7th INTERNATIONAL EARTH SCIENCE OLYMPIAD

IESO 2013

वसुधैव कुटुम्बकम्
The Earth is indeed a family

GEOSPHERE PRACTICAL TEST

Name

Nationality

Instructions:

1. Please write your name and nationality in English (ALL CAPITAL LETTERS) on the cover page.
2. Please write your answers legibly with a pen. Illegible answers will be counted as incorrect.
3. You may respond to questions either in English or your native language, or a combination of both.
4. Please mark your choice of answers in the English version of the Test Paper provided to you.
5. Please choose the most appropriate answer by encircling the letter that corresponds to the answer.
6. Read all the questions carefully.
7. For Part 1, exercise 1 and Part 2 the numbering scheme is the following. Each correct answer is assigned 1 point and **0.5 point will be deducted for each wrong answer**. For Part 1, exercise 2 & 3, the points are mentioned next to the question.
8. Any inappropriate examination behavior will result in your withdrawal from the IESO.

7th International Earth Science Olympiad
GEOSPHERE PRACTICAL TEST
PART 1 – INFOSYS CAMP

EXERCISE #1

Study the set of samples in spots 1 – 4 and answer the following five questions. ***Time: 40 MINUTES***

Instructions: Complete the following 5 questions based on the rock sample provided.

Spot 1:

1. 1 Which of the following features can you observe in the sample? (You may choose more than 1 answer).

1. Fossil
2. Cross bedding
3. Horizontal lamination/ bedding
4. Crystalline structure
5. A multi-minerallic rock (more than one mineral)
6. A mono-minerallic rock (one mineral)
7. Lineation (Elongated minerals are arranged in a parallel manner)
8. Foliation (Marked with bands of different minerals)
9. Vesicular structure
10. Minerals cannot be seen with the naked eye
11. Glassy texture

1.2. What conclusion(s) can you draw about the formation of this rock sample? (You may choose more than 1 answer).

a) This rock formed in a shallow marine environment.

b) This rock formed in an open sea environment.

c) This rock formed in a deep sea environment.

d) Sedimentation in an oversaturated environment.

e) Sedimentation in a cave environment.

f) This rock formed in a lake environment.

g) This rock formed in a river environment.

h) This rock formed in a dune environment.

i) This rock formed in an (igneous) plutonic environment.

j) This rock formed in an (igneous) volcanic environment.

k) This rock underwent regional metamorphism.

l) This rock underwent contact metamorphism.

1.3. What observation/ principle helped you draw the conclusion? (You may choose more than 1 answer).

a) The principle of original horizontality.

b) The principle of "the present is the key to the past" (Principle of Actualism).

c) The principle of superposition.

d) The size of a mineral crystal in an igneous rock is dependent on the rate of cooling.

e) Slow cooling of magma occurs when the surrounding temperature is relatively high.

f) Fast cooling of magma occurs when the surrounding temperature is relatively low.

g) The temperature is relatively high at deeper levels of the crust.

h) The temperature is relatively low towards the surface of the crust.

i) The pressure is relatively high deep in the crust.

j) Linear minerals grow with a parallel orientation under conditions of high pressure.

k) Rocks can behave elastically under conditions of high pressure and high temperature.

l) The roundness of a grain is a result of both the distance of transport and hardness of the mineral.

m) Cross bedding structure is a result of sedimentation by moving air (wind) or water.

n) Sedimentation in a river environment leads to all the layers inclined in the same direction and the thickness of the layers is on the order of a few tens of centimeters.

o) Sedimentation in a wind environment leads to inclination of the layers in different directions and the thickness of the layers is on the order of meters.

1.4. Which processes are **directly** relevant to the formation of the sample? (You may choose more than 1 answer).

a) Sedimentation

b) Uplift

c) Erosion

d) Weathering

e) Burial

f) Lithification

g) Melting

h) Slow crystallization

i) Fast crystallization

j) Regional metamorphism

k) Contact metamorphism

1.5. Which of the following Earth Systems are involved in the formation of the rock? (Note: Choose only ONE response, which represents all the systems that DIRECTLY influenced the formation of the sample).

a) Geosphere and Atmosphere.

b) Geosphere and Hydrosphere.

c) Geosphere and Biosphere.

d) Hydrosphere and Atmosphere.

e) Hydrosphere and Biosphere.

f) Atmosphere and Biosphere.

