

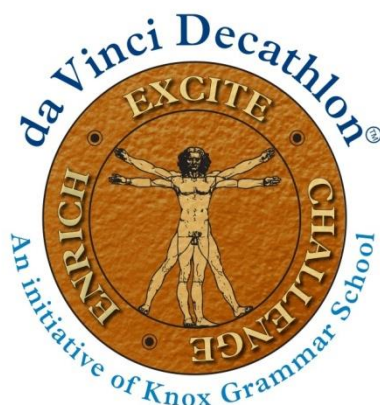


KNOX
GRAMMAR
SCHOOL

STATE

DA VINCI DECATHLON 2019

CELEBRATING THE ACADEMIC GIFTS OF STUDENTS
IN YEARS 5 & 6



SCIENCE

Q1a-d	Q1e	Sec1 - Q2	Sec 2 - Q3	Sec 3 -Q4	Total	Rank
/5	/15	/3	/17	/15	/55	

Complete the above table with question numbers and marks as required.

SECTION 1: ROCK FORMATION

QUESTION 1: DENSITY OF ROCKS IN THE LANDSCAPE

Density is a measure of how much mass something has per unit of volume. Water has a density of 1 gram per 1 cm³. The way a rock is formed affects how dense it is. Most rocks are more dense than water and sink, but some rocks are less dense than water and float. You might have seen the rock pumice washed up on the beach or even for sale in the Chemist shop as an aid to smoothing rough skin. If you pick up pumice and look closely, you will notice how light it feels in your hand and see tiny spaces filled with gas. These spaces are called vesicles and we call pumice a vesicular rock.



1) Write the missing values into these density calculations for different rocks and materials.

a) The density of **water** (1 mark)

$$\frac{\text{Mass}}{\text{Volume}} = \frac{74\text{g}}{\boxed{} \text{cm}^3} = 1 \text{ g/cm}^3$$

b) The density of **water** (2 marks)

$$\frac{\text{Mass}}{\text{Volume}} = \frac{1562\text{g}}{\boxed{} \text{ litres}} = \frac{1562\text{g}}{\boxed{} \text{ cm}^3} = 1 \text{ g/cm}^3$$

c) The density of **granite** (1 marks)

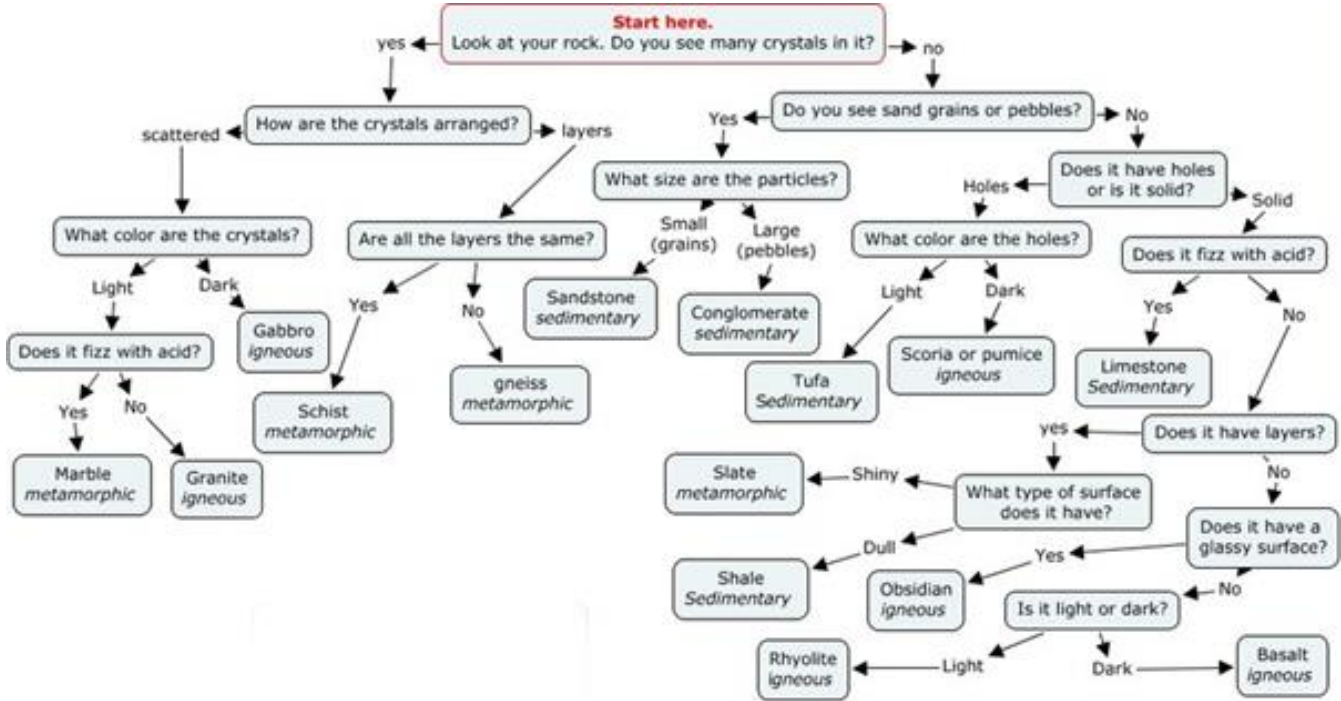
$$\frac{\text{Mass}}{\text{Volume}} = \frac{33\text{g}}{\boxed{} \text{ cm}^3} = 2.75 \text{ g/cm}^3$$

