Igneous rock field notes.

Name: Class: Date:

Use these notes alongside the lesson, or with real rock specimens and a hand lens. Fill them in as you go.

SCREEN 1 Using a hand lens

1. Hold the hand lens close to your eye.
2. Keep the lens still, and bring the rock up towards it until the crystals are in focus.
3. Look at a fresh surface, not a weathered one, and compare the crystals with the dots below.



Grain size, using the British Geological Survey's limits. Printed at 100% on A4, the dots are actual size: 0.2 mm, 1 mm, 5 mm and 20 mm across.

SCREENS 2 TO 7 Texture words

TEXTURE	WHAT YOU SEE	WHAT IT TELLS YOU
Glassy	Smooth and shiny, no crystals	Cooled too fast for crystals to grow
Vesicular	Holes left by gas bubbles	Gas came out of the magma as it rose
Fine-grained	Crystals too small to see without a lens	Cooled fast, at or near the surface
Medium-grained	Crystals you can just see	Cooled more slowly, in a dyke or sill
Coarse-grained	Crystals easy to see	Cooled slowly, deep underground
Very coarse-grained	Crystals more than 16 mm across	Grew from a water-rich last melt
Porphyritic	Large crystals in a fine groundmass	Cooled in two stages, slowly then fast
Fragments	Broken bits of glass, crystals and rock	Blasted out in an eruption, then settled

SCREEN 4 Minerals and colour

GROUP	COLOUR	MAIN MINERALS	FINE	MEDIUM	COARSE
Mafic	Dark	Pyroxene, plagioclase rich in calcium	Basalt	Dolerite	Gabbro
Intermediate	Grey or speckled	Amphibole (hornblende), plagioclase with sodium and calcium	Andesite		Diorite
Felsic	Pale, often pink or grey	Quartz, potassium feldspar, plagioclase rich in sodium	Rhyolite		Granite

Main minerals from Tompkins (2011). Obsidian, pumice, pegmatite and tuff are named by their texture.

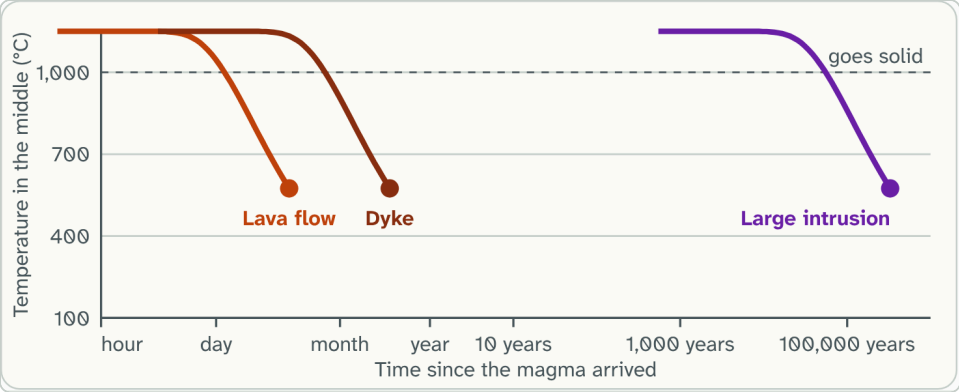
SCREENS 2 TO 7

Comparing rocks

For each set of rocks, write what is the same, what is different, and what caused the difference.

ROCKS	WHAT IS THE SAME	WHAT IS DIFFERENT	WHAT CAUSED THE DIFFERENCE
SCREEN 2 **Basalt, dolerite and gabbro**			
SCREEN 3 **The edge and the middle of one dyke**			
SCREEN 4 **Basalt and rhyolite, gabbro and granite**			
SCREEN 5 **Granite and pegmatite**			
SCREEN 6 **Obsidian and pumice**			
SCREEN 7 **Tuff and rhyolite**			

