JD's REGENTS PREPARATION, LLC.

-Presents-

Earth and Space Sciences

REVIEW MANUAL

WITH 6 REGENTS EXAMS, 4 TOPICALLY ORGANIZED

SPECIAL EDITION
Each Question Linked is to a Solution Video QR Coded for One to One Initiative

Earth and Space Sciences Review

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GEOLOGY

Unit Four – Earth Materials

Unit Five – The Dynamic Earth

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Unit Seven – The Atmosphere, Weather, and Climate

Stars, their Origin and Evolution

1. Which process produces the largest amount of energy given off by stars?
   (1) nuclear fusion of lighter elements into heavier elements
   (2) nuclear fusion of heavier elements into lighter elements
   (3) radioactive decay of lighter elements into heavier elements
   (4) radioactive decay of heavier elements into lighter elements

06 17 03

Base your answers to questions 2 through 4 on the star chart on the next page and on your knowledge of Earth science. The star chart shows the approximate locations of the Big Dipper, Little Dipper, and Cassiopeia visible in the night sky from Syracuse, New York, at a particular time of night. The dots represent individual stars. During the night, these stars appear to move counterclockwise around the star in the center of the chart. Straight lines are at 15-degree intervals. The stars *Caph*, *Kochab*, and *Merak* are labeled.

06 17 54-56

The Origin and Nature of Earth's Hydrosphere

1. During a rainstorm, water is flowing down the side of a hill composed of solid bedrock. What will be the effect on the relative amounts of runoff and infiltration when the water reaches an area of unsaturated soil with a gentler slope?

   06 17 09

   (1) Runoff will decrease as infiltration decreases.
   (2) Runoff will decrease as infiltration increases.
   (3) Runoff will increase as infiltration decreases.
   (4) Runoff will increase as infiltration increases.

2. Which ocean current brings warm water to the southeastern coast of Africa?

   06 17 21

   (1) Agulhas Current
   (2) Benguela Current
   (3) West Australian Current
   (4) Equatorial Countercurrent

19. Identify, by name, *two* geologic periods when the brachiopods represented in the data table were living.

20. State the names of the *two* brachiopod index fossils found in New York State bedrock.

21. The earliest horses appeared in the Eocene epoch and were about the size of a large dog of today. Explain how the evolution of horses supports Cope's Rule.

22. The existence of which group of organisms spans the shortest geologic time?
    (1) birds
    (2) humans
    (3) dinosaurs
    (4) placoderm fish

08 18 17

23. Which New York State geologic event occurred most recently?
    (1) Taconian orogeny
    (2) Grenville orogeny
    (3) formation of the Catskill delta
    (4) dome-like uplift of the Adirondack region

08 18 18

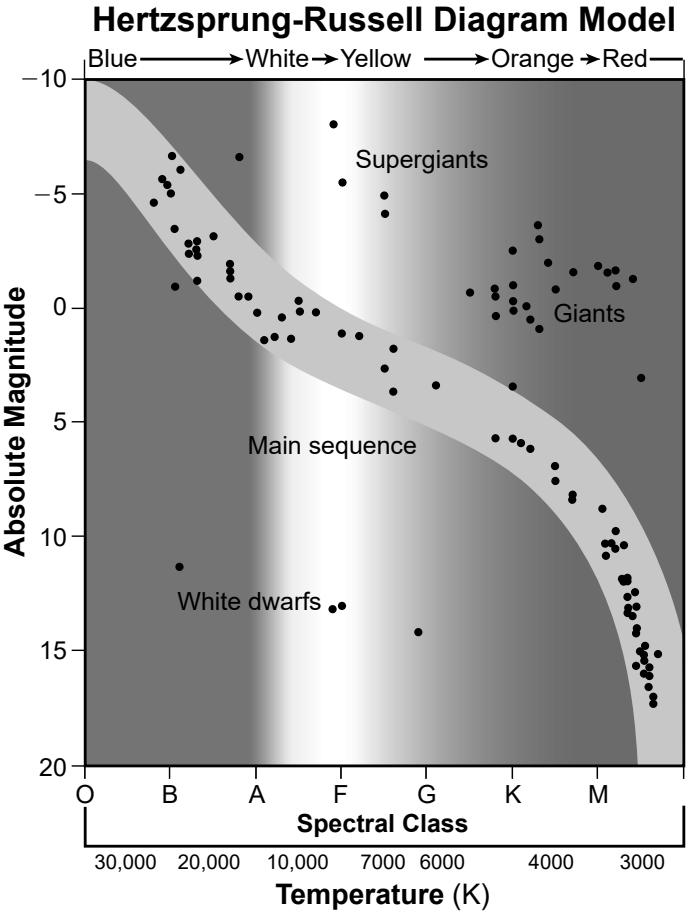
EARTH AND SPACE SCIENCES
June 2025

Answer all questions in this part.

