1. The Multichannel Analysis of Surface Waves (MASW) method inverts for which quantity?
   (a) P-wave velocity
   (b) S-wave velocity
   (c) Density
   (d) Young's modulus

2. Before stacking reflection seismic data, a normal move-out correction is applied. This correction is applied to data that is sorted in:
   (a) common shot gathers
   (b) common receiver gathers
   (c) common midpoint gathers
   (d) common offset gathers

3. A synthetic seismogram is generated from an acoustic impedance log by
   (a) convolving it with an input pulse
   (b) determining the density of each layer
   (c) determining the seismic velocities of each layer
   (d) generating a reflection coefficient log, converting to time and convolving with an input pulse

4. For a reflection seismic survey, where the subsurface has an average P-wave velocity of 1000m/s and we use a 10ms seismic wavelet, the best resolution we could obtain is?
   (a) 1 m
   (b) 2.5 m
   (c) 5m
   (d) 10 m

5. Which of the following statements about Snells law in the context of a seismic survey is incorrect?

$$\frac{\sin\theta_1}{\sin\theta_2} = \frac{v_1}{v_2}$$

Here, θ_1 is the incidence angle and θ_2 is the transmission angle.

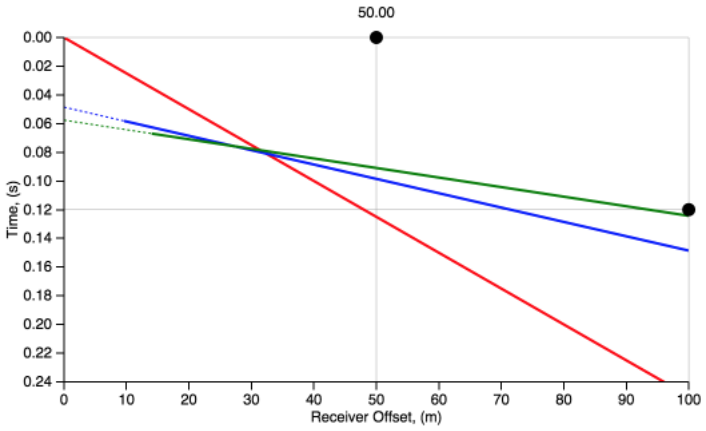
(a) Snells law shows the angular relationship between the incident and transmitted waves at the interface in terms of velocities.

(b) The angle of reflection can be different from the angle of incidence.

(c) When a seismic wave travels from a region of low velocity to high velocity, the wave is refracted away from the normal vector of the interface .

(d) When $\theta_2 = 90°$, a head wave develops due to critical refraction.

6. Which of following statements about below figure is right?



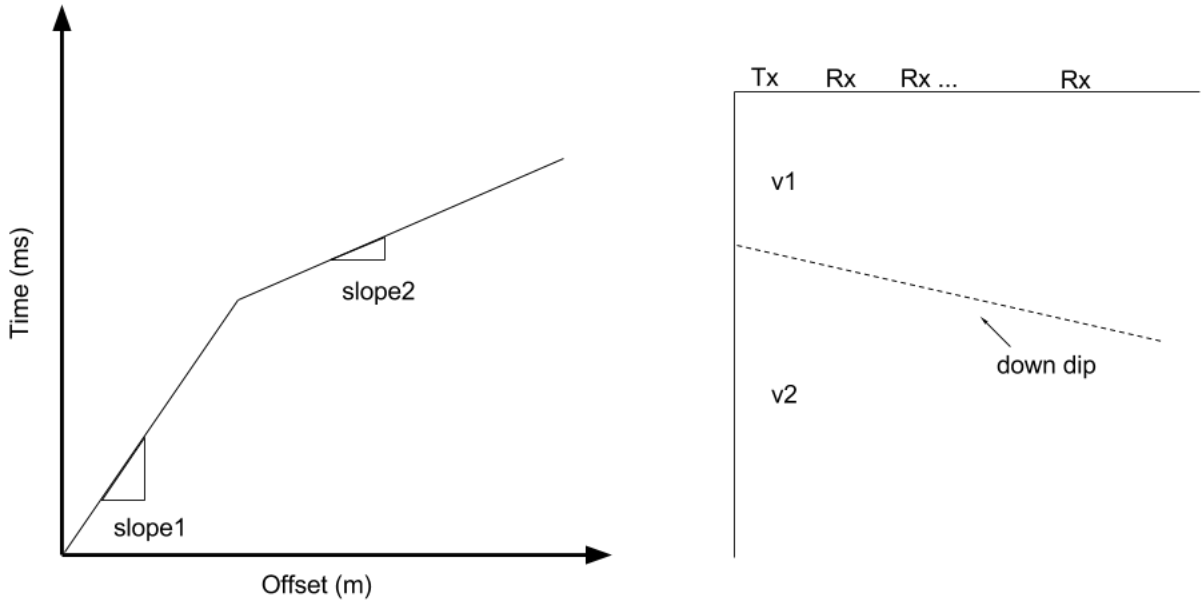
(a) Dashed line indicates cross over distance

(b) Critical distance is about 30 m

(c) Red line shows critically refracted signal

(d) Second layer is apparently visible (we only take first arrival as our data)

(e) All of them are wrong



7. In the region where it contains two dipping layers, EOSC350 team obtained a seismic refraction data from a single shot. Obtained data on t-x diagram is shown in below figure. Which of following interpretation can be wrong?
   (a) v1 is equal to 1/slope1
   (b) v2 can be greater than the 1/slope1
   (c) v2 can be greater than the 1/slope2
   (d) If 1/slope1 is greater than v2, this possibly indicates dipping layer is downward