g) Geosphere and Atmosphere and Hydrosphere.

h) Geosphere and Atmosphere and Biosphere.

i) Geosphere and Hydrosphere and Biosphere.

j) Hydrosphere and Atmosphere and Biosphere.

k) Geosphere and Atmosphere and Hydrosphere and Biosphere.

l) Geosphere

Spot 2:

2.1. Which of the following features can you **observe** in the sample? (You may choose more than 1 answer).

1. Fossil
2. Cross bedding
3. Horizontal bedding
4. Crystalline structure
5. A multi-minerallic rock (more than one mineral)
6. A mono-minerallic rock (one mineral)
7. Lineation (Elongated minerals are arranged in a parallel manner)
8. Foliation (Marked with bands of different minerals)

9. Vesicular structure
10. Minerals cannot be seen with the naked eye
11. Glassy texture

2.2. What conclusion(s) can you draw about the formation of this rock sample? (You may choose more than 1 answer).

a) This rock formed in a shallow marine environment.

b) This rock formed in an open sea environment.

c) This rock formed in a deep sea environment.

d) Sedimentation in an oversaturated environment.

e) Sedimentation in a cave environment.

f) This rock formed in a lake environment.

g) This rock formed in a river environment.

h) This rock formed in a dune environment.

i) This rock formed in an (igneous) plutonic environment.

j) This rock formed in an (igneous) volcanic environment.

k) This rock underwent regional metamorphism.

l) This rock underwent contact metamorphism.

2.3. What observation/ principle helped you draw the conclusion? (You may choose more than 1 answer).

a) The principle of original horizontality.

b) The principle of “the present is the key to the past” (Principle of Actualism).

c) The principle of superposition.

d) The size of a mineral crystal in an igneous rock is dependent on the rate of cooling.

e) Slow cooling of magma occurs when the surrounding temperature is relatively high.

f) Fast cooling of magma occurs when the surrounding temperature is relatively low.

g) The temperature is relatively high at deeper levels of the crust.

h) The temperature is relatively low towards the surface of the crust.

i) The pressure is relatively high deep in the crust.

j) Linear minerals grow with a parallel orientation under conditions of high pressure.

k) Rocks can behave elastically under conditions of high pressure and high temperature.

l) The roundness of a grain is a result of both the distance of transport and hardness of the mineral.

m) Cross bedding structure is a result of sedimentation by moving air (wind) or water.

n) Sedimentation in a river environment leads to all the layers inclined in the same direction and the thickness of the layers is on the order of a few tens of centimeters.

o) Sedimentation in a wind environment leads to inclination of the layers in different directions and the thickness of the layers is on the order of meters.

2.4. Which processes are **directly** relevant to the formation of the sample? (You may choose more than 1 answer).

a) Sedimentation

b) Uplift

c) Erosion

d) Weathering

e) Burial

f) Lithification

g) Melting

h) Slow crystallization

i) Fast crystallization

j) Regional metamorphism

k) Contact metamorphism

2.5. Which of the following Earth Systems are involved in the formation of the rock? (Note: Choose only ONE response, which represents all the systems that DIRECTLY influenced the formation of the sample).

a) Geosphere and Atmosphere.

b) Geosphere and Hydrosphere.

c) Geosphere and Biosphere.

d) Hydrosphere and Atmosphere.

e) Hydrosphere and Biosphere.

f) Atmosphere and Biosphere.

g) Geosphere and Atmosphere and Hydrosphere.

h) Geosphere and Atmosphere and Biosphere.

i) Geosphere and Hydrosphere and Biosphere.

j) Hydrosphere and Atmosphere and Biosphere.

k) Geosphere and Atmosphere and Hydrosphere and Biosphere.

l) Geosphere

Spot 3:

3.1. Which of the following features can you observe in the sample? (You may choose more than 1 answer).

1. Fossil
2. Cross bedding
3. Horizontal bedding
4. Crystalline structure
5. A multi-minerallic rock (more than one mineral)
6. A mono-minerallic rock (one mineral)
7. Lineation (Elongated minerals are arranged in a parallel manner)
8. Foliation (Marked with bands of different minerals)
9. Vesicular structure
10. Minerals cannot be seen with the naked eye
11. Glassy texture

3.2. What conclusion(s) can you draw about the formation of this rock sample? (You may choose more than 1 answer).

a) This rock formed in a shallow marine environment.

b) This rock formed in an open sea environment.

c) This rock formed in a deep sea environment.

d) Sedimentation in an oversaturated environment.

e) Sedimentation in a cave environment.

f) This rock formed in a lake environment.

g) This rock formed in a river environment.

h) This rock formed in a dune environment.

i) This rock formed in an (igneous) plutonic environment.

j) This rock formed in an (igneous) volcanic environment.

k) This rock underwent regional metamorphism.

l) This rock underwent contact metamorphism.

