



Theatre of Science Rock Cycle 1: Weathering

By the end of today I'd like you to be able to: Describe what weathering is and give at least four examples of how a rock could be weathered.

You might also be able to: Explain the difference between biological, chemical and physical weathering and give examples of each.

If you're confident or do extra research you could also: Explain how acid rain is made and the negative impact it has on buildings.

What causes weathering?

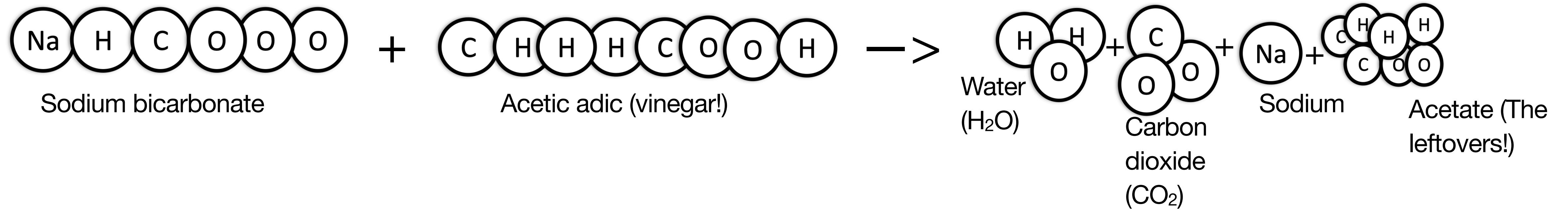
As I'm putting these clues on the board, try to write a few words saying how they might cause rocks to break down into little bits, or dissolve.

(Listed twice on purpose!)

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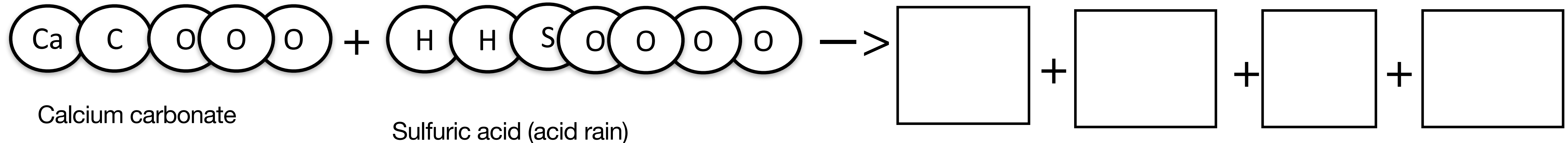
Chemical weathering

Pouring vinegar onto bicarbonate of soda is quite a good model for how acid rain weathers rock. Here's the equation for our model:



Can you work out what happens when acid rain falls onto rocks?

(Rocks like Limestone and Marble are made from Calcium Carbonate, the same thing egg shells and chalk are made of).



(Formed when sulphur, given off by fossil fuels, reacts with oxygen to form sulfur dioxide (SO₂). This dissolves in water to give sulphur dioxide.)

Adults and older children: There is a very in-depth but clear description of the chemistry behind the bicarb and vinegar activity here: <https://www.thoughtco.com/equation-for-the-reaction-of-baking-soda-and-vinegar-604043>

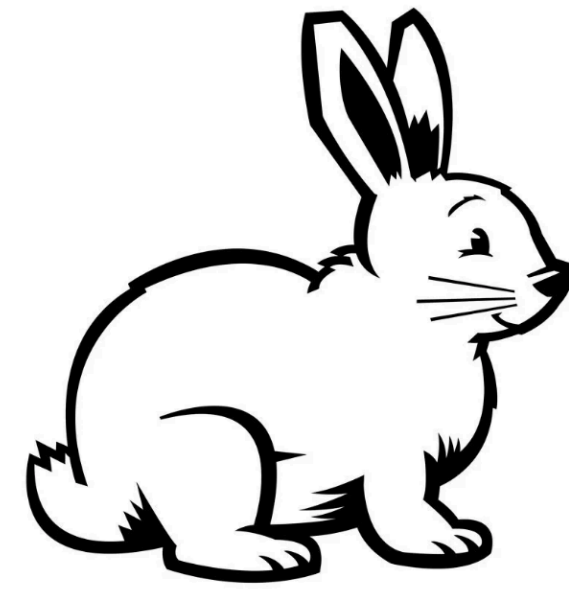
Are these types of weathering biological, chemical or physical?

Write a 'b', 'c' or 'p' next to each one.

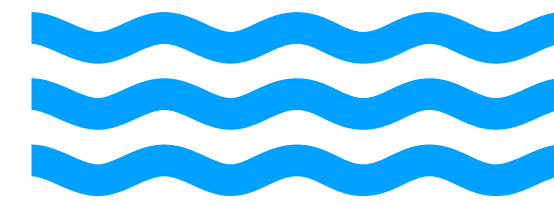


Rain falling onto rocks

Hikers!



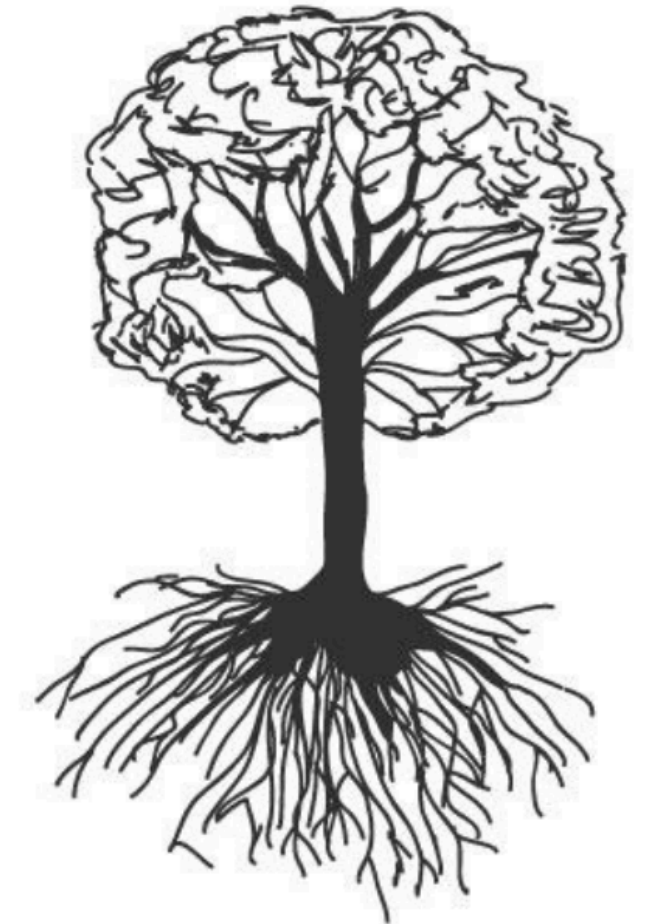
Burrowing animals



Waves lashing against them



Acid rain dissolving the rock



Tree roots growing between / into rock



Wind blowing particles of rock against them

Finished? Explain why volcanoes cause a little bit of weathering, and why humans cause a LOT more!

GCSE questions!

The rock cycle isn't in any science IGCSEs, but I think you might be able to do these Chemistry ones!

- 1) a) Sulfur dioxide is an air pollutant.
State ONE source of sulphur dioxide.

_____ (1)

- b) State ONE adverse affect of acid rain on buildings. (*Why is it bad for buildings?!*)

_____ (1)

- 3) A student adds **acid A** and **acid B** to separate, identical pieces of calcium carbonate. **Acid A** is the strongest acid.

