National Exams December 2018

04-BS-14, Geology

3 hours duration

NOTES:

1. If doubt exists as to the interpretation of any question, the candidate is urged to submit with the answer paper, a clear statement of any assumptions made.

2. This is a CLOSED BOOK EXAM. Candidates may use one of two calculators, the Casio or Sharp-approved models.

3. Four (4) questions constitute a complete exam paper. YOU MUST ANSWER QUESTIONS 1 TO 3.

4. On Question 4, choose 4 only from 34 to 44 to answer; the first four (4) answers, as they appear in the answer book, will be marked. The only exception will be if the candidate clearly indicates that another response should be substituted for a previous choice.

5. The marks assigned to the subdivisions of each question are shown for information.

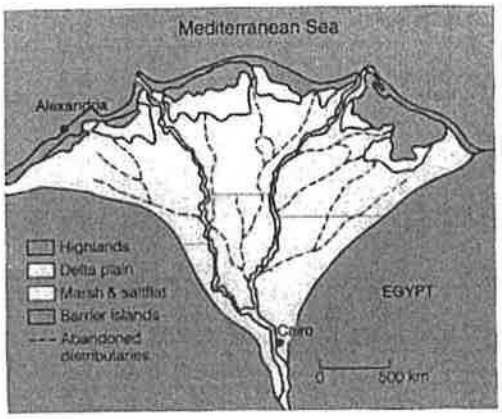
6. The total number of marks for the exam is 100

Question 1. Multiple Choice / True and False 20 Marks

****NOTE** write your answers in the Exam Booklet (ie not on this page).**

1. Which of the following is an andesitic rock?
   a. Granite
   b. Rhyolite
   c. Basalt
   d. Andesite

2. The following is an example of a _____ dominated delta.
   a. Tide
   b. Stream
   c. Wave



3. When does permanent rock deformation occur?
   a. once its elastic limit is surpassed
   b. when it goes on a real bender
   c. once it is completely lithified and becomes inflexible
   d. only after it comes to be located on a plate margin

4. The best way to determine the age a pre-Cambrian rock is:
   a. Tree rings
   b. Radioactive dating
   c. Carbon14 dating
   d. Asking the rock

5. _____ is one of the three ways a glacier can move over its bed.
   a. Frost heaving
   b. Basal slip
   c. Morainal sliding
   d. Crevassal slip

6. During mountain building episodes, originally flat lying sedimentary and volcanic rocks are often bent into a series of _____.
    a. Folded anticlines and synclines
    b. Box pleats
    c. Horsts and grabens
    d. Heaves and sags

7. The principal causes of mechanical fragmentation of rocks *in place* are _____.
    a. erosion and transport by moving wind, water, or ice
    b. the relentless actions of Sisyphus
    c. always inscrutable because they happened at some time in the past
    d. biologic activity, expansion from unloading, frost wedging

8. The _____ of the geologic time scale occurs within the time of Earth's most recent "Ice Age."
    a. Proterozoic Eon
    b. Pleistocene Epoch
    c. Permian Period
    d. Pliocene Epoch

9. Most crustal deformation occurs in active tectonic zones _____.
    a. deep within old plate interiors
    b. at the base of sedimentary basins
    c. in thick piles of unconsolidated sedimentary strata
    d. along plate margins

10. A syncline is _____.
    a. a fold with only one limb
    b. a fold in which older flanking strata dip toward the axis
    c. a paralytic drunken fold characterized by recumbent limbs
    d. a fold in which the older central strata dip away from the axis

11. Which of the following best defines a mineral and a rock?
    a. A rock has an orderly, repetitive, geometric, internal arrangement of minerals; a mineral is a lithified or consolidated aggregate of rocks.
    b. A rock consists of atoms bonded in a regular, geometrically predictable arrangement; a mineral is a consolidated aggregate of different rock particles.
    c. In a mineral the constituent atoms are bonded in a regular, repetitive, internal structure; a rock is a lithified or consolidated aggregate of minerals.
    d. A mineral consists of its constituent atoms arranged in a geometrically repetitive structure; in a rock, the atoms are randomly bonded without any geometric pattern.

