



# Appendix

# Appendix

About The Open Water Scuba Diver Course .....	284
About This Instructor Guide .....	284
Using the OWSDI Cue Cards and the SDI Student Skills Checklist Slate .....	285
Additional Training Activities .....	285
<b>Appendix A:</b>	
<b>Open Water Scuba Diver</b>	
<b>Academic Presentation Outlines.....</b>	<b>287</b>
Welcome and Course Orientation.....	288
Open Water Scuba Diver Academic Presentation Quick Reference Outline .....	290
Open Water Scuba Diver Complete Academic Outlines:	
Chapter 1: The Underwater Environment .....	297
Chapter 2: Physics and Physiology .....	303
Chapter 3: Scuba Equipment .....	311
Chapter 4: Skills Development .....	323
Chapter 5: Planning Your Dive.....	335
Pool/Confined Water.....	341
Open Water.....	367
Open Water Certification .....	379
SDI – Open Water Referral Procedures .....	380

**Appendix B:**

**Open Water Scuba Diver**

**Knowledge Quest Answers ..... 383**

Chapter 1: The Underwater Environment ..... 384

Chapter 2: Physics and Physiology ..... 388

Chapter 3: Scuba Equipment ..... 393

Chapter 4: Skills Development ..... 398

Chapter 5: Planning Your Dive ..... 403

**Appendix C:**

**SDI/TDI Gas Laws Equations Worksheet ..... 407**

## About The Open Water Scuba Diver Course

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The Scuba Diving International Open Water Scuba Diver Course provides the appropriate training for the entry-level recreational diver.

The SDI Open Water Scuba Diver course is the beginning of a new adventure and gives participants the ability to explore the underwater world. It is here that an individual learns about the equipment needed to dive, how the underwater world affects the human body, how to perform basic scuba skills as well as self aid and basic buddy aid skills. Completion of this program is not intended to be the end of training for scuba divers but a starting point. During this program the student will come to appreciate the value and benefit of diving with quality equipment and continuing their scuba training by taking specialty training.

## About This Instructor Guide

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The material within this instructor guide addresses the required academic pool / confined and open water material for the SDI Open Water Scuba Diver program. It follows the flow of information as it is presented in the student manual; however, for easy reference, the material is presented here in an outline format precisely matching that information as it is detailed in the PowerPoint® presentations.

This instructor guide is also built on the pretence that the open water scuba diver student has completed all the required pre-course work and is ready to begin their training.

Naturally, this information may be supplemented by the instructor based upon past experience combined with local customs and the local diving environment.

## Using the OWSDI Cue Cards and the SDI Student Skills Checklist Slate

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SDI Open Water Scuba Diver Instructors should use the confined and open water five (5) slate series, referred to in this manual as 'Instructor Cue Cards,' as references for the skills to be taught or reviewed in each water session.

This instructor guide indicates which cue card the instructor should use at the beginning of each water session outline.

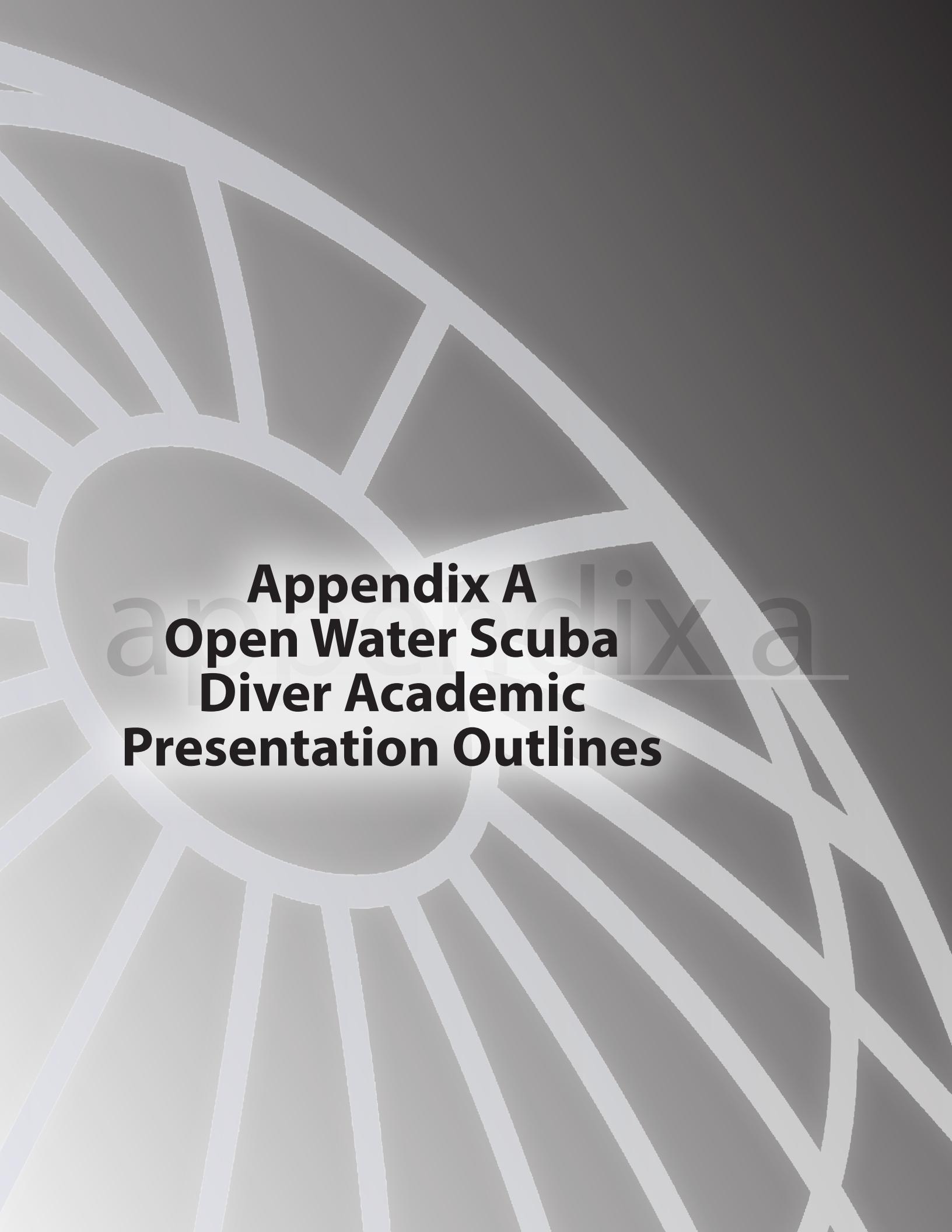
An additional slate that can be used is the SDI Student Skills Checklist Slate. This slate is an excellent tool for courses that have multiple instructors. It can also be used by assistants to keep track of which students have completed which skills, so that the instructor can focus on the demonstration and final evaluation of the skill itself.

## Additional Training Activities

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In addition to the academic material addressed in the student manual and this instructor guide, the SDI Open Water Scuba Diver Course includes required training activities in pool / confined water and open water. Accordingly, the reader is directed to the current SDI Standards for additional information regarding the requirements for the SDI Open Water Scuba Diver certification.





# **Appendix A**

## **Open Water Scuba**

### **Diver Academic**

#### **Presentation Outlines**

# Welcome and Course Orientation

---

## Paperwork

### Student Training Record

- Personal Information
- Liability Release
- Medical Statement

## Let's Get to Know Each Other

### Professional Staff

### Participants

- Your name?
- Do you have any diving experience?
- Why are you interested in becoming a diver?
- Have you thought about which diving activities may interest you?

## About International Training

**SDI:** Scuba Diving International®

**TDI:** Technical Diving International®

**ERDI:** Emergency Response Diving International®

## About This Program

### Course Objective

- Develop the appropriate knowledge and skills that every SDI Open Water Scuba Diver must master so that they may dive in the open water without supervision.

## **Subject Areas**

- The Underwater Environment
- Physics and Physiology
- Scuba Equipment
- Skills Development
- Planning Your Dive

## **Structure and Schedule**

- Independent Study
- Classroom Presentations
- Confined Water Training
- Open Water Training

## **Required Equipment**

- Items you'll need for this course

*Note to Instructor: Prepare a complete list for discussion, including those items specified by SDI standards, as well as any other items locally required.*

## **Any Questions?**

# **Open Water Scuba Diver Academic Presentation Quick Reference Outline**

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The following outlines are a quick reference of the topics that should be covered in each academic session. For a more detailed version please refer to the complete Presentation Outlines following this section.

Depending on the time allotment, the chapters can be combined into single session presentations. While the chapters in this outline have been combined into three presentations, they are only suggested combinations and can be adjusted based on the needs of the instructor or the specific course structure.

The estimated time for each presentation is approximately 4 hours. This time is generalized and will vary based on the size of the class and the amount of student interaction.

# Presentation One

.....

## Chapter 1: The Underwater Environment

- History
- Scuba Diving International
- Adapting to the Underwater world
  - Vision
  - Light
  - Sound
  - Heat Loss
- Oceanography
  - Tides
  - Current
  - Waves
  - Surge
  - Marine Life
  - Marine Life Injuries

## Chapter 2: Physics and Physiology

- Physics and Physiology Overview
- Buoyancy
  - Positive Buoyancy
  - Neutral Buoyancy
  - Negative Buoyancy
- Pressure
  - Boyle's Law and Increasing Pressure
  - Available Cylinder Time
- Physiology
  - Air Spaces
  - Squeeze
  - Equalization Techniques
  - Mask Squeeze
  - Tooth Squeeze
  - Reverse Block
- Boyle's Law and Decreasing Pressure
  - Lung Over-expansion Injuries
- Breathing Air Under Pressure
  - Density
  - Nitrogen
  - Decompression Sickness
    - Signs and Symptoms of Decompression Sickness
    - Decompression Illness
  - Nitrogen Narcosis
  - Oxygen Toxicity
  - Carbon Monoxide Poisoning
  - Mixed Gases

# Presentation Two

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## Chapter 3: Scuba Equipment

- Personal (Snorkeling) Equipment
  - Mask
  - Snorkel
  - Fins
- Exposure Protection
  - Body Suit (Skin)
  - Wet Suit
  - Dry Suit
  - Boots and Gloves
  - Hoods
- Scuba Equipment
  - Buoyancy Compensator Device (BCD)
  - Regulator
    - First Stage
    - Second Stage
- Alternate Air Source
- Cylinder
  - Cylinder Valves
- Weight System
- Underwater Instruments
  - Submersible Pressure Gauge (SPG)
  - Dive Computers
- Other Instruments
  - Dive Watch
  - Depth Gauge
  - Compass
- Accessories
  - Rescue Signal
  - Knife
  - Equipment Bag
  - Dive Flag
  - Slate

## Presentation Two (Cont.)

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### Chapter 4: Skills Development

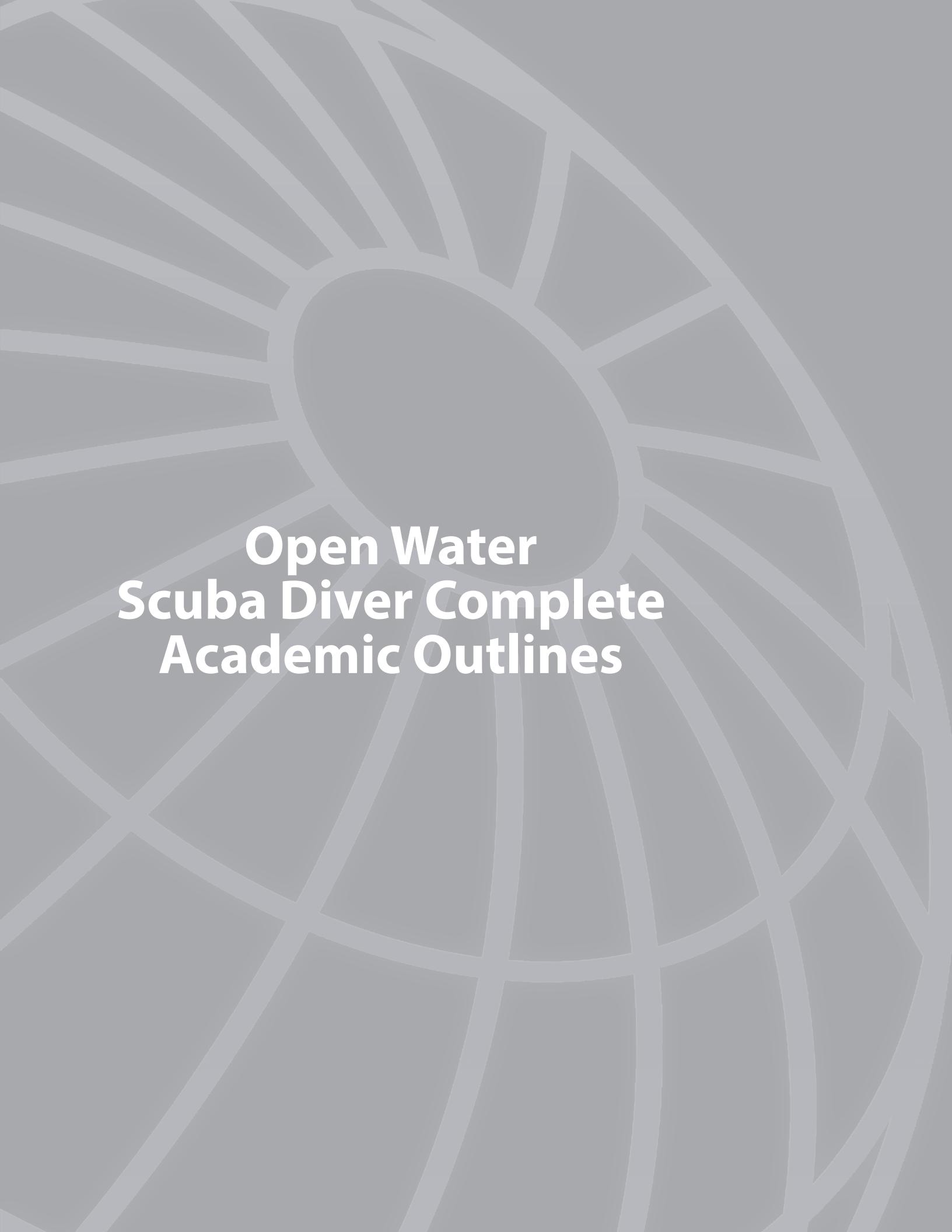
- Setting Up
- Scuba Assembly
  - Cylinder Check
  - BCD Attachment
  - Regulator Attachment
  - BCD Inflator Hose Attachment
  - Regulator Test
  - Streamline Hoses
- Putting On the Scuba Unit
  - Exposure Protection
  - Weight Belts
  - Donning the Scuba Unit
- Pre-dive Briefing
  - Review the ABCs
- Entries
  - Giant Stride
  - Controlled Seated
  - Back Roll
  - Shore Entry
  - Surf Entry
- In-water Skills
  - BCD Inflation and Deflation
  - Weight (Buoyancy Check)
  - Descents
  - Regulator Clearing
  - Regulator Recovery
  - Hovering
  - Free Flow Breathing
  - Mask Flood and Clear
  - Mask Removal and Replacement
  - Swimming Techniques
  - Cramp Relief
  - BCD Removal Underwater
  - Compass Navigation (Definitions)
  - Snorkel Clearing
  - Underwater Communications
  - Ascents and Out-of-Air Emergencies
    - Normal Ascent
    - Alternate Air Source Ascent
    - Controlled Swimming Ascent
    - Buoyant Ascent
  - Scuba Disassembly

# Presentation Three

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## Chapter 5: Planning Your Dive

- Awareness
- Diver Fitness
- Buddy System
- Dive Planning
  - Repetitive Dives
  - Safety Stop
  - Emergency or Omitted Decompression
  - Computer Failure
- In-Water Emergencies
  - Overexertion
  - Problems at the Surface
  - Tired Diver Tow
  - Entanglement
  - Missing Diver
- Rescue Diver Program
- First Aid for Open Water Divers
  - Seasickness
  - Decompression Illness
  - CPROX/ CPROX1st/ CPROX1stAED
- Additional
  - Academic Course Wrap-up
  - Equipment Fitting
  - Paperwork



# **Open Water Scuba Diver Complete Academic Outlines**



# **Presentation Outline**

## **Chapter 1: The Underwater Environment**

### **History**

Scuba Diving International

### **The Aquatic Environment**

#### **Adapting to the Underwater World**

Vision

Light

Sound

Heat Loss

#### **Oceanography**

Tides

Currents

Waves

Surge

#### **Marine Life**

#### **Marine Life Injuries**

# History

---

Early reported diving attempts

## Key Points

- Cousteau and Gagnon invent demand regulator in 1943.
- Navy Tables published in 1957.
- First dive computers available in 1959.
- “Tech” diving gains acceptance in the diving community.

