ADCI Supervisor's Certification Examination

Diving Formula Worksheet

PSIG to PSIA

PSIA = PSIG + 14.7
Round up to the next whole number

PSIA to PSIG

PSIG = PSIA – 14.7
Round up to the next whole number

Depth (fsw) to PSIG

PSIG = Depth x .445
Round up to next whole number

PSIG to Depth (fsw)

Depth = PSIG divided by .445
Round up to next whole number

PSIG to Atmospheres Absolute (ATA)

$$\text{ATA} = \frac{(\text{PSIG} + 14.7)}{14.7}$$

Carry two decimal places

Atmospheres Absolute (ATA) to PSIG

(ATA – 1) x 14.7 = PSIG

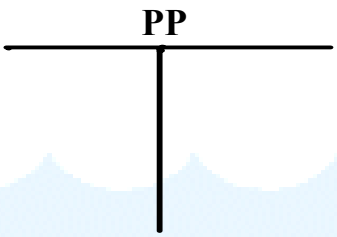
Depth (fsw) to Atmospheres Absolute (ATA)

$$\text{ATA} = \frac{\text{Depth} + 33}{33}$$

Carry two decimal places

ATA to Depth (fsw)
ATA – 1 x 33 = Depth (fsw)
Round up to next whole number

DALTON'S LAW ("T" Formula)



PP = Partial Pressure
% = Percent by Volume of the identified gas
ATA = Atmospheres Absolute

GAY-LUSSAC'S LAW

$$P2 = \frac{P1 \times T2}{T1}$$

Volume is constant
T1 = Initial Temperature (absolute)
T2 = Final Temperature (absolute)
P1 = Initial Pressure (absolute)
P2 = Final Pressure (absolute)

CHARLES' LAW

$$V2 = \frac{P1 \times T2}{T1}$$

Pressure is constant
T1 = Initial Temperature (absolute)
T2 = Final Temperature (absolute)
P1 = Initial Pressure (absolute)
P2 = Final Pressure (absolute)

Boyles Law (Pressure/Volume Relationship)

$$\frac{DL + 33}{DA + 33} \times OV = NV$$

DL= Depth Left
DA = Depth Arrived
OV = Original Volume
NV = New Volume

Henry's Law
(The Law of Gas Absorption and Solubility) EXPLANATION:

- **"The amount of any given gas that will dissolve in a liquid at a given temperature is directly proportional to the partial pressure of that gas."**
- **Gas diffuses and dissolves in blood, because of the difference in partial pressure, between inhaled and exhaled air.**
- **The inert gas in the breathing media, (nitrogen or helium), will be dissolved into the diver's body tissues as he is descending and during the time spent on bottom.**
- **Whatever gases that has been dissolved in a diver's body tissues, at a given depth and pressure, will remain in the tissues, as long as the depth is maintained. As the diver starts to ascend, more and more of the dissolved gas will come out of his tissues. If his ascent is controlled, as through the use of the decompression table, the dissolved gas will be carried to the lungs and exhaled, before it accumulates sufficiently to form significant bubbles in the blood or tissues.**

General Gas Law (Pressure/Volume/Temperature Relationship)

(P1 x V1) ÷ T1 = (P2 x V2) ÷ T2

Degrees Fahrenheit to Rankine

R° = F° + 460°

Degrees Celsius to Absolute

C° + 273° = Degrees Kelvin

Degrees Fahrenheit to Celsius

5 x (F° – 32°) ÷9 = Celsius (carry 1 decimal place)

Degrees Celsius to Fahrenheit

(9 x C°) ÷ 5 = 32° = Fahrenheit (carry 1 decimal place)

Gas Volume Requirement Formula If Using an LP Compressor

SCFM = ATA x ACFM x N

Gas Volume Requirement Formula If Using an HP Gas Bank

SCF = ATA x ACFM x N x T

SCFM = Standard Cubic Feet per Minute
SCF = Standard Cubic Feet
ATA = Atmospheres Absolute
ACFM = Actual Cubic Feet Per Minute
N = Number of Divers
T = Time (Always expressed in minutes)

Minimum Manifold Pressure

MMP = D x .445 + Over Bottom Pressure
(OBP is established by company or a set standard used)
Round up to next whole number

Gas Consumption

Free-Flow Type Hat(Desco, MK V)	**4.5 ACFM**
Demand Type Hat(Superlite/Miller)	**1.4 ACFM**
Built-in-Breathing System(BIBS)	**0.3 ACFM**

Treatment Gas Mixtures (O2/HeO2/N2O2)

Depth (fsw)	Gas Mixture	PPO2
0 – 60 fsw	100 % O2	1.00 – 2.81 ATA
61 – 165 fsw	50/50% HeO2 or N2O2	1.42 – 3.00 ATA
166 – 225 fsw	64/36% HeO2	2.17 – 2.80 ATA

Calculating In-Water Travel Time

1. Depth left (ft/m) minus(-) Depth arrived (ft/m) = Distance Traveled (ft/m)
2. Distance Traveled divided(÷) by ascent/descent rate = minutes (and/or percentage of a minute in decimal
3. Whole number is minute(s). Decimal is percentage of minute. Take decimal and multiply(x) by 60 (number of seconds in a minute). Decimal will then convert to actual seconds. FOR EXAMPLE:

215 fsw – 87 fsw = 128 fsw Ascent rate: 30 fpm
128 fsw ÷ 30 fpm = 4.26 (4 minutes and .26 or 26% of a minute)
.26 x 60 = 15.6 seconds (round up to next whole second)= 16 seconds
:4::16 is your travel time from 215' to 87'

One Example of: Calculating Surface Interval

Reached surface (RS) @ 2305 hrs.
Left surface (LS) @ 0317 hrs. (carry over 24 hr. clock)
0317 hrs. could be expressed, ONLY FOR THE PURPOSE OF CALCULATION, as 2717 hrs. 2717 minus(-) 2305 = 4:12
4 hrs. and 12 min.

Salvage Formulas

Area of a Square or Rectangle

Length x Width

Area of a Cylinder

Ends = (¼Π x D²) x 2
Tube = (Π x D) x L
Ends + Tube = Total Area

Volume of a Cube

Length x Width x Height = Volume

Volume of a Cylinder

(Π x D²) ÷ 4 x Height = Volume

Lifting Capacity

Volume x Weight of Water – Weight of Lifting Device = Lifting Capacity