31 multiple choice X 2 pts each = 62 points
13 short answer, variable points = 36 points
#27 freebie = 2 points
TOTAL = 100 points

Name_____KEY_____

Section (9am / 12pm)

Read each question carefully. Choose the BEST answer among those available for multiple choice questions. Write your own answer where indicated.





Use the images above to answer questions 1-4. ***Assume that you know nothing about these mountains other than what you can see in the photos.***

1) Based on the photos alone, what would be the most useful geology-related criteria for evaluating the age of these mountains?

a) the shape of the peaks, b) the height of the mountains, c) the presence of snow, d) vegetation, e) folds and faults

2) Based on your answer above, which mountain range is likely to be youngest?

a) mountains on right, b) mountains on left, c) you can't tell, d) they are the same age

3) What process of mechanical weathering is most likely to be occurring in the mountains shown on the left?

a) unloading, b) biological weathering, c) mass wasting, d) frost wedging, e) glacial erosion

4) What process of mechanical weathering is most likely to be occurring in the mountains shown on the right?

a) unloading, b) biological weathering, c) mass wasting, d) frost wedging, e) glacial erosion

5) What is different about the solid form of water relative to the solid forms of all other Earth materials?

a) it is more dense than the liquid form, b) it occupies more volume than the liquid form, c) it is chemically distinct from the liquid form, d) it occupies less volume than the liquid form

Use the image below to answer questions 6-9.

6) How far have the rocks in the image below been transported?

a) a short distance, b) a medium distance, c) a long distance, d) you can't tell

7) In the space below, give <u>two</u> pieces of information about the rocks that you observe that justify your answer to question 6.



1) They are large (1 point)
2) They are angular/jagged (1 point)

8) What process probably *created* the talus pieces that you observe in the image above?

a) erosion, b) mechanical weathering, c) chemical weathering, d) mass wasting, e) unloading

9) What process *transported* the talus pieces that you observe to their current location?

a) erosion, b) mechanical weathering, c) chemical weathering, d) mass wasting, e) unloading

10) What is the most common continental rock type?

Granite (2 points)

11) What are the two primary products of chemical weathering of that rock type?

a) quartz & mica, b) mica & feldspar, c) mica & clay, d) feldspar & quartz, e) quartz & clay

12) What two processes can convert loose sediments into detrital sedimentary rocks?

a) compaction & pressure, b) heat & pressure, c) pressure & cementation, d) cementation & compaction, e) heat & cementation

13) What happens to loose sediments as they convert into detrital sedimentary rocks?

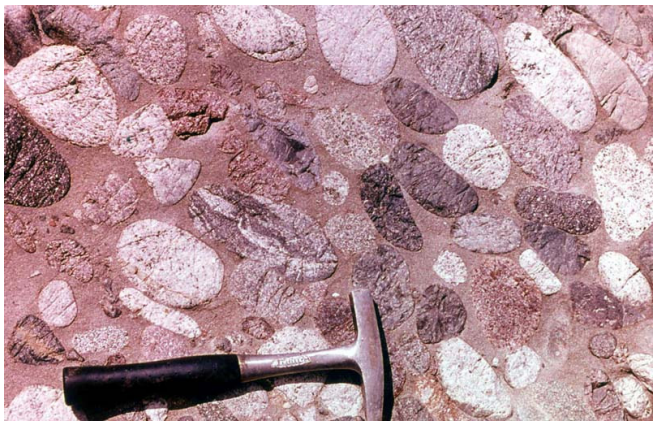
a) density decreases, b) porosity decreases, c) porosity increases, d) weight decreases, e) pore fluids increase

Use the image below to answer questions 14-17.

14) How far have the particles in this detrital sedimentary rock been transported?

a) a short distance, b) a medium distance, c) a long distance, d) you can't tell

15) In the space below, give <u>two</u> pieces of information to justify your answer to question 14.



