Geology · Biology and Earth Sciences

# Types of Rocks continued (Sedimentary and Metamorphic Rocks), the Rock Cycle

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## Multiple choice questions — 107 questions

1 Which of the following belongs to the rocks that make up the smallest volume of the rock types of the Earth's crust?

(A) Diorite (B) Slate (C) Sandstone (D) Marble

2 Most of the sandstone found in Aswan was formed .....

(A) inside the Earth, where the temperature is higher than the melting point of quartz

(B) on the Earth's surface from the cooling of acidic lava rich in quartz

(C) in the desert from deposited sand grains that were stuck together by mineral materials

(D) in the mountains, where metamorphism by pressure and heat fused quartz crystals together

3 Most sedimentary rocks are made of .....

(A) gravel, sand and clay (B) lime, sand and clay

(C) gravel, lime and gypsum (D) clay, gypsum and gravel

4 Fine sand is expected to have a grain diameter of about .....

(A) 50 microns (B) 100 microns (C) 1.5 mm (D) 2.5 mm

5 The rock fragments lying directly above an unconformity surface have a grain diameter .....

(A) greater than 2 mm (B) between 2 mm and 62 microns

(C) between 62 microns and 4 microns (D) less than 4 microns

**6** The opposite rock is a sedimentary rock. The best statement that describes this rock accurately is that the rock .....



(A) has a grain size of about 1 mm

(B) has a coarse texture

(C) contains grains stuck together by a cementing material

(D) contains deformed fossils

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**7** Which type of sedimentary rocks may become fissile (split into sheets) when compacted?

(A) Fine-grained

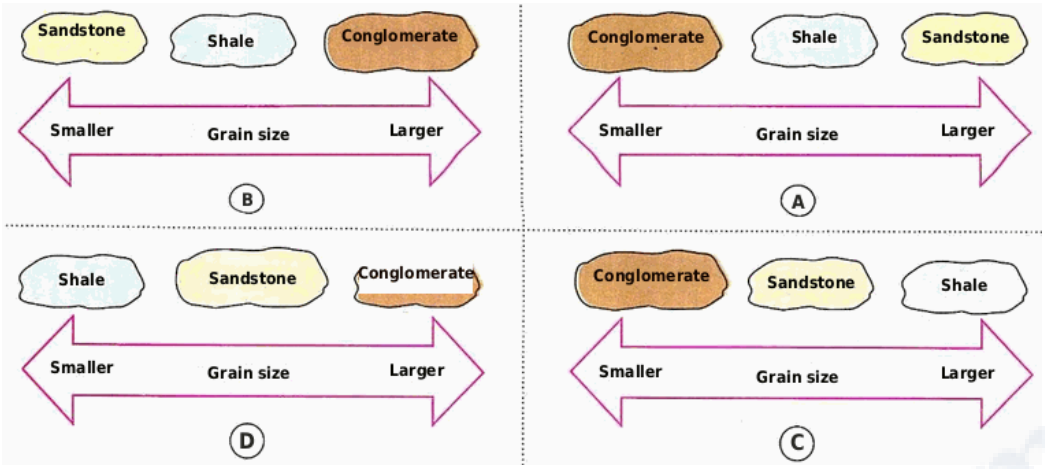
(B) Medium-grained

(C) Coarse-grained

(D) Of chemical origin

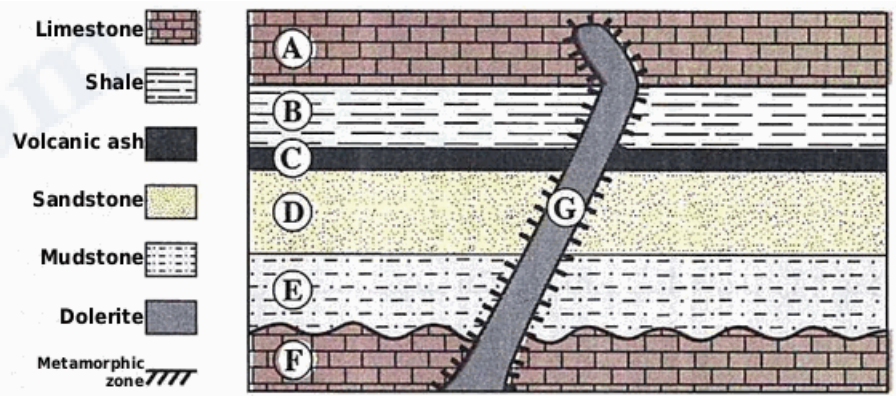
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**8** The figure that shows the grain size of some common sedimentary rocks is .....



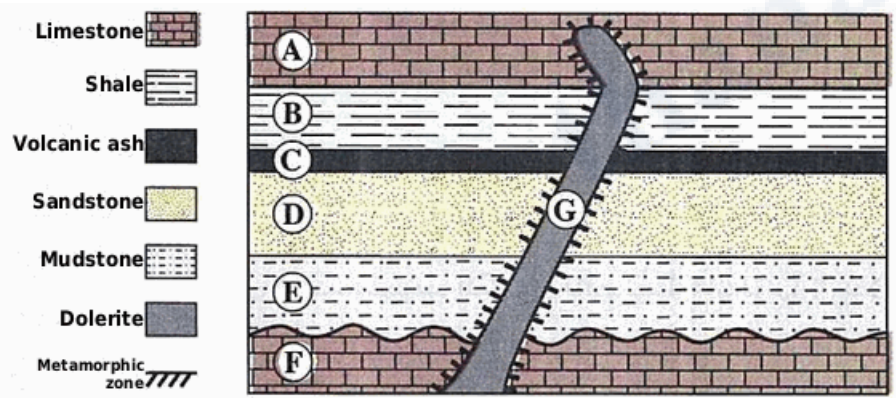

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**9** The opposite vertical section shows rock units labelled (A : G). Study it well, then answer:
The grain size of the sediments deposited in layer (B) is .....




(A) greater than 2 mm
(B) from 2 to 1 mm
(C) from 1 mm to 62 microns
(D) less than 62 microns

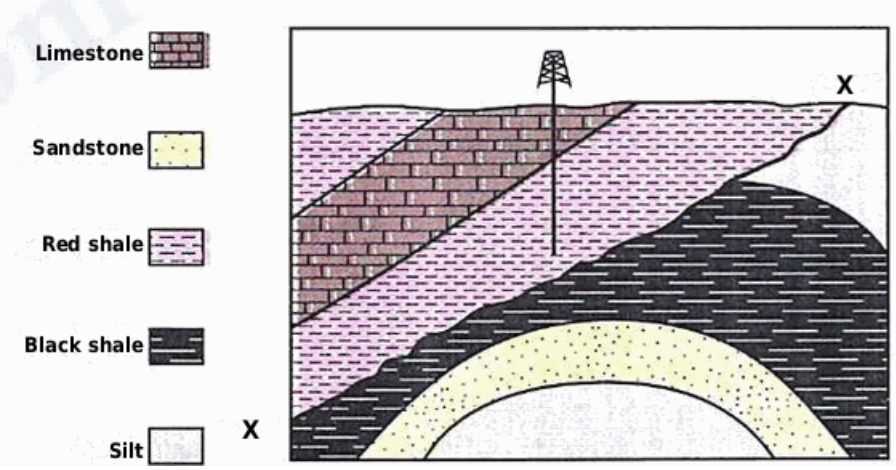
**10** The opposite vertical section shows rock units labelled (A : G). Study it well, then answer:
The youngest of the following rock units is .....




(A) limestone (A)
(B) volcanic ash
(C) dolerite
(D) sandstone

**11** The opposite figure represents a vertical section in an area of oil exploration. A well was drilled to a depth of 1000 m. Study it well, then answer:

What is the best explanation for not extracting oil from the well in the opposite section?




(A) Because the well is only 1000 m deep

(B) Because the red shale contains no organic matter

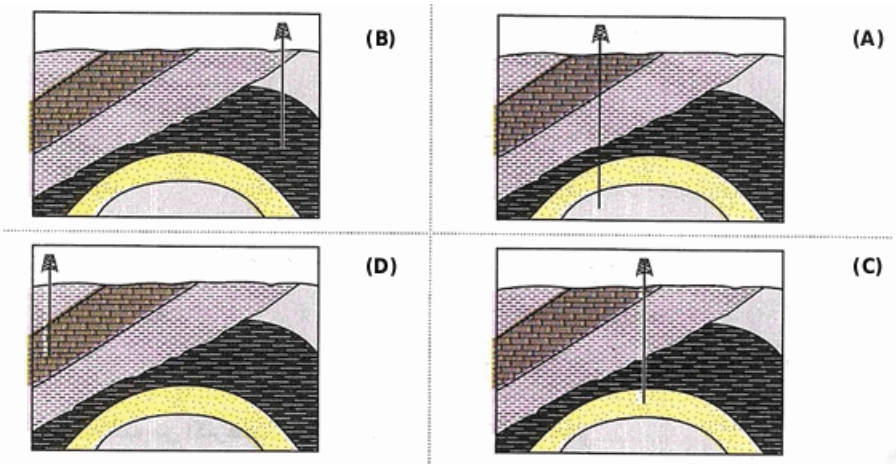
(C) Because the red shale is not a reservoir rock

(D) Because there is an angular unconformity surface below the red shale

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**12** The opposite figure represents a vertical section in an area of oil exploration. A well was drilled to a depth of 1000 m. Study it well, then answer:

Which of the following sections is the best for drilling a well that produces the largest amount of liquid oil or natural gas?




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**13** Which of the following statements about fossil fuels is the most accurate?

(A) Coal formation needs oxygen

(B) Oil shale is in the solid state at a temperature of 500 °C

(C) Natural gas matures at a depth of 8 km

(D) Oil is stored in a layer of limestone

**14** The rocks that make up stalagmites and stalactites are made of the mineral .....

(A) gypsum (B) anhydrite (C) calcite (D) quartz

**15** Which of the following statements accurately describes the rocks in which petroleum matures?

(A) Limestone rocks rich in microscopic organisms such as foraminifera and algae

(B) Limestone rich in hydrocarbon materials of plant origin found in a solid waxy state

(C) Clay rocks that contain the remains of microscopic marine animals and plants

(D) Clay deposits in swamp areas containing plant remains

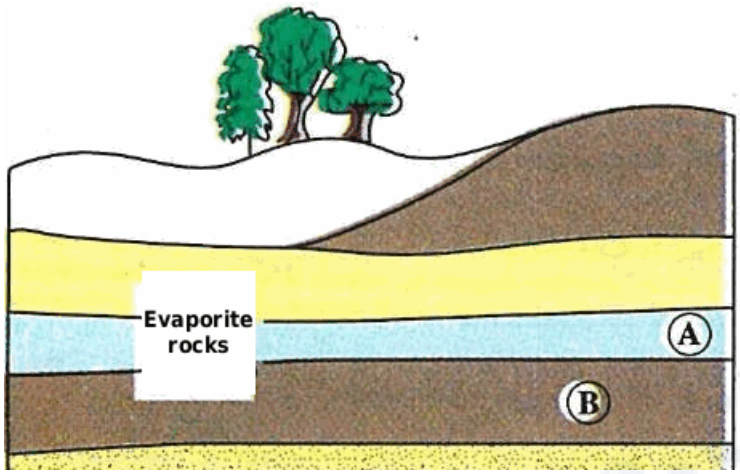
**16** The mineral that cannot be found in igneous rocks among the following is .....

(A) calcite (B) orthoclase (C) olivine (D) quartz

**17** The sedimentary rock that may result from the evaporation of lake water is .....

(A) limestone (B) phosphate (C) shale (D) anhydrite

**18** Which minerals may make up the two rocks (A) and (B) in the opposite vertical section?




(A) (A) mica and (B) feldspar (B) (A) quartz and (B) calcite

(C) (A) pyrite and (B) chert (D) (A) halite and (B) gypsum

**19** Microscopic marine animal remains, under certain conditions of pressure, heat and depth, are a source for the formation of .....

(A) petroleum (B) coal (C) kerogen (D) limestone

**20** Which of the following are petroleum reservoirs?

(A) Shale and limestone (B) Gravel and clay
(C) Sand and clay (D) Sand and limestone

**21** Oil can be obtained by heating .....

(A) sandstone to a temperature of 480 °C (B) mudstone to a temperature of 840 °C
(C) limestone to a temperature of 840 °C (D) kerogen to a temperature of 480 °C

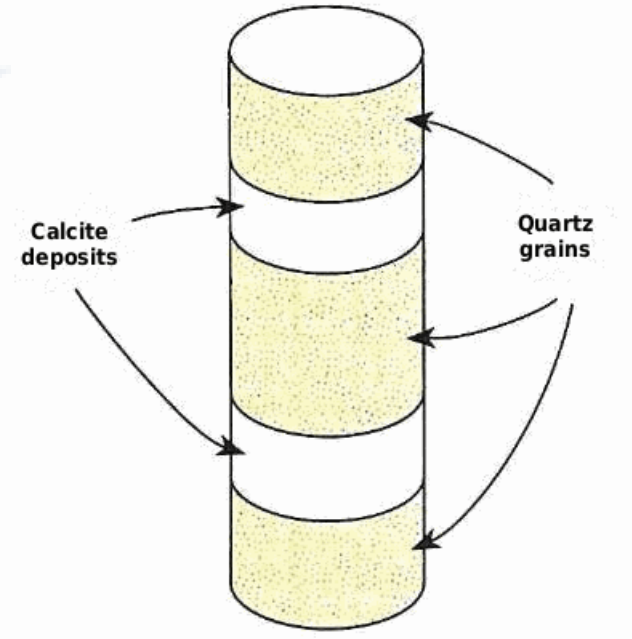
**22** A rock made mostly of the two most common elements in the Earth's crust is .....

(A) limestone (B) sandstone (C) anhydrite (D) dolomite

**23** The mineral that may form from the cooling of magma and also takes part in the formation of a sedimentary rock is .....

(A) quartz (B) calcite (C) gypsum (D) chert

**24** The opposite figure shows a cylindrical core of sediments. The rocks that can form from the consolidation and lithification of these sediments are .....




(A) mudstone and conglomerate
(B) shale and breccia
(C) sandstone and limestone
(D) shale and conglomerate

**25** The rock that belongs to the carbonate group and forms as a result of chemical processes is .....

(A) limestone (B) anhydrite (C) gypsum (D) rock salt

**26** If deposits of the minerals gypsum and halite are found in some areas, these areas are expected to have been .....

(A) active faults
(B) salt lakes
(C) petroleum reservoirs
(D) limestone caves

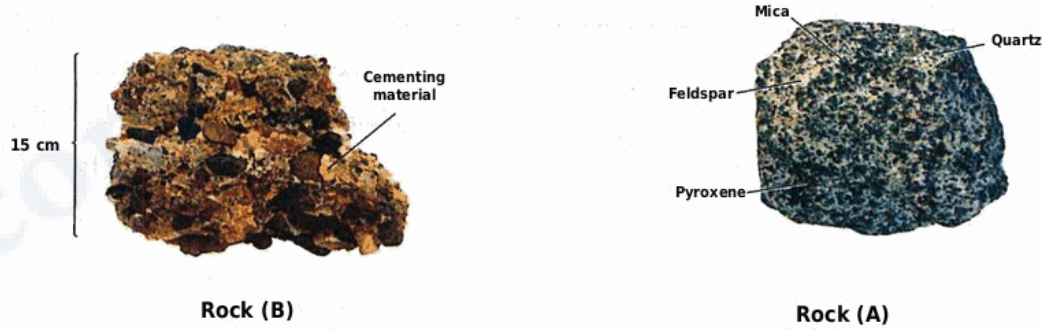
**27** A very hot marine environment can be inferred when deposits of ..... are found.

(A) shale (B) gypsum (C) coal (D) breccia

**28** The ability of sandstone to store petroleum, natural gas and groundwater is because it is a(n) ..... rock.

(A) sedimentary (B) clastic (C) porous (D) quartz-rich

**29** By studying the two rock samples (A) and (B): what do the two samples represent, respectively?




(A) (A) intermediate volcanic igneous rock - (B) organic sedimentary rock

(B) (A) acidic volcanic igneous rock - (B) chemical sedimentary rock

(C) (A) intermediate plutonic igneous rock - (B) clastic sedimentary rock

(D) (A) acidic plutonic igneous rock - (B) clastic sedimentary rock

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**30** Rock salt is classified as a chemical sedimentary rock because it formed as a result of .....

(A) the change of salt fragments carried by sea waves

(B) the lithification of the remains of salt-sea organisms

(C) the evaporation of water from salt lakes

(D) the accumulation of the remains of marine vertebrates

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**31** Most gypsum rocks formed as a result of .....

(A) heating rocks that had already been metamorphosed

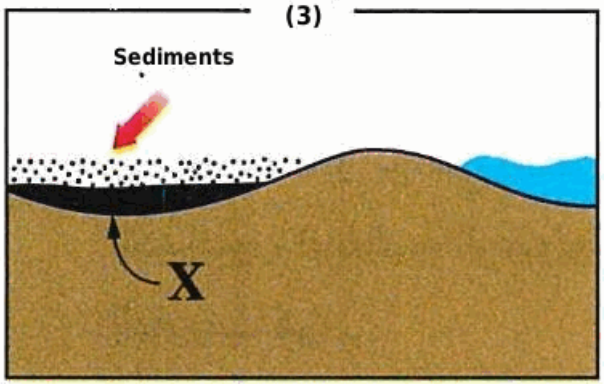
(B) the cooling and solidification of highly viscous volcanic lava

(C) the compaction and cementation of the remains of shells and skeletons of marine animals

(D) the chemical precipitation of minerals from the water of closed lakes

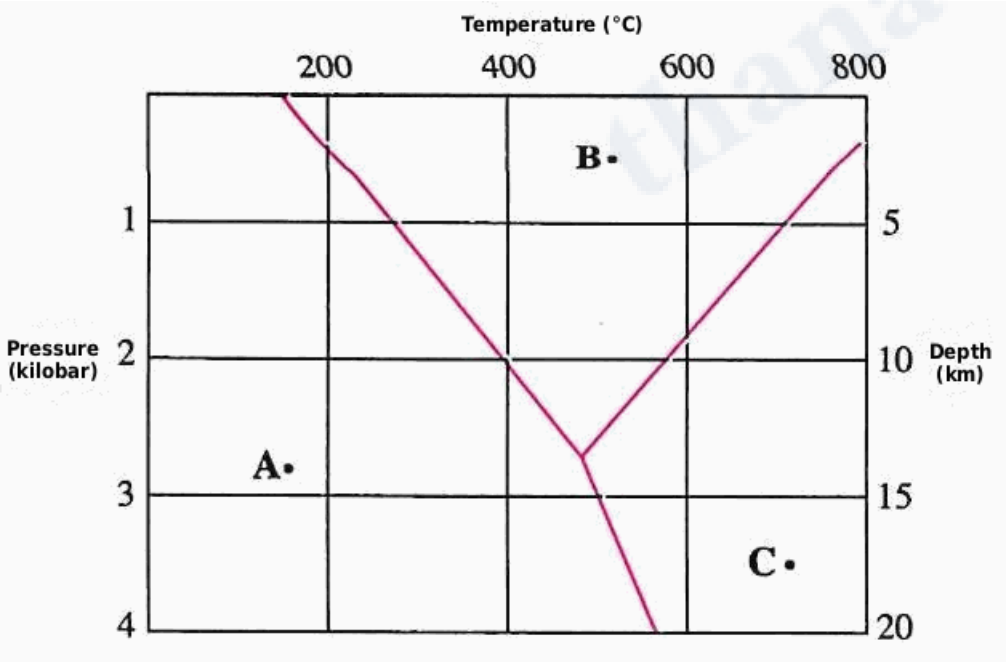
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**32** From the following figures: sedimentary rocks formed at (X) as a result of the sequence of processes shown. This rock is most likely .....




(A) chert (B) shale (C) limestone (D) rock salt

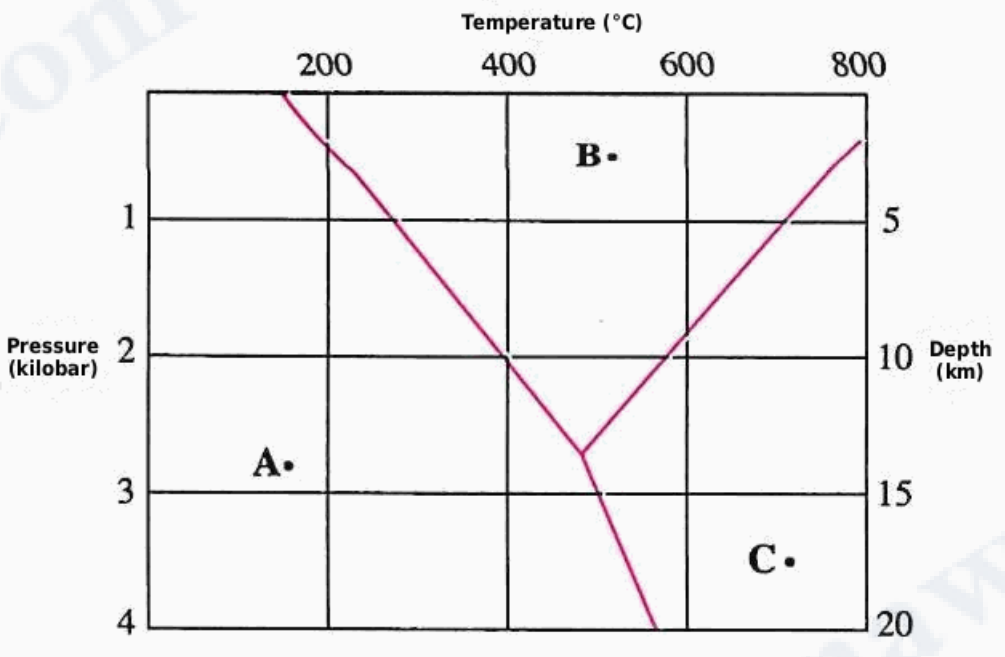
**33** The following graph shows the conditions that silicate minerals were exposed to in forming the metamorphic rocks (A), (B) and (C). Study it well, then answer:
Which of the following choices represents the rocks (A), (B) and (C)?




