

Advanced Earth Science

Earth Science · Answer Key · 12 Questions

1. Which metamorphic facies is characteristically defined by the presence of glaucophane under high-pressure and low-temperature conditions?

- A) Greenschist facies
- B) Blueschist facies**
- C) Eclogite facies
- D) Granulite facies

2. What primary seismic wave behavior occurs at the Gutenberg discontinuity located at a depth of approximately 2,900 kilometers?

- A) P-waves double in velocity
- B) S-waves completely stop propagating**
- C) P-waves reflect without refraction
- D) S-waves accelerate significantly

3. In Bowen's reaction series, which silicate mineral crystallizes first from a cooling basaltic magma along the discontinuous branch?

- A) Pyroxene
- B) Biotite
- C) Amphibole
- D) Olivine**

4. In rubidium-strontium (Rb-Sr) geochronology, which isotope ratio is plotted on the x-axis of an isochron diagram?

- A) $^{87}\text{Sr}/^{86}\text{Sr}$
- B) $^{87}\text{Rb}/^{86}\text{Sr}$**
- C) $^{87}\text{Rb}/^{87}\text{Sr}$
- D) $^{86}\text{Sr}/^{87}\text{Rb}$

5. What is the approximate orbital period length of Earth's axial tilt (obliquity) variation in Milankovitch cycles?

- A) 21,000 years
- B) 41,000 years**
- C) 100,000 years
- D) 400,000 years

6. A pronounced negative europium anomaly in rare-earth element (REE) rock profiles is primarily caused by the removal of which mineral during fractional crystallization?

A) Quartz

B) Plagioclase feldspar

C) Garnet

D) Zircon

7. What is the name of the current geomagnetic polarity chron that began approximately 780,000 years ago?

A) Matuyama

B) Gauss

C) Brunhes

D) Gilbert

8. Which atmospheric boundary layer contains the coldest naturally occurring temperatures on Earth, dropping to roughly -90°C?

A) Tropopause

B) Stratopause

C) Mesopause

D) Thermopause

9. Where is the majority of Antarctic Bottom Water (AABW), the densest water mass in the ocean, primarily produced?

A) Weddell and Ross Seas

B) Drake Passage

C) Subantarctic Front

D) Agulhas Basin

10. The Afar Triple Junction in East Africa is classified as which specific type of tectonic triple junction?

A) Ridge-Ridge-Ridge (R-R-R)

B) Trench-Trench-Trench (T-T-T)

C) Transform-Transform-Transform (F-F-F)

D) Ridge-Trench-Transform (R-T-F)

11. In a classical Bouma sequence representing a turbidite sediment layer, which division lies at the very base (Division A)?

A) Laminated siltstone

B) Massive to graded sandstone

C) Parallel-laminated sandstone

D) Pelagic mudstone

12. On a glaciated roche moutonnée feature, how are the stoss (upstream) and lee (downstream) sides distinctively formed?

A) Stoss side is steep and plucked; lee side is smooth and abraded

B) Stoss side is smooth and abraded; lee side is steep and plucked

C) Both sides are steep and plucked

D) Both sides are smooth and abraded