Directions **Use your knowledge of Earth and Space Sciences to answer all questions in this examination. Throughout this exam, some questions may require the use of the *2024 Edition Reference Tables for Earth and Space Sciences.* This is provided in the back of this review book. Note that diagrams are not drawn to scale unless otherwise noted.**

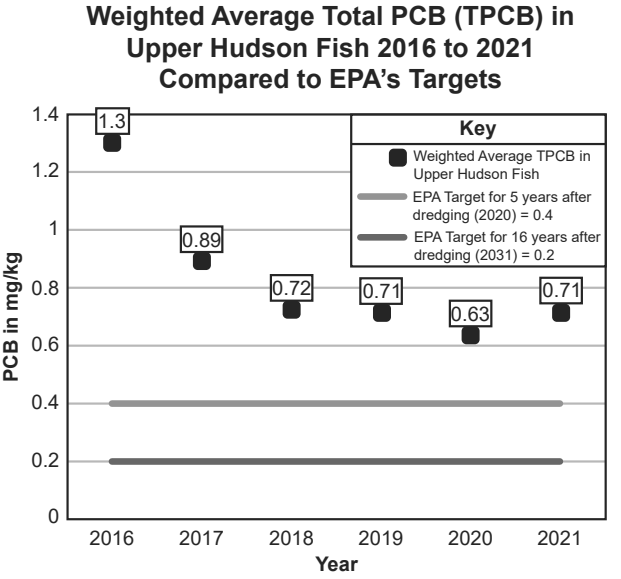
Our Sun – A Star

The Hertzsprung-Russell (H-R) diagram was developed from star charts by two scientists in different countries independently of each other in 1911. It classified stars based on their surface temperatures, observable color, and magnitude. Absolute magnitude is a measurement of how bright a star would appear if all stars are the same distance from Earth. The brighter the star, the lower the absolute magnitude value.



Eating contaminated fish is the single greatest human exposure to PCBs. The PCBs in the upper Hudson River have been present for 70 years and have accumulated in fish.

The EPA issued an advisory to not eat fish taken from the upper Hudson River. In 2002, the EPA adopted targets of PCB concentrations in fish to be reached by 2020 and 2031. The graph shows PCB concentrations of fish taken from the upper Hudson River and these targets.



24. Based on the model and graph, which would be the next logical solution that would cause the *greatest* decrease in PCB levels in fish in the Hudson River?

(1) Do nothing and let the river naturally remove the PCBs into the Atlantic Ocean.

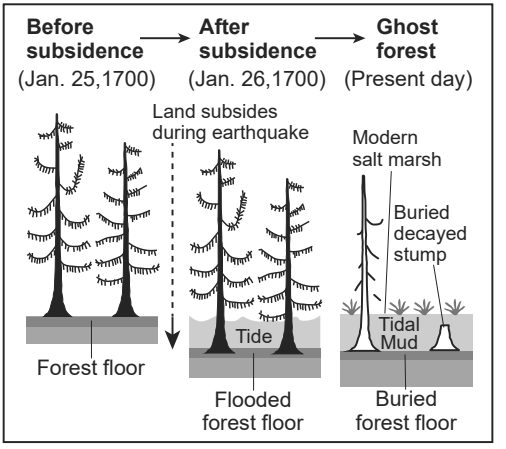
(2) Dredge additional areas that still have PCBs in sediment to permanently remove pollutants from the river.

(3) Build another large dam where the dam was removed to capture most PCBs before the contaminated sediment moves downstream.

(4) Breed larger fish that can remove PCBs from the water and sediments.

25. Explain how the graph supports the claim that dredging of the Hudson River has only been partially effective at reducing PCB levels in fish, compared to EPA targets.

The model shows the effects of subsidence in the creation of ghost forests as a result of an earthquake that occurred on January 26, 1700, along the west coast of the United States.



(Not drawn to scale)

39. Use the model to compare the temporal scale of land subsidence associated with the earthquake to the temporal scale of land subsidence associated with the development of a ghost forest.

Temporal scale of land subsidence associated with an earthquake: _____

Temporal scale of land subsidence associated with the development of a ghost forest: _____

Six proposed solutions for reducing the expansion of ghost forests are below.

Proposed Solutions

1. Fortify seawalls with concrete
2. Use sand and soil to create dunes with grasses along the coast
3. Limit development along coastal wetlands
4. Install sand fencing to reduce loss of sand from wind erosion
5. Preserve and restore the biodiversity of vegetation in tidal areas
6. Install tall rock walls and other artificial breakwaters

40. Which three proposed solutions reduce the expansion of ghost forests and would most likely be accomplished with minimal environmental impact and maximum aesthetic value to local residents?

(1) 1, 3, 4 (2) 1, 4, 6 (3) 2, 5, 6 (4) 2, 3, 5

EARTH AND SPACE SCIENCES
August 2025
Answer all questions in this part.

