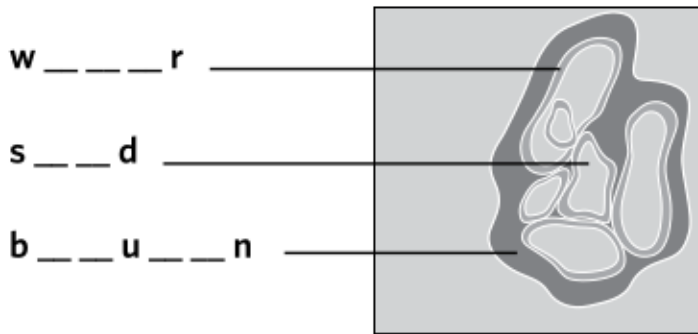


STUDENT WORKSHEETS

VIDEO 1: WHAT ARE THE OIL SANDS?

1. Fill in the missing letters to show what oil sands are made of.



2. Order the events from 1 to 5 to explain how oil sands were formed millions of years ago.

Plants are buried by layers of sediment.	Oil is soaked up into sandstone.	Alberta is covered in swampland.	Bacteria consumes lighter oil leaving bitumen behind.	Heat and pressure transform plants into oil and natural gas.
_____	_____ 4 _____	_____ 1 _____	_____	_____

3. In the past, First Nations people used bitumen for waterproofing _____.

- a) teepees
- b) snowshoes
- c) canoes

4. Complete the location names on the map to show where oil sands are found in Alberta.



5. It is predicted that bitumen could meet Canada's energy needs for the next _____ years.
- a) 100
 - b) 500
 - c) 800

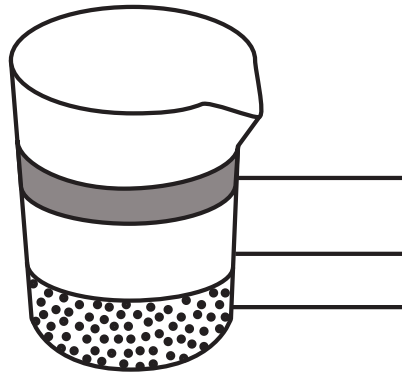
One method of extracting bitumen from oil sands is to add _____.

- a) hot water
- b) cold water
- c) warm air

6. During the *extraction* phase, oil sands separate into three main parts. Label the beaker to show the layers that form.

Word Bank:

water sand bitumen

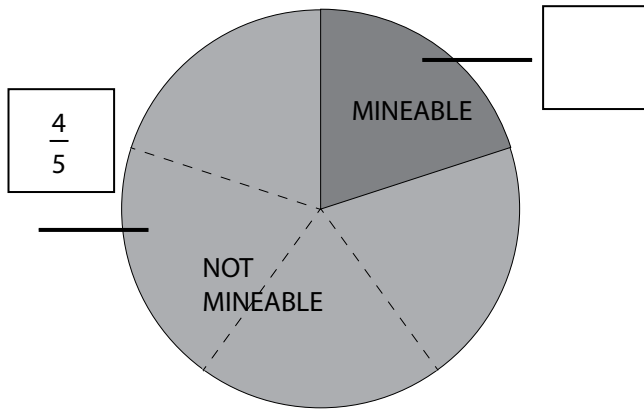


7. Turning bitumen into something useful requires two steps: upgrading and refining.
- a) Fill in the blank. First, bitumen is upgraded into a cleaner, runnier liquid called synthetic _____ oil.
 - b) At the refinery, oil is made into many useful products. Place a check mark beside any thing that can be produced from bitumen.

<input type="checkbox"/> vegetables	<input type="checkbox"/> diamonds
<input type="checkbox"/> gasoline	<input type="checkbox"/> diesel fuel
<input type="checkbox"/> petroleum products	<input type="checkbox"/> paper

VIDEO 2: MINING

- Complete the chart to show what fraction of bitumen is MINEABLE at the surface.



- Create a timeline of oilsands formation by matching the date to an event.

DATE

EVENT

Early 1900's

Huge deposits of conventional oil are found and interest in the oil sands fade.

1925

Scientists and engineers explore ways to **separate bitumen** from oil sands.

1940's

Conventional oil supplies decline, **demands for energy rise** and oil sands are revisited.

Today

Karl Clark extracts bitumen by mixing oil sands with hot water.