## Scuba Diving International

- First Agency to require the use of personal dive computers for the entry-level (Open Water Scuba Diver) program
- Recognizes need for updated diver training methods

# Adapting to the Underwater world

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Omni-directional

Weightlessness

## Vision

## Key Points

- Refraction also causes objects to appear larger and closer underwater than on land
- In order for the eye to focus there must be an airspace, the mask
- Visibility is expressed in horizontal distance and is reduced in water depending on available light, water turbidity and distance.

## **Light**

### **Key Points**

- Light colors are absorbed red, green, and blue (R.O.Y.G.B.I.V) as they go deeper.
- Artificial light (using a flashlight) can let us see natural color underwater.
- Turbidity decreases visibility.

## **Sound**

### **Key Points**

- Water is approximately 800 times denser
- Sound moves four (4) times faster in water.
- Divers can't determine which direction a sound comes from.

## **Heat Loss**

### **Key Points**

- Water absorbs heat from our bodies twenty-five (25) times faster than air does.
- Divers should not dive when cold.
- Thermoclines can be unexpected and dramatic.
- Be prepared with the right exposure protection for all the conditions that might reasonably be expected on a given dive.

## **Oceanography**

### **Key Points**

- Seventy Five percent (75%) of earth's surface is water.
- Understanding water forces, such as current, can turn them into useful tools (e.g. drift diving).
- Use good common sense in dealing with the forces of water in motion.

## Tides

### Key Points

- Caused by gravitational pull of the moon
- Slack time between low and high tide is the best time to dive near shorelines.
- Plan dives around the tides.
- Check local tide tables prior to diving

## Current

### Key Points

- Global currents are fixed while local currents fluctuate.
- Long shore currents run parallel to shore
- Rip currents are water funneled through a narrow area back to sea
- Don't fight currents; swim parallel to exit.

## Waves

### Key Points

- Waves caused by wind primarily
- Wave height measured from crest to trough.
- Wave length is measured from one wave crest to the crest of the next wave
- Waves can be dangerous to divers when shore diving or trying to enter or exit from a boat.

## Surge

### Key Points

- Surge is a back and forth motion underwater that can injure you against an object.
- Move away from objects that may cause problems in surge and get into deeper water
- Try to use surge to your advantage when swimming.

## **Marine Life**

### **Key Points**

- Most marine injuries come from a marine animal's defensive response
- The marine world is extremely fragile – look but don't touch.
- Avoid touching anything underwater

## **Marine Life Injuries**

### **Key Points**

- Most injuries are temporary but painful stings or abrasions.
- Jelly fish or Portuguese Man-O-War stings.
- Scorpion fish and urchin stings.
- First aid for simple injuries includes meat tenderizer, hot water or vinegar.
- Divers are subject to the laws of the locality where they are diving, spear-fishing or performing any other activity whether they know those laws or not.

## Summary

- History
- Scuba Diving International
- The Aquatic Environment
- Adapting to the Underwater World
  - Vision
  - Light
  - Sound
  - Heat Loss
- Oceanography
  - Tides
  - Currents
  - Waves
  - Surge
- Marine Life
  - Marine Life Injuries

**Complete Student Training Record for Chapter One (1)**

**Any Questions?**

# **Presentation Outline**

## **Chapter 2: Physics and Physiology**

### **Physics**

#### **Buoyancy**

- Positive
- Neutral
- Negative

#### **Pressure**

- Boyle's Law

### **Physiology**

#### **Air Spaces**

- Equalization Techniques
- Boyle's Law and Decreasing Pressure
- Lung Over-Expansion Injuries

#### **Breathing Air Under Pressure**

- Decompression Sickness
- Nitrogen Narcosis
- Oxygen Toxicity
- Mixed Gases

# Physics and Physiology Overview

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## Key Points:

- Physics studies how matter and energy behave
- Physiology studies our bodies' response to physical force

# Buoyancy

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## Key Points:

- The laws of physics control buoyancy and understanding buoyancy is vital to divers.
- Archimedes Principle explains why some objects float and others don't, even when they are the same size

## Positive Buoyancy

### Key Points:

- Most important for resting on the surface.
- Establish each time you are at the surface
- Conserves energy while on the surface

## Neutral Buoyancy

### Key Points:

- Does not sink or float
- Protects the environment and conserves air.
- The ability to maintain neutral buoyancy is a characteristic of accomplished divers.

## Negative Buoyancy

### Key Points:

- Important for descent and stabilizing on the bottom.
- Differences in salt and fresh water

# Pressure

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## **Key Points:**

- Water is approximately 800 times more dense than air
- Ten (10) m / thirty three (33) ft exerts as much weight as the entire atmosphere above.
- A person at sea level has one (1) bar/atm or 14.7 psi of pressure on them
- Every 10 m/33 ft the pressure increase by one (1) bar/atm

## **Boyle's Law and Increasing Pressure**

## **Key Points:**

- As pressure goes up, volume goes down by the same ratio.
- Density of air increases as the surrounding pressure increases

## **Available Cylinder Time**

## **Key Points:**

- Dive plans must consider the affect of depth on cylinder time.
- Watch the SPG even closer at deeper depths.

# Physiology

---

## **Air Spaces**

## **Key points:**

- Body is two-thirds water and therefore not affected by pressure
- Air spaces affected include ears, lungs, sinuses and artificial air spaces

## **Squeeze**

## **Key Points:**

- Squeeze is a practical application of Boyle's Law that you can feel and have control over.

## Equalization Techniques

### Key Points:

- Any gentle method of equalization that works is OK to use.
  - Valsalva Maneuver
  - Frenzel Maneuver
- Equalize at the surface and every few decimeters / feet during descent.
- Ascend a few feet if needed.
- Avoid diving with a cold or congestion
- May have to abort dive if equalization cannot be accomplished

## Mask Squeeze

### Key Points:

- Feeling pressure from their mask is the first indication of a mask squeeze.
- Exhale through nose into the mask airspace to prevent/eliminate mask squeeze.
- Note that excessive blowing through the nose can contribute to mask fogging.

## Tooth Squeeze

### Key Points:

- Not very common
- No equalization technique for this type of squeeze
- See your dentist.

## Reverse Block

### Key Points:

- Occurs during ascent when air does not escape naturally
- Stop, descend, and wait for discomfort to pass

## Boyle's Law and Decreasing Pressure

### Key Points:

- As divers near the surface, pressure and volume changes occur more rapidly and slower ascent rates are needed to vent the more rapidly expanding gasses – don't forget the safety stop.

## Lung Over-expansion Injuries

### Key Points:

- Rare, but can be fatal.
- Caused by breath holding on ascent.
- Can occur at swimming pool depths.
- If suspected, give O<sub>2</sub> and get medical help.
- Always breathe continuously and never hold your breath.
- Use
  - Computerize
  - Your
  - Ascent
- Air Embolism
  - Blocks blood flow to brain
  - Signs and symptoms include unconsciousness and paralysis

## Breathing Air Under Pressure

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### Key Points:

- Gas percentages don't change with pressure.
- Total gas density (concentration) increases with pressure yielding a higher "dose" to the diver at depth.

## Density

### Key Points:

- Since our lungs need to expand to normal volume with each breath irrespective of density, greater depths mean progressively higher doses of O<sub>2</sub> and N<sub>2</sub> with each breath.

## Nitrogen

### Key Points:

- Deeper depths and long dive times mean more N<sub>2</sub> is absorbed.
- Repetitive dives mean more N<sub>2</sub> absorption.
- NDLs are based on N<sub>2</sub> absorption and off gassing.

## Decompression Sickness

### Key Points:

- Coming up slowly lets us breathe off the excess N2 and avoids bubbles.
- Rapid ascents can cause the bends.

## Signs and Symptoms of Decompression Sickness

### Key Points:

- Joint pain is the most common symptom of DCS.
- Shortness of breath, numbness or tingling is some of the other signs.
- Untreated DCS can become deadly.
- The treatment is the same for all decompression related injuries - breathe one hundred percent (100%) oxygen and seek help.
- If symptoms are severe or persist - go to a chamber.

## Decompression Illness

### Key Points:

- The treatment is the same for all decompression related injuries - breathe one hundred percent (100%) oxygen and seek help (worth repeating).

## No-Fly Time

### Key Points:

- After diving you must wait to fly
- Monitor dive computer for safe fly time
- General rule wait 12 to 24 hours before flying

## **Nitrogen Narcosis**

### **Key Points:**

- Nitrogen narcosis is typically related to depths over thirty (30) m/one hundred (100) ft.
- Nitrogen narcosis will go away immediately with ascent to shallower depths.
- Divers may not recognize they have it.

## **Oxygen Toxicity**

### **Key Points:**

- The oxygen in air is not harmful to divers at sport diving depths (42 m/130 ft).
- Students should never use oxygen-enriched air (nitrox) without the appropriate training.

## **Carbon Monoxide Poisoning**

### **Key Points:**

- Get air fills from a reputable source.
- Never use air that has a smell or taste.
- A diver that has an unexplained headache or feels badly for no apparent reason should alert his buddy and surface.

## **Mixed Gases**

### **Key Points:**

- Never use NITROX or other special breathing mixtures without specialized training.

## Summary

- Physics
  - Buoyancy
  - Positive
  - Neutral
- Negative
- Pressure
  - Boyle's Law
- Physiology
- Air Spaces
  - Equalization Techniques
  - Boyle's Law and Decreasing Pressure
  - Lung Over-Expansion Injuries
- Breathing Air Under Pressure
  - Decompression Sickness
  - Nitrogen Narcosis
  - Oxygen Toxicity
  - Mixed Gases

## Complete Student Training Record for Chapter Two (2)

### Any Questions

# **Presentation Outline**

## **Chapter 3: Scuba Equipment**

### **Personal Equipment**

- Mask, Fins, Snorkel
- Exposure Protection

### **Scuba Equipment**

- Buoyancy Compensator Device
- Regulator
- Cylinder
- Weight Systems

### **Underwater Instruments**

- Dive Computers
- Other Instruments
  - Dive Watch
  - Depth Gauge
  - Compass

### **Accessories**

- Rescue Signal
- Knife
- Dive Lights
- Equipment Bag
- Dive Flag
- Logbook
- Slate

# Scuba Equipment

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## Key Points:

- Scuba is an equipment intensive sport.
- Each piece of scuba equipment is an important part of a functional unit.
- Fit is usually the most important factor.

# Personal (Snorkeling) Equipment

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## Mask

### Key Points:

- A mask creates airspace between the diver's eyes and the water.
- Fit and comfort are the most important factors in selection.
- Low volume = less to equalize.
- High volume = better peripheral vision.
- Can be fitted with corrective lenses.
- Purge valve optional but is good if a diver has a tendency to exhale through the nose a lot.

## Snorkel

### Key Points:

- Allows a diver to conserve cylinder air while swimming on the surface.
- Select for comfort and unobtrusive design.
- One way exhaust valves
- Wet and dry snorkels
- Attached on the left side of the mask strap

## Fins

### Key Points:

- Increases swimming efficiency by increasing the surface area of divers' feet.
- Two basic types, open-heel and full-foot
- Open-heel style allows boot.
- Fit is most important.

## Exposure Protection

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### Body Suit (Skin)

#### Key Points:

- Protects against sun, wind and abrasions.
- Adds minimal thermal protection, best in warm water

### Wet Suit

#### Key Points:

- Primarily used for thermal protection.
- Should fit snug enough to slow the flow of water over the skin.
- Discuss the various styles and thicknesses.
- Best in cool to cold water.

### Dry Suit

#### Key Points:

- Intended to keep all the water out.
- Under garments worn to provide extra warmth
- Holds a layer of air between the inside of the suit and the diver's skin.
- Requires specialized training.
- Best in cold to very cold waters.

## Boots and Gloves

### Key Points:

- Boots should fit like a shoe – prefer a good sole.
- Gloves should have a snug fit, but not prohibit dexterity.
- Gloves should be thinnest material that still provides adequate warmth.

## Hoods

### Key Points:

- Greatest heat loss is from the head.
- Comfortable fit not constricting neck or jaw (carotid sinus pressure).

# Scuba Equipment

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## Buoyancy Compensator Device (BCD)

### Key Points:

- Harness (“tech”) BCDs have more lift and are most often used in more advanced diving.
- Vest style (recreational) BCDs are more compact and streamlined.
- Can be inflated with air from cylinder (power inflation) or from diver’s lungs (oral inflation)
- BCD is deflated from various spots depending on type of BCD
- Weight integrated BCDs have pockets for weights that have a quick release for emergencies

## Regulator

### Key Points:

- Function with extreme internal pressures and a harsh external environment.
- Require good care and annual service.

## **First Stage**

### **Key Points:**

- Converts hundreds (100s) of bar / several thousand (1000s) psi to about ten (10) bar / one hundred forty (140) psi above surrounding pressure for the 2nd stage.
- Available in DIN or yoke style, balanced or unbalanced.
- Allows connection of SPG and other equipment (dry-suit, alternate air source and BCD).

## **Second Stage**

### **Key Points:**

- Converts pressure to ambient pressure.
- All 2nd stages have a purge button.
- How a second stage works to deliver air
- Explain fail-safe design (free-flow).

## **Alternate Air Source**

### **Key Points:**

- Several types; octopus, BCD inflator-integrated or redundant “Spare Air” type.
- Hose is generally slightly longer
- Second stage is generally a different and brighter color
- Regular maintenance and testing is important.
- Emphasize placement in the “triangle”.