(A) (A) marble / (B) schist / (C) quartzite (B) (A) quartzite / (B) gneiss / (C) schist
(C) (A) slate / (B) quartzite / (C) gneiss (D) (A) slate / (B) marble / (C) gneiss

**34** The following graph shows the conditions that silicate minerals were exposed to in forming the metamorphic rocks (A), (B) and (C). Study it well, then answer:

What metamorphism conditions can be inferred from the graph for the two rocks (C) and (B)?



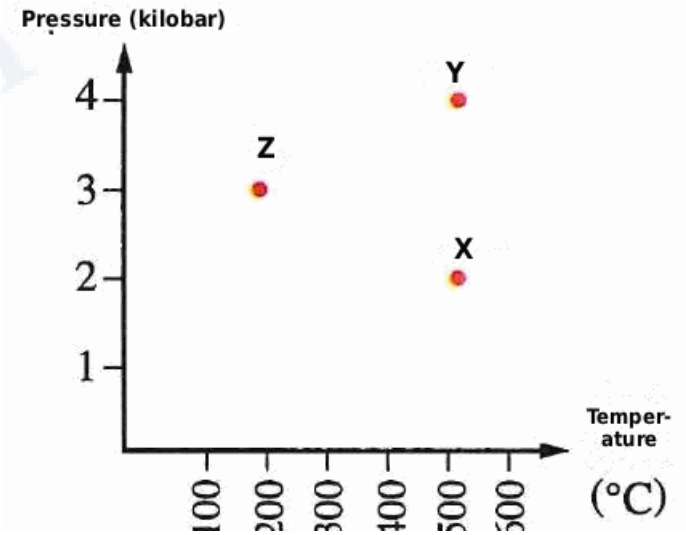

(A) (B) pressure 3 kilobar and temperature 200 °C - (C) depth 2 km and temperature 300 °C

(B) (B) depth 7 km and temperature 300 °C - (C) pressure 3 kilobar and temperature 800 °C

(C) (B) pressure 4 kilobar and temperature 600 °C - (C) depth 3 km and temperature 500 °C

(D) (B) depth 3 km and temperature 500 °C - (C) pressure 3.5 kilobar and temperature 700 °C

**35** The opposite graph represents the relation between pressure and temperature in the formation of some metamorphic rocks. Which of the following may represent these rocks?

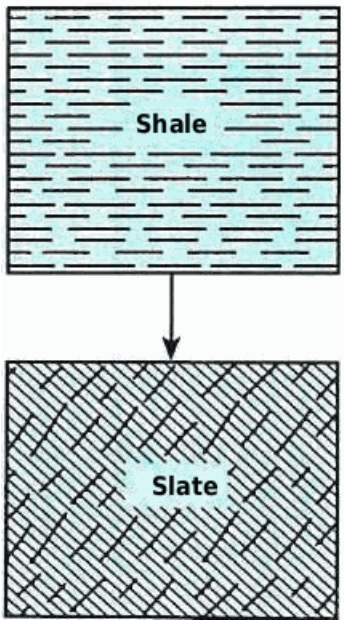



(A) (X) slate, (Y) schist, (Z) gneiss
(B) (X) quartzite, (Y) slate, (Z) schist
(C) (X) marble, (Y) gneiss, (Z) slate
(D) (X) schist, (Y) marble, (Z) gneiss

**36** The rock that may contain clear fossils among the following is .....

(A) marble (B) gneiss (C) granite (D) shale

**37** The opposite figure shows some physical changes that may happen to some rocks. The geological process that caused these changes in the rock is .....

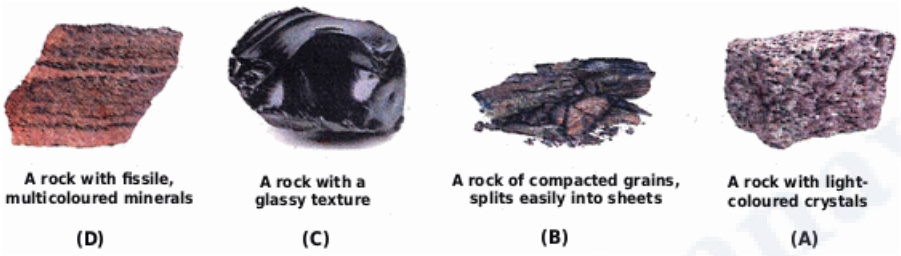



(A) the succession of layer deposition
(B) magma intrusion
(C) metamorphism
(D) weathering

**38** Which of the following choices shows the correct causes of metamorphism of the rocks in the table?

| High pressure | Intense heat | Cause of metamorphism / Rock name | |
|---|---|---|---|
| ✓ | ✓ | Marble | (A) |
| ✗ | ✓ | Quartzite | (B) |
| ✓ | ✓ | Slate | (C) |
| ✗ | ✓ | Gneiss | (D) |

**39** Which of the following rocks forms from flowing lava, given that the samples are shown at their natural size?




**40** Which of the following rocks is made of silicate minerals and may contain fossils?

(A) Granite (B) Schist (C) Gneiss (D) Limestone

**41** The rock formed as a result of metamorphism by pressure and heat is .....

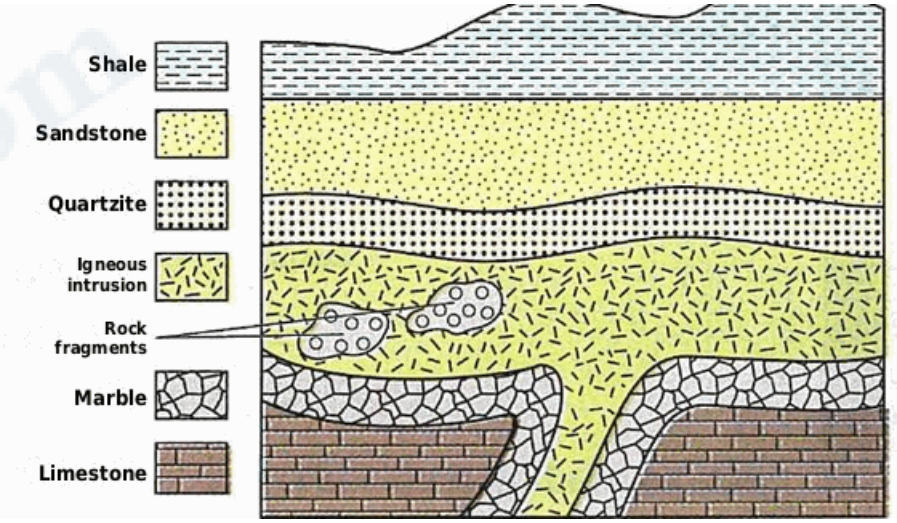
(A) gneiss (B) marble (C) shale (D) quartzite

**42** Which of the following properties do diorite, quartzite and slate share?

(A) Crystalline, non-porous rocks
(B) Rocks containing intact fossils
(C) Stratified rocks
(D) Rocks containing deformed fossils

**43** The opposite figure represents a vertical geological section. Study it well, then answer:

The rock fragments were most likely broken off the original rock layers .....




(A) at the same time as the magma intrusion

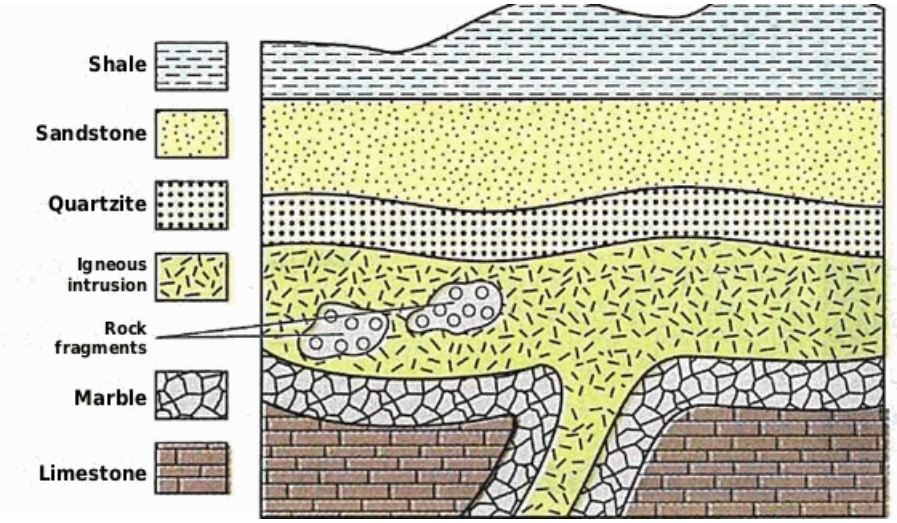
(B) after the magma cooled and crystallized

(C) before the formation of the sandstone

(D) before the formation of the limestone

**44** The opposite figure represents a vertical geological section. Study it well, then answer:

The igneous rock in the section is .....




(A) older than the sandstone and the limestone

(B) older than the limestone and younger than the sandstone

(C) younger than the marble and the quartzite

(D) younger than the limestone and older than the sandstone

**45** The rock that differs in texture from the others among the following is .....

(A) marble (B) slate (C) gneiss (D) schist

**46** When the highly viscous magma that forms a laccolith rises below granite, the following may form: .....

(A) granite melt (B) gneiss (C) slate (D) mica schist

**47** What do gneiss and schist have in common?

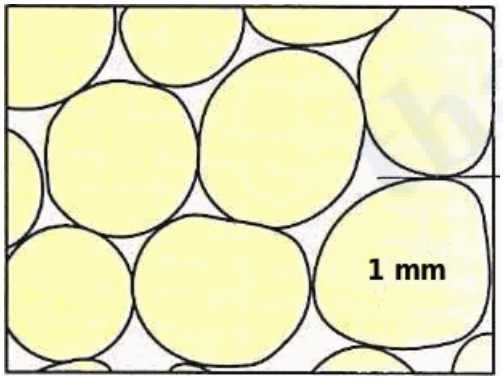
(A) The crystals are arranged parallel to the direction of pressure

(B) The crystals are arranged parallel and continuous

(C) The crystals are arranged perpendicular to the direction of pressure

(D) The crystals are arranged parallel and discontinuous

**48** The opposite sample represents .....




(A) breccia (B) sandstone (C) conglomerate (D) shale

**49** Which of the following rocks contains a large proportion of the minerals orthoclase and quartz?

(A) Slate (B) Marble (C) Gneiss (D) Schist

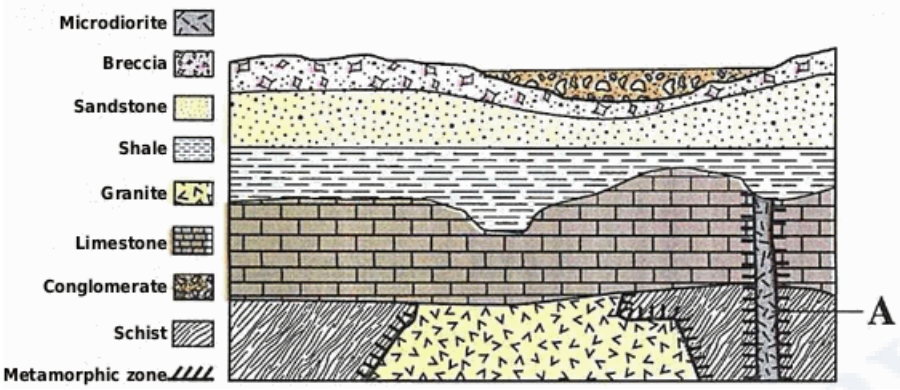
**50** Which of the following rocks is made of parallel sheets?

(A) Mudstone (B) Gneiss (C) Sandstone (D) Granite

**51** Which of the following choices gives the best evidence of the conditions under which non-stratified rocks formed?

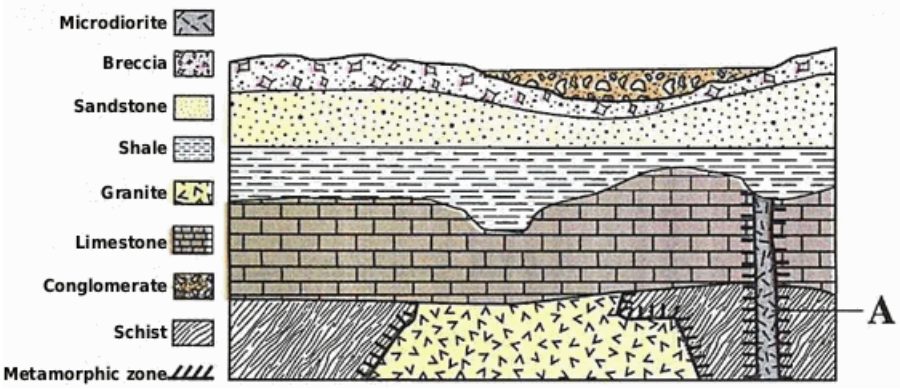
(A) The size of the rock
(B) The thickness of the rock
(C) The texture of the rock
(D) The colour of the rock

**52** In front of you is a vertical section. Study it well, then answer:
Shape (A) in the section represents a .....




(A) laccolith
(B) lopolith
(C) dyke
(D) sill

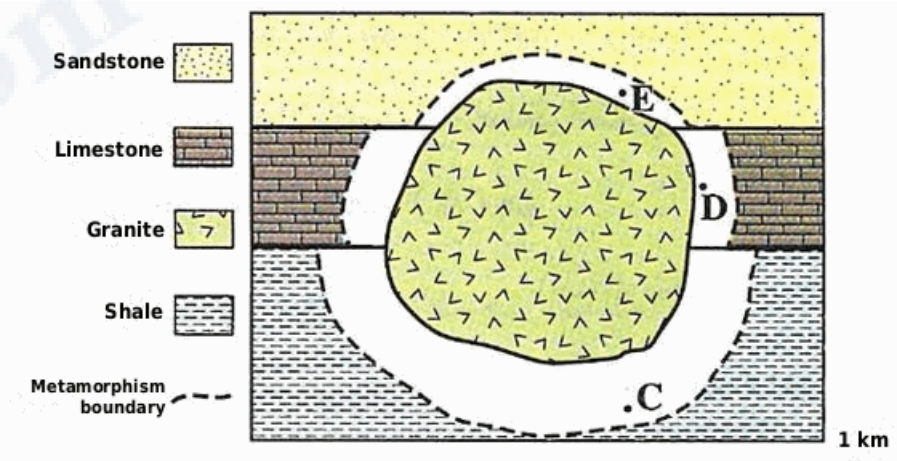
**53** In front of you is a vertical section. Study it well, then answer:
The oldest rock among the following in the section is .....




(A) sandstone
(B) schist
(C) limestone
(D) shale

**54** The opposite horizontal section shows an igneous intrusion and the rocks surrounding it. Study it well, then answer:

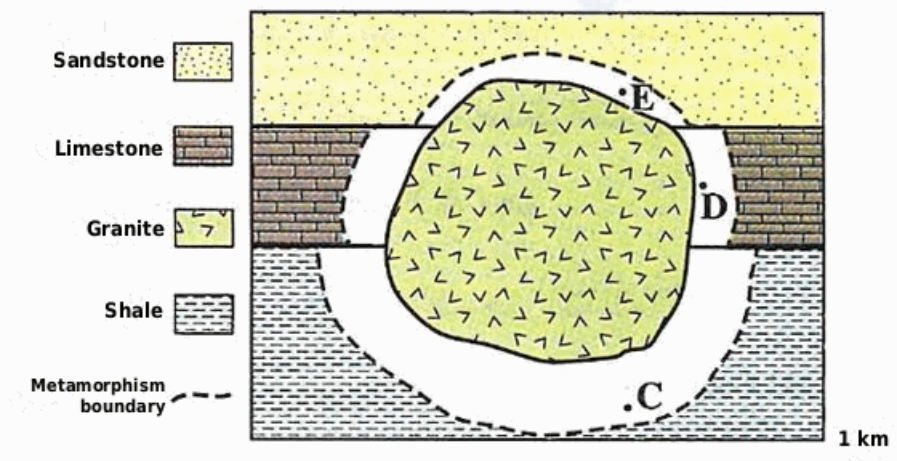
What type of rock texture is produced in the metamorphic zone (D)?




(A) Coarse (B) Granular (C) Foliated (D) Porphyritic

**55** The opposite horizontal section shows an igneous intrusion and the rocks surrounding it. Study it well, then answer:

Which metamorphic rocks can be found in the metamorphic zones (E), (D) and (C), respectively?




(A) (C) quartzite / (D) slate / (E) schist

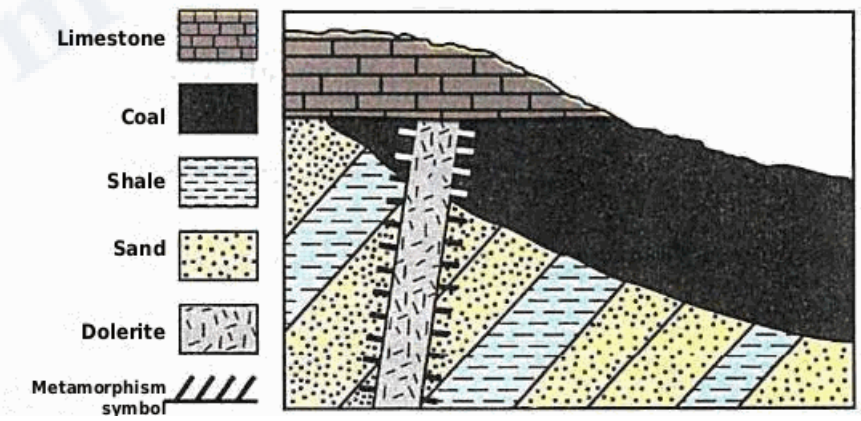
(B) (C) marble / (D) quartzite / (E) slate

(C) (C) gneiss / (D) marble / (E) quartzite

(D) (C) slate / (D) marble / (E) quartzite

**56** In front of you is a vertical section in the face of a slope made of some rocks. Study it well, then answer:

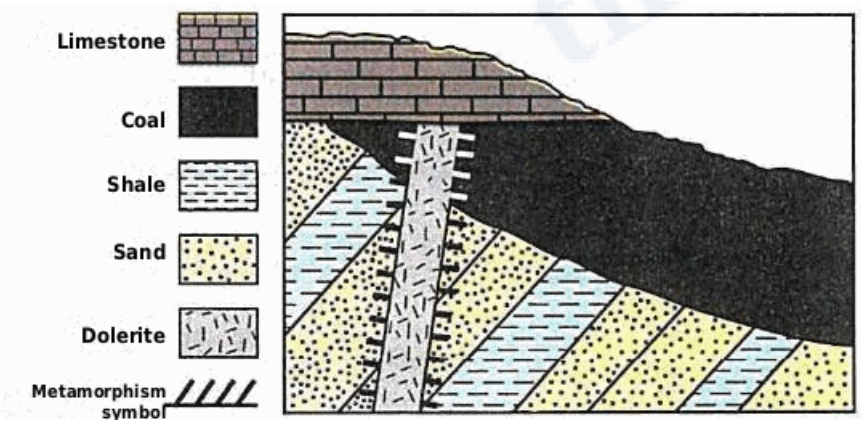
The youngest rock in the opposite section is .....




(A) coal (B) limestone (C) the dolerite dyke (D) sandstone

**57** In front of you is a vertical section in the face of a slope made of some rocks. Study it well, then answer:

«The dyke is older than the shale», «The coal is younger than the shale». How correct are the two statements?



