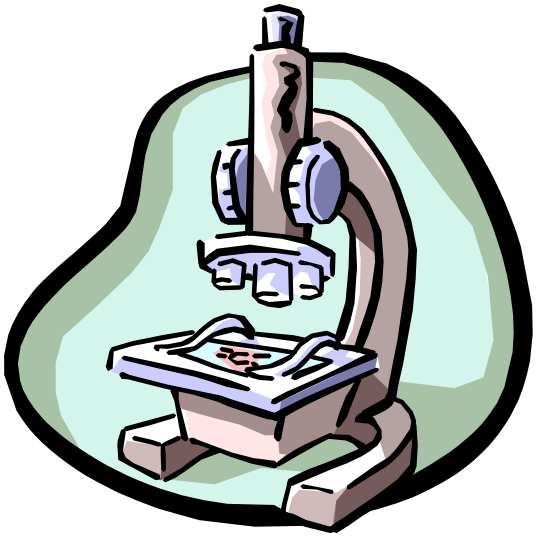
Melbourne High School Science

Year 10 Semester 1 2008



Practical Booklet

Name: ……..

Class: ……..

Teacher: ……

All course information can be obtained from the Science web site:

http://resources.mhs.vic.edu.au/science/

Printed: 13 December 2007

Contents

Safety in the Science Rooms (Laboratory rules)

1. You must not enter the laboratory unless a teacher is present, and you must not enter any preparation room, store room or the roof top nursery except under the direct instruction of a science teacher.
2. Chemicals must not be removed from the laboratory. Theft will be dealt with severely.
3. Never attempt unauthorised experiments. You must follow instructions exactly.
4. If you see another student using an incorrect procedure, point out the error.
5. All apparatus should be examined carefully before use; it should be clean and in working order. Any damaged or dangerous apparatus must be reported immediately. Check all apparatus before putting it away. It should be undamaged and clean. Keep your work area clean and tidy.
6. Avoid waste. Use only small quantities of chemicals and make sure all gas and water taps are turned off before leaving the laboratory.
7. Most waste liquids can be poured down the sink, flush with water if this is the instructed method of disposal. Most waste solids can be disposed of in the bin. Alternative instructions will be given if required. All clean waste paper must be placed flat in the Visy recycle box.
8. If there is an accident, inform your teacher immediately.
9. Whenever you are not sure of how to handle a situation consult with your teacher.
10. Do not handle hot objects, allow sufficient time for the apparatus to cool.
11. Use matches to light a Bunsen burner, not pieces of flaming paper.
12. Be very careful with flammable liquids. Do not open or pour flammable liquids near a flame.
13. Handle glass with respect. Broken glass should be swept up immediately, wrapped and placed in the bin. All accidents must be reported to your teacher.
14. Treat ALL chemicals as poisonous. NEVER taste chemicals. Smell with care and only after being instructed to do so. Avoid skin contact or inhaling any chemicals.
15. Wash your hands thoroughly after using chemicals.
16. Do not eat or drink in the science laboratory.
17. Handle electrical equipment with great care.
18. Always leave the Science rooms looking better than you found them.

What to do in case of accidents or injuries:

1. Inform your teacher immediately.
2. Treat splashes in the eye by irrigating the eye with water continuously for several minutes.
3. Flood spills on the skin or clothes with large amounts of water. This also applies to benches. Clean up.
4. Shower burning paper and other burning solids with water. Use the liquid carbon dioxide fire extinguisher on electrical fires.
5. If a person is on fire, shower with water or cover with a fire blanket. Do not use a fire extinguisher.

Safety is always our first concern!

- Irresponsible and dangerous behaviour will result in your parents being informed and may result in the withdrawal of hands-on practical work.
- Careless handling of equipment causing damage or deliberate breakage will result in the student(s) responsible paying for damaged or broken equipment.
- Serious accidents can occur especially through irresponsibility, disobedience and inattention.
- Class behaviour is also important. Unruly classes will not do practical work.

We expect you to work well, safely & enjoy this excellent subject.