State TWO things they might observe that show acid A is stronger than acid B.

_____ (2)

- 2) Read these statement about aqueous ethanoic acid:

1. It contains the functional group -COOH
2. It turns Universal Indicator paper blue
3. It reacts with carbonates to produce hydrogen gas

Which are true? (1 mark)

A: 1 and 3.

B: 2 and 3.

C: Only 1

D: Only 3

Summary Questions

- 1) GCSE question 1 (b)!
- 2) Explain what weathering is.
- 3) Give two examples of biological weathering, one of chemical, and two physical.



Theatre of Science Rock Cycle 2: Erosion and Sediment!



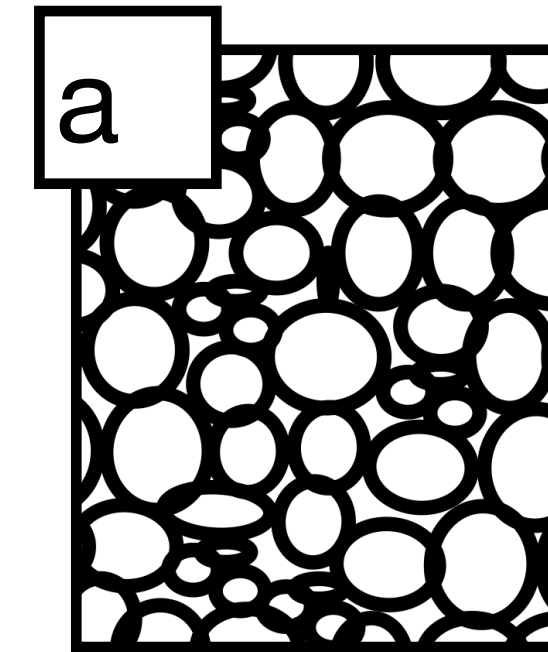
THANKS FOR SUPPORTING ME ON KO-FI! I'll send you rainbow glasses, sticker and a magazine! It's the only way this can be my job xx

By the end of today I'd like you to be able to: State the meanings of the words *Erosion*, *Sediment*, *Well Sorted*, *Poorly Sorted*, *Angular* and *Rounded* (You might also know the words *clast* and *deposition*).

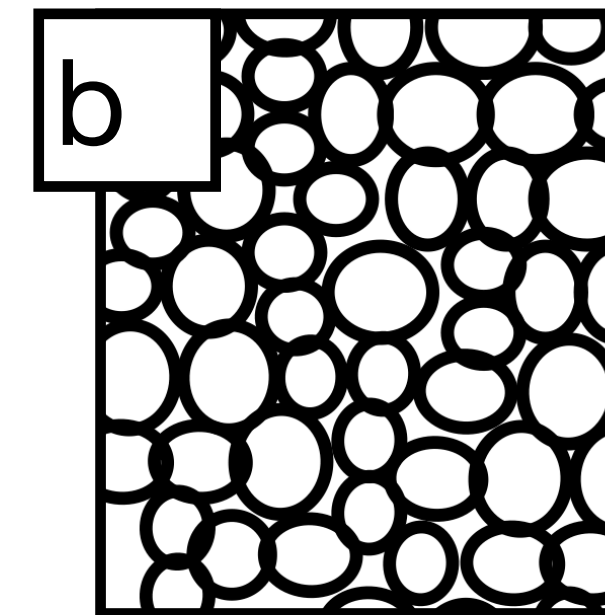
You might also be able to: Describe at least three ways that sediments can be eroded and transported.

If you're confident or do extra research you could also: Explain how different erosion and transportation methods can lead to sedimentary rocks having grains that are poorly sorted, well sorted, angular or rounded, and identify examples in photographs.

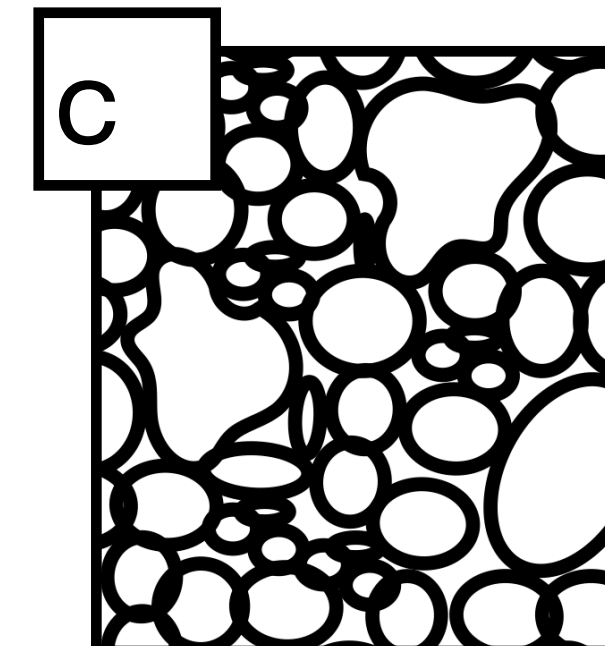
1) Match the diagrams to the labels.



Well sorted



Moderately well sorted



Poorly sorted

To join in bring: Cereal bowl of v hot water, cereal bowl of v cold / icy water, narrow necked glass bottle, washing up liquid, jar half full of soil (not compost), glass of water, old spoon!

2) Which situations would you expect to result in poorly sorted rock, and which in well sorted?

Write 'ps' or 'ws'.

Meteorite throwing rock into the air and falling back to Earth

At the bottom of a large lake

A stream very near to where the sediments were weathered off the rock

A glacier (sheet of ice) ploughing across the land

A river meeting an ocean and slowing down.

Desert sand being swept into a pile by the wind.

