1. The ability of a fluid to flow through a rock is known as the rock’s:
   a) airspace  b) permeability  c) porosity  d) viscosity  e) texture

2. Which of the following rock types is likely to form the least permeable sediment (aquiclude or aquitard)?
   a) shale  b) basalt  c) limestone  d) sandstone  e) fractured granite

3. The geologic setting of most geyser systems is:
   a) active volcanic  b) granitic  c) stable cratonic  d) sedimentary  e) high-grade metamorphic

4. The boundary between drainage basins is known as:
   a) recharge area  b) discharge break  c) cirque  d) drainage divide  e) basin rim.

5. The average elevation fall along a stream bed in ft/mi (U.S.) of m/km (rest of world) is its:
   a) discharge  b) flow rate  c) gradient  d) drainage basin  e) slope.

6. If a stream is flowing at an average velocity of 1 m/s (meter/second) and is 10m across with an average depth of 1m, its discharge is:
   a) 5 m³/s  b) 10 m³/s  c) 20 m³/s  d) 40 m³/s  e) 0.5 m³/s.

7. The Colorado River flows into (first encounters salt water at) the:
   a) Atlantic Ocean  b) Gulf of Mexico  c) Pacific Ocean  d) Gulf of California  e) Great Salt Lake

8. The presence of many channel bars in a river (i.e., a braided stream) indicates that:
   a) the river is actively eroding its bed  b) the river is flowing up gradient
   c) the river dries up periodically  d) the river is actively depositing in its bed.
   e) the river has a steep gradient.

9. A crescent-shaped dune with limbs downwind is called a
   a) parabolic dune  b) barchan  c) croissant  d) transverse dune  e) longitudinal dune

10. A long desert dune oriented parallel to the prevailing wind is a
    a) parabolic dune  b) barchan  c) playa  d) transverse dune  e) longitudinal dune

11. Wind-deposited silt-sized particles of glacial rock flour can form significant deposits in periglacial regions. This material is called:
    a) karst  b) till  c) loess  d) moraine  e) breccia

12. Deserts tend to have high relief with abundant steep slopes and cliffs because:
    a) the wind is very strong  b) the land is rising
    c) there is little vegetation to prevent water erosion  d) deserts are tectonically active  e) there is no rain

13. The ocean tide wave has a period of about 12 hours. The time between high and low tides is typically about:
    a) 3 hours  b) 6 hours  c) 12 hours  d) 18 hours  e) 24 hours
14. The distance between successive wave crests is the:
   a) Wave length  b) wave height  c) period  d) wave base  e) crest time

15. The major mineral in beach sand in tropical coastal regions is?
   a) aragonite  b) quartz  c) calcite  d) dolomite  e) feldspar

16. Why are there no coral reefs in Alaska?
   a) calcite dissolves in cold sea water  b) They were wiped out by oil spills
   c) The are destroyed by frequent tsunamis  d) corals cannot survive in oxygen rich sea water
   e) They were destroyed by glaciers

17. An annular (ring-shaped) coral island is called a(n):
   a) guyot  b) atoll  c) barrier reef  d) mid-ocean ridge  e) reef.

18. Parallel magnetic anomalies symmetric about the mid-ocean ridge are believed to be caused by:
   a) precession of the Earth's magnetic pole  b) periodic reversal of the Earth's magnetic field
   c) rhythmic diffusion of magnetic minerals  d) compression waves in the ocean floor
   e) alignment of magnetic minerals in response to shear stress.

19. Rocky headlands, sea caves, sea stacks and small inlet beaches are characteristic of
   a) emergent coasts  b) submergent coasts  c) drowned coasts  d) tropical coasts
   e) arctic coasts

20. The wave motion of water extends to a depth of approximately
   a) 1m  b) 1/2 wavelength  c) 10m  d) 1 wave height  e) 100m

21. The bending of waves by slowing in shallow water so that they approach nearly perpendicular to the
    shore is called
   a) inflection  b) refraction  c) reflection  d) diffraction  e) deflection

22. Any large permanent (non-seasonal) mass of ice that is formed on land and moves under the force of
    gravity is a
   a) snowfield  b) crevasse  c) icefall  d) glacier  e) avalanche

23. The line dividing the zone of accumulation from the zone of wastage (ablation) on a valley glacier is
    called the:
   a) snow line  b) bergschrund  c) cirque  d) drumlin  e) terminal moraine

24. Tensional fractures in the surface of a glacier are called:
   a) arêtes  b) bergschrunds  c) crevasses  d) drumlins  e) seracs

25. Compressional waves on the surface of a glacier are called
   a) avalanches  b) bergschrunds  c) ogives  d) crevasses  e) seracs

26. Wind-deposited silt-sized particles of glacial rock flour can form significant deposits in periglacial
    regions. This material is called:
   a) karst  b) till  c) loess  d) moraine  e) breccia

27. A ridge formed by a resistant sedimentary layer that has been tilted to near vertical is called a:
   a) hogback  b) mesa  c) plateau  d) flatiron  e) cuesta

