

## ANSWER GUIDE

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**Term 2, 2021**

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# Part 1: The future is golden

PAGE 1

Activity title	Answers
Gold Standard	

PAGE 2

Activity title	Answers
Early Innovations	Student's own response
Getting gold from stone	
Changing ways	<ol style="list-style-type: none"> <li>1. Discovery</li> <li>2. Mining</li> <li>3. Extraction</li> <li>4. Rehabilitation</li> </ol>
What next?	Student's own response

Activity title	Answers																								
Out of this world	Infrared light																								
Tech bling	Electronic items with gold: airbag, gaming console, tablet, drone																								
Why gold?	<div>Student’s own response</div> <div><div>Why gold?</div><div>Tick which properties of gold you think make it useful to these industries. Most of the properties will benefit more than one industry.</div><table><thead><tr><th></th><th>space exploration</th><th>electronics</th><th>medicine</th></tr></thead><tbody><tr><td>durable</td><td><input checked="" type="checkbox"/></td><td><input checked="" type="checkbox"/></td><td><input checked="" type="checkbox"/></td></tr><tr><td>malleable</td><td><input checked="" type="checkbox"/></td><td><input checked="" type="checkbox"/></td><td><input checked="" type="checkbox"/></td></tr><tr><td>conductive</td><td><input checked="" type="checkbox"/></td><td><input checked="" type="checkbox"/></td><td><input checked="" type="checkbox"/></td></tr><tr><td>reflective</td><td><input checked="" type="checkbox"/></td><td><input type="checkbox"/></td><td><input type="checkbox"/></td></tr><tr><td>recyclable</td><td><input type="checkbox"/></td><td><input checked="" type="checkbox"/></td><td><input type="checkbox"/></td></tr></tbody></table></div> <div>Suggested response:</div>		space exploration	electronics	medicine	durable	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	malleable	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	conductive	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	reflective	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	recyclable	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
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Activity title	Answers
Clean energy	geothermal biomass hydroelectric tidal
Sustainable camps	Student's own response
Gold in numbers	<ul style="list-style-type: none"> <li>• WA produces around 70% of Australia's gold.</li> <li>• WA's gold industry provided jobs for 31000 people in 2020.</li> <li>• WA's gold rush began in 1893.</li> <li>• The largest gold nugget found in WA weighed 35.5 kg.</li> <li>• Last year, the government received \$411 million in royalty payments from the gold industry.</li> </ul>

## Part 2: Smarter and safer

### PAGE 1

Activity title	Answers
What's what?	<p><b>data</b></p> <p><b>robot</b></p> <p><b>submersible</b></p> <p><b>remote operation</b></p> <p><b>immersive technology</b></p> <p><b>autonomous</b></p> <p>a machine that can work independently and respond to the real world, without being controlled by a person</p> <p>an operator in another location monitors and controls machinery, often using a computer or joystick</p> <p>a machine that can carry out complex actions automatically, often pre-programmed for specific tasks</p> <p>creates a virtual, augmented or simulated reality for users</p> <p>information that can be analysed, including facts and statistics</p> <p>a small watercraft that can operate underwater, usually without people on board</p>

### PAGE 2

Activity title	Answers
But how?	<p>Tick the true statements about the environmental impacts of autonomous vehicles.</p> <p><input checked="" type="checkbox"/> Autonomous vehicles use less fuel because they drive steadily.</p> <p><input checked="" type="checkbox"/> Less employees traveling to and from site means lower carbon emissions.</p> <p><input type="checkbox"/> Autonomous vehicles run on renewable energy.</p>
World class training	<p>Student's own response, possible responses include:</p> <ul style="list-style-type: none"> <li>increased tourism to the region</li> <li>improved infrastructure to support facility</li> <li>opportunities for local employment</li> <li>use of local businesses (ie to provide food, goods to facility)</li> </ul>

Remote resources	<p>Remote operations can benefit a resources project in a variety of ways. Place ticks to show if you think each idea is a safety, efficiency, environmental or lifestyle benefit. Some ideas may have benefits in more than one category.</p> <table><tr><td></td><td>safety</td><td>efficiency</td><td>environmental</td><td>lifestyle</td></tr><tr><td>people do not have to go to dangerous locations like deep underground or underwater</td><td><input checked="" type="checkbox"/></td><td><input type="checkbox"/></td><td><input type="checkbox"/></td><td><input type="checkbox"/></td></tr><tr><td>less travel to and from sites means fewer emissions and less transport costs</td><td><input type="checkbox"/></td><td><input checked="" type="checkbox"/></td><td><input checked="" type="checkbox"/></td><td><input type="checkbox"/></td></tr><tr><td>specialists can work on multiple projects in different locations</td><td><input type="checkbox"/></td><td><input checked="" type="checkbox"/></td><td><input type="checkbox"/></td><td><input type="checkbox"/></td></tr><tr><td>workers can be based in a city, instead of relocating or working FIFO</td><td><input type="checkbox"/></td><td><input type="checkbox"/></td><td><input type="checkbox"/></td><td><input checked="" type="checkbox"/></td></tr><tr><td>there can be greater flexibility in work arrangements, for example, part-time work</td><td><input type="checkbox"/></td><td><input checked="" type="checkbox"/></td><td><input type="checkbox"/></td><td><input checked="" type="checkbox"/></td></tr><tr><td>teams from different areas can work together and share information more easily</td><td><input checked="" type="checkbox"/></td><td><input checked="" type="checkbox"/></td><td><input type="checkbox"/></td><td><input type="checkbox"/></td></tr><tr><td>remote operation centres can better cater to people with diverse abilities, for example wheelchair users</td><td><input type="checkbox"/></td><td><input checked="" type="checkbox"/></td><td><input type="checkbox"/></td><td><input checked="" type="checkbox"/></td></tr></table>		safety	efficiency	environmental	lifestyle	people do not have to go to dangerous locations like deep underground or underwater	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	less travel to and from sites means fewer emissions and less transport costs	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	specialists can work on multiple projects in different locations	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	workers can be based in a city, instead of relocating or working FIFO	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	there can be greater flexibility in work arrangements, for example, part-time work	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	teams from different areas can work together and share information more easily	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	remote operation centres can better cater to people with diverse abilities, for example wheelchair users	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
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Record breaking robot	Pilbara																																								

