Exam I

Short answers: 1. Live for about 75 yrs ⇒ 75(365)(24)(60)(60) ≈ 2 × 10^9 s, and take 1 breath every 4 secs, so number of breaths ≈ 2 × 10^9(1/4) = 6 × 10^8.
2. Shoot horizontally. By measuring the horizontal distance it makes before hitting the ground gives \( v_o \) since in the vertical direction \( 0 = h - \frac{1}{2}gt^2 \Rightarrow t = \sqrt{2h/g} \) (where you measure \( h \) as well), and horizontally \( D = v_o t \Rightarrow v_o = D\sqrt{g/2h} \).
3. (a) 6.7 × 10^{-22} MeV·s.

4. \begin{align*}
&\begin{align*}
&120° \quad 120° \quad 120° \quad 120° \quad 120°
&\end{align*}
&\begin{align*}
&\text{Yes, as long as } A + B + C = 0; \text{ and no, because if } |A| > |B|, \\
&\text{then } A + B \text{ can never cancel and equal zero.}
&\end{align*}
\end{align*}

Problem 1: (a) 289 m (b) 43 m/s.

Problem 2: (a) \( t = 2.46 \) s (b) \( v = 9.07 \) m/s in \( \hat{i} \) direction.

Problem 3: (a) \( v = 2.58 \times 10^4 \) m/s (b) \( a = 5.14 \times 10^{-3} \) m/s^2 (c) \( R = 3.55 \times 10^5 \) km.

Problem 4: (a) \( |\vec{v}_{p/I}| = 3.72 \) m/s and \( \theta = 46.1° \) (b) \( v_{La} \)

Exam I*

Short answers: 1. Live for about 75 yrs ⇒ 75(365)(24)(60)(60) ≈ 2 × 10^9 s, and take 1 breath every 4 secs, so number of breaths ≈ 2 × 10^9(1/4) = 6 × 10^8.
2. (a) 6.7 × 10^{-22} MeV·s.
3. Same a Short Answer (4) above.
4. Shoot horizontally. By measuring the horizontal distance it makes before hitting the ground gives \( v_o \) since in the vertical direction \( 0 = h - \frac{1}{2}gt^2 \Rightarrow t = \sqrt{2h/g} \) (where you measure \( h \) as well), and horizontally \( D = v_o t \Rightarrow v_o = D\sqrt{g/2h} \).

Problem 1: (a) 244 m (b) 37 m/s.

Problem 2: (a) \( t = 1.98 \) s (b) \( v = 13.3 \) m/s in \( \hat{i} \) direction.

Problem 3: (a) \( v = 3.38 \times 10^4 \) m/s (b) \( a = 6.72 \times 10^{-3} \) m/s^2 (c) \( R = 4.11 \times 10^5 \) km.

Problem 4: (a) \( |\vec{v}_{p/I}| = 2.63 \) m/s and \( \theta = 55.7° \) (b) See Problem 4 (b) above.