8. Assuming a positive impulse source, which of the following configurations will likely give rise to the strongest negative (-) reflection? (Assume layer 2 below layer 1).
   (a) $v_1 > v_2$ and $\rho_1 < \rho_2$
   (b) $v_1 < v_2$ and $\rho_1 < \rho_2$
   (c) $v_1 < v_2$ and $\rho_1 > \rho_2$
   (d) $v_1 > v_2$ and $\rho_1 > \rho_2$

9. Please order the common materials below according to their seismic velocity
   (a) air > sediments > sandstone > granite
   (b) granite > sandstone > sediments > air
   (c) granite > sediments > sandstone > air
   (d) air > sediments > granite > sandstone

10. What is the moveup rate and fold for a survey with 8 geophones that are 3 meters apart and shots are every 4 meters?
   (a) Moveup rate = 1.33; Fold = 3
   (b) Moveup rate = 1.33; Fold = 6
   (c) Moveup rate = 0.75; Fold = 3
   (d) Moveup rate = 0.75; Fold = 6

11. Within a given sedimentary layer, a change in the p-wave acoustic impedance could indicate a change in
   (a) Porosity
   (b) Pore fluid content
   (c) Lithification
   (d) All of the above

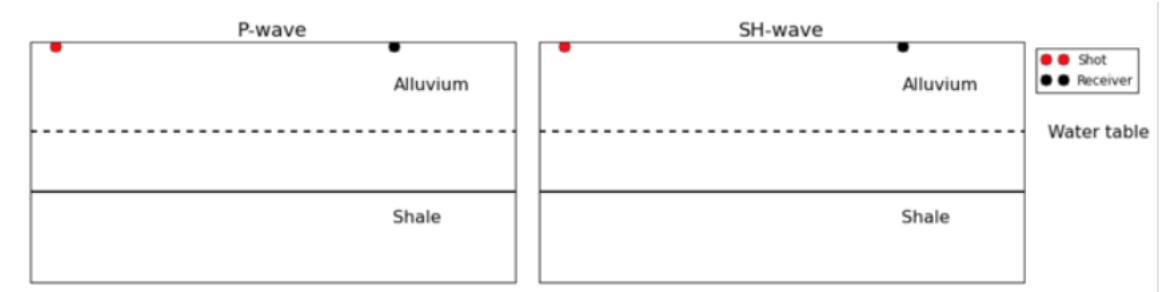
12. A synthetic seismogram is important for interpreting reflection seismic data because it provides a relationship between
   (a) travel times and depth to interfaces
   (b) density and seismic velocity
   (c) layer thicknesses and travel times
   (d) density and depth to interfaces

13. Typically, seismic velocity increases with depth. The main reason for this is that, in general, _____ with depth
    (a) Density increases
    (b) Bulk and shear modulus increase
    (c) Bulk and shear modulus increase more rapidly than density
    (d) Density increases more rapidly than bulk and shear modulus

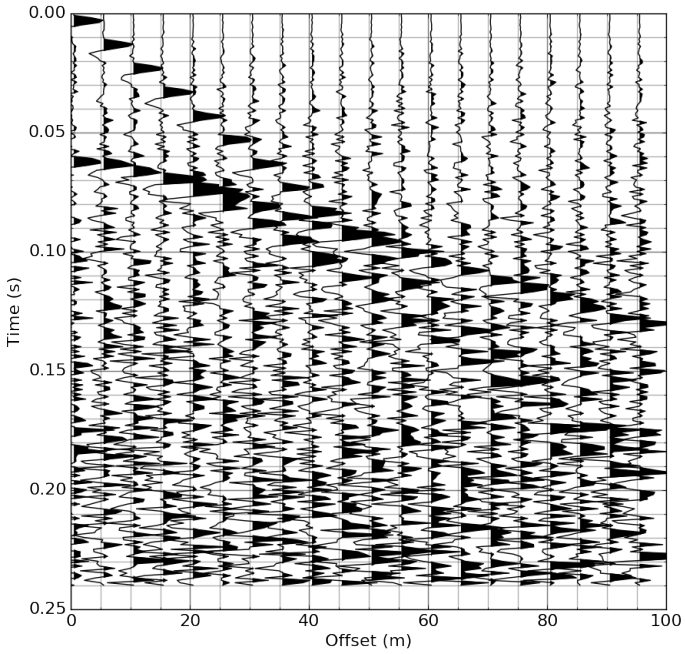
14. Seismic migration can be best described as
    (a) Converting the seismic section from time to depth
    (b) Adjusting the reflection time based on the hyperbolic travel time
    (c) Stacking the traces
    (d) Putting seismic reflectors in their correct location

15. A seismic survey is set-up with a source in a borehole, 100m below the surface, and an array of geophones on the surface. There is an interface at 200m. The top layer has velocity 1000m/s and the lower layer has velocity 2000m/s. Which of the following characteristics on a T-X plot will remain the same if the source was now moved to the surface?
    (a) Slope of the refracted arrivals
    (b) Intercept times of the refracted arrivals
    (c) Arrival times of the direct ray
    (d) Arrival times of the reflections

16. (1.5 pts) Draw the reflection and refracted wave for both P- and Sh-waves between a shot and a receiver shown in the diagram below (Hint: Seismic velocities (both Vp and Vsh) of alluvium is much smaller than shale)



17. Consider a seismic shot gather shown in below figure, answer following questions.



(a) (1.5 pts) Estimate the first layer velocity using direct arrival

(b) (1.5 pts) Estimate the second layer velocity

(c) (1.5 pts) Compute the critical distance

(d) (1.5 pts)Estimate thickness of the first layer