3.3. What observation/ principle helped you draw the conclusion? (You may choose more than 1 answer).

a) The principle of original horizontality.

b) The principle of "the present is the key to the past" (Principle of Actualism).

c) The principle of superposition.

d) The size of a mineral crystal in an igneous rock is dependent on the rate of cooling.

e) Slow cooling of magma occurs when the surrounding temperature is relatively high.

f) Fast cooling of magma occurs when the surrounding temperature is relatively low.

g) The temperature is relatively high at deeper levels of the crust.

h) The temperature is relatively low towards the surface of the crust.

i) The pressure is relatively high deep in the crust.

j) Linear minerals grow with a parallel orientation under conditions of high pressure.

k) Rocks can behave elastically under conditions of high pressure and high temperature.

l) The roundness of a grain is a result of both the distance of transport and hardness of the mineral.

m) Cross bedding structure is a result of sedimentation by moving air (wind) or water.

n) Sedimentation in a river environment leads to all the layers inclined in the same direction and the thickness of the layers is on the order of a few tens of centimeters.

o) Sedimentation in a wind environment leads to inclination of the layers in different directions and the thickness of the layers is on the order of meters.

3.4. Which processes are **directly** relevant to the formation of the sample? (You may choose more than 1 answer).

a) Sedimentation

b) Uplift

c) Erosion

d) Weathering

e) Burial

f) Lithification

g) Melting

h) Slow crystallization

i) Fast crystallization

j) Regional metamorphism

k) Contact metamorphism

3.5. Which of the following Earth Systems are involved in the formation of the rock? (Note: Choose only ONE response, which represents all the systems that DIRECTLY influenced the formation).

a) Geosphere and Atmosphere.

b) Geosphere and Hydrosphere.

c) Geosphere and Biosphere.

d) Hydrosphere and Atmosphere.

e) Hydrosphere and Biosphere.

f) Atmosphere and Biosphere.

g) Geosphere and Atmosphere and Hydrosphere.

h) Geosphere and Atmosphere and Biosphere.

i) Geosphere and Hydrosphere and Biosphere.

j) Hydrosphere and Atmosphere and Biosphere.

k) Geosphere and Atmosphere and Hydrosphere and Biosphere.

l) Geosphere

Spot 4:

4.1. Which of the following features can you observe in the sample? (You may choose more than 1 answer).

1. Fossil
2. Cross bedding
3. Horizontal bedding
4. Crystalline structure
5. A multi-minerallic rock (more than one mineral)
6. A mono-minerallic rock (one mineral)
7. Lineation (Elongated minerals are arranged in a parallel manner)

8. Foliation (Marked with bands of different minerals)
9. Vesicular structure
10. Minerals cannot be seen with the naked eye
11. Glassy texture

4.2. What conclusion(s) can you draw about the formation of this rock sample? (You may choose more than 1 answer).

a) This rock formed in a shallow marine environment.

b) This rock formed in an open sea environment.

c) This rock formed in a deep sea environment.

d) Sedimentation in an oversaturated environment.

e) Sedimentation in a cave environment.

f) This rock formed in a lake environment.

g) This rock formed in a river environment.

h) This rock formed in a dune environment.

i) This rock formed in an (igneous) plutonic environment.

j) This rock formed in an (igneous) volcanic environment.

k) This rock underwent regional metamorphism.

l) This rock underwent contact metamorphism.

