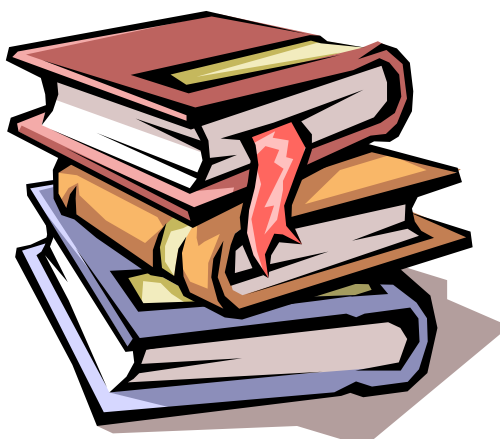




Melbourne High School Science

Year 10 Semester 2 2004



Worksheet Booklet

Name:

Class:

Teacher:

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

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

Materials & Society

Glossary: Define the following terms

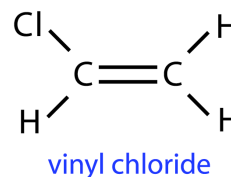
Acid
Alloy
Base
Corrosion
Monomer
Oxidation
pH scale
Polymer
Reactivity
Smelting

Questions

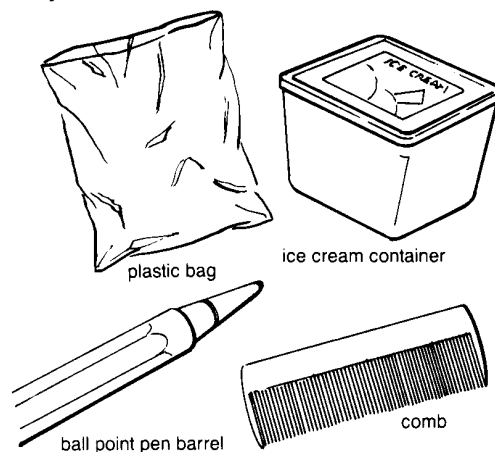
1. Explain why it is that silver and gold can be found in nuggets, but sodium and magnesium can not.
2. Where on the periodic table would you find the most reactive metals?
3. Describe one method by which a metal can be extracted from its ore.
4. Explain what is meant by the term *alloy*. List five alloys and their uses.
5. Explain why the exhaust pipe on a car will corrode over time.
6. What conditions are necessary for iron to rust. Why can't rusting be reversed?
7. Describe (in a number of steps) the process of electroplating. What is electroplating used for?
8. Draw the molecules of the following hydrocarbons:

- | | |
|------------|-------------|
| a) methane | b) ethane |
| c) butane | d) butene |
| e) butyne | f) hexane |
| g) octane | h) decane |
| i) ethanol | j) methanol |

9. Describe the similarities and differences in the chemical and physical properties of the hydrocarbons in a homologous series.
10. Explain why figure 2.21 on page 46 of the textbook is incorrect.
11. Describe how crude oil can be separated to produce derivatives such as gases, oils, waxes and tar.
12. What is meant by the term plastic?
13. Describe the relationship between a monomer and polymer.
14. The vinyl chloride acts as monomer in the formation of a polymer.
 - a) What is the name of the polymer formed?
 - b) Draw the structure of this polymer.



15. Describe the differences between a thermoplastic and a thermosetting plastic. What advantages does each type of plastic have?
16. Describe at least three processes by which plastic can be extruded and moulded.
17. How can plastics be recycled? Why must different plastics be separated for recycling?
18. Plastics have different properties. Describe how you could test these four different plastics for strength, density and flammability.



19. What is meant by the term acid? List at least three examples of compounds that act as acids.
20. What is meant by the term base? List at least three examples of compounds that act as bases.
21. Explain what is meant by the term indigestion and explain how an antacid works to relieve the pain.
22. Describe how an indicator, such as bromothymol blue, works. How does a universal indicator give a variety of colours for different pH values?
23. Write fully balanced equations for the following acid base reactions:
 - a) $\text{NaOH}(\text{aq}) + \text{H}_2\text{SO}_4(\text{aq})$
 - b) $\text{CaCO}_3(\text{s}) + \text{H}_2\text{SO}_4(\text{aq})$
 - c) $\text{Mg}(\text{s}) + \text{HCl}(\text{aq})$
 - d) $\text{Al}(\text{s}) + \text{HNO}_3(\text{aq})$
 - e) $\text{CaCO}_3(\text{s}) + \text{HCl}(\text{aq})$ (hint: a non-flammable gas is produced)
24. What types of products will always be produced from reactions between:
 - a) Metals and acids
 - b) Acids and bases

