Igneous rocks

1. The magma from which this felsic volcanic rock is derived
   is very viscous, and contains >65% SiO_2

2. The magma from which this intrusive rock is formed starts
   to solidify at 600-800°C (1100-1475°F), and contains
   >65% SiO_2

3. Extrusive (volcanic) igneous rock of intermediate
   composition (55-65% SiO_2)

4. Intrusive (plutonic) igneous rock of intermediate composition
   (55-65% SiO_2); Kate calls it the 'dalmation rock' because
   the proportion of mafic minerals is highly variable

5. Extrusive (volcanic) igneous rock, mafic in composition
   (45-55% SiO_2)

6. Intrusive (plutonic) igneous rock, mafic in composition
   (45-55% SiO_2)

7. This igneous rock does not currently form at the earth's
   surface; it contains < 40% SiO_2, and the first crystals
   start to solidify at >1200°C

8. Calcium-rich varieties of this mineral are present in mafic
   intrusive rocks (gabbros); this mineral forms a solid solution
   series, and Ca-poor, Na-rich varieties of it are present
   in granites

9. This mineral is not present in mafic igneous rocks (gabbros
   and more mafic rocks); it is, however one of the essential
   minerals in granite, together with quartz and
   plagioclase feldspar

Sedimentary & Metamorphic Rocks

1. This mineral has one perfect cleavage; in its very-fine
   grained form it is called sericite; it is often responsible for
   the 'sheen' seen on cleavage surfaces in fine-grained
   metamorphic rocks

2. This metamorphic rock is derived from biochemical
   sedimentary rocks

3. This metamorphic rock is derived from a texturally and
   compositionally mature sandstone

4. This is a biochemical sedimentary rock; this rock type
   often contains fossils or fossil fragments

5. The mineral segregation or compositional banding of
   medium-to-coarse grained felsic and mafic minerals is
   characteristic of this metamorphic rock

6. This metamorphic rock is characterized by a foliation,
   which results from the growth of medium-to-coarse
   grained mica minerals; this metamorphic rock typically
   forms from fine-to-medium-grained sedimentary rocks

7. This well-cleaved, fine-grained metamorphic rock has
   shale as its 'protolith' or 'parent' rock

8. This fine-grained sedimentary rock is composed of mud-
   sized particles

9. This siliciclastic detrital sedimentary rock is named on the
   basis of the size of the siliciclastic grains it is made up of;
   the grains can range from 0.064 mm to 2 mm in diameter

General & Tectonics

1. Recrystallization in solid state (i.e. the rock has not
   melted) of felsic and mafic minerals under directed
   pressure (compressional or tensional) produces this
   'high grade' metamorphic rock, in which the felsic
   and mafic minerals are layered or segregated

2. This rock is the product of the metamorphism of very
   fine-grained sedimentary rocks at convergent plate
   boundaries; the metamorphic product is fine-grained

3. This mineral does not crystallize from molten rock; it
   is characteristic of sedimentary rocks, and does not
   react with dilute hydrochloric acid

4. This is the volcanic rock named for its relative
   abundance in the continental arc that makes up the
   western margin of South America

5. The Sierra Nevada Batholith is dominated by this
   intrusive igneous rock

6. This is the rock type present in Karst areas

7. Pahoehoe and Aa flows are made up of this igneous
   rock type

8. This mineral / mineral group is a common alteration /
   metamorphic product of mafic minerals such as
   olivine and pyroxene; it is present in many igneous
   rocks and metamorphosed igneous rocks

9. This ultramafic rock is exposed at the earth's surface
   as xenoliths in igneous rocks, or within Ophiolite
   Sequences, or as parts of Layered Mafic Igneous
   Intrusions

Regional Geology, Rocks & Minerals (Minnesota)

1. Mafic igneous rock found in the Proterozoic North Shore Volcanics

2. Mafic igneous rock found in the Proterozoic Duluth Complex

3. Felsic volcanic rock found in the Proterozoic North Shore Volcanics

4. This biochemical sedimentary rock forms the resistant 'caprock' in the
   Paleozoic sedimentary sequence in the Twin Cities

5. This is the fine-grained sedimentary rock, similar to that which underlies
   Platteville Limestone in the Twin Cities and southeastern Minnesota

6. This sedimentary rock type is made up of siliciclastic grains that may
   range from 0.064 mm to 2 mm in diameter; in the Twin Cities area
   there is a very-poorly cemented example of this rock type lying
   beneath the Glenwood Shale

7. This is similar to the rock-type in the two 'outliers' of Proterozoic
   metasedimentary rock in the Upper Midwest; both contain texturally-
   and compositionally-mature grains

8. This felsic intrusive rock intruded rocks of the Penokean Orogen
   approximately 1.8 by ago. It forms a large batholith in east-central MN

9. Metamorphic rock type for the oldest dated rock in Minnesota