GCSE Geology – 1.3 Sedimentary rocks and their fossil

Sedimentary rocks have three common features:

- They are formed at or very close to the Earth's surface.
- They are deposited in horizontal layers (beds).
- They often contain fossils.

Sedimentary rocks can be formed in three different ways:

Clastic – formed by the accumulation of the weathered, eroded, and transported fragments of older rocks (breccia, conglomerate, sandstone, shale). It is classified according to particle size: coarse >2mm, medium 1/16 – 2mm, fine <1/16 mm.
Organic – formed by the accumulation of organic matter (coal from plants, limestone from seashells).
Chemical – formed by precipitation of minerals from seawater (limestone, rock salt, rock gypsum). All limestones react with dilute hydrochloric acid, effervescing and giving off CO_2.

Weathering is the disintegration and decomposition of rocks in situ at the Earth's surface by physical, chemical, and biological processes. This produces rock fragments, unreactive quartz grains and ions in solution which are the building blocks of sedimentary rocks (along with organic matter).
Erosion is the removal of the products of weathering from the site of formation by wind, water (rain, rivers, the sea), ice and gravity. Increasing the distance of transport results in sedimentary grains becoming more rounded, smaller, and better sorted due to continual abrasion and attrition.

Sedimentary rock type is dependent upon the **environment** in which it is deposited:

-Shallow marine (beach and continental shelf) – conglomerate, sandstone, limestone
-Deep marine (continental slope and abyssal plain) – turbidites, black shale
-Terrestrial (on land, rivers and deltas) – conglomerate, sandstone, shale, coal
-Terrestrial (on land, deserts) – breccia, desert sandstone
-Terrestrial (on land, coastal lagoons and lakes) – rock salt (halite), rock gypsum
-Terrestrial (on land, ice sheets and glaciers) – glacial till/ tillite.

Fossils in sedimentary rocks indicate past sedimentary environments. Reef-building corals indicate shallow marine (<50m deep), warm water (22-28˚C) and clear water (sediment-free) within the tropics. Trilobites and ammonites both indicate marine of variable depths. Plants (terrestrial/land) may indicate past climate (tropical/temperate). Trace fossils (burrows) indicate shallow water (inter-tidal). Footprints and trackways suggest terrestrial/land.

-Sedimentary rocks contain distinctive **sedimentary structures** characteristic of the way in which the sediments were deposited.
-Laminations are layers of sediment <1mm thick, formed by the very slow deposition of clay minerals from suspension in deep water. Typical of black shales.
-Beds are layers of sediment >1cm thick, up to metres thick. They represent a continuous period of more rapid deposition of medium to coarse-grained sediment.
-Graded bedding is formed by the rapid deposition of poorly-sorted sediment in water. It results in coarser sediment settling quickly, followed by finer material more slowly. The grain size of the bed is coarse at the base and fine at the top. Typical of turbidites.
-Cross bedding is formed by sediment moving as ripples or dunes in one direction. The cross bedding is at an angle to the normal horizontal bedding and represents the front face of a ripple or dune moving along a river channel or across a desert surface. Typical of desert sandstone.
-Ripple marks are preserved on the top of sedimentary beds and formed by sediment being moved by a current of wind or water.
-Desiccation cracks are formed by sediment originally deposited under water being exposed to the atmosphere. As it dries out, the sediment (usually mud) contracts to form a polygonal pattern of cracks which are wider at the surface, tapering to a point just a few mm deep.