Some reactions of carbon dioxide– student sheet

Apparatus
- Student information sheet and worksheet
- Clear plastic sheet (eg ohp sheet)
- Plastic petri dish (base + lid), 9 cm
- Plastic pipette
- Scissors

Chemicals
- Solutions contained in plastic pipettes, see standard health and safety guidance here https://rsc.li/3LNbkfo
- Hydrochloric acid 1 mol dm\(^{-3}\)
- Barium nitrate solution 0.2 mol dm\(^{-3}\)
- Sodium hydroxide 0.5 mol dm\(^{-3}\)
- Small marble chips

Procedure
- You must wear eye protection.
- Cover the worksheet with a clear plastic sheet.
- Place the base of the petri dish directly over the circle below. Place the reaction vessel in the centre.
- At the corners of the triangle add drops of the test solutions as indicated below (Care: barium nitrate is toxic).
- Put a small marble chip in the reaction vessel and add three drops of hydrochloric acid. Quickly replace the lid on the petri dish.
- Record all your observations over the next 15 min.
- The action of hydrochloric acid on marble chips generates carbon dioxide: \(\text{CaCO}_3(s) + 2\text{HCl}(aq) \rightarrow \text{CaCl}_2(s) + \text{CO}_2(g) + \text{H}_2\text{O(l)}\)

Question
What explanations can you give for your observations?

Health, safety and technical notes
- Students must wear suitable eye protection (Splash resistant goggles to BS EN166 3).
- Hydrochloric acid, HCl(aq), 1 mol dm\(^{-3}\) is of low hazard (see CLEAPSS HazCard HC047a).
- Sodium hydroxide, NaOH, 0.5 mol dm\(^{-3}\) is corrosive (see CLEAPSS HazCard HC091a). Reducing the concentration to 0.4 mol dm\(^{-3}\) means it is an irritant with less of a requirement for goggles.
- Barium nitrate, Ba(NO\(_3\))\(_2\), 0.2 mol dm\(^{-3}\) (s) is a skin/eye irritant (see CLEAPSS HazCard HC011).
One drop of barium nitrate solution
and one drop of sodium hydroxide solution

Reaction vessel
with marble chip
and hydrochloric acid

Two drops of barium
nitrate solution

Two drops of sodium
hydroxide solution

There must be a gap between the top of the
reaction vessel and the lid of the petri dish

Lid of petri dish

Reaction vessel