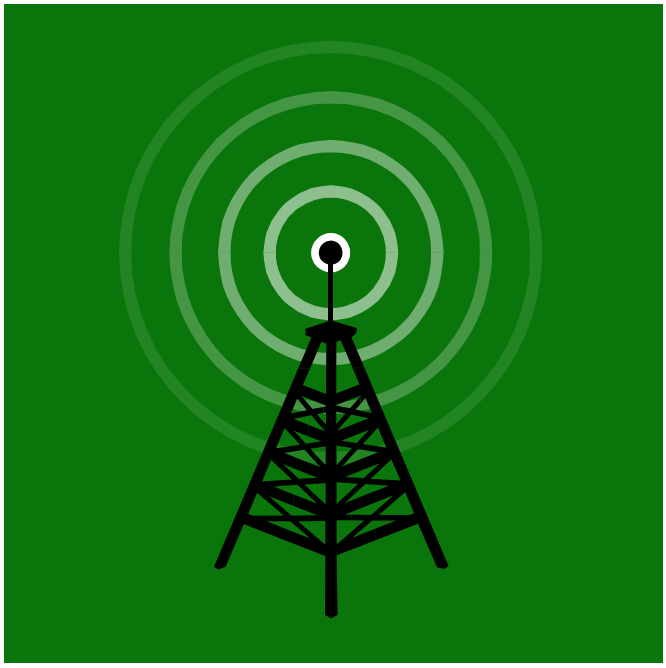
Year 9

Waves and Electricity

HOMEWORK BOOK



Worksheet 1

Find-a-word

C	R	J	M	K	O	P	X	D	C	R	E	S	T	R	M	V	E	C	U
O	P	E	O	O	U	B	E	M	R	D	K	H	Q	G	O	I	L	J	L
M	L	D	K	F	T	R	K	A	R	P	N	T	N	A	E	S	E	U	T
M	S	O	V	E	A	A	E	L	N	A	A	G	Y	M	G	I	C	S	R
U	J	Y	N	R	L	L	S	N	V	M	Y	N	W	M	R	B	T	M	A
N	D	Z	F	G	C	W	S	Z	P	I	Q	E	T	A	A	L	R	E	V
I	O	N	E	U	I	F	B	L	N	W	Z	L	R	O	D	E	O	C	I
C	I	H	N	R	G	T	I	T	S	S	O	E	O	P	I	D	M	H	O
A	E	Y	Q	S	C	T	U	S	E	S	J	V	U	M	A	N	A	A	L
T	I	R	G	O	U	J	K	D	E	L	R	A	G	I	T	O	G	N	E
I	M	Y	A	D	N	M	I	M	I	G	E	W	H	Y	I	R	N	I	T
O	X	G	E	D	C	V	W	Y	B	N	B	C	Q	B	O	T	E	C	G
N	J	S	Q	V	I	A	H	X	P	P	A	V	T	K	N	U	T	A	E
A	G	I	P	V	D	O	W	S	E	B	J	L	O	R	P	E	I	L	V
W	B	R	A	D	I	O	A	C	T	I	V	E	W	D	O	N	C	W	A
Z	S	A	P	O	F	M	N	O	T	O	R	P	A	A	O	N	Y	A	W
R	F	W	Y	U	S	O	T	Q	O	D	R	A	G	N	V	C	V	V	B
I	L	Z	R	E	M	I	C	R	O	W	A	V	E	S	X	E	P	E	A
S	F	Q	Y	C	N	E	U	Q	E	R	F	E	T	Z	K	F	S	S	J
C	K	S	U	R	F	A	C	E	W	A	V	E	S	T	Q	B	A	A	N

amplitude
atom
communication
crest
electromagnetic
electron
frequency
gamma
infrared
longitudinal waves
mechanical waves
microwaves
neutron
nuclear
proton
radiation
radio
radioactive
surface waves
trough
ultraviolet
visible
wave
wavelength
x-ray

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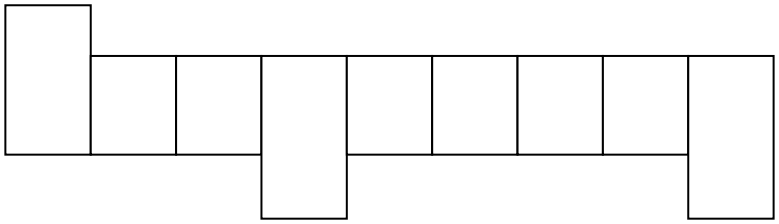
Worksheet 2

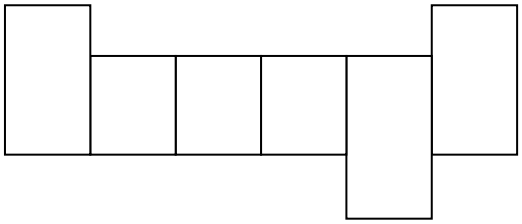
Wave words

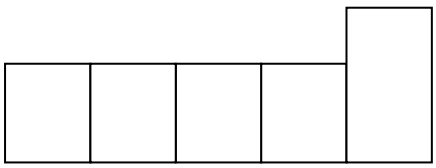
1. Draw lines to match the words in the word list to its definition