### PAGE 3

Activity title	Answers
Gizmos and gadgets	<p>Students' own responses, possible responses include:</p> <p>RFID tag: monitors employee location, used to check areas before blasting or bringing in machinery, can locate employees in case of emergency</p> <p>All terrain robot: used to ensure an area is safe before people enter, can go in places people don't safely fit</p> <p>Proximity detection device: forces an automatic stop so vehicles don't collide with each other or people, an extra safety measure if visibility is poor</p> <p>Wearable health technology: monitors health of employees, can pick up changes to health, could be used to improve health by monitoring stress, workload, etc.</p> <p>Unmanned aerial vehicle: can be used to view hazards from an aerial view, including overheating, rock falls, etc., unmanned so reduces the need for small aircraft flights</p> <p>Wearable gas detector: alerts the wearer if the air quality is unsafe, because its wearable employees will not forget to take it with them as they move through the mine</p>
My machine	Students' own response

Far, far away!	<p>Students' own responses, possible responses include:</p> <p>Positives</p> <ul style="list-style-type: none"> <li>- some minerals which are rare on Earth are abundant in space</li> <li>- better for the environment on Earth</li> <li>- new opportunities for innovation</li> <li>- increased job opportunities</li> <li>- increased Space discovery/exploration</li> <li>- potential to discover</li> </ul> <p>Negatives</p> <ul style="list-style-type: none"> <li>- will be very expensive initially</li> <li>- dangerous</li> <li>- could have unknown consequences</li> <li>- ethical concerns</li> </ul>
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## Part 3: On the job

PAGE 1

Activity title	Answers
A job that fits	<p>Can you fit these occupations into the puzzle? Use the number of letters in each word to help you figure it out.</p>

PAGE 2

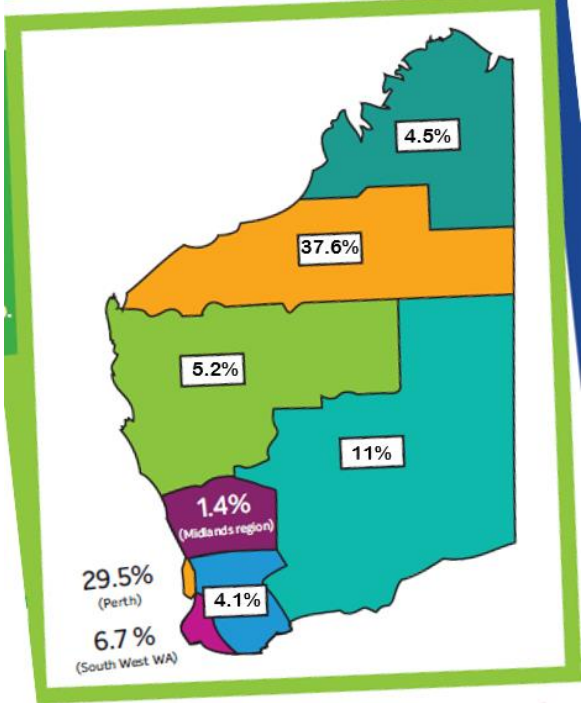
Activity title	Answers
Big changes	
Rate your STEM skills	Students' own responses
Get more STEM	Students' own responses
Full STEAM ahead	<p>Students' own responses, possible answers include:</p> <ul style="list-style-type: none"> <li>- problem solving skills can be used to pioneer new methods of working</li> <li>- design can improve the interface between person and machine</li> <li>- communication is important in remote operations</li> </ul>



Activity title	Answers
On location	DIDO – Drive in, drive out BIBO – Bus in, bus out
The FIFO life for me	Students' own responses, possible responses include: Positives: you can choose where to live, home and work life are separate, can holiday/relax in break, good facilities on site, few expenses while working as food/accommodation are provided, good pay, etc. Negatives: long hours of work, time away from friends and family, can be uncomfortable environment (hot/humid/etc.), shift work can mess with sleep patterns, freedom can be restricted on site due to remote location, etc.
Do you have what it takes?	Students' own responses

Activity title	Answers
Who, what, where?	



Where in WA?	
New opportunities	<p>amalgamator: handled heated mercury in the process of extracting gold from ore, often without proper protective equipment</p> <p>skipman: oversaw the movement of people and ore in and out of a mineshaft, using bell or whistle signals to communicate</p> <p>crackerman: in charge of breaking up large rocks using either a sledgehammer or explosives</p> <p>timberman: cut timber and placed wooden support beams in underground mines</p>
The drive for diversity	<p>Students' own responses, possible responses include:</p> <ul style="list-style-type: none"> <li>- flexible work rosters</li> <li>- a culture of inclusion, no tolerance of exclusionary actions and language</li> <li>- appropriate facilities on site, such as ambulant toilets or accessible ramps</li> <li>- organise events and activities that celebrate employee differences</li> <li>- giving employees a say in matters that concern them</li> <li>- ensure employees, understand the benefits of a divers workplace</li> </ul>