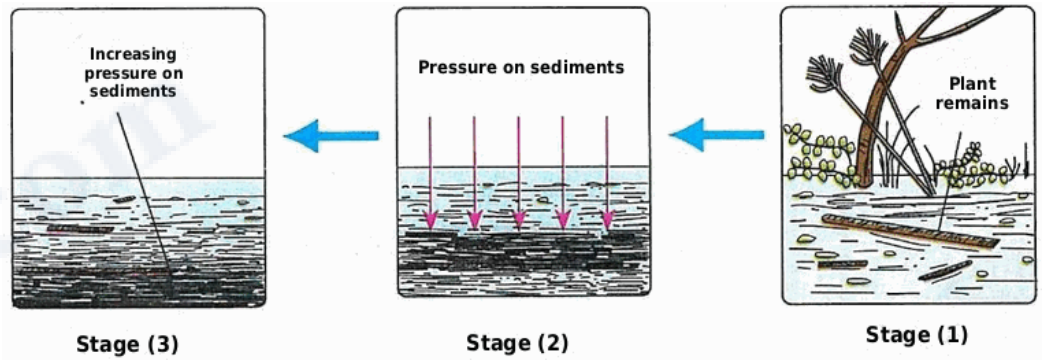

(A) The first statement is wrong and the second is correct

(B) The first statement is correct and the second is wrong

(C) Both statements are wrong

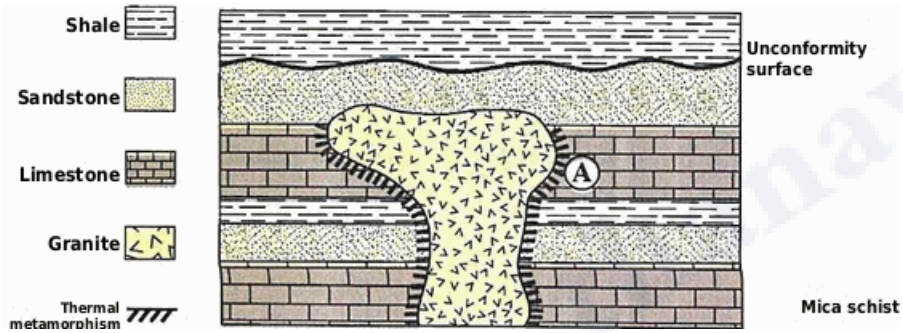
(D) Both statements are correct

**58** By studying the following figures, we find that they show the stages of formation of .....



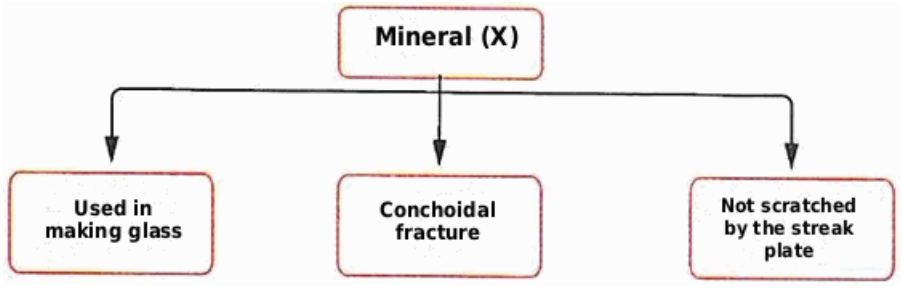

(A) mica schist (B) limestone (C) coal (D) gneiss

**59** The opposite figure shows a vertical section in the Earth's crust. The metamorphic rock found at point (A) is .....




(A) quartzite (B) marble (C) slate (D) mica schist

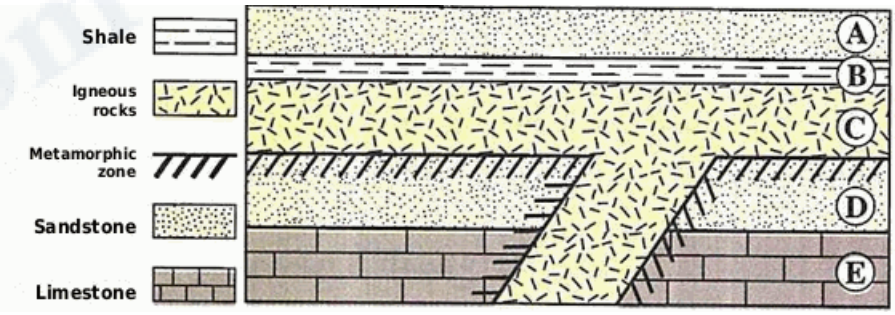
**60** From the opposite diagram, which of the following rocks contains the mineral (X)?




(A) Gneiss (B) Quartz (C) Marble (D) Chert

**61** The opposite figure shows a vertical section, and the letters (A), (B), (C), (D) and (E) represent different types of rocks. Study it well, then answer:

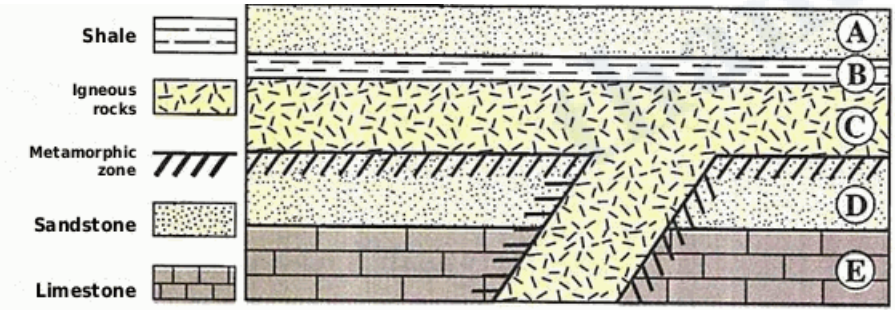
The most accurate order of the rocks from oldest to youngest is .....




(A) A then B then C then D then E
(B) C then D then A then B then E
(C) E then D then B then A then C
(D) E then D then C then B then A

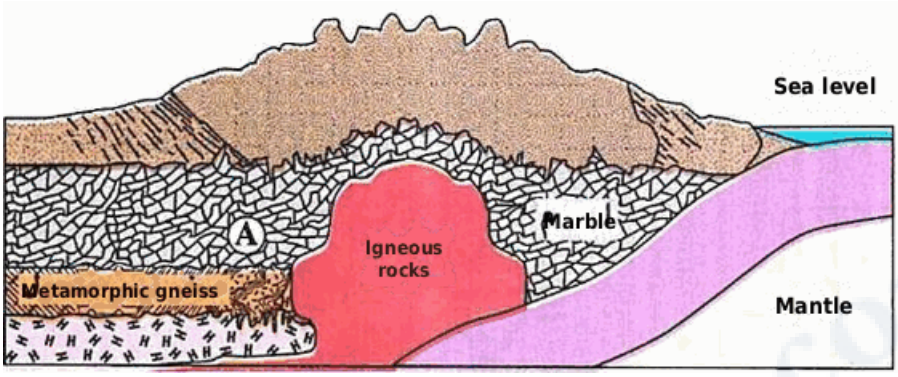
**62** The opposite figure shows a vertical section, and the letters (A), (B), (C), (D) and (E) represent different types of rocks. Study it well, then answer:

The rock formed in the metamorphic zone of rock (D) is .....




(A) marble
(B) quartzite
(C) limestone
(D) sandstone

**63** From the opposite vertical section, what mineral is found in the rocks of zone (A)?




(A) Quartz
(B) Calcite
(C) Pyroxene
(D) Mica

**64** The opposite figure shows a rock sample of gneiss. Which of the following minerals are found in the rock?

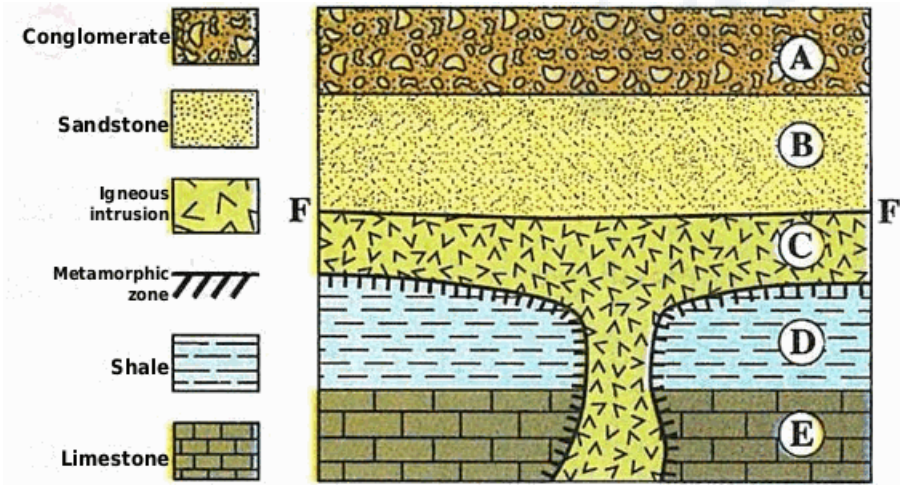


(A) Mica and pyroxene
(B) Orthoclase and olivine
(C) Quartz and feldspar
(D) Plagioclase and olivine

---

**65** The opposite figure represents a vertical section in the rocks of the Earth's crust. Study it well, then answer:

The surface (F - F) represents a(n) .....

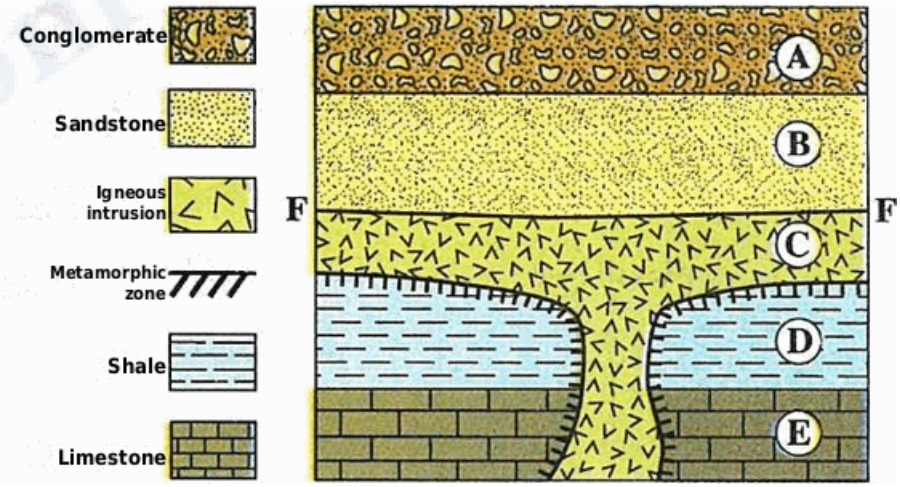



(A) disconformity
(B) nonconformity
(C) normal fault plane
(D) reverse fault plane

---

**66** The opposite figure represents a vertical section in the rocks of the Earth's crust. Study it well, then answer:

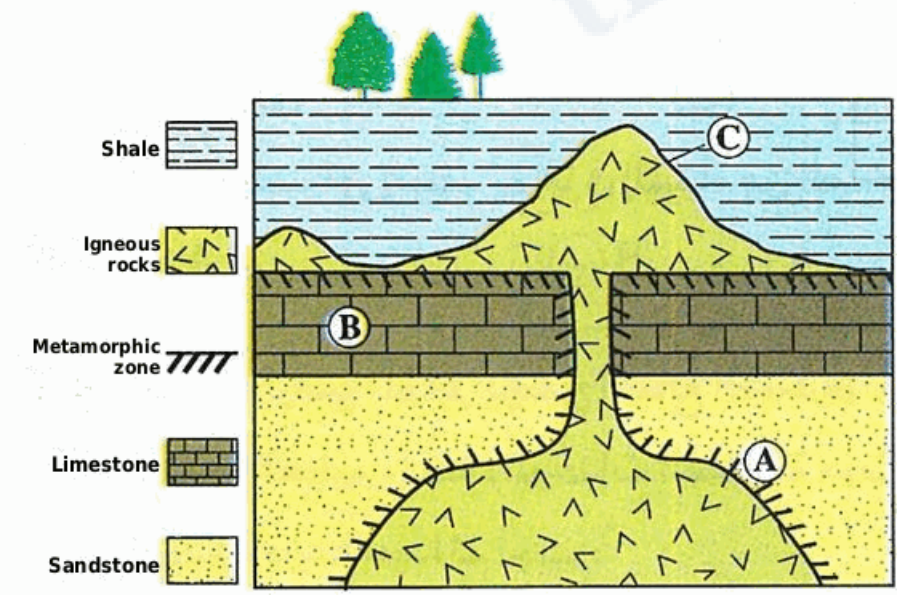
Rocks (C) affected rocks (E), forming .....




(A) quartzite with a granular texture
(B) quartzite with a foliated texture
(C) marble with a granular texture
(D) marble with a foliated texture

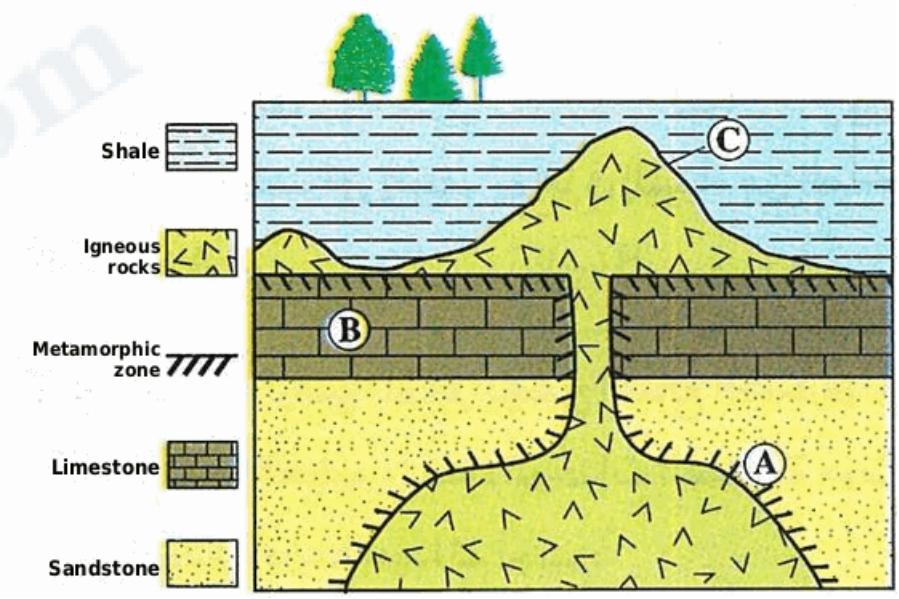
**67** In front of you is a vertical geological section. Study it well, then answer:

The metamorphic rock in zone (A) is .....



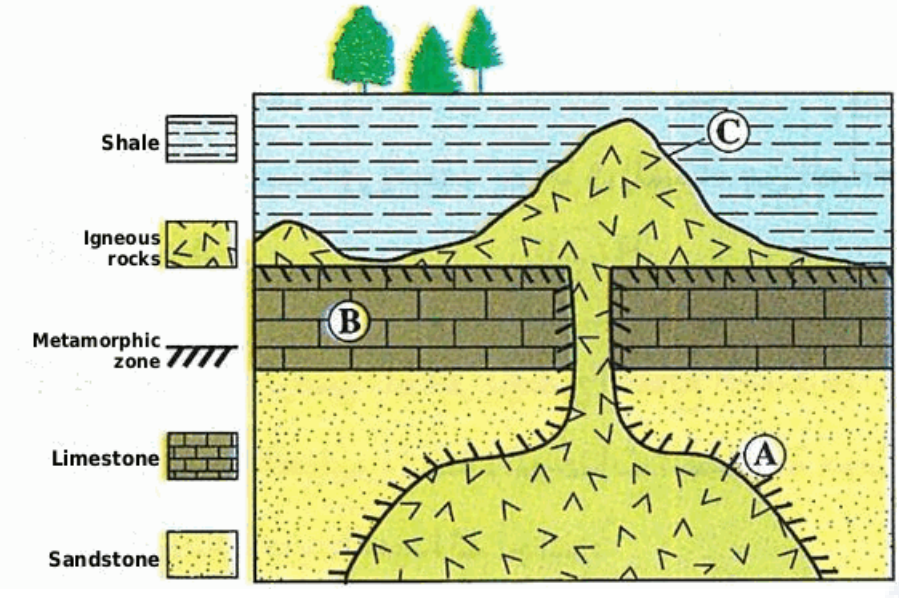

(A) marble
(B) slate
(C) mica schist
(D) quartzite

**68** In front of you is a vertical geological section. Study it well, then answer:
Which of the following rocks is the youngest?



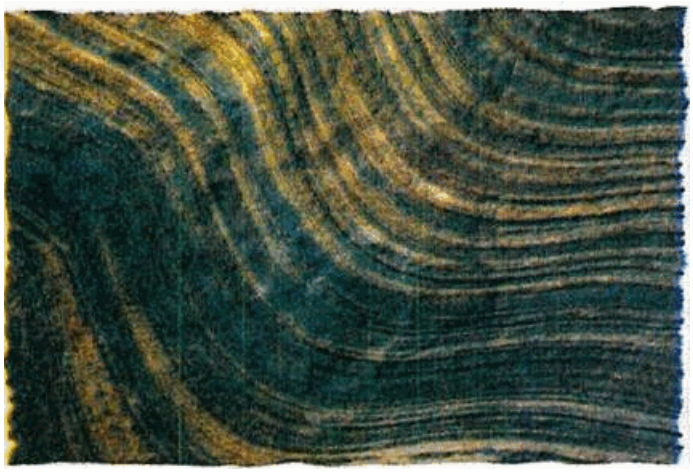

(A) The metamorphic rock in zone (A)
(B) Sandstone
(C) Igneous rocks
(D) Limestone

**69** In front of you is a vertical geological section. Study it well, then answer:
What does (C) indicate among the following?




(A) An anticline
(B) An angular unconformity surface
(C) A metamorphic zone
(D) A nonconformity surface

**70** The opposite figure shows a sample of a rock. What is the name of the rock, and what type is its texture?



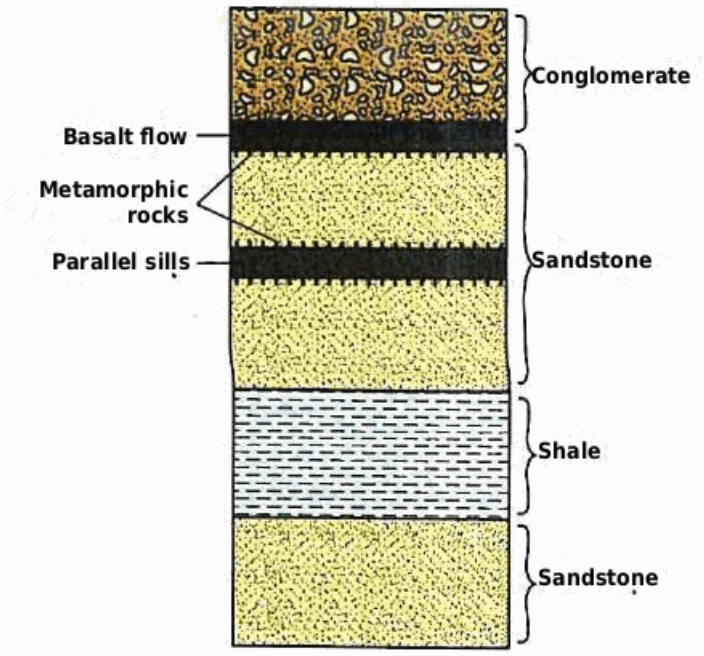
(A) Schist, metamorphosed by pressure and heat - foliated

(B) Quartzite, metamorphosed by heat - foliated

(C) Marble, metamorphosed by heat - granular

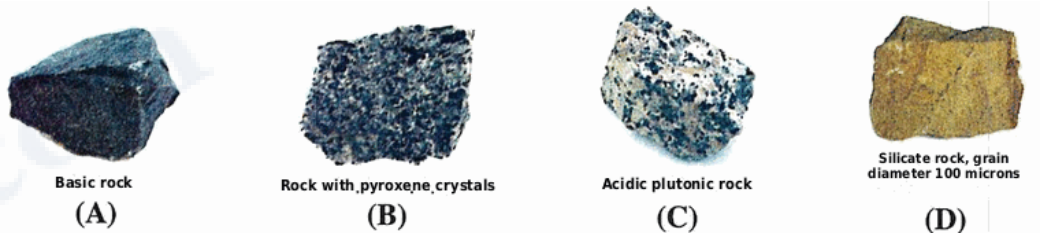
(D) Slate, metamorphosed by pressure and heat - granular

**71** From the opposite figure, which shows a vertical rock section, what is the metamorphic rock found in the section?



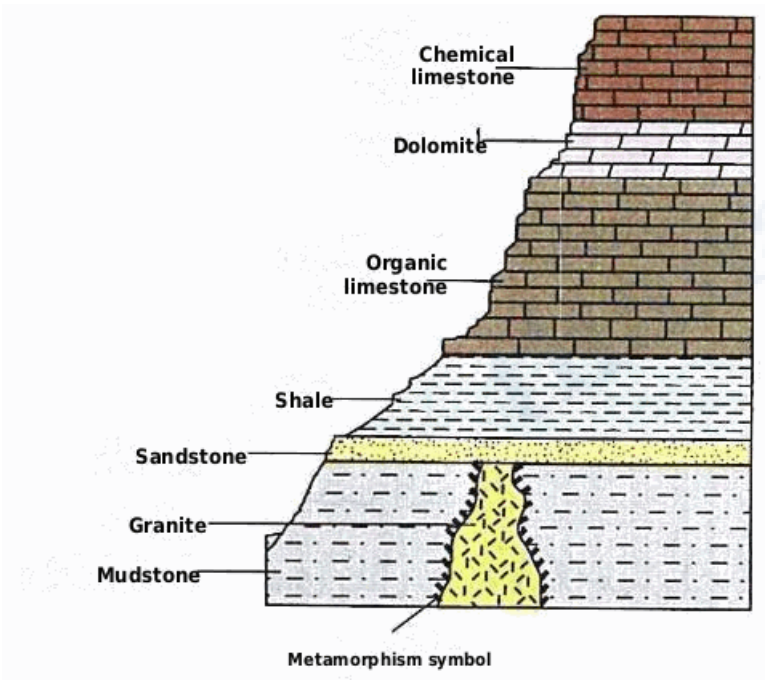

(A) Marble (B) Gneiss (C) Quartzite (D) Slate

**72** In front of you are rock samples at their real size: which of these rocks is completely different in origin from the others?