## Cylinder

### Key Points:

- Materials
- Working pressures and volumes
- You should never allow a cylinder to become completely empty of air.
- Aluminum cylinders are never filled over their service pressure.
- Required inspections (VIP and Hydro)
- Cylinder markings

### Example of the manufacturer's stamp on a Luxfer aluminum cylinder

**CTC/DOT-3AL3000-S80  
P123456 LUXFER 9A09**

- CTC/DOT = Canadian Transport Commission (Transport Canada)/ US Department of Transportation
- 3AL = Type of material (code for aluminum alloy)
- 3000 = Service pressure (in psi)
- S80 = Scuba 80 cubic feet
- P123456 = Cylinder serial number
- LUXFER = Cylinder manufacturer
- 9A09 = Hydrostatic test date (September 2009)
- A = Inspector's symbol

### **Example of a manufacturer's stamp on a Pressed Steel galvanized steel cylinder**

**G CTC/DOT - E9791 - 3500 TP5250 1-09**

**12345 PST GALVANIZED**

- CTC/DOT = Transport Canada / US Department of Transportation
- E9791 = DOT exemption number, steel alloy indicator
- 3500 = Service pressure
- TP = Test pressure
- 1-09 = Hydrostatic test date
- 12345 = Cylinder serial number
- PST = Manufacturer (Pressed Steel)

## **Cylinder Valves**

### **Key Points:**

- “K” valve is the modern standard type without a reserve.
- Yoke style is the most common for pressures up to two hundred and six (206) bar / three thousand (3000) psi.
- Din style is another common valve and handles pressures to three hundred and ten (310) bar / four thousand five hundred (4500) psi.
- DOT and CTC valves have a burst disc.
- O-Rings should be checked every time the first stage is attached to the cylinder valve.

## **Weight System**

### **Key Points:**

- All weight systems should have a quick release mechanism.
- Caution divers not to entrap weight systems by donning equipment over them.
- Weight belts should be right hand release.

# Underwater Instruments

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## Submersible Pressure Gauge (SPG)

### Key Points:

- Monitors air in cylinder
- Types: analog or digital
- Periodic maintenance
- Where to locate SPG

## Dive Computers

### Key Points:

- Dive computers reduce the likelihood of human error when planning a dive.
- Dive computers allow longer dives because they credit NDLs for multilevel diving.
- Because computers are different in their features and operation, divers must familiarize themselves with their computer before they go diving.
- Since no two (2) divers can ever have the exact same dive, a dive computer cannot be “shared” by two divers.
- Dive computers usually track in .1 m / one (1) foot increments thus making it “impossible” to use a buddy’s dive computer as a replacement for a personal one.
- Features and functions of a dive computer
  - No-stop time, depth, dive time, ascent rate, required decompression, surface interval, time to fly, logbook
- There is no absolute guarantee of safety even with a PDC.

## Other Instruments

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### Dive Watch

**Key Points:**

- Provides a redundant timer in case of computer failure.
- Vary from a simple timepiece to a downloadable computer.

### Depth Gauge

**Key Points:**

- Select for ease of reading.
- Digital style often easiest to read.
- May have backlight.
- Analog style generally doesn't require batteries.

### Compass

**Key Points:**

- Using a compass effectively is one of the marks of an accomplished diver.
- No specific feature is as important as knowing how to use it.
- Stress, “Keep rehearsing and train yourself” in compass usage – can be done in, for example, a parking lot or a back yard.
- Big metal objects like a wreck negatively impacts the accuracy of a compass.

# Accessories

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## Rescue Signal

### Key Points:

- A whistle is basic but the best type; depends on the dive circumstances.
- A long inflatable “sausage” can be seen from a long distance.
- Air powered units used above and below surface

## Knife

### Key Points:

- Intended as a tool, not a weapon.
- Like any tool, its selection should be based upon its likely use.
- Should be attached where it can be easily reached but is not likely to snag.

## Scissors or Cutting Device

### Key Points:

- Safer than a dive knife because they are less likely to stab or cut the wrong things.

## Dive Lights

### Key Points:

- Restores natural color underwater.
- Check batteries before diving
- Two (2) lights are standard on a night dive.
- The larger light is the primary and the smaller light is the backup.
- Avoid blinding buddies – don’t point the light in their eyes!

## **Equipment Bag**

**Key Points:**

- Select for size, function and durability.

## **Dive Flag**

**Key Points:**

- Types of dive flags
- Protect yourself; use a dive flag when appropriate and required by law.

## **Logbook**

**Key Points:**

- Log every dive.

## **Slate**

**Key Points:**

- A slate is both an underwater notebook and communications device.

## Summary

- Personal Equipment
  - Mask, fins, snorkel
  - Exposure Protection
- Scuba Equipment
  - Buoyancy Compensator Device
  - Regulator
  - Cylinder
  - Weight Systems
- Underwater Instruments
  - Dive Computers
  - Other Instruments
  - Dive Watch
  - Depth Gauge
  - Compass
- Accessories
  - Rescue Signal
  - Knife
  - Dive Lights
  - Equipment Bag
  - Dive Flag
  - Logbook
  - Slate

**Complete Student Training Record for Chapter Three (3)**

**Any Questions?**

# **Presentation Outline**

## **Chapter 4: Skills Development**

### **Setting Up**

- Scuba Assembly
- Putting On the Scuba System
- Pre-dive briefing
- Review ABCs

### **Entries**

- Giant Stride
- Controlled Seated
- Back Roll
- Shore
- Surf

### **In-water Skills**

- BCD Inflation/Deflation
- Weight Check
- Descents
- Regulator Clearing
- Regulator Recovery
- Fin Pivot
- Hovering

### Breathing from a Free-Flow Regulator

- Mask Clearing
- Swimming Techniques
- Cramp Removal
- BCD Removal Underwater
- Compass Navigation
- Snorkel Clearing

### **Communications**

### **Hand Signals**

### **Ascents and Out-of-Air**

- Emergencies
- Normal Ascent
- Alternate-Air Assisted Ascent
- Controlled Swimming Ascent
- Buoyant Ascent
- Scuba Disassembly

# Setting Up

---

## Scuba Assembly

### Cylinder Check

**Key Points:**

- Check cylinders before using.
- Makes sure all inspections have been completed
- Smell air

### BCD Attachment

**Key Points:**

- Divers must be familiar with the features and functions of the BCD they are using.
- Check to ensure BCD is tightly attached to cylinder.

### Regulator Attachment

**Key Points:**

- Regulators should be inspected for damage.
- Naturally, the type, DIN or yoke, should match the type of valve on the cylinder.
- Emphasize that the air hole in the valve must point into the hole in the first stage inlet, as students will commonly try to put them on backwards.
- Explain why the power inflator hose and the SPG hose are on the left and the regulator is on the right.
- Make sure to caution against over-tightening the first (1st) stage to the valve.
- Explain the purpose of the dust cover for the first stage and the fresh water rinse at the end of every dive day.

## **BCD Inflator Hose Attachment**

### **Key Points:**

- Show where the power inflator hose connects to the inflator valve.
- Explain the proper sequence of pressurization while holding the purge in with gauge diverted away.
- Then turn the valve completely on and one-fourth (1/4) turn back.
- Listen for leaks and check the SPG.

## **Regulator Test**

### **Key Points:**

- It is important that students test their equipment before they use it
- They should not dive if they feel uncomfortable with the equipment

## **Streamline Hoses**

### **Key Points:**

- When divers streamline their equipment, they are automatically organizing it. It helps them know where everything is and encourages a sense of pride in their “setup”.
- Reduces chance of entanglement and damaging equipment

## **Care and Maintenance of equipment**

### **Key Points:**

- All equipment should be rinsed with fresh water
- Equipment should be dried out of direct sunlight
- Equipment should be completely dry before storage
- Putting On the Scuba Unit

## Exposure Protection

(This information is an FYI for the instructor to share not in student manual.)

**Key Points:**

- Relate timing of donning exposure suits to weather conditions and surface comfort.

## Weight Belts

**Key Points:**

- Knowing the release or buckle position and avoiding belt entrapment by other equipment are concepts that need special emphasis.
- Right Hand Release

## Donning the Scuba Unit

**Key Points:**

- Talk about the buddy system.

## Pre-dive Briefing

**Key Points:**

- Overlook this step and all your efforts can deteriorate into disorganization and confusion.

## Review the ABCs

- A good pre-dive checklist is the ultimate save-a-dive kit. Emphasize the buddy system and let your buddy help check your setup and equipment. One useful mnemonic is the ABC's.
  - **A**ir on
  - **BCD** inflated
  - **C**omputer on
  - **D**ive equipment complete (personal equipment and scuba equipment)
  - **E**nter the water

# Entries

---

## **Key Points:**

- Divers keep second stage in mouth until they have stabilized on the surface
- BCD inflated
- All entries should be followed by the hand(s) over head OK signal

## **Giant Stride**

### **Key Points:**

- Emphasize holding mask and regulator, looking into the horizon and “stepping out” but do not jump.
- Check to ensure entry area is clear.

## **Controlled Seated**

### **Key Points:**

- Emphasize leaning to one side and swinging backside around and out.

## **Back Roll**

### **Key Points:**

- Avoid dangling equipment and losing masks.

## **Shore Entry**

### **Key Points:**

- Fins go on after entry to waist level.

## **Surf Entry**

### **Key Points:**

- Fins on at surf-line, then walk backwards into the waves.
- Buddies should be close to assist each other in this type of entry.

## In-water Skills

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**Note:** In-water skills are best taught by demonstration with students participating in the water. During the academic sessions you should introduce the skills they will be performing in confined water and explain their value. This introduction helps to minimize the learning curve students will feel in the confined water sessions. If you have already taken them to confined water, this “academic” review of what they were doing (and why) will reinforce their skills.

### BCD Inflation and Deflation

#### Key Points:

- Use of the power inflator and the oral inflator
- Add or vent small amounts of air to the BCD.
- You may need to wait a few seconds and take a few breaths before a change in buoyancy becomes apparent.
- Don’t over-inflate BCD and risk uncontrolled ascent!

### Weight (Buoyancy Check)

#### Key Points:

- Verify power inflator function
- Deflate BCD completely (so all of its lift is available)
- Float at eye level with a full breathe of air
- Exhale and sink slowly keeping the inflator in hand
- Proper buoyancy at the surface helps divers have a streamlined and comfortable dive.
- Important to perform with changes in equipment or a long layoff from diving.

## Descents

### **Key Points:**

**Controlled** - physically holding the line or other fixed object.

**With reference**- visual contact with a line or other fixed reference.

**Free** - without a line to hold onto or fixed visual reference.

- Should always be “under control”
- Equalize at the surface and frequently on the way down – “early and often”.
- Keep the power inflator in hand.
- Descend upright and in visual contact with buddy.

## Regulator Clearing

### **Key Points:**

- Explain the two methods (oral and purge) of clearing a flooded regulator and the importance of tongue positioning for airway protection.

## Regulator Recovery

Discuss the sweep and reach methods of regulator recovery.

Most divers find the sweep method to be the most convenient.

### **Key Points:**

- Exhale (bubbles) continuously whenever the regulator is out of the mouth.
- Exaggerate the lean

## Hovering

### **Key Points:**

- Don't breath-hold on rising – breathe on the top (or bottom) of lung capacity.

## Free Flow Breathing

### Key Points:

- Don't close mouth around the mouthpiece – excess air must escape freely.
- Breathe slowly and shallow.
- Ascend with control.

## Mask Flood and Clear

### Key Points:

- Inhale through mouth – exhale through nose.
- Pressure on top of mask helps with either type of purge method.
- Blow gently and steadily, excessive blowing fogs masks.
- Divers with contact lenses need to adjust technique.

## Mask Removal and Replacement

### Key Points:

- Emphasize holding onto the mask and controlling the strap.
- Divers with contact lenses need to adjust technique.

## Swimming Techniques

### Key Points:

- There are different kinds of underwater swimming kicks that can be useful in differing circumstances.

## Cramp Relief

### Key Points:

- Relieve a cramp on your own
- Relieve a cramp with help of a buddy

## **BCD Removal Underwater**

### **Key Points:**

- Emphasize diver negative and BCD neutral or positive.
- Loosen but don't unsnap shoulder straps.
- Keep regulator in mouth and remove BCD to the right, left arm out first.

## **Compass Navigation**

Definitions:

**Lubber line** - aligned with your body in the direction of travel

**Magnetic needle** - points north

**Index marks** - set index marks on magnetic needle point with 1 lubber line positioned in direction of travel

**Reciprocal**- as above but turn until the tail of the needle is in the index marks

**Bezel**- proper adjustment and alignment

### **Key Points:**

- A compass is only useful if the diver knows how to use it.

## **Snorkel Clearing**

### **Key Points:**

- Blast method
- Displacement method

## **Underwater Communications**

### **Key Points:**

- Review key hand signals (page 81 student manual)
- Hand signals are important to know and use.
- Emphasize slow and exaggerated.
- Remind students that a thumb up means “go up” and not “OK”.
- Waving to the boat means they’re in trouble.

## Ascents and Out-of-Air Emergencies

### Key Points:

- Follow same procedure on each ascent to minimize problems
- Five ways to ascend

## Normal Ascent

### Key Points:

- Maintain control of the BCD inflator.
- Look up and breathe normally with ascent.
- Ascend slowly (discuss ascent rates) CYA)).
- Always complete the safety stop.

## Alternate Air Source Ascent

### Key Points:

- Signal need and intent to share air – communicate.
- Locate donor's *alternate* regulator.
- Solid hook-up and eye contact between buddies.
- Ascend at a normal rate (CYA).

## Controlled Swimming Ascent

### Key Points:

- Controlled rate at about thirty (30) centimeters/one (1) foot a second.
- Recommended rate is fifteen (15) centimeters/one-half (1/2) foot per second.
- Exhale with ascent.
- Establish buoyancy on the surface.

## Buoyant Ascent

### Key Points:

- Never practice this skill!
- Last ditch but preferable to drowning.
- Control ascent rate as much as possible.
- Exhale all the way up.

## Scuba Disassembly

The reverse of assembly, but they need to know why the system must be depressurized to remove the regulator.

### Key Points:

- Remove weights and accessories
- Dry dust cap before replacing.
- Avoid wetting the 1st stage internals during the fresh water rinse.
- Stow cylinders safely with dust cap off of used cylinders

## Summary

- Setting Up
  - Scuba Assembly
  - Putting On the Scuba System
  - Pre-dive briefing
  - Review ABCs
- In-water Skills
  - BCD Inflation/Deflation
  - Weight Check
  - Descents
  - Regulator Clearing
  - Regulator Recovery
  - Fin Pivot
  - Hovering
  - Breathing from a Free-Flow Regulator
  - Mask Clearing
  - Swimming Techniques
  - Cramp Removal
  - BCD Removal Underwater
  - Compass Navigation
  - Snorkel Clearing
- Communications
- Hand Signals
- Ascents and Out-of-Air Emergencies
  - Normal Ascent
  - Alternate-Air Assisted Ascent
  - Controlled Swimming Ascent
  - Buoyant Ascent
  - Scuba Disassembly

### Complete Student Training Record for Chapter Four (4)

**Any Questions?**

# **Presentation Outline**

## **Chapter 5: Planning Your Dive**

### **Awareness**

Diver Fitness

### **Buddy System**

### **Dive Planning**

Repetitive Dives

Safety Stop

Emergency or Omitted Decompression

Computer Failure

### **In-Water Emergencies**

Overexertion

Problems at the Surface

Tired Diver Tow

Entanglement

Missing Diver

### **First Aid**

Seasickness

Decompression Sickness

CPROX/CPROX1st/CPROX1stAED

# Introduction

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Risk management is a means of preventing problems and planning a response for possible emergencies that may arise.

