Q: Where do we obtain most of our metals from?	Q: What is an ore?
Q: In what form do we find very unreactive metals?	Q: Explain how iron is extracted from its ore (haematite, Fe_2O_3).
Q: Explain how aluminium is extracted from its ore (bauxite, Al_2O_3).	Q: What factors affect the method chosen for the extraction of a metal from its ore?
Q: What factors affect the cost of producing metals?	Q: Which metals must be extracted by electrolysis and why?

A: A rock that contains minerals, including metals, *e.g.* iron.	A: Extraction from ores found in the Earth's crust.
A: By reduction with carbon. The ore is heated in the presence of a form of carbon, usually coke, in a blast furnace. The oxygen moves from the iron to the carbon, as carbon is more reactive. The iron is reduced and carbon is oxidised.	A: In their pure states, as uncombined elements.
A: The metal's position in the reactivity series, and the cost of the extraction process.	A: By electrolysis. The crushed ore is melted and then an electric current is passed through the ore to extract the metal.
A: Any metals above carbon in the reactivity series, *e.g.* potassium, sodium, calcium, magnesium, aluminium.	A: The availability of the ore; the method of extraction; how much metal is in the ore.

Q: Which metals can be extracted by reduction with carbon?	Q: What is an oxidation reaction?
Q: What is a reduction reaction?	Q: During metal extraction, are metal ores reduced or oxidised?
Q: What is corrosion?	Q: Why do some metals corrode more easily than others?
Q: What are the advantages of recycling metals?	Q: What are the properties of aluminium?

A: An oxidation reaction adds oxygen to a substance.	A: Metals below carbon in the reactivity series (but reactive enough not to be found in their native state, *e.g.* zinc, iron, tin, lead.
A: Reduced.	A: A reaction that removes oxygen from a substance.
A: Metals that are higher in the reactivity series are more likely to corrode because they react more easily with oxygen.	A: Corrosion occurs when metal, oxygen and sometimes water are exposed to each other and react; the metal is oxidised.
A: Strong and light; excellent conductor of heat; good reflector of heat and light.	A: It uses fewer resources; it uses energy (in mining and extraction of metals); it uses less money (as energy costs money); it makes less rubbish that goes into landfills.

Q: What are the uses of aluminium?	Q: What are the properties of copper?
Q: What are the uses of copper?	Q: What are the properties of gold?
Q: What are the uses of gold?	Q: What is an alloy?
Q: Why is the cast iron produced in a blast furnace not very useful?	Q: Why does converting pure metals into alloys often increase the strength of the product?

A: Best electrical conductor of all cheap metals; very ductile; very malleable.	A: Aircraft components, containers for food and drink, window frames, electricity cables, reflective surfaces for telescope mirrors.
A: Excellent electrical conductor; corrosion resistant; very reflective; rare (expensive).	A: Electrical wiring, plumbing pipes.
A: A mixture of two or more metals, or a mixture of a metal and a non-metal.	A: Electrical connectors, satellite shields, jewellery, dentistry (tooth fillings).
A: By introducing atoms of a different type into the mix, the atoms of the metal cannot align as regularly as in the pure metal. These different atoms prevent the metal atoms sliding as freely as in the pure metal, making the metal harder to bend.	A: It is only 96% iron; the other 4% is impurities, including carbon. This impure iron is brittle. It's used for ornamental railings but it doesn't have many other uses.

Q: What are the properties and uses of low carbon steel?	Q: What are the properties and uses of high carbon steel?
Q: What are the properties and uses of stainless steel?	Q: What are the properties and uses of titanium steel?
Q: Describe how alloying nickel and titanium into nitinol changes their properties?	**Q: What is the purpose of alloying gold in jewellery?**
Q: What are the two scales used to measure purity of gold?	**Q: Describe two examples of how chemists have developed new smart materials to fit new applications.**

A: < 0.5% carbon. Hard, stronger than mild steel but more brittle. Used for blades for cutting tools, bridges.	A: > 0.25% carbon. Cheap, strong, easily shaped. Used for construction, car body parts, appliance cases.
A: 0.5%-2% titanium, varying amounts of chromium, nickel and vanadium. Very strong, reduced weight, resistant to corrosion. Used for aircraft components.	A: 80% iron, 15% chromium, 4% nickel, 0.5-1% carbon. Strong, hard, very corrosion resistant. Used for cookware, cutlery, containers for corrosive materials.
A: Pure gold is too soft so metals such as zinc, copper and nickel are used to harden it.	**A: Nitinol is a smart or "shape memory" alloy – it remembers its original shape. If you bend a wire made of this smart alloy, it will go back to its original shape when it is heated.**
A: Nitinol for glasses frames – if they get bent they can easily be reshaped. Shape memory alloys are also used to make stents (tubes) for use in damaged blood vessels.	**A: The carat scale, in which pure gold is 24 carat (*i.e.* 18 carat is 75% gold); and the fineness scale, which is parts per thousand (*i.e.* 750 fineness is 18 carat).**