GEOL 1122 Mid-Term Exam I.
Tuesday September 17, 2019
30 Questions   4 pages   100 points

Read all questions carefully!
For all matching questions, any letter may be used any number of times.
The number of points allocated to a question is shown in brackets to the right. It means nothing more than that.

1. Match the minerals with the chemical formulas.   [3]

____ Magnetite   A. Fe_3O_4, an iron oxide.   H. Cu_2SiO_4, a copper silicate
                        B. $CaSO_4.2H_2O$, a hydrous calcium sulfate
____ Quartz   C. NaCl, sodium chloride.   J. Al_2O_3, aluminum oxide.
                        D. SiO_2, silicon dioxide.   M. $ZrSiO_4$, zirconium silicate.
____ Gypsum   E. $CaCO_3$, calcium carbonate.   P. MgF, magnesium fluoride

2. For each mineral, give the letter indicating its significance to understanding Earth's history.   [4]

____ Gypsum ($CaSO_4.2H_2O$)   A. A mineral produced only in the bones of mammals
                                B. A mineral of which many marine organisms make their shells
____ Aragonite ($CaCO_3$)   C. A mineral common around craters made by meteorite impacts
                                D. A mineral produced by O_2 and thus evidence of an oxidizing atmosphere
____ Hematite (Fe_2O_3)   E. A mineral produced by evaporation of seawater or lake water and
                                   thus evidence of a region of evaporation
____ Calcite ($CaCO_3$)   F. A mineral produced only in the bones of ancient reptiles

3. Match the following eight sedimentary rocks with their typical depositional environments.

____ Redbeds   A. Extremely deep lakes   [5]
        ____ Chalks   B. Deep seas   C. Tundra and polar bays
____ Limestones   D. Lagoons and restricted seas in Horse Latitudes
        ____ Coal   E. Swamps   F. Polar Icecaps
____ Evaporites   G. Lake bottoms, river floodplains, continental shelves, deep oceans
        ____ Shales   H. Alluvial fans, river channels, wave-swept beaches
____ Sandstones   J. Continents, especially deserts
                        K. Rivers, coastlines, desert dunes
____ Conglomerates   M. Mountain tops   Q. Warm shallow seas

4. Silicate minerals can placed in a spectrum from mafic to sialic. Match each with its characterization. [3]
                A. Rich in magnesium and iron, and therefore dense; melt at higher temperatures than sialic ones.
____ Mafic   B. Rich in manganese and fluoride; melt at lower temperatures than sialic minerals.
                C. Rich in sialium, and therefore dense; melt at higher temperatures than mafic.
____ Sialic   D. Rich in silicon and aluminum; less dense than and melt at lower temperatures than mafic.

5. Match these names for igneous rocks with their characteristics.   [3]
   A. Fine-grained (volcanic) rock with felsic/sialic composition.
                B. Fine-grained (volcanic) rock with intermediate composition.
____ Basalt   C. Coarse-grained (intrusive) rock with felsic/sialic composition.
                D. Coarse-grained (intrusive) rock with mafic composition.
____ Granite   E. Coarse-grained (intrusive) rock with sulfuric composition.
                F. Fine-grained (volcanic) rock with mafic composition.

6. Metamorphic rocks (schists, gneisses, etc.) typically form as the result of   [3]
        A. the passage of time   E. Exposure to rain and snow
        B. great temperature and pressure below Earth's surface F. Penetration by plant roots
____   C. low temperatures in polar regions   G. Exposure to sunlight
        D. impact by meteorites   H. Flooding by seawater

7. An organism is more likely to be preserved as a fossil if . . .   [3]

      A. It is a photosynthesizer converting CO_2 into $C_6H_{12}O_6$.   J. A and B   S. D and E

      B. It makes a shell or skeleton consisting mineral material.   K. A and C   T. C and E

____   C. It lives in the ocean, rather than on land   M. A and D   V. A, B, & C

      D. It can fly or run.   Q. B and C   W. B, C, & D

      E. It is a carnivore rather than a herbivore.   R. C and D   Z. C, D, & E

8. For each the following vertical cross-sections, indicate the kind of fault shown and the stress that causes it.

                [4]
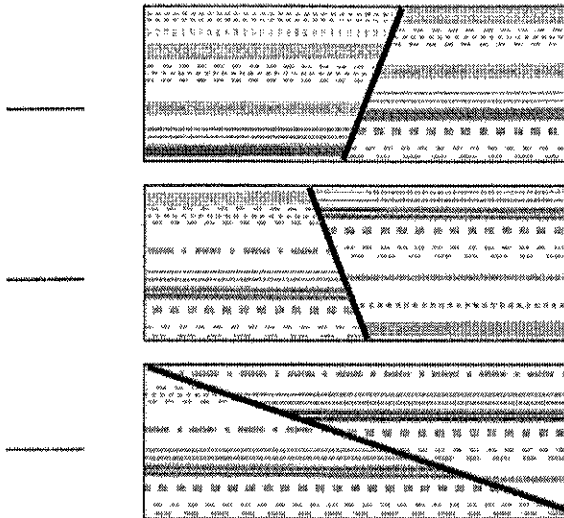
B. Reverse fault – result of compressional stress