## Awareness

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### **Key Points:**

- Personal awareness
- Mental and physical abilities
- Dive within your experience level

## Diver Fitness

### **Key Points:**

- Stay hydrated when diving.
- No alcohol or drugs prior to a dive.
- Avoid smoking, especially before and immediately after a scuba dive.
- There is no data to support the safety of diving while pregnant, so don't.

## Buddy System

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### **Key Points:**

- Diving alone is not considered safe at the sport level. Requires special training.
- Be familiar with each other's dive equipment
- Review hand signals
- If buddies get separated look for no more than three (3) minutes.
- When qualified complete the SDI Solo Diver program

# Dive Planning

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## **Key Points:**

- Even when using a computer, plan dives.
- Parameters to plan.

## **Repetitive Dives**

### **Key Points:**

- The repetitive dive requires more planning – not less.
- Deepest dive first.

*Any dive made within more than ten (10) minutes but less than twelve (12) hours of another is a repetitive dive*

## **Safety Stop**

### **Key Points:**

- Treat safety stops with respect and so will your students.
- Suggested for any dive up to 30 m/100 ft. Over 30 /100 ft it is mandatory.
- Make sure to stay between three (3) m – six (6) m/ten (10) ft - twenty (20) ft for three (3) minutes.
- If possible maintain contact with a line

## **Emergency or Omitted Decompression**

### **Key Points:**

- Don't panic; follow your computer instructions.
- Come up before you run out of air.
- Inform the divemaster or instructor.
- Follow first aid procedures for decompression sickness

## **Computer Failure**

### **Key Points:**

- Abort the dive in a controlled manner.
- Complete safety stop if available air
- Do not resume computer controlled diving for twenty four (24) hours.

# In-Water Emergencies

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## **Key Points:**

- Think about problems and solutions before they happen.
- Practice emergency techniques (tired diver tow).
- Training and practice prevent panic.
- Promote the rescue diver course.

## **Overexertion**

### **Key Points:**

- Should overexertion occur, STOP, REST, THINK and BREATHE
- Communicate situation to others.

## **Problems at the Surface**

### **Key Points:**

- Establish positive buoyancy. (Inflate BCD)
- Keep air supply in mouth.
- Signal for help. (Carry surface signaling device)

## **Tired Diver Tow**

### **Key Points:**

- Don't get within reach of a panicked diver unless trained.
- Establish positive buoyancy for both divers
- Pace yourself
- First stage pull or fin push

## **Entanglement**

### **Key Points:**

- Don't struggle.
- Stop, think and act if necessary.
- Assist one another if possible before taking any other action

## **Missing Diver**

### **Key Points:**

- Surface within three (3) minutes of being separated from your buddy.
- Notify dive supervisor immediately

## **Rescue Diver Program**

### **Key Points:**

- Teaches how to recognize and reduce chances of diving accidents.
- Advanced Diver rating or forty (40) logged dives.

## **First Aid for Open Water Divers**

.....

### **Key Points:**

- Be prepared
- Complete an SDI CPROX1stAED program.

## **Seasickness**

### **Key Points:**

- Methods that help to avoid seasickness.

## **Decompression Illness**

### **Key Points:**

*Recompression in a hyperbaric chamber usually required*

### **EMERGENCY PROCEDURES FOR DCI:**

- Move the afflicted diver out of danger
- Activate the Emergency Medical System (EMS)
- Monitor life support signs (pulse and respiration) and provide CPR if necessary
- Provide 100% oxygen via demand regulator if the diver is breathing
- Evacuate if necessary.

## **CPROX/CPROX1st/CPROX1stAED**

### **Key Points:**

- Designed to teach divers how to properly administer aid in a diving emergency

## **Summary**

- Awareness
  - Diver Fitness
- Buddy System
- Dive Planning
  - Repetitive Dives
  - Safety Stop
  - Emergency or Omitted Decompression
  - Computer Failure
- In-Water Emergencies
  - Overexertion
  - Problems at the Surface
  - Tired Diver Tow
  - Entanglement
  - Missing Diver
- First Aid
  - Seasickness
  - Decompression Sickness
  - CPROX/CPROX1st/CPROX1stAED

## **Complete Student Training Record for Chapter Five (5)**

### **Review Questions**

### **Any Questions?**

# Presentation Outline Pool/Confined Water – Dive 1

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***Use Cue Card: 'CW1-Confined Water 1'***

## ***Swimming Skills Assessment***

(200m / 218y Swim and 10 min. Tread Water)

Must be performed prior to any scuba skill being taught. The first confined water session is often the most convenient time and setting. Students must perform each of these skills non-stop. “Style” is not important but they should demonstrate reasonable comfort in the water and be in control throughout the exercises. Any combination of strokes is acceptable for the two hundred (200) metre/two hundred eighteen (218) yard swim.

## ***Buddy Teams (Assign and Discuss)***

Emphasize the importance of staying with their buddy and following the three (3) minute rule to surface for a lost buddy. Encourage buddy teams to swim side by side so that they can see each other at all times. Vary buddy teams when possible, students should experience a variety of dive buddies. It is sometimes helpful to separate “couples” during in-water training to help foster independence and self-reliance.

## ***Communication - Hand Signals***

Demonstrate basic hand signals - OK, go up, go down, stop, level off, low on air, out of air, need air, something’s wrong. Ask students to return the signal to you when you demonstrate to them. Use exaggerated demonstration quality technique.

## ***Weights System/Mask Defog***

When using a belt, emphasize buckle opens to right. Putting their belt on first may be easier but they must not trap their belt under other equipment such that it could not be dropped if necessary.

## ***Scuba System Assembly***

Demonstrate assembly, explain as you go and let students assemble theirs along with you. Help them where needed.

- *Cylinder check – check cylinder and O-ring.*
- *BCD attachment – watch for BCD backwards or too loose.*
- *Regulator attachment – watch for 1st stage of regulator upside down.*
- *BCD inflator hose attachment – before pressurization.*
- *Turn on the air – with purge slightly depressed.*
- *Test the regulator, BCD inflator and computer / SPG.*

## ***Donning Scuba System***

Teach standing, right arm first with assistant lifting system for them. Review SDI Open Water Scuba Diver Manual for technique description. Buddies should help each other.

## ***Briefing***

It is important to give your students a thorough pre-dive briefing before each dive, even in confined water exercises. The pre-dive briefing removes confusion and reduces anxiety for pool and open water dives. It provides an atmosphere of control and makes you look more professional. It also helps to establish a lifelong habit of advance thinking and organization for your students.

Points to emphasize include:

- A description of the dive site (even if it's a swimming pool).
- If the pool has special features, describe them.

- The dive profile including planned depth, bottom time and minimum air pressure for ascent.
- Review hand signals and safety considerations.
- Discuss the method of entering and exiting the water.
- Remind students to check their air supply and signal you every thirty four (34) bar / five hundred (500) psi. Do this even in confined water to initiate the habit of checking their air supply and help make it automatic in open water.

## **ABCDE's**

Emphasize the importance of checklists much like those used by pilots.

*Air on*

*BCD inflated*

*Computer on*

*Dive equipment on*

*Enter on go*

## **Equalization**

Emphasize starting equalization at the surface and continuously.

Demonstrate nose pinch (Valsalva), head wobble, yawn and ear lobe pull.

Any gentle method or combination of methods is acceptable.

## Entry

Try to use a different entry at each session in order to expose students to all common types of entries. Often the first session will be at the shallow end of a pool making the controlled seated entry ideal.

**Objective:** “You will be able to” enter the water using the controlled seated method

**Why:** “You’ll be” a more confident diver being able to enter the water the easiest way from any setting. This method is especially useful at the shallow end of a pool.

**Demo:** Enter water using correct controlled seated method.

**Problems:** Didn’t rotate with push-off so as to end up facing side of pool. Didn’t partially fill BCD before entry.

Regulator or mask not in place.

## BCD Inflation and Deflation

Teach both power and manual methods of BCD inflation. Make sure students understand clearly which button serves which function.

**Objective:** “You will be able to” orally inflate a BCD to about half full and then fully deflate it at the surface or underwater.

**Why:** “You can” inflate your BCD either orally or by using the low pressure inflator so you can relax on the surface, descend or ascend whenever you want to.

**Demo:** Oral and auto inflation.

Demonstrate proper positioning for complete deflation.

Deflation.

**Problems:** Pushing the wrong button,

Too little or too much inflation.

Not opening the valve while attempting to orally inflate.

Incorrect body position for deflation.

## Regulator Breathing

Often taken for granted by instructors, many of your students will be anxious or claustrophobic about breathing through a regulator. You will also have students ask you if they can get AIDS or other dread diseases from the regulator mouthpiece. Tell students that mouthpieces should be thoroughly rinsed between users and providing that is done, there is no risk of contagion. For those still in doubt, recommend they purchase their own mouthpiece or regulator.

**Objective:** “You will be able to” breath in a relaxed and efficient manner while on scuba.

**Why:** “You will enjoy” increased comfort and enjoyment of the underwater environment.

**Demo:** Demonstrate slow, deep, relaxed, regulator breathing.

**Problems:** Inhaling through the nose.

Exhaling through the nose (fogs mask).

Not purging regulator before first inhalation.

## Regulator Purge - Mechanical and Oral

Regulator purging should be practiced until it is second nature to your students. This skill gives them a vital boost in confidence because their regulator is literally their lifeline underwater. Inhaling even a few drops of water can result in choking.

**Objective:** “You will be able to” clear your regulator by the purge and exhalation methods while underwater.

**Why:** “In the event” your regulator should become flooded, you will be able to clear it by two different methods.

**Demo:** Demonstrate purge and exhalation methods.

Emphasize exhaling slowly while regulator is out of mouth.

**Problems:** No air left in lungs to clear by exhaling.

Failure to protect airway by lifting tongue while purging.

Didn't exhale while regulator was out of mouth.



## **Regulator Recovery - Sweep and Reach**

Just as important as regulator purging, the ability to act quickly and replace a displaced regulator is important to your students' confidence and safety. Remind them that in the event they cannot promptly locate their primary regulator, they should know how to locate their alternate second stage and use it to allow a more relaxed search for their primary.

**Objective:** "You will be able to" recover your regulator should it become displaced from your mouth while underwater.

**Why:** "In the event" your regulator is displaced from your mouth while underwater, you will be able to recover it.

**Demo:** Demonstrate both the sweep and the cylinder lift methods of regulator recovery.

Emphasize proper positioning for the cylinder lift and reach method.

Clear regulator as previously instructed.

Exhale slowly while regulator is out of mouth.

**Problems:** Failure to keep arm straight and close to cylinder while sweeping.

Inadequate cylinder "lift for reach" method.

Didn't exhale while regulator was out of mouth.

## **Mask Flood and Clear (Partial)**

Mask management is taught in three stages. First, students are introduced to partially flooding their masks and then clearing - much as they will in order to defog their masks. In the next session they are taught to completely flood and clear - a skill that will be useful when their mask is knocked ajar in open water. In the last session, they will graduate to complete removal and replacement underwater - finally achieving complete comfort with their masks in all situations.

**Objective:** “You will be able to” clear a partially flooded mask while underwater.

**Why:** “In the event” your mask should become partially filled with water, you can clear it easily and continue your dive.

**Demo:** Partially flood mask letting the water trickle in from the top.

Emphasize head and hand positions and exhaling through nose.

Ask about contact lenses!

**Problems:** Didn’t look up to clear.

Students often flood from bottom - gets in nose, remind them to trickle from top.

Exhaled too little or through mouth instead of nose.

Blows in one big blast - tell them to do it slowly and deliberately

Mask skirt not close enough to face and sealed against forehead.

Contact lenses (student’s eyes closed - tap them on shoulder when mask is clear and they can open their eyes).

**Teaching Tools:** Mask flood and clear is the skill most often associated with anxiety and subsequent failure in the open water course. One helpful method of teaching this skill is outlined here:

1. With their heads above water, masks off and regulators in mouth, have students practice the breathing cycle - in through the mouth - out through the nose.
2. With their masks off but regulators in mouth, dip heads under-water for several breathing cycles as above.
3. Masks on but not flooded, have them repeat step 2 while pushing top of mask against their forehead (non-purge style) or center of mask to face (purge style).
4. Partially flood masks from top and repeat step three (3).
5. Now teach mask partial flood and clear as usual.

## ***Fin Kick - Flutter, Modified Flutter and Frog Kicks***

Demonstrate each of these kicks. The advantages of each of these were discussed in the classroom sessions and should be briefly reviewed again here. This is a good time to re-emphasize control of diving technique and respect for the underwater environment in choosing the “best kick for the job.” Remind students that appropriate choice and control of kicking is a highly visible attribute of accomplished divers.

## ***Weight System Removal and Replacement (Surface)***

Demonstrate proper method of weight system removal and replacement on the surface in a horizontal position. When using a weight belt teach them to start face up and “roll” the belt on. Make sure students have second stage in their mouth so they can breathe. Have students practice this skill until proficient.

## ***BCD Removal and Replacement (Surface)***

Demonstrate proper method of BCD removal and replacement on the surface in a horizontal position. There are several ways to complete this exercise. Select the one that best fits the student’s needs. Demonstrate, and then have students practice until proficient.

## ***Under Water Swim and Practice Time***

Let students’ just “play” in confined water. They need the opportunity to work on the skills you have just taught them. Try to avoid excessive correcting of them unless they are having difficulty or developing a bad habit.

## ***Exit***

Exit by the appropriate method. Encourage buddy assistance.

## **Check Air**

Check the student's air at the end of each pool/confined water session to make sure they are completing the class with plenty of air. This will get them in the habit of checking their air throughout the class and later when they start to dive on their own.

## **Disassemble Scuba System**

Emphasize keeping first stage dry, rinsing equipment thoroughly, stowing out of walkways.

## **Debriefing**

After positive corrections, congratulations and encouragement are a component of the debriefing. Positive peer recognition is the most important reward to your students, especially from YOU, their instructor. Never make fun of your students - your remarks may be taken more seriously than you intended.

## **Complete Student Training Record for pool / confined water session One (1)**

## **Log and Sign Dive Books**

Logging the confined water dives lends confirmation and importance to your teaching and what they are learning. It also "imprints" the "log your dive" habit in your students right from the start.



## Pool/Confined Water – Dive 2

.....  
*Use Cue Card: 'CW2-Confined Water 2'*

### ***Briefing (As In Session #1)***

Pre-dive briefings are very important, even in confined water sessions! It demonstrates the pattern of thoughtful planning that you have been trying to communicate to your students. It's time to encourage them to think and begin participating in making decisions. For example, ask them what kind of entry they think would work best.

