Concordia University
CIVI-231 Geology for Civil Engineers (Fall 2016)

Oct. 17, 2016 **17:45-19:45**

Mid-term exam

Student Name/ ID Number: _____

PART ONE: MULTIPLE CHOICES (2 marks each)

1. _____ includes the study of how rocks and minerals form and change according to physical, chemical, and biologic processes which affect everything from Earth's internal structures and tectonic plates to landscape evolution and crystal forms.
A) Physical geology B) Historical geology C) Manifest destiny D) Catastrophism

2. In the rock cycle, the series of processes that transform unconsolidated sediment into sedimentary rocks is termed _____.
A) cementation B) compaction C) dewatering D) lithification

3. In geologic theory, volcanic eruptions, earthquakes, landslides, floods, and tsunamis are all _____.
A) exceptions to the theory of uniformitarianism B) unique phenomena that can neither be predicted nor understood C) naturally recurring geologic hazards from ongoing physical processes
D) divine punishments sent to discourage us of our evil ways

4. The _____ is the thinnest layer of the Earth.
A) crust B) outer core C) mantle D) inner core

5. The composition of the core of Earth is thought to be _____.
A) basalt B) granite C) peridotite D) iron-nickel alloy

6. The _____, about 100 km thick, is the coldest, most rigid, and most brittle layer in the Earth.
A) lithosphere B) asthenosphere C) mesosphere D) inner core

7. The asthenosphere is actually a part of the _____ of the Earth.
A) outer core B) crust C) inner core D) mantle

8. The process by which magmas cool and solidify to rock is termed _____.
A) volcanism B) plutonism C) crystallization D) thermal metamorphism

9. In sedimentary rocks, lithification includes _____.
A) compaction and cementation B) cementation and weathering C) compaction and transportation
D) crystallization and cooling

10. 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 octahedral C) chemically bonded in a regular crystalline structure D) physically attached to each other by shared protons

Student Name/ ID Number:_____

11. The property of _____ is controlled by planes of few or weak bonds within the mineral structure.
A) absorbency B) bondage C) cleavage D) well formed crystal faces

12. Which mineral is easily soluble in water at room temperature conditions?
A) diamond B) talc C) halite D) olivine

13. Which carbonate mineral reacts readily with cool, dilute hydrochloric acid to produce visible bubbles of carbon dioxide gas?
A) calcite B) quartz C) dolomite D) plagioclase

14. Which group of minerals are the most abundant in the Earth's crust?
A) sulphides B) carbonates C) silicates D) chlorides

15. All silicate minerals contain which two elements?
A) iron, silicon B) silicon, sodium C) oxygen, carbon D) silicon, oxygen

16. Three processes contribute to the formation of every igneous rock: _____.
A) assimilation, crystallization, and dyke injection B) extrusion, intrusion, and consolidation
C) partial melting, buoyant rise, and crystallization D) volcanism, plutonism, and magmatic differentiation

17. Which of the following is the major dissolved volatile constituent in both magmas and volcanic gases?
A) carbon monoxide B) methane C) nitrous oxide D) water

18. The process of _____ is driven by _____ and transforms a magma into an igneous rock.
A) crystallization, cooling (heat loss) B) intrusion, overlying rock weight C) partial melting, pressure increase D) volcanism, internal heating

19. As melts cool their viscosity increases (they lose their mobility and get stiffer) even before they start to crystallize because _____.
A) all of the sodium and potassium escape B) their ions become more disordered
C) the silica tetrahedra in the melt start to link up and make larger and stronger units
D) they increase in volume

20. The ion at the centre of a silicon-oxygen tetrahedron is surrounded by _____.
A) 4 oxygen ions B) 6 oxygen ions C) 4 sodium ions D) 6 sodium ions

21. The most abundant elements in common crustal igneous rocks are _____.
A) calcium and sodium B) iron and magnesium C) oxygen and silicon D) granite and basalt

