisfaction.

_____ _____

Student Signature Date

Practical Evaluation Record

Emergency Oxygen for Scuba Diving Injuries

(The instructor will retain the answer sheet and Practical Evaluation Record for seven years.)

Student Name _____

Provider Skills Development	Instructor Initials	Student Initials
• Equipment Identification, Disassembly and Assembly	_____	_____
• Scene Safety Assessment	_____	_____
• Initial Assessment with Basic Life Support	_____	_____
• Demand Inhalator Valve	_____	_____
• Nonrebreather Mask	_____	_____
• Resuscitation with a Bag Valve Mask (BVM)	_____	_____
• Using a Manually Triggered Ventilator (MTV)	_____	_____
• Emergency Assistance Plan	_____	_____

I am comfortable with my skills performance as an Emergency Oxygen for Scuba Diving Injuries provider.

_____ _____

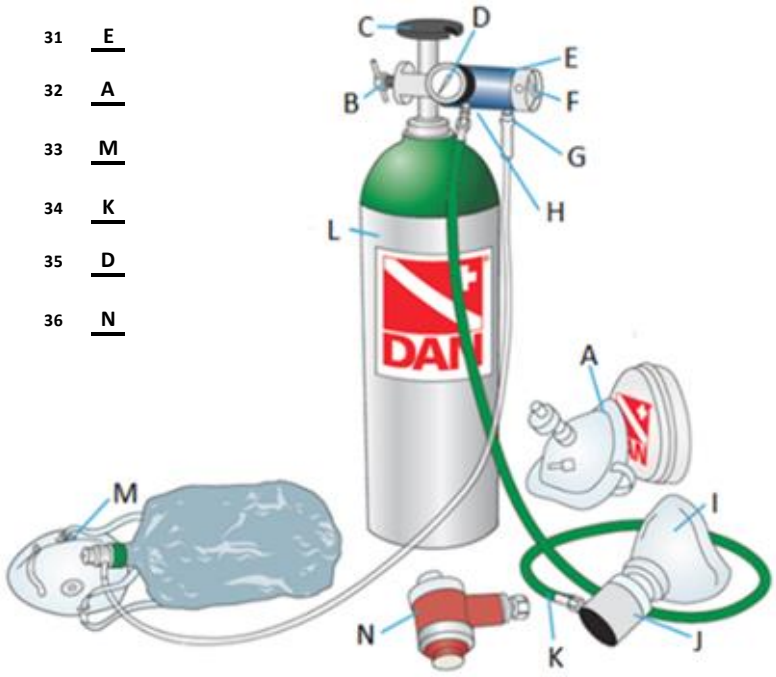
Student Signature Date

Emergency Oxygen for Scuba Diving Injuries Answer Key

The final assessment may be administered in written or oral form. The instructor must review every question with each student to ensure 100 percent comprehension of the materials. Questions have only one correct answer.

	A	B	C	D
1	■			
2				■
3			■	
4				■
5	■			
6				■
7				■
8		■		
9				■
10			■	
11				■
12	■			
13	T	■	F	
14	T	■	F	
15	T	■	F	
16		■		
17				■
18			■	
19	■			
20	T	■	F	

	A	B	C	D
21			■	
22				■
23	I			
24	L			
25	H			
26	B			
27	C			
28	F			
29	G			
30				J
31				E
32				A
33				M
34				K
35				D
36				N



I have reviewed this assessment with the course instructor, and I understand the correct responses as indicated by my initials.
Any questions regarding this assessment and the contents of this course have been answered to my satisfaction.

_____ _____

Student Signature Date

Quick Reference Chart

1. Student completion of *Emergency Oxygen for Scuba Diving Injuries* online module before attending class

2. Introductions and Registration (if not completed previously)
   a. Course registration forms
   b. Statement of Understanding

3. Review Question Discussion

4. Skills Development Session
   a. Equipment Identification, Disassembly and Assembly
   b. Scene Safety Assessment
   c. Initial Assessment with Basic Life Support
   d. Demand Inhalator Valve
   e. Nonrebreather Mask
   f. Resuscitation with a Bag Valve Mask
   g. Using a Manually Triggered Ventilator
   h. Emergency Assistance Plan
   i. Assisting Two Injured Divers (optional skill)

5. Final Assessment and Review

6. Approve successful course participants via the eLearning platform under *My Students.*

7. Remind students to download their completion card through their eLearning account when they receive their email notification and to complete the online feedback survey (link included in email).

8. Provide additional time for knowledge and skill remediation for individuals who require additional practice.