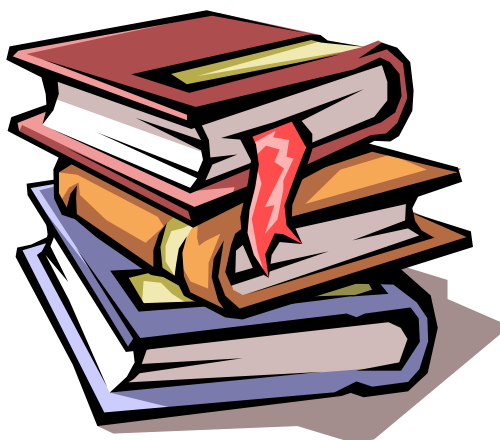




Melbourne High School Science Year 9 Semester 1 2006



Worksheet Booklet

Name:

Class:

Teacher:

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

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

The study of science

Glossary: Match the following terms to the definitions

Revise what you know already by matching the words with their meanings. Choose the words from the following list.

experiment, generalisation, hypothesis, inference, model, observations, prediction, scientific method, theory, variable.

- a) A well thought out scientific test, usually designed to test a hypothesis or prediction.
- b) An explanation of an observation.
- c) Any changeable factor that may influence the results of an experiment.
- d) What a hypothesis becomes after it has been supported again and again by experimental results.
- e) Information about objects and events, collected using one or more of your senses.
- f) A way of representing something which can not be observed directly.
- g) A statement or conclusion based on many observations that holds true for most cases.
- h) A forecast of what a future observation will be.
- i) A series of steps used in science to solve problems.
- j) A generalisation that can be tested by experimenting.

Questions

IDENTIFYING VARIABLES

Anthony is designing an experiment to investigate whether it is true that mosquitoes do not bite people with low blood pressure as often as people with higher blood pressure.

- 1. Which will be Anthony's independent variable?
- 2. Which will be the dependent variable (which factor depends on the independent variable)?
- 3. Suggest ways of measuring each of your variables.
- 4. What other variables will Anthony need to control to ensure that the results of his test are valid?

DESIGNING EXPERIMENTS

- 5. Match these four words to the four statements below: inference, observation, hypothesis, prediction.
 - a) My pulse is 56 beats per minute.
 - b) My pulse rate will increase when I run.
 - c) The more active you are the higher the pulse rate.
 - d) I think that my pulse rate is caused by my heart beating.
- 6. A magnet moving through a coil of wire generates an electric current. What *variables* could be changed to produce a larger current?
- 7. Billy set up five pots, each containing 10 small cabbage plants. Each plant was 4-5cm high and each pot had the same amount of loam soil in it. On the day after the cabbages were planted, Billy added different amounts of fertiliser to each pot, From then on he watered the plants the same amount each day. He observed the growth of the plants over 14 days. His results are shown below:

POT	AMOUNT OF FERTILISER ADDED (ML)	OBSERVATIONS AFTER 14 DAYS	
		COLOUR OF LEAVES	AVERAGE HEIGHT (CM)
1	NONE	PALE GREEN	8
2	5	GREEN	8
3	10	GREEN	12
4	15	GREEN	15
5	20	YELLOW	5

- What was the aim of Billy's experiment?
- What variables were controlled and how?
- What conclusions can you draw from these results?
- How could Billy come up with a more definite conclusion?

EVALUATING

Lauren and Amy worked separately to solve this problem: A cube of sugar has about the same mass as a level teaspoon of sugar crystals. Which will dissolve more quickly?

LAUREN

Method:

- Fill two glasses with tap water.
- At the same time add a teaspoon of sugar crystals to one and a cube of sugar to the other.

Results:

The cube broke up into a pile of crystals and took about the same time to dissolve as the teaspoon of crystals.