### ***Weight System/Mask Defog (As In Session #1)***

### ***Scuba System - Assemble and Don as Instructed***

Let students attempt the assembly on their own, only assist and guide as needed. Be positive in correcting their errors. Even instructors sometimes try to assemble their scuba unit backwards.

### ***ABCDE's***

As in confined water #1

### ***Water Entries***

As noted in session one, try to use a different entry every time. For example, if they used a controlled - seated entry in confined water #1, use the giant stride or back-roll into the deep end of the pool this time. Emphasize thinking about the appropriateness of each type of entry for the site.

**Objective:** “You will be able to” enter the water by both giant stride and back-roll methods.

**Why:** “You will be” a more confident diver knowing that you are able to enter the water the easiest way from any setting.

**Demo:** Enter water using correct giant stride and back-roll methods.

**Problems:** Failed to use scissors technique on giant stride.

“Hopped” on giant stride.

Allowed equipment to become entangled with deck or boat on back-roll.

## **6 Point Descending Technique (ORCESD)**

Just as take-off and landing are important skills in flying an airplane, ascents and descents are very important parts of a scuba dive. The “checklist” is a useful tool to help you remember the steps in a proper descent.

**Objective:** “You will be able to” demonstrate a descent using the appropriate step-wise method.

**Why:** “It’s important to know” a simple procedure that helps you remember all the important steps to follow when you’re ready to descend.

**Demo:** Demonstrate proper descent techniques.

Orient

Regulator in the Mouth

Computer On

Equalize

Signal Buddy

Deflate & Descend



## **Computer Use**

Students should start to learn how to read and interpret information while using a dive computer.

## **Breathing From a Free-Flowing Regulator**

Remind students that regulators are designed fail-safe and may free flow. Make sure they understand that this is a manageable situation and they will be able to breathe while surfacing in a controlled manner. Emphasize that there will be so much available air that they cannot inhale it all, in fact they must not put the mouthpiece in their mouth, but instead, breathe slowly and shallowly from the blast of air.

**Objective:** “You will be able to” breathe effectively from a free flowing regulator for approximately 30 seconds in shallow water.

**Why:** “Isn’t it nice to know” that in the unlikely event of a regulator malfunction that results in a free flow of air, you can breathe only the air you need and let the rest escape into the water as you make a safe controlled ascent?

**Demo:** Demonstrate by pressing regulator mouthpiece against your upper teeth with your mouth partially opened below so that excess air can escape and pressing purge button to simulate free flow.

Stress not sealing lips on mouthpiece and using tongue as a splashguard.

**Problems:** Incorrectly or inadequately pressing purge valve.

Sealing lips around mouthpiece.

Poor airway control - Incautious breathing.

Improper head position to breathe comfortably and see out of dive mask.

## **Mask Flood and Clear**

This is step two (2) of the three (3) step mask management group of skills.

**Objective:** “You will be able to” flood and clear your mask while underwater.

**Why:** “In the event” you should get water inside of your mask, you can clear it easily and continue your dive.

**Demo:** Fully flood mask

Emphasize head and hand positions and exhaling through nose.

Ask about contact lenses!

**Problems:** Didn’t look up to clear.

Exhaled through mouth instead of nose or too little.

Mask seal must be close to face and touching on top.

Contact lenses (student’s eyes closed - tap them on shoulder when mask is clear and they can open their eyes).

Stress proper positioning of their mask.

## **Weight System Removal and Replacement (On the Bottom)**

Demonstrate the proper technique for weight system removal and replacement on the bottom of the pool in deep water. Students with integrated BCDs should practice with a weighted belt in addition to their BCD. Emphasize the need to completely empty the BCD of air before unbuckling their belt.



## ***Snorkel Use, Clearing and Exchange***

Divers often minimize the importance of snorkel skills because snorkels are not perceived as part of “real” dive equipment. Actually, the snorkel is an important piece of safety equipment and it would be hard to find an experienced diver who has not, at one time or another, turned to the snorkel to help them out of an exhausting situation.

**Objective:** “You will be able to” clear a snorkel of water by using the blast method and resume breathing through it without lifting the face from the water.

**Why:** “Isn’t it nice to know” that there is an easy way to get that unwanted water out of your snorkel after you’ve done a dive or inadvertently dipped the end of the snorkel under water and allowed water to enter it?

**Demo:** Fill and blast clear snorkel.

Students should develop airway control allowing them to keep their faces in the water while breathing.

Stress proper snorkel position and the need to be cautious on initial breaths.

**Problems:** Improper head or snorkel position to breathe easily.

Insufficient exhalation to clear snorkel.

Lifting face out of water to clear snorkel.

Poor airway control – in-cautious first breath after clearing.

## **Tired Diver Tow**

This simple rescue technique is fun to teach and its importance is easy for students to appreciate. It's the one skill that all divers want their buddies to know.

**Objective:** “You will be able to” safely tow a tired or incapacitated diver on the surface for at least 25 yards.

**Why:** “In the event” you should encounter a diver who is unable to swim on the surface, you will be able to assist them to a boat or shore.

**Demo:** Show proper position of rescuer behind tired diver, both on back.

Make tired diver buoyant.

Emphasize staying out of reach of tired diver in case of panic.

**Problems:** Failure to make tired diver buoyant.

## **Cramp Relief**

Demonstrate proper method of self cramp relief and assisting a buddy with cramp relief.

## **Deep Water Exit**

Use the exit method that is most appropriate for the site. Emphasize removal of weights and other awkward and heavy pieces of gear before trying to get out of the water. Encourage buddies to help each other.

## **Check Air**

Continue to stress checking their air at the end of each pool/confined water session.

### ***Disassemble Scuba System***

As before, rinse, dry and store.

### ***Debriefing (As in pool/confined water session #1)***

After positive corrections, congratulations and encouragement are a component of the debriefing. Make sure they understand the correct method of completing a skill. Extra time during a water session or a one-on-one session can be set to make sure the student is comfortable.

### ***Complete Student Training Record for pool/confined water session Two (2)***

### ***Log and Sign Dive Books***

## Pool/Confined Water – Dive 3

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***Use Cue Card: 'CW3-Confined Water 3'***

### ***Briefing***

By now, students are beginning to expect the briefing and will organize themselves around it. Be sure you always brief what you intend for them to do and do what you have briefed (plan your dive - dive your plan).

### ***Weight System/Mask Defog (As in Sessions #1 and 2)***

### ***Scuba System - Assemble and Don***

Let them do it and assist them only as needed.

### ***ABCDE's***

Continue to emphasize the importance of checklists much like those used by pilots.

### ***Entry***

Try to use a different entry at each session in order to expose students to all common types of entries.

### ***Surface Navigation Run***

Briefly review compass reading during the briefing for this session; students (and divers) have a lot of trouble with compass use. Make this exercise short (confined water) and fun.

### ***6 Point Descent (ORCESD)***

As described in Ascents and Descents above. Of course, all descents should be “under control.” Controlled descent means holding on to a fixed object.

## ***Hovering***

Tell students it is another visible marker of an accomplished diver. They should know that hovering is especially difficult in shallow water and they shouldn't be discouraged, but keep practicing. Emphasize continuous breathing.

**Objective:** “*You will be able to*” hover motionless (without kicking or sculling) in the water for at least thirty (30) seconds using buoyancy control.

**Why:** “*Isn’t it nice to know*” that you can avoid damaging sensitive coral or stirring up silt on the bottom simply by fine-tuning your buoyancy through your breathing?

**Demo:** Stress breath control to make final adjustments but avoid breath holding.

**Problems:** Too much/too little inflation/deflation of BCD.

Failure to allow sufficient time before adding/depleting air from BCD.

Failure to breathe slowly and deeply - fine tune breath control

Using hands/legs to maintain position - sculling.

Removing regulator from mouth.

## **Mask Removal and Replacement**

The third step in mask management. Once they are comfortable with mask removal and replacement, they will be comfortable with their masks. Encourage students to practice seeing underwater without their masks (unless they are wearing contacts).

**Objective:** “You will be able to” remove, replace and clear your mask while underwater.

**Why:** “In the event” your mask should become displaced while underwater, you will be able to replace and clear it easily and continue your dive.

**Demo:** Fully flood mask, then remove, replace and clear.

Emphasize head and hand positions and exhaling through nose.

Ask about contact lenses!

**Problems:** Contact lenses.

Poor breathing control - inhaling water through nose.

Hair, hood or strap caught under skirt on replacement.

Improper head or hand position for clearing

Inability to exhale through nose or exhaling through mouth.

Inadequate exhalation to clear.

Mask skirt too far from face or failure to seal back to face.

Disorientation.

## No Mask Breathe and Swim

This is really the fourth step in mask management - learning to get along without one at all! If a student is wearing contacts, they should keep their eyes closed and let their buddy lead them in the swim.

**Objective:** "You will be able to"

(1) breathe under water for not less than one minute while not wearing a mask. While stationary and while swimming at least fifteen (15) meters / fifty (50) feet and

(2) completely remove, replace and clear the mask of water while under water.

**Why:** "In the unlikely event" your mask floods with water, is lost or cannot be worn because a strap has broken, you can replace and clear it or swim to the surface without it while breathing normally.

**Demo:** Demonstrate kneeling in shallow water.

Stress airway control and need to exhale through nose. Tell students not to pinch their noses.

Proceed from partial clear first.

**Problems:** Contact lenses.

Poor breathing control - inhaling water through nose.

Hair, hood or strap caught under skirt on replacement.

Improper head or hand position for clearing.

Inability to exhale through nose or exhaling through mouth.

Inadequate exhalation to clear.

Mask skirt too far from face or failure to seal back to face.

Disorientation.

## **BCD Removal and Replacement Underwater**

This can be an anxiety provoking exercise. Emphasize regulator control and taking their time. The procedure is outlined in a simple and easy method in the SDI Open Water Scuba Diver Manual.

**Objective:** “You will be able to” remove, replace, adjust and secure the scuba unit on the bottom, with minimal assistance, in water too deep to stand up in.

**Why:** “Isn’t it nice to know” that if you have to remove your scuba unit because something has become entangled in it, you can remove it, correct the problem and replace it easily underwater?

**Demo:** Stress that the unit must not be over-inflated and that all maneuvers should be accomplished by feel.

Left arm out first – left arm in last.

**Problems:** Difficulty finding and releasing straps.

Pulling regulator out of mouth on removal.

Failure to hold onto or control scuba unit once removed.

Difficulty replacing and securing scuba unit - entanglement.

Trapping hoses upon replacement.

## **Controlled Ascent (Computer Monitored)**

Confined water may make this a limited experience. Emphasize the importance of knowing how their computer works and what the arrows mean.

## **Skills Practice**

This is where students can play and “iron out the wrinkles.” Correct only as necessary or to head off bad habits.

## **Exit**

***Check Air (As in Session #1 and 2)***

Important they monitor for when they start to dive on their own.

***Disassemble Scuba System***

As in previous sessions.

***Debriefing***

As in previous sessions.

***Complete Student Training Record for pool/confined water session Three (3)***

***Log and Sign Dive Books***

## Pool/Confined Water – Dive 4

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***Use Cue Card: 'CW4-Confined Water 4'***

### ***Briefing***

Brief as in earlier sessions. This confined water session is oriented to emergency skills. Emphasize the satisfaction students will feel in knowing how to rescue others.

### ***Weight System/Mask Defog***

This is the last scheduled pool / confined water session before they attend their open water dives. This should be becoming second nature by now.

### ***Scuba System - Assemble and Don***

Begin to emphasize the fine points of scuba assembly such as regulator purge while pressurizing and facing the SPG away from the diver when pressurizing.

### ***Entry***

Try to rotate through all types.

### ***ABCDE's***

Continue to stress buddies help each other.

### ***6 point Descent (ORCESD) On A Line***

If logistics permit in the confined water setting, use a line to demonstrate how they can control a descent using a line.

## Alternate-Air Sharing Ascent

Have students practice sharing air on the bottom until they are comfortable before they ascend, then instruct this procedure as outlined in the SDI Open Water Scuba Diver Manual. Make sure both buddies participate as donor and recipient. Emphasize exhaling a bubble stream when the regulator is out of their mouths, having a firm hookup with each other on ascent and maintaining good eye contact.

**Objective:** “You will be able to” locate, secure and breathe from an alternate air source supplied by a buddy for one minute, both in a stationary and a swimming position while under water.

**Why:** “Isn’t it nice to know” that in the unlikely event you run out of air, you can use your buddy’s alternate air source to provide you with air while you both make a safe controlled ascent?

**Demo:** Demonstrate locating, securing and breathing from an alternate air source (stationary and swimming).

Students to switch roles as donor and receiver.

Stress no breath holding.

Stress looking up and holding deflator valve in hand.

**Problems:** Failure to signal and secure alternate air source from buddy.

Difficulty securing, clearing or breathing from alternate air supply.

Failure to make continuous “aaaahhh” sound or exhale when regulator is out of mouth.

Lack of secure contact between buddies (right arm hook up).

Insufficient coordination/communication between buddies while swimming/ascending.

## Controlled Swimming Ascent (CSA)

Controlled Swimming Ascent or CSA is the “last resort” controlled self-rescue. The diver who must resort to CSA is caught between the need to surface quickly enough to avoid drowning but slowly enough to avoid DCS. Remind divers that the volume of air in their lungs will steadily increase as they surface; so, they must exhale slowly (or hum) to let the excess air out and avoid lung expansion injury. Since this is an out of air ascent, they will need to orally inflate their BCD on the surface.

**Objective:** “You will be able to” simulate a controlled emergency swimming ascent by swimming horizontally underwater for at least 9 m / 30 ft while continuously exhaling and emitting a continuous sound.

**Why:** “Isn’t nice to know” that in the unlikely event you run out of air and your dive buddy is unable to quickly provide you with an alternate air source, you can make a safe swimming ascent to the surface while continuously exhaling and not exceeding the maximum safe ascent rate (18 m / 60 ft per minute)?

**Demo:** Demo in shallow water - lead divers to deep water and watch them continuously.

Hold diver’s console when he adds air to BCD to achieve neutral buoyancy (Signal).

Grip ascent line between your hand and diver’s BCD.

1. Neutral buoyancy
2. Look up and inhale
3. Slowly kick up saying “Ah”

Oral inflation at surface (2 breaths).

“If you feel air deprivation or I signal you to stop, just resume normal breathing through your regulator.”

**Problems:** Improper hand/body position for swim.

Removing regulator from mouth.

Failure to make a continuous sound.

Exhales too fast and runs out of air too soon (no bubbles)

Swimming too fast/slow or lack of buoyancy control.

## **Compass Navigation (Underwater)**

Review again the components of a compass and their use. Give students a simple direction and reciprocal to navigate in confined water. This exercise is fun and gives them a great sense of achievement when they perform a satisfactory run. It also represents their first underwater “mission” and as they concentrate on it they will be performing their scuba skills naturally.

## **Skills Practice**

This is the student’s time to play and polish their skills in anticipation of open water. Watch out for bad habits and look for marginal students who may need more confined water work.

## **Exit**

By appropriate method, using buddies.

## **Check Air**

As in previous sessions

## **Disassemble Scuba System**

Rinse, dry and store.

## **Debriefing**

The students should be ready to go to open water dives by this time.

