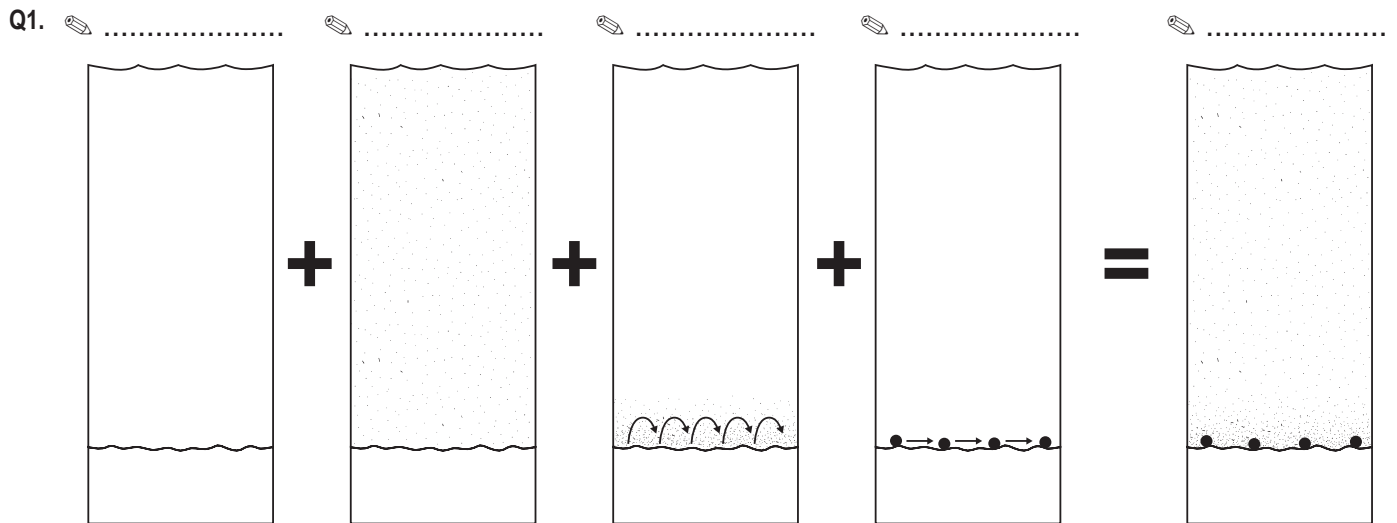



# How rivers carry away material

Rivers carry material of all sizes during a flood. Normally they are all mixed together, but they have been separated in the diagram below.

**Q1.** With each column, match one or more of these words: solution, mud, silt, sand, pebbles. Write the word(s) above the column.

**Q2.** Below each column, write a sentence that describes how the material is moved.



Q2.  .....  .....  .....  .....

.....

.....

.....

**Q3.** What is the only kind of material that moves even when the water appears clear?

 .....

**Q4.** Why does a river suddenly become muddy during a flood?

 .....

.....

## Answers

These questions concentrate on the diagrams that show how rivers carry a variety of sediment. The important point to make is that many kinds of transport are involved, and that sediment, or alluvium if you prefer the word, is made of many kinds of material.

**Qs 1 and 2. From left to right: solution (material carried in solution); suspension (mud and silt is suspended in the water); hopping (saltation) of sand close to the river bed; and rolling of pebbles along the bed. No caption should be placed below the last column.**

**Q3. Material in solution.**

**Q4. Material will only move when the water speed is high enough to move the armouring pebbles, gravel, etc., that cover the bed between floods. Then all grades of material will move, including the clay that makes the water muddy.**

## Resources

- ▶ Large glass jar with soil and water in it. This is to be shaken up and allowed to settle to show that soil, for example, contains many sizes of material.
- ▶ A rectangular tank and some fine sand to make a rocking tank and recreate ripples.
- ▶ A glass with vinegar and an antacid tablet.

## Background support

You may want to introduce the words 'sediment' and 'alluvium' for the material moved and deposited by a river. It is best not to use the word silt too regularly because technically it describes just one size of material (between clay and sand), and doesn't emphasise the variety of material sizes that may be on the move.

For much of the year, the energy of the water is only sufficient to carry dissolved material. This is an invisible process, which is why rivers often look clear. If they are cloudy, then some clay, and possibly silt, is being carried in suspension. Dipping an empty jam jar in a river will make it easy to see just how sediment-laden the water really is.

Solution and suspension are important processes and carry material between floods. However, their effect is minor when compared with the amount of material moved when the river is nearly full and flowing swiftly. During these rare times, the extra energy causes many other types of material to move and also allows more mud to move in suspension. The extra processes at work are the rolling of pebbles, and the bouncing and hopping of sand grains. In general sand, silt, and clay are the only materials carried by suspension no matter how fast the flow. Sand is mainly carried by hopping and bouncing (saltation).

It is important to stress that most material is carried by rivers during floods. This is why field trips are usually unsuccessful in demonstrating transport of sediment. When it is safe to visit them, most rivers are clear.

### Across the curriculum

Using this material you can link:

- ▶ Physical processes, such as buoyancy, viscosity, resistance of sediment, and its shape – flat pebbles align themselves with the direction of greatest force, for example;
- ▶ How to make a variety of test equipment;
- ▶ Chemical action to cause solution;
- ▶ Making physical models to examine phenomena;
- ▶ Concepts of safe working in the field.