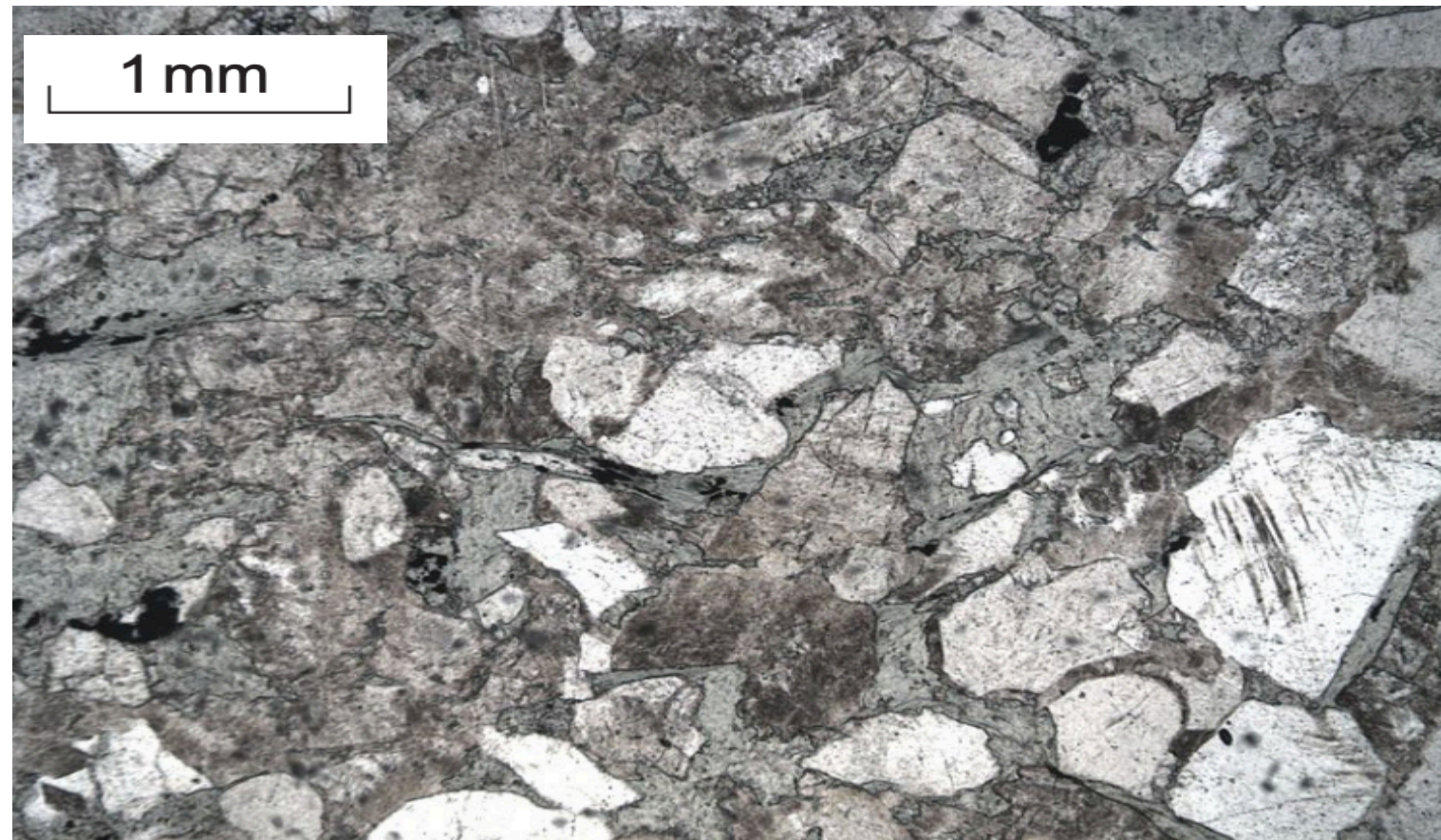
A volcano ejecting bits of rock into the air

3) Looking at 'clast' size like this is one thing to compare in different rocks. What other ways can you think of?

(Starter hint: what do the sediments in question 1. all have in common?)

GCSE questions!

1) The image shows a sandstone, 'Rock 1'.



Copyright: Michael C. Rygel CC BY-SA 3.0

a) Which *two* lines describe the texture of rock 1?

1. Poorly sorted
2. Well sorted
3. Angular clasts
4. Well-rounded clasts
5. Coarse grained



b) This image shows 'Rock 2'. Which two statements are correct?

1. The grains in rock 2 have been transported much further than those in rock 1.
2. Rock 2 has more white minerals than rock 1.
3. Rock 2 is better sorted than rock 1
4. Rock 2 is more likely to have formed under an ice sheet than Rock 1.
5. Rock 1's grains are more rounded

Summary Questions

- 1) Explain the difference between weathering and erosion.
- 2) Sketch a well-sorted rock and a poorly sorted rock and give an example of how each might have formed.



Theatre of Science Rock Cycle 3: Fossils!



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By the end of today I'd like you to be able to: Explain what a fossil is, list at least three examples and describe one way that fossils can form.

You might also be able to: Explain the difference between a body fossil and a trace fossil.

If you're confident or do extra research you could also: Explain how fossils are formed by the process of permineralisation.

Points in today's lesson relating to GCSEs: The AQA Triple Science GCSE has:

Fossils are the 'remains' of organisms from millions of years ago, which are found in rocks.

Fossils may be formed: from parts of organisms that have not decayed because one or more of the conditions needed for decay are absent; when parts of the organism are replaced by minerals as they decay; as preserved traces of organisms, such as footprints, burrows and rootlet traces.

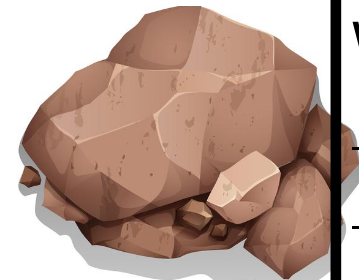
(Fossils do not appear on any iGCSE science specifications)

Say whether each example is a *fossil* or not and explain your answer



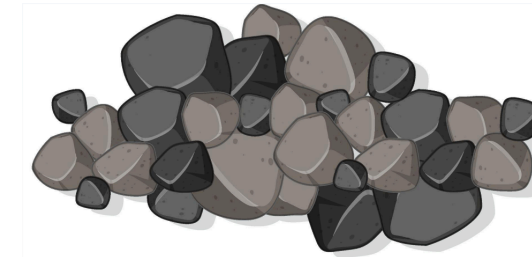
20 000 year old shark's tooth

Fossil?: _____
Why / why not?



1 Million year old piece of sandstone

Fossil?: _____
Why / why not?



Pebbles in a dinosaur's stomach it used to digest food.

Fossil?: _____
Why / why not?



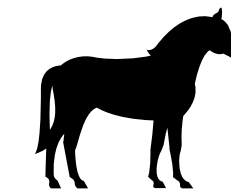
Particle of fat produced by a microbe

Fossil?: _____
Why / why not?



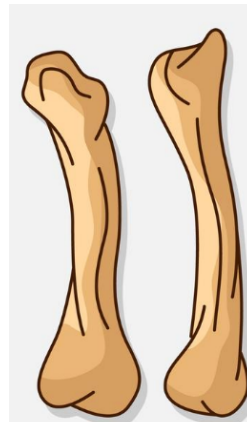
A real fossil pushed into wet cement to leave an imprint.

Fossil?: _____
Why / why not?



40 000 year-old foal frozen in ice.

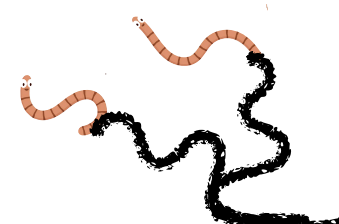
Fossil?: _____
Why / why not?



4000 year-old mammoth bones

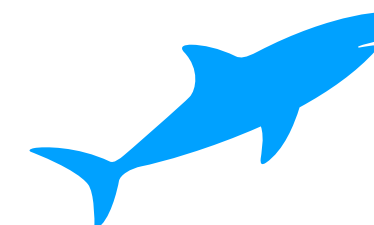
Fossil?: _____
Why / why not?

Wanda! Wilhelm!
Keep up!



10 000 year old worm trails

Fossil?: _____
Why / why not?



A living Goblin Shark

Fossil?: _____
Why / why not?

Confident you know the rules?! Put some of your own questions in the comments or write some for your family.

GCSE questions!

- 1) Why are there so few fossils of very early life-forms?
 - a) They were eaten by predators
 - b) Fossils only last a few million years
 - c) They became extinct very fast
 - d) They had soft bodies

3) The image shows a fossil of a giant platypus. Explain how it may have formed. (3 marks)

2) Explain why fossils of dinosaurs are often incomplete. (3 marks).



Summary Questions

- 1) Give two examples of a *trace fossil*.
- 2) Explain why a mammoth trapped in ice is a fossil but a 300 000 year-old spear isn't.
- 3) Have a go at GCSE question 3. Use the words "sediment" "covered" "decay" "minerals" "replace"



Theatre of Science Rock Cycle 4: Ammonites!



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By the end of today I'd like you to be able to: Explain what the law of superposition is. State that ammonites lived for a long time and can help us age layers of rock.