## **Complete Student Training Record for pool/confined water session Four (4)**

## **Log and Sign Dive Books**

# Open Water – Dive 1

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***Use Cue Card: 'OW1-Open Water 1'***

## ***Briefing***

Begin every open water dive with a thorough instructor briefing. Review computer use and make sure that your students have a clear picture of the dive environment and dive plan. Brief them on the skills they will perform following the open water presentation form format. Do not overly caution students at this point as they are already anxious and task loaded. Your students will be extremely attuned to your mood and attitude at this critical time and they want to be able to dive like you. At this point, they are learning more from watching you than listening to you - be relaxed, positive and show them how much you enjoy diving!

## ***Weights Adjustment and Mask Defog***

Emphasize the importance of balance and knowing how to drop diver and buddy's weight system.

## ***Scuba System Assembly***

Students should be fairly proficient at this by now but they are in a new setting and may be anxious. They will make the same simple mistakes (putting the regulator on backwards, etc.) as they made in confined water. Try to have fun with this (even instructors make simple mistakes) and take advantage of this opportunity to emphasize the value of buddies checking each other's equipment.

## ***Don Scuba System***

Buddy assistance during preparation reinforces the buddy system during the dive.

## **Review ABCDE's**

This is the last opportunity for a thorough recheck of the divers' and buddies' equipment.

## **Entry, Weights Check and Bubble Check**

Entry can be an anxiety-provoking event. Enter by the simplest method appropriate to the dive setting. Give everyone surface time to relax and get comfortable. Performing weight checks and buddy bubble checks helps keep divers minds on tasks and gives them a sense of self-control. It also reinforces the buddy system. Consider having students try no mask breathing on surface to get their faces used to the water for the breathing exercises. Remind them to signal you when their cylinder pressure reaches the minimum pressure limit you have established.

## **ORCESD (Holding on to Buoyed Line)**

Make sure everyone is really ready before you go down so you don't find yourself in the awkward situation of having some divers down on the line while others are still on the surface struggling with their equipment. The line is for control only - descend by buoyancy - no "pull downs".

## **Remove/Recover/Clear Regulator**

Use any combination of methods learned in confined water. Follow the format of the open water presentation form.

## **Mask Flood and Clear (Partial)**

Follow the format of the open water presentation form.

## **Fin Pivot (LPI)**

Follow the format of the open water presentation form.

## **Tour - Neutral Buoyancy**

Emphasize neutral buoyancy - for experience and underwater observation. This is their “reward” for many hours of study and practice - they’re finally diving! Try to orient the dive and site so there are a couple of interesting features to show them. If they like this dive, they’ll probably do well from here on out.

## **Controlled Ascent (On a Line)**

You should caution divers to use good buoyancy to achieve their ascent. The line is meant to be a reference and help them fine-tune their ascent. However, you should “give them permission” to hold on firmly if necessary to avoid an uncontrolled ascent.

## **Safety Stop**

If you want your students to accept the importance of safety stops, you must make sure that you and they make a safety stop on every training dive.

## **Exit (appropriate method)**

## **Debrief Dive**

Since this is their first open water dive they want to know how they did. Remember to evaluate their abilities in a positive manner. If they feel they’ve done well and had fun during the first open water dive they’ll be ready to come back again.

## **Complete Student Training Record for Open Water Session One (1)**

## **Log and Sign Dive Books**

Your students are learning by watching you - log your dive in your logbook and sign their logbooks.

## Open Water – Dive 2

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### *Use Cue Card: 'OW2-Open Water 2'*

#### ***Brief and Prepare for Dive***

Begin every open water dive with a thorough instructor briefing. Review computer use and be sure that your students have a clear picture of the dive environment and dive plan. Brief them on the skills they will perform following the open water presentation form format. Do not overly caution students at this point as they are already anxious and task loaded. Your students will be extremely attuned to your mood and attitude at this critical time and they want to be able to dive like you

#### ***Weight System/Mask Defog***

Stress key points again from open water session one.

#### ***Scuba Unit Assembly***

Students should be able to assemble their equipment without many problems by now. Keep an eye open for those who may be under some stress. Again, emphasize the value of buddies checking each other's equipment.

#### ***Don Scuba Unit***

Continue the importance of using the buddy system before during and after a dive.

#### ***Review ABCDE's***

Continue to stress checklists

## **Entry**

Use the appropriate entry for conditions. If possible, choose a different entry than was used in Open Dive 1 to expose the students to various entry methods during their open water dives.

## **ORCESD with Reference**

(To a Buoyed Line or Other Fixed Object)

Divers should look at but not hold onto the fixed reference. This adds a new layer of complexity and self-control. Be sure you “give them permission” to grab the line if they need to in order to control their descent.

## **Flood and Clear Mask**

Follow the format of the open water presentation form.

## **Alternate Air Assisted Ascent**

Rotate and repeat. Follow the format of the open water presentation form.

## **Tour - Neutral Buoyancy**

For experience and underwater observation, make it interesting!

## **Controlled Ascent with Reference**

You should caution divers to use good buoyancy to achieve their ascent. The line is meant to be a reference and help them fine-tune their ascent. However, you should “give them permission” to hold on firmly if necessary to avoid an uncontrolled ascent.

## **Safety Stop**

Safety Stop on every dive! We teach by doing.

### ***Tired Diver Tow***

This may be the last time they practice it before they need it!

### ***Exit (appropriate method)***

### ***Debrief Dive***

Debrief the dive.

### ***Complete Student Training Record for Open Water Session Two (2)***

### ***Log and Sign Dive Books***

Your students are learning by watching you - log your dive in your logbook and sign their logbooks.

# Open Water – Dive 3

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***Use Cue Card: 'OW3-Open Water 3'***

## ***Brief and Prepare for Dive***

Begin every open water dive with a thorough instructor briefing. Review computer use and be sure that your students have a clear picture of the dive environment and dive plan. Brief them on the skills they will perform following the open water presentation form format. Do not overly caution students at this point as they are already anxious and task loaded. Your students will be extremely attuned to your mood and attitude at this critical time and they want to be able to dive like you

## ***Weight System/Mask Defog***

As in previous sessions

## ***Scuba Unit Assembly***

As in previous sessions, allow them to assemble with their buddy. Watch for signs of stress.

## ***Don Scuba Unit***

As in previous sessions

## ***Review ABCDE's***

Reinforce checklists

## ***Entry***

As in previous sessions

## ***Weight System Removal and Replacement (Surface)***

When using a belt, watch for “right hand release” and equipment entanglement.



## ***Surface Navigation Run***

Use at least 3 points (i.e., a triangle)

## ***ORCESD without Reference (No Line To Hold On To Or Look At)***

This is their first open water “free descent”. Emphasize using other cues (bubbles, underwater objects, etc.) to gauge their rate and direction.

## ***Hover (LPI)***

Follow the format of the open water presentation form.

## ***Tour - Neutral Buoyancy***

Use the tour for experience and U/W observation. Learning to dive is fun! So is teaching.

## ***Controlled Swimming Ascent***

(With Instructor on a buoyed line)

Watch for anxiousness on the part of the student. Be sure to fully explain skill before they attempt it. Reiterate they must make the “ah” sound as they ascend.

## ***Safety Stop***

Safety Stop on every dive! We teach by doing.

## ***Exit (appropriate method)***

### ***Debrief Dive***

Use format on open water presentation form.

### ***Complete Student Training Record for Open Water Session Three (3)***

### ***Log and Sign Dive Books***

Your students are learning by watching you - log your dive in your logbook and sign their logbooks.

# Open Water – Dive 4

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***Use Cue Card: 'OW1-Open Water 4'***

## ***Brief and Prepare for Dive***

Begin every open water dive with a thorough instructor briefing. Review computer use and be sure that your students have a clear picture of the dive environment and dive plan. Brief them on the skills they will perform following the open water presentation form format. Do not overly caution students at this point as they are already anxious and task loaded. Your students will be extremely attuned to your mood and attitude at this critical time and they want to be able to dive like you.

## ***Weight System/Mask Defog***

As in previous sessions

## ***Scuba Unit Assembly***

By now they should be able to completely assemble the unit without problems.

## ***Don Scuba Unit***

Last chance to emphasize the buddy system before they become certified diver.

## ***Review ABCDE's***

Last chance stress the use of checklists

## ***Entry***

As in previous session use the most appropriate entry for conditions.

## ***BCD Removal and Replacement***

This exercise should only be performed on the surface in open water.

## ***ORCESD without Reference***

Hold line only in case of a problem. Make sure divers know the pros and cons between using a surface buoyed or bottom fixed line.

## ***Weight System Removal and Replacement (underwater)***

Watch for ascents due to no weight or students dropping the weight from the weight belt.

## ***Compass Run with Reciprocal***

Follow the format of the open water presentation form.

## ***Slate Tour***

Make notations of marine life to discuss with instructor. Now you're adding a new task by asking them to dive and make notes on their slates. This adds interest and builds confidence.

## ***Controlled Ascent***

You should caution divers to use good buoyancy to achieve their ascent. The line is meant to be a reference and help them fine-tune their ascent. However, you should "give them permission" to hold on firmly if necessary to avoid an uncontrolled ascent.

### ***Safety Stop***

Safety Stop on every dive! We teach by doing.

### ***Exit (appropriate method)***

### ***Debrief Dive***

Use format on open water presentation form.

### ***Complete Student Training Record for Open Water Session Four (4)***

### ***Log and Sign Dive Books***

This is a Big Signature to your students!

# Open Water Certification

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You can be justifiably proud of your students and yourself. You have taken a group of non-divers and turned them into certifiably safe and competent divers! Your students probably had different personality types and reasons for diving, and teaching conditions may have been less than ideal. In spite of these challenging circumstances, you exposed them to a carefully chosen package of core knowledge and skills. And you did it in a remarkably short amount of time. SDI is proud of you and your students will admire you for the rest of their diving careers.

## **Certification Ceremony**

Your students should be proud of themselves too, but simply being told they have passed and are certified can be notably anti-climactic. Completing the last dive and being certified should be the climax of the entire scuba course. Where logistics permit, try to hold a post-dive ceremony at the end of the course. This may be very casual and can even be carried out on the dive boat or at the dive shop, but you should “make a fuss” over their success. For example, consider giving them a “diploma” of some diving related artifact or make awards for fun categories like “best entry.” This serves as formal recognition of the newly certified divers’ accomplishment and allows relaxed camaraderie to replace the air of anxiety that may have been present in the class.

## **Orientation To Advanced And Technical Diving**

The certification ceremony embellishes your role as instructor and is an opportune time to encourage your new divers to sign up for their next training course. You can also tell them that they are now on the path that leads to even more adventure and excitement with, for example, Nitrox and technical diving. As your newly certified divers can see, there is a world of diving excitement waiting for the adventurous diver starting with SDI Open Water Scuba Diver and progressing through TDI’s technical courses.



## SDI – Open Water Referral Procedures

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### ***SDI Instructor to Any Active SDI Instructor - Procedure***

- A SDI Instructor sends a student that has completed the academic and confined water portion of the SDI Open Water Scuba Diver course to a second SDI Instructor to complete the open water requirements with a GLOBAL REFERRAL FORM.
- Once the student has completed the open water requirements, the SDI Open Water Scuba Diver Instructor signs off that the skills listed on the back of the referral form have been completed.
- The student takes the signed form back to the original SDI Confined Water Instructor to have their card issued.
- The SDI Open Water Scuba Diver Instructor fills out the SDI Student Registration Form with the names of both instructors and sends it to SDI Headquarters to have the certification card issued with both instructor names on the card. The SDI Instructor may also use the online registration system, or in-store card printing system if available.

### ***SDI Instructor to Any Active Instructor – Procedure***

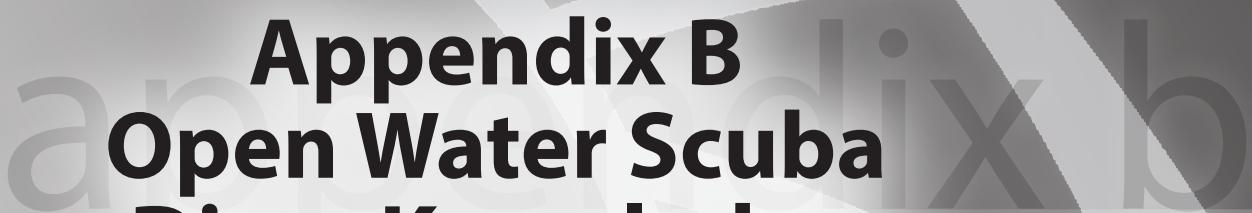
- A SDI Open Water Scuba Diver Instructor sends a student that has completed the academic and confined water portion of the open water course to any other active instructor from any dive training agency to complete the open water requirements with GLOBAL REFERRAL FORM.
- The open water instructor signs off that the skills listed on the back of the referral form have been completed.

- The student takes the signed form back to the original SDI Confined Water Instructor to have their card issued.
- The SDI Confined Water instructor fills out the SDI student registration form with the names of both instructors and sends it to SDI Headquarters to have the certification card issued with both instructor names on the card. The SDI Instructor may also use the online registration system, or in-store card printing system if available.

### ***Any Instructor to an Active SDI Instructor – Procedure***

- The SDI Instructor must teach the student how a personal dive computer works and have them wear a personal dive computer during the open water dives.
- The SDI Instructor **MUST** make sure the student completes all the skills required in the SDI Open Water Scuba Diver standards (a short list is found on the back of the GLOBAL REFERRAL FORM).
- Upon successful completion of the skills, the SDI Open Water Scuba Diver Instructor fills out and sends the SDI Student Registration form to SDI Headquarters to process the certification cards where both the confined and open water instructor name will appear on the card. The SDI Instructor may also use the online registration system, or in-store card printing system if available.
- SDI also requires the SDI Open Water Scuba Diver Instructor to make a copy of the referral letter that accompanied the student and file it with the student training record. SDI recommends that if a student comes with a Universal Referral Form, they not only issue a SDI certification card but also sign the Universal Referral form and give it back to the student so they may go back to their original instructor.





# **Appendix B**

## **Open Water Scuba Diver Knowledge Quest Answers**

# AppendixB– Open Water Scuba Diver Knowledge Quest Answers

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## Chapter 1: The Underwater Environment

### 1. What does SCUBA stand for?

- The Self-Contained Underwater Breathing Apparatus (S.C.U.B.A) gave a diver freedom to descend underwater without relying on an air umbilical to the surface.

### 2. List the two important changes that occurred in the 1950s.

- The publishing of dive tables in the 1957 U. S. Navy Diving Manual to allow for repetitive scuba dives.
- Manufacturers made dramatic improvements in both the design and workmanship of scuba equipment.
- Dive computers commercially available

### 3. Name three (3) different devices that modern dive computers replace.

Personal Dive Computers have made separate gauges to measure the following practically obsolete:

- Depth
- Time
- Pressure

#### **4. What sets Scuba Diving International apart from other training agencies?**

The properly equipped SDI student will use a personal dive computer (PDC) during all their in-water instruction and certification dives.

