Water Sampling

See notes in Krawczyk (1997), p6. Also Saunders (1998), chapter 9.

The first step is to have a PLAN.

What is the **purpose** of the sampling? This will affect the location, number and timing of the sample(s) and the ions and properties to be measured (and hence the volume to be collected and any special on-site treatments & precautions)

Talk to your analytical laboratory before planning the collection. Discuss what you want to analyse for - check the volume they want and any special in-field procedures that are needed. For example, they might ask you to split the sample and acidify one half (for cations). Most laboratories ask for a one litre sample though 0.5 l should suffice for a standard test.

Most states provide a water analysis service for farmers. This will give you a rough indication of the major ions, but they are not geared up for accurate analysis of the unstable HCO_3 ion. There is little point for them when the average farm sample arrives in a Coke bottle that has been rolling on the floor of a ute for a week!

Collection

Collect in a clean non-coloured plastic bottle with water-tight lid.
If collecting from a pumped well, first run the pump for long enough to purge out the stagnant water that has been sitting in the pipe and replace it with fresh water from the aquifer.
Rinse the bottle in the sample stream 3 times before collecting, and fill so as to avoid any air bubbles.
Dry and label the container at once, and clearly.
Do any on-site sample treatments recommended by your laboratory.
The pH should be measured at time of collection, as should also the water temperature at the collection point, and possibly the EC. In most situations you will also measure (or estimate) the discharge rate. For best results, the bicarbonate (HCO_3) should be analysed on site. If not, samples for HCO_3 analysis should be kept chilled but not frozen (use an esky in the field, and keep in a refrigerator at the lab) and delivered to the laboratory as soon as possible after collection.

Typical Analysis for karst studies should include:

pH (ideally measured to 2 decimal places)
EC (electrical conductivity, or resistivity, which is simply its inverse)
Anions: Ca, Mg, Na, K.
Cations: HCO_3, Cl, SO_4,
TDS: (total dissolved solids) is optional but will often be done automatically.

Additional measurements for specific studies include.

Turbidity, Eh, ...
Organic pollution: NO_3, Dissolved Oxygen (DO),
NB for DO the bottle must be airtight and if not tested immediately in the field then it should be stabilised with $MnSO_4$ and KI solutions (talk to your laboratory).
Special karst studies: dissolved CO_2 (is best done in field) ..... etc

Further reading

Krawczyk, W.E., 1997: *Manual for Karst Water Analysis.* International Journal of Speleology, Handbook 1 - Physical Speleology. 51pp.
[This is for those who wish to 'roll their own' karst water analyses or do the essential in-field tests for dissolved oxygen or free CO_2. She details analytical procedures, instruments, glassware & reagents for a field laboratory as well as a base laboratory. A section on 'Elaboration of Results' provides a set of spreadsheet formulae for calculating calcite SI from the results and a conversion from EC to TDS.]

Sanders, L.L. 1998: *A Manual of Field Hydrogeology*. Prentice Hall. 380pp.
[A manual of field techniques. It is not specific to karst but is a very useful practical guide regardless - especially if you have had little field experience.]