d) The density of **pumice** (1 mark)

$$\frac{\text{Mass}}{\text{Volume}} = \frac{\boxed{} \text{ g}}{92 \text{ cm}^3} = 0.25 \text{ g/cm}^3$$

QUESTION 2: IDENTIFYING ROCKS IN THE LANDSCAPE

2) Scientists often use a **dichotomous key** to classify organisms or substances. Use the **dichotomous key** below to identify the rocks in the pictures below.



(a) This rock **does not fizz** when a few drops of HCl acid is placed on it. (1 mark)

The rock is: _____



b) This rock **does not fizz** when a few drops of HCl acid is placed on it. (1 mark)

The rock is: _____



- c) This rock **does not fizz** when a few drops of HCl acid is placed on it. (1 mark)

The rock is: _____

SECTION 2: EXPERIMENTAL DESIGN

QUESTION 3: SCIENTIFIC INVESTIGATION OF CRYSTALLISATION IN ROCKS

A student was hiking through the Australian Alps in Victoria and noticed that some of the rocks had **large crystals** while the shiny particles in other rocks were **really small**. He began to wonder what affects how big the crystals get in rocks. He knew that most of these rocks started out as magma or lava. Just then, a chilly gust of wind made him shiver and it sparked a thought, "Maybe the size of crystals in rocks is affected by how quickly the hot liquid rock cools down." When the student got back to school, his teacher helped him test his theory that it was the rate that the lava cooled down that caused some rocks to have large crystals while the crystals in other rocks were so small you could hardly see them, if at all.

The teacher was eager to help but said it wasn't possible to work with actual lava because it would be too hot but she was able to show him a few chemicals that could be dissolved in large amounts in hot water and then cooled to form crystals. They chose to work with a chemical called Aluminium Potassium Sulphate.

They set up test tubes as shown below.



The procedure they followed was:

- 1) Create three different cooling conditions:
 - A beaker full of ice for fast cooling
 - A beaker with just air inside for moderate cooling
 - A beaker full of cotton wool for slow cooling

- 2) Place an empty test tube in each beaker
- 3) Measure 15g of Aluminium Potassium Sulphate
- 4) Heat 100mls of water to 60°C
- 5) Dissolve the Aluminium Potassium Sulphate in the water and stir until clear
- 6) Pour 30mls of the hot solution into each test tube and wait 8 hours
- 7) Remove the test tubes from the beakers and observe the size of the largest crystal in each test tube

After eight hours, the crystals in the test tube that had been in the ice bath were small and looked like grains of table salt. The crystals in the test tube that had cooled in a beaker of air were a bit bigger. The test tube that had been wrapped in cotton wool and cooled very slowly contained large crystals the size of peas.

