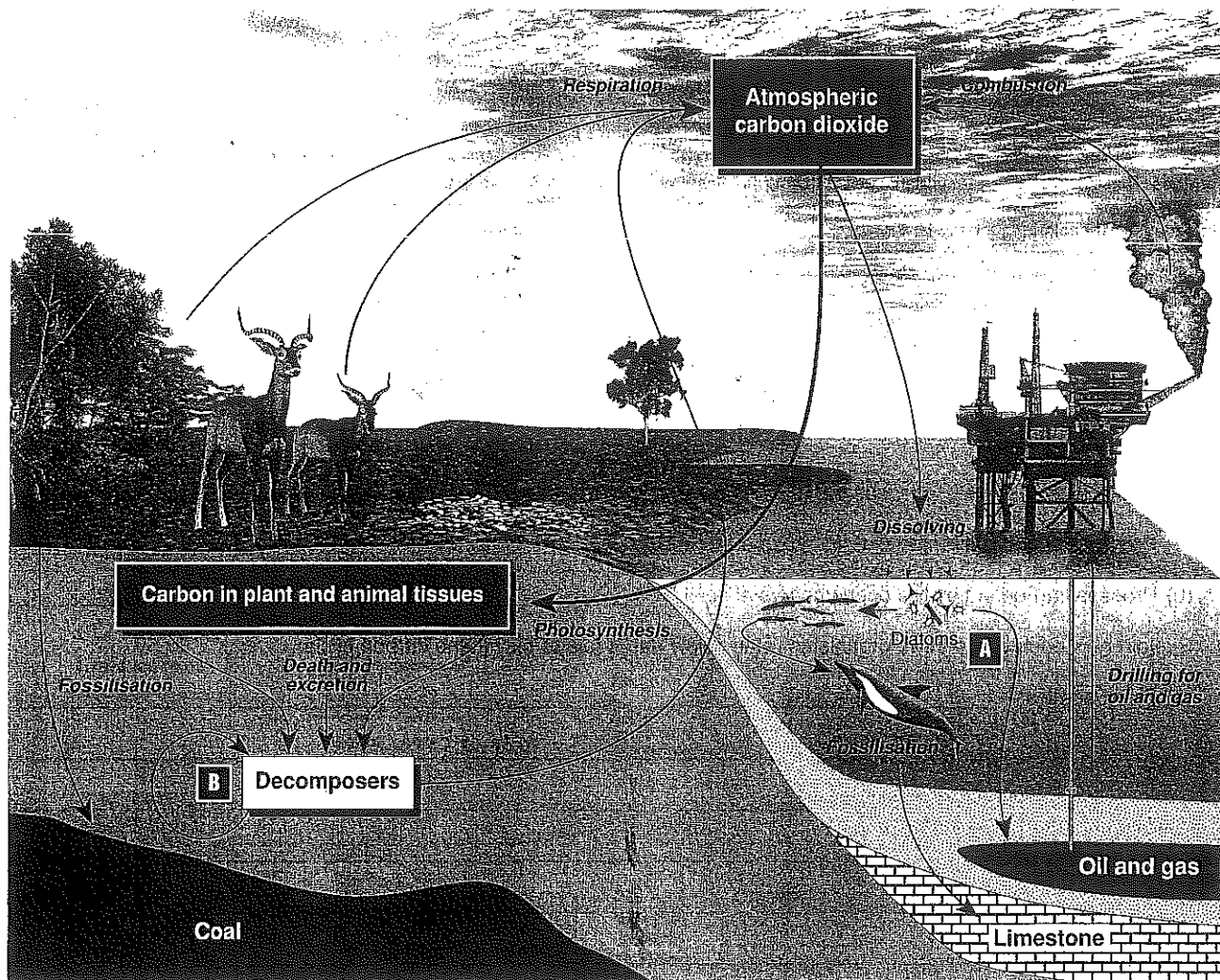


# The Carbon Cycle

Carbon is an essential element in living systems, providing the chemical framework to form the molecules that make up living organisms (e.g. proteins, carbohydrates, fats, and nucleic acids). Carbon also makes up approximately 0.03% of the atmosphere as the gas carbon dioxide (CO<sub>2</sub>), and it is present in the ocean as carbonate and bicarbonate, and in rocks such as limestone. Carbon cycles between the living (biotic) and non-living (abiotic)

environment: it is fixed in the process of photosynthesis and returned to the atmosphere in respiration. Carbon may remain locked up in biotic or abiotic systems for long periods of time as, for example, in the wood of trees or in fossil fuels such as coal or oil. Human activity has disturbed the balance of the carbon cycle (the global carbon budget) through activities such as combustion (e.g. the burning of wood and fossil fuels) and deforestation.



Ecosystems

1. In the diagram above, add arrows and labels to show the following activities:

- (a) Dissolving of limestone by acid rain
- (b) Release of carbon from the marine food chain
- (c) Mining and burning of coal
- (d) Burning of plant material.

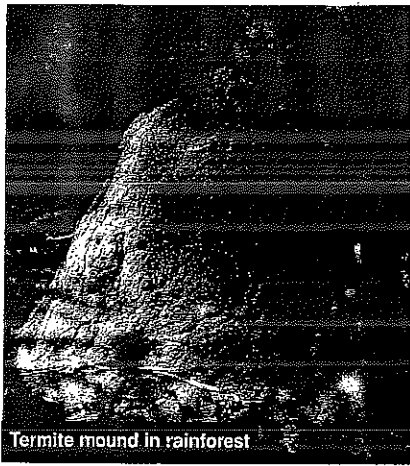
2. Describe the **biological origin** of the following geological deposits:

- (a) Coal: \_\_\_\_\_
- (b) Oil: \_\_\_\_\_
- (c) Limestone: \_\_\_\_\_

3. Describe the two processes that release carbon into the atmosphere: \_\_\_\_\_  
 \_\_\_\_\_

4. Name the four geological reservoirs (sinks), in the diagram above, that can act as a source of carbon:

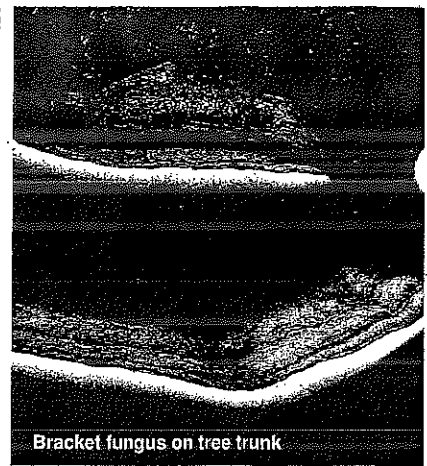
- (a) \_\_\_\_\_
- (b) \_\_\_\_\_
- (c) \_\_\_\_\_
- (d) \_\_\_\_\_



Termite mound in rainforest



Dung beetle on cow pat



Bracket fungus on tree trunk

**Termites:** These insects play an important role in nutrient recycling. With the aid of symbiotic protozoans and bacteria in their guts, they can digest the tough cellulose of woody tissues in trees. Termites fulfill a vital function in breaking down the endless rain of debris in tropical rainforests.

**Dung beetles:** Beetles play a major role in the decomposition of animal dung. Some beetles merely eat the dung, but true dung beetles, such as the scarabs and *Geotrupes*, bury the dung and lay their eggs in it to provide food for the beetle grubs during their development.

**Fungi:** Together with decomposing bacteria, fungi perform an important role in breaking down dead plant matter in the leaf litter of forests. Some mycorrhizal fungi have been found to link up to the root systems of