You might also be able to: Say what an index fossil is and explain what makes a good index fossil.

If you're confident or do extra research you could also: Explain that cephalopods are a class of animal that includes ammonites, and describe the key features of ammonites and other closely related cephalopods.



Goniatite



Ceratite



'True Ammonite'

1) Index Fossils are used to date layers of rocks. Work out the ages of the layers below!

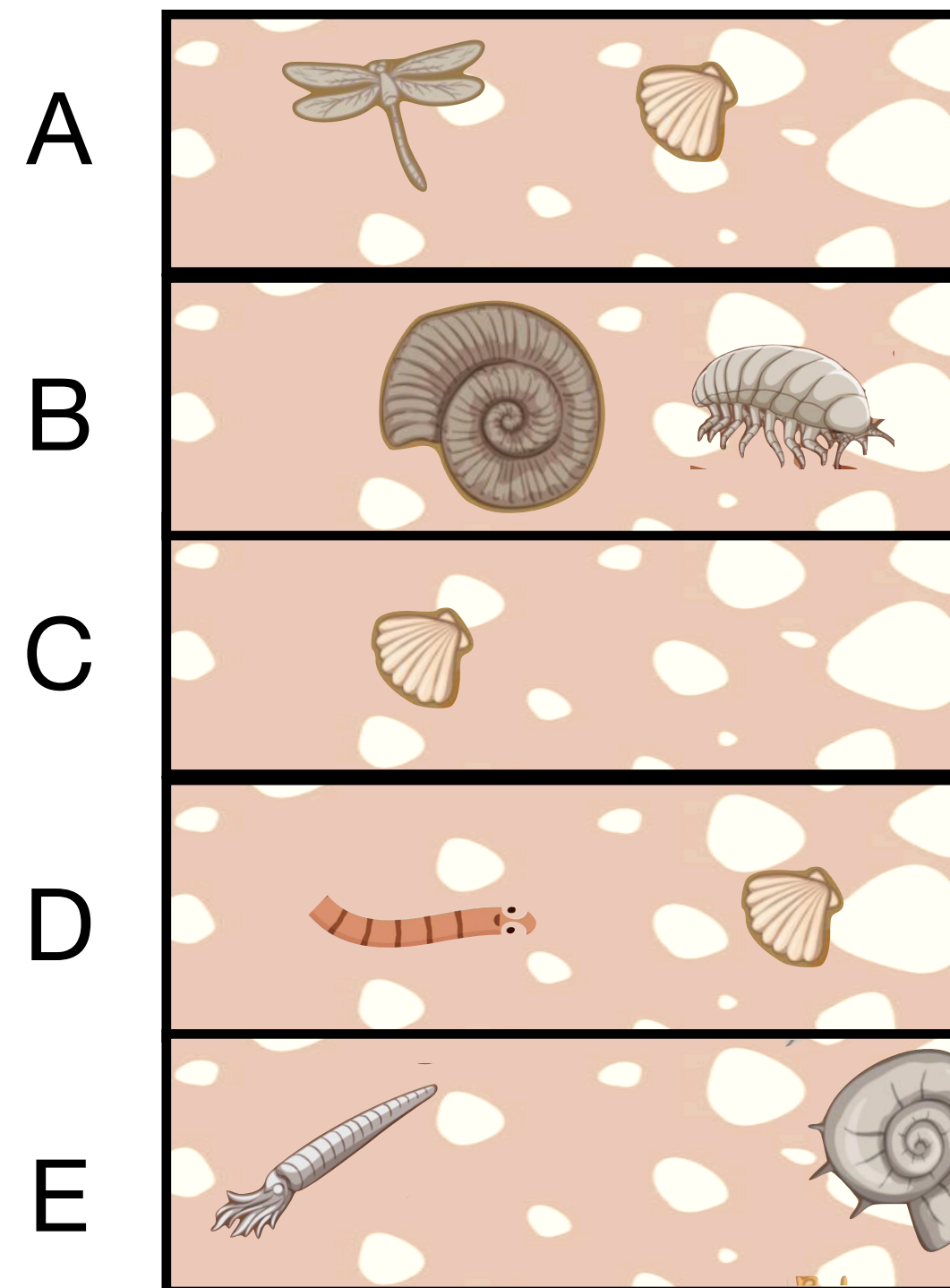
- All the layers are *different ages*.
- Don't use halves! Just '1 Ma' '3 Ma'.
- The layers haven't been disturbed by earthquakes since they formed.

Ma means 'mega annum' - million years.

2) Which is the least useful fossil in question 1 and why?

3) What makes a living thing a good index fossil? Circle / note down the five correct answers!

-  Lived 2 - 9 Ma ago
-  Lived 2 Ma ago
-  Lived 2-4 Ma ago
-  Lived 4-7 Ma ago
-  Lived 6 Ma ago
-  Lived 8 - 9 Ma ago
-  Lived 1 - 8 Ma ago



There are lots of them ('abundant')

Lived on land

Lived in many different parts of the world

Rare

Existed for a long time

New to science

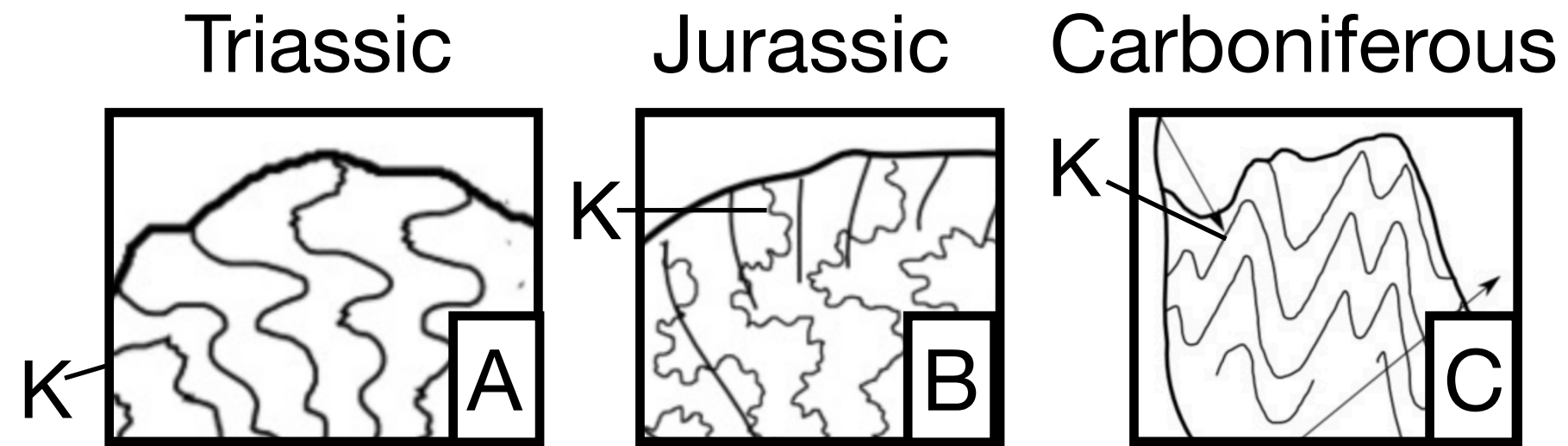
Had hard parts / easily fossilised

Existed for a short amount of time

Fragile

Easy to recognise

GCSE questions!



Images from Cambridge University Department of Earth Sciences
<https://creativecommons.org/licenses/by-nc-sa/3.0/legalcode>

1) The diagrams show details of three fossils. What group of living thing do they belong to?

