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| Worksheet 3: Carbon Capture |

**Exercise A – Vocabulary Overview**

**Instructions** Tick (✓) the vocabulary that you understand and underline the vocabulary that you need to know from the article *Is Carbon Removal Critical or Crazy?*. (+ = New General Service List Vocabulary, @ = New Academic Word List Vocabulary; \* = Mid-frequency Vocabulary)

compress\* react with**+**

transform@ form**+**

reverse\* concentrate**+**

bind with**+** expose X to Y+

convert X into Y**+**

Verbs

disposal\* profit\*

reversal\* feasibility\*

fertility\* optimism\*

optimist\* skeptic\*

skepticism\*

Nouns

Phrasal Verbs

carry sth. across

pull sth. back

pump sth. full of

turn sth. back into

suck sth. out of

suck sth. in

draw sth. in from

come into contact with

Adjectives

feasible**\***

fertile\*

profitable\*

conclusive\*

substantial\*

**Carbon Capture**

**Instructions** Discuss vocabulary learning strategies using the questions below.

* What strategies have you found useful for learning and using vocabulary? Write down three.

1. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
2. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
3. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

* In this course you started using a vocabulary diary. How effective has this been for you?
* What information would you record for the vocabulary you underlined in Exercise A?

**Exercise B – Reading Effectively**

**Instructions** Discuss the tips below about reading effectively. Can you add three more general or specific tips to the list?

Students in BCIT’s regular programs are surprised at the amount and type of reading they have to do. It is easy to get buried under a mountain of reading! These are some points to help you be better readers:

* Read a lot – especially about things that interest you
* Increase your reading speed and reading fluency
* Figure out why you are reading something: How are you going to use what you read?
* Use different strategies depending on what you’re reading (e.g., textbooks, magazines, websites)
* Consider what you already know about the topic
* Annotate the article you are reading
* Assess the importance, usability, quality, relevance, etc. of the content and ideas
* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
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**Exercise C – Making Choices Before Reading**

**Instructions** Browse multiple resources related to the article *Is Carbon Removal Critical or Crazy?*: WS 4–Joint Writing, the article itself, reference sources at the end of the article, and a video of one capture technology at work. Identify your purpose in reading the *Is Carbon Removal Critical or Crazy?* Then, write down 3 ideas about how to approach reading the article.

<https://www.youtube.com/watch?v=YbzSAPh0D8g>Greensters – The machine that could save us all!

* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
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**Instructions** Now, read the whole first page of the article (Introduction). Take notes and discuss the key ideas.

**Exercise D – Vocabulary**

**Instructions** Look at each example sentence below. Take notes in your vocabulary diary based on the questions in the box.

|  |
| --- |
| What can you learn about the word from the context?  What part of speech (noun, verb, etc.) is it?  Is it sometimes a noun and sometimes a verb?  What words collocate with the target words? (i.e., what other words go with the target word and, perhaps, change its meaning?) Do not use a dictionary. |

1. compress
2. As more snow fell, the bottom layer was compressed into ice. ***Pressed down*** *so hard it becomes ice*
3. The main ideas were **compressed/packed into** the first chapter. *The main ideas were* ***summarized in*** *the…*
4. Since we are behind schedule, practice time will have to **be compressed into** just two evenings. …*practice time will have to be* ***shortened to*** *just two evenings*
5. disposal
   1. We are all concerned with the disposal of garbage and recyclable materials. **…the throwing away of garbage; …the removal of garbage…; …the getting rid of…**
   2. Talks were held on the safe disposal of nuclear weapons. ***Discussions/negotiations/ conferences were conducted/ organised [on the safe removal/ dismantling/ elimination/ disarming of nuclear weapons.***
   3. If you need help, the clerk is **at your disposal.**= at your service = available to help you
   4. The government had **at their disposal** a very powerful army. Available for them to use = at their service = **ready to be deployed**
6. feasibility
   1. I am sorry, but I have some doubts about **the feasibility** of your plan. **…the practicality… the viability…**
   2. Brett suggested the explosives be sent by plane but also wondered about **the feasibility** of doing this.

