ANSWER KEY.

ZornScience
zornscience.org

The Carbon Cycle

Biology | ANSWER KEY

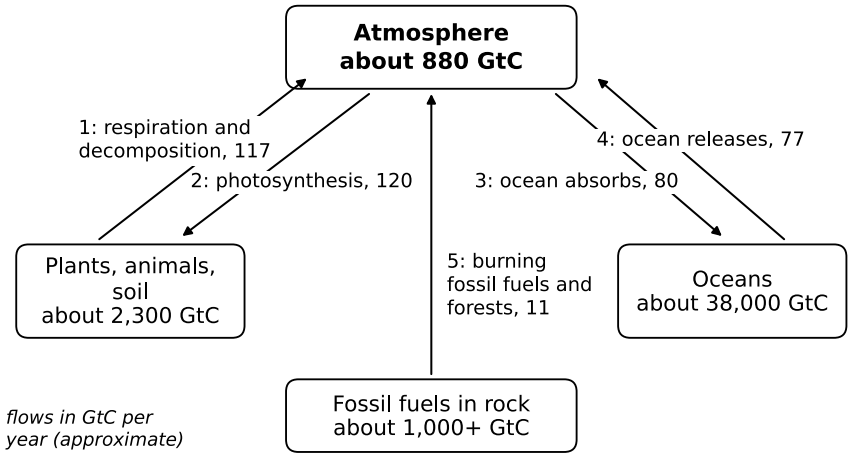
Answer in complete sentences. Show your work for calculations.

1. Complete the table comparing photosynthesis and cellular respiration.

	Photosynthesis	**Cellular respiration**
Reactants (what goes in)	**CO_2 and H_2O (plus light energy)**	**Glucose and O_2**
Products (what comes out)	**Glucose and O_2**	**CO_2 and H_2O (plus usable energy)**
Which organisms do it?	**Producers (plants, algae)**	**Almost all organisms, including plants**

The reactants of each process are the products of the other.

2. The model shows the carbon cycle.



(a) Which two numbered arrows move carbon out of the atmosphere? Name each process.

(b) Which numbered arrow is caused by people? Name the process.

(a) **Arrow 2: photosynthesis. Arrow 3: the ocean absorbs CO_2.**

(b) **Arrow 5: burning fossil fuels and forests.**

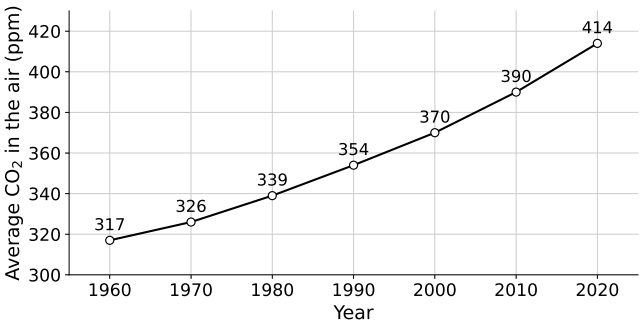
CC BY-NC-SA 4.0 | zornscience.org

3. The table gives the yearly flows for the arrows in question 2. Find the net change in carbon in the atmosphere each year. Is carbon in the air rising or falling?

Arrow	**1**	**2**	**3**	**4**	**5**
Flow (GtC per year)	117	120	80	77	11

Into the air (arrows 1, 4, 5): 117 + 77 + 11 = 205 GtC. Out of the air (arrows 2, 3): 120 + 80 = 200 GtC. Net = **+5 GtC per year, so carbon in the air is rising.**

4. The graph shows average CO_2 in the air measured in Hawaii.



(a) Find the average rate of increase from 1960 to 1990 and from 1990 to 2020, in ppm per year.

(b) Is CO_2 rising faster or more slowly now? Suggest a reason.

(a) 1960 to 1990: (354 − 317) ppm ÷ 30 yr = **1.2 ppm per year**. 1990 to 2020: (414 − 354) ppm ÷ 30 yr = **2.0 ppm per year**

(b) **Faster.** People now burn more fossil fuels each year than in the past.

5. Bromothymol blue turns yellow when CO_2 is added to water and blue when CO_2 is removed. Four sealed tubes of blue solution are left for 24 hours.

Tube	**Contents**	**Light?**	**Color after 24 h**
1	Snail	Light	Yellow
2	Water plant	Light	Blue
3	Snail and water plant	Light	Blue
4	Water plant	Dark	Yellow

(a) Explain the colors in tubes 1 and 2.

(b) Why did tube 4 turn yellow, even though it holds a plant?

(a) **Tube 1:** the snail's respiration added CO_2. **Tube 2:** photosynthesis removed CO_2 faster than respiration added it.

(b) **In the dark the plant cannot photosynthesize**, but its respiration still adds CO_2.

CC BY-NC-SA 4.0 | zornscience.org