22. The most common non-ferromagnesian silicate minerals (>40 %) in most igneous rocks are _____.
A) calcite B) feldspar C) olivine D) quartz

23. Felsic rocks have silica contents of _____ are rich in _____.
A) under 40%, olivine and pyroxene B) around 50%, pyroxene and plagioclase feldspar
C) about 70%, quartz and feldspar D) more than 85%, calcium rich feldspars and amphiboles

24. Which of the following best describes sets of fractures in relatively fresh bedrock, such as granite, that are roughly parallel to the land surface?
A) thermal expansion cracks B) sheeting fractures C) hydrolytic failures D) columnar joints

25. Hydrolysis is _____ to weaken or destroy the mineral lattice.
A) the dissolution of minerals by water B) the replacement of mineral cations by hydrogen ions from solution C) the conversion of useless minerals to hydrogen gas D) the chemical removal of bonded hydrogens

26. _____ is the most common mineral breakdown product of $KAlSi_3O_8$ (potassium feldspar).
A) Asbestos B) Calcite C) Kaolinite D) Quartz

27. Which type of sediment undergoes the most compaction as it lithifies to sedimentary rocks?
A) marine mud B) desert dune sand C) reef limestone D) coarse gravel

28. What are the most common cementing agents in sedimentary rocks?
A) CaO B) $Ca(OH)_2$ C) calcite, silica, and iron oxides D) clays and bitumen

29. Which characteristic is absolutely necessary for a sedimentary rock to have potential as a possible reservoir rock for oil or gas?
A) high porosity B) clastic texture C) chemical origin D) good stratification

30. Which common mineral of igneous rocks is the most abundant mineral in detrital sedimentary rocks?
A) calcite B) orthoclase C) quartz D) biotite

31. Shales are distinguished from other mudrocks by their _____.
A) colour B) sand content C) fissility D) fossil content

32. Shales are usually described as weak because they are _____.
A) so porous and permeable B) devoid of quartz C) only compacted but not well cemented
D) too thinly bedded to use for building stone

33. What is the chemical formula for dolomite, the major mineral in dolostones?
A) NaCl B) $CaSO_4 \cdot 2H_2O$ C) SiO_2 D) $CaMg(CO_3)_2$

34. Nonclastic textures are most common in which of the following sedimentary rocks?
A) sandstones B) limestones C) boulder breccias D) cherty conglomerates

Student Name/ ID Number:_____

Answers:

1	A	11	C	21	C	31	C
2	D	12	C	22	B	32	C
3	C	13	A	23	C	33	D
4	A	14	C	24	B	34	B
5	D	15	D	25	B		
6	A	16	C	26	C		
7	D	17	D	27	A		
8	C	18	A	28	C		
9	A	19	C	29	A		
10	C	20	A	30	C		

PART TWO: DESCRIPTIVE QUESTIONS

35. Please list (in the order of abundance) eight elements that make up the bulk rock forming minerals (8 marks)

oxygen （O）, silicon (Si), aluminum (Al), iron (Fe), calcium (Ca), sodium (Na), potassium (K), and magnesium (Mg).

36. Please list the main factors which directly affect crystal size of all igneous rocks (6 marks)

Rate of cooling, Amount of silica (SiO2) present, Amount of volatiles (dissolved gases)

37. What is "sorting" and "roundness of sand grains" for a sandstone? (8 marks)

Sorting is the degree of similarity in particle size in a sedimentary rock.
Roundness of sand grains reflecting the dree to which corners and edges of grains have been smoothed down.

38. Please use your knowledge in physical geology to lay out the similarities and differences between Granite and Rhyolite? (10 marks)

Similarities
Both Granite and Rhyolite are igneous rocks, and they are felsic, (rich in elements that form feldspar and quartz).
Differences
Granite is a typical intrusive igneous rock, and it has coarse-grained (phaneritic) texture. Rhyolite is a typical extrusive igneous rock, it has fine-grained (aphaneritic) texture.