12. Minerals consist of an ordered array of atoms or ions that are _____.
    a. all the same size and charge
    b. always packed together in cubes or octahedra
    c. physically attached to each other by shared protons
    d. chemically bonded in a regular crystalline structure

13. During major earthquakes, instantaneous displacements of _____ occur across pre-existing faults.
    a. a few kilometres
    b. a few millimetres
    c. a few metres
    d. a few thousand kilometres

14. The physical removal of dissolved or disaggregated rock from the site of weathering by wind, water, or ice is termed _____
    a. ablation
    b. recidivism
    c. solifluction
    d. erosion

15. A(n) _____ represents a former meltwater channel or tunnel on, in, or beneath glacial ice, that became filled with sand and gravel
    a. drumlin
    b. esker
    c. valley train
    d. kettle

16. The main direct geologic effect(s) of glaciers is (are) to _____.
    a. raise global sea level by depressing the crust
    b. warm the global climate by absorbing more solar radiation
    c. erode the continental landscape and to transport and deposit sediments
    d. reduce high latitude marine sedimentation by reducing biologic productivity

17. The three major processes involved in chemical weathering are _____.
    a. dissolution, hydrolysis, and oxidation
    b. precipitation, ion exchange reactions, and degasification
    c. carbonation, dissimulation, and salinization
    d. recrystallization, pitting, and rinsing

18. Brittle deformation would be favoured over plastic deformation in which of the following conditions?
    a. warmer temperatures and high confining pressures
    b. cooler temperatures and low confining pressures
    c. shallow depths
    d. high confining pressures

19. Compared to earlier or subsequent streams in the same valleys, alpine glaciers move _____ but carry _____ sediment.
    a. faster; less
    b. mainly in the winter; mostly very coarse
    c. a little slower; only finer
    d. very much slower; vastly more

20. Which one of the following stress situations results in folding of flat-lying, sedimentary strata?
    a. horizontally directed, extensional stresses
    b. vertically oriented digital stresses
    c. vertically directed, extensional or stretching stresses
    d. horizontally directed, compressive stresses

Question 2. True and False 10 marks

****NOTE** write your answers in the Exam Booklet (ie not on this page).**

21. In locations with continuous permafrost the active layer never melts.

22. Silicates are, after carbonates, the second most abundant minerals in the crust of the Earth.

23. An aquifer is an impermeable layer which serves as a confining layer above an aquiclude which has the capacity for transmitting groundwater.

24. A spring is a place where the groundwater flows into the ground.

25. Oxbow lakes form when a mature meandering stream cuts off a meander.

26. Drumlins and roche moutonnees have the same overall shape however drumlins are composed of till with and roche moutonnees are composed of rock.

27. Normal faults are caused by extensional tectonic forces and reverse faults are caused by compressional tectonic forces.

28. The water velocity required to mobilize a grain of silt is greater than that which will mobilize a grain of sand.

29. Quartz is a three dimensional arrangement of silica tetrahedra, while biotite is a chain-like arrangement.

30. A mineral's color and streak are always a consistent and reliable property for identification.

Question 3. Short Answer 30 marks

31. Figures Q3-1 and Q3-2 shown below have white boxes that must be filled in. Fill in the boxes with the appropriate words/concepts/structures etc.