1) they are quite rounded
2) they are cobble-sized (smaller than talus)
3) various lithologies
4) etc.

(1 point per correct answer = 2 points)

16) What was the probable energy of the medium that transported these rock particles to this location?

a) low energy, b) medium energy, c) high energy, d) *super* high energy, e) you can't tell

17) *What* probably transported these rock particles to this location and *how can you tell*?

(1 point) + (1 point) = 2 points total
a) streamflow, b) you can see that they are roughly aligned in the direction of former streamflow

Use the image below to answer questions 18-20.

18) In the space below, write what category of sedimentary rocks this sample would fall into.



Biochemical sedimentary rocks
(1 point for "bio", 1 point for "chemical" = 2 points total)

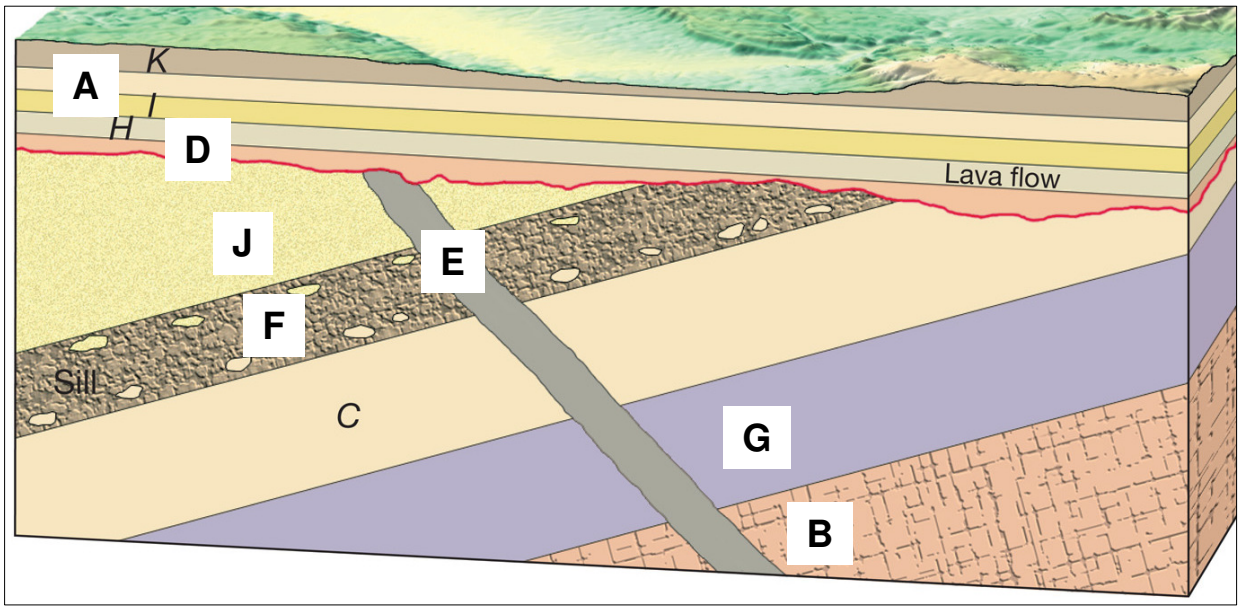
19) How far have the particles in this sedimentary rock been transported *prior to solidification of the rock*?

a) a short distance, b) a medium distance, c) a long distance, d) you can't tell

20) In the space below, justify your answer to question 19.

(1 point) + (1 point) = 2 points total
These fragile shells are mostly intact, indicating that they haven't been damaged by transport

Use the image below to answer questions 21-23.



21) What is the youngest material in this image?

a) B, b) E, c) Sill/(F), d) Lava flow/(H), e) D, f) K

22) What is the oldest material in this image?

a) B, b) E, c) Sill/(F), d) Lava flow/(H), e) D, f) K

23) Rank all materials (A-K) in age order from youngest to oldest.

