Sample assessment task	
Year level	9
Learning area	Technologies
Subject	Design and Technologies: Engineering principles and systems
Title of task	Circuit symbols and identifying components
Task details	
Description of task	Students are required to develop knowledge and understanding of the language of engineering electrical and electronic circuits; components used in electronics and identifying circuit symbols. Students will; • Recognise and explain the function of circuit symbols • convert units of measurement • identify and read resistor colour codes.
Type of assessment	Summative
Purpose of assessment	To assist students in understanding circuit symbols and their function, units of measurement and their value.
Assessment strategy	Written work
Evidence to be collected	Student work booklet
Suggested time	2 x 1 hour lessons
Content description	
Content from the Western Australian Curriculum	***Knowledge and understanding*** **Engineering principles and systems** The characteristics and properties of materials, combined with force, motion and energy, to create solutions ***Processes and production skills*** **Investigating and defining** Investigate a selection of components/resources to develop solution ideas, identifying and considering constraints **Collaborating and managing** Work independently and collaboratively to manage projects, using digital technology and an iterative and collaborative approach. Considers time, cost, risk and safety
Task preparation	
Prior learning	Students will be familiar with principles of engineering and have a fundamental understanding of electrical/electronic theory.
Assessment differentiation	Teachers should differentiate their teaching and assessment to meet the specific learning needs of their students, based on their level of readiness to learn and their need to be challenged. Where appropriate, teachers may either scaffold or extend the scope of the assessment tasks.

Assessment task	
Assessment conditions	All sections are completed within each worksheet, within a suitable timeframe.
Resources	• Electrical and electronics theory notes and texts • Relevant theory explanations and skill demonstrations • Selection of available materials, components, tools and equipment

Instructions for teacher

Using the worksheet provided, students are required to:

- research the broad categories of components, common types of circuits and terminology used in electrical engineering

- identify and record specific information about commonly used circuit symbols and components used in electrical engineering

- complete the table to provide the names and terminology that explain the properties and function of circuit symbols and components used in electrical engineering

- include all references used in a reference list

- complete exercises in identifying and converting common units of measurement as
    - written
    - common symbol
    - numerical value

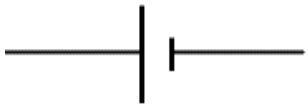
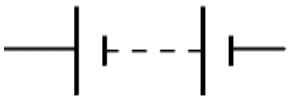
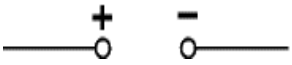
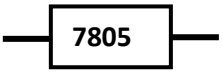
- complete worksheet on the banded colour coding used with fixed resistors (E12 series), and translate examples of the colour codes into correct resistor values.

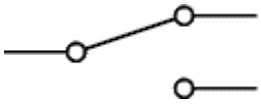
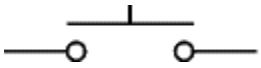
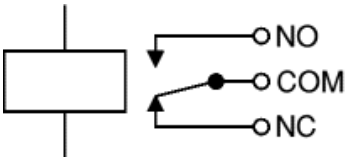
Circuit Symbol Worksheet

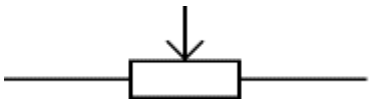
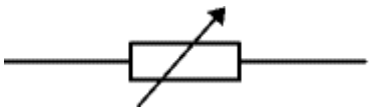
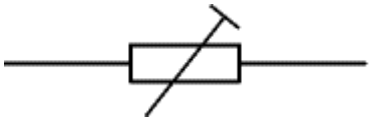
Student name: _____ **Date: _____**

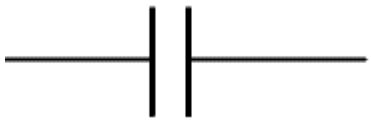
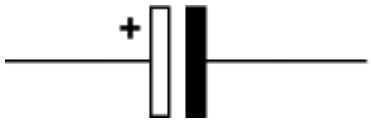
Common circuit symbols are used to design, draw and construct circuits. Circuit diagrams are an electronic designer's way of conceptualising the arrangement and working relationship of the components of a circuit. It is important to recognise these symbols. Frequently used symbols are: *diode, resistor, thermistor, capacitor, transistor, variable resistor, light dependent resistor, light emitting diode, integrated circuits, motor, piezobuzzer, speaker, bulb, supply voltage, battery cells, return voltage, ground, switches, relay, transformer, voltage regulator and different types of testing meters.*

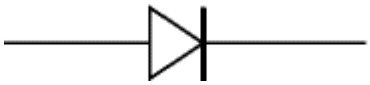
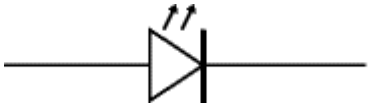
Research, recognise, name and explain the function of the following circuit symbols.