**73** The opposite vertical section shows the rock succession found in the Grand Canyon, with the names of the rock units shown on the section. Study it well, then answer:

The granite mass formed mainly as a result of .....



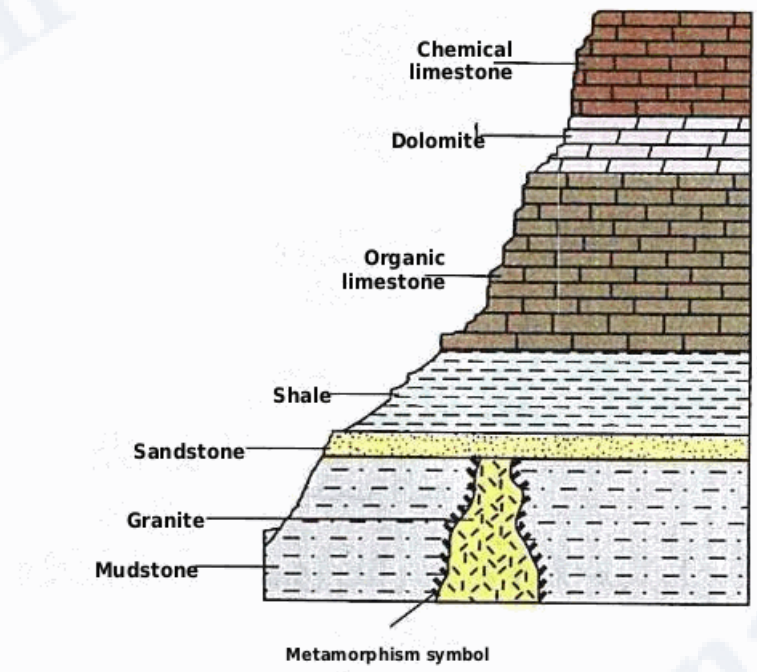

(A) the metamorphism of the sandstone layers

(B) the crystallization of acidic melt

(C) the lithification of quartz grains

(D) the cementation of clastic sediments

**74** The opposite vertical section shows the rock succession found in the Grand Canyon, with the names of the rock units shown on the section. Study it well, then answer:
The succession of the rock units in the section shows that the organic limestone is .....

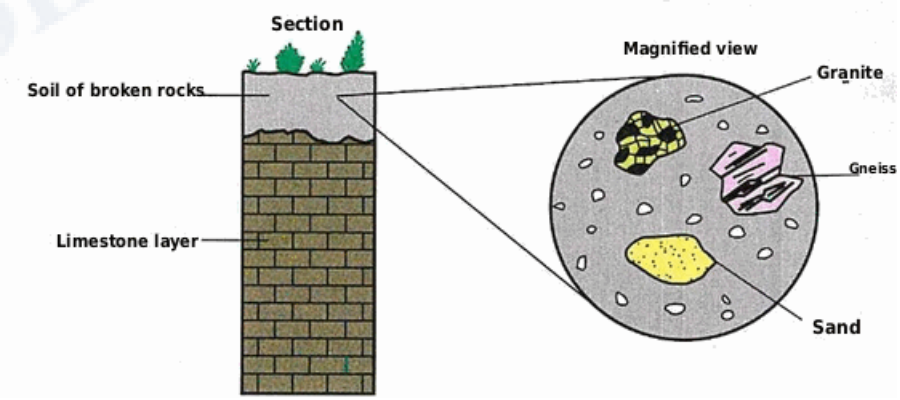



(A) younger than the dolomite but older than the shale
(B) younger than the dolomite and the shale
(C) older than the dolomite but younger than the shale
(D) older than the dolomite and the shale

**75** Which of the following shows two rocks, one of which is likely to affect the texture of the other?

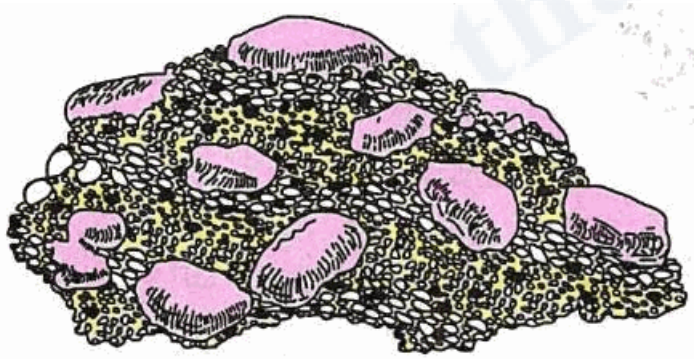
(A) Volcanic breccia with mudstone above it
(B) Volcanic ash with shale below it
(C) A lava flow with sandstone below it
(D) A lava flow with limestone above it

**76** The following figure represents a section in the soil near the Red Sea mountains. The upper soil layer contains broken rocks. A sample was taken from this layer and examined under the microscope. The most common mineral in the rock fragments of the magnified sample is .....



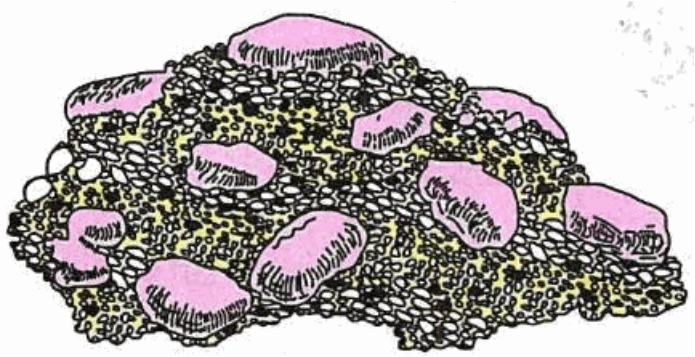

(A) pyroxene (B) hematite (C) quartz (D) olivine

**77** The opposite figure shows a rock made of cemented pebbles and sand grains whose chemical composition is silicon dioxide. Study it well, then answer:
This rock can be classified as a(n) .....



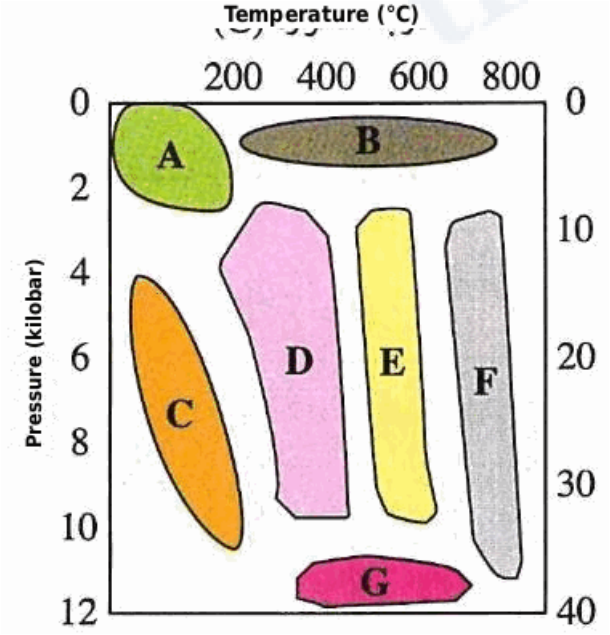
(A) plutonic igneous rock (B) surface (volcanic) igneous rock
(C) chemical sedimentary rock (D) clastic sedimentary rock

**78** The opposite figure shows a rock made of cemented pebbles and sand grains whose chemical composition is silicon dioxide. Study it well, then answer:
What change may happen if this rock is buried deep in the Earth's crust and exposed to new heat conditions but does not melt?



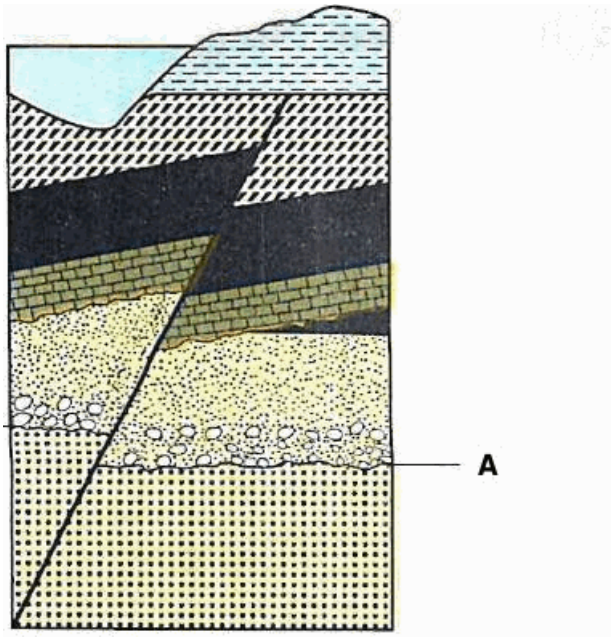
(A) The density of the pebbles and sand grains decreases
(B) The rock becomes a plutonic igneous rock made mostly of quartz
(C) The rock becomes more acidic as the magnesium concentration increases
(D) The sand grains fuse and interlock, and it becomes harder

**79** From the opposite figure, which letters may represent quartzite and slate, respectively?



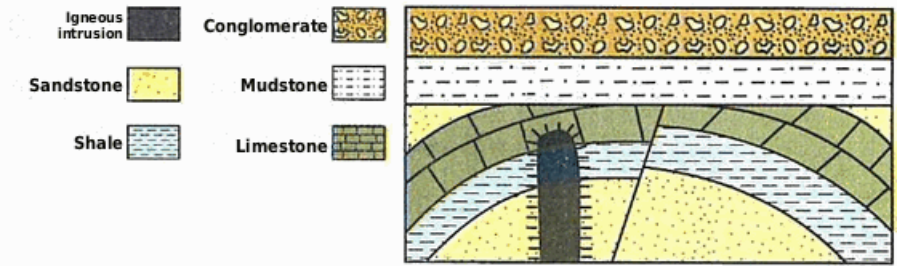

(A) (A) quartzite / (D) slate
(B) (B) quartzite / (C) slate
(C) (E) quartzite / (G) slate
(D) (F) quartzite / (A) slate

**80** In front of you is a section of some rock units with a nonconformity surface (A - A). The lower rock unit is most likely made of .....



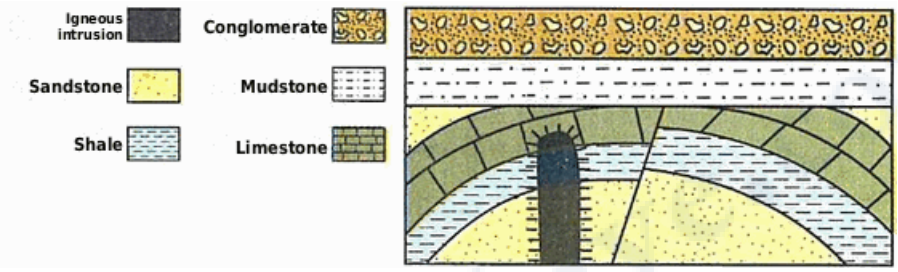

(A) dolomite (B) quartzite (C) shale (D) anhydrite

**81** The following figure shows a vertical section in the Earth. Study it well, then answer: Which of the following rocks does not form by the effect of the igneous intrusion in the section?




(A) Quartzite (B) Marble (C) Schist (D) Slate

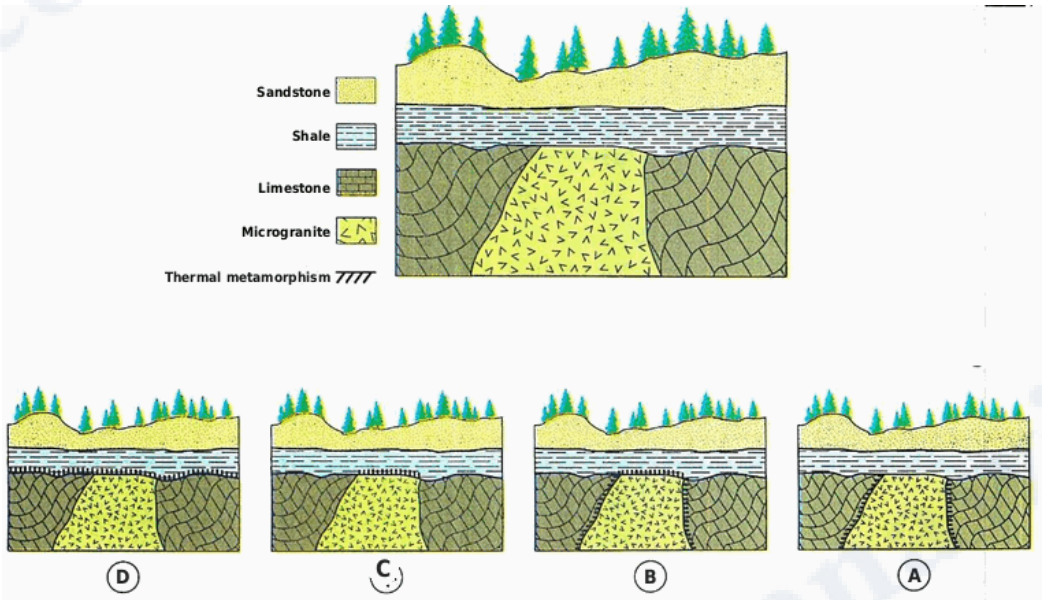
**82** The following figure shows a vertical section in the Earth. Study it well, then answer: The fault shown in the section is a(n) ..... fault.




(A) normal (B) reverse (C) thrust (D) graben

**83** The following vertical section represents four different rock units arranged from oldest to youngest as follows: (limestone, then microgranite, then shale, then sandstone). The metamorphism symbol has been left out of the section.

The best section to represent the zone of thermal metamorphism, based on the relative time relation, is .....

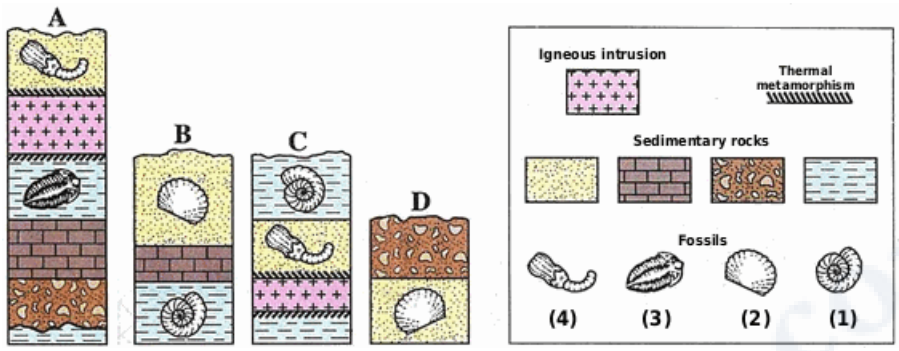



**84** The metamorphic rock with interlocking medium-sized crystals, most of which are made of one silicate mineral, is .....

(A) slate (B) gneiss (C) quartzite (D) marble

**85** In front of you are four vertical sections (A), (B), (C) and (D) of sedimentary rocks far apart in the Earth's crust, with the fossils (1), (2), (3) and (4) shown in the rocks. Study them well, then answer:

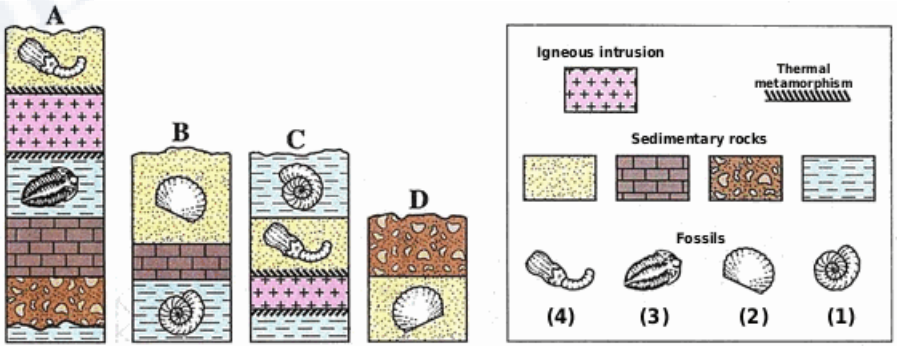
The fossils found in a deformed form in the rocks are .....




(A) (1), (2) (B) (2), (3) (C) (3), (4) (D) (4), (1)

**86** In front of you are four vertical sections (A), (B), (C) and (D) of sedimentary rocks far apart in the Earth's crust, with the fossils (1), (2), (3) and (4) shown in the rocks. Study them well, then answer:

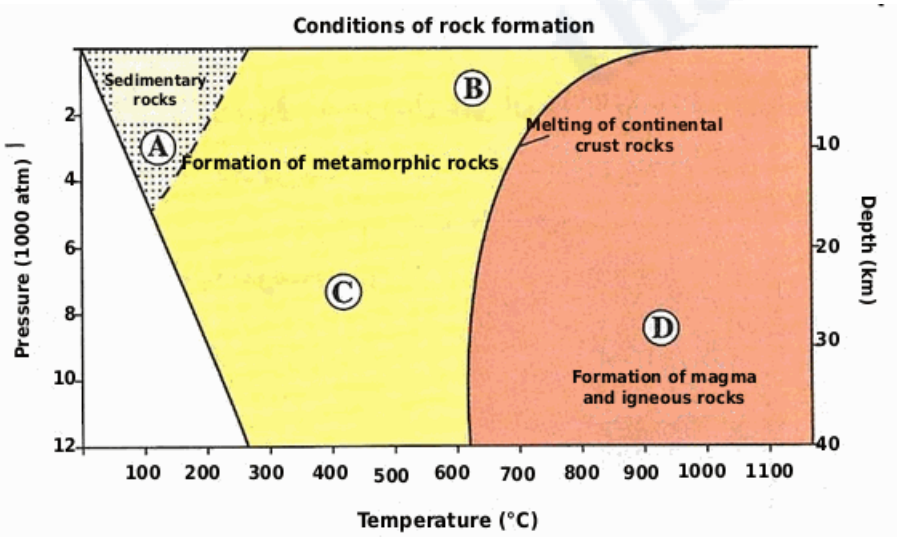
The igneous intrusion found in sections (C) and (A) is one of the .....




(A) dykes (B) sills (C) laccoliths (D) lopoliths

**87** The following figure shows the relation between temperature, pressure and depth for the formation of three main types of rocks. Study it well, then answer:

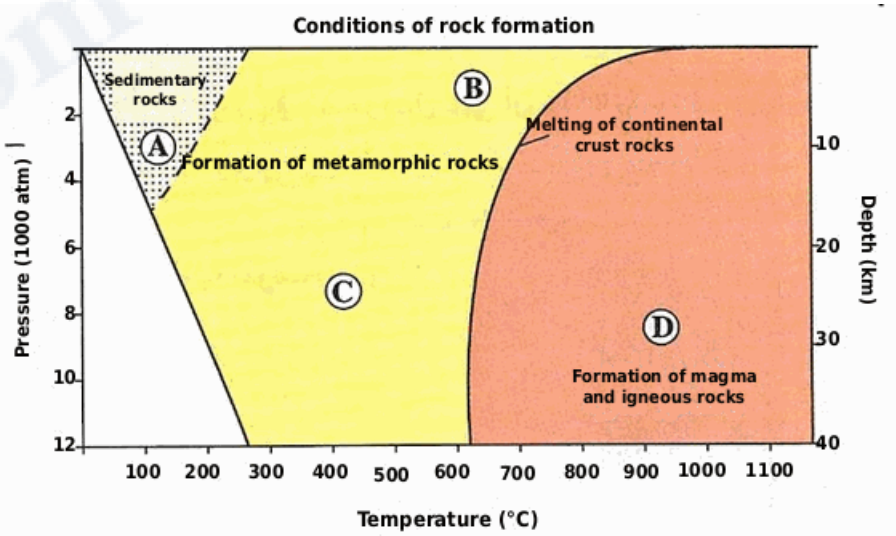
The rock that can form directly from magma found at a depth of 30 km, where the temperature is 1000 °C, is .....



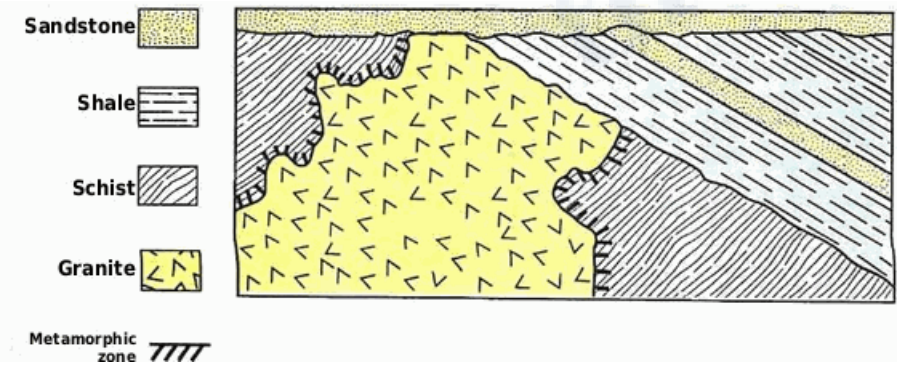

(A) quartzite (B) pumice (C) shale (D) diorite

**88** The following figure shows the relation between temperature, pressure and depth for the formation of three main types of rocks. Study it well, then answer:

The letter that represents the suitable conditions for forming gneiss is .....