10 marks

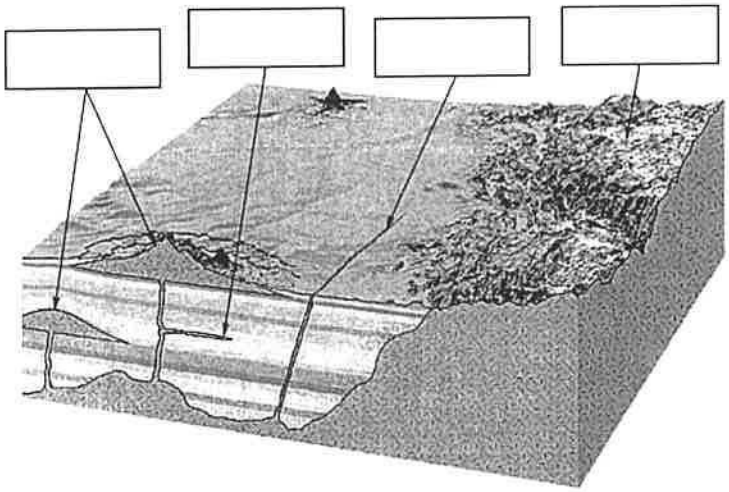


Figure Q3-1 – Fill in the four blanks above indicating the structures shown

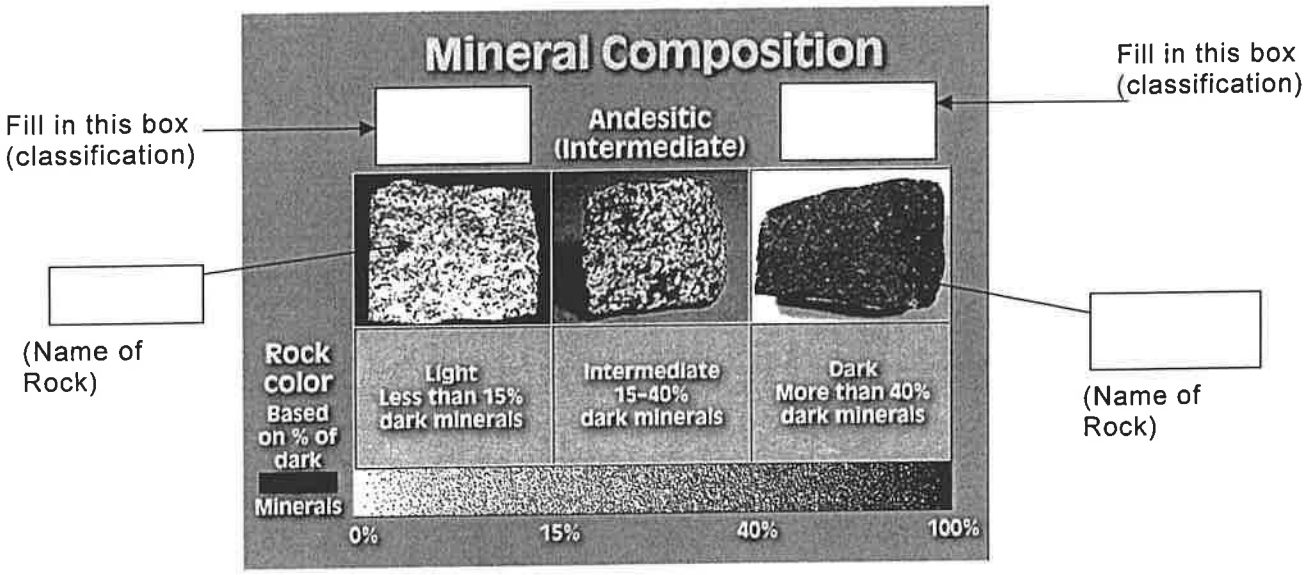


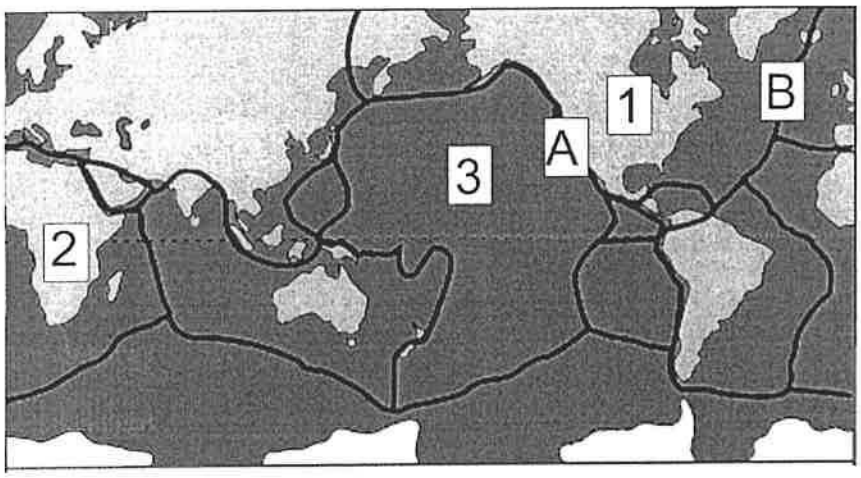
Figure Q3-2 – Classification of a certain Rock Type