4.3. What observation or principle helped you draw the conclusion? (You may choose more than 1 answer).

a) The principle of original horizontality.

b) The principle of “the present is the key to the past” (Principle of Actualism).

c) The principle of superposition.

d) The size of a mineral crystal in an igneous rock is dependent on the rate of cooling.

e) Relatively slow cooling of lava occurs when the surrounding temperature is relatively high.

f) Relatively fast cooling of lava occurs when the surrounding temperature is relatively low.

g) The temperature is relatively high at deeper levels of the crust.

h) The temperature is relatively low towards the surface of the crust.

i) The pressure is relatively high deep in the crust.

j) Linear minerals grow with a parallel orientation under conditions of high pressure.

k) Rocks can behave elastically under conditions of high pressure and high temperature.

l) The roundness of a grain is a result of both the distance of transport and hardness of the mineral.

m) Cross bedding structure is a result of sedimentation by moving air (wind) or water.

n) Sedimentation in a river environment leads to all the layers inclined in the same direction and the thickness of the layers is on the order of a few tens of centimeters.

o) Sedimentation in a wind environment leads to inclination of the layers in different directions and the thickness of the layers is on the order of meters.

4.4. Which processes are **directly** relevant to the formation of the rock? (You may choose more than 1 answer).

a) Sedimentation

b) Uplift

c) Erosion

d) Weathering

e) Burial

f) Lithification

g) Melting

h) Slow crystallization

i) Fast crystallization

j) Regional metamorphism

k) Contact metamorphism

4.5. Which of the following Earth Systems are involved in the formation of the rock? (Note: Choose only ONE response, which represents all the systems that DIRECTLY influenced the formation of the sample).

a) Geosphere and Atmosphere.

b) Geosphere and Hydrosphere.

c) Geosphere and Biosphere.

d) Hydrosphere and Atmosphere.

e) Hydrosphere and Biosphere.

f) Atmosphere and Biosphere.

g) Geosphere and Atmosphere and Hydrosphere.

h) Geosphere and Atmosphere and Biosphere.

i) Geosphere and Hydrosphere and Biosphere.

j) Hydrosphere and Atmosphere and Biosphere.

k) Geosphere and Atmosphere and Hydrosphere and Biosphere.

l) Geosphere

EXERCISE #2

Measure and write down the strike and dip of the inclined plane at Spots 5 & 6. ***Time: 10 minutes (10 POINTS)***

EXERCISE #3

Measure the porosity of sand using the apparatus provided at Spot 7. ***Time: 15 minutes (10 POINTS).***

7th International Earth Science Olympiad
GEOSPHERE PRACTICAL TEST
PART 2 – LOCATION: KARIGHATTA

Instructions: Study the rocks at spots 5 to 8 and answer the following questions. Please surrender your papers with the answers marked to the mentor on site before you get into the bus. (Time 30 minutes; 20 points).

Spot 5

5.1. Which of the following features can you observe in the sample? (You may choose more than 1 answer).

1. Fossil
2. Cross bedding
3. Horizontal bedding
4. Crystalline structure
5. A multi-minerallic rock (more than one mineral)
6. A mono-minerallic rock (one mineral)
7. Lineation (Elongated minerals are arranged in a parallel manner)
8. Foliation (Marked with bands of different minerals)
9. Vesicular structure
10. Minerals cannot be seen with the naked eye
11. Glassy texture

5.2. What conclusion(s) can you draw about the formation of this rock sample? (You may choose more than 1 answer).

a) This rock formed in a shallow marine environment.

b) This rock formed in an open sea environment.

c) This rock formed in a deep sea environment.

d) Sedimentation in an oversaturated environment.

e) Sedimentation in a cave environment.

f) This rock formed in a lake environment.

g) This rock formed in a river environment.

h) This rock formed in a dune environment.

i) This rock formed in an (igneous) plutonic environment.

j) This rock formed in an (igneous) volcanic environment.

k) This rock underwent regional metamorphism.

l) This rock underwent contact metamorphism.

5.3. What observation/ principle helped you draw the conclusion? (You may choose more than 1 answer).

a) The principle of original horizontality.

b) The principle of "the present is the key to the past" (Principle of Actualism).

c) The principle of superposition.

d) The size of a mineral crystal in an igneous rock is dependent on the rate of cooling.

e) Slow cooling of magma occurs when the surrounding temperature is relatively high.

f) Fast cooling of magma occurs when the surrounding temperature is relatively low.

g) The temperature is relatively high at deeper levels of the crust.

h) The temperature is relatively low towards the surface of the crust.

i) The pressure is relatively high deep in the crust.

j) Linear minerals grow with a parallel orientation under conditions of high pressure.

k) Rocks can behave elastically under conditions of high pressure and high temperature.

l) The roundness of a grain is a result of both the distance of transport and hardness of the mineral.

m) Cross bedding structure is a result of sedimentation by moving air (wind) or water.

n) Sedimentation in a river environment leads to all the layers inclined in the same direction and the thickness of the layers is on the order of a few tens of centimeters.

o) Sedimentation in a wind environment leads to inclination of the layers in different directions and the thickness of the layers is on the order of meters.