**89** The opposite vertical geological section represents geological structures containing a granite intrusion. If the age of the granite is 24 million years, the ages of the schist and the shale in millions of years are most likely .....



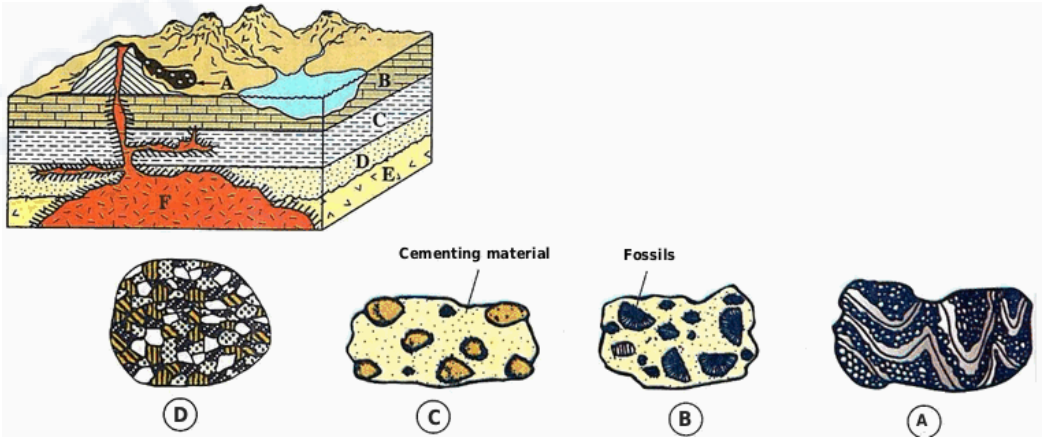

(A) schist 25 / shale 23

(B) schist 25 / shale 26

(C) schist 23 / shale 25

(D) schist 23 / shale 24

**90** The opposite block diagram shows a vertical section in the Earth, and the letters (A) : (F) represent different types of rocks. Which of the following figures represents the rock found at (F)?



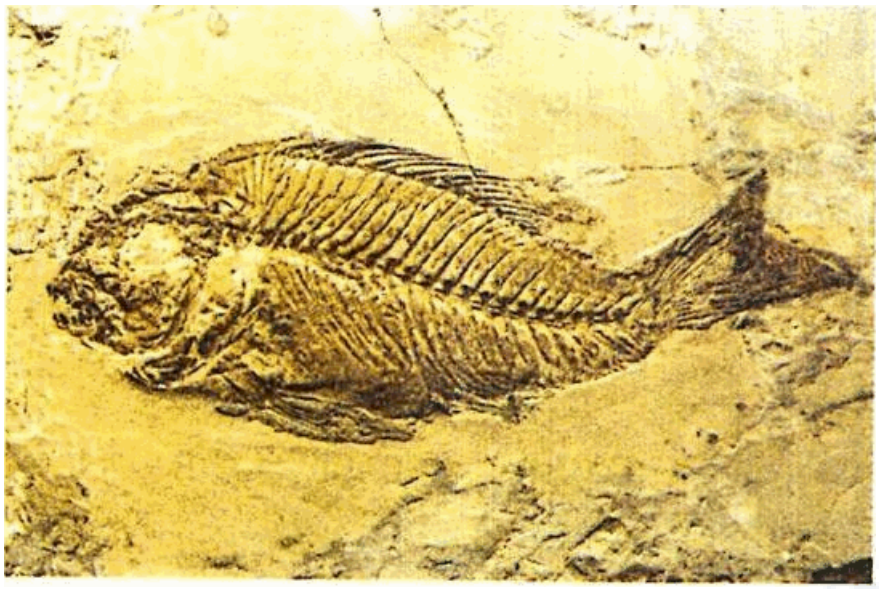

**91** The rock in which a fossil of shellfish cannot be found is .....

(A) granite (B) limestone (C) shale (D) marble

**92** Finding a fossil of the oldest bird on Earth in a rock shows that this rock may be .....

(A) gabbro (B) andesite (C) gneiss (D) mudstone

**93** The fossil of the bony fish shown in the opposite picture was found in .....

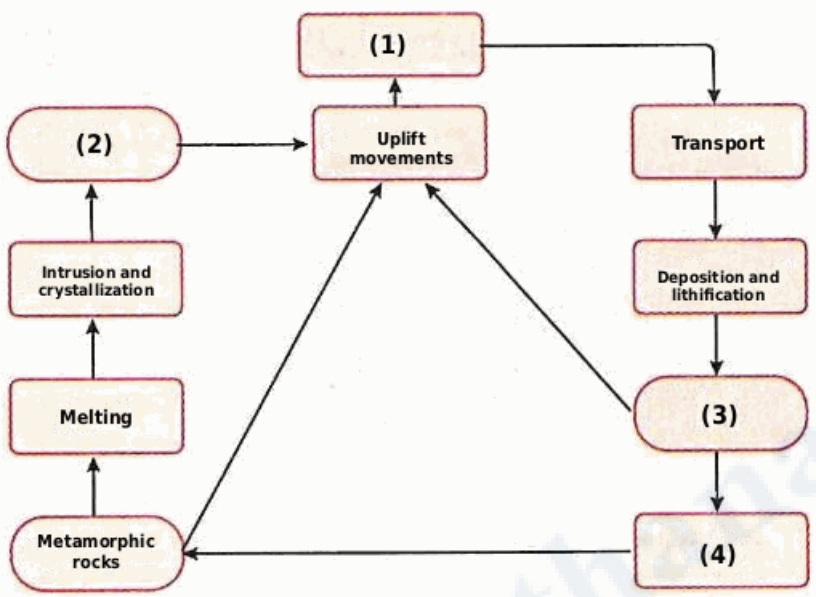


(A) andesite (B) granite (C) limestone (D) gneiss

**94** The processes that lead directly to the formation of igneous rocks are .....

(A) weathering and deposition
(B) compaction and cementation
(C) pressure and heat
(D) melting and crystallization

**95** The opposite diagram represents the rock cycle, which includes a series of geological processes and rocks. What do (2), (3) and (4) represent, respectively, in the diagram?




(A) (2) magma / (3) sedimentary rock / (4) lithification and compaction
(B) (2) igneous rock / (3) sediments / (4) cooling and lithification
(C) (2) igneous rock / (3) sedimentary rock / (4) metamorphism
(D) (2) sedimentary rock / (3) igneous rock / (4) metamorphism

**96** The first process that happens directly to rock fragments when the speed of the transporting agent decreases is .....

(A) lithification (B) deposition (C) metamorphism (D) compaction

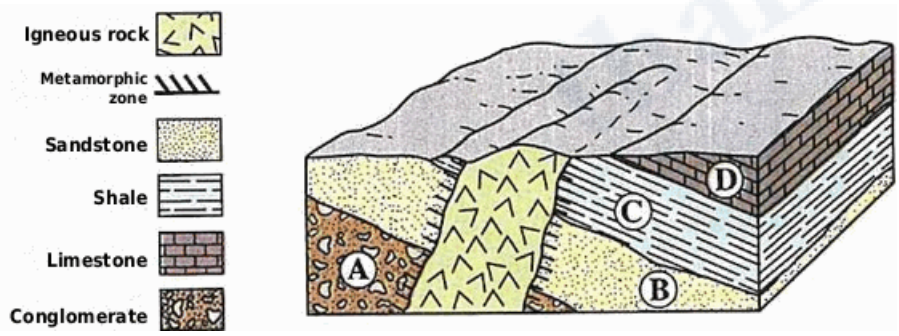
**97** The sediments in the opposite picture formed directly from the processes of .....



(A) cooling and crystallization
(B) weathering and transport
(C) consolidation and lithification
(D) metamorphism and cementation

---

**98** The following block diagram represents part of the Earth's crust, and the letters (A), (B), (C) and (D) indicate sedimentary rocks. Study it well, then answer:
The most recent of the following processes is .....

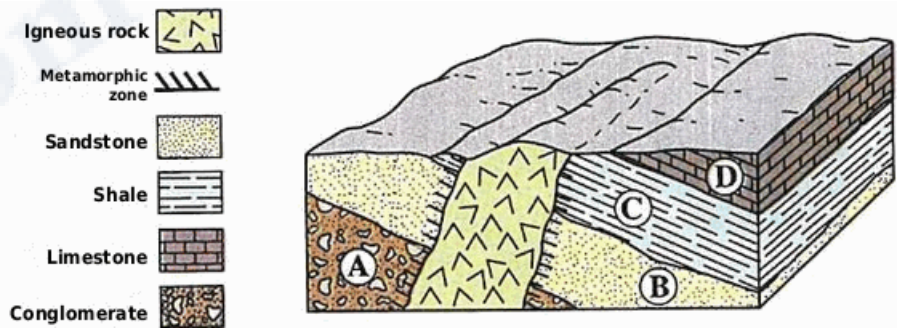



(A) the formation of layer (A)
(B) the formation of layer (D)
(C) the tilting of all the sedimentary rock layers
(D) the erosion of the igneous rocks exposed at the surface

---

**99** The following block diagram represents part of the Earth's crust, and the letters (A), (B), (C) and (D) indicate sedimentary rocks. Study it well, then answer:

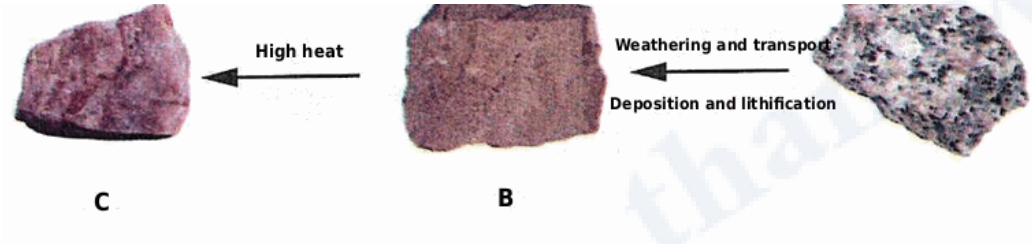
The process that caused the formation of layer (B) is .....




(A) melting and crystallization
(B) metamorphism by pressure and heat
(C) metamorphism by pressure
(D) lithification and cementation

---

**100** If rock (B) is made of a mineral used in making glass, what is rock (C)?

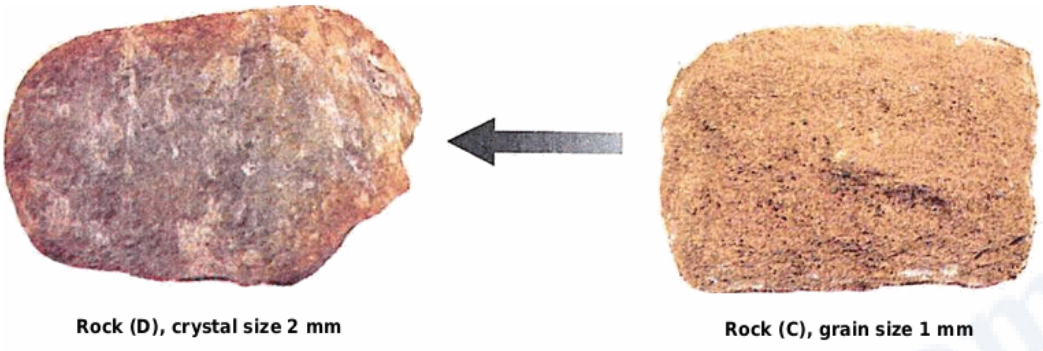



(A) Gneiss
(B) Marble
(C) Schist
(D) Quartzite

---

**101** In front of you are two samples of two rocks that have the same mineral composition. Observe them well, then answer:

These two rocks form by two processes, which are .....

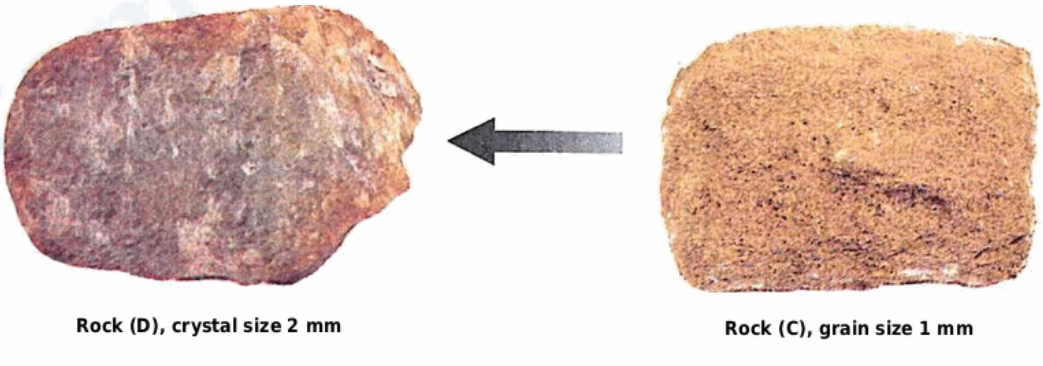



(A) cooling then metamorphism
(B) melting then crystallization
(C) lithification then metamorphism
(D) melting then metamorphism

---

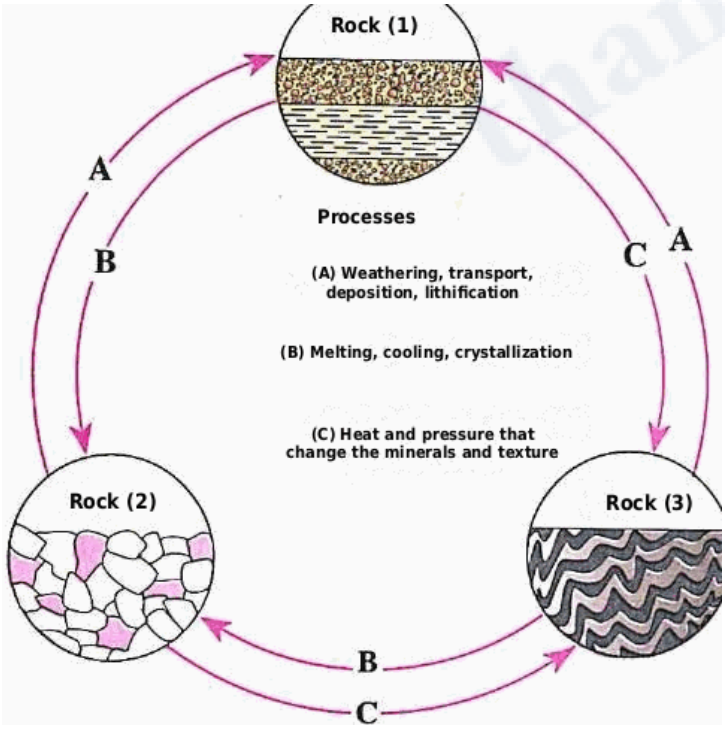
**102** In front of you are two samples of two rocks that have the same mineral composition. Observe them well, then answer:

The property we can use to describe rock (D) is that it is a(n) ..... rock.




(A) massive (non-foliated)
(B) fissile
(C) clastic
(D) foliated

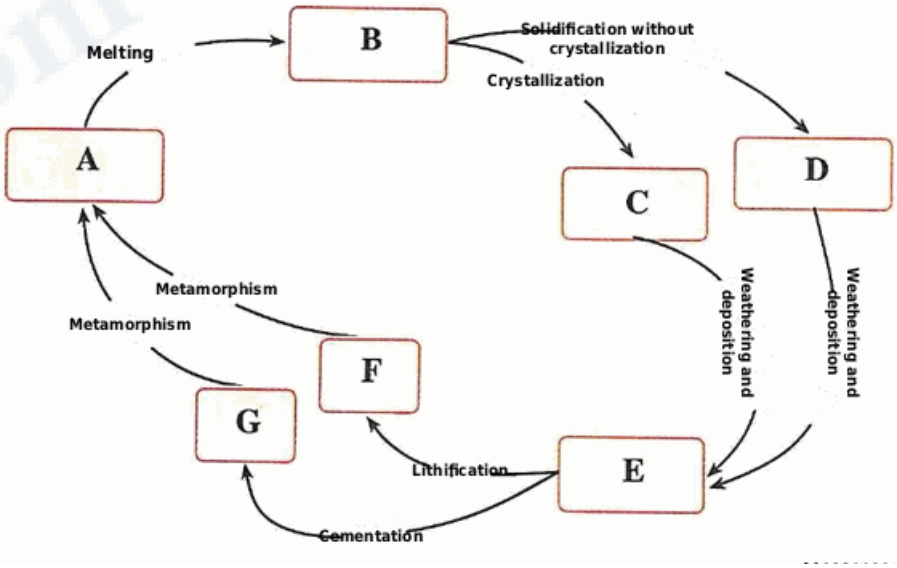
**103** The opposite diagram represents the geological processes that continuously happen on Earth to form different types of rocks. The correct choice that classifies the rocks accurately is .....




(A) (1) sedimentary, (2) metamorphic, (3) igneous
(B) (1) sedimentary, (2) igneous, (3) metamorphic
(C) (1) metamorphic, (2) igneous, (3) sedimentary
(D) (1) igneous, (2) metamorphic, (3) sedimentary

**104** The opposite diagram shows the processes that happen in the rock cycle, and the letters (A : G) represent rocks and rock materials. Study it well, then answer:

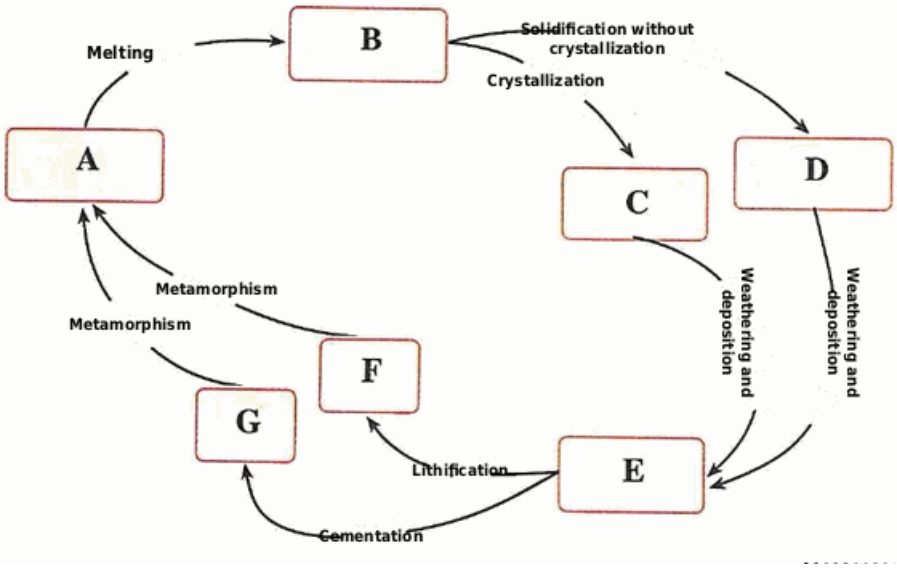
The letter that may represent conglomerate is .....




(A) E (B) G (C) C (D) D

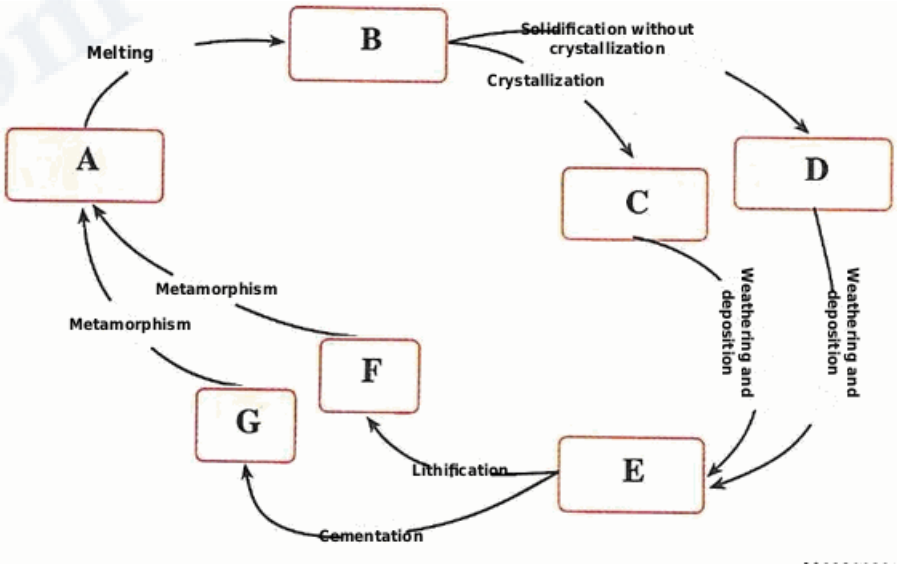
**105** The opposite diagram shows the processes that happen in the rock cycle, and the letters (A : G) represent rocks and rock materials. Study it well, then answer:

The letter that may represent a massive (non-foliated) rock is .....