Motion in motion

Glossary: Define the following terms

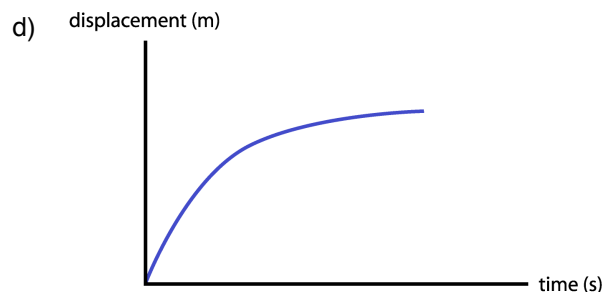
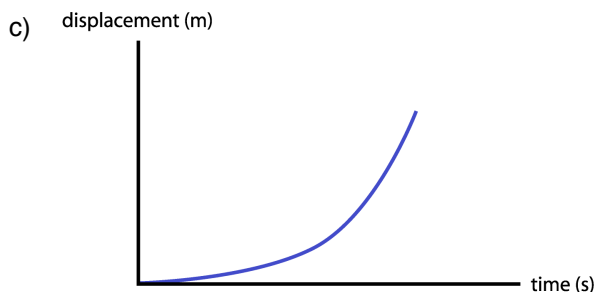
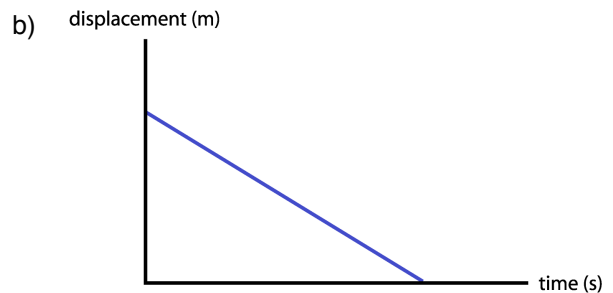
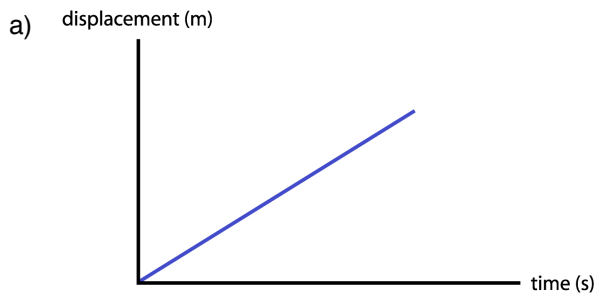
acceleration
 displacement
 distance
 force
 gravity
 inertia
 momentum
 speed
 velocity
 weight

Questions

1. Which of the following motion represents an acceleration?
 - a) Moving forward at a constant speed
 - b) A car slowing down for a red light
 - c) A car stationary
 - d) A cyclist turning a corner at a constant speed

2. A walker travels 100m north, 25m east, 100m south and then 25m to the west in five minutes.
 - a) What is his final position?
 - b) What was his average speed?
 - c) What was his average velocity?