**…the safety… the viability… …legality…**

* 1. The feasibility of finding a new job in the field made Kamala consider changing her profession. …the possibility… the viability…

1. feasible
   1. We agreed on a ***feasible/viable/ practical/appropriate/effective/realistic/reasonable*** plan, and within a week, we implemented it.
   2. It’s perfectly **feasible/possible/doable/viable** to produce electricity without creating pollution.
   3. We need to find out first if the idea is technically ***feasible/possible/practical/viable/attainable/workable.***
2. fertile
   1. Farmers left the rocky hills close to the sea and moved inland to the ***fertile/productive/fruitful/rich*** lands beyond the mountains.
   2. New IT businesses were once considered a ***fertile/productive/favourable/lucrative*** area for investment.
   3. The movie comes from the ***fertile/productive/creative*** imagination of Jordan Peele.
3. fertility
   1. Due to the ***fertility/productivity/fruitfulness/richness*** of the soil, his farm thrived.
   2. Utah has the highest ***fertility/birth﻿*** rate in the country and the biggest and youngest households.
4. optimism
   1. There was ***optimism/hope/expectation*** that an agreement could be reached.
   2. I don’t share his ***optimism/expectation/positive outlook/positive perspective*** about our chances of success.
   3. We can look to the future with considerable **optimism/hope/expectation**.
5. optimist
   1. You have to be an ***optimist/a hopeful, optimistic, positive person*** to be in an occupation such as farming.
   2. ***Optimists/hopefuls, positive/optimistic***, still believe we can resolve the problem without going to war.
6. conclusive
   1. Videos taken by security cameras showed ***conclusive/definite/valid*** evidence of the criminal’s identity.
   2. There is ***conclusive/valid/reliable/convincing/undeniable*** evidence that second-hand smoke causes lung cancer.
   3. After the votes were counted, the results were ***conclusive/valid/undeniable:*** she won by 3 million votes.
7. profit
   1. There isn’t much ***profit/benefit/earnings/gains*** in running a restaurant these days.
   2. The company made a healthy ***profit/earning*** on the deal.
   3. Convicted criminals should not be allowed to ***profit/gain/benefit*** from their crimes.
8. profitable
   1. Last year our business became ***profitable/successful/in the black***: before that, we were just managing to cover our costs.
   2. I had a very ***profitable﻿/beneficial/productive/fruitful*** conversation with Jack today.
   3. What can be done to keep the business profitable/successful/sustainable?
9. transform
   1. The new material will ***transform/change/alter*** the interior, making it feel light and airy rather than dark and heavy.
   2. The history of human progress is the ***transforming/exploitation*** of things, from nature, to benefit people.
10. reversal
    1. The Second World War saw a dramatic ***reversal/a (significant) shift/change in direction of*** traditional attitudes towards women.
    2. The profits of supermarkets declined until 1975 when a ***reversal/change in direction*** began.
11. reverse
    1. The government has failed to ***reverse/change the direction*** the economic decline.
    2. Falling birth rates may ***reverse/change the direction*** the trend towards early retirement.
    3. As I approached the house a car ***reversed/backed*** out of the driveway and sped off down the road.
12. skeptic
    1. Though some showed confidence in the idea, ***skeptics/pessimists/doubters/people who doubt or are skeptical*** argue that these plans are rarely successful.
    2. But he's a dual personality, ***skeptic/pessimist***, and optimist in one.
13. skepticism
    1. Such claims should be regarded with a certain amount of ***skepticism/suspicion/doubtfulness/critical thinking***.
    2. Other scientists have expressed ***skepticism/suspicion/doubt*** about these results.
    3. Many police officers have a hardened ***skepticism/cynicism*** about humanity.
14. substantial
    1. There are ***substantial/significant/considerable/real/major/notable/fundamental/important*** differences between the two groups.
    2. The refugees face a ***substantial/real/significant/major/considerable*** threat of harm if they are sent home.