SCREEN 2 Cooling and crystals



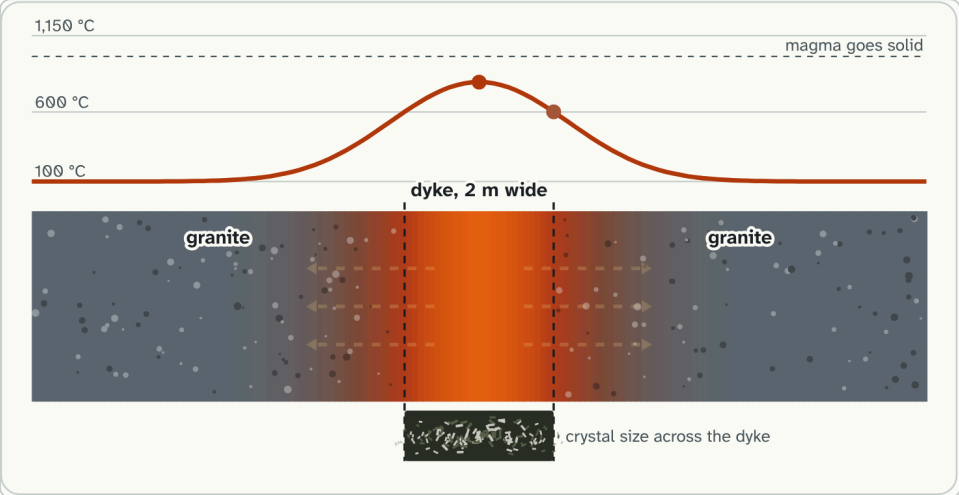
The temperature in the middle of the magma in each place, from the cooling model on screen 2. Each step along the time scale is ten times longer than the last.

About how long did each one take to go solid, below 1,000 °C?

Lava flow: _____ Dyke: _____ Large intrusion: _____

Why did the large intrusion grow the largest crystals?

SCREEN 3 Heat leaving a dyke



The 2 m dyke at Lesmurdie Falls, 6 days after it pushed into the granite, from the model on screen 3. The curve shows the temperature across the dyke and the granite. This model leaves out latent heat, so its dyke goes solid in about 3 days, sooner than the 3 weeks in the chart above.

At this time the dyke still holds 61% of the heat it brought. What percentage of that heat is now in the granite? Explain your answer using the law of conservation of energy.

Use the curve to explain why the edges of the dyke are fine-grained.

SCREEN 8

My classification grid

Write each rock in its box. Glassy rocks, pegmatite and tuff can have any make-up, so each has one tall box.

Basalt · Dolerite · Gabbro · Andesite · Diorite · Rhyolite · Granite · Pegmatite · Obsidian · Pumice · Tuff

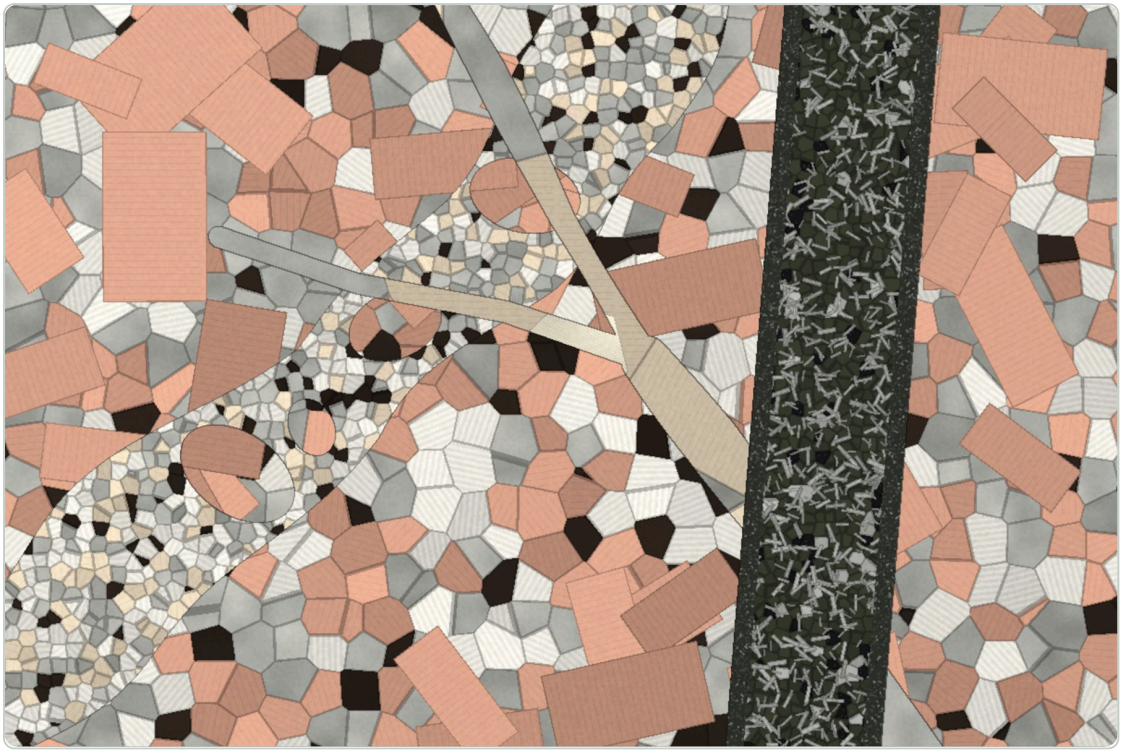
	GLASSY	FINE	MEDIUM	COARSE	VERY COARSE	FRAGMENTS
Dark (mafic)						
Grey or speckled (intermediate)						
Pale (felsic)						

