

**Write your name here:**

This exam counts 20% of your grade for this course; your instructions are as follows:

- 1) You have 75 minutes to finish this exam.
- 2) No books or discussion are allowed. If you have questions please ask the proctor.
- 3) It is your responsibility to communicate your understanding of the subject matter.

**Section 1: (2 points each, 40 points total)**

Answer 20 and **only** 20 of the questions in this section by circling the **single best** answer. Clearly mark the **three** questions that you don't want graded. No partial credit.

1. Igneous rocks that solidified beneath the earth's surface will have a \_\_\_\_\_ texture.
  - a) coarse grained
  - b) fine grained
  - c) glassy
  - d) porphyritic
2. An extremely strong and durable rock type.
  - a) dolostone
  - b) schist
  - c) slate
  - d) quartzite
3. The mineral gypsum alters the properties of concrete by:
  - a) speeding the setting time
  - b) slowing the setting time
  - c) inducing the alkali-silica reaction
  - d) lowering water content
4. The unconfined compressive strength of most rocks is:
  - a) greater in tension than in compression
  - b) smaller in tension than in compression
  - c) equal for all stresses (tensile, compressive, shear)
  - d) none of the above
5. In comparison to felsic igneous rocks, mafic rocks are:
  - a) less dense, lighter in color, richer in potassium
  - b) more coarsely grained
  - c) denser, darker in color, richer in iron/magnesium
  - d) much more common at the Earth's surface

6. With respect to concrete, the unconfined compressive strength of unweathered igneous rocks is:
- a) always lower
  - b) always higher
  - c) usually lower
  - d) usually higher
7. Which of the following qualities is highly desirable for aggregate, but less important for rip-rap:
- a) high density
  - b) roughly spherical
  - c) resistant to weathering
  - d) locally available
8. Which of the following methods are used to test the tensile strength of rock?
- a) Brazilian test
  - b) point load test
  - c) California pull-apart test
  - d) Darcian test
9. Which of the following minerals is particularly susceptible to the alkali-silica reaction?
- a) quartz
  - b) muscovite
  - c) chlorite
  - d) chert
10. Sediments deposited in water are typically laid down in horizontal layers. These layers, known as \_\_\_\_\_ can form planar weaknesses in sedimentary rocks.
- a) joints
  - b) fractures
  - c) bedding planes
  - d) faults
11. A highly soluble mineral that is also known to swell when it comes into contact with water, causing potentially severe problems as a result.
- a) amphibole
  - b) feldspar
  - c) muscovite
  - d) gypsum

12. In general, which of the following rock textures would you expect to have the best engineering properties.
- a) coarse grained
  - b) fine grained
  - c) mixed coarse/fine (e.g., porphyritic)
  - d) glassy
13. Rocks of this type are generally unsuitable to be crushed for aggregate.
- a) igneous
  - b) sedimentary
  - c) foliated metamorphic
  - d) non-foliated metamorphic
14. Conglomerate is a \_\_\_\_\_ sedimentary rock, deposited in a \_\_\_\_\_ environment.
- a) clastic, high-energy
  - b) clastic, low-energy
  - c) chemical, low-energy
  - d) not a sedimentary rock
15. Most common mineral group in the earth's crust.
- a) sulfates
  - b) carbonates
  - c) silicates
  - d) native elements
16. A test for ability of aggregates to withstand abrasion in which steel balls are placed in a drum with the sample and rotated.
- a) slake-durability test
  - b) California abrasion test
  - c) Proctor test
  - d) tri-axial test
17. The relationship between unconfined compressive strength and point-load strength is:
- a) empirical
  - b) derived from first principles
  - c) a unique function of the Elastic Modulus
  - d) no relationship between the two

18. Carbonate rocks weather when exposed to acidic water. Which of the following is likely to be the most susceptible to weathering.
- a) dolostone
  - b) dirty limestone containing a substantial amount of clay
  - c) dense, fine-grained limestone
  - d) chlorite
19. This rock splits easily, is somewhat resistant to slaking, and is commonly used for flagstones and roofing tile.
- a) slate
  - b) shale
  - c) gneiss
  - d) basalt
20. Mineral properties are largely defined by the chemical bonds, which of the following bond types will be the strongest
- a) ionic
  - b) covalent
  - c) Van der Waals
  - d) polar
21. Limestone generally forms through:
- a) metamorphosis of marble
  - b) accumulation of the shells of marine organisms
  - c) decomposition of mafic rocks
  - d) volcanic activity
22. Rock that is used to make low density concrete in applications where strength is less important than weight.
- a) shale
  - b) pumice
  - c) gneiss
  - d) chert
23. In terms of chemical and engineering properties, the metamorphic rock granite is very similar to:
- a) granite
  - b) basalt
  - c) quartzite
  - d) limestone

**Section 2: (6 points each, 60 points total)****Name:**

Answer **ten and only ten** of the following questions. Clearly mark the **three** questions that you do not want graded.

1. Explain how rock mass properties are different than rock properties
2. Is there a difference between engineering geology and geological engineering? If so explain.
3. Draw a plot depicting the results of an unconfined compressive strength test on a rock core. Label the axes, elastic deformation, plastic deformation, and ultimate strength.
4. Why is it desirable for aggregate materials to be approximately uniform in size?





13. Explain how texture influences the engineering properties of igneous rocks.