Fill in the blank:

1. a. The partitioning of an incident wave’s energy at an interface is determined by the ________________ of the two layers and by the angle of ________________.
2. b. In a two-layer case, the upward moving wave front generated when the angle of incident is the critical angle is known as a ________________ wave.
3. c. Total reflection occurs when the angle of incident is (greater than, less than) the critical angle. ________________
4. d. This reflection velocity converts a reflector’s zero-offset time to reflector depth: ________________.
5. e. The proportionality constant for Hooke’s law for normal stress is known as the ________________.
6. f. ________________ states that every point on an advancing wave front is the source of new elastic wave energy.
7. g. ________________ or radial scattering of incident seismic energy occurs at abrupt discontinuities along interfaces, or structures whose radius of curvature is shorter than the wavelength of the incident wave.
8. h. Particle motion in this surface wave is transverse to the direction of propagation of the wave: ________________.
9. i. The bulk modulus is the proportionality constant for Hooke's law for _________ stress.
10. j. The most common method of collecting seismic reflection data to increase the fold coverage on the subsurface is known as ________________.
11. k. Low frequency (long wavelength) surface waves travel faster than higher frequency surface waves causing the waveform of the surface wave to change continuously with time as the wave is recorded. This frequency dependent phenomena is termed ________________.
12. l. High frequency body waves attenuate (faster, slower) than low frequency body waves as a function of distance? ________________
m. This seismic wave alternately compresses and dilates the rock it passes through: ______

n. In seismic reflection processing, a statics correction corrects for ____________.

o. This process provides a means of obtaining second layer refraction times between the end-on shot and the original cross-over distance: ________________

p. The velocity of a seismic wave is directly proportional to the ____________ of the rock and inversely proportional to the ______________ of the rock.

q. The ___________________________ is the ratio of the amplitude of the reflected wave to the amplitude of the incident wave.

r. The reflection hyperbola is symmetrical about x = 0 when the reflector is horizontal, but when the reflector interface is dipping, the hyperbola’s minimum value (i.e., time) is offset (up dip, down dip): __________________________.

s. The ΔT shown in the figure below is called ____________________________.
2. The time-distance plot below either indicates a two-layer case or a vertical contact separating a surface layer with different velocities. How would an off-end shot or shots placed on the left hand side of the spread help resolve the dilemma?

3. Using the information on the diagram below, what must the angle of incidence of a seismic ray be on the 1-2 interface to cause a critically refracted wave on (a) the 4-5 interface, and (b) on the 2-3 interface. For case (a) sketch the proper ray path on the diagram.

\[ V_1 = 500 \text{ m/sec} \]

\[ V_2 = 2000 \text{ m/sec} \]

\[ V_3 = 2000 \text{ m/sec} \]

\[ V_4 = 1500 \text{ m/sec} \]

\[ V_5 = 4000 \text{ m/sec} \]
4. The diagram below is a seismic refraction profile from an ocean basin. A sonobuoy (floating geophone) was tossed into the water; the ship then periodically fired an airgun as it moved away (to the right). The horizontal scale gives the distance from the source (ship) to the receiver (sonobuoy). The vertical scale represents the elapsed time between firing the air gun and arrival of events (refractions and reflections) at the sonobuoy.

a. Identify and draw in lines (curved or straight where appropriate) through the direct, three refracted, and a few reflected waves on the seismic section.

b. What is the depth to the ocean floor in this area?
5. From the time distance plot shown below. Determine the first and second layer velocities, the dip and dip direction of the $V_1 - V_2$ interface, and the vertical depth directly below the geophone located at $x = 100$ m.
6. Determine the RMS velocities of the three layers giving rise to the reflections shown in the x - t data shown below. Also determine the interval velocity for layer 2 and the 1st and 2nd layer thickness. Lastly, what is the time-averaged velocity to reflector 2? Be sure to show your work. To help in your interpretation the x^2 - t^2 plot is also shown and includes the equations describing the best-fit lines to those data.
7. Along the line covered by the seismic reflection section shown below, Tertiary shales are known to outcrop at A and D and to be underlain by horizontal Carboniferous sandstones, which in turn lie conformably on limestones. As the equipment could not record reflections with two-way times less than 150 ms, reversed refraction lines were shot along AB and CD to provide information about the shallow structure. Both lines gave symmetrical "t - x" graphs with branches corresponding to $V_1 = 2000$ m/sec and $V_2 = 3000$ m/sec, with intercept times at A and B of 75 ms and at C and D of 38 ms. Horizontal lines on the time section below represent the same reflecting horizon offset by faulting (note diffractions). The reflector between A and B is at a time depth of 300 ms, between C and D the reflector is at time depth of 250 ms, and between D and E the reflector is at a 200 ms time depth.

a. Interpret the refraction lines and use the results to convert the reflection time section into a depth section, taking the sandstones to be of uniform velocity and thickness.

b. Draw the "t - x" that you would expect from a reversed refraction line along DE.