#### **5. How much closer do objects appear underwater and why?**

- When looking through a dive mask underwater everything appears larger than normal. This is because light bends as it enters the airspace between your eyes and the mask lens, magnifying objects by about twenty five percent (25%).
- Objects also appear about twenty five percent (25%) closer.
- You will also notice that you cannot see as far as you can above the water. Divers express visibility, how far they can see horizontally, in distance (e.g. feet).
- Available light, water turbidity, and distance are factors that influence how far a diver can see and how objects appear underwater.

#### **6. What is the first color to be absorbed underwater?**

Red objects appear brown starting at about 20 feet and green in much deeper water. The order that colors are absorbed is red, orange, yellow, green, blue, and violet, but the entire spectrum of color is gradually absorbed (gradually changing the colors) until all light energy is totally absorbed at depths beyond the range a scuba diver can dive.

**7. How much faster does sound move through water than air and why?**

- Sound travels fastest through dense mediums. Because water is about eight hundred (800) times denser than air, sound moves approximately four (4) times faster in water than in air.
- Sound moves so fast underwater that there is not enough time delay from one ear to the other for the human brain to determine the direction sound comes from. Not in the student information
- When you hear the crunching sound of a parrotfish feeding or your buddy tapping on their cylinder to get your attention, it will be difficult to tell exactly where the sound is coming from.

**8. When diving from shore, the best time to dive is when there is the least amount of tidal current \_\_\_\_\_ tide is when the water is neither rising nor falling and there is the least amount of tidal current.**

- The period of time between tides when there is no vertical movement of water is called a slack. This means the water level is neither rising nor falling, but there may still be horizontal motion or current.

**9. If you are caught in a rip current, first swim \_\_\_\_\_ to the current to get out of it before swimming towards shore.**

- If you are caught in a rip current, swim across it (or perpendicular) to get out, never against it.
- Or you can float and let it carry you out to where it dies out and then swim back to shore away from the rip.

**10. Waves are usually caused by \_\_\_\_\_.**

- Waves are a form of energy that is primarily generated by wind.

**11. Anticipate surge action to avoid contact with stationary objects.**

**True or False?**

- True. When swimming through an area with strong surge, kick when the force is pushing you in the direction you wish to go. Grab hold of a rock or stick your hand in the sand to prevent being pulled backward when the force opposes your heading. When diving a shallow water reef with many coral formations, surge can push you into an object you wish to avoid contact with. Under such conditions it is best to increase your distance from natural obstructions by either moving farther off to the side or into deeper water where the surge is weaker.

**12. What types of marine life cause most diving injuries?**

- Most marine life injuries amount to no more than a temporary, yet painful sting.

**13. What should you do if you see a potentially dangerous animal underwater and it does not leave the area?**

- If you see a shark, or any other potentially dangerous marine animal, remain still and calm.

**14. List three different reasons that it is advisable to check with your local dive center before conducting a dive in an area you are unfamiliar with.**

- Some areas are prone to rip currents. A rip current, or run-out, is a narrow flow of swiftly moving water running seaward from the shore.
- When deciding on the thermal protection, find out if the area you plan to dive at typically has thermoclines.
- Be advised that laws in some locations may prohibit certain diving activities, such as harvesting live shells, ornamental fish, food fish, and other game while using scuba equipment.

## Chapter 2: Physics and Physiology

### **1. What is the absolute pressure (in atmospheres/bars) at 20 metres / 66 fsw?**

- As a diver descends the pressure surrounding them increases. It increases at a rate equal to one (1) atmosphere or 14.7 psi every 10msw/33fsw or 10.3mfw/34ffw. Thus, at 10msw/33fsw the pressure is 2atm, at 20msw/66fsw it is 3atm, at 30msw/99fsw it is 4atm, at 40msw/132fsw it is 5atm, and so on.

### **2. What will be the volume in a balloon that is filled with two (2) liters/cubic feet. of air at 30 metres/ 99 fsw when it is taken to the surface?**

- If a balloon is filled with two (2) cubic feet of air at ninety (99) fsw, then it will be eight (8) cubic feet at the surface. The reason air volume decreases with increases in ambient pressure is because the air inside the balloon is being compressed.

### **3. How many more times dense is the air in a balloon at four (4) atm/bar compared to its density at the surface?**

- The pressure and volume relationship of Boyle's Law influences gas density. As air becomes compressed the gas molecules move closer together making the air denser. Air density increases in direct proportion with increases in ambient pressure. Therefore, the density of air in a balloon at 10msw/33fsw will be double what it is at the surface. If the balloon is taken down to a depth of 66fsw, the air inside will be three times as dense as its density at the surface, and at 30msw/99fsw (4ata) it will be four times as dense.

**4. If a scuba cylinder lasts two hours at sea level, how long will it last at 20 msw/66 fsw?**

- If it takes one (1) hour for a diver to breathe all the air from their cylinder at the surface (1 atmosphere), the same cylinder will last only 30 minutes at 10msw/33fsw, and will only last 20 minutes at twenty 20msw/66fsw, everything else being equal. Therefore, if the cylinder lasts two (2) hours at the surface it will last 40 minutes at 20msw/66fsw.

**5. How often should a scuba diver equalize during a descent?**

- To prevent injury, it is very important to perform an equalization maneuver at the surface just before beginning your descent and then every couple of feet before you feel any discomfort.

**6. What should you do if you experience discomfort in your ears upon descending?**

- If you experience discomfort or pain during descent, immediately stop descending and ascend a few decimeters/feet to a shallower depth where you no longer feel any discomfort.

**7. What is a reverse block?**

- A reverse block occurs when air cannot expand or escape freely upon ascending.

**8. What should you do if you experience a reverse block upon ascending?**

- Descend a couple of decimeters/feet to the depth where the discomfort goes away and remain there until the expanding air has time to vent, or as time and air supply permit.

**9. What is the most important rule in scuba diving?**

- Breathe continuously; never hold your breath.

**10. What is the most serious injury that a diver could suffer from if they hold their breath upon ascending?**

- The most serious consequences of violating Boyle's Law are lung over-expansion injuries.

**11. Which gas component in air causes decompression sickness and narcosis?**

- Nitrogen narcosis and decompression sickness are the two (2) most common problems associated with absorbing nitrogen.

**12. What medical problem can occur if a diver ascends much too rapidly for nitrogen to be slowly released?**

- Decompression Sickness

**13. List at least five (5) factors that can predispose a diver to decompression sickness.**

• If a scuba diver ascends too fast, the pressure change will be too rapid to permit the slow release of dissolved nitrogen from the tissues into the blood stream. Instead it may come out of solution in the form of bubbles and block blood flow. This physiological problem is called decompression sickness (DCS). The list includes:

- |                         |   |  |
|-------------------------|---|--|
| • Obesity               | • Ingestion of drugs                            | • Chilling during the dive   |
| • Older age             | • Bounce dives or saw-tooth profiles            | • Ascending to altitude too soon after diving by driving into the mountains or flying. |
| • Illness               | • Performing deeper dives after shallower dives |  |
| • Past/present injuries | • Over exertion during or soon after a dive     |  |
| • Prior history of DCS  |   |  |
| • Fatigue               |   |  |
| • Dehydration           |   |  |
| • Smoke inhalation      |   |  |

**14. Describe the symptoms of DCS, including mild to severe signs and symptoms.**

- A diver may have a rash if bubbles occur in the capillaries near the skin.
- Joint pain is the most common symptom because bubbles typically coalesce and collect in and around joints, causing the joint to bend, hence the nickname, “bends.”
- Difficulty inhaling and/or a frequent dry non-productive cough may indicate the diver’s lungs are affected.
- A loss of sensation, loss of bladder or bowel control, or paralysis may occur if bubbles form in the spinal cord or other areas of the peripheral nervous system.
- Dizziness, numbness, tingling, paralysis, temporary blindness, and unconsciousness can occur if bubbles go to the brain or affect the central nervous system.
- Severe decompression sickness can result in permanent disability or death.

**15. What is the depth threshold where most scuba divers generally begin to be affected by nitrogen narcosis?**

Most divers are not affected until a depth of thirty 30msw/100fsw and greater, so narcosis should not be a problem for beginning scuba divers whose certification limits them to a maximum depth of eighteen 18msw/60fsw.

**16. List two possible ways a diver may feel if they become affected by Nitrogen Narcosis.**

A diver experiencing nitrogen narcosis may feel euphoric or anxious. In either case, their ability to think clearly and act appropriately will be diminished if not completely compromised. What is worse is that they may not perceive themselves to be impaired and this is likely to endanger them and their dive partner depending on the circumstances.

**17. What should a diver do to alleviate the symptoms of nitrogen narcosis?**

If you feel strange or believe you are “narked”, simply ascend normally until you no longer feel the effects. You may only have to ascend a half a meter/few feet, but how much you have to ascend will depend on your personal tolerance or susceptibility, which can vary from day to day.

**18. Which gas causes extreme headache and nausea, and in high enough concentrations causes unconsciousness and the lips and fingernail beds to turn bright red?**

Bright red lips and finger nail beds are indications of exceptionally high CO (Carbon Monoxide) levels and pending unconsciousness.

**19. What may indicate the air in a scuba cylinder is harmful to consume?**

The air has an odor or taste to it. Do not use air that has an odor or taste.

**20. What should you do if you suddenly feel sick during a scuba dive?**

If you ever begin to feel ill at depth, immediately abort the dive by making a controlled ascent to the surface. Breathe fresh air or oxygen if it is available. The symptoms should clear up, but if they do not, seek medical attention.

## Chapter 3: Scuba Equipment

### 1. How do you know if a mask fits correctly?

Place the mask on your face without using the mask strap. Be sure you do not have any hair under the skirt. Inhale through your nose to create suction and then hold your breath. The mask fits if it tightens against your face and does not fall off. The mask does not fit if you must continue to inhale to keep it on or air leaks in under the skirt.

### 2. What is the main purpose of a snorkel?

Using a snorkel allows a diver to conserve air from their scuba cylinder while swimming at the surface.

### 3. Name at least one (1) visual and one (1) audible rescue signaling device.

Every scuba diver needs to carry at least one (1) signaling device for use at the surface.

- A yellow or red colored inflatable device, such as a narrow tube or lift bag, is preferable visual signals.
- Audible signals are also useful. A whistle or air horn make very loud sounds that will attract the attention of boats or divers on the surface.

### 4. Name two (2) basic fin designs and describe the main features of each.

- A full-foot fin encloses your entire foot inside the foot pocket, just as a typical shoe does.
- An open-heel fin has a foot-pocket that is open in the heel area

**5. What is the main difference between a wet suit and a dry suit?**

- A wet suit is necessary for colder conditions and for long dives.
- A dry suit becomes mandatory when water temperatures are about 10°C/50°F and below.

**6. What extra attire can enhance a diver's warmth when worn with a wet or dry suit?**

You can increase thermal protection by wearing a neoprene cap, hood and/or gloves.

**7. Name two (2) functions of wet suit boots.**

Feet are another area that requires protection from both (1) heat loss and (2) incidental injury when not wearing fins. Wet suit boots provide both.

**8. List four (4) functions of a dive computer.**

- Depth
- Dive Time
- Ascent Rate
- No-Decompression timer / No-Stop time
- Required Decompression
- Surface Interval Timer
- Time to Fly
- Logbook.

**9. Define maximum dive depth.**

- Maximum Depth is the deepest point reached during the dive.

**10. Define no-stop time.**

The no-stop time is the amount of time that is remaining, at any point during a dive, before a diver is incurring a mandatory decompression stop.

**11. What are two (2) ways a PDC may alert a diver that he is ascending too fast?**

Most PDCs display visual warnings when a diver ascends too fast, but they may also have an audible alarm to alert the diver to slow down.

**12. How do you determine the time limit for a repetitive dive from a PDC?**

When the dive computer is in the Surface Mode (or Plan Mode depending on the Computer model), the display will scroll through a range of depths (in even three (3) meter/ten (10) feet increments) showing the no-stop time limit or the adjusted no-stop time limit for repetitive dive depths based on the credit derived from the surface interval time.

**13. What are the two (2) main modes of operation of a dive computer?**

A personal dive computer has (at least) two (2) distinct modes of operation that you will use to regulate your dive:

- Surface mode
- Dive mode.

**14. What are two (2) types of weight systems?**

There are two (2) different types of weight systems that are defined by how the diver carries the weight.

- Weight-belt
- Weight-integrated.

**15. What are the two (2) types of dive flags that are commonly flown from a dive boat?**

There are two (2) types of dive flags, one (1) for diving from a boat that is restricted in its ability to maneuver and one (1) for conducting dives from shore.

- The international flag is a rigid replica of the white and blue Alpha flag. Must be flown from a dive boat.
- The diver down flag is a rectangular red flag with a white diagonal stripe from the top left to the bottom right

**16. Describe the function of a scuba regulator first-stage and second-stage.**

A scuba regulator delivers breathing gas from a compressed gas cylinder to a diver on demand.

**17. A cylinder should be visually inspected at least \_\_\_\_\_ a year and hydrostatically tested every \_\_\_\_\_ years in the United States.**

- Currently it is standard practice for scuba cylinders to receive a visual inspection at least once a year.
- A scuba cylinder must be hydrostatically tested every five (5) years at a certified testing facility.

**18. List three (3) components of a compass?**

- An analog compass consists of a plastic housing filled with oil and a free spinning needle (or card) that points to the north.
- It also has a lubber line that is a stationary line of reference that is used to align with the centerline of the diver's body.
- Some compasses may have index marks on a rotating bezel which, when aligned with the needle, help keep the diver traveling in the desired direction.

**19. What does the abbreviation BCD stands for?**

To support their scuba cylinder and to give them the capability to float, sink, or maintain a constant depth in the water, a diver wears a Buoyancy Compensator Device.

**20. State the gauges that a console might hold.**

A three (3) gauge console would have:

- A Submersible Pressure Gauge (SPG),
- A Depth Gauge
- A Compass.

## Chapter 4: Skills Development

### 1. Describe all the steps to assemble a BCD and regulator to a scuba cylinder.

- Step 1: Before attaching your BCD to a cylinder, be sure the cylinder band(s) is threaded through the CAM buckle(s) correctly.
- Step 2: With the valve orifice facing you, place the BCD band(s) over the top of the cylinder so that the front of the BCD is facing you and the top of the neck is at least the same height as the cylinder valve.
- Step 3: Position the band so that it is perpendicular to the cylinder band or pressing your knee against it. Then push the buckle until it closes flat against the cylinder band.
- Step 4: If there is a second cylinder band, follow these same steps, but always secure the top band before securing the bottom to make sure the BCD height and alignment is correct.
- Step 5: Stand behind the cylinder so that it is in front of your legs and you are facing the same direction as the BCD as if you were wearing it.
- This simple tactic is an easy way to avoid confusion when connecting the first-stage to the valve outlet and determining the correct sides the hoses go on.
- Step 6: Loosen and remove the dust cap from the first-stage air inlet.
- Step 7: Hold the first-stage in your left hand and the second-stage hoses in your right hand. Mate the first-stage air inlet to the valve outlet. The first-stage body should be between the valve and the back of the D. Screw the yoke attachment knob clockwise until it is snug or tightened with your thumb and two fingers.
- Step 8: Connect the Low Power Inflator on the BCD.
- Step 9: Open for the air and listen for any leaks.