Conclusion:

AMY

Method:

- Fill a glass with water from the tap.
- Add a teaspoon of sugar crystals and stir.
- Use a stopwatch to measure how long it takes for all the sugar to dissolve.
- Repeat the experiment using a sugar cube in a glass of tap water

Results:

	Time to dissolve			
	Trial 1	Trial 2	Trial 3	Average
Sugar crystals	69	65	61	65
Cube of sugar	66	74	76	72

Conclusion:

8. Write a conclusion for Lauren's experiment.
9. Write a conclusion for Amy's experiment.
10. Lauren claimed that her experiment was better because she solved the problem more quickly than Amy did. Do you agree with her? Explain.
11. How can you explain the fact that Amy obtained different results in her three trials?
12. Why did Amy calculate the average in each case?
13. Would Amy's conclusion have been different if she had not repeated her measurements? Explain.

DRAWING AND INTERPRETING GRAPHS

Tam used a spring balance to measure the force needed to pull two long pieces of Velcro apart. The Velcro strips were 2 cm wide and 10 cm long. The bottom strip was clamped at the end to the edge of the table. The top strip was connected to the spring balance. Tam varied the length of Velcro that was in contact, which meant that he varied the contact area. His results are below.

Length of Velcro in contact (cm)	Force needed to separated the two strips (newton)			
	Trial 1	Trial 2	Trial 3	Average
1	38	38	40	
2	86	80	78	
3	130	126	126	
4	149	166	165	
5	218	198	199	
6	241	216	248	
7	291	281	277	
8	318	315	326	

14. Which is the independent variable in Tam's experiment?
15. Which is the dependent variable?
16. For each length of Velcro calculate the average force needed, and add these to the data table. Use Tam's data to draw a graph (line of best fit). Remember that the independent variable should be on the x-axis and the dependent on the y-axis. Use a sheet of graph paper
17. Write a generalisation describing the relationship between the two variables.

18. Complete these sentences.

*An increase in the length of Velcro in contact causes an increase in
 Similarly, a decrease in the length of Velcro causes a in
 The fact that the graph is a straight line means that the increases or decreases
 are equal. For example, if you double the length of Velcro you
 the force needed, and if you triple the length you
*

19. Use your graph to make these predictions:
 - a) How much force is needed to pull the Velcro apart if there is 4.5 cm in contact?
 - b) How much Velcro is in contact if the force needed is 300 N?
 - c) How much force is needed if there is 10 cm of Velcro in contact?

20. Which of your predictions in Question 7 are *interpolations*?
21. Which of your predictions in Question 7 were *extrapolations*?

MEASUREMENT AND UNITS

22. When the decimal moves to the right, the exponent is positive / negative. (circle one)

23. When the decimal moves to the left, the exponent is positive / negative. (circle one)

24. Put the following numbers into standard form:

a) 1 234 567	b) 0.00234
c) 987 673 239 234	d) 0.00000000067
e) 4 550 000 000	f) 456 005.907
g) 34 700 000	h) 57
i) 123.4567	j) 0.000000034500

25. Complete the following table.

Quantity	Symbol for Quantity	SI Unit	Symbol for Unit
mass			
			s
		metre	
	T		

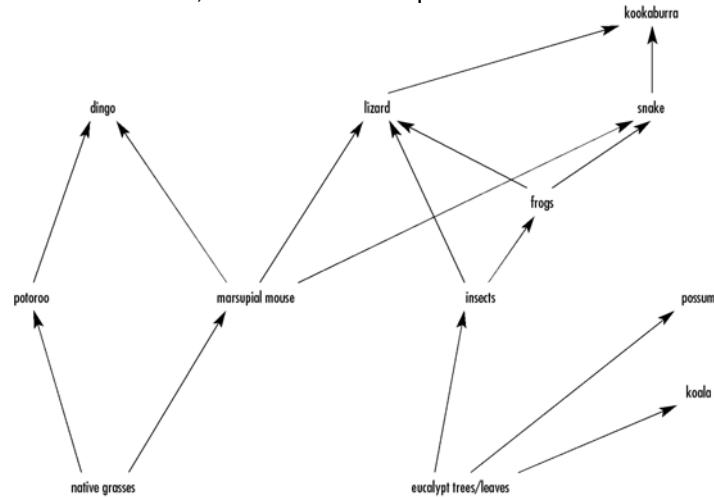
26. Complete the following table describing the use of prefixes for units.