C. Reverse fault – result of lateral shear stress

E. Isogonal fault – result of extensional stress

G. Normal fault – result of extensional stress

L. Thrust fault – result of hyperbolic stress

M. Anticlinal fault – result of extractional stress

R. Thrust fault – result of compressional stress

S. Diametric fault – result of compressional stress

W. Neiridic fault – result of inclined stress

9. Match the kinds of faults and folds with the kind of plate boundary at which they are most likely to form.
    (Some letters may be used more than once.)   [4]

____ Normal Faults   ___ Anticlines   E. Convergent plate boundaries   P. Pyramidal plate boundaries

                                               B. Imbricate plate boundaries   S. Schismic plate boundaries

____ Reverse Faults   ___ Synclines   H. Hyperbolic plate boundaries   T. Transform plate boundaries

                                               M. Divergent plate boundaries   W. Wyldian plate boundaries

____ Thrust Faults   ___ Strike-slip faults   J. Orthogonal plate boundaries   X. Xeric plate boundaries

10. Evidence that the continents have moved includes (check all that apply)   [3]

                                 ___ Matching geology of the interfit continents

                      ___ Presence on interfit continents of fossils restricted to land

               ___ Matched pairs of cities on opposites of oceans

        ___ Geographic fit of the continents (including their continental shelves)

___ Past movements of glaciers across the interfit continents

11. Our understanding of plate tectonics indicates that new crustal area (new earth surface) is generated . . .

      A. at the mid-ocean ridges.   D. in the abyssal plains of the oceans.

____   B. at the trenches in the oceans.   E. in mountain ranges.

      C. in the centers of the continents.   F. In Antarctica   [2]

12. Which of the following best explains the philosophical idea called "Ockham's Razor" or "Occam's Razor"?

      A. Any idea supported by someone more than 30 years of age is wrong.   [3]

      B. Our explanations of things should not include ideas for which there is no evidence.

____   C. The simplest explanation is the best explanation.   J. B and C   W. D and E

      D. The most complex explanation is the best explanation.   M. C and D   Y. B and E

      E. The oldest explanation is the best explanation.   Q. B, C, D, and E   Z. C and E

13. Our Web reading called "What is Science?" contrasted Scholasticism (a way of thinking about scientific questions dominant before 1600) with what it called "Modern Science". Match each with its best definition. [3]

A. A system of thought in which theories are valid only if they are supported by observational facts and physical evidence.

_____ Scholasticism

B. A system of thought in which the validity of theories depends on the scholarly reputation of the people proposing them.

_____ Modern Science

C. A system of thought in which theories are derived from ancient texts and from principles of symmetry and ideal form.

14. Which of the following is the best definition of a scientific theory? [3]

A. An idea proposed as a tentative explanation of some natural phenomenon or phenomena.

B. A coherent set of propositions that explain a class of phenomena, that are supported by extensive factual evidence, and that may be used for prediction of future observations.

_____

C. A coherent set of propositions that is an indisputably true explanation of a class of phenomena; simple observation and fact prove it true.

15. The eons (the largest divisions) of geologic time are, from first (earliest) to last (most recent), ...

A. Hadean, Archean, Proterozoic, and Phanerozoic. [3]

B. Archean, Proterozoic, Phanerozoic, and Paleozoic.

_____

C. Hadean, Archean, Proterozoic, and Cenozoic.

D. Proterozoic, Phanerozoic, Mesozoic, Cenozoic.

E. Phanerozoic, Paleozoic, Mesozoic, Cenozoic.

16. The periods of the Paleozoic era are, in order from first (earliest) to last (most recent), ... [3]

A. Triassic, Jurassic, Cretaceous, Paleogene, Quaternary.

B. Jurassic, Triassic, Cretaceous, Neogene, Quaternary.

_____

C. Triassic, Jurassic, Cretaceous, Neogene, Quaternary.

D. Quaternary, Neogene, Paleogene, Cretaceous, Jurassic, Triassic.

E. Cambrian, Ordovician, Silurian, Devonian, Mississippian, Pennsylvanian, Permian.

17. The Paleozoic era ended and the Mesozoic era began . . . [3]

A. 2.5 billion years ago.	D. 370 million years ago.	G. 36 million years ago
B. 1.7 billion years ago.	E. 252 million years ago.	H. 18 million years ago.
C. 541 million years ago.	F. 72 million years ago	J. 3.2 million years ago.