3. Demonstrate the process used to mine oil sands by filling in the blanks using the words below.

WORDBANK			
water	extraction	soil	
trucks	sand	crushers	

- a. First, the _____ and vegetation called overburden is removed.
- b. Next, power shovels scoop up the oil sands and load them onto big _____.
- c. The trucks carry the oil sands to the _____, which break up any large chunks.
- d. The oil sands are mixed with hot _____ and travel by pipeline to the extraction plant.
- e. Along the way, the bitumen begins to separate from the _____ and minerals.
- f. The separation process continues in the _____ plant.

4. Circle the word that best completes each sentence.

Waste materials that are left over from mining oil sands are called _____. They are placed into large artificial ponds.

- a) tailings
- b) garbage
- c) overburden

If left untouched, tailings will take many _____ to settle.

- a) years
- b) decades
- c) centuries

5. Companies working in the oil sands use different methods to keep wildlife away from tailings ponds. List the two methods that were suggested in the video:

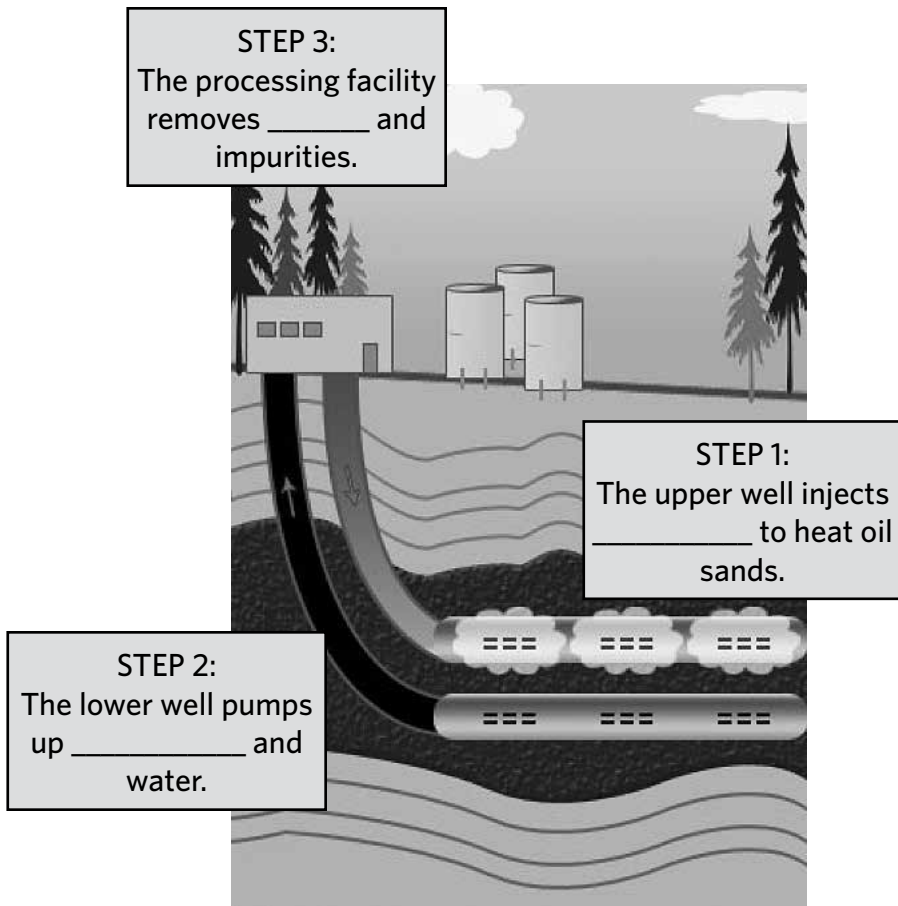
- a.
- b.

VIDEO 3: IN SITU

1. Oil sands found deep underground can be extracted using *in situ* techniques. In Latin, the word *in situ* means _____
2. Complete the words below to identify a common method used during in situ operations.
S team
__ ssisted
__ ravity
__ rainage
3. Fill in the missing words to describe the process of SAGD.