Prefix	Symbol	Meaning	Factor
kilo			
	μ		
		one hundredth	
			10^{-3}

27. Complete the following conversions:

a) 3.012 kg = _____ g	b) 0.0001 m = _____ mm
c) 45kg = _____ mg	d) 57 cm = _____ km
e) 9874 μ g = _____ mg	f) 0.0347 ms = _____ s

Examine the food web shown below, then answer the questions 7- 10.



7. List the producer organisms in this food web.
8. Explain why the producer organisms are important.
9. Prepare food chains that represent the kookaburra as:
 - a) a third-order consumer
 - b) a fourth-order consumer
10. The kookaburra is a carnivore. Explain how it relies on the producer organisms for its survival.
11. Not all of the chemical energy present at each level of a food chain is passed on to the next level. What happens to the energy which is not passed on?
12. What limits the length of a food chain?
13. There are different types of food chains, called predator-prey, detritivore, decomposers and parasite-host food chains. Bacteria and fungi as decomposers are the last link. Explain why the last link is so important.
14. Consider a simple ecosystem consisting of a single food chain, where a crop plant is eaten by an insect (such as a grasshopper), which is eaten by a bird (such as a kestrel).
 - a) What might be the effect on the number of grasshoppers from shooting the kestrels?
 - b) What subsequent effect might there be on the crop?
15. If the ecosystem were more complex with more food cross-linked in a food web, would the effect of shooting one species of bird be the same as in a monoculture? Explain your answer.
16. 'Spraying a lake with DDT to control mosquitoes is justified provided that the concentration of DDT in the spray is not directly lethal to fishes and birds'. Explain why this statement is false.
17. Explain the differences between anaerobic respiration and aerobic respiration.

Understanding atoms

Glossary: Define the following terms

atom
 atomic number
 boiling point
 chemical symbol
 compound
 element
 isotopes
 mass number
 melting point
 periodic table

Questions

1. State the *Law of Conservation of Mass* as it applies to chemical reactions.
2. In what way(s) are the plum pudding and the shell models of the atom (i) similar (ii) different?
3. Atoms contain positively charged particles and negatively charged particles yet they are electrically neutral. Explain how this is possible.
4. You are given the atomic number (Z) and mass number (A) of a particular atom. In terms of Z and A, how do you calculate (i) the number of electrons in the atom (ii) the number of neutrons in the atom?
5. Distinguish between groups and periods as used in the periodic table.
6. How many electrons are there in the outer shell of neon, argon, krypton, xenon and radon atoms? Although helium is located in the same group of the periodic table as all of these elements, it is not included in this list - why not?
7. The first 2 letters of the word 'copper' are C and O. Why, then, is the symbol *Cu*, rather than *Co*, used for copper?
8. State the number of protons, number of neutrons and number of electrons in ${}^9_4\text{Be}$ and ${}^{37}_{17}\text{Cl}$.
9. Draw electron shell diagrams for the atoms in Question 8.
10. Complete the table about atoms:

<u>element</u>	<u>symbol</u>	<u>atomic number</u>	<u>electron configuration</u>
	B		2,3
	F		
lithium		3	
		16	
			2,8,8,1
carbon			

11. Name and give the symbols of two elements that you would expect to have similar properties to (i) potassium and (ii) iodine.

12. Both carbon and lead (*Pb*) are members of the same group in the periodic table (group IV in the old naming scheme, group 14 in the new one) yet their properties are quite different. Why are their properties different?
13. Why are neutrons much less common overall in the universe than are protons or electrons?
14. Sodium chloride crystals do not conduct electricity yet both sodium chloride solution (sodium chloride dissolved in water) and molten sodium chloride (above its melting point of 801°C) do. Explain this in terms of the mobility of charged particles.