

Name: _____ Date: _____

Answer Key: Science Multiverse: 11th Grade Interdisciplinary Challenge

Synthesize complex data across thermodynamics, genomics, and plate tectonics to prove your expertise in how the major scientific disciplines intersect.

1. A researcher is utilizing CRISPR-Cas9 to modify the genome of a thermophilic archaea species to investigate its metabolic efficiency. This study primarily bridges which two sub-disciplines?

Answer: A) Molecular Biology and Thermodynamics

CRISPR-Cas9 is a tool of molecular biology/genetics, while studying metabolic efficiency involves energetic transfers governed by the laws of thermodynamics.

2. The study of the chemical signatures left by prehistoric life in sedimentary rock layers is known as _____, a field combining Earth Science and Chemistry.

Answer: B) Biogeochemistry

Biogeochemistry specifically analyzes the chemical, physical, geological, and biological processes that govern the composition of the natural environment.

3. Quantum Mechanics is a sub-branch of Physics that is negligible when explaining the behavior of electrons in covalent bonding within the field of Chemistry.

Answer: B) False

Quantum mechanics is essential to chemistry, as it explains electron orbitals, hybridization, and bonding patterns.

4. When an environmental scientist analyzes the isotopic ratios of oxygen in ice cores to determine paleoclimatic temperatures, they are applying which branch of science?

Answer: C) Geology (Earth Science)

Analyzing ice cores to reconstruct past climates is a key technique in paleoclimatology, a specialized area within Earth Science.

5. The investigation of the Redshift of distant galaxies to determine the rate of universal expansion is a primary focus of _____.

Answer: A) Astrophysics

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Astrophysics applies the laws of physics to celestial phenomena like galactic motion and the expanding universe.

6. Biological systems are considered 'closed systems' that operate independently of the second law of thermodynamics.

Answer: B) False

Biological systems are open systems that maintain order by increasing the entropy of their surroundings, consistently following thermodynamic laws.

7. Which field would be most concerned with the role of plate tectonics in determining the biodiversity of isolated island chains over millions of years?

Answer: B) Evolutionary Geology

Evolutionary Geology (or Geobiology) examines the co-evolution of the Earth's physical structure and the life forms that inhabit it.

8. If a technician is testing the tensile strength of a new carbon-nanotube polymer for use in bridge construction, they are working in _____.

Answer: A) Materials Science

Materials science is an interdisciplinary field involving the properties of matter and its applications to various areas of science and engineering.

9. The study of the impact of ocean acidification on coral calcification rates involves a synthesis of Marine Biology and Chemistry.

Answer: A) True

Ocean acidification is a chemical change (lowering pH) that directly impacts the biological processes of marine organisms like corals.

10. A scientist studying the nucleosynthesis of heavy elements during a supernova event is primarily engaging with which fields?

Answer: B) Nuclear Physics and Astronomy

Nucleosynthesis involves nuclear reactions (physics) occurring within stars and cosmic events (astronomy).