O2 Transportation

From the air to the tissues and back again!

Numbers to remember about O2 transportation...

- PO2 at sea-level = 149 or 159
- PAO2 = 109
- PaO2 = 95
- PvO2 = 40
- P_B = 760
- PaCO2 = 40

- These are all normal, at sea-level breathing an FIO2 of .21

Atmosphere

- ~78% nitrogen
- 20.9 or ~21% Oxygen
- ~1% other inert gases, krypton, etc.

- FIO2 is same at sea-level as on highest mountain or flying in a plane.

- Why O2 masks drop down in planes if we lose cabin pressure?

Barometric Pressure P_B

- 760 mmHg pressure at sea level
- P_B declines as you go up in altitude
- In Alveolar air equation(see other week), the P_B a part of it in the calculation of PAO2.

- How does P_B effect the calculation of PAO2?

Dalton's Law of Partial Pressures

- *In any give mixture of gases, each gas will exert it own partial pressure based on the percent of the total gas, the gas in question occupies of the total.*

- *Total atmospheric pressure is 760 at sea-level.*

- *What is the PO2 in the earth's atmosphere at sea-level?*

O2 transport continued…

- So O2 comes to you from the earth's atmosphere.
  - Thank you trees, through photosynthesis they use CO2 and produce O2
  - We use O2 and produce CO2
    - This is a synergistic relationship!
- You inhale the O2 through the nose and mouth.

O2 transport anatomy...

- After it enters nasal or oral cavities it must pass though an opening at the top of the trachea(windpipe).
  - The Glottis
  - This opening allows air to move into the lungs
- After glottis air enters the trachea, then the rt and lf mainstem bronchi.

O2 transport anatomy...

- Next it goes to the respiratory bronchioles
  - The first place in the lung gas exchange with the blood takes place.
- Then to the alveolar sacs
  - The main transporter of Oxygen in the blood, the alveolar capillary membranes, as large as the surface area of a tennis court.

- What is the PO2 of gas in the alveoli, at sea-level breathing an FIO2 of .21?

O2 transport anatomy...

- O2 crosses the membrane into the blood and CO2 crosses into the lungs to be exhaled.
- The O2 then gets on the red blood cells and the heart starts pumping the blood with O2 in it to the tissues via the arteries.
- The arteries carry it to the capillary tissue beds and out to the cell mitochondria.

- What is the Arterial PO2 before the blood enters the tissue capillary bed?

O2 transport anatomy...

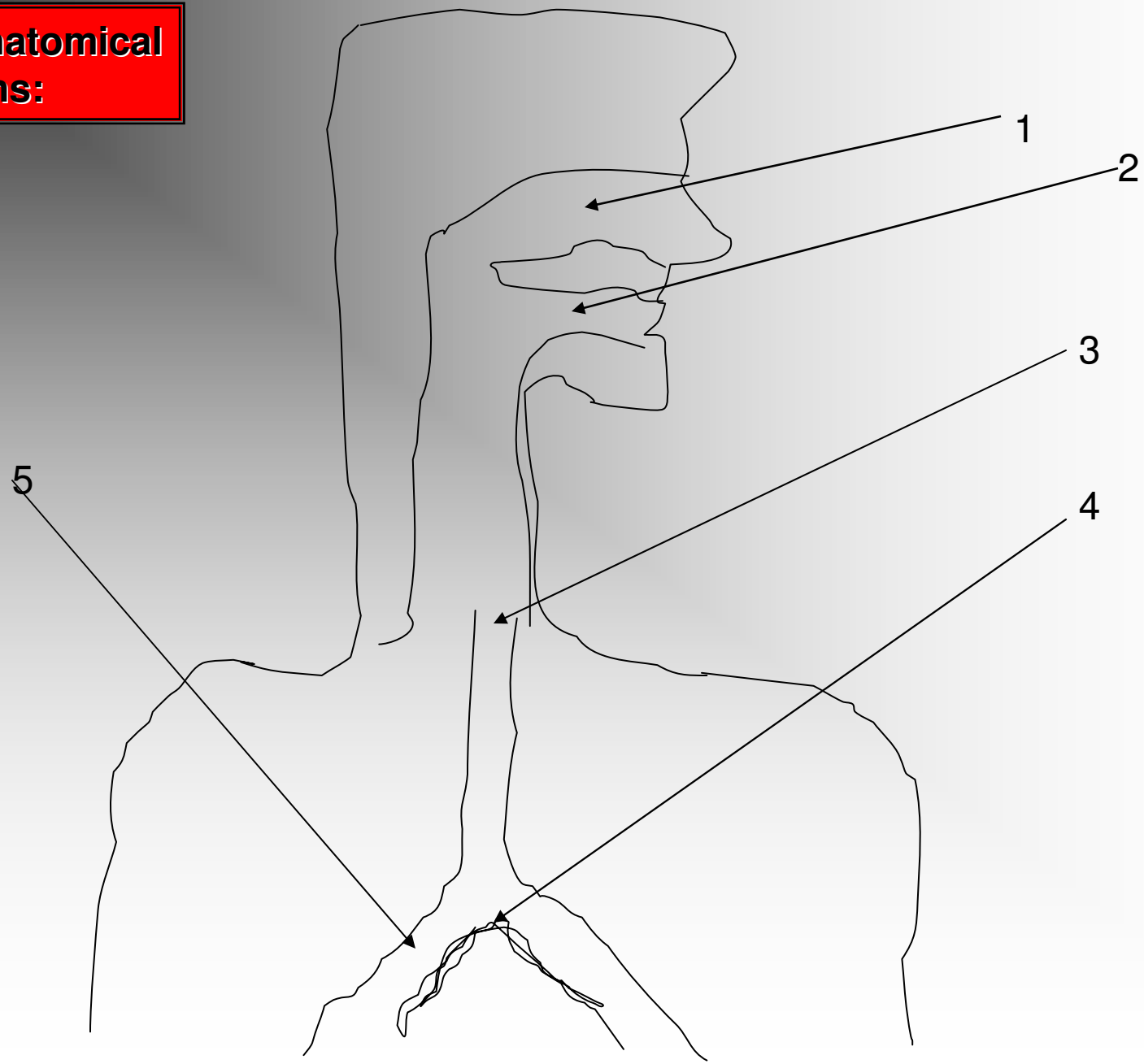
- After the tissue capillary bed, blood enters the veins.
- The veins always carry blood back to the heart, arteries always carry it away.