K, A, I, H, D, E, F, J, C, G, B (0.5 points each, except F/J combined = 0.5 points, for 5 points total)

or

K, A, I, H, D, E, J, F, C, G, B ok too since we didn't talk about sills in class

24) What process other than biological activity can create chemical sedimentary rocks?

a) compaction, b) evaporation, c) heat, d) cementation, e) mid-ocean ridge venting

Use the image of the *sandstone* below to answer questions 25-27.

25) What was the probable energy of the medium that transported these rock particles to this location?

a) low energy, b) medium energy, c) high energy, d) *super* high energy, e) you can't tell

26) *What* probably transported these rock particles to this location and *how can you tell*?



Wind (1 point)

The remnant cross-bedding tells you these were sand dunes which are created by wind (1 point)

27) What direction was the transporting medium moving in this image?
THROW OUT SINCE I PRESENTED THIS WRONG IN CLASS!
a) left to right, b) right to left, c) upper left to lower right, d) upper right to lower left

28) Thinking about Earth's geothermal gradient, where are we most likely to develop metamorphic rocks?

a) the location where an oceanic plate is being subducted, b) in the center of an oceanic plate, c) in the center of a continental plate, d) at the location of convergent volcanism, e) at a transform fault boundary

29) In addition to heating, what other forces/processes contribute to the development of metamorphic rocks?

a) chemical fluid circulation and cementation, b) cementation and compaction, c) pressure and chemical fluid circulation, d) evaporation and cementation, e) pressure and evaporation

30) During the process of regional metamorphism, what is the response of materials to stress?

a) elongation parallel to the stress direction, b) elongation perpendicular to the stress direction, c) shortening perpendicular to the stress direction, d) shortening in every direction

Use the image below to answer questions 31-33.

31) What is the type of dark metamorphic rock formation at the top of this mountain range?



A roof pendant (2 points)

32) What has caused the formation of these metamorphic materials?

a) mineral reorientation, b) mineral recrystallization, c) mineral elongation, d) foliation, e) chemical fluid circulation

33) Where did these metamorphic materials probably form?

a) under ground, b) at the surface of Earth, c) at a hotspring, d) in the Himalayas, e) at the top of the mountains

34) Where is regional metamorphism most common?

a) continental divergence, b) oceanic divergence, c) oceanic convergence, d) continental convergence, e) transform faults

35) List one modern and one ancient example of where regional metamorphism has occurred.

(2 points) + (2 points) = 4 points total
Modern: Himalayas, Ancient: Appalachians

36) What is the name of the texture exhibited by the metamorphic rock below?



Foliation (2 points)

37) From what directions was pressure being applied to this same rock during metamorphism?

a) left and right, b) top and bottom, c) upper right and lower left, d) upper left and lower right

38) What type of metamorphic rocks result from the interaction of seawater and magma at a mid-ocean ridge?

a) evaporites, b) conglomerates, c) roof pendants, d) sulfates, e) pillow basalts

Use the information below to answer questions 39 & 40.

39) You have a piece of meteorite containing Uranium-238 and Lead-206 with a parent to daughter ratio of 13/87. How old is your sample in billions of years?

a) 4.5, b) 9.0, c) 13.5, d) 18.0, e) 47.0

40) Assume the rocks shown in the schematic cross-section below are in their original positions (never disturbed since deposition). The Moenkapi Formation contains Uranium-235 and Lead 207 with a parent daughter ratio of 25/75. The Wingate Sandstone contains Potassium-40 and Argon-40 with a parent/daughter ratio of 50/50. What is the range of possible ages for the Chinle Formation? Show your work in the space below.