**Exercise E – Vocabulary**

**Instructions** From your notes on the target vocabulary in Exercise C, match the meaning of the words with the definitions. Some words have only one meaning, and others may have several.

|  |  |  |
| --- | --- | --- |
| 1 | profit | (verb) to get something useful from a situation; to be useful to somebody or give them an advantage |
| 2 |  | (adjective) (of a person’s mind or imagination) that produces a lot of new ideas |
| 3 | fertile | (adjective) (of land or soil) that plants grow well in |
| 4 | fertility | (adjective) (of people, animals or plants) that can produce babies, young animals, fruit or new plants |
| 5 | substantial | (adjective) large in amount, value or importance |
| 6 | conclusive | (adjective) that gives somebody an advantage or a useful result |
| 7 | profitable | (adjective) that makes or is likely to make money |
| 8 | optimist | (adjective) that produces good results; that encourages activity |
| 9 | reversal | (noun) a change of something so that it is the opposite of what it was |
| 10 | optimism | (noun) a feeling that good things will happen and that something will be successful; the tendency to have this feeling |
| 11 | optimism | (noun) a person who always expects good things to happen or things to be successful |
| 12 | skeptic | (noun) a person who usually doubts that claims or statements are true, especially those that other people believe in |
| 13 | skepticism | (noun) an attitude of doubting that claims or statements are true or that something will happen |
| 14 | reverse | (noun) the act of getting rid of something |
| 15 | feasible | (adjective) achieved easily or by a large margin (related to victory or success) |
| 16 | feasibility | (adjective) having or likely to have the effect of proving a case (related to evidence or argument) |
| 17 | profit | (noun) the money that you make in business or by selling things, especially after paying the costs involved |
| 18 | transform | (noun) the quality of being possible and likely to be achieved |
| 19 | fertility | (noun) the state of being able to create offspring or ideas |
| 20 | feasibility | (adjective) possible and likely to be achieved |
| 21 | transform | (verb) to change direction; to change the way in which something is done |
| 22 | reversal | (verb) to change something completely so that it is the opposite of what it was before, or goes the opposite direction |
| 23 | reverse | (verb) to make a marked change in the form, nature, or appearance of something |
| 24 | compress | (verb) to press or squeeze something together or into a smaller space; to be pressed or squeezed in this way |
| 25 | compress | (verb) to reduce something and fit it into a smaller space or amount of time |

**Exercise F – Joint Reading**

**Instructions** In groups of two or three, take turns reading aloud from *Is Carbon Removal Crazy or Critical?* beginning with *Narrowing our options*. As you read together, follow the steps below. Take notes on the worksheet below for steps 2-4.

|  |  |  |  |
| --- | --- | --- | --- |
| **Part of the text** | **Vocabulary** | **Summary** | **Prediction** |
| Introduction (Optional, if you have not completed Exercise B) |  |  |  |
| Narrowing our Options |  |  |  |
| Planting Synthetic Forests |  |  |  |
| Deep Trouble |  |  |  |

**Exercise G – Vocabulary – Verbs and Phrasal Verbs for Processes**

**Instructions** Sort the verbs and phrasal verbs into the appropriate categories.

~~compress~~ ~~draw sth. in from~~ transform X into Y form

reverse concentrate bind with expose X to Y

convert X into Y carry sth. across pull sth. back suck sth. in

pump sth. full of ~~turn sth. back into~~ suck sth. out of react with

~~come into contact with~~

|  |  |  |  |
| --- | --- | --- | --- |
| **Move things in and out of a space** | **Come into contact with** | **One thing changing into another** | **Changing the amount of something in the same space** |
| draw sth. in from  suck sth. out of  pump sth. full of  carry sth. across  pull sth. back  suck sth. in | come into contact with  bind with  expose A to B | turn sth. back into  transform A into B  convert A into B  reverse (the process)  react with form | Compress = press together into a small space resulting in a concentration of a gas [that may turn into a liquid]  Concentrate [opposite is to “dilute” = add water] |

**Instructions** Select 8 of the vocabulary above and take additional notes in your vocabulary diary. You might use these words later in your writing.