32. In the following map of the Earth the continents and oceans are shown. The tectonic plates and boundaries are also indicated with the thick black lines. Do Not Mark Anything on the map and do not hand it in with your exam booklet. Clearly write the answers in your exam booklet

a. Name the 3 tectonic plates (1, 2 and 3)

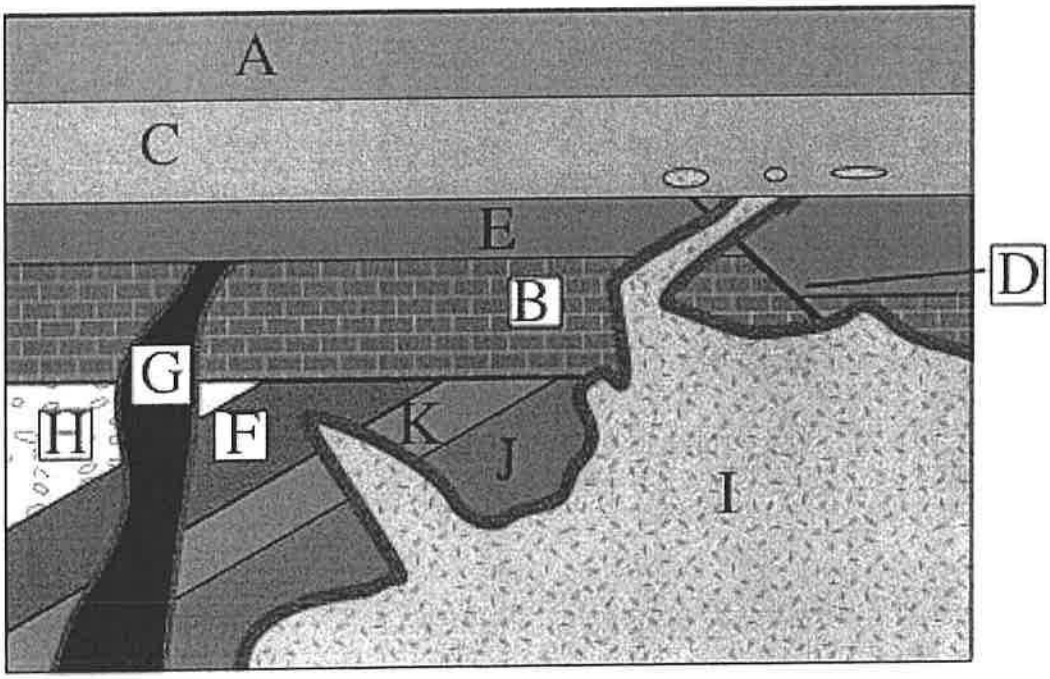
b. Name each type of tectonic boundary indicated in capital letters (A, B)

6 marks



33. For the cross-section shown below, list the geologic events that caused the current configuration in chronological time.

14 marks



Question 4. Answer four (4) of the following questions: 40 marks

34. List and describe three (3) types of unconformities.

35. Name and draw four (4) drainage patterns. For each pattern, provide a reasonable explanation of the type of geology that may exist below the surface that has directly influenced these drainage patterns.

36. List and describe five (5) factors that influence mass wasting.

37. List and describe two (2) erosional features and two (2) depositional features associated with glaciers.

38. Sketch and describe the hydrologic cycle.

39. Name three (3) types of glaciers and give key characteristics of each.

40. List and describe three (3) erosional features and three (3) depositional features associated with glaciers.

41. Describe Bowen's Reaction Series.

42. List and describe five (5) types of volcanoes.

43. Draw a typical permafrost profile, label, and describe the layers. Beside the profile (i.e. correlating it to depth), sketch a graph of temperature versus depth for summer and winter.

44. Describe the structure of the interior of the Earth, providing some qualitative judgment of the thickness of the various units and a description of the nature of the materials involved