- a) Trilobites
- b) Reptiles
- c) Cephalopods
- d) Corals

2) What's the name of the feature labeled 'K' on the fossils?

- a) Suture Line
- b) Stem
- c) Eye
- d) Septa

3) Which fossil is a *goniatite*? Give a reason for your answer.

Answer _____

Reason _____

4) Fossils A, B and C are good index fossils, used for dating rocks. Name three characteristics (things about the fossil) which make them useful index fossils.

Summary questions

Explain what the Law of Superposition tells us about layers of rock.

Index fossils help us name rocks. Give two reasons why ammonites make good index fossils.



Theatre of Science Rock Cycle 5: Igneous Rocks!

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By the end of today I'd like you to be able to: Explain the difference between magma and lava, & igneous & sedimentary rock.

You might also be able to: Explain the difference between intrusive & extrusive igneous rock.

If you're confident or do extra research you could also: Pick out key features of real igneous rocks and use them to suggest how the rock was formed.

1) Complete the sentences using the words below. You won't need some of them!

Liquid rock is called _____ when it's underground and _____ when it's above ground. When _____ or _____ solidify they form a new kind of rock called _____ rock. _____ rock formed underground has cooled slowly so has course (_____) crystals. Igneous rock formed above ground has cooled _____ so has fine (small) crystals.

To join in bring: Two mugs, flour, water, spoon, A4 paper, scissors and sellotape, or a straw! EYE PROTECTION Sunglasses / goggles etc.

- lava
- igneous
- Sediment
- large
- magma
- lava
- igneous
- fast
- slowly
- small
- magma

2) Match the picture to the description

Often called 'black granite'!

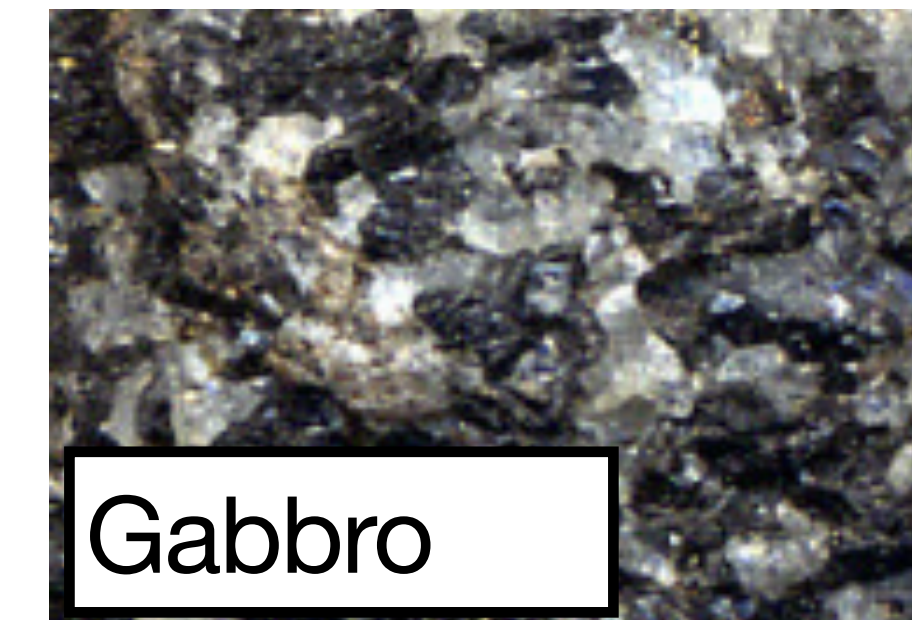
Formed when rock cools so quickly crystals don't have time to form; looks 'glassy'.

Formed when rock containing white/pink minerals cools slowly.

Formed from lava that has cooled quickly



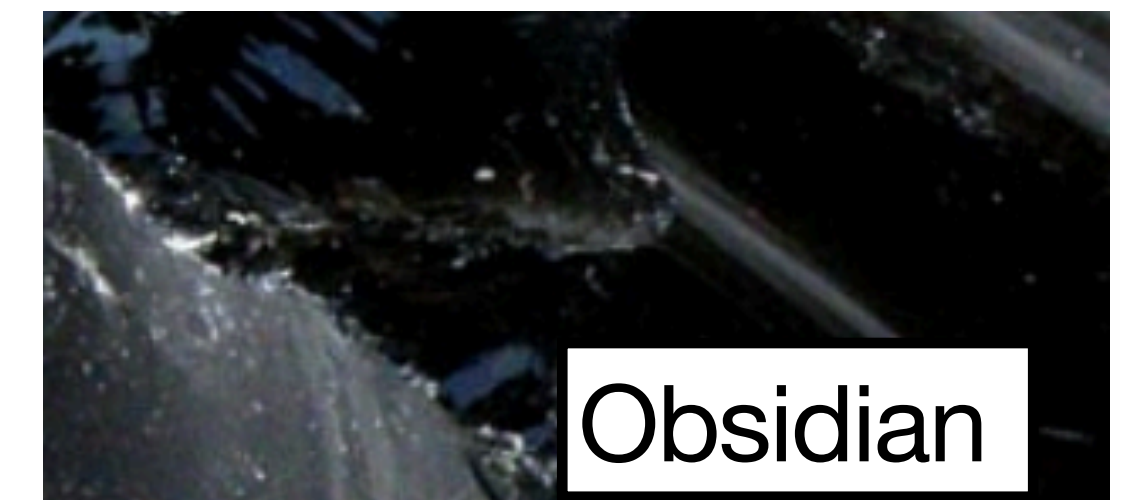
Granite



Gabbro



Basalt



Obsidian

3) Some rocks have coarse *and* very fine crystals in them. Suggest what could have happened?!
(Real challenge this!)

GCSE questions!

1) A student measures 100 crystals in a section of rock. She records her results in table 1.

a) Complete figure 1 by drawing crystals to show what the section of rock looks like (3 marks)