Write up the student's experiment below:

Aim:

(1 mark)

Independent variable: _____

(2 marks)

Dependent variable: _____

(2 marks)

Hypothesis: _____

(3 marks)

Name 4 things that must be kept exactly the same to ensure a “fair test”:

(4 marks)

Risk Assessment (Identify 3 hazards, harms and precautions) (5 marks)

HAZARD OR DANGEROUS SUBSTANCE OR OBJECT	HOW IT COULD HARM A PERSON	PRECAUTIONS. WHAT CAN BE DONE TO STAY SAFE

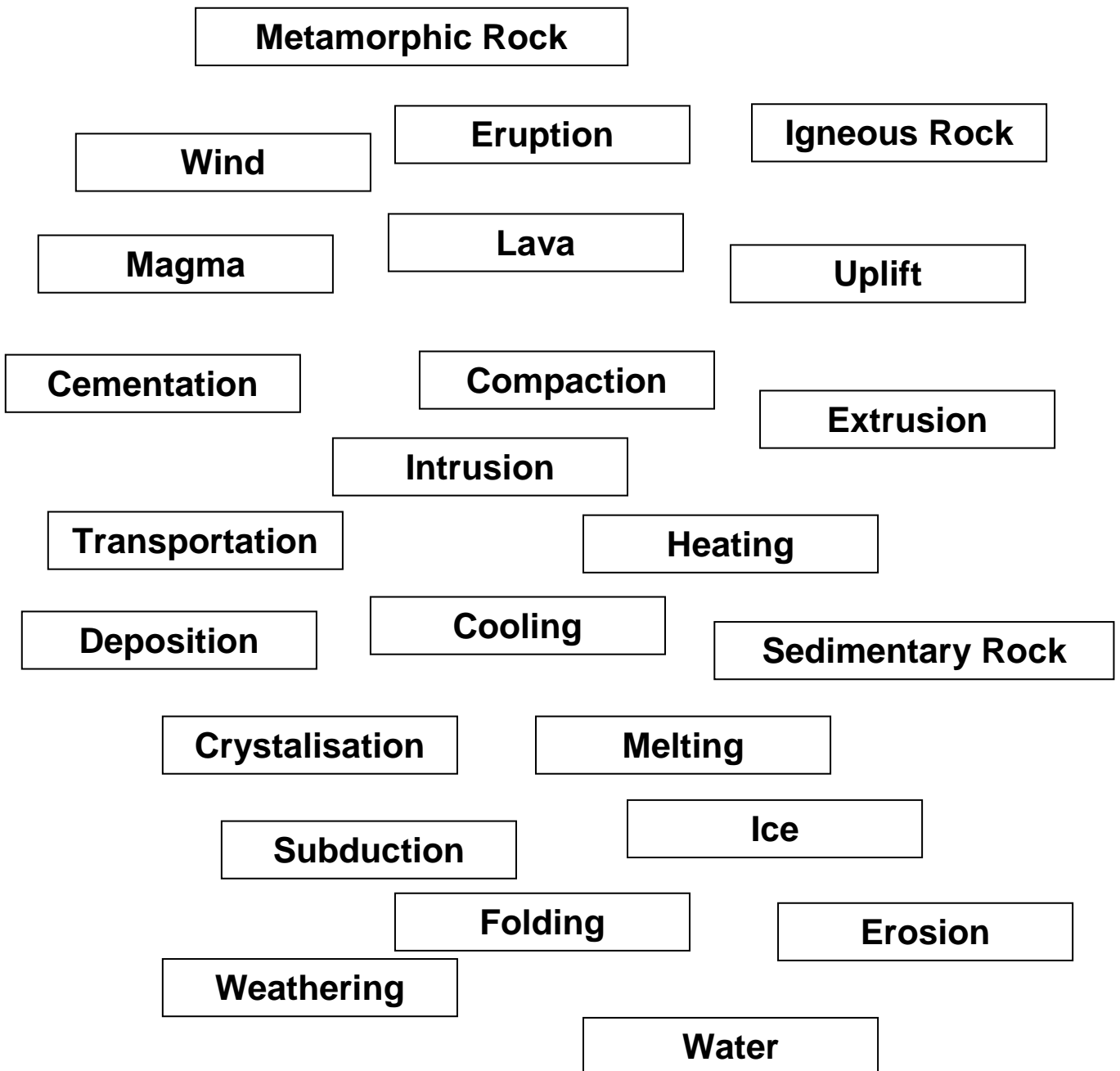
SECTION 3: PROCESSES SHAPING THE LANDSCAPE

QUESTION 4: THE ROCK CYCLE

The landscape is continuously being shaped and transformed by processes that make, remove and change rock. Arrange the terms below into a mind map, flowchart or diagram on an A3 sheet to show possible sequences that lead to the construction or destruction of rock. It's unlikely to be in a straight line.

Use arrows and text to explain the why you connected terms.

You will be awarded marks for showing that you can infer the meaning of the terms and make logical connections between the concepts.



END OF PAPER

OTHER INFORMATION

MATERIALS TO BE PROVIDED

- A3 paper