5.4. Which processes are **directly** relevant to the formation of the rock? (You may choose more than 1 answer).

a) Sedimentation

b) Uplift

c) Erosion

d) Weathering

e) Burial

f) Lithification

g) Melting

h) Slow crystallization

i) Fast crystallization

j) Regional metamorphism

k) Contact metamorphism

5.5. Which of the following Earth Systems are involved in the formation of the rock? (Note: Choose only ONE response, which represents all the systems that DIRECTLY influenced the formation of the sample).

a) Geosphere and Atmosphere.

b) Geosphere and Hydrosphere.

c) Geosphere and Biosphere.

d) Hydrosphere and Atmosphere.

e) Hydrosphere and Biosphere.

f) Atmosphere and Biosphere.

g) Geosphere and Atmosphere and Hydrosphere.

h) Geosphere and Atmosphere and Biosphere.

i) Geosphere and Hydrosphere and Biosphere.

j) Hydrosphere and Atmosphere and Biosphere.

k) Geosphere and Atmosphere and Hydrosphere and Biosphere.

l) Geosphere

Spot 6

6.1. Which of the following features can you observe in the sample? (You may choose more than 1 answer).

1. Fossil
2. Cross bedding
3. Horizontal bedding
4. Crystalline structure

5. A multi-minerallic rock (more than one mineral)
6. A mono-minerallic rock (one mineral)
7. Lineation (Elongated minerals are arranged in a parallel manner)
8. Foliation (Marked with bands of different minerals)
9. Vesicular structure
10. Minerals cannot be seen with the naked eye
11. Glassy texture

6.2. What conclusion(s) can you draw about the formation of this rock sample? (You may choose more than 1 answer).

a) This rock formed in a shallow marine environment.

b) This rock formed in an open sea environment.

c) This rock formed in a deep sea environment.

d) Sedimentation in an oversaturated environment.

e) Sedimentation in a cave environment.

f) This rock formed in a lake environment.

g) This rock formed in a river environment.

h) This rock formed in a dune environment.

i) This rock formed in an (igneous) plutonic environment.

j) This rock formed in an (igneous) volcanic environment.

k) This rock underwent regional metamorphism.

l) This rock underwent contact metamorphism.

6.3. What observation/ principle helped you draw the conclusion? (You may choose more than 1 answer).

a) The principle of original horizontality.

b) The principle of “the present is the key to the past” (Principle of Actualism).

c) The principle of superposition.

d) The size of a mineral crystal in an igneous rock is dependent on the rate of cooling.

e) Slow cooling of magma occurs when the surrounding temperature is relatively high.

f) Fast cooling of magma occurs when the surrounding temperature is relatively low.

g) The temperature is relatively high at deeper levels of the crust.

h) The temperature is relatively low towards the surface of the crust.

i) The pressure is relatively high deep in the crust.

j) Linear minerals grow with a parallel orientation under conditions of high pressure.

k) Rocks can behave elastically under conditions of high pressure and high temperature.

l) The roundness of a grain is a result of both the distance of transport and hardness of the mineral.

m) Cross bedding structure is a result of sedimentation by moving air (wind) or water.

n) Sedimentation in a river environment leads to all the layers inclined in the same direction and the thickness of the layers is on the order of a few tens of centimeters.

o) Sedimentation in a wind environment leads to inclination of the layers in different directions and the thickness of the layers is on the order of meters.

6.4. Which processes are **directly** relevant to the formation of the sample? (You may choose more than 1 answer).

a) Sedimentation

b) Uplift

c) Erosion

d) Weathering

e) Burial

f) Lithification

g) Melting

h) Slow crystallization

i) Fast crystallization

j) Regional metamorphism

k) Contact metamorphism

6.5. Which of the following Earth Systems are involved in the formation of the rock? (Note: Choose only ONE response, which represents all the systems that DIRECTLY influenced the formation of the sample).

a) Geosphere and Atmosphere.

b) Geosphere and Hydrosphere.

c) Geosphere and Biosphere.

d) Hydrosphere and Atmosphere.

e) Hydrosphere and Biosphere.

f) Atmosphere and Biosphere.

g) Geosphere and Atmosphere and Hydrosphere.

h) Geosphere and Atmosphere and Biosphere.

i) Geosphere and Hydrosphere and Biosphere.

j) Hydrosphere and Atmosphere and Biosphere.

k) Geosphere and Atmosphere and Hydrosphere and Biosphere.

