Oxidation - Teacher's Notes

Chemical Weathering - Oxidation

<u>Composition of dry air</u>

Nitrogen	78.09%
Oxygen	20.95%
Argon	0.93%
Carbon Dioxide	0.93%
Others	0.03%

Students often talk about breathing in oxygen but the air we breathe is not all oxygen. Indeed about 4/5 of it is nitrogen and most of the rest is oxygen. If the square on the left was air, mark off and label how much of it would be nitrogen and how much oxygen.

Nitrogen is very important, as it does not easily bond with other elements. Oxygen is mostly released when green plants make food. Earth's very early atmosphere had only 0.2% oxygen because simple bacterial mats similar to the stromatolites we can see now at Shark Bay, produced oxygen through photosynthesis. This restricted the development of complex life forms, which would have needed more oxygen. When volcanoes erupted during those times their iron rich lava flows would not have been oxidised (rusted) away. This created the conditions, which made our wonderful Banded Iron Formations in this state's north, which are the source of rich iron ore for export.

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As plants increased in numbers populating the oceans our atmospheric oxygen levels rose first to 2% about 540 million years ago, then higher. This corresponds to the appearance of complex creatures with hard skeletons in our oceans. With the increase of oxygen, iron rich deposits could no longer be made.
Half of the oxygen in our present atmosphere is still produced by tiny marine plankton and algae. The level of oxygen in the atmosphere is critical to the survival of living organisms. At 15% oxygen fires will not burn whereas at 25% organics (living things including ourselves) would spontaneously combust!

Curious coins

Metal mixes (alloys) for coins are chosen because they are fairly resistant to oxidation. However they weather faster than most rocks!

Draw an arrow indicating the direction of oldest to youngest.

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What clues did you use to guide you? Change in reflection/shininess, damage to rim, change in colour.
What other clues could you have used? Coins have their date stamped on them.

EXTRA for EXPERTS - (This has not been included in the student worksheet – could be a good discussion point)
What does painting houses have to do with weathering? Painting protects wood and iron by isolating it from weathering due to oxidation, fungal and bacterial attack, which can rot wood.
If your classroom has aluminium windows, rub your finger on the surface and the white dust that rubs off is aluminium oxide. This layer of dust actually protects the underlying aluminium from oxygenation.

Oxygen in our atmosphere bonds with our rocks and helps break them down. The process may take several thousand years or more. If you break open a weathered rock you can see its unweathered core. Note the light weathered crust on this mudstone from behind Geraldton.

The student worksheets show some amazingly coloured Banded Iron formation rocks from the Hamersley Range.

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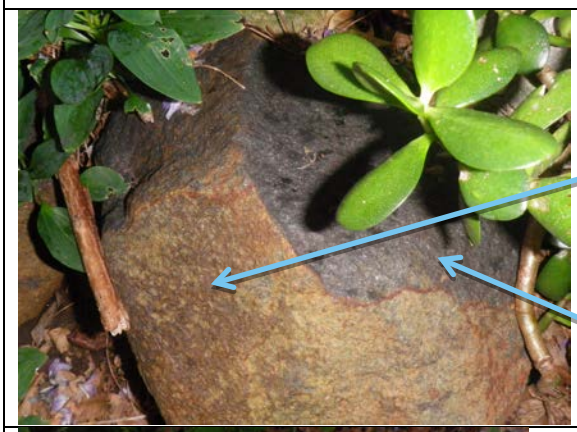
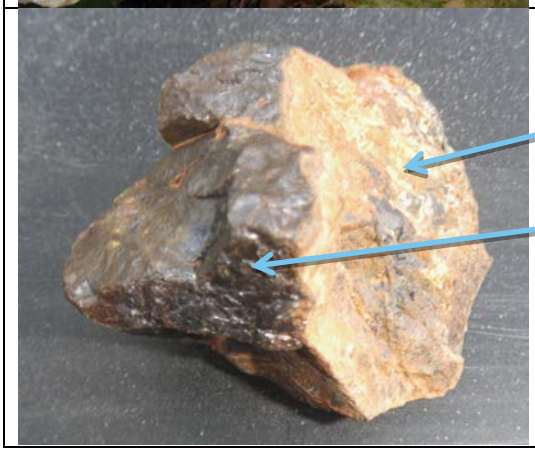
Label the weathered and un-weathered parts of the following rocks.

Picture	Comment
	Dolerite (an igneous rock) from near Northam Weathered outer edge is orangey brown caused by the iron in the rock rusting (oxidising). Unweathered dark core.
	Yellow coastal Tamala Limestone from Fremantle The white weathered fine grained outer weathered rim has been colonised by green moss. The inner unweathered rock is yellowish.
	Chert from the Pilbara. The white outer crust is weathered. The silica and iron rich core is darker and un-weathered