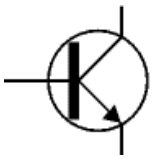
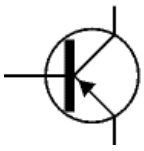
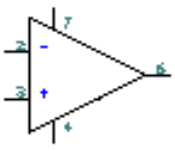
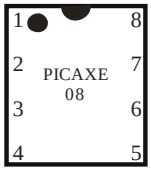
Power supplies		
You may discover other power supply symbols and be able to identify some common drawing characteristics.		
Circuit symbol	**Component name**	**Function of component**
		
		
		
		
		

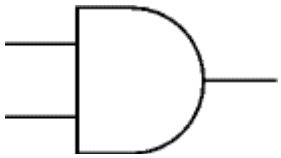
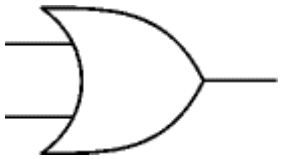
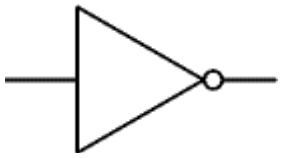
Switches		
The outer appearance of a switch does not necessarily indicate its functional operation.		
Circuit symbol	**Component name**	**Function of component**
		
		
		
		

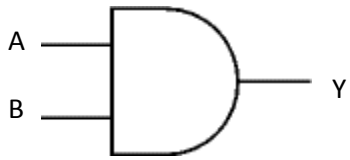
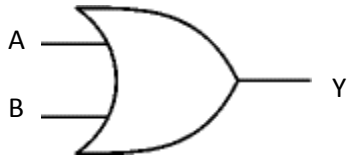
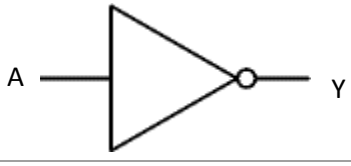
Resistors		
The most common components on a circuit that influence the flow of current		
Circuit symbol	**Component name**	**Function of component**
		
		
		
		

Capacitors		
Variable, adjustable or trimmer capacitors are used for specific devices.		
Circuit symbol	**Component name**	**Function of component**
		
		

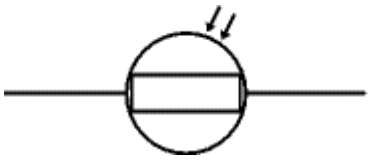
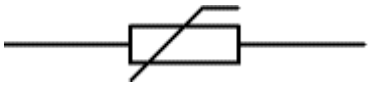
Diodes		
Diodes are constructed, micro-integrated circuits.		
Circuit symbol	**Component name**	**Function of component**
		
		

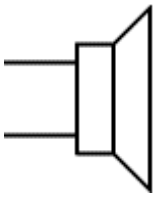
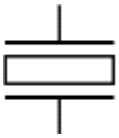
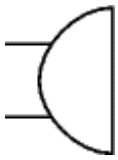
Process and control		
Integrated circuits: transistors, program chips and logic gates		
Circuit symbol	**Component name**	**Function of component**
		
		
		
		

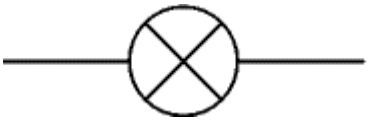
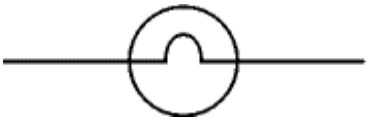
Logic Gates		
Logic Gates are digital I.C. process devices that receive and send digital signals. Signals can be expressed in different ways. On is 1, high, plus volts and true. Off is 0, low, zero volts and false. The following symbols are the most common and can be used in combination series or parallel. You may find IEC symbols as well.		
Circuit symbol	**Component name**	**Function of component**
		
		
		

Logic Gates			
	Input		**Output**
Circuit symbol	**A**	**B**	**Y**
	0	0	
	0	1	
	1	0	
	1	1	
	0	0	
	0	1	
	1	0	
	1	1	
	0		
	1		
	0	0	
	0	1	
	1	0	
	1	1	
	0	0	

	0	1	
	1	0	
	1	1	
	0	0	
	0	1	
	1	0	
	1	1	
	1	0	
	1	1	

Input devices		
Simple switches can be a digital input. Sensors are usually analogue input devices of variable resistance.		
Circuit symbol	**Component name**	**Function of component**
		
		

Devices for sound output		
Variable signals from process components can generate sounds.		
Circuit symbol	**Component name**	**Function of component**
		
		
		

Other output devices		
Variable signals from process components can create motion or illumination.		
Circuit symbol	**Component name**	**Function of component**
		
		
		
		

Symbols for testing		
Different sizes and quality meters can be found. The most common testing device is a multi-meter. Multimeters can be used to test for voltage, resistance and current and they usually present a digital display. The voltage across a component is tested by having the meter in parallel. The current draw of a component is tested by having the meter in series with the component.		
Circuit symbol	**Component name**	**Function of component**
		
		
		

Indicate all references in a reference list.

Units of Measurement

Using the engineering or mathematical reference tables, complete the table below by filling in the blank spaces.

Prefix	Symbol	Factor	Numeric value
tera		10^{12}	
	G		1,000,000,000
mega		10^{6}	
milli	m		
	µ	10^{-6}	0.000 001
pico			0.000 000 000 001

Write the numerical value of the following written measurements.

Example 42µA = 42 micro amps = 0.000 042A

8k2Ω = 8 kilo 200 ohms = _____

30mV = 30 milli volts = _____

330nF = 330 nano farad = _____

100kV = 100 kilo volts = _____

2µ2F = 2.2 micro farad = _____

47kΩ = 47 kilo ohms = _____

Resistor colour coding

The following resistors have four coloured bands, to identify resistor value and tolerance.

The first two bands represent digits – a value between 0 and 9.

The third band is the multiplier and represents how many zeros follow the first two digits to give the final value in ohms (Ω)

Black	0
Brown	1
Red	2
Orange	3
Yellow	4
Green	5
Blue	6
Violet	7
Grey	8
White	9

The last band is the tolerance band. This is a quality control guarantee from the manufacturer and specifies the accuracy of the resistor within a percentage range.

Brown	±1%
Red	±2%
Gold	± 5%
Silver	±10%

Complete the following as per example:

Example	**Yellow 4**	**Violet 7**	**Red 2**	**Gold ± 5%**	**=**	**4700**	**4k7**
	1st band	**2nd band**	**Multiplier**	**Tolerance**		**Resistance (ohms)**	**Written as**
1	Brown	Black	Red	Gold	=		
2	Orange	White	Brown	Silver	=		
3	Brown	Black	Orange	Gold	=		
4	Brown	Red	Red	Brown	=		
5	Grey	Red	Green	Gold	=		
6	Orange	Orange	Brown	Gold	=		
7	Red	Violet	Brown	Red	=		
8	Brown	Green	Orange	Gold	=		

Suggested references

http://www.school-electronics.co.uk/

http://www.doctronics.co.uk/design.htm

http://www.electronics-tutorials.com/

http://www.kpsec.freeuk.com/symbol.htm

http://www.economatics-education.co.uk/

http://www.rev-ed.co.uk/picaxe/

http://www.crocodile-clips.com/crocodile/technology/index.jsp

http://www.rsaustralia.com/cgi-bin/bv/rswww/home.do?cacheID=auie&returningUser=N

http://www.wavecom.com.au/

http://www.altronics.com.au/

http://www.wiltronics.com.au/ http://www1.curriculum.edu.au/sciencepd/index.htm

Sample marking key

Description	Marks
Engineering principles and systems	
Labels input symbols correctly.	8–10
Labels some input symbols correctly.	4–7
Attempts to label some input symbols.	1–3
Subtotal	**10**
Description	**Marks**
Engineering principles and systems	
Explains the function of input components.	8–10
Defines the function of input components.	4–7
Attempts to define the function of input components or incorrectly defines the function of input components.	1–3
Subtotal	**10**
Description	**Marks**
Engineering principles and systems	
Labels output symbols correctly.	8–10
Labels some output symbols correctly.	4–7
Attempts to label some output symbols.	1–3
Subtotal	**10**
Description	**Marks**
Engineering principles and systems	
Explains the function of output components.	8–10
Defines the function of output components.	4–7
Attempts to define the function of output components or incorrectly defines the function of output components.	1–3
Subtotal	**10**
Description	**Marks**
Investigating and defining	
Uses time productively to comprehensively investigate input/output sources and units of measurement.	8–10
Investigates input/output sources and units of measurement.	4–7
Attempts to investigate input/output sources.	1–3
Subtotal	**10**
Total	**50**