**2. How should you go about checking that your BCD is attached securely to your cylinder?**

To check that your BCD is secured around the cylinder, push downward on the buckle and on the top of the BCD directly opposite of the buckle. Alternatively, pick up on the buckle and the top of the BCD. If the BCD slips or if the buckle moves, retighten the cylinder bands.

**3. What is the purpose of streamlining your hoses and accessories?**

During a dive it is a good idea to have your hoses and gauges close to your body for easy access, to avoid entanglement, and to prevent damaging delicate aquatic life.

**4. Describe from start to finish the steps to disassemble your scuba system.**

- Step 1: Turn the cylinder valve knob completely clockwise to close the valve to turn the air off. Unless the BCD is positioned on the cylinder differently than described in the assembly section, the on/off knob will always be on the right side, coinciding with the right side of the BCD, and the knob for the first-stage yoke will be directly behind the valve and the BCD.
- Step 2: Depress one of the second-stage purge buttons or the auto-inflator button to vent air that is remaining in the hoses.
- Step 3: Detach the LP hose from the inflator

**5. Describe two (2) important features of a weight system.**

- Must have a quick release mechanism
- Must have evenly dispersed lead.

**6. What should you do anytime the second-stage is out of your mouth?**

Exhale tiny bubbles because you should never hold your breath.

**7. Describe two (2) ways to clear a flooded second-stage.**

- To mechanically purge the second-stage, place the mouthpiece in your mouth, block the mouthpiece opening with your tongue or place your tongue against the roof of your mouth and press the purge button.
- To orally purge the second-stage, you supply the airflow by exhaling into the mouthpiece until the water is removed.

**8. What is the hand signal for out-of-air?**

Hand across throat (Refer to the hand signal chart.)

**9. The thumbs up signal means OK. True or False?**

False. Refer to the hand signal chart.

**10. Describe two (2) different ways to indicate OK.**

- Circle with Fingers
- Hand on Head.

**11. Describe how to perform a giant stride entry off a boat.**

- Stand on the dive platform with your feet at the edge (and the blades of your fins protruding off the platform).
- Hold your mask, regulator, and hoses as described in the back-roll entry.
- Stand straight and look directly ahead
- Step out with one leg while pointing its fin tip up.

**12. Name four (4) different water entries.**

- Controlled seated entry is an easy way to enter calm water from a low platform
- Back roll entry is the most common water entry from a small boat that does not have a large dive platform.
- Giant stride entry is probably the most common deep-water entry, especially from large dive boats. It can be conducted from a low or high platform and in practically any sea state.
- Shore entry is appropriate when diving in a confined area that has a gradual slopping bottom.

**13. Describe the two (2) unassisted emergency out-of-air ascents.**

The two types of unassisted emergency ascents are

- Swimming Ascent
- Buoyant Ascent.

**14. How do you vent air from a BCD?**

To vent your BCD, hold the end of the BCD deflator over your head (if you are vertical). The deflator orifice (exhaust-valve outlet) must be higher than the BCD bladder to enable all the air to escape while you depress the deflator button.

**15. A properly weighted scuba diver should float at \_\_\_\_\_ when his BCD is deflated and lungs are fully inflated.**

You should float at eye level when your BCD is deflated but your lungs are fully inflated.

### **16. How do you relieve a leg cramp?**

To relieve a leg cramp, stop swimming and bend forward at the waist to grasp the fin tip of the afflicted leg. Pull it toward you as hard as you can as you straighten your leg. Maintain this position until the pain is relieved or repeat this procedure between momentary rest intervals.

### **17. What is the reciprocal of a two hundred degree ( $200^\circ$ ) heading?**

To determine the reciprocal heading (for a straight line), add one hundred eighty degrees ( $180^\circ$ ) to a bearing that is less than one hundred eighty degrees ( $180^\circ$ ), but subtract one hundred eighty degrees ( $180^\circ$ ) from a bearing that is greater than one hundred eighty degrees ( $180^\circ$ ). So to get the reciprocal of a two hundred degree ( $200^\circ$ ), subtract one hundred eighty degrees ( $180^\circ$ ) and the answer is  $20^\circ$ .

## **Chapter 5: Planning Your Dive**

### **1. Define Risk Management.**

It is a means of preventing problems and planning a response to any emergency that arises.

### **2. Why should you avoid consuming drugs or alcohol prior to a dive?**

Consuming drugs or alcohol prior to diving greatly increases your risk of decompression sickness. It also impairs your judgment.

### **3. What elements should you and your buddy agree on before the dive?**

You and your buddy should:

- Familiarize yourselves with each other's equipment.
- Formulate your dive plan together.
- Go over the objectives of the dive.
- Review underwater communications.
- Review out-of-air emergency plan.

**4. Describe what to do if you and your buddy become separated during a dive.**

Buddies must employ the same search procedure.

- Look around for three (3) minutes.
- Then ascend a half a meter / few feet to look for rising bubbles.
- Rap on your cylinder and listen for a reply.
- If you are reunited underwater, check each other's air supplies and remaining no-stop time to decide how to continue.
- If you do not find your buddy after three (3) minutes, do a normal ascent to the surface and wait there until your buddy ascends.

**5. When planning a repetitive dive, the \_\_\_\_\_ dive should be made first.**

Deepest.

**6. Describe the procedure recommended for a safety stop.**

A safety stop should be conducted between three (3) and six (6) msw/ ten (10) and twenty (20) fsw for three (3) to five (5) minutes before coming up to the surface. It is recommended on any dive under and mandatory for dives over thirty (30) msw/one hundred (100) fsw.

## **7. Describe what to do if you exceed the no-deco time registered on your computer.**

Most modern computers will give an audible and /or visual alarm if you enter decompression. The computer will display each decompression stop depth and time. If this happens,

- Ascend at a normal rate and stop at the first decompression depth.
- Stay at the depth for the time required.
- Once the mandatory time at this stop has elapses, the computer will display the next shallower depth and time required.
- Perform all stops until the computer clears you to ascend to the surface.

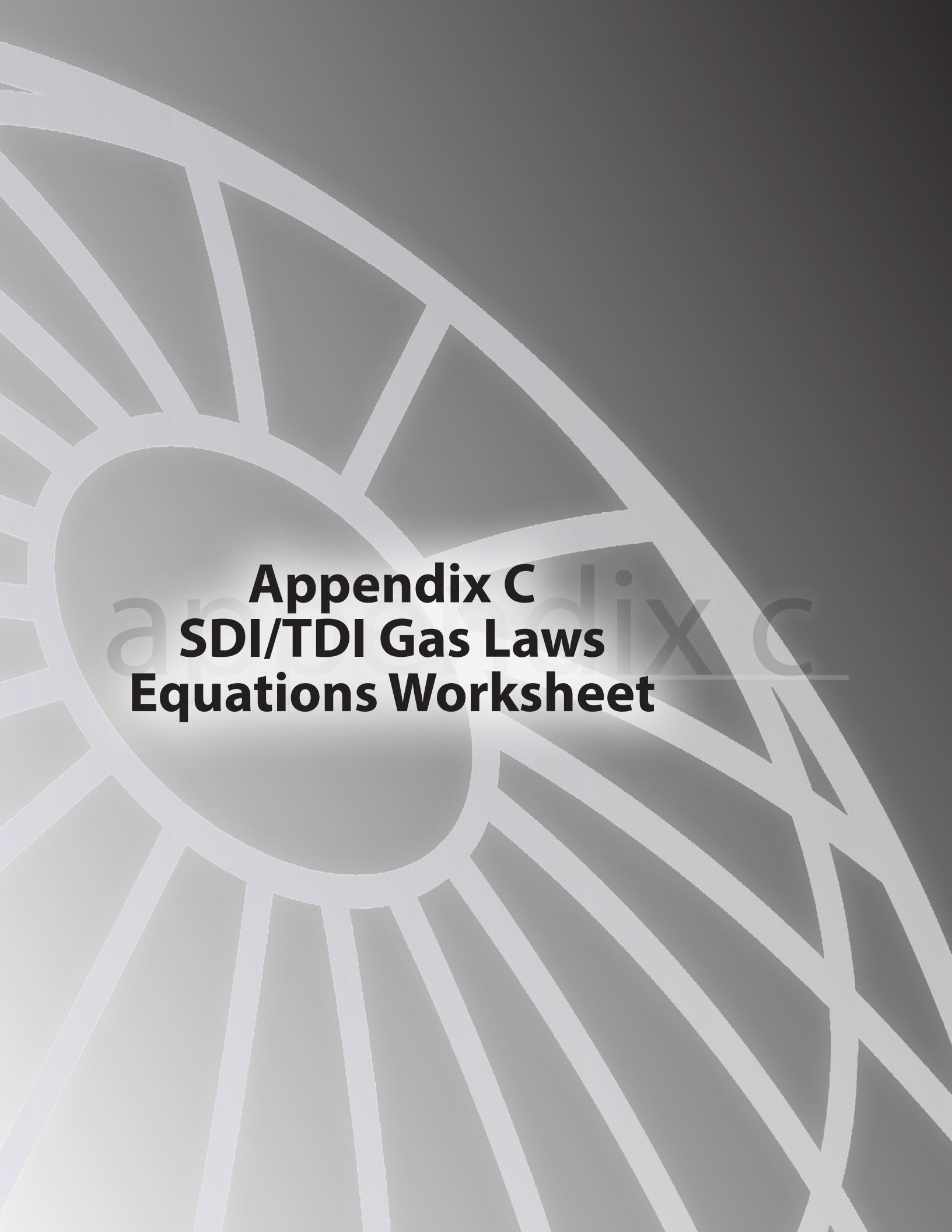
## **8. What should you do if you become entangled underwater?**

Do not struggle to free yourself. Figure out how to get untangled or carefully use your knife to cut the line away or get your buddy to help.

## **9. What is the emergency procedure for suspected decompression sickness?**

- Move the afflicted diver out of danger.
- Activate the Emergency Medical System (EMS).
- Monitor life support signs (pulse and respiration) and provide CPR if necessary.
- Provide one hundred percent (100%) O<sub>2</sub>.
- Contact Divers Alert Network (DAN).





# **Appendix C**

## **SDI/TDI Gas Laws**

### **Equations Worksheet**





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## SDI/TDI Gas Laws Equations Worksheet

The following abbreviations appear within the formulas on this document:

- "P" for Pressure
- "D" for Depth
- "T" for Temperature
- "V" for Volume
- "°C" for Degrees Celsius (or Centigrade)
- "°F" for Degrees Fahrenheit
- Subscript "1" for a Starting Value
- Subscript "2" for an Ending Value
- "msw" for Metres of Seawater
- "mfw" for Metres of Freshwater
- "fsw" for Feet of Seawater
- "ffw" for Feet of Freshwater

### Buoyancy Calculations

#### Buoyancy Characteristics of an Object

##### **Metric:**

Buoyancy = weight of object - [ (litres displaced) x (kg per litre of water) ]

##### **Imperial:**

Buoyancy = weight of object - [ (cu ft displaced) x (lbs per cu ft of water) ]

#### Offsetting Negative Buoyancy

##### **Metric:**

litres required = [kg of negative buoyancy] / [kg per litre of water]

##### **Imperial:**

cu ft required = [lbs of negative buoyancy] / [lbs per cu ft of water]

### Pressure and Depth Conversions

#### Gauge Pressure

##### **psi to bar:**

bar = psi / 14.7

##### **bar to psi:**

psi = bar x 14.7

#### Depth

##### **Imperial to Metric:**

metres = feet / 3.3

##### **Metric to Imperial:**

feet = metres x 3.3

#### Depth-to-Pressure (Freshwater)

##### **Metric:**

P = [D / 10.3] + 1 or P = [D + 10.3] / 10.3

##### **Imperial:**

P = [D / 34] + 1 or P = [D + 34] / 34

#### Pressure-to-Depth (Freshwater)

##### **Metric:**

D = [P - 1] x 10.3 or D = [P x 10.3] - 10.3

##### **Imperial:**

D = [P - 1] x 34 or D = [P x 34] - 34

#### Depth-to-Pressure (Seawater)

##### **Metric:**

P = [D / 10] + 1 or P = [D + 10] / 10

##### **Imperial:**

P = [D / 33] + 1 or P = [D x 33] / 33

#### Pressure-to-Depth (Seawater)

##### **Metric:**

D = [P - 1] x 10 or D = [P x 10] - 10

##### **Imperial:**

D = [P - 1] x 33 or D = [P x 33] - 33

#### Depth Seawater-to-Freshwater

##### **Metric:**

mfw = msw x 1.03

##### **Imperial:**

ffw = fsw x 1.03

#### Depth Freshwater-to-Seawater

##### **Metric:**

msw = mfw / 1.03

##### **Imperial:**

fsw = ffw / 1.03





# International Training

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## SDI/TDI Gas Laws Equations Worksheet

### Pressure and Volume Calculations

#### Calculating Volume Following Change in Pressure

**Metric and Imperial:**  
 $V_2 = [P_1 \times V_1] / P_2$

#### Calculating Pressure Following Change in Volume

**Metric and Imperial:**  
 $P_2 = [P_1 \times V_1] / V_2$

#### Calculating Gas Consumption Time Based on Known Consumption at a Specific Depth

**Metric and Imperial:**  
 $\text{minutes}_2 = [P_1 \times \text{minutes}_1] / P_2$

#### Calculating Depth at which a Gas Supply will Last Based on Known Consumption at a Specific Depth

**Metric and Imperial:**  
 $P_2 = [P_1 \times \text{minutes}_1] / \text{minutes}_2$

#### Calculating Relative Change in Ambient Pressure

**Metric and Imperial:**  
 $\text{relative change} = P_2 / P_1$

### Temperature, Volume and Pressure Calculations

#### Calculating Volume Following Change in Temperature

**Metric:**  
 $V_2 = (C_2 + 273) \times [V_1 / (C_1 + 273)]$

**Imperial:**  
 $V_2 = (F_2 + 460) \times [V_1 / (F_1 + 460)]$

#### Quick Estimates for Temperature and Pressure

**Metric:**  
 $1^\circ\text{C} = 0.6 \text{ bar}$

**Imperial:**  
 $1^\circ\text{F} = 5 \text{ psi}$

#### Combined Gas Law

**Metric and Imperial:**  
 $(P_1 \times V_1) / T_1 = (P_2 \times V_2) / T_2$

#### Ideal Gas Law

**Metric and Imperial:**  
 $P \times V = (n \times R) \times T \text{ or } PV = nRT$

### Partial Pressure Calculations

#### Calculating PO2 and PN2

**Metric and Imperial:**  
 $PO_2 = P \times F_{O_2} \text{ and } PN_2 = P \times F_{N_2}$

#### Calculating Max Depth of a Nitrox Mixture that does not Exceed a Specified PO2

**Metric and Imperial:**  
 $P = PO_2 / F_{O_2}$

#### Calculating FO2 and FN2

**Metric and Imperial:**  
 $F_{O_2} = PO_2 / P \text{ and } F_{N_2} = PN_2 / P$

#### Equivalent Air Depth

**Metric:**  
 $EAD = [(FN_2 / 0.79) \times (D + 10)] - 10$

**Imperial:**  
 $EAD = [(FN_2 / 0.79) \times (D + 33)] - 33$