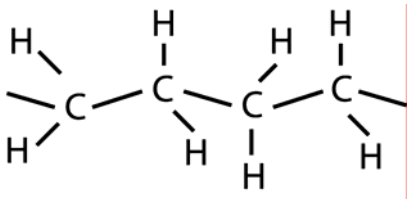
Name: _____

Form: _____

Partner(s): _____

Properties of plastics

The term "plastic" is generally used to describe polymers, large chain molecules that have been made from the reaction of smaller molecules (monomers). The simplest polymer is polyethylene is shown below. Other polymers have a similar structure, but with different groups in place of some of the hydrogen atoms.



polyethylene

Aim: To test the properties of some common polymers and determine the identity of a mystery polymer.

a) polyethylene teraphalate (PET)
b) high density polyethene (HDPE)
c) polyvinyl chloride (PVC)
d) perspex
e) nylon
f) polystyrene (PS)
g) Polymer x

Part A: Appearance

Materials:
Uniform samples of all seven plastics
Procedure:
Describe the appearance of each plastic; is it transparent, flexible etc? Record your results below.

Plastic	Description of appearance
a)	
b)	
c)	
d)	
e)	
f)	
g)	

Part B: Strength

Materials

- uniform samples of all seven plastics
- drawing pin

Procedure

- Push the drawing pin into each of the seven uniform samples to measure the strength of the plastic.
- Rank the plastics from strongest to weakest

Plastic	Observations	Ranking
a)		
b)		
c)		
d)		
e)		
f)		
g)		

Part C: Density

Materials

- beaker
- uniform samples of all seven plastics
- water
- detergent

Procedure

- Add water and two drops of detergent to a 250ml beaker.
- Add each piece of polymer in turn and observe whether it floats or sinks
- Record your observations for all seven plastics.

Plastic	observations
a)	
b)	
c)	
d)	
e)	
f)	
g)	

Part E: Heat test

Materials

- 2 pairs of tongs
- Bunsen burner
- samples of all seven plastics
- bench mat
- fume cabinet

- **Burning plastics can potentially release dangerous fumes. This must be done in the fume cabinet.**
- Ensure that any drips are falling onto the bench mat, rather than down the Bunsen burner shaft.

Procedure

Using tongs, hold the sample of plastic over the bench mat in the flame from the Bunsen burner in the fume cabinet. Withdraw the plastic from the flame and make a note of the following:

- flame
- whether the flame goes out or continues to burn
- whether the plastic is charred after burning
- smoke colour
- whether the plastic drips while burning

Plastic	Flame & smoke description	Continues to burn?	Drips?	Charred?
a)				
b)				
c)				
d)				
e)				
f)				
g)				

Part F: Chlorine test (To be done as a teacher demonstration)

Materials

- copper wire
- Bunsen burner
- dilute hydrochloric acid
- bench mat
- tongs
- samples of all seven plastics

Procedure

1. Clean a piece of wire by holding the wire in the flame with tongs for about 15 seconds.
2. Dip the wire in the hydrochloric acid and then put it back in the flame. The green colour indicates the presence of Cu^{2+} ions. This is caused by the chlorine oxidising the copper atoms to copper ions.
3. Clean the wire again.
4. Place a plastic strip on the bench mat and place the hot wire on the strip and back into the flame. A green flame will indicate the presence of chlorine in the plastic.
5. Clean the wire and repeat for all of the plastic samples.
6. Record the data in the table below.

Plastic	Flame description and colour	Chlorine?
a)		
b)		
c)		
d)		
e)		
f)		
g)		

Conclusion

1. Identify the mystery polymer. Which tests helped to identify this polymer? Which tests were not useful in identifying the polymer?

2. Complete the table below based on your observations:

Plastic	Thermosetting or thermoplastic?
a)	
b)	
c)	
d)	
e)	
f)	
g)	

3. Why must the burning tests be completed in a fume hood rather than in the classroom?

4. Are any of the materials suited to situations where there is a fire risk?

5. Explain the term “density” and identify the two densest polymers that you tested.

Research

1. Many household polymer products have a recycling symbol stamped on them with a number within it indicating the type of polymer for recycling purposes. Research the name of the polymer associated with each of the numbers 1 to 6 and complete the table below showing the structure and name of the polymer.

1.	2.
3.	4.
5.	6.