Why are pegmatite and tuff kept out of the sequence from glassy to coarse?

Look back at the groups you made on screen 1. Which of them match the geologist's grid, and what would you change now?

SCREEN 10

Reading a quarry wall



A quarry wall based on Bunting's (2013) description of Stathams Quarry, at Gooseberry Hill on the Darling Scarp, from screen 10. The arrangement is simplified, and the rocks are not to scale.

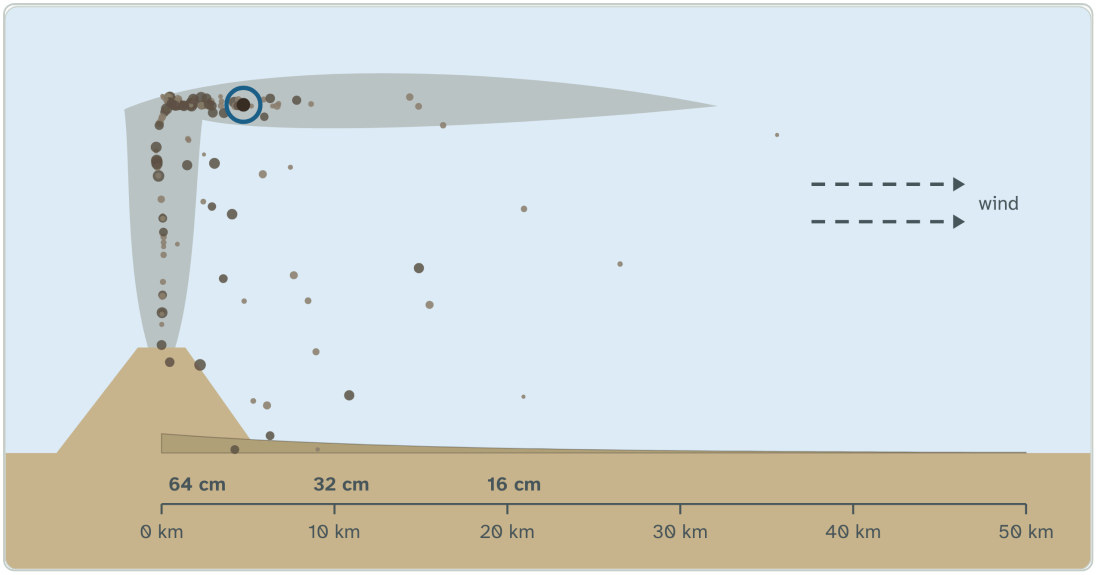
Label the coarse granite, the grey granite, a xenolith, the pegmatite vein, and the dolerite dyke with its chilled margins.

Put the four rocks in order, oldest first, and give the evidence for each.

ORDER	ROCK	EVIDENCE
1		
2		
3		
4		

Explain where the heat of the small dyke went, from the moment it pushed into the granite until today. Use the law of conservation of energy.

SCREEN 7 Energy in an eruption



An eruption column part way through an eruption, from the model on screen 7. The ringed piece of ash is high in the column.

Follow one piece of ash. For each step, write the energy change.

STEP	WHAT THE ASH IS DOING	ENERGY CHANGES FROM	TO
1	Blasted out of the vent by the expanding gas		
2	Lifted high by the hot, rising column		
3	Falling back to the ground		
4	Landing		

How would you tell tuff from rhyolite with a hand lens?

SCREEN 10 Looking back

Which pair of rocks on screens 2 to 7 showed you the most, and what did it show you?