STUDENT WORKSHEETS

VIDEO 1: WHAT ARE THE OIL SANDS?

1. What are the two substances that cover sand particles, making up the oil sands?
   W _____
   B _____

2. Order the events to show how oil sands were formed.

Order (1-5)	Event
	Plants are buried by layers of sediment.
	Oil is gradually soaked up into sandstone.
1	Millions of years ago Alberta is covered in swamp.
	Bacteria consumes lighter oil, leaving bitumen behind.
	Heat and pressure transform plants into oil and natural gas.

3. Fill in the Blanks.
   First Nations boiled the oil sands to make _____ for their _____.

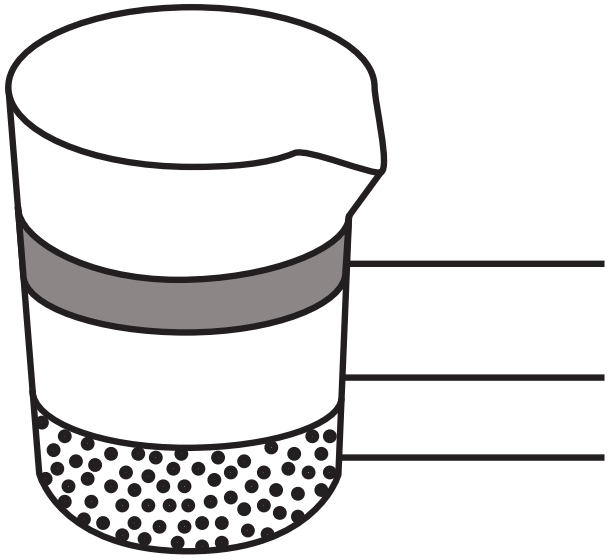
4. Place a check mark beside the areas where the oil sands are found in Alberta.

Athabasca		Peace River	
Calgary		Lethbridge	
Jasper		Cold Lake	

5. Circle the answer that correctly completes the sentence.
   It is predicated that bitumen could meet Canada's energy needs for the next _____years.
   a) 100
   b) 500
   c) 750

6. What is added to oil sands to separate the bitumen from the sand?
   a) Hot Water
   b) Cold Water
   c) Compressed Air

7. In the **extraction plant,** the three main components of the oil sands are separated. Label the beaker with the names of the components and the order in which they would separate in the extraction plant.



8. Making bitumen into a useable product involves two steps. Fill in the blanks to describe where the steps occur using the following two words: **upgrader, refinery**

   a. At an_____, immense heat and pressure are used to break down bitumen into a liquid called Synthetic Crude Oil.
   b. At a_____, oil is converted into gasoline, diesel, and other petroleum products.

VIDEO 2: MINING

1. What percentage of bitumen can be mined from the surface? _____

2. Create an oil sands timeline by matching the date to the 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.

overburden	trucks	crushers
hot water	shovels	extraction

a. The first step in mining oil sands is to remove the soil and vegetation, which is called _____.

b. Next, power _____ scoop up the oil sands and load them into large _____.

c. The oil sands are transported to _____which break up any large oil sands chunks.

d. The broken up oil sands are then mixed with _____ and fed into a pipeline.

e. The mixture is transported to the _____ plant where the bitumen seperation process takes place.

4. What is the name of the water mixture that contains bitumen, water, sand and clay and is stored in large artificial ponds? _____

5. If left on their own, tailings ponds will take many decades to settle.

   True or False

6. Companies working in the oil sands use different techniques to keep wildlife away from tailings ponds. List the two techniques that were given in the video:

   a.

   b.

VIDEO 3: IN SITU

1. Oil sands found deep underground can be extracted using in situ techniques. The word *in situ* is Latin for ____ _____.