- What is the PO2 in the veins?

O2 transport anatomy...

- The veins carry blood back to the the right side of the heart.
- The right side of the heart pumps the blood back to the lungs where the gas exchange(discussed above) takes place:
  - $O_2 \rightleftharpoons CO_2$
- Then the whole thing is repeated, 60 to 80 times every minute, 24/7 !

Label anatomical Locations:



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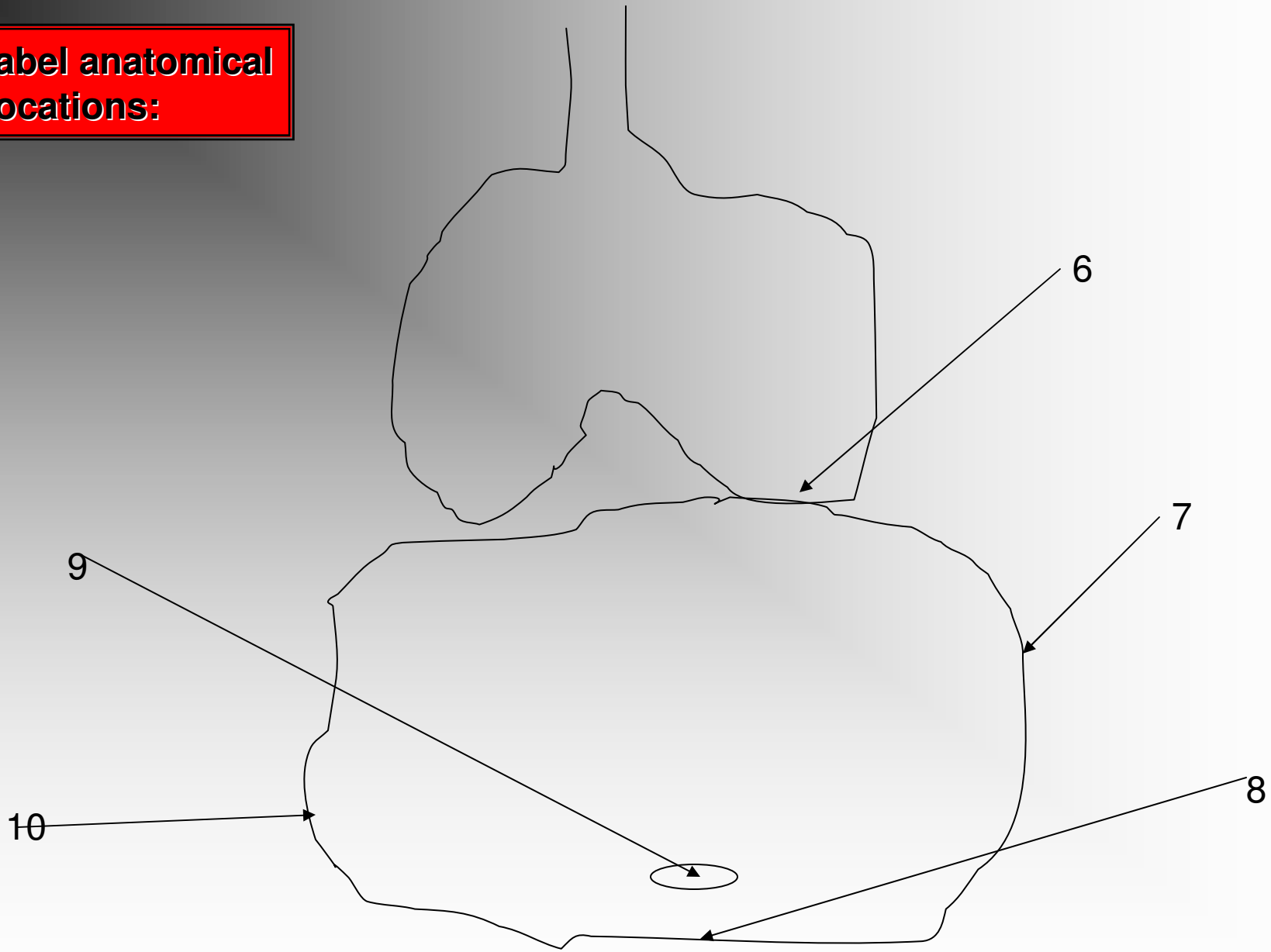