Word bank:

steam
bitumen
water

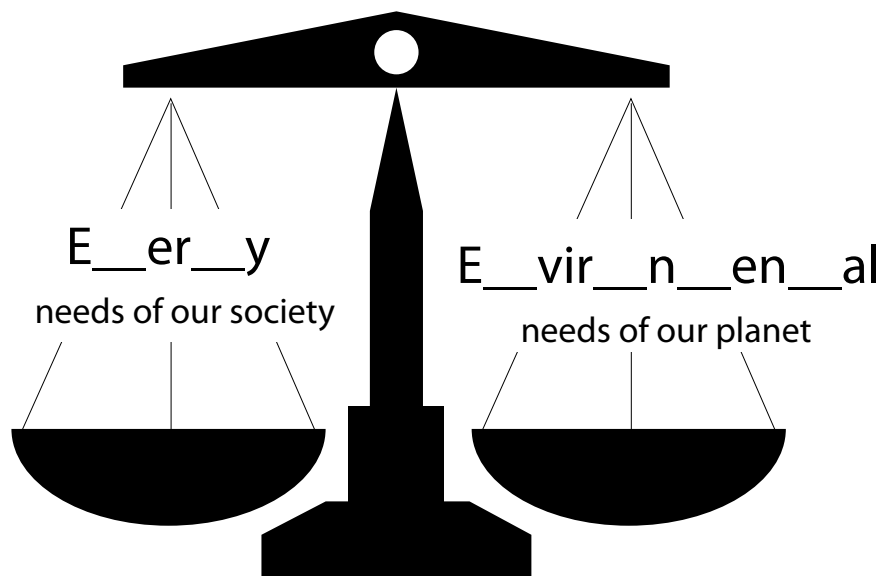


4. To create steam required for SAGD the energy primarily comes from burning _____.
- a) coal
 - b) wood
 - c) natural gas
5. What happens with the water after it is used in the SAGD process? (*Check all that apply*).
- Water is recycled and used over again
 - Water isn't used in SAGD
 - Water is put into Tailings Ponds
 - Water is injected deep underground
6. Not all of the bitumen found in deep oil sands can be extracted using SAGD.
Complete the fractions to show how much bitumen is left behind. /4 to /4
7. Fill in the blank to complete the sentence.
Researchers are constantly working to make the in situ process more productive and reduce its impact on the _____.

VIDEO 4: MEETING THE CHALLENGES

1. Circle the answer that correctly completes the sentence.
In the future, it is expected that the demand for Alberta's oil sands will _____.
a) increase
b) decrease
c) stay the same

2. Complete the words on both sides of the scale to show which needs must be balanced when considering oil sands operations.



3. Use the words below to complete the environmental statements.

WORDBANK		
gas	water	bacteria
tailings	land	

- a. Fresh _____ is precious. We simply can't waste it.
- b. Eventually, researchers hope to clean up _____ as quickly as they are produced.
- c. Finding ways to reduce energy saves money and reduces greenhouse _____ emissions.
- d. Researchers believe they have found _____ and enzymes that will digest bitumen.
- e. Before any new oil sands project begins, it must include a plan for reclaiming the _____.

4. Circle the word that correctly completes the sentence.

The oil sands industry provides jobs for _____ of Canadians.

- a) hundreds
- b) thousands
- c) millions

5. Place a check mark beside all of the jobs that are directly related to oil sands development.

- environmental specialist
- dentist
- author
- truck driver
- hairdresser
- researcher

Can you think of any others? _____

GLOSSARY

Bitumen - a thick, sticky form of unconventional oil found in oil sands. It is similar in consistency to molasses at room temperature.

Conventional crude oil - liquid oil, produced by drilling wells and pumping it to the surface.

Crusher - a machine that receives oil sand from the mine, breaks up lumps and removes rocks.

Environmental monitoring - the process of checking, observing and measuring the environmental quality of the air, land and water.

Extraction - the processes involved in separating bitumen from the oil sands.

Heavy hauler - the largest trucks in the world. They are used to transport the oil sand from the mine to the processing facility. They can carry up to 400 tonnes of oil sand.

In-situ - a Latin term meaning "in place." It describes the method used to recover deeply buried bitumen deposits.

Oil sand - grains of sand surrounded by a layer of water and film of bitumen.

Open-pit mine - an open hole, dug for the purpose of extracting natural resources.

Overburden - the topsoil and vegetation that sits on top of an oil sands deposit.

Petroleum products - useful materials derived from refining crude oil.

Reclamation - the process of returning the disturbed landscape back to a healthy, productive ecosystem.

Refinery - the facility where impurities are removed and oil is converted into gasoline, diesel and other petroleum products.

SAGD - an in-situ method that uses steam injection to heat and separate the bitumen from the oil sands. Once the bitumen is more fluid it can be pumped to the surface.

Synthetic crude oil - the product derived from upgrading bitumen at a processing facility. It has a similar density and viscosity to conventional crude oil.

Tailings - the wastewater left over from the extraction process; containing sand, clay and traces of bitumen.

Upgrader - the facility where heat and pressure are used to break down bitumen into synthetic crude oil.