Part B: Removal of Iron Filings

4. Use a magnet to collect the iron filings from the pile of sand and iron filings on the paper towel.
5. Using your fingers, sweep off the filings from the magnet onto another paper towel.
6. Repeat steps 4 and 5 until all the iron filings have been separated from the sand.

Part C: Separation of Alcohol and Water

7. Pour the liquid from the large beaker into a round-bottomed flask.
8. Turn on the water tap so that the condenser tube in the distillation apparatus has water running within its outer walls.
9. Light the Bunsen burner and place it under the round-bottomed flask.
10. When the temperature reaches approximately 78°C, the alcohol will start to boil. At this temperature, the distillate is alcohol.
11. Collect the distillate at the end of the condenser tube into a 10-mL graduated cylinder.
12. Stop collecting the distillate when the temperature has reached 82°C.

13. Distribute the gas into three test tubes. To determine whether the gas is hydrogen, invert the first test tube and place a burning splint just inside its mouth. If you hear a popping sound, the gas is hydrogen. To determine whether the gas is oxygen, invert the second test tube and place a glowing splint just inside its mouth. If the splint ignites, the gas is oxygen. To determine whether the gas is carbon dioxide, pour limewater into the third test tube. If a white precipitate forms, the gas is carbon dioxide.

Technical Skills and Safety

14. (a) This action is unsafe. The student may cut herself with the broken glass through the paper towel. The broken glass may be coated with toxic or corrosive chemicals. Also, the student may not be able to collect all the pieces of broken glass with a paper towel, leaving behind an unsafe work area for other students. The student should have obtained a brush and dustpan from the teacher to collect the broken glass. The broken glass should have been placed in the container designated "Broken Glass" in the classroom.
    (b) This action is unsafe. Rubbing one's eyes does not remove the chemical, but further distributes it and allows it to be further absorbed by the eye, resulting in more irritation and damage. The student should have proceeded immediately to the eye wash station and flushed the eye with water for 10 min.
    (c) This action is safe.
    (d) This action is unsafe. The substances ingested may be poisonous. No chemicals should ever be ingested in a chemistry laboratory.
15. (a) compressed gas
    (b) flammable and combustible materials
    (c) corrosive materials

GETTING STARTED

TRY THIS ACTIVITY: AN INTRODUCTION TO QUALITATIVE ANALYSIS

(Page 7)

(a) Depending on the type of ink used, the banding pattern will vary. One possible colour pattern of bands, moving up the chalk, is blue, brown, red/orange, and yellow. If the steps were repeated using the same black ink and a similar piece of chalk, the pattern of colour would be identical. It would only vary in terms of distance between bands, which depends on how long the chalk was allowed to sit in the water.
(b) As the black ink moved up the chalk, it separated into its component colours.
(c) The separation distances between the bands vary.
(d) The most soluble ink molecules are yellow in colour and the least soluble ink molecules are blue in colour. An experiment that could be conducted to test this hypothesis is to obtain one yellow marker, one blue marker, and two pieces of chalk. One piece of chalk could be used to separate the components of yellow ink, while the second piece of chalk could be used to separate the components of blue ink. The chalk would be identical and the test would be conducted at the same time. The distance travelled up the chalk by each colour of ink would be recorded. If chromatography is based only on size of molecules, the yellow ink should travel farther up the chalk than the blue ink in the same amount of time.
(e) The observations are very similar to the prediction made in (a). The prediction is therefore valid.
(f) An advantage of this separation method is that it is quick, easy to set up, and produces qualitative results. Some disadvantages are that the colour separation is not definitive, and that it is difficult to quantify the results.

(g) Two changes in the procedure that might improve band separation include allowing the chalk to sit in the water for a longer period of time, and using a thinner ring of ink.

REFLECT ON YOUR LEARNING

(Page 7)

1. Some physical properties that may be used to identify matter include colour, odour, texture, boiling point, melting point, and conductivity. Some chemical properties that may be used to identify matter include behaviour in an acidic or alkaline environment.
2. Models are important in science because they allow scientists to communicate their ideas to other scientists. Models help scientists conceptualize, simplify, and/or clarify ideas. When coming up with models, scientists must think through their ideas and test them before presenting them to others.
3. Some careers in which people need to identify matter include forensics, environmental science, and chemistry. Forensic scientists examine crime scenes to find and analyze evidence from a crime scene for use in law enforcement. Environmental technicians test water samples to detect the presence of contaminants. Chemists need to identify different substances produced in a laboratory setting.

1.1 ACTIVITY: IDENTIFYING A MYSTERY POWDER

(Pages 8–9)

Observations

Student answers will vary depending on the powders chosen by the teacher. If the powders suggested in this teacher's resource are used, the following observations will be made.

Table 1

Powder	Appearance
(1) Aspirin	white crystalline powder, slightly yellow tint
(2) powdered sugar	fine white powder, becomes matted easily when touched
(3) sodium dihydrogen phosphate	fine white powder
(4) buffered Aspirin	fine white powder
(5) baking soda	very fine white powder, does not become matted when touched
(6) sodium monohydrogen phosphate	fine white powder

Table 2

	Aspirin	Powdered sugar	Sodium dihydrogen phosphate	Buffered Aspirin	Baking soda	Sodium monohydrogen phosphate
water	insoluble	soluble	soluble	insoluble	soluble	soluble
universal indicator	acidic	neutral	acidic	acidic	basic	basic
$HCl_{(aq)}$	no reaction	no reaction	no reaction	gas released	gas released	no reaction
$Fe(NO_3)_{3(aq)}$	brownish-purple	no reaction	no reaction	brownish-purple	no reaction	no reaction
$I_{2(aq)}$	blue-black	no reaction	no reaction	blue-black	no reaction	no reaction

Student answers in **Table 3** will vary depending on which of the six powders the teacher chooses to be the mystery powder. If buffered Aspirin is provided, the observations will be as follows (on page 8).