1. What does resistivity (ρ) represent in geophysical prospecting?

✗ - The density of the medium

✓ - The difficulty of current passing through a medium

✗ - The temperature of the medium

✗ - The elastic properties of the medium

2. What does the 'geometric factor' in a four-electrode resistivity measurement depend on?

✗ - The resistivity of the electrodes

✗ - The depth of the water table

✓ - The positions of the electrodes on the ground

✗ - The temperature of the soil

3. In electrical prospecting, what does the term 'penetration depth' refer to?

✗ - The maximum depth of the borehole

✗ - The depth of the Earth's core

✗ - The depth at which magnetic anomalies are detected

✓ - The depth at which the method can effectively investigate

4. Which law describes the relationship between voltage, current, and resistance?

✗ - Gauss's Law

✓ - Ohm's Law

✗ - Newton's Law

✗ - Hooke's Law

5. What is the geoid?

✓ - An equipotential surface of Earth's gravitational field coinciding with mean sea level

✗ - The Earth's actual physical shape including mountains and valleys

✗ - The surface of the Earth's crust

✗ - A hypothetical flat surface at sea level

6. Which factor is NOT corrected for in gravimetric surveys?

✗ - Latitude and terrain effects

✗ - Altitude variations

✓ - The Earth's magnetic field

✗ - Instrument drift

What is the main application of gravimetric surveys in mineral and oil exploration?

✗ - Monitoring surface temperature changes

✓ - Detecting density anomalies that may indicate ore veins or hydrocarbon deposits

✗ - Mapping seismic fault lines

✗ - Determining the chemical composition of underground minerals

7. Which seismic wave type is most responsible for earthquake damage?

✗ - Body S-waves

✗ - Body P-waves

✗ - Love waves

✓ - Rayleigh waves

8. Which of the following is NOT a type of seismic wave?

✗ - S waves

✓ - Love waves

✗ - Rayleigh waves

✗ - P waves

9. What is the typical duration of seismic waves recorded after an explosion during seismic prospecting?

✗ - 30 seconds or more

✗ - 1 to 2 seconds

✓ - 4 to 5 seconds

✗ - Immediately, within milliseconds

ELECTRICAL PROSPECTING METHODES

Filling the gaps:

a) The constant of proportionality that expresses the difficulty of current passing through a medium is called [resistivity].

Resistivity , conductivity or Resistance

b) To increase the penetration depth of an electrical survey, the [electrode separation] is increased.

Number of electrods , electrode separation or intensity of current

c) In electrical prospecting, [direct current] is often injected using two electrodes to measure subsurface properties.

direct current , discontinuous current

d) In a heterogeneous medium, the calculated resistivity is called [apparent resistivity].

resistivity , apparent resistivity or permeability

e) Resistivity (ρ) is measured in [ohm-meters].   (unit)

GRAVIMETRIC PROSPECTING METHODES
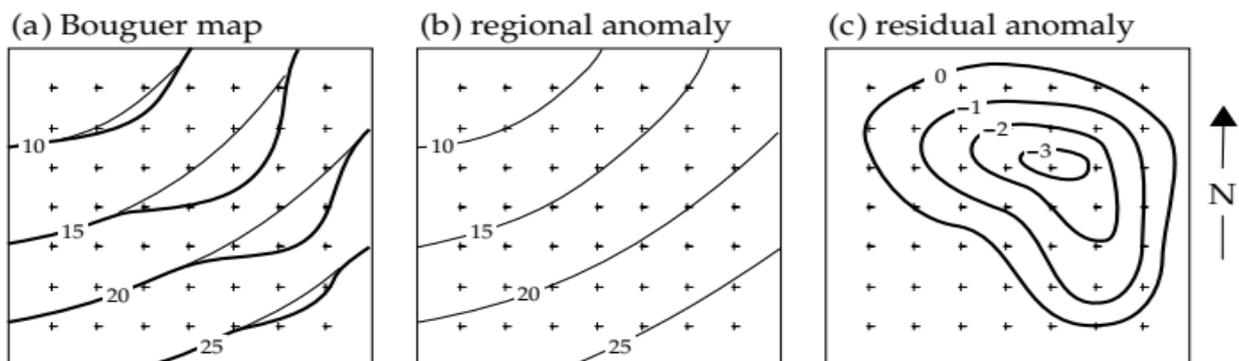
(a) Bouguer map   (b) regional anomaly   (c) residual anomaly

Total anomaly = Regional anomaly - Residual anomaly

✓-Total anomaly = Regional anomaly + Residual anomaly

Total anomaly = Regional anomaly * Residual anomaly

SEISMIC METHOD

Filling the gaps with: Volume or shape

a) Longitudinal waves (P waves) cause only a change in [volume] as they propagate through a medium.
b) Transverse waves (S waves) cause a change in the [shape] of the body as they propagate

Exercise B — 3 layers, Schlumberger (KQ-type)

Given (field readings): $MN = 1.5$ m (fixed), current $I = 0.45$ A. Measurements at various $AB/2$:

$AB/2$ (m)	6	10	16	25	40	65
ΔV (mV)	28	26	24	25	32	45

Geometry factor (Schlumberger):

$$K = \pi \frac{AB^2 - MN^2}{2MN}, \quad AB = 2(AB/2).$$

Apparent resistivity: $\rho_a = K \dfrac{\Delta V}{I}.$

1) Compute ρ_a (rounded)

$AB/2$ (m)	AB (m)	K (m)	ΔV (V)	ρ_a (Ω·m)
6	12	≈ 299.2	0.028	18.6
10	20	≈ 837.7	0.026	48.4
16	32	$\approx 2\,148$	0.024	114.6
25	50	$\approx 5\,235$	0.025	291.9
40	80	$\approx 13\,432$	0.032	954.3
65	130	$\approx 35\,402$	0.045	3,538
100	200	$\approx 83\,680$	0.062	11,518

A weathered layer has P-wave velocity $v_1 = 1500$ m/s.
The underlying bedrock has velocity $v_2 = 3000$ m/s.

Tasks

1. Is refraction possible (i.e., is $v_2 > v_1$)?
2. Compute the **critical angle** i_c (in degrees).

1. Yes, refraction is possible if $v_2 > v_1$.

    Here, $3000 > 1500 \rightarrow$ ✔ **Yes, possible.**
2. Critical angle formula:

$$\sin i_c = \frac{v_1}{v_2} = \frac{1500}{3000} = 0.5$$

$$i_c = \arcsin(0.5) = 30°$$

✔ **Critical angle = 30°**