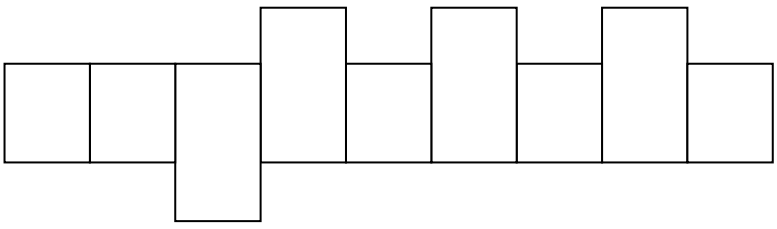
wave	•	• the top of a wave
wavelength	•	• something that carries energy
frequency	•	• the bottom of a wave
amplitude	•	• the number of waves in a given time period
crest	•	• the distance between two crests or two troughs of a wave
trough	•	• waves that do not need a medium to travel through
mechanical waves	•	• waves that require a medium to travel through (e.g. air)
electromagnetic waves	•	• a measurement of the height of a wave

2. Fill in the word outlines using the list of words above.









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Worksheet 3

Electromagnetic radiation

1. Complete the table below

Electromagnetic wave	General use	Use in communication
radio		
microwave		
infrared		
visible		
ultraviolet		
x-ray		
gamma ray		

2. What is the difference between mechanical waves and electromagnetic waves?

   .....

   .....

   .....

3. What is the difference between the wavelength of a radio wave and a gamma wave?

   .....

   .....

4. What is the difference between the frequency of a radio wave and a gamma wave?

   .....

   .....

5. Consider this statement: “The higher the frequency of a wave the more energy it has.” So, which has more energy, a radio or gamma wave?

   .....

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Worksheet 4

School certificate questions - *multiple choice*

1. Which of the following lists contains ONLY forms of electromagnetic radiation?

   (A) Infrared, sound, ultraviolet
   (B) Sound, x-rays, gamma rays
   (C) Infrared, seismic, microwaves
   (D) Gamma rays, ultraviolet, x-rays

2. Mobile phones use microwaves to send information to a transmitter.

   What type of energy is used to carry the information from the mobile phone to a transmitter?

   (A) Electromagnetic
   (B) Heat
   (C) Light
   (D) Sound

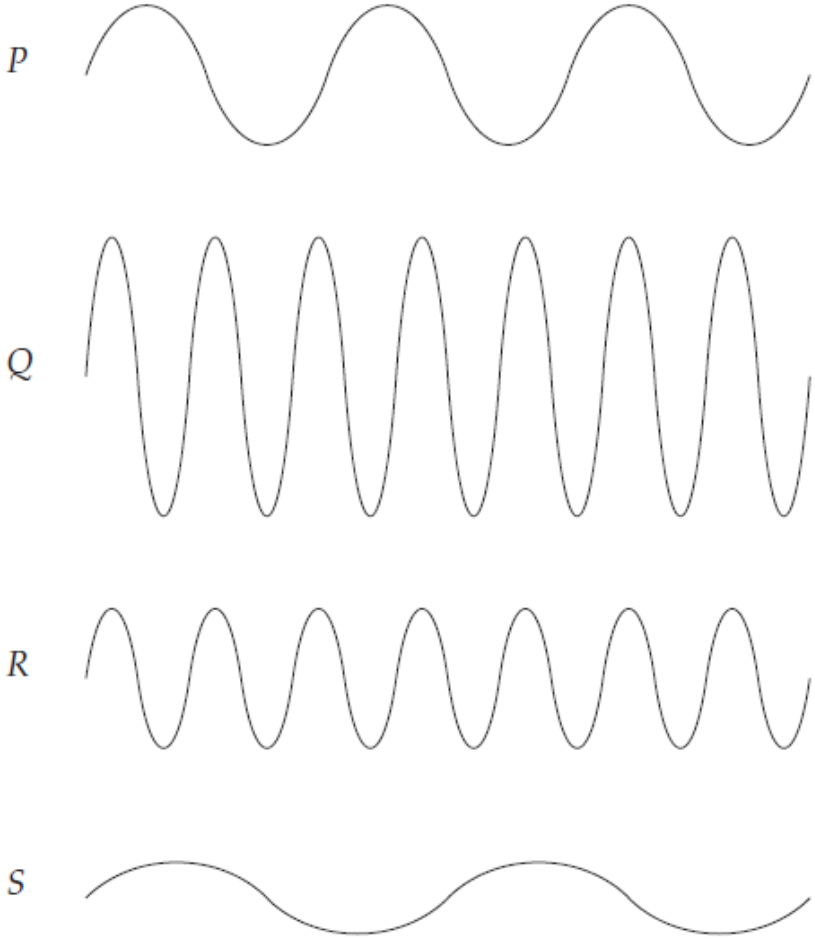
3. What is the *frequency* of a wave?