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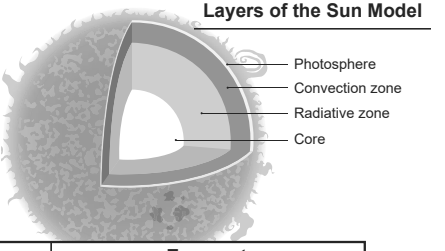
Base your answers to questions 1 through 5 on the information below and on your knowledge of Earth and Space Sciences.

Energy in the Sun

The Sun's energy influences the environment of all celestial objects in our solar system. Different forms of the hydrogen and helium atoms contained in the Sun's core, deuterium (^{2}H) and the helium atom (^{3}He), are under very high temperatures and pressures. These atoms combine to form helium (^{4}He), while releasing tremendous amounts of energy.

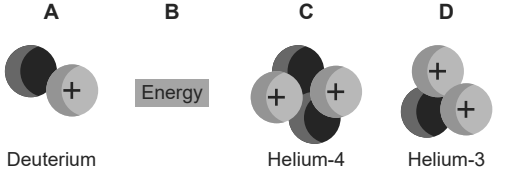
The model shows some information about the Sun.



Sun's Layer	Information About Layer	Temperature
Photosphere	Observable layer – gives off electromagnetic energy	6700°F – 11,000°F or 4000K – 6500K
Convection zone	• Convection causes hot material to rise to surface and cool • Creates sunspots and solar flares	11,000°F – 2 million °F
Radiative zone	Serves as a passage for radiation energy from core to surface	7 million °F
Core	Nuclear reactions occur	27 million °F or 15 million K

Four components of nuclear fusion, labeled *A*, *B*, *C*, and *D*, including models of the nuclei of deuterium, helium-4, and helium-3, are shown below.

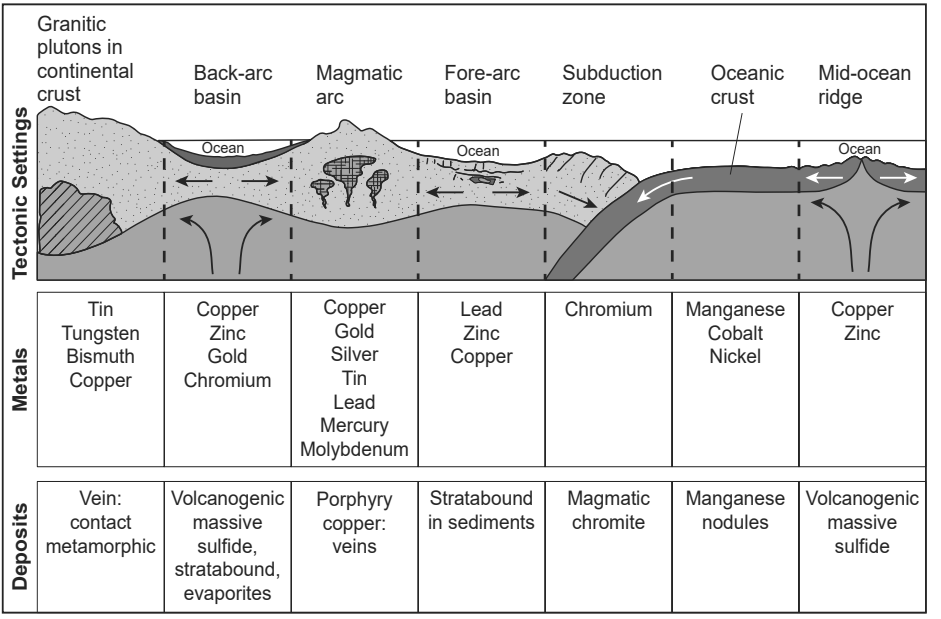
1. Complete the model of nuclear fusion by placing the letter of the correct position in the equation.



_____ + _____ $\xrightarrow[\text{Fusion}]{\text{Nuclear}}$ _____ + _____ + Neutron

The model below pairs tectonic locations with metal deposits that form within them.

Tectonic Locations Where Mineral and Metal Deposits Form



30. Based on the model above, identify the two tectonic settings in which pyrite, a sulfide-based deposit, forms in association with zinc and copper.

(1) back-arc basin and mid-ocean ridge
(2) fore-arc basin and magmatic arc
(3) mid-ocean ridge and granitic plutons in continental crust
(4) subduction zone and fore-arc basin

Base your answers to questions 31 through 35 on the information below and the models on the following page.

Earth-Moon History

About four billion years ago, the Moon was very close to Earth, and Earth may have been rotating at a much faster rate than today. It is estimated that each Earth day, at that time, may have been six to eight hours long, which, when calculated, would result in an Earth year of about 1400 days. The force that causes tides on Earth creates tidal friction which, over time, slowed Earth's rotation, causing Earth days to become about 24 hours long. As Earth's rate of rotation has decreased, the Moon has continued to move farther away from Earth at an average rate of 3.8 cm/yr. The Moon orbits Earth at an average distance of 384,400 km. The model and graph below show some information about tides.