Spot 7

7.1. Which of the following features can you observe in the sample? (You may choose more than 1 answer).

1. Fossil
2. Cross bedding
3. Horizontal bedding
4. Crystalline structure
5. A multi-minerallic rock (more than one mineral)
6. A mono-minerallic rock (one mineral)
7. Lineation (Elongated minerals are arranged in a parallel manner)
8. Foliation (Marked with bands of different minerals)
9. Vesicular structure
10. Minerals cannot be seen with the naked eye
11. Glassy texture

7.2. What conclusion(s) can you draw about the formation of this rock? (You may choose more than 1 answer).

a) This rock formed in a shallow marine environment.

b) This rock formed in an open sea environment.

c) This rock formed in a deep sea environment.

d) Sedimentation in an oversaturated environment.

e) Sedimentation in a cave environment.

f) This rock formed in a lake environment.

g) This rock formed in a river environment.

h) This rock formed in a dune environment.

i) This rock formed in an (igneous) plutonic environment.

j) This rock formed in an (igneous) volcanic environment.

k) This rock underwent regional metamorphism.

l) This rock underwent contact metamorphism.

7.3. What observation or principle helped you draw the conclusion? (You may choose more than 1 answer).

a) The principle of original horizontality.

b) The principle of "the present is the key to the past" (Principle of Actualism).

c) The principle of superposition.

d) The size of a mineral crystal in an igneous rock is dependent on the rate of cooling.

e) Slow cooling of magma occurs when the surrounding temperature is relatively high.

f) Fast cooling of magma occurs when the surrounding temperature is relatively low.

g) The temperature is relatively high at deeper levels of the crust.

h) The temperature is relatively low towards the surface of the crust.

i) The pressure is relatively high deep in the crust.

j) Linear minerals grow with a parallel orientation under conditions of high pressure.

k) Rocks can behave elastically under conditions of high pressure and high temperature.

l) The roundness of a grain is a result of both the distance of transport and hardness of the mineral.

m) Cross bedding structure is a result of sedimentation by moving air (wind) or water.

n) Sedimentation in a river environment leads to all the layers inclined in the same direction and the thickness of the layers is on the order of a few tens of centimeters.

o) Sedimentation in a wind environment leads to inclination of the layers in different directions and the thickness of the layers is on the order of meters.

7.4. Which processes are **directly** relevant to the formation of the rock? (You may choose more than 1 answer).

a) Sedimentation

b) Uplift

c) Erosion

d) Weathering

e) Burial

f) Lithification

g) Melting

h) Slow crystallization

i) Fast crystallization

j) Regional metamorphism

k) Contact metamorphism

7.5. Which of the following Earth Systems are involved in the formation of the rock? (Note: Choose only ONE response, which represents all the systems that DIRECTLY influenced the formation of the sample).

a) Geosphere and Atmosphere.

b) Geosphere and Hydrosphere.

c) Geosphere and Biosphere.

d) Hydrosphere and Atmosphere.

e) Hydrosphere and Biosphere.

f) Atmosphere and Biosphere.

g) Geosphere and Atmosphere and Hydrosphere.

h) Geosphere and Atmosphere and Biosphere.

i) Geosphere and Hydrosphere and Biosphere.

j) Hydrosphere and Atmosphere and Biosphere.

k) Geosphere and Atmosphere and Hydrosphere and Biosphere.

l) Geosphere

Spot 8

8.1. Which of the following features can you observe in the sample? (You may choose more than 1 answer).

1. Fossil
2. Cross bedding
3. Horizontal bedding
4. Crystalline structure

5. A multi-minerallic rock (more than one mineral)
6. A mono-minerallic rock (one mineral)
7. Lineation (Elongated minerals are arranged in a parallel manner)
8. Foliation (Marked with bands of different minerals)
9. Vesicular structure
10. Minerals cannot be seen with the naked eye
11. Glassy texture

8.2. What conclusion(s) can you draw about the formation of this rock sample? (You may choose more than 1 answer).

a) This rock formed in a shallow marine environment.

b) This rock formed in an open sea environment.

c) This rock formed in a deep sea environment.

d) Sedimentation in an oversaturated environment.

e) Sedimentation in a cave environment.

f) This rock formed in a lake environment.

g) This rock formed in a river environment.

h) This rock formed in a dune environment.

i) This rock formed in an (igneous) plutonic environment.

j) This rock formed in an (igneous) volcanic environment.

k) This rock underwent regional metamorphism.

l) This rock underwent contact metamorphism.