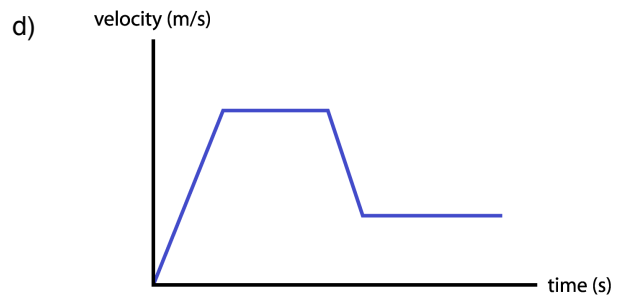
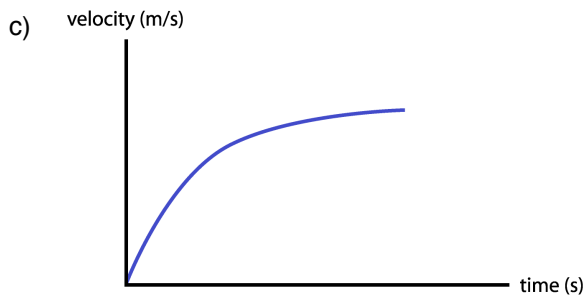
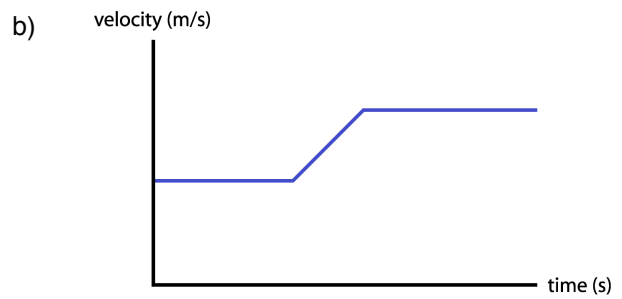
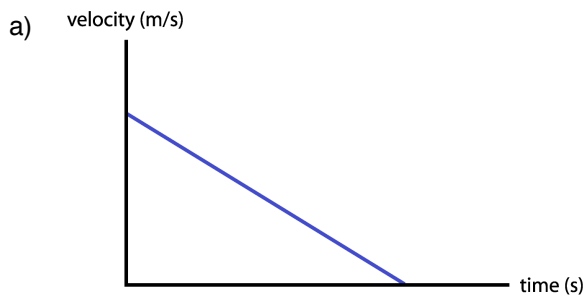
3. Describe in terms of direction, displacement and velocity the following diagrams of displacement vs time.



4. A car travels 5km in 4 minutes. Calculate its average speed in km/h and m/s.
5. Draw a displacement time graph for the motion described below:

A cyclist sets out at 8.00, headed west along Main Road at a constant speed. At 8.12 he sees on a sign that he has travelled 4km and realising that he will be late for school increases his speed. At 8.20, having travelled the distance of 8km to school he stops at the gate. It's then that he realises that he has forgotten his homework. He races back home at 40 km/h and grabs his work. On leaving the front gate he notices a flat tyre and spends the next 10 minutes fixing it. He sprints off, riding at a constant speed to just make it to school for the 9.00 start.

6. From the graph for the question above, calculate:
 - a) What was the average speed of the cyclist in the first 12 minutes?
 - b) What was the average speed of the cyclist between 8.12 and 8.20?
 - c) At what time did the cyclist arrive home to collect his homework?
 - d) At what speed must the cyclist have ridden to make the 9.00 bell?
7. Describe in terms of direction, displacement and velocity the following diagrams of velocity vs time.



8. Draw a velocity time graph for the motion described below:

A car drives along the straight road at 20 m/s for 10 seconds, then slows at a constant acceleration to 10 m/s in 10 seconds. After 10 seconds of constant speed, the brakes are applied to come to rest in 2 seconds. The car rests for 10 seconds, then reverses back accelerating at a constant 1 m/s^2 for 6 seconds. This speed is maintained for 5 seconds and then the car stops at a constant acceleration in 2 seconds.

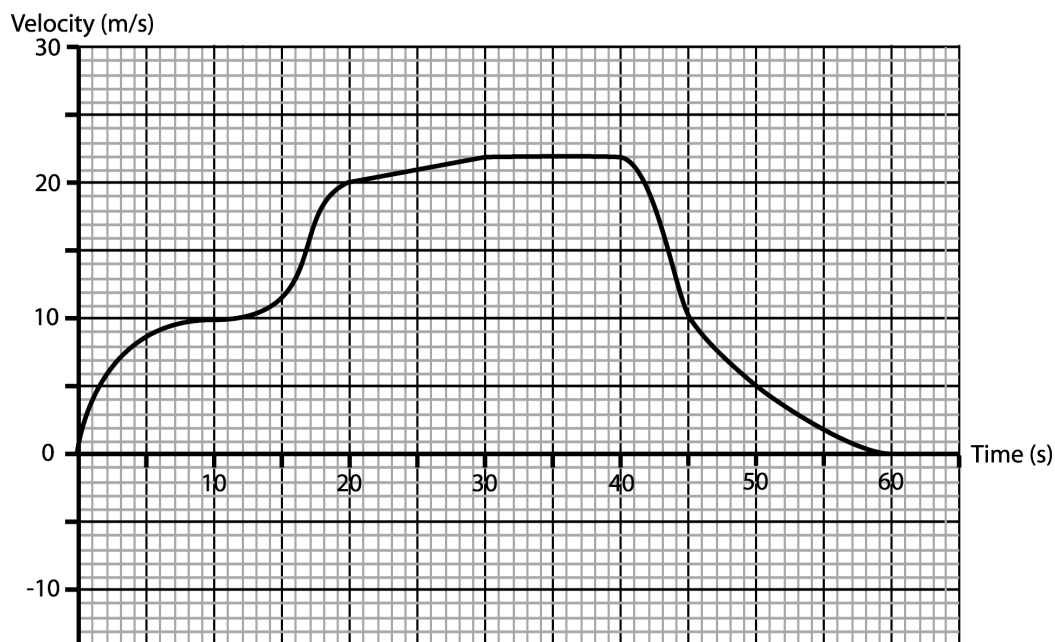
9. From the graph for question 8, calculate:
 - a) The highest speed reached by the car
 - b) The period of highest magnitude of acceleration
 - c) The final displacement of the car
 - d) The total distance covered by the car.