   (A) The speed of the wave
   (B) The direction of the wave
   (C) The distance between wave crests
   (D) The number of vibrations each second

4. What type of waves are radio waves?

   (A) Electromagnetic
   (B) Electrostatic
   (C) Gravitational
   (D) Sound

5. The diagram shows four light waves drawn to the same scale.



Which statement about the waves is correct?

(A) *P* and *R* have the same energy but different frequencies.
(B) *R* and *S* have the same energy but different frequencies.
(C) *Q* and *S* have different energy but the same frequency.
(D) *P* and *Q* have the same energy and the same frequency.

6. Police use two types of speed detection devices in NSW:

RADAR – stands for ‘RAdio Detection And Ranging’, and
LIDAR – stands for ‘LIght Detection And Ranging’, commonly known as a ‘laser gun’.

Which speed detection device uses electromagnetic radiation?

(A) LIDAR
(B) RADAR
(C) Both devices
(D) Neither device

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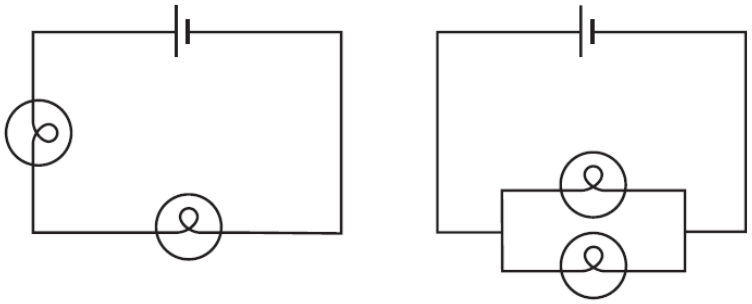
Worksheet 5

Understanding electricity

Skill: Understanding

Look at the two circuits. Twice as much current flows in circuit B as in circuit A. This is because there are two ways for the current to flow.



Here is a model that might help you to understand more about parallel circuits. Imagine a single queue going through one gate only to enter an NRL match between the Knights and the Panthers. With only one gate, five people can enter and pay every minute.

1 Identify which circuit this is like (A or B). _____

2 Predict what would happen if another gate was opened.

_____

3 Calculate how many people would enter every minute once two gates are open.

_____

4 Identify which circuit this is like (A or B). _____

5 Explain why the total current in circuit B is higher than in circuit A.

_____

_____

Each gate is like a resistor in a circuit. It controls the flow. Imagine now that the second gate is twice as wide as the first gate.

6 Calculate how many people could now flow through this gate in one minute.

_____

7 State whether this gate has high or low resistance.

_____

Now imagine that the gate of the truck entrance is opened nearby. No one is taking money at this gate.

8 In terms of people entering the ground, predict what would now happen at each gate.

_____

_____

9 In a circuit this situation is called a short circuit. That is, all current will not go through any of the resistors. Draw on diagram B a wire that creates a short circuit.

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Worksheet 6

Electricity costs

Skills: Understanding, numeracy

Energy usage, including electrical energy, is measured in various units, including kilowatt hours or kWh for short. If you look carefully on an electric appliance, you will find a panel of information on which is a power rating, measured in kilowatts (kW) or watts (W). This rating is a measure of how much energy the appliance uses each hour (or minute or second). Obviously the longer the appliance is operated, the more energy is consumed.

To calculate how much energy a device uses, we multiply the power rating in kilowatts by the number of hours of use. For example, if a 2000 W electric fan heater operates for three hours, to find the energy used first convert the power rating to kilowatts (2000 W = 2 kW), then multiply by the hours of use:

$$\text{energy used} = 2 \times 3 = 6 \text{ kilowatt hours or } 6 \text{ kWh}$$

The cost of each kilowatt hour of energy depends on a number of factors, but a rough guide is 12 cents per kWh. So the cost of operating the fan heater above (which used 6 kWh) is about $6 \times 12 = 72$ cents.

The table below shows typical power ratings of some household electrical appliances.

1 Complete the empty columns for each appliance (assume a cost of 12 cents per kilowatt hour).

Appliance	Power rating (W)	Power rating (kW)	Time used for	Time used for (hours)	Energy used (kWh)	Cost ($)
Standard globe	75		36 hours			
Fluorescent light	40		24 hours			
Hair dryer	1500		10 minutes			
Fan heater	2000		2 hours			
Iron	750		30 minutes			
Computer	350		5 hours			
Microwave oven	1200		15 minutes			
Stove	8000		30 minutes			
Frypan	1500		15 minutes			
Refrigerator	600		1 week			
Washing machine	1000		1.5 hours			
Television	250		2 hours			
Kettle	1800		5 minutes			
Cassette player	10		20 minutes			

2 Calculate the total cost of the electricity over one week by totalling the last column.

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