PEOPLE UNDER BOARD
Lab Questions

Mrs. Butler
OC_ScubaLab.doc

Define these key words using the content in the **ATTACHED NARATIVE**.

Air emboli	Decompression sickness	Pressure	Asphyxia
Gills	SCUBA	Atmosphere	Narcotic
Bends	Stage Decompression	Nitrogen	Stupor
Symptoms	Caisson's Disease	Oxygen	Convulsions
Dr. J. S. Haldane	Nitrogen Narcosis		

Answer these questions using the **ATTACHED NARATIVE**
Answer using your own words in complete sentences. **DO NOT PLAGIARIZE**

1. At what depth do scuba divers become useless?

2. Why is there a problem with the nitrogen – oxygen balance under the ocean?
   What are the normal percentages of oxygen and nitrogen in humans?

3. Name three effects of Nitrogen narcosis.

4. Tunnel workers experienced "Caisson's disease".
   Name two of the symptoms they displayed.

5. List the numerous problems that Nitrogen bubbles in the body can cause. (LIST ALL)

6. At 130 feet depth a scuba diver may stay _____ minutes without decompressing.

7. Two major problems people must overcome to adapt to live in the sea are.

8. Design a system to allow humans to live within and under the sea.
   Give this some thought.
   Draw and color a diving vessel, Undersea city, or a Network of pressurized zones to give people the freedom to live and to explore the oceans.

PEOPLE UNDERBOARD!

What happens to people when they enter the world of water? Do their cells adjust to the changes of pressure? Let's take a look. and see. The average scuba diver becomes useless at about 250 feet of depth. (They Often become worse than useless, They become a hazard,) This Is a far cry from the 11,500 foot depth at which we find the angler fish fishing What happens to people as they descend into the DEPTHS OF THE OCEAN?

We need oxygen to survive. Oxygen makes up about 21% of the air we breathe. About 78% of the air we breathe is nitrogen gas. Nitrogen Is relatively Inert and is more or less chemically inactive, The oxygen and nitrogen are carried in the blood stream. At sea level, the nitrogen presents no problem for people, but what happens to these gases as we descend into the Ocean's depths?
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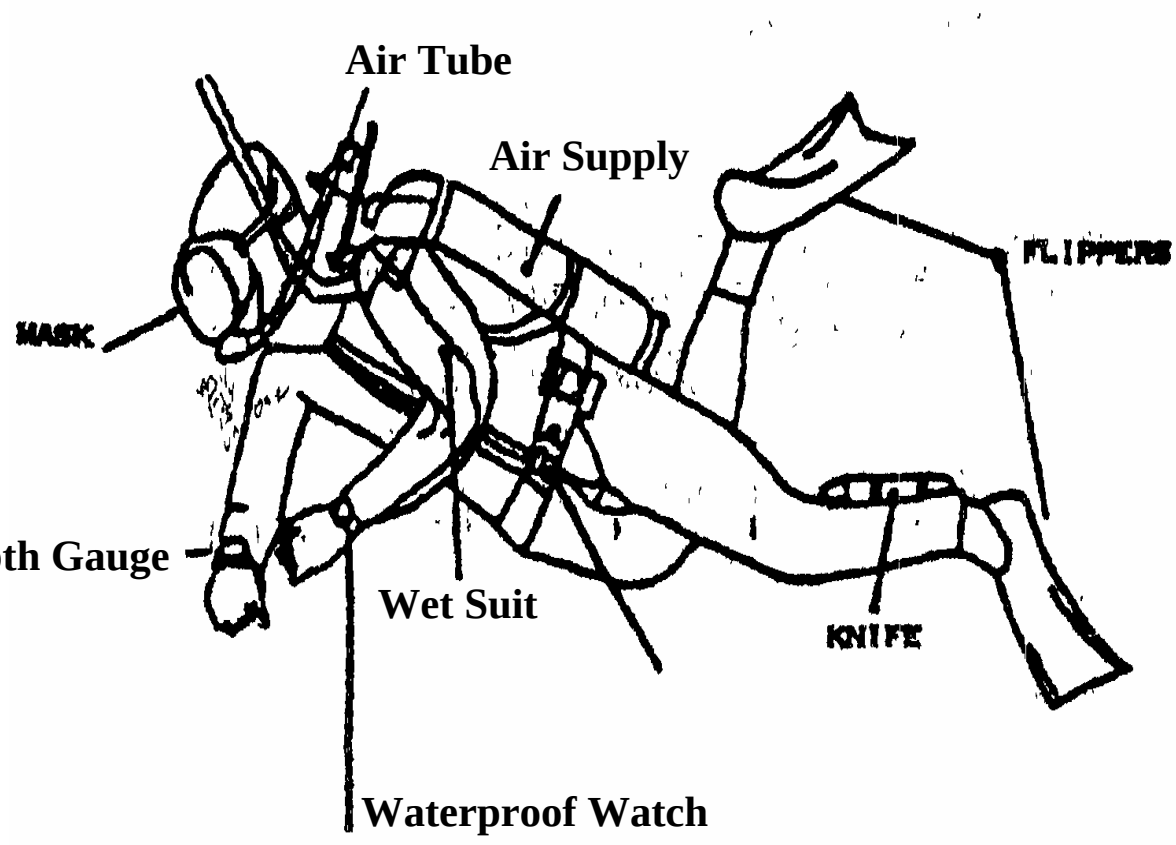
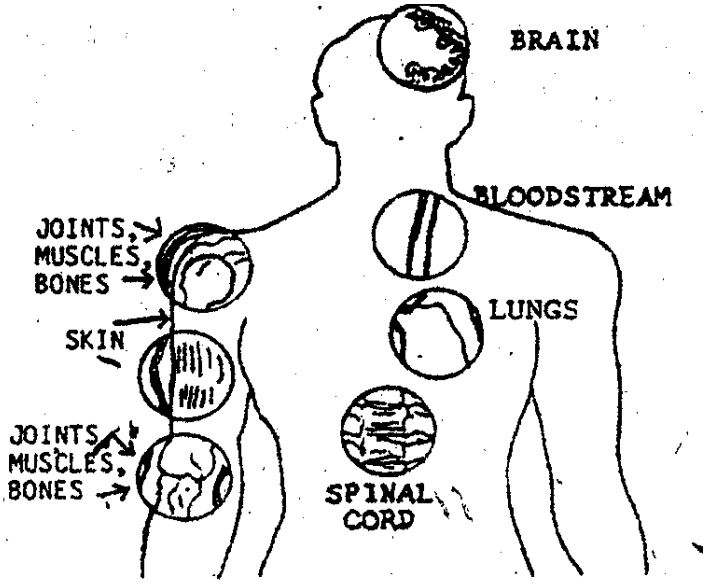