10. A runner is travelling at 10 m/s 3 seconds after starting her race. Calculate her average acceleration for that time.

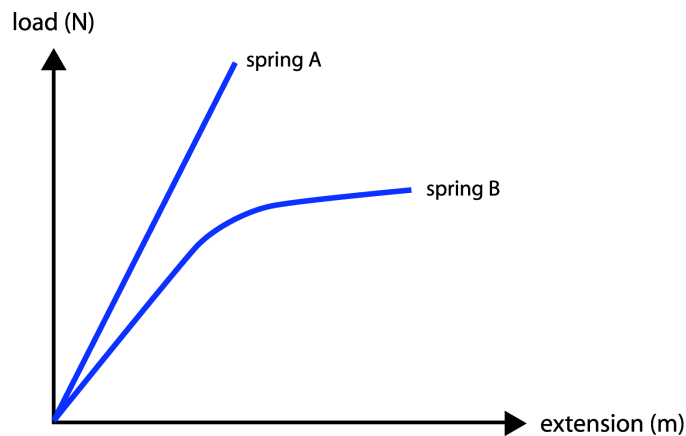
11. A car initially travelling at 20 m/s stops in 8 seconds. Calculate the rate of deceleration of the car.
12. Calculate the distance travelled by the car in the question above as it slows.
13. A Ford Falcon has brakes and tyres that are capable of producing an acceleration of -6 m/s^2 while braking. A driver travelling at 25 m/s sees an echidna on the road 80m ahead and after taking 1 second to react, slams on the brakes.
 - a) Calculate the time that it takes for the car to brake to rest.
 - b) Calculate the distance covered by the car before braking.
 - c) Calculate the distance covered while braking.
 - d) What happens to the echidna?
14. The following data is recorded for the height (displacement) of a ball above the ground:

Time (s)	Height (m)	Velocity (m/s)
0.00	1.000	
0.02	0.998	
0.04	0.992	
0.06	0.982	
0.08	0.968	
0.10	0.950	
0.12	0.928	
0.14	0.902	
0.16	0.872	
0.18	0.838	

- a) Complete the table by calculating the average velocity during each time interval.
 - b) In what direction is the ball moving?
 - c) In what direction is the ball accelerating?
 - d) What is the displacement of the ball at 0.20s?
 - e) Estimate the rate of acceleration for the motion.
 - f) Sketch the shape that you would expect for displacement and velocity vs time graphs.
15. Complete the following questions about the motion of the car shown in the velocity-time graph below.



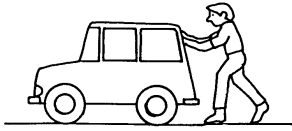
- a) Describe in a few sentences the motion of the car. You will need to mention *displacement*, *velocity* and *acceleration* and how these change over time.
 - b) State the velocity at $t = 0\text{s}$, $t = 20\text{s}$ and $t = 40\text{s}$
 - c) Calculate the acceleration at $t = 0\text{s}$, $t = 10\text{s}$ and $t = 25\text{s}$
 - d) At what times was the car speeding up?
 - e) At what times was the car slowing down?
 - f) At what times was the velocity of the car constant?
 - g) What was the maximum magnitude of acceleration?
 - h) What was the displacement of the car at the end of the motion?
16. A 10,000kg truck, travelling south at 20m/s collides head on with a 1500kg car travelling north at 25m/s. As a result of the impact, the two vehicles join together as one large, crumpled mass.
- a) Calculate the momentum of the truck before the collision.
 - b) Calculate the combined momentum of the truck and car before the collision.
 - c) Calculate the combined momentum of the truck and car after the collision.
 - d) Calculate the combined speed of the truck and car after the collision.
 - e) State the direction in which the truck and car move after the collision.
17. A student performs an experiment to see if Hooke's Law works. He uses two springs. After taking measurements, he plots a graph of load against extension for each spring and obtains the results in the Figure below.