28. Valleys eroded by fast-moving, high-gradient mountain streams have a characteristic:
   a) V-shape  b) U-shape  c) flat bottom  d) broad flood plain  e) meander pattern
29. An example of a non-renewable energy source that does not generate significant quantities of greenhouse gasses would be:
   a) Coal    b) Natural Gas  c) Methane hydrates    d) Nuclear fission of $^{235}\text{U}$ e) wind

30. The ultimate energy source from which fossil fuels are derived is
   a) radioactive decay of U, Th and K
   b) thermonuclear fusion of H in the sun
   c) primordial carbon in the Earth
   d) nuclear fission of U in the deep Earth.
   e) cosmic rays

31. Which of the following is a renewable energy source?
   a) oil    b) natural gas  c) solar    d) nuclear (U fission) e) oil shale

32. Which of the following is a non-renewable energy source?
   a) wind    b) wood  c) solar    d) tar sand e) ethanol from sugar cane

33. Gases in the atmosphere that absorb infrared radiation but pass visible light are known as:
   a) inert gases b) noble gases c) greenhouse gases d) diatomic gases e) exotic gases

34. U-fission nuclear reactors always produce.
   a) highly radioactive spent fuel elements
   b) large amounts of CO$_2$ and SO$_3$
   c) large amounts of dioxin
   d) large amounts of radon gas
   e) extensive lead contamination.

35. The energy released from burning fossil fuels is derived from
   a) the Earth's internal heat engine powered by the decay of natural U, Th and K.
   b) the Earth's external heat engine powered by thermonuclear fusion in the sun.
   c) the combustion of primordial reduced carbon that was present in the primitive Earth.
   d) uranium fission deep in the Earth.
   e) thermonuclear fusion deep in the Earth.

Comprehensive questions:

36. Surface processes on the Earth are mostly driven by an external heat engine. The source of energy for this engine is:
   a) radioactive decay of U, Th, and K.  b) thermonuclear fusion in the sun.  c) burning of fossil fuels
   d) gravitational collapse of the solar nebula  e) tides driven by lunar gravitation.

37. Plate motion and other internal processes believed to be driven by solid state convection of the silicate mantle. This convection is driven by the Earth's internal heat engine, which is powered by:
   a) radioactive decay of uranium, thorium, and potassium  b) thermonuclear fusion in the sun
   c) burning of fossil fuels  d) fission reactions in the Earth's core  e) radioactive decay of 14C.

38. The age of the Earth, as indicated by radiometric dating of meteorite, lunar, and terrestrial rocks, generally believed to be:
   a) 13.8 billion years  b) 4.5 billion years  c) 545 million years  d) 40 million years  e) 7000 years.

39. The inner core of the Earth is composed of
   a) solid silicate  b) liquid silicate magma  c) liquid metal  d) solid metal e) olivine.
40. The mantle of the Earth is composed of
   a) solid silicate  b) liquid silicate magma  c) liquid metal  d) solid metal  e) olivine.

41. A rock formed by the processes of solid-state recrystallization of pre-existing rock is called:
   a) igneous      b) metamorphic     c) hydrothermal  d) sedimentary   e) limestone.

42. A rock formed by the processes melting, cooling and crystallization is called:
   a) igneous      b) metamorphic     c) hydrothermal  d) sedimentary   e) limestone.

43. The number of protons in the nucleus is known as the:
   a) atomic number    b) atomic weight  c) mass number  d) ionic charge    e) ionic weight.

44. Those elements of the periodic table that form ionic bonds with oxygen and are enriched in the crust
   and mantle (rocky portion) of the Earth are termed:
   a) atmophile  b) siderophile  c) chalcophile  d) lithophile  e) thermophile

45. The density of water is 1.00 g/cm$^3$ (gram per cubic centimeter). The density of granite is about:
   a) 0.5 g/cm$^3$    b) 1.5 g/cm$^3$ c) 2.7 g/cm$^3$  d) 8.0 g/cm$^3$ e) 22 g/cm$^3$

46. Although silica (SiO$_2$) composes 40 to 70% by weight of most igneous rocks, the mineral quartz (SiO$_2$)
   is only abundant in the rock
   a) lherzolite (ultramafic)  b) gabbro  c) diorite  d) basalt  e) granite.

47. The most abundant mineral in most sandstones is:
   a) calcite    b) clay    c) quartz    d) gypsum   e) feldspar

48. The Era of the dinosaurs is subdivided into the Triassic, Jurassic, and Cretaceous Periods. This Era is
   the:
   a) Pre-Cambrian  b) Paleozoic  c) Mesozoic  d) Cenozoic  e) Quaternary

49. Water in Boulder Creek eventually drains to (first encounters salt water at) the:
   a) Atlantic Ocean  b) Gulf of Mexico  c) Pacific Ocean  d) Gulf of Cortez  e) Great Salt Lake

50. The standing water level in a borehole is known as the:
   a) saturated zone  b) artesian line  c) water table  d) aquitard  e) float line