The increased pressure allows more oxygen and more nitrogen to dissolve into the blood. A strange thing now happens. At about 100 feet, the pressure will cause enough nitrogen to dissolve in the blood for the nitrogen to become a dangerous drug, a narcotic. *Nitrogen narcosis* eventually results in stupor and sleep (not a good condition 100 feet below the surface). Before the stupor stage, divers become dizzy; their ability to make simple mental decisions (like tell time) is reduced. Sometimes they decide they no longer need to breathe through their mouthpiece.

The precise symptoms (and the depths at which the symptoms appear vary with each individual and with each dive. Diving below 100 feet requires special skills and is dangerous. Returning to the surface reduces the nitrogen content and reduces the symptoms.

Nitrogen narcosis is not the only problem human divers face. Interestingly enough, the second major danger faced by divers was not discovered beneath the water's surface. The 19th century was a period of rapid industrial expansion. Roads were needed to carry manufactured goods. Some of these roads needed to cross rivers. In some cases, engineers decided going under the river was better than building a bridge over it. As the tunnel builders worked, the tunnels were pressurized to keep the water in the river from flowing into the work areas. At the end of the day's work, the workers developed pain in their joints. Some became paralyzed, Their symptoms were given the name "caisson disease" (A caisson is a watertight enclosure inside which people can do construction work underwater.)

The symptoms were recognized, and the disease had a name. The causes, however, remained a mystery. In 1907, Dr. J. S. Haldane discovered a way to prevent the disease. By placing the sufferer in a pressurized room and gradually reducing the pressure, the disease did not occur. Now a way to prevent the disease was known, but the cause was still uncertain.



Maybe we should open some champagne to celebrate the cure? Pop! Out flies the cork. "Eureka, I have it! The cause of the disease! The cork flies out because the gas in the champagne bottle is under pressure. The pressure is released and the gas in the champagne bubbles out. The nitrogen in the blood stream is also under pressure. A quick rise to the surface is just like popping the cork. The pressure is released and the nitrogen in the bloodstream forms bubbles. "Carbonated blood" affects the whole body. Bubbles in the brain tissue can cause blindness, dizziness, paralysis, unconsciousness, and convulsions. Extreme pain is experienced in the joints and muscles as the bubbles form. The bubbles can cause *air emboli* which block the circulation. Bubbles in the spinal cord can cause paralysis of legs and arms. Asphyxia (lack of oxygen) and choking are signs of bubbles in the lungs. Severe cases can result in death.

Caisson disease is now also called decompression sickness or the beads. Divers can avoid the disease by limiting the time and depth of their dives. Coming, to the surface in stages (stage decompression) with a pause at each stage allows the nitrogen to diffuse out of the blood. The length of time a diver can stay at a certain depth without stage decompressing decreases with depth.

Depth (Feet)	No-Decompression Limits (minutes)
10	
15	
20	
25	
30	
35	310
40	200
50	100
60	60
70	50
80	40
90	30
100	25
110	20
120	15
130	10
140	10
150	5
160	5
170	5
180	5
190	5

We differ from fish and most other aquatic animals in that we breathe using lungs rather than gills. Even so, aquatic animals including whales and other diving mammals must deal with the problems of dissolved gases. The aquatic animals have evolved mechanisms to handle these problems that we face. People are not yet able to be totally at home in the marine environment.