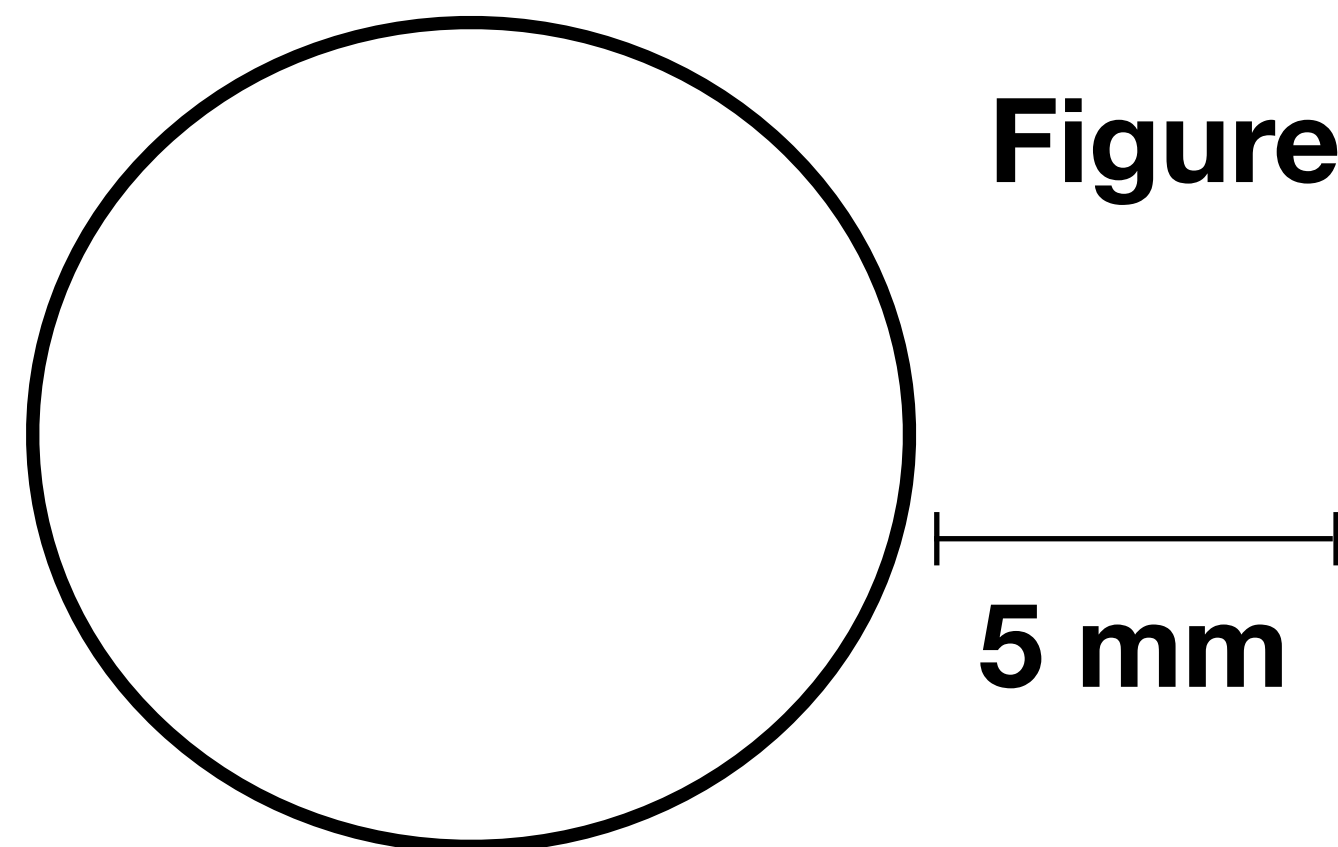


Table 1

Crystal Size (millimeters)	Amount of crystals
0-1.9	0
2-3.9	15
4-5.9	85
6-7.9	0

b) What is the crystalline texture of the rock? (1 mark)

c) Explain how the texture of the rock sample formed (3 marks)

Summary questions! Explain the difference between...

Magma and Lava _____

Intrusive and extrusive rock _____



Theatre of Science Rock Cycle 6: Minerals!

You will need: salt, an ice cube, also a pencil if you can find one!

By the end of today I'd like you to be able to: State at least two properties of minerals.
(Say what makes a mineral a mineral).

You might also be able to: Name three common minerals and describe them

If you're confident or do extra research you could also: Be able to identify these minerals in rocks and use that information to explain how the rock formed.

Mineral or not? Explain your answer!

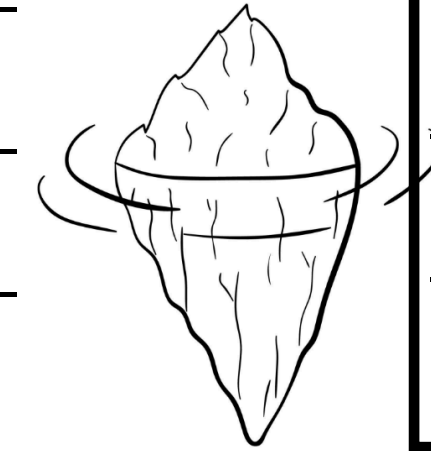
Cornflakes Mineral?: _____

Why / why not?



Iceberg Mineral?: _____

Why / why not?



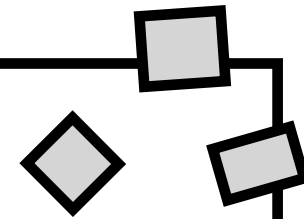
Man-made emerald Mineral?: _____

Why / why not?



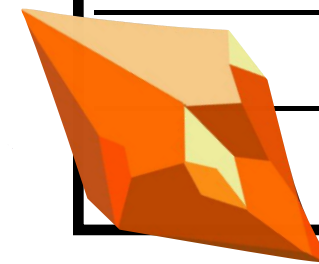
Salt Mineral?: _____

Why / why not?



Fossilised tree resin (Amber) _____

Why / why not?



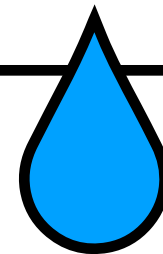
Carbon Dioxide _____

Why / why not?



Water _____

Why / why not?



A rock containing three different types of mineral. _____

Why / why not?



Finished?

Explain in your own words some of the rules for what makes a mineral a mineral! (I'll be very impressed if you can explain all five!)

GCSE questions!

1. When identifying minerals, what's the advantage of using a microscope over a hand lens? (1)

2. Rock A contains Mica, Feldspar and Quartz.

a) Which mineral will be most stable at Earth's surface? Explain your answer. (2)

b) Name rock A _____ (1)

3. Name the main mineral that forms sandstone (1)

Summary questions!

1. Explain why mint leaves are not a mineral, but salt is.

2. Give two reasons why coca cola is not a mineral.

3. Match the mineral to the description

Black and shiny	Feldspar
White	Mica
Grey and glassy	Quartz



Theatre of Science Rock Cycle 7: The Choc Cycle

You will need: a bowl/plate over a pan of just boiled water, a plate, grated chocolate (two different colours great but not essential, two sweets/pieces of cereal/raisins to act as fossils. Breadcrumbs and pieces of pasta would also work well.

By the end of today I'd like you to be able to:

Describe some of the processes that turn rocks into different kinds of rocks.

You might also be able to:

Name the three main groups of rocks in the rock cycle and explain how they form.

If you're confident or do extra research you could also:

Explain some of the methods by which sedimentary rocks can be identified and dated.

If this is your first Rock Cycle Lesson: write down 3/4 ideas for how little bits of rock might break off a big rock. (Example: If the wind blew against it small bits might be blown off)

**If you've done previous lessons: try and recall all the different ways a rock can be weathered!
Use words or pictures.**

1) Which of these is a clue you might be holding a sedimentary rock?