2. List 6 common household items and identify the polymers used to make them.

Household item	polymer

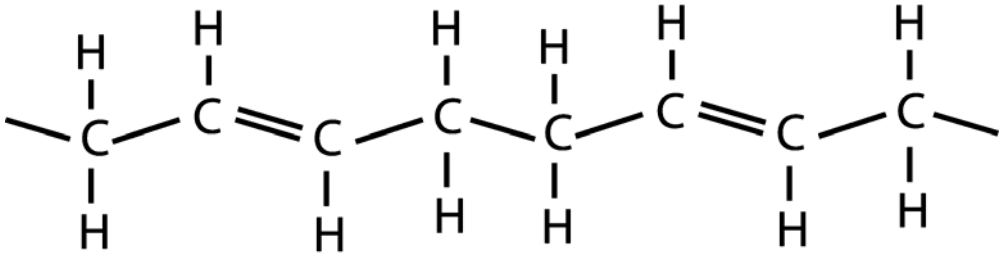
Name: _____

Form: _____

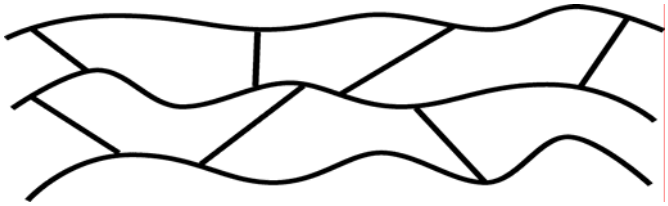
Partner(s): _____

Making rubber balls

Rubber is the heat-treated form of a naturally occurring substance called latex. Latex is harvested from rubber trees. The structure of the polymer is shown below.



After the reaction with acid has occurred, the structure of the rubber is quite different, with cross-linking of the chains.



In this practical you will mix some latex with dilute acetic acid (in vinegar).

Materials

- Latex solution
- Vinegar
- 50 ml beaker
- Stirring rod
- Plastic gloves

- **Safety glasses and safety aprons** must be worn for this prac!
- The latex is dissolved in an ammonia solution and should be opened in a ventilated area.
- The mixture gets really messy with too much acid. Use one or two drops at first, then add only single drops
- If the latex and acid are not mixed quickly or thoroughly, a skin will form on the outside with a liquid centre. Do not squeeze it if this is the case!

Procedure

- Pour a dollop of latex solution into the 50 ml beaker.
- Add two or three drops of vinegar and mix thoroughly.
- Once the latex has started to harden, put on the plastic gloves and roll the ball of rubber in your hand for around 60 seconds or until it has hardened completely.

Questions

1. How do you think that rubber balls would be made in a factory?

2. What properties does your rubber ball have?

3. How could you improve your rubber ball?

Name: _____

Form: _____

Partner(s): _____

Metal Reactivity

Aim

To test the reactivity of a range of metals.

Materials

- water
- 1 M acetic acid (vinegar) (CH_3COOH)
- 1 M sulfuric acid (H_2SO_4)
- 4 test tubes (1.5cm diameter)
- test tube rack
- matches
- sandpaper
- 1 cm strip magnesium ribbon
- 1 cm square of aluminium foil
- 1 cm square of copper foil
- 1 cm square of tin foil
- 1 cm square of zinc foil

- **Safety glasses and safety aprons** must be worn for this prac!
- Any acid spilt should immediately be washed away with water

Method

Before completing the experiment below, your teacher will perform a demonstration of the reactivity of some group I & II metals. Complete the appropriate sections on the table below before proceeding with the experiment.

1. **Clean each piece of metal with some sandpaper until it is shiny.**
2. Place a sample of each metal in separate test tubes.
3. Carefully pour 5ml (approximately 3 cm depth) of water into each of the test tubes containing the metal samples.
4. Tightly cover the top of the test tube with foil to trap any gas produced by the reaction.
5. Record observations over 5 minutes and take note of how vigorously the sample reacted.
6. While keeping the test tube in the test tube rack, test the trapped gas by placing a lighted match inside the test tube (Hint: this needs to be done very quickly after the foil cover is removed, or you can break through the foil with the lit match)- record observations.
7. Repeat steps 3 - 6 for any of the metals that **did not** react with water, replacing the water with the acetic acid.
8. Repeat steps 3 - 6 for any of the metals that **did not** react with acetic acid, replacing the acetic acid with the sulfuric acid.

Results

Metal	Reacts with	Observations	Gas Test Observations
lithium			
sodium			
potassium			
calcium			
magnesium			
aluminium			
copper			
zinc			
tin			

From the results above, answer the following questions:

1. List symbols of the metals tested in order of reactivity:

Most reactive $\rightarrow$ Least reactive

2. Give 2 pieces of evidence that a reaction has taken place between the metal and the acid.

3. Give the word equation for the reaction involving magnesium and sulfuric acid. (Sulfuric acid is hydrogen sulfate solution.)