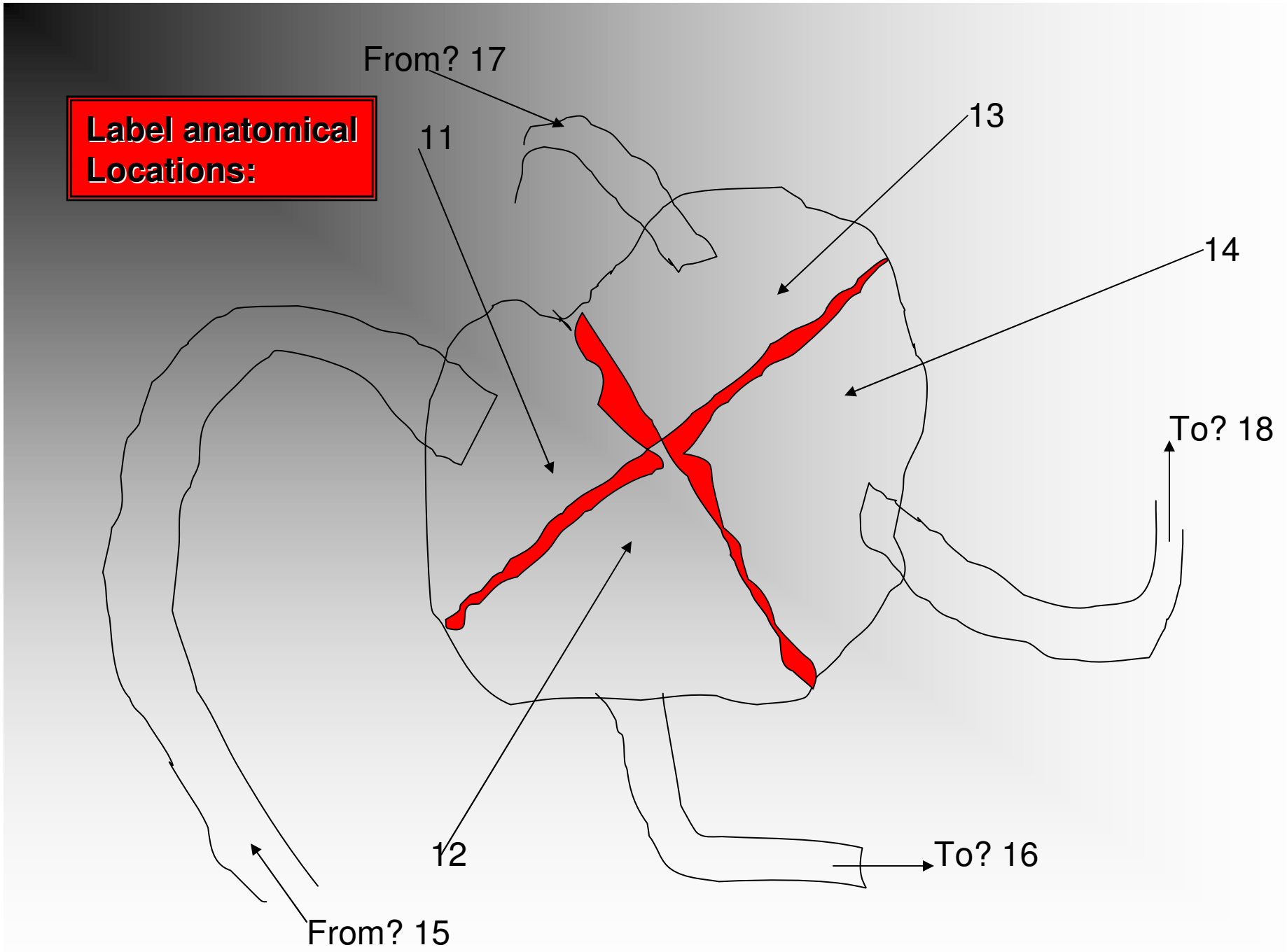
Label anatomical Locations:
From? 17
11
13
14
To? 18
12
To? 16
From? 15

Label PO2 at the numeric Locations: