9. Fill in the blank.
   a. __________________ minerals have a negative magnetic susceptibility.
   b. Ground surveys that use gradiometer magnetometers generally measure the ________________________________.
   c. Horizontal derivatives of potential field data (especially gravity data) produce gradients that are steepest over the ___________ of tabular bodies.
   d. The degree to which a body becomes magnetized is determined by this fundamental physical property ________________________________________.
   e. Upward continuation of a potential field produces a map where __________ (longer, shorter) wavelengths are preserved.
   f. The presence of linear magnetic anomalies on the ocean floor suggest that the Konigsberger ratio (Q) of the ocean floor basalts is (greater than, less than) one.
   g. The angle between the horizontal component \( (H_o) \) and the total field vector \( (T_o) \) is termed the __________________.
   h. The partitioning of an incident wave's energy at an interface is determined by the _________________ of the two layers and by the angle of the angle of incidence.
   i. The magnetic field one Earth radius above the North Magnetic Pole is _________ \((8x, 4x, 2x, \frac{1}{2}x, \frac{1}{4}x, \frac{1}{8}x)\) the value of the field at the pole.
   j. Particle motion in this surface wave is transverse to the direction of propagation of the wave: ________________________________.
   k. 1 nanotesla = ___ gammas = ___ gauss = ___ Teslas = ___ webers/m²
   l. This type of remanent magnetization is acquired by lava flows as they cool in the presence of Earth’s magnetic field ________________________________.
   m. If a wave impinges upon an irregular surface with a sharp radius of curvature, the seismic wave bends around the feature giving rise to ____________________.
   n. Magnetic permeability of free space \( (\mu_o) \) in the cgs system is equal to ________.
   o. In these materials the spin magnetic moments of unpaired electrons between neighboring atoms are magnetically coupled, moments are parallel and equal ____________________.
2. Two magnetic anomalies are evident on the profile shown below. Both are caused by sources having the same size, shape, and directions of magnetization. Which source body

a. is the deepest?

b. has the strongest magnetization?

Defend your answers.

3. What is the name given to the phenomenon shown in the figure below and what is the cause of this phenomenon?
4. If the magnetic field of Earth were due entirely to a dipole aligned along its rotation axis and position at its center, i.e. geocentric axial dipole (GAD), what is the relationship between magnetic latitude and geographic latitude?

Paleomagnetic measurements on the Portage Lake volcanics indicate that these rocks formed during a period of time when the inclination of Earth’s magnetic field in the Houghton vicinity was 30°. At what latitude was Houghton at during the eruption of these volcanics? If the average declination determined from these volcanics was zero, what is the location of the North Magnetic Pole? Assume a GAD model for the field. If

5. Many airports on the Hawaiian Islands are built over areas underlain by lava tubes. The Keohole Airport on the big island of Hawaii is a case in point. Geological evidence points to the existence of shallow east-west trending master-tube system in the vicinity of the proposed airport expansion. These tubes have an average diameter of 5 meters and typically lie 1 meter below ground surface. What would the maximum gravity anomaly in $\text{gu}$ be directly over one of these tubes? Density of the volcanic rocks is 2950 $\text{kg/m}^3$.

6. Given a P-wave travelling through a rock unit ($V_p = 1200 \text{ m/sec}$). This rock unit is in contact with another unit that has greater seismic wave velocities ($V_p = 3800 \text{ m/sec}$; $V_s = 1900 \text{ m/sec}$). At what angle must the ray strike the contact between these two units to produce a compressional head wave? a shear head wave?
7. Alkali-vapor and proton precession magnetometers are said to be scalar magnetometers while fluxgate magnetometers are said to be vector magnetometers. Why?

8. The diagram below depicts the $\Delta H$, $\Delta Z$, and $\Delta T$ anomalies over a uniformly magnetized sphere with radius 1 m and whose center lies at 3 m depth at position $x = 15$ m. Earth’s inducing field ($T_o$) is 50,000 nT, inclination ($I_o$) is 60°, declination is zero, and $k = 0.05$ SI units. What’s wrong with these anomalies? North is to the right. What is the correct $\Delta H$ value at $x = 15$ m?
9. The magnetic anomalies shown below are caused by buried spheres (dipoles) magnetized by induction in the Northern Hemisphere. In the circle to the right of each anomaly draw the orientation of the inducted magnetization vector ($J_i$) responsible for the anomaly.