Easy to pick bits off it

Has layers

Has a pinkish tinge

Has lines

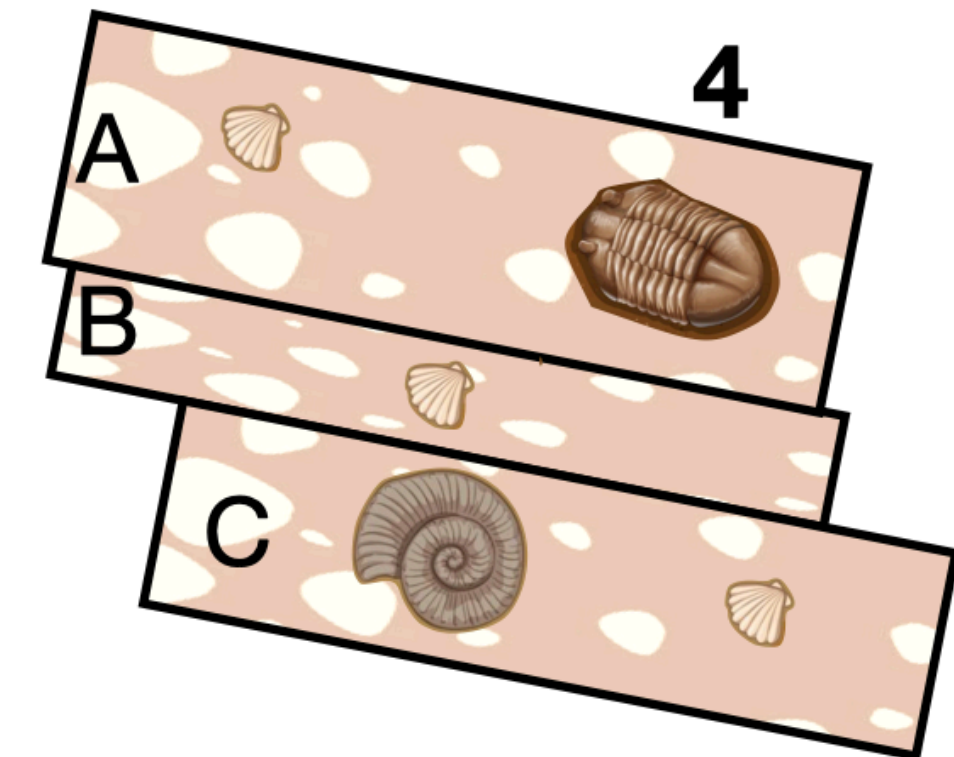
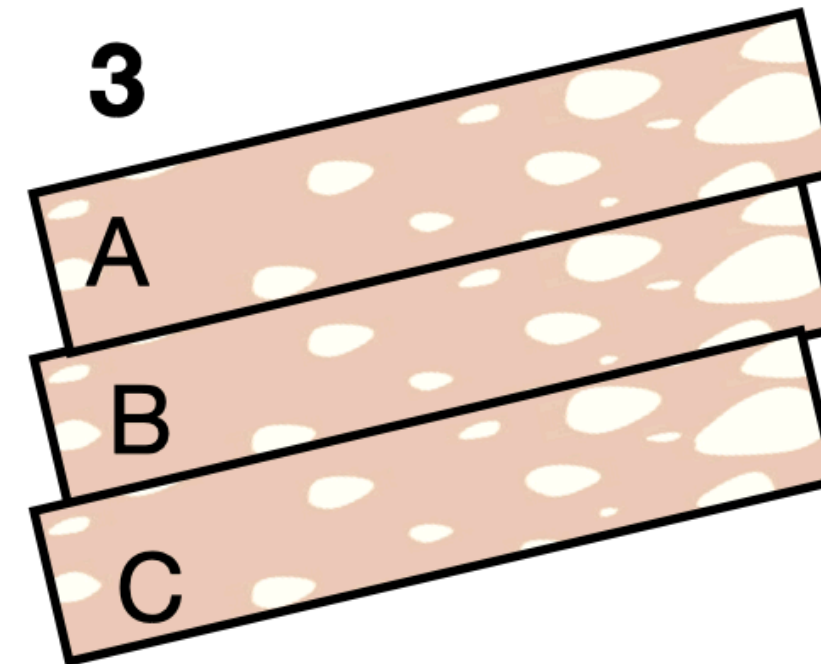
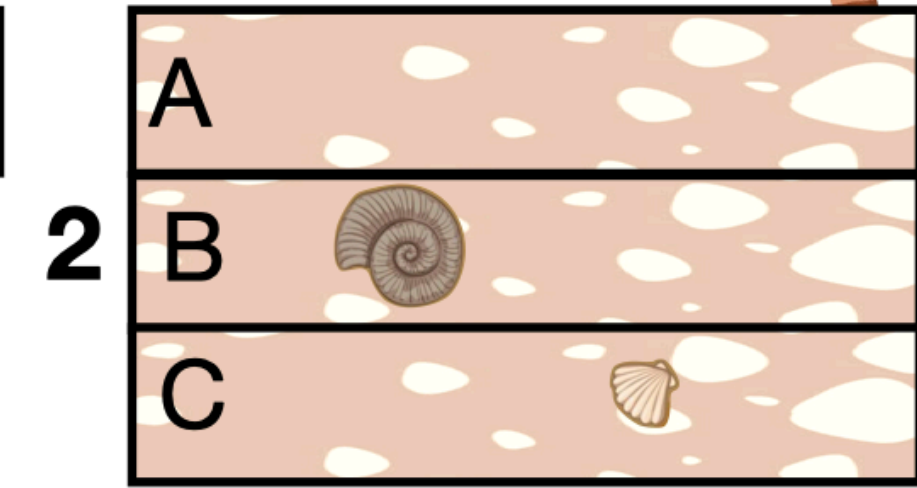
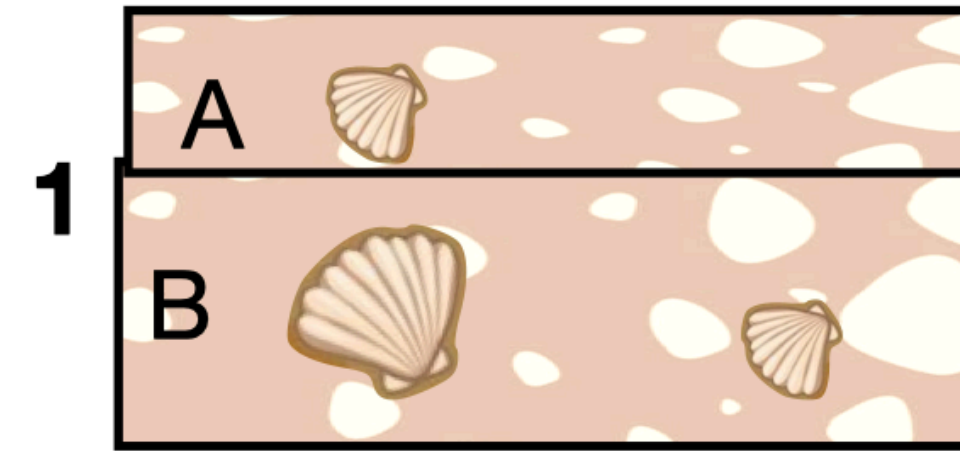
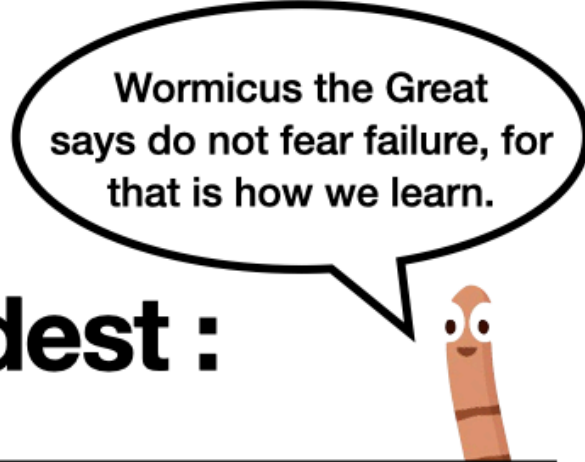
Rounded edges