8.3. What observation/ principle helped you draw the conclusion? (You may choose more than 1 answer).

a) The principle of original horizontality.

b) The principle of “the present is the key to the past” (Principle of Actualism).

c) The principle of superposition.

d) The size of a mineral crystal in an igneous rock is dependent on the rate of cooling.

e) Slow cooling of magma occurs when the surrounding temperature is relatively high.

f) Fast cooling of magma occurs when the surrounding temperature is relatively low.

g) The temperature is relatively high at deeper levels of the crust.

h) The temperature is relatively low towards the surface of the crust.

i) The pressure is relatively high deep in the crust.

j) Linear minerals grow with a parallel orientation under conditions of high pressure.

k) Rocks can behave elastically under conditions of high pressure and high temperature.

l) The roundness of a grain is a result of both the distance of transport and hardness of the mineral.

m) Cross bedding structure is a result of sedimentation by moving air (wind) or water.

n) Sedimentation in a river environment leads to all the layers inclined in the same direction and the thickness of the layers is on the order of a few tens of centimeters.

o) Sedimentation in a wind environment leads to inclination of the layers in different directions and the thickness of the layers is on the order of meters.

8.4. Which processes are **directly** relevant to the formation of the sample? (You may choose more than 1 answer).

a) Sedimentation

b) Uplift

c) Erosion

d) Weathering

e) Burial

f) Lithification

g) Melting

h) Slow crystallization

i) Fast crystallization

j) Regional metamorphism

k) Contact metamorphism

8.5. Which of the following Earth Systems are involved in the formation of the rock? (Note: Choose only ONE response, which represents all the systems that DIRECTLY influenced the formation of the sample).

a) Geosphere and Atmosphere.

b) Geosphere and Hydrosphere.

c) Geosphere and Biosphere.

d) Hydrosphere and Atmosphere.

e) Hydrosphere and Biosphere.

f) Atmosphere and Biosphere.

g) Geosphere and Atmosphere and Hydrosphere.

h) Geosphere and Atmosphere and Biosphere.

i) Geosphere and Hydrosphere and Biosphere.

j) Hydrosphere and Atmosphere and Biosphere.

k) Geosphere and Atmosphere and Hydrosphere and Biosphere.

l) Geosphere

GEOSPHERE PRACTICAL KEY

PARTS	EXERCISES	QUESTION NO.	Correct Answers
PART 1	Exercise 1	1.1	1,3,10
		1.2	A,F
		1.3	A, B
		1.4	A,C,D,E,F
		1.5	K
		2.1	1,10
		2.2	A,B
		2.3	B
		2.4	A,E,F
		2.5	I
		3.1	5,8 **2**
		3.2	A,B,F,G,H
		3.3	A,B,N **M**
		3.4	A,C,D,E,F **B**
		3.5	G
		4.1	4,5,9
		4.2	J
		4.3	B,D,F,H **E**
		4.4	G,I **B**
		4.5	A
	Exercise 2		N-S; 68-72 ^{0} 120/300; 30 ^{0}
	Exercise 3		50 %
Part 2		5.1	4,5
		5.2	K **L**
		5.3	A,B,G, **I**
		5.4	A,B,C,D,E,F,J **K**
		5.5	G
		6.1	2,3,6
		6.2	A,G **K**
		6.3	A,B,C,M,N,O
		6.4	A,B,C,D,E,F **J**
		6.5	G
		7.1	4,5,8 **7**
		7.2	K
		7.3	G,I,K **J**
		7.4	E,J **B**
		7.5	L
		8.1	4,5
		8.2	I
		8.3	D,E,F,G,H
		8.4	B,G,H,I
		8.5	L

Correct Answer = +1 point

Wrong Answer = -0.5 point

Letters (Bold & underlined) = 0 points