2. Complete the words below to name a common method used during in situ operations.

____team	____ravity
____ssisted	____rainage

3. Match the terms on the left with the process on the right to describe how SAGD operates.

SAGD Equipment	**Process**
Wells	Injects steam, which heats the oil sands and softens the bitumen.
Upper Well (Steam Injection Well)	Water and impurities are removed here.
Lower Well (Production Well)	These are drilled into the oil sands formation, one on top of the other.
Processing Facility	Collects the liquid bitumen and pumps it to the surface.

4. To create the steam required for SAGD, the energy primarily comes from burning _____.
   a) Coal
   b) Natural Gas
   c) Wood

5. What happens to the water that is used in the SAGD process? *(Circle the best answer)*
   a) Water isn't used in SAGD
   b) Waste water is injected into underground formations
   c) The water can be recycled
   d) Answers b and c

6. Many SAGD operations use _____ groundwater that can't be used for drinking or agriculture.

7. 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

VIDEO 4: MEETING THE CHALLENGES

1. Why is the demand on Alberta's oil sands to provide energy for Canada going to increase in the future?
   a) Supplies of regular crude oil are shrinking
   b) Oil sands are a cleaner burning fossil fuel
   c) More products can be made from the oil sands

2. The video states *"we have to find ways to balance the energy needs of our society with the environmental needs of our planet."* Use the words below to complete the statements describing the processes that try to minimize the impact of oil sands operations on the environment.

   fire reclaim bacteria salty enzyme

   a. In situ operations use _____ water instead of fresh water for their operations.
   b. Researchers are trying to find ways to get _____ and _____ to break down bitumen instead of using heat and pressure.
   c. Rather than using steam to heat bitumen, some in situ operations pump air into the oil sands and then light the air on _____ to liquefy the bitumen.
   d. Before an oil sands project can begin, the project must include a plan that outlines how the oil sands company is going to _____ the land once the bitumen is extracted.

3. When the oil sands are reclaimed, they have to support healthy and productive ecosystems.
   True or False.

4. The oil sands provide _____ of jobs for Canadians.
   a) hundreds
   b) thousands
   c) millions

5. List three of the four careers that the oil sands industry generates as mentioned in the video?

   a. _____

   b. _____

   c. _____

STUDENT WORKSHEETS ANSWER KEY

Video 1: What are the oil sands?

1. W**ater**

   B**itumen**
2. **2, 4**, 1, **5, 3**
3. **tar** for their **canoes**
4. **Athabasca, Peace River, Cold Lake**
5. **b) 500**
6. **a) hot water**
7. **bitumen** (top), **water** (middle), **sand** (bottom)
8. 1. **upgrader**

   2. **refinery**

Video 2: Mining

1. **20%**
2. **Early 1900's** – Scientists and engineers explore ways to **separate bitumen** from oil sands.

   1925 – **Karl Clark** extracts bitumen by mixing oil sands with hot water.

   1940's – **Huge deposits** of conventional oil are found and interest in the oil sands fade.

   Today – Conventional oil supplies decline, **demands for energy rise** and oil sands are revisited.
3. a) **overburden** b) **shovels /trucks** c) **crushers** d) **hot water** e) **extraction**
4. **tailings**
5. **true**
6. **noise-making cannons, scarecrows**

Video 3: In situ

1. **in place**
2. **S**team

   Assisted

   Gravity

   Drainage
3. **Wells** – These are drilled into the oil sands formation, one on top of the other.

   Upper (Injection) Well – Injects steam, which heats the oil sands and softens the bitumen.

   Lower (Production) Well – Collects the liquid bitumen and pumps it to the surface.

   Processing Facility – Water and impurities are removed here.
4. **b) natural gas**
5. **d) Answers b and c**

   Wastewater is injected into underground formations

   The water can be recycled
6. **saline**
7. **1/4** to **3/4**

Video 4: Meeting the challenges

1. **a) Supplies of regular crude oil are shrinking**
2. a) **salty** b) **bacteria** and **enzymes** c) **fire** d) **reclaim**
4. **true**
5. **b) thousands**
6. **researchers, scientists, environmental specialists, truck drivers**