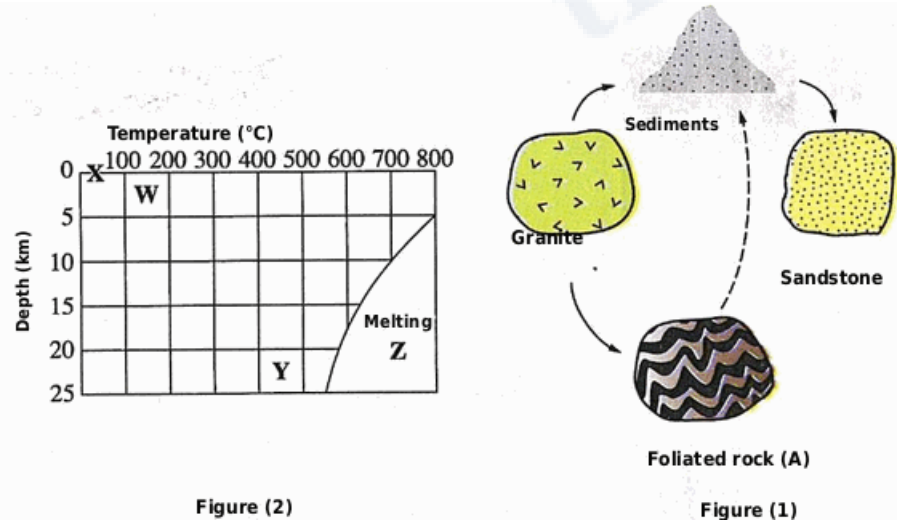


**106** The opposite diagram shows the processes that happen in the rock cycle, and the letters (A : G) represent rocks and rock materials. Study it well, then answer:

The letter that represents the formation of obsidian is .....




**107** Figure (1) shows part of the rock cycle, and figure (2) shows the conditions of formation of 4 different rocks (W), (X), (Y) and (Z): which of these rocks represents the same formation conditions as rock (A)?




(A) W (B) X (C) Y (D) Z

## Essay questions — 12 questions

**1** Deduce the name of the rock produced by each of the following:

(1) The melting of gneiss, then the crystallization of the resulting melt in two stages.

(2) The effect of contact with lava from volcanoes on sandstone.

(3) The slow crystallization of magma containing 60% silica.

(4) The consolidation of quartz grains by a cementing material.

**2** (Rhyolite – shale – mica schist) are three different rocks:

(1) What are the most important chemical properties of rhyolite?

(2) How does shale form?

(3) Can mica schist form on the Earth's surface? Why?

**3** On a visit to the geological museum, you found three rock samples:

A : a light-coloured sample with clear crystals.

B : a rock made of rounded gravel.

C : a light-weight sample rich in gas bubbles.

(1) Name these rocks.

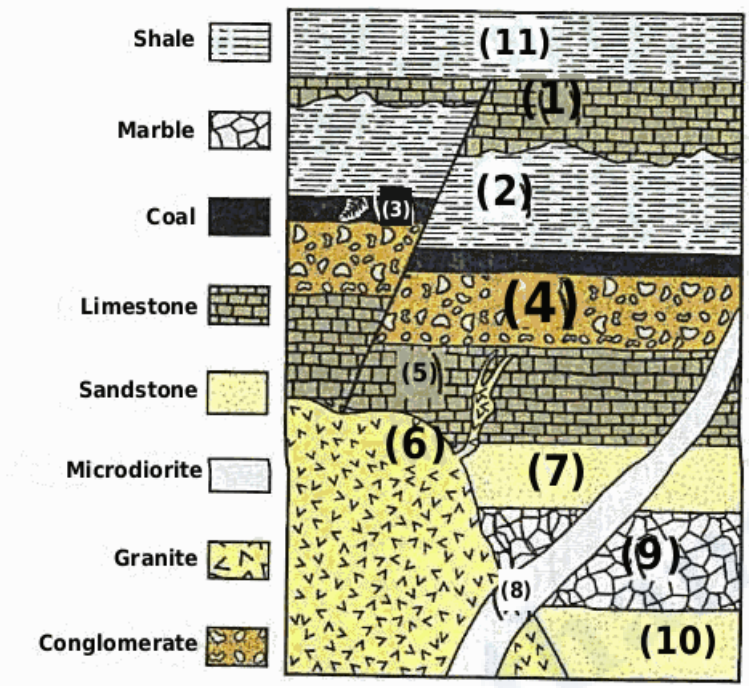
(2) Do you expect fossils in the samples? Why?

**4** Study the opposite vertical section, then answer the following:

(1) What are the type and importance of the two rocks (6) and (9)?

(2) What is the effect of the two rocks (6) and (8) on the two rocks (7) and (5)?

(3) If rock (2) is metamorphosed by the effect of pressure and low temperature, what is its importance?

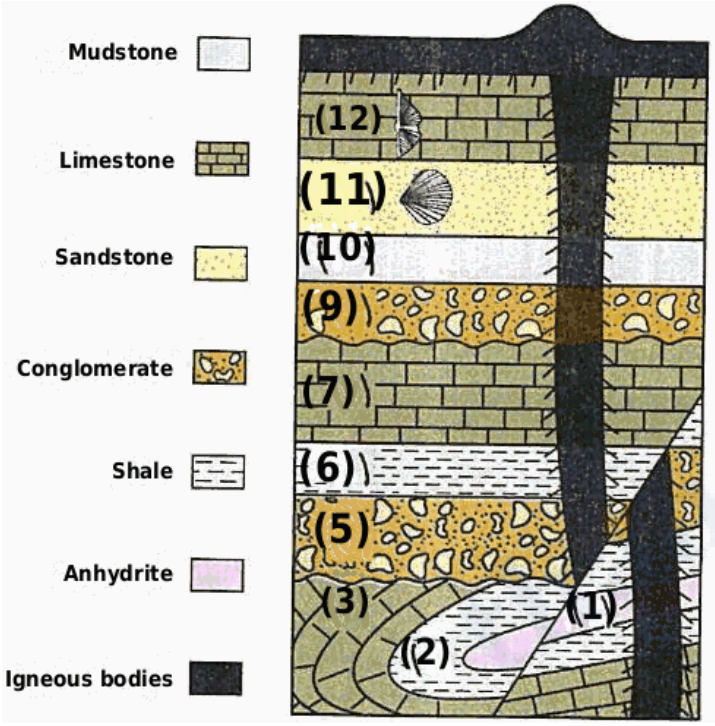


**5** The opposite vertical section is made of rock layers represented by the numbers (1) : (12). Study it well, then answer the following questions:

(1) Locate the unconformity surfaces in the section, and give the type of each.

(2) Explain the effect of the igneous bodies on the limestone, and the properties of the fossils in it after exposure to heat.

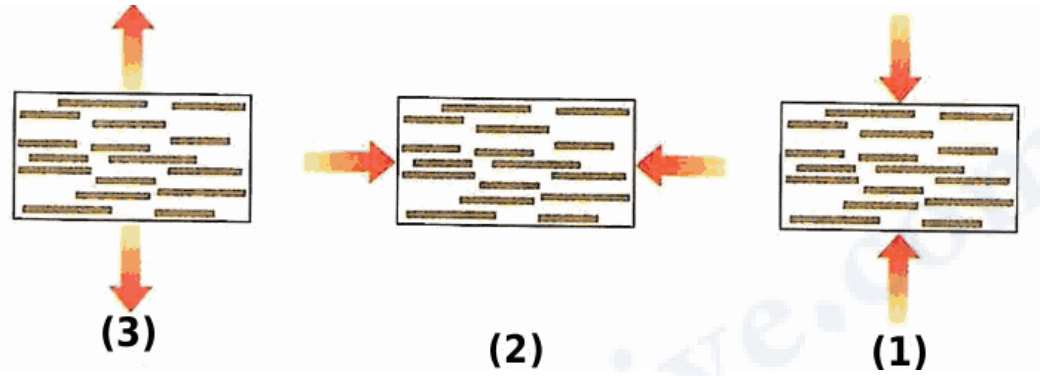
(3) To which type of rocks does rock (1) belong? What is its chemical composition?




**6** Study the following figures, which represent the texture of a metamorphic rock, given that the arrows represent the direction of pressure, then answer:

(1) Which of the previous figures shows the correct direction of pressure in the metamorphic rock?

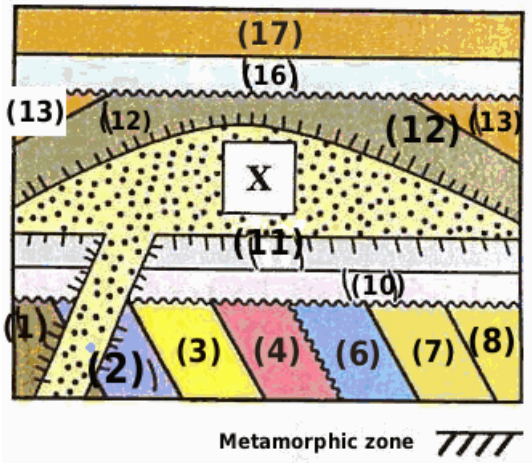
(2) Name the original rock if the metamorphic rock contains minerals whose crystals are parallel and discontinuous.



**7** The opposite vertical section is made of rock layers represented by the numbers (1) : (17) and contains geological structures. Study it well, then answer:

(1) What is the geological structure found between layer (13) and layer (16)? How can it be recognized?

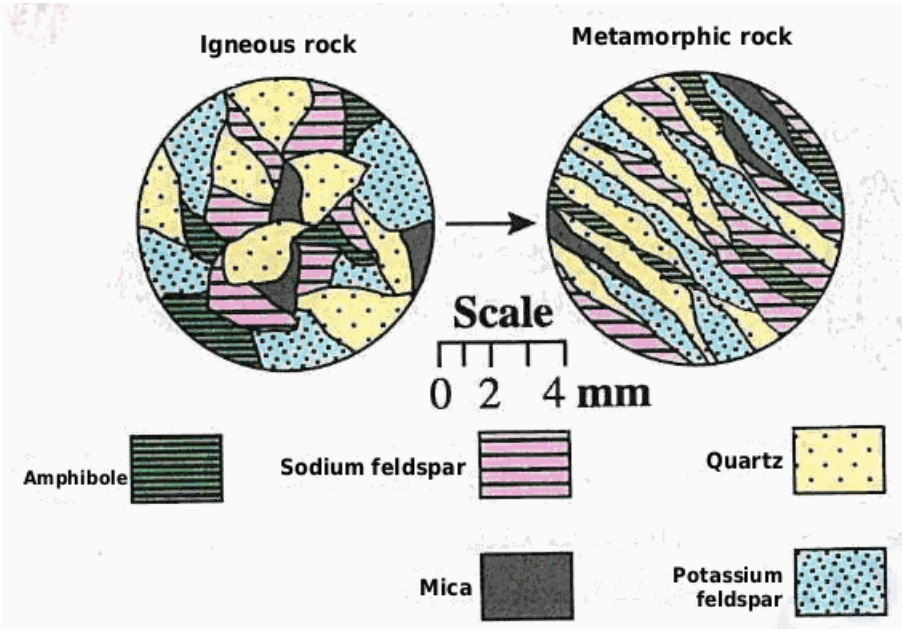
(2) If layer (12) is limestone, what is produced by its contact with structure (X)?




**8** In front of you are two samples of two different rocks. Study them well, then answer:

(1) What geological conditions led to the formation of the igneous rock, based on the size of its interlocking crystals and its mineral composition? What is the rock?

(2) What geological conditions led to the formation of the metamorphic rock, based on the arrangement of its crystals?

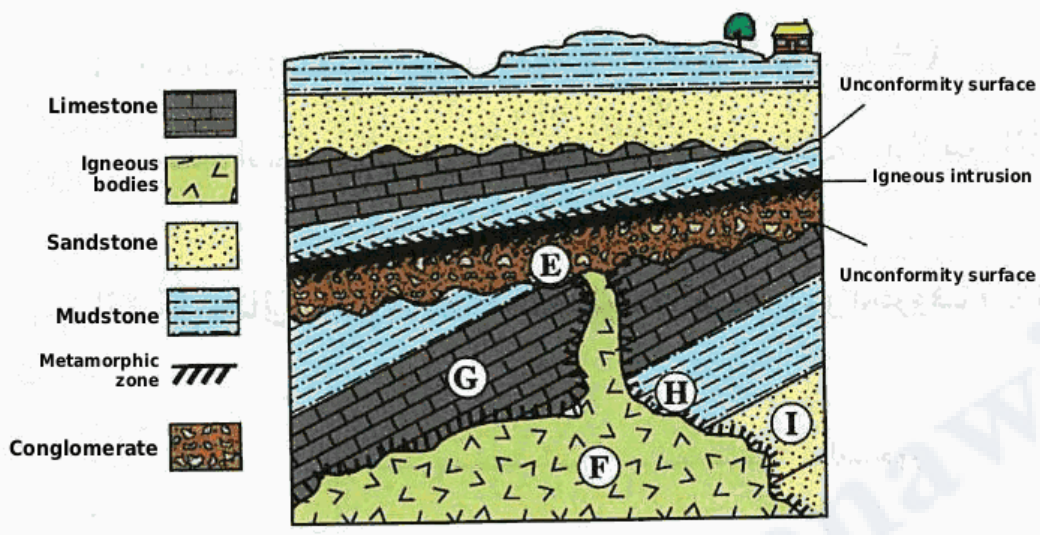


**9** The opposite vertical section represents some rock units that are part of the Earth's crust. Study it, then answer:

(1) What metamorphic rocks formed at the boundaries of the igneous body (F) in each of the rock units (G) and (I)?

(2) What is the type of the two unconformity surfaces in the section?

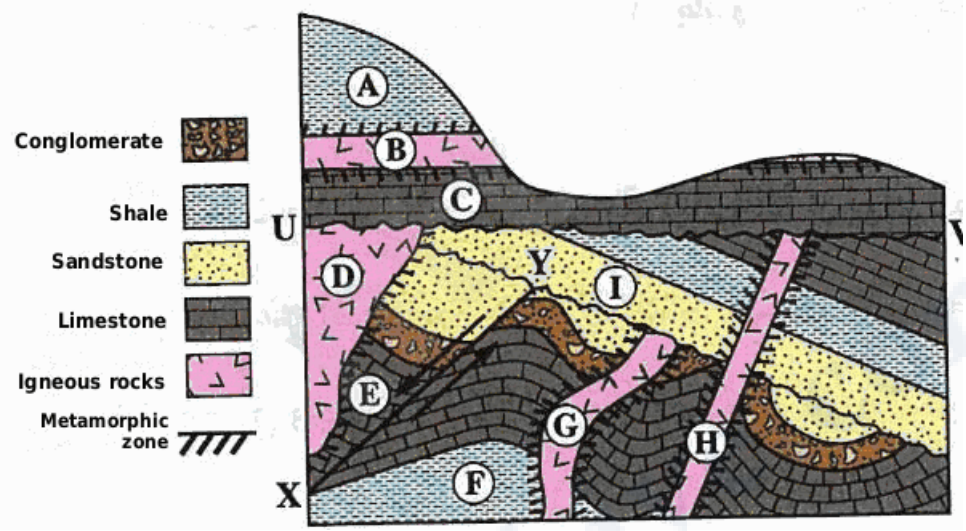
(3) Arrange the geological events (E), (H) and (F) from oldest to youngest.




**10** The opposite figure represents a vertical section of part of the Earth's crust. Some rock units are marked with the letters (A : I), (X-Y) represents a fault and (U-V) represents an unconformity surface. Study it, then answer:

(1) What are the type and texture of the rock metamorphosed by thermal contact with mass (B) that formed in rock unit (C)?

(2) Assuming no erosion happened in rock unit (B), what is the difference between the type of igneous body in rock unit (B) and the type of body in rock unit (G)?

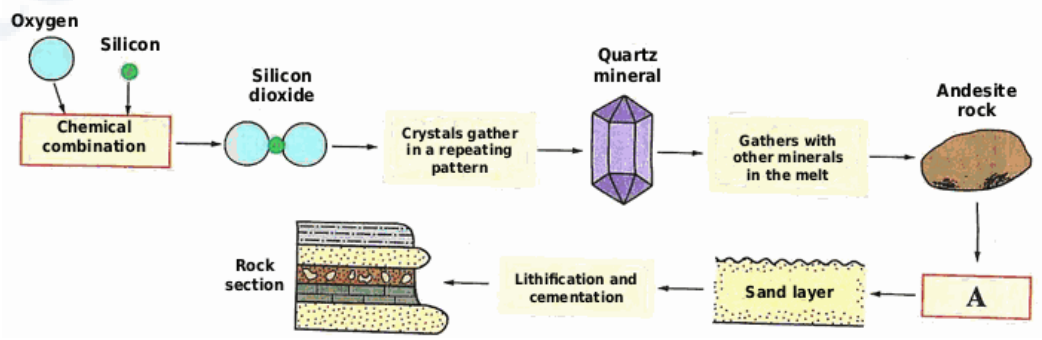


**11** Study the following diagram, then answer:

(1) Deduce three minerals that are usually found with quartz in andesite.

(2) Deduce a geological process that the letter (A) may represent.

(3) Name two plutonic rocks that, if put in place of andesite, keep the diagram complete as it is.

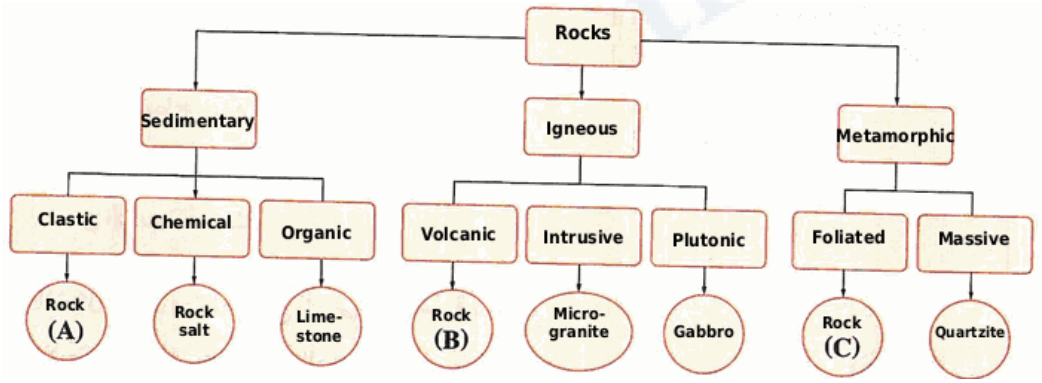



**12** The following figure represents a rock classification chart, and the letters (A), (B) and (C) represent specific rocks. Study it, then answer:

(1) Deduce the name of the foliated rock (A) whose grain diameter is 30 microns.

(2) Deduce the name of rock (B), which contains the minerals quartz and pyroxene.

(3) Give one difference between rock (C) and quartzite.