Contains body fossils

Smaller than 2cm across

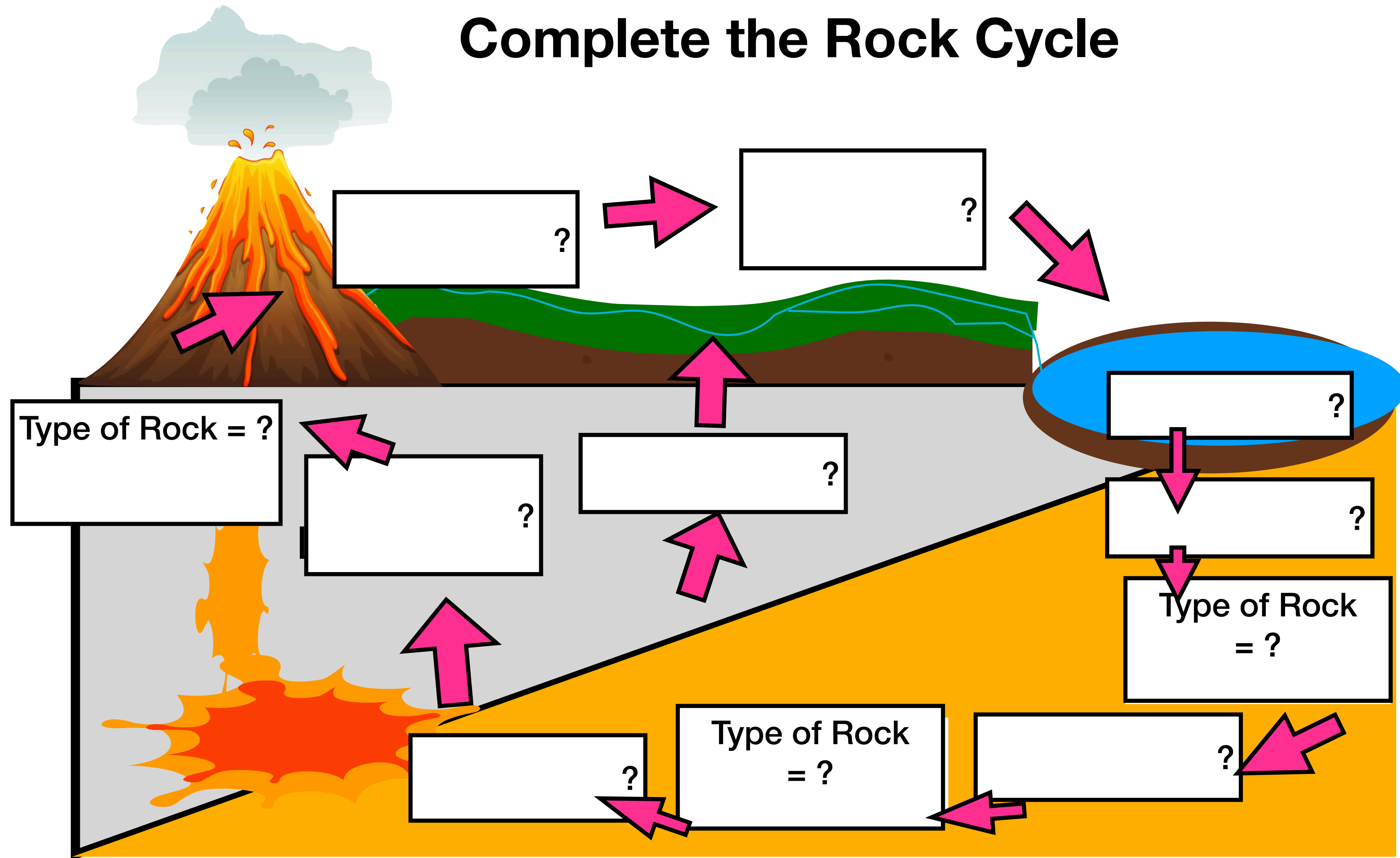
Contains trace fossils (eg a footprint)

2) For each section of cliff, say which layer is likely to be the oldest :



3) You find a sedimentary rock containing pebbles of a different, igneous rock. Which is older, the sedimentary or the igneous? Explain your answer.

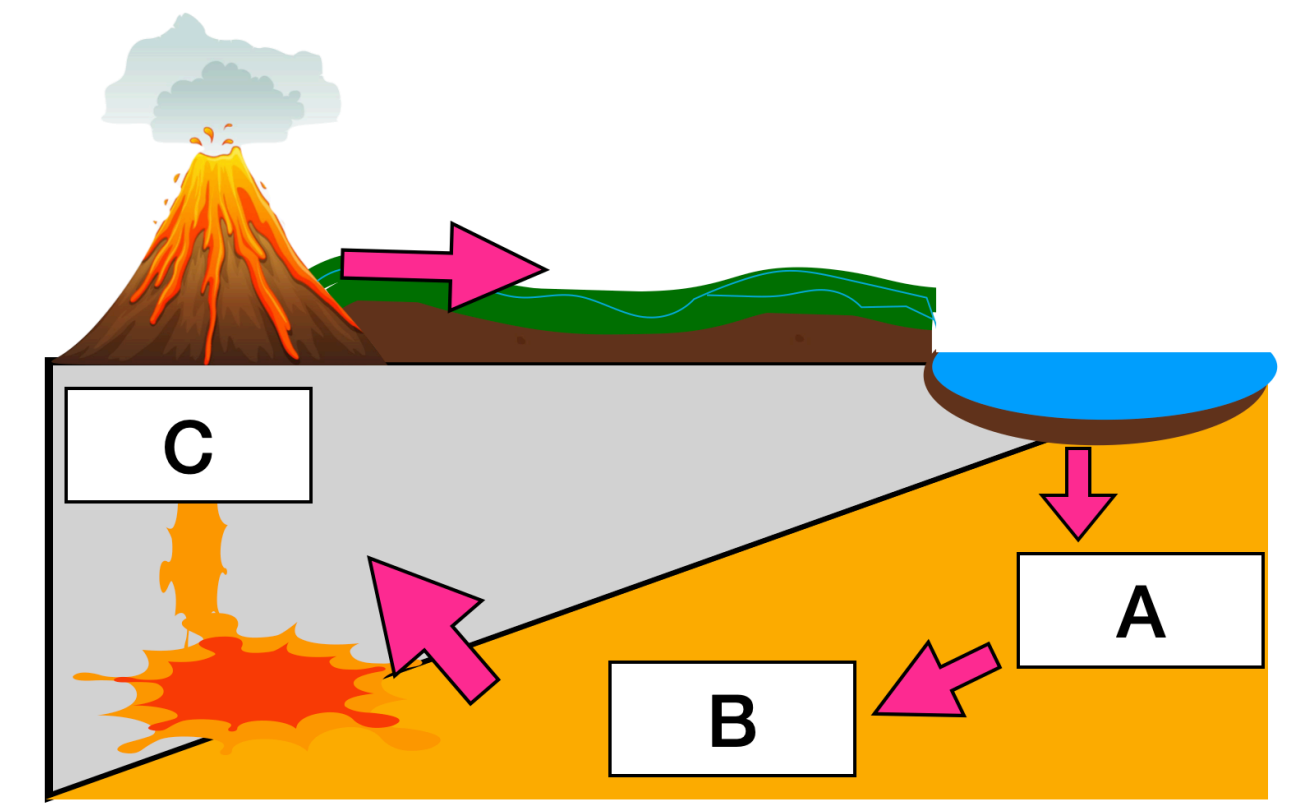
Complete the Rock Cycle



A Level questions!

1. You are studying rocks in a cliff face. Name two things you could do to stay safe (2)

3) The diagram shows the rock cycle. Name the rock groups associated with A, B and C. (1)



4) Explain the difference between weathering and erosion (2)

2. Name fossils A and B (2)



Summary questions!

1. What is the name for the process that breaks rocks into smaller pieces? _____
2. Name the three main groups of rocks in the rock cycle
3. Explain why two of the rock groups do not contain fossils.