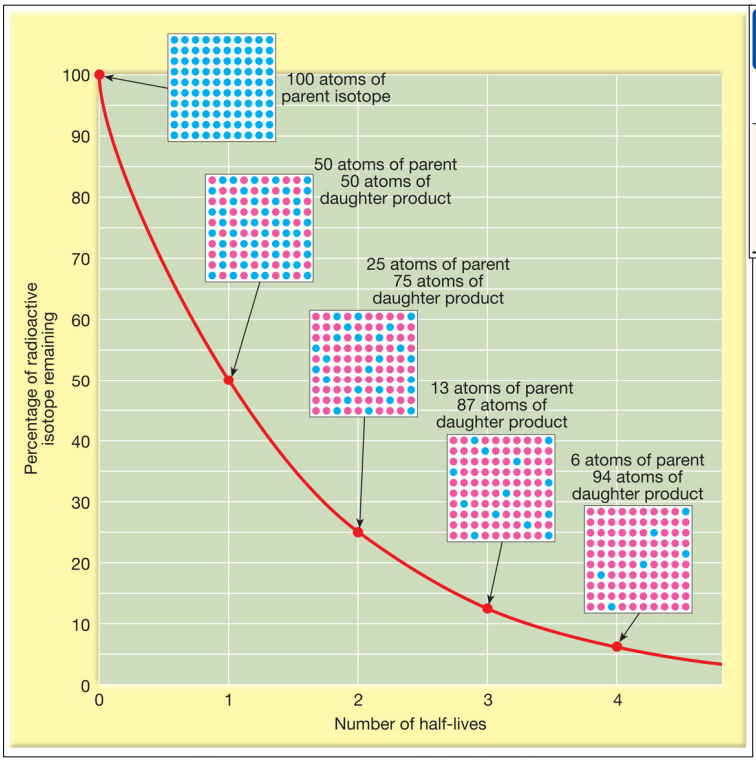
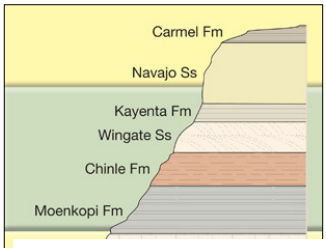


Table 18.1 Radioactive isotopes frequently used in radiometric dating.

Radioactive Parent	Stable Daughter Product	Currently Accepted Half-life Values
Uranium-238	Lead-206	4.5 billion years
Uranium-235	Lead-207	713 million years
Thorium-232	Lead-208	14.1 billion years
Rubidium-87	Strontium-87	47.0 billion years
Potassium-40	Argon-40	1.3 billion years



Chinle must be intermediate in age between the Moenkopi and Wingate Formations due to relative dating techniques
(1 point)
(6 points total for whole question)

(2 pts) Moenkopi = 2 half lives x 713 million years = 1426 million years or 1.4 billion years old
(2 pts) Wingate = 1 half life x 1.3 billion years = 1.3 billion years old
(1 pt) Therefore Chinle must be between 1.4 billion and 1.3 billion years old

41) In describing the Geologic Timescale, what defines intervals on the timescale?

a) predominant types of rocks, b) predominant types of fossils, c) extinctions of life forms, d) meteorite impacts, e) Earth's temperature

42) In describing the Geologic Timescale, what defines boundaries on the timescale?

a) predominant types of rocks, b) predominant types of fossils, c) extinctions of life forms, d) meteorite impacts, e) Earth's temperature

43) What two factors favor fossil preservation?

a) skeletons & teeth, b) rapid burial & compaction, c) cementation & hard parts, d) hard parts & rapid burial, e) compaction & cementation

Use the image below to answer questions 44 & 45.

44) What can we infer about the lifestyle of these organisms?

a) they were carnivores, b) they were predators, c) they were adults, d) they could swim, e) they were colonial

45) Based on what you can observe in the image below, what type of environment do you think these organisms lived in? Give three pieces of evidence to support your answer.



(1 pt) They were marine based on their resemblance to modern organisms

(1 pt) They were coastal based on the presence of sand in their molds

(1 pt) If they were coastal this means they lived in shallow waters

(1 pt) They lived in groups based on there being many of them preserved together

Etc…**(up to 3 points total)**