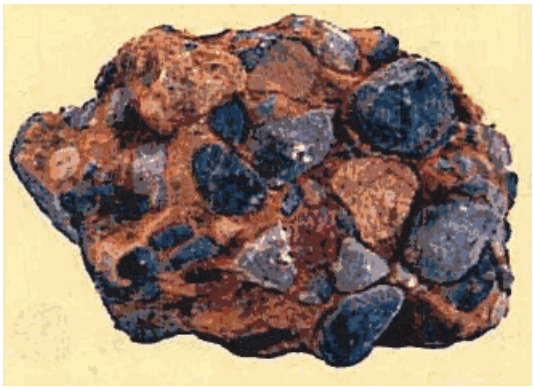


## Past exam questions — 47 questions

**1** The fragments that make up the sharp-angled sedimentary breccia rocks are originally ..... sediments. (Trial exam / June 2021, Sample exam 2025)

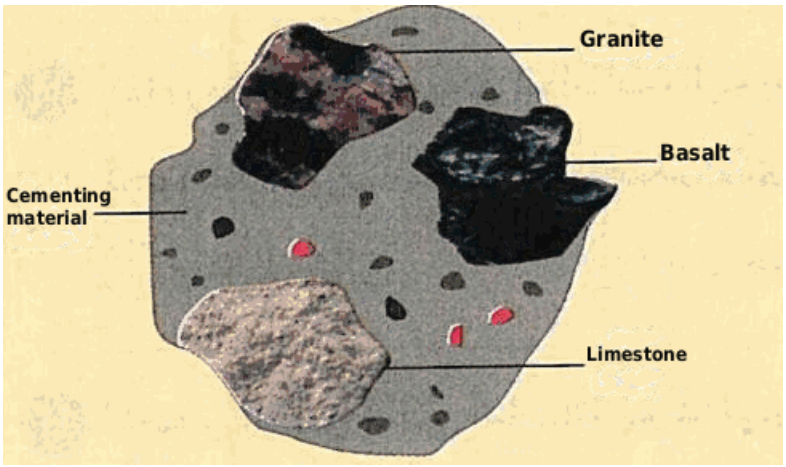
(A) gravel (B) sand (C) silt (D) mud

**2** In front of you is a hand sample of cemented grains. The size of most of the grains is expected to be ..... (Trial exam / June 2021, Sample exam 2025)



(A) 2500 microns (B) 1500 microns (C) 500 microns (D) 100 microns

**3** In front of you is a hand sample of a clastic sedimentary rock. Which statement describes this rock most accurately? (2nd session 2021)




(A) All the mineral components of the rock have the same age

(B) All the mineral components of the rock come from different rocks

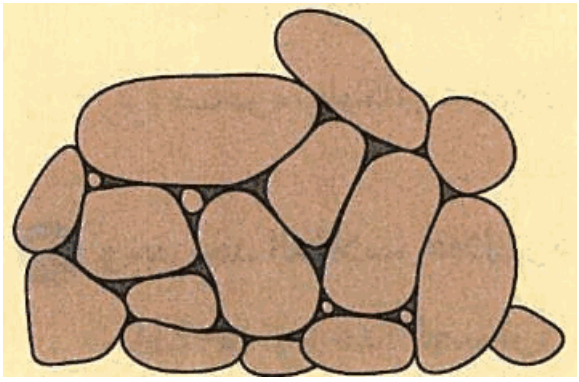
(C) All the mineral components of the rock have the same chemical composition

(D) All the mineral components of the rock come from one igneous rock

**4** If you found a layer containing rock pieces with rounded edges, covered by sand deposits and then clay deposits at the top, predict which structure these deposits belong to. (Trial exam 2023)

(A) Graded bedding (B) Ripple marks (C) Cross bedding (D) Mud cracks

**5** The opposite figure shows a hand sample of a rock made of grains of different sizes. What is the name of the rock, and its type? (1st session 2023)



(A) Marble – massive metamorphic
(B) Quartzite – massive metamorphic
(C) Breccia – clastic sedimentary
(D) Conglomerate – clastic sedimentary

**6** Hydrocarbon materials mature inside the Earth, changing into the liquid or gaseous state, at a temperature of about ..... (Trial exam / June 2021)

(A) 80°C (B) 50°C (C) 40°C (D) 110°C

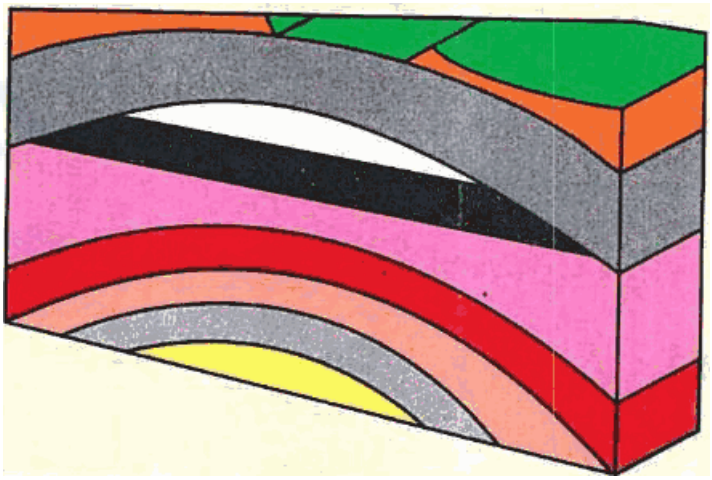
**7** The chemical combination of calcium ions and the carbonate group may produce ..... (Trial exam / June 2021)

(A) stalagmites and cracks
(B) stalagmites and stalactites
(C) stalactites and joints
(D) stalactites and cracks

**8** A reserve energy source that is not used at present and is in a waxy state is ..... (1st session 2021)

(A) coal (B) petroleum (C) natural gas (D) kerogen

**9** What is the economic importance of the opposite structure? (1st session 2021)



(A) Rock melt collects in it
(B) It is a magma reservoir
(C) Measuring the age of different rocks
(D) It stores hydrocarbon materials

**10** Organic deposits of economic value that usually form in swamp areas behind deltas are deposits of ..... (2nd session 2021)

(A) oil shale (B) coal (C) limestone (D) shale

**11** During a geological trip to the Bahariya Oasis, a sample of a rock was found that is made mostly of a mineral with a hardness of «2» belonging to the sulphate group. What type of rock does this sample represent? (1st session 2022)

(A) Massive metamorphic
(B) Basic plutonic igneous
(C) Chemical sedimentary
(D) Intermediate volcanic igneous

**12** Examine the picture in front of you well, then answer: which of the following statements applies to the rock shown? (Trial exam 2023)



(A) A non-organic silicate rock containing more than one mineral that cannot be scratched by a copper coin

(B) An organic non-silicate rock containing a mineral that can be scratched by a copper coin

(C) A non-organic non-silicate rock containing a mineral that cannot be scratched by a streak plate

(D) An organic silicate rock containing a mineral that can be scratched by a piece of glass

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**13** During a geological trip, a student found large amounts of salty-tasting cubic crystals near a lake in a hot, dry area. What type of rock is this? (1st session 2023, 2025)

(A) Biochemical sedimentary

(B) Clastic sedimentary

(C) Chemical sedimentary

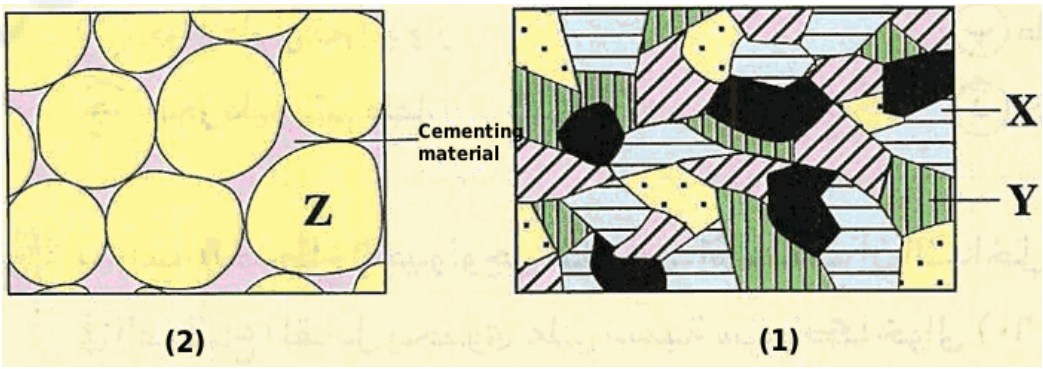
(D) Massive metamorphic

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**14** From the two opposite figures:

(X): a silicate mineral rich in sodium, (Y): a silicate mineral rich in calcium, (Z): a silicate mineral made of only two elements.

From the previous information, what is the classification of the two rocks (1) and (2)? (1st session 2024)




(A) (1) basic plutonic igneous rock, (2) massive metamorphic rock

(B) (1) intermediate plutonic igneous rock, (2) clastic sedimentary rock

(C) (1) acidic plutonic igneous rock, (2) chemical sedimentary rock

(D) (1) ultrabasic plutonic igneous rock, (2) organic sedimentary rock

---

**15** The grain diameter of source rocks ranges between ..... (1st session 2025)

(A) 2000 microns and 200 microns

(B) 500 microns and 80 microns

(C) 200 microns and 62 microns

(D) 50 microns and 3 microns

---

**16** A sedimentary rock in which hydrocarbon materials mature.

A sedimentary rock in which hydrocarbon materials are stored, and which is used in making cement.

From the above, it can be deduced that they are, respectively, ..... sedimentary rocks. (Sample exam 2026)

(A) chemical / biochemical

(B) clastic / chemical

(C) clastic / clastic

(D) chemical / chemical

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**17** Silt and clay deposits take part in the formation of all of the following except ..... (Sample exam 2026)

(A) reservoir rocks (B) source rocks (C) shale (D) oil shale

---

**18** The sedimentary rock made of one mineral with rhombohedral cleavage is ..... (Sample exam 2026)

(A) limestone (B) sandstone (C) calcite (D) gypsum

**19** The compound mineral that forms one of the evaporite rocks, whose crystals have cubic cleavage and three equal, perpendicular axes, is ..... (Sample exam 2026)

(A) quartz (B) galena (C) halite (D) chert

**20** The hard remains of marine vertebrates take part in the formation of ..... (Sample exam 2026)

(A) sandstone
(B) coal
(C) phosphate and limestone
(D) sandstone and oil shale

**21** During your visit to the geological museum, you found a sample of a coloured, veined rock. What type of rock is it? (Trial exam / May 2021)

(A) Clastic sedimentary
(B) Basic plutonic igneous
(C) Intermediate plutonic igneous
(D) Massive metamorphic

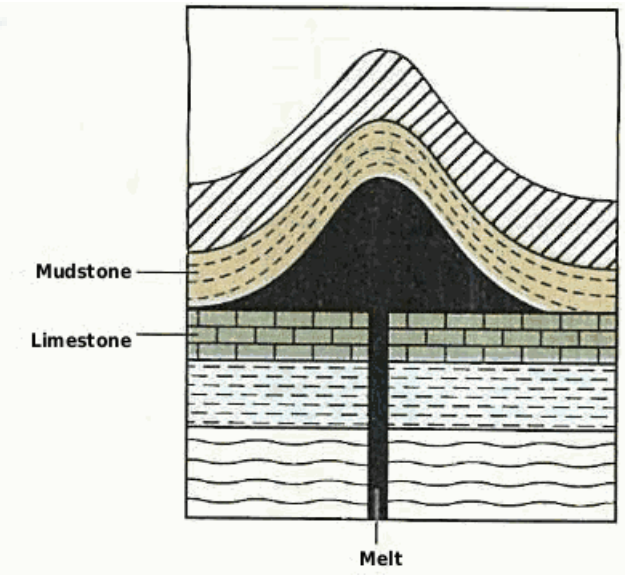
**22** Low-viscosity magma intruded between rocks, with sandstone above it and granite below it. What are the rocks produced by this contact above and below, respectively? (Trial exam / May 2021)

(A) Marble / schist
(B) Quartzite / gneiss
(C) Schist / marble
(D) Gneiss / quartzite

**23** When sediments smaller than 60 microns are exposed to compaction and then to intense pressure and low temperature, what type of rocks forms? (Trial exam / June 2021)

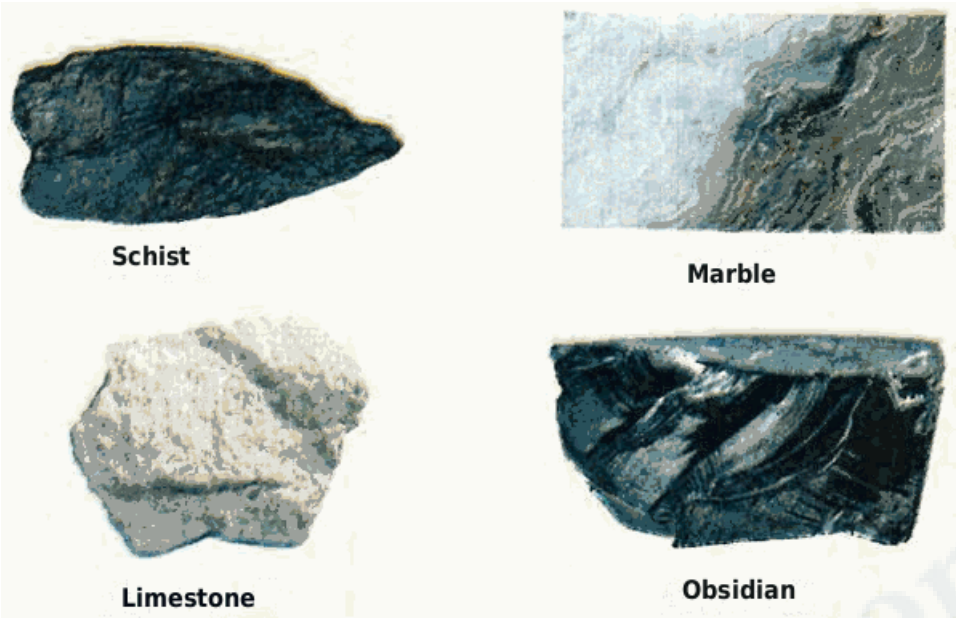
(A) Mudstone then slate
(B) Shale then slate
(C) Mudstone then shale
(D) Mudstone then schist

**24** By studying the opposite geological section, and knowing that the igneous intrusion in the section contains about 60% silica, which of the following rocks did the melt cause to form in the area? (1st session 2021)




(A) Quartzite - slate - diorite
(B) Marble - slate - microdiorite
(C) Marble - schist - microdiorite
(D) Quartzite - schist - microdiorite

**25** Some rocks make up 5% of the volume of the rocks of the Earth's crust. Using the opposite pictures, which of them is an example of these rocks? (1st session 2021)




(A) Marble (B) Schist (C) Obsidian (D) Limestone

**26** When you visited the Geological Museum in Cairo, you found a carbonate rock with large, firmly bound crystals. In the light of this information, what is the rock? (2nd session 2021)

(A) Calcite (B) Shale (C) Marble (D) Schist

**27** What results when a layer of clay rocks is exposed to the push of highly viscous melt from below it? (1st session 2022)

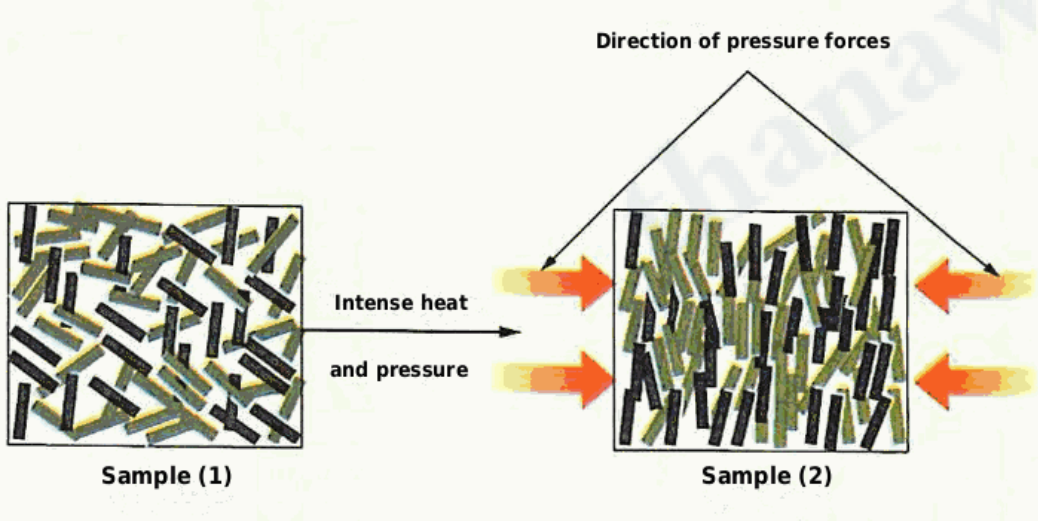
(A) It bends downward and the crystals are arranged in continuous rows

(B) It bends upward and the crystals are arranged in discontinuous rows

(C) It bends downward and the crystals are arranged in discontinuous rows

(D) It bends upward and the crystals are arranged in continuous rows

**28** By studying the opposite figure, what is the texture of the rock in sample (2)? (2nd session 2022)




(A) Granular (B) Porphyritic (C) Foliated (D) Glassy

**29** What distinguishes foliated metamorphic rocks from igneous rocks when both are exposed to pressure and heat without melting? (2nd session 2022)

(A) The silica percentage stays constant (B) The chemical composition changes

(C) The mineral composition changes (D) The type of texture stays the same

**30** Which of the following changes may happen to a rock when it is exposed to pressure and heat? (Trial exam 2023)

(A) The crystals are arranged in the same direction as the pressure in continuous rows

(B) The crystal size increases without arrangement

(C) The crystals are arranged perpendicular to the direction of pressure in discontinuous rows

(D) The crystal size decreases without arrangement

---

**31** Two rocks have the same mineral composition; the first is biochemical sedimentary and the second is a massive rock. What is the difference between the two rocks? (Trial exam 2023)

(A) The first has a complete fossil, and the second a deformed fossil and veins

(B) The first has a deformed fossil and veins, and the second an intact fossil

(C) Each of them has deformed fossils and no veins

(D) Each of them has veins and contains no fossils

---

**32** When a clastic sedimentary rock whose grain size is less than 62 microns is exposed to high pressure and intense heat, what is the rock formed? (2nd session 2023)

(A) Mica schist (B) Slate (C) Quartzite (D) Shale

---

**33** Which of the following rocks can contain fossils? (1st session 2024)

(A) Schist and gneiss (B) Marble and gneiss

(C) Granite and slate (D) Limestone and schist

---

**34** When sediments with a diameter of 50 microns are exposed to different conditions in two areas:

area (X) was exposed to intense pressure and heat, and area (Z) was exposed to compaction only.

The classification of the resulting rocks is ..... (1st session 2024)

(A) (X) clastic sedimentary, (Z) massive metamorphic

(B) (X) foliated metamorphic, (Z) clastic sedimentary

(C) (X) and (Z) foliated metamorphic

(D) (X) and (Z) clastic sedimentary

---

**35** A sheet-like rock made of fine crystals contains deformed parts of a fish fossil. What is the classification of this rock? (2nd session 2024)

(A) Foliated metamorphic
(B) Surface (volcanic) igneous
(C) Clastic sedimentary
(D) Massive metamorphic

**36** We have two rock samples (X) and (Y). Sample (X) is chert and sample (Y) is obsidian. Which of the following choices is correct? (2nd session 2024)

(A) (X) massive metamorphic rock and (Y) surface (volcanic) igneous rock
(B) (X) clastic sedimentary rock and (Y) acidic igneous rock
(C) (X) massive metamorphic rock and (Y) intermediate igneous rock
(D) (X) chemical sedimentary rock and (Y) surface (volcanic) igneous rock

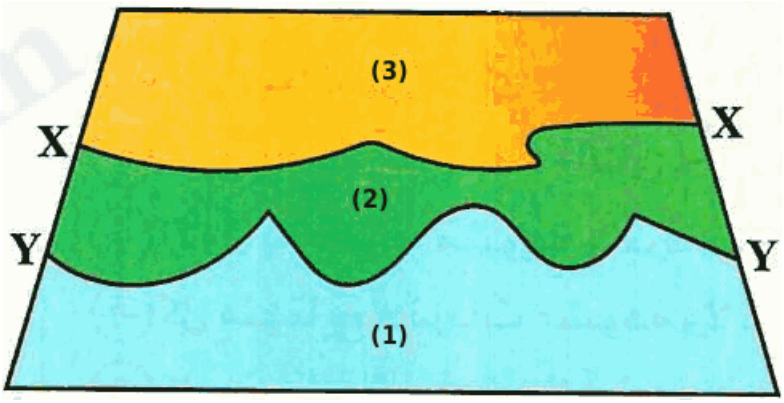
**37** The massive metamorphism of the rocks around a volcano results from ..... (2nd session 2024)

(A) the pressure of volcanic ash on the surrounding rocks
(B) the hot gases released from the volcano's crater
(C) the flow of volcanic lava over the rocks
(D) the pressure of volcanic breccia on the rocks below it

**38** Which of the following is not expected to happen when oil reservoir rocks undergo metamorphism? (Sample exam 2025)

(A) Formation of quartzite
(B) Formation of marble
(C) The rocks lose their porosity
(D) The rock texture becomes foliated

**39** In the opposite vertical section, if (XX) is a disconformity and (YY) is a nonconformity, the rocks (1), (2) and (3), respectively, are ..... (Sample exam 2025)




(A) (1) gneiss / (2) sandstone / (3) limestone

(B) (1) granite / (2) gneiss / (3) sandstone

(C) (1) sandstone / (2) quartzite / (3) limestone

(D) (1) marble / (2) basalt / (3) sandstone

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**40** When magma rich in potassium rises and crystallizes between the layers of sedimentary rocks, the magma forms a(n) ..... rock. (Sample exam 2026)

(A) acidic intrusive, and massive metamorphic

(B) acidic volcanic, and foliated metamorphic

(C) clastic sedimentary, and basic igneous

(D) chemical sedimentary, and ultrabasic igneous

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**41** Which of the following is not correct about the changes that happen to sedimentary and igneous rocks during metamorphism? (Sample exam 2026)

(A) Formation of new minerals

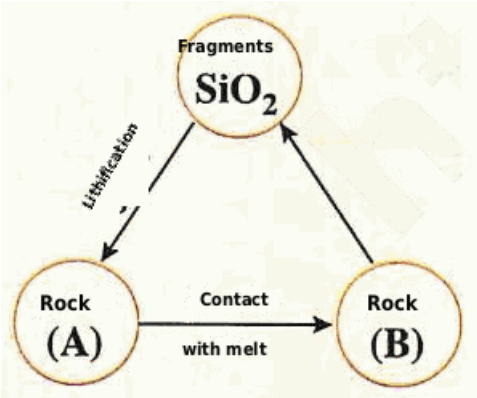
(B) A change in the rock texture

(C) A change in the crystal size

(D) A change in the chemical elements

---

**42** The opposite figure shows part of the rock cycle. What are the two rocks indicated by the letters (A) and (B), respectively? (Trial exam / May 2021)




(A) (A) quartzite / (B) sandstone
(B) (A) sand / (B) quartzite
(C) (A) quartzite / (B) sand
(D) (A) sandstone / (B) quartzite

---

**43** What happens when a plutonic igneous rock rich in sodium and potassium is exposed to weathering agents in a desert area? (Trial exam 2023)

(A) Its components break down into the minerals feldspar, biotite and quartz
(B) Its components break down into the minerals olivine, mica and quartz
(C) Its components break down into the minerals olivine, clay and quartz
(D) Its components break down into the minerals kaolinite, pyroxene and iron oxide

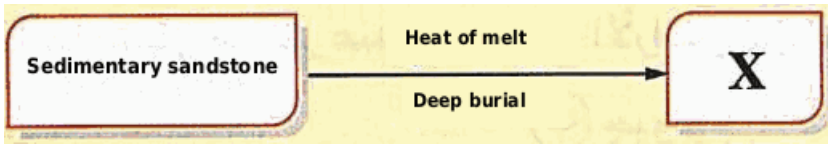
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**44** When the transporting agent loses its ability to carry the fragments, the process that follows directly is ..... (1st session 2025)

(A) lithification (B) metamorphism (C) crystallization (D) deposition

---

**45** Study the opposite diagram, which represents part of the rock cycle, then answer:
What is the most likely rock-cycle path that rock (X) will follow? (Sample exam 2026)




(A) It will change into quartzite as a result of the fusion and crystallization of quartz
(B) It will change into an igneous rock because of the high heat
(C) It will melt to form basaltic magma, then cool to form a basic igneous rock
(D) It will dissolve directly to form basic magma

---

**46** In a mountainous area, a rock zone was observed made of:

(1) granite rocks at depth.