**Exercise H – Grammar: Adverbial Clauses of Time and Cause**

**Instructions** Re-read the section *Planting synthetic forests* from the article *Is Carbon Removal Crazy or Critical?* Highlight, in different colours, as many examples you can find of 1) adverbial clauses of time/simultaneous events and 2) adverbial clauses of cause/reason (Se *TAE RW Grammar Worksheets*, page 7). Then practice combining sentences to use these structures.

1. Which words signal the beginning of adverbial clauses? Circle them.
2. What other words can be used at the beginning of adverbial clauses of time to describe processes?
3. What other words can be used at the beginning of adverbial clauses of cause/reason?
4. **Sentence Combining** Combine each pair of sentences below into one sentence.
   1. Fans blow air over polymer strips containing anion exchange resin.

At the same time, carbon dioxide is captured by the negatively charged ions in the resin.

Fans blow air over polymer strips containing anion exchange resin, capturing carbon dioxide through the negatively charged ions in the resin.

1. First, polymer strips are placed in the water.

Then, the bicarbonate on the resin is converted into carbonate ions.

Polymer strips are placed in the water, converting the bicarbonate on the resin into carbonate ions.

1. The water drains away, carbonate ions come into contact with air.

Those compounds become unstable, and turn back into carbon dioxide.

As the water drains away, the carbonate ions come into contact with air, causing the compounds to become unstable and turn back into carbon dioxide.

1. Carbon capture machines could pluck carbon dioxide from the air.

At the same time, solar panels could drive a process that extracts hydrogen from water to produce the raw materials for fuel.

Carbon capture machines could simultaneously extract carbon dioxide from the air, while solar panels drive a process that extracts hydrogen from water to produce raw materials for fuel.

1. This method only works in dry areas.

The reason is that humidity allows the carbon dioxide to escape.

This method only works in dry areas because humidity allows the carbon dioxide to escape.

1. This is an important topic.

The reason is that climate change is having negative impacts on all life on our planet.

The importance of this topic lies in the negative impacts of climate change on all life on our planet.

**Exercise I – Grammar: Infinitive Phrases: Adverbs of Reason/Purpose/Cause**

**Instructions** Re-read the section *Planting synthetic forests* from the article *Is Carbon Removal Crazy or Critical?* Highlight, as many examples you can find of infinitive phrases using adverbs of reason/purpose/cause (See *TAE RW Grammar Worksheets*, pages 8, 10). Then practice combining sentences to use these structures.

1. **Sentence Combining** Combine each pair of sentences below into one sentence. Use an infinitive phrase to combine them in order to provide a reason/purpose/cause.
   1. I am writing this report.

The reason is that I want to provide an overview of my presentation topic.

I am writing this report in order to provide an overview of my presentation topic.

* 1. We need carbon capture technologies.

The reason is we need to solve climate change.

We need carbon capture technologies to solve climate change.

* 1. Two new technologies are now being developed.

These technologies remove greenhouse gases from the air.

Two new technologies are now being developed to remove greenhouse gases from the air.

* 1. The device retracts its frame into a container full of water.

As a result, polymer strips release carbon dioxide.

As a result of the device retracting its frame into a container full of water, polymer strips release carbon dioxide.

**Exercise J – Grammar: Relative Clauses**

**Instructions** Re-read the section *Planting synthetic forests* from the article *Is Carbon Removal Crazy or Critical?* Highlight examples of relative clauses. (See *TAE RW Grammar Worksheets*, page 4). Then practice splitting sentences that use this structure.

1. **Sentence Splitting** Look at the sentences from the text below. What two simple, shorter sentences were used to produce the longer complex sentences in each case.
   1. Their plant has a large fan in the middle of the roof, which draws in air from the atmosphere.

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* 1. Adjacent solar panels drive an electrolysis process that extracts hydrogen from water.

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* 1. Direct capture processes employ heat to drive the subsequent reactions that release the carbon dioxide.

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1. Why are complex sentences like the examples above an effective and efficient way of expressing the same meaning?

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