_____

18. Measurement of the K^{40} and Ar^{40} in a crystal determines that, of the total number of atoms of the two, 400 are Ar^{40} and 400 are K^{40}. The half-life of K^{40} is 1.25 billion years. How old is this crystal?

A. Two years old	E. 23 million years old	J. 2.50 billion years old [3]
B. Thee years old	F. 122 million years old	L. 3.75 billion years old
C. Four years old	G. 0.625 billion years old	M. 5.0 billion years old
D. Six years old	H. 1.25 billion years old	Q. Some other age: _____

_____

19. Match the kind of radiometric dating with the appropriate characterization. [3]

____ ^{238}U-^{206}Pb ____ ^{14}C

____ ^{235}U-^{207}Pb ____ ^{40}K-^{40}Ar

____ ^{232}Th-^{208}Pb ____ ^{87}Rb-^{87}Sr

A. Half-life < 10,000 years

B. 10,000 years < half-life < 1 million years

C. Half-life > 1 million years

(Fill in every blank! Some letters will have to be used more than once.)

20. In considering the age of the Earth, we examined the following lines of geologic (non-radiometric) evidence. Of them, which suggest an old (at least millions of years old) Earth, rather than a young (thousands of years old) Earth? [3]

A. Angular Unconformities	F. A and B	K. A, B & C	R. B, D, & E
B. Exposures of intrusive igneous rocks	G. B and C	L. B, C, & D	S. A, B, C, & D
C. Exposures of metamorphic rocks	H. C and D	M. C, D, & E	T. B, C, D, & E
D. The amount of salt in the oceans	J. D and E	P. A, C, & D	U. A, B, D, & E
E. The collective thickness of sedimentary rocks		Q. A, D, & E	W. A, B, C, D, & E

_____

Questions 21 to 28 concern the illustration on the screen.

_____ 21a. What is the oldest rock unit on the cross-section? [2]

_____ 21b. Of Z and M, which feature is younger (formed later)? [2]

_____ 21c. Of W and Z and J, which feature can you be sure is older (formed earlier)? [2]

21d. During the formation of which lettered rock unit was seawater the deepest [3]
_____ (i.e., sea level was highest)?

22. Answer the following using letters from the list at right.

A. Anthropozoic
B. Biozoic

_____ 22a. Layer Y is from what time interval? C. Cenozoic [2]
G. Geozoic

_____ 22b. Layer P is from what time interval? M. Mesozoic [2]
N. Neozoic

_____ 22c. Layer V is from what time interval? P. Paleoozoic [2]

23. During the time in which Layers D to K were deposited . . . [2]
A. The shoreline and land were to the right and the deeper sea to the left.
B. The shoreline and land were to the left and the deeper sea to the right.
_____

_____ Layers D to K are a/an . . . A. Anticline E. Eon H. Hiatus N. Nonconformity S. Sequence [1]

24. Answer the following using letters from the list at right. A. Amphiboles
B. Batholiths

_____ 23a. What are Units W and Z? D. Dikes [3]
F. Faults

_____ 23b. What are surfaces like M and Q? M. Micas [3]
U. Unconformities

_____ 23c. What are surfaces like E and G? V. Volcanoes [3]

25. To what tectonic stress was this region first subjected? B. Biflexural M. Monoclinic
C. Compressional T. Trilateral [3]
_____ Q. Quadrilaterial O. Orthogonal E. Extensional W. Wrenching

_____ 26. From the list for Question 22, give the letter for the time in which that first stress occurred. [2]

_____ 27. What kind of rock might H be? H. Chalk O. Coal L. Limestone G. Gneiss [1]

_____ 28. What kind of modern deposit might A be? H. Chalk Y. Gypsum R. Granite O. Coal [1]

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29. What lines of radiometric evidence discussed in lecture have lead to the modern scientific conclusion about
the age of the earth? Check all that apply. [3]
_____ Radiocarbon dating of fossils.
_____ Earth's oldest rocks, which are 545 million years old.
_____ Earth's oldest minerals, which are 4.4 billion years old.
_____ Ratios of isotopes of lead (Pb) in the entire (bulk) Earth,
which imply an age of 4.5 billion years.
_____ Ratios of isotopes of carbon (C) in the entire (bulk) Earth,
which imply an age of 4.0 billion years.
_____ The oldest sedimentary rocks, which are 545 million years old.
_____ The oldest protons, which are 5.2 billion years old.
_____ The oldest lunar materials, which are 4.5 billion years old.
_____ The oldest lunar rocks, which are 545 million years old.
_____ The oldest lunar rocks, which are 3.8 billion years old.
_____ The oldest fossils, which are 65 million years old.
_____ Meteorites, which are 4.5 billion years old.

_____ 30. What is the scientifically accepted age of the Earth? [3]
Fill in the blank.