- a) Which was the stiffer spring?
 - b) Explain the shape of the extension graph for Spring B.
18. The value of g is measured to be 9.81 N/kg at one location. What would be the weight in N of the following masses at this location?
- a) 0.1 kg
 - b) 1 kg
 - c) 5 kg
 - d) 235 g
19. An astronaut travelling through space lands on an unexplored planet. The astronaut's mass (including spacesuit) is 120 kg. He measures his weight on the planet to be 540 N.
- a) What is the value of g on the surface of the planet?
 - b) What would his weight be on Earth?
 - c) Is the planet more or less massive than Earth?

20. Describe the forces acting in the situations below. Indicate any unbalanced forces and the overall force in each example.

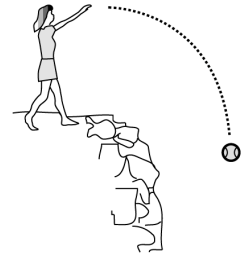
- a) The man is trying to move the car, but the car is not moving.



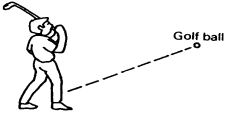
- b) No brakes, no pedalling, slowing down.



- c)



- d)



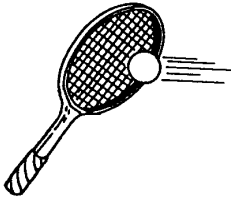
- e)



- f)



- g)



- h)



- i)



21. A scientist uses a very sensitive spring balance to weigh small objects. If the object weighs 1 N at sea level near Kooliwarra (36°S) would you expect it to weigh more or less or just the same in the following locations (give your reasons and do not assume that the Earth is perfectly round).

- the equator (at sea level).
- at the top of Mt Everest?
- a helicopter hovering at 2000 m above Kooliwarra?
- the North pole?

22. Explain why passengers in a car that slows down feel themselves moving forward.

Evolution

Glossary: Define the following terms

adaptation
artificial selection
convergent evolution
divergent evolution
homologous structures
mutation
natural selection
parallel evolution
speciation
variation

Questions

1. What is a gene pool? How do gene pools change over long time periods?
2. What does the term evolution mean to you?
3. Use point form to compare how Darwin and Lamarck would have explain the long neck of a giraffe.
4. What is selection pressure? What are some factors in an organism's environment that could act as selection agents?
5. Why is the fossil record incomplete?
6. In genetic terms, why do you think a species of organisms that produce offspring 12 times a year can evolve more rapidly than a species that only produces offspring once a year?
7. There are flightless birds on several different continents; there are emus in Australia, ostriches in Africa rheas in South America. There used to be flightless moas in New Zealand, and New Zealand still has some flightless kiwis. In what ways does the existence of these widely separated flightless bird species support the ideas of continental drift and evolution of species?
8. Explain whether the following pairs of organisms show convergent, divergent or parallel evolution.
 - a) butterflies and bats
 - b) dolphins and porpoises
 - c) sharks and whales
 - d) snakes and lizards
 - e) eels and earthworms
 - f) zebras and horses
9. What does the expression survival of the fittest really mean in genetic and evolutionary terms?
10. With reference to gene pools, what is extinction?
11. How is extinction related to survival of the fittest?
12. Explain whether you think extinction of a species could ever have been a natural event?
13. Explain why the sort of breeding carried out in agriculture is known as "artificial selection".

14. Wild budgerigars are green, but those kept as pets come in many different colours. Why is this?
15. How might modern technologies and lifestyles be altering human gene pools and reshaping human populations and the human species as a whole?
16. Explain how resistance to anti-biotics in bacteria occurs. Explain why this is an example of evolution.