(2) directly above them, metamorphic schist rocks.

(3) at the top, horizontal layers of sandstone and limestone containing fossils.

Which of the following sequences represents the correct geological development of this area according to the rock cycle? (Sample exam 2026)

(A) Cooling of magma → deposition → metamorphism

(B) Deposition → metamorphism → cooling of magma

(C) Metamorphism → cooling of magma → deposition

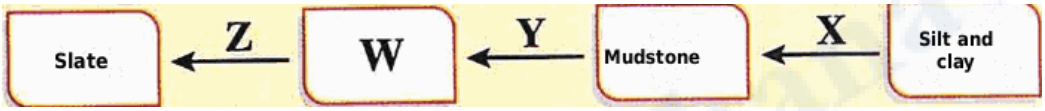
(D) Metamorphism → deposition → cooling of magma

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**47** From the opposite schematic diagram: (Sample exam, 2nd session 2025)

(1) What geological processes do the letters (X), (Y) and (Z) represent?

(2) What rock does the letter (W) represent?




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# Answer key and solutions

## Multiple choice questions

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 1 C | 2 C | 3 B | 4 B | 5 A | 6 C | 7 A | 8 D | 9 D | 10 C |
| 11 C | 12 C | 13 D | 14 C | 15 C | 16 A | 17 D | 18 D | 19 A | 20 D |
| 21 D | 22 B | 23 A | 24 C | 25 A | 26 B | 27 B | 28 C | 29 C | 30 C |
| 31 D | 32 D | 33 C | 34 D | 35 C | 36 D | 37 C | 38 B | 39 C | 40 B |
| 41 A | 42 A | 43 A | 44 C | 45 A | 46 B | 47 C | 48 B | 49 C | 50 B |
| 51 C | 52 C | 53 B | 54 B | 55 D | 56 B | 57 A | 58 C | 59 B | 60 A |
| 61 D | 62 B | 63 B | 64 C | 65 B | 66 C | 67 D | 68 C | 69 D | 70 A |
| 71 C | 72 D | 73 B | 74 C | 75 C | 76 C | 77 D | 78 D | 79 B | 80 B |
| 81 C | 82 A | 83 A | 84 C | 85 C | 86 B | 87 D | 88 C | 89 A | 90 D |
| 91 A | 92 D | 93 C | 94 D | 95 C | 96 B | 97 B | 98 D | 99 D | 100 D |
| 101 C | 102 A | 103 B | 104 B | 105 A | 106 C | 107 C | | | |

**1** **Answer (C)**

Sedimentary rocks make up a small proportion of the volume of the Earth's crust, and sandstone is one of them.

**2** **Answer (C)**

Sandstone is sedimentary; it forms from sand grains that were deposited and stuck together by cementing materials.

**3** **Answer (B)**

Most sedimentary rocks are made of gravel, sand and clay.

**4** **Answer (B)**

The grain size of fine sand is about 100 microns.

**5** **Answer (A)**

The rock directly above an unconformity surface is usually conglomerate, so its grains are larger than 2 mm.

**6** **Answer (C)**

The rock is conglomerate: large rounded grains stuck together by a cementing material.

**7** **Answer (A)**

Fine-grained rocks (shale) may become fissile when compacted.

**8** **Answer (D)**

The order of grain size from largest to smallest: conglomerate, then sandstone, then shale.

**9** **Answer (D)**

Layer (B) is shale, and its grains are smaller than 62 microns.

**10** **Answer (C)**

Dolerite is an igneous intrusion that cuts all the layers, so it is the youngest.

**11** **Answer (C)**

**12** **Answer (C)**

**13** **Answer (D)**

**14** **Answer (C)**

Stalagmites and stalactites form from the deposition of calcium carbonate (calcite).

**15** **Answer (C)**

**16** **Answer (A)**

Calcite is a carbonate mineral that forms in sedimentary environments.

**17** **Answer (D)**

Anhydrite is one of the evaporite rocks that form from the evaporation of lake water.

**18** **Answer (D)**

Evaporite rocks are made of halite and gypsum.

**19** **Answer (A)**

Microscopic marine animal remains change into petroleum under pressure and heat.

**20** **Answer (D)**

Petroleum reservoirs are porous, permeable rocks: sand and limestone.

**21** **Answer (D)**

**22** **Answer (B)**

The two most common elements are oxygen and silicon; they make quartz, the main component of sandstone.

**23** **Answer (A)**

**24** **Answer (C)**

Quartz grains form sandstone, and calcite deposits form limestone.

**25** **Answer (A)**

Limestone is a carbonate and forms chemically by the precipitation of calcium carbonate.

**26** **Answer (B)**

Gypsum and halite are evaporites that form in salt lakes.

**27** **Answer (B)**

Gypsum is an evaporite that forms when evaporation is intense in a hot environment.

**28** **Answer (C)**

Sandstone is porous, so liquids and gases are stored in its pores.

**29** **Answer (C)**

(A) is an igneous rock with large crystals (plutonic) and an intermediate composition.

(B) is rock fragments stuck together by a cementing material: clastic sedimentary.

**30** **Answer (C)**

Rock salt forms by the evaporation of water from salt lakes, which is a chemical process.

31 **Answer (D)**

Gypsum is an evaporite; it precipitates chemically from the water of closed lakes.

32 **Answer (D)**

The evaporation of the lake water precipitates rock salt.

33 **Answer (C)**

34 **Answer (D)**

35 **Answer (C)**

36 **Answer (D)**

Shale is a sedimentary rock, so it may keep clear fossils.

37 **Answer (C)**

Shale changes into slate as a result of metamorphism.

38 **Answer (B)**

39 **Answer (C)**

The rock with a glassy texture is obsidian, and it forms from flowing lava.

40 **Answer (B)**

41 **Answer (A)**

Gneiss is a metamorphic rock formed by the effect of pressure and heat.

42 **Answer (A)**

43 **Answer (A)**

The fragments broke off the surrounding rocks while the magma was forcing its way between them.

44 **Answer (C)**

The igneous rock intruded into the surrounding rocks and metamorphosed them, so it is younger than them.

**45** **Answer (A)**

Marble is non-foliated (granular), while slate, gneiss and schist are foliated.

**46** **Answer (B)**

**47** **Answer (C)**

In gneiss and schist, the crystals are arranged in parallel rows perpendicular to the direction of pressure.

**48** **Answer (B)**

Equal grains about 1 mm in size stuck together by a cementing material: sandstone.

**49** **Answer (C)**

Gneiss is rich in quartz and orthoclase (similar to granite in composition).

**50** **Answer (B)**

Gneiss is a foliated rock made of parallel sheets.

**51** **Answer (C)**

The texture of the rock shows the conditions of its formation (cooling or metamorphism).

**52** **Answer (C)**

(A) cuts the layers vertically, so it is a dyke.

**53** **Answer (B)**

Schist is at the bottom of the section, so it is the oldest.

**54** **Answer (B)**

The limestone next to the intrusion changes into marble with a granular texture.

**55** **Answer (D)**

**56** **Answer (B)**

The limestone lies above the other layers, so it is the youngest.

**57** **Answer (A)**

The dyke cuts the shale, so it is younger than it, and the coal lies above the shale, so it is younger than it.

**58** **Answer (C)**

The accumulation of plant remains under pressure forms coal.

**59** **Answer (B)**

The limestone next to the granite changes into marble by heat.

**60** **Answer (A)**

(X) is quartz (its fracture is conchoidal and it is used in making glass), and it is found in gneiss.

**61** **Answer (D)**

The oldest rocks are at the bottom: E then D then C then B then A.

**62** **Answer (B)**

Sandstone changes into quartzite.

**63** **Answer (B)**

Zone (A) is marble, and marble is made of calcite.

**64** **Answer (C)**

Gneiss is made mainly of quartz and feldspar.

**65** **Answer (B)**

The surface (F - F) separates sedimentary rocks above it from an igneous intrusion below it: a nonconformity.

**66** **Answer (C)**

The limestone (E) next to the igneous intrusion changes into marble with a granular texture.

**67** **Answer (D)**

The sandstone next to the igneous intrusion changes into quartzite.

**68** **Answer (C)**

The igneous rocks cut the other units, so they are the youngest.

**69** **Answer (D)**

(C) is a surface separating igneous rocks from sedimentary rocks above them: a nonconformity.

**70** **Answer (A)**

The rock is foliated with wavy sheets; it is schist, metamorphosed by pressure and heat.

**71** **Answer (C)**

The sandstone next to the parallel sills changed into quartzite.

**72** **Answer (D)**

Rock D is a silicate sedimentary rock, while A, B and C are igneous rocks.

**73** **Answer (B)**

Granite is an acidic rock; it forms from the crystallization of acidic melt.

**74** **Answer (C)**

The organic limestone lies above the shale and below the dolomite: it is older than the dolomite and younger than the shale.

**75** **Answer (C)**

The hot lava heats the sandstone below it and changes its texture.

**76** **Answer (C)**

Quartz is the mineral most resistant to weathering, so it is the most common in the fragments.

**77** **Answer (D)**

Cemented pebbles and sand grains: a clastic sedimentary rock.

**78** **Answer (D)**

Heat without melting fuses the grains, forming a harder rock (quartzite).

**79** **Answer (B)**

**80** **Answer (B)**

A nonconformity surface separates sedimentary rocks from igneous or metamorphic rocks below them, and quartzite is a metamorphic rock.

**81** **Answer (C)**

**82** **Answer (A)**

**83** **Answer (A)**

The microgranite is younger than the limestone and older than the shale, so only the limestone on both sides of the intrusion is metamorphosed, and the shale above it is not.

**84** **Answer (C)**

Quartzite forms from sandstone (quartz), so its crystals become interlocked.

**85** **Answer (C)**

**86** **Answer (B)**

Sills intrude between the sedimentary layers, parallel to them.

**87** **Answer (D)**

At a depth of 30 km and 1000 °C, magma and igneous rocks form, such as diorite.

**88** **Answer (C)**

Gneiss is a metamorphic rock; it forms under the pressure and heat of zone (C).

**89** **Answer (A)**

The schist was affected by the heat of the granite, so it is older than it (25), while the shale was not affected, so it is younger than it (23).

**90** **Answer (D)**

**91** **Answer (A)**

Granite is an igneous rock formed from magma, so it contains no fossils.

**92** **Answer (D)**

Fossils are found in sedimentary rocks such as mudstone.

**93** **Answer (C)**

Fossils are found in sedimentary rocks such as limestone.

**94** **Answer (D)**

Igneous rocks form from the melting of rocks and then their crystallization.

**95** **Answer (C)**

(2) is igneous rock formed by melting and crystallization, (3) is sedimentary rock formed by deposition and lithification, and (4) is metamorphism, which forms metamorphic rocks.

**96** **Answer (B)**

When the speed of the transporting agent decreases, the rock fragments are deposited first.

**97** **Answer (B)**

Desert sands formed from the weathering of rocks and then their transport.

**98** **Answer (D)**

The erosion of the igneous rocks exposed at the surface is the last event in the section.

**99** **Answer (D)**

Layer (B) is sandstone; it formed by lithification and cementation.

**100** **Answer (D)**

Rock (B) is sandstone (made of quartz), and with high heat it changes into quartzite.

**101** **Answer (C)**

(C) is sandstone formed by lithification, then it was metamorphosed by heat into quartzite (D).

**102** **Answer (A)**

Rock (D) is quartzite, which is a massive (non-foliated) rock.

**103** **Answer (B)**

(1) layers: sedimentary, (2) interlocking crystals: igneous, (3) wavy bands: metamorphic.

**104** **Answer (B)**

**105** **Answer (A)**

**106** **Answer (C)**

Obsidian is volcanic glass that forms when melt solidifies without crystallizing (D).

**107** **Answer (C)**

Rock (A) is foliated; it is gneiss, which forms under high pressure and temperature at a great depth (Y).

## Essay questions

**1** **Model answer**

(1) Microgranite.

(2) Quartzite.

(3) Diorite.

(4) Sandstone.

**2** **Model answer**

(1) The chemical properties of rhyolite: acidic, rich in potassium and sodium, rich in silica.

(2) Formation of shale: it results from the compaction and consolidation of the components of clay rocks.

(3) Schist cannot form on the Earth's surface, because it results from exposing clay rock to heat and pressure inside the Earth, which changes it into another form (metamorphism).

**3** **Model answer**

(1) (A): granite, (B): conglomerate, (C): pumice.

(2) (A): contains no fossils because it is an igneous rock.

(B): usually contains fossils because it is a clastic sedimentary rock.

(C): contains no fossils because it is an igneous rock.

**4** **Model answer**

(1) (6) is an acidic plutonic igneous rock / used in building works.

(9) is a massive metamorphic rock / used as an ornamental stone.

(2) Rock (7) changes into quartzite, and rock (5) changes into marble.

(3) It is used in building works.

**5** **Model answer**

(1) There are two unconformity surfaces: an angular unconformity below layer (5), and a disconformity below layer (9).

(2) The limestone changes into marble (a massive metamorphic rock) with a granular texture, and the fossils in it become deformed by the effect of the heat.

(3) Anhydrite belongs to the chemical sedimentary evaporite rocks / its chemical composition is anhydrous calcium sulphate.

**6** **Model answer**

(1) (1): perpendicular to the direction of crystal growth.

(2) Granite.

**7** **Model answer**

(1) An angular unconformity surface / it is recognized by the different dip of the layers on the two sides of the unconformity surface, as it forms between two groups of sedimentary rocks, with the older group of layers tilted and the younger one horizontal.

(2) The limestone changes into marble by the effect of heat, as the calcite crystals fuse and interlock, which increases the hardness of the marble and its strength.

**8** **Model answer**

(1) It crystallized at depth below the Earth's surface from acidic magma, and it is granite.

(2) Granite was exposed to heat and pressure.

**9** **Model answer**

(1) (I): quartzite, (G): marble.

(2) Both surfaces are angular unconformities.

(3) H then F then E

**10** **Model answer**

(1) Marble (massive metamorphic rock), with a granular texture.

(2) Igneous body (B): a sill, igneous body (G): a dyke.

**11** **Model answer**

(1) Plagioclase feldspar - pyroxene - amphibole - mica - potassium feldspar.

(2) Weathering (breaking down), transport and deposition.

(3) Diorite - granite.

**12** **Model answer**

(1) Shale.

(2) Andesite.

(3) The texture - the agent of metamorphism - the original rock.

## Past exam questions

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

| 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 40 |
|---|---|---|---|---|---|---|---|---|---|
| A | A | D | B | A | D | C | D | A | A |

| 41 | 42 | 43 | 44 | 45 | 46 | 47 |
|---|---|---|---|---|---|---|
| D | D | A | D | A | C | — |

**1** **Answer (A)**

Breccia is made of sharp-angled pieces of gravel (larger than 2 mm) that were not transported for long distances.

**2** **Answer (A)**

The sample is conglomerate whose grains are gravel visible to the eye, and gravel has a diameter greater than 2 mm (2000 microns).

**3** **Answer (B)**

The components of a clastic rock come from the breaking down of different rocks.

**4** **Answer (A)**

Depositing the large grains first, then the smaller ones, and the finest at the top forms graded bedding.

**5** **Answer (D)**

Cemented grains with rounded edges and different sizes: conglomerate, which is a clastic sedimentary rock.

**6** **Answer (A)**

Hydrocarbon materials mature in source rocks at a temperature of about 80°C.

**7** **Answer (B)**

The combination of calcium ions with carbonate precipitates calcium carbonate in caves, forming stalagmites and stalactites.

**8** **Answer (D)**

Kerogen is a waxy material in oil shale; it is a reserve energy source not used at present.

**9** **Answer (D)**

The structure is an anticline, which is one of the petroleum traps, so it stores hydrocarbon materials.

**10** **Answer (B)**

Coal forms from the remains of plants that accumulated in swamps behind deltas.

**11** **Answer (C)**

Gypsum is a sulphate mineral with a hardness of 2, and gypsum rock is chemical sedimentary (evaporites).

**12** **Answer (B)**

The rock is limestone with fossils, so it is organic, and it is made of calcite (a non-silicate carbonate) with a hardness of 3, so it is scratched by a copper coin.

**13** **Answer (C)**

The salty-tasting cubic crystals are halite (rock salt), produced by the evaporation of lake water, and it is chemical sedimentary.

**14** **Answer (B)**

Rock (1) has large interlocking crystals of sodium and calcium plagioclase: intermediate plutonic igneous.

Rock (2) is grains of quartz ($SiO_2$) with a cementing material: sandstone, clastic sedimentary.

**15** **Answer (D)**

Source rocks are of shale, and their grain diameter is between 50 and 3 microns.

**16** **Answer (B)**

The source rock (shale) is clastic, and the reservoir rock used in cement is limestone, which is chemical.

**17** **Answer (A)**

Silt and clay form source rocks, shale and oil shale.

Reservoir rocks are porous, such as sandstone and limestone.

**18** **Answer (A)**

Limestone is made mainly of one mineral, calcite, which has rhombohedral cleavage.

**19** **Answer (C)**

Halite is a compound mineral (NaCl) from the evaporites; its cleavage is cubic and its crystal system is cubic.

**20** **Answer (C)**

The bones of marine vertebrates take part in forming phosphate, and calcareous skeletons in forming limestone.

**21** **Answer (D)**

A coloured, veined rock such as marble is a massive metamorphic rock.

**22** **Answer (B)**

Sandstone changes by contact into quartzite, and granite changes into gneiss.

**23** **Answer (B)**

Sediments smaller than 60 microns are compacted to form shale, which changes into slate under intense pressure and low temperature.

**24** **Answer (C)**

Heat changes limestone into marble and mudstone into schist, and the intruding melt with 60% silica forms microdiorite.

**25** **Answer (D)**

Sedimentary rocks make up about 5% of the volume of the rocks of the Earth's crust, and limestone is one of them.

**26** **Answer (C)**

Marble is a carbonate metamorphic rock with large, fused crystals.

**27** **Answer (D)**

Highly viscous melt forms a laccolith, so the layers bend upward, and the clay rocks change into foliated rocks whose crystals are in continuous rows.

**28** **Answer (C)**

The crystals of sample (2) are arranged in parallel rows perpendicular to the direction of pressure: a foliated texture.

**29** **Answer (D)**

Foliated metamorphic rocks stay foliated in texture, while igneous rocks change their texture when metamorphosed.

**30** **Answer (C)**

In metamorphism by pressure and heat, the crystals are arranged perpendicular to the direction of pressure in discontinuous rows.

**31** **Answer (A)**

Limestone (biochemical) has complete fossils, and marble (massive) has deformed fossils and veins.

**32** **Answer (A)**

A fine-grained clastic rock (shale) changes into mica schist under high pressure and intense heat.

**33** **Answer (D)**

Limestone is a sedimentary rock that contains fossils, and schist may contain deformed fossils.

**34** **Answer (B)**

(X): with pressure and heat, the shale changes into a foliated rock, and (Z): with compaction only, it forms a clastic sedimentary rock.

**35** **Answer (A)**

The sheet-like rock with fine crystals and a deformed fossil is slate, a foliated metamorphic rock.

**36** **Answer (D)**

Chert is a chemical sedimentary rock, and obsidian is a surface (glassy) igneous rock.

**37** **Answer (C)**

The flow of hot lava over rocks changes them by heat into massive metamorphic rocks (contact metamorphism).

**38** **Answer (D)**

Reservoir rocks (sandstone and limestone) change into quartzite and marble and lose their porosity.

These are massive metamorphic rocks, so their texture does not become foliated.

**39** **Answer (A)**

(YY) is a nonconformity, so rock (1) is igneous or metamorphic (gneiss).

(XX) is a disconformity, so rocks (2) and (3) are sedimentary.

**40** **Answer (A)**

Magma rich in potassium is acidic and crystallizes between the layers, so it is intrusive, and it changes the rocks it touches into massive metamorphic rocks.

**41** **Answer (D)**

Metamorphism changes the minerals, the texture and the crystal size, but not the chemical elements.

**42** **Answer (D)**

The fragments are lithified to form sandstone (A), and contact with the melt changes it into quartzite (B).

**43** **Answer (A)**

The plutonic rock rich in sodium and potassium is granite, and its mechanical weathering in the desert breaks it down into feldspar, biotite and quartz.

**44** **Answer (D)**

When the transporting agent loses its ability to carry the fragments, deposition happens directly.

**45** **Answer (A)**

Sandstone, with the heat of the melt and deep burial, changes into quartzite by the fusion and crystallization of the quartz grains.

**46** **Answer (C)**

The schist formed first by metamorphism, then the magma cooled forming the granite, then the horizontal layers were deposited at the top.

**47** **Model answer**

(1) Process (X): lithification, process (Y): compaction, process (Z): metamorphism by pressure and heat.

(2) Shale.