4. Name the gas that was produced by the reaction.

5. The "pop test" is used to test for the presence of hydrogen gas. This test is a reaction in itself where hydrogen reacts with oxygen to produce water. Give the chemical equation for this reaction.

6. Explain which of the above metals would be the best choice for making water pipes?

7. Sodium is not found in its elemental (pure metal) state on Earth. Explain why not.

8. a) Use a Periodic Table to list the group number and period for each of the metals in the table.

Metal	sodium	potassium	magnesium	calcium	aluminium
Group					
Period					

b) Describe how metal reactivity changes:

i) down the group

ii) across the period

Name: _____

Form: _____

Partner(s): _____

Modelling Allele Combinations

AIM:
By the end of this activity I will be able to explain the probability of the occurrence of particular allele combinations and the resulting phenotype.

INTRODUCTION:
It is often helpful in genetic counselling to be able to advise potential parents about the probability of their children being born with a genetic defect. As genes are found on chromosomes and chromosomes occur in pairs, the probability of one or the other chromosome from one parent being passed on to their children is 50:50. The type of inheritance pattern for the specific gene will determine the probability of showing the defect, being a carrier of the defect or not acquiring the gene at all.

APPARATUS:
2 x 20 cents masking tape, marking pen.

PROCEDURE:
1. Fix a strip of masking tape around each of the coins and mark one side of each coin with a "*B*", the other side with a "*b*". Each side of each coin represents a gamete. (There is a 50% chance of either a "*B*" or "*b*" toss, the same as passing on one or other chromosome to offspring). One coin represents a "mother " coin, the other is a "father" coin.
2. Each partner should toss one coin and record the letter finishing UP. Fill in the table.
3. Repeat this 50 times and fill in the table after each toss.
4. To complete the outcomes (phenotype) column of the table, use these rules:

- if the letter combination is either *B* + *B* or *B* + *b* the phenotype of the offspring is *B*,
- if the letter combination is *b* + *b* the phenotype of the offspring is *b*.
- (Note: for this experiment we are assuming the characteristic has a dominant / recessive pattern of inheritance where "*B*" represents a dominant allele and "*b*" represents the recessive allele).

5. Collect totals from the whole class for "*B*" and "*b*" tosses and for *B* phenotype (*BB* + *Bb*) *b* phenotype (*bb*).

GROUP RESULTS:

Toss	Coin 1 (B or b)	Coin 2 (B or b)	Outcome (B or b)	Toss	Coin 1 (B or b)	Coin 2 (B or b)	Outcome (B or b)
1.				26.			
2.				27.			
3.				28.			
4.				29.			
5.				30.			
6.				31.			
7.				32.			
8.				33.			
9.				34.			
10.				35.			
11.				36.			
12.				37.			
13.				38.			
14.				39.			
15.				40.			
16.				41.			
17.				42.			
18.				43.			
19.				44.			
20.				45.			
21.				46.			
22.				47.			
23.				48.			
24.				49.			
25.				50.			
				Total	B b	B b	B b

CLASS RESULTS:

	1	2	3	4	5	6	7	8	9	10	Average
No B tosses											
No b tosses											
No B phenotypes											
No b phenotypes											
% B phenotypes											
% b phenotypes											

DISCUSSION:

1. What percentage of your group's outcomes were *B*? What percentage were *b*?

2. What percentage of your class outcomes were *B*? What percentage were *b*?

3. The expected fraction of *B* tosses is 1/2.

a) What percentage of your own tosses came down "*B*" ?

b) What percentage of your partners tosses came down "*B*" ?

c) What percentage of the class results came down "*B*" ?

4. Which set of results do you think was most reliable, your group's or the whole class? Why do you think so?

5. If a father had blue eyes (genotype *bb*) and his brown-eyed wife (whose father had blue eyes) were having a baby, what would be the probability that the baby's eyes would become blue ? What is the probability that the baby's eyes would become brown? (N.B brown eyes is dominant to blue eyes). Show all working, including a pedigree chart from the child's grandfather to the child, assuming it is a son.

6. If a mother could not roll her tongue, nor could the father, what is the probability that the child could? (N.B tongue rolling is dominant)?

7. If the child is born with attached ear lobes, and its mother's ear lobes are free, what is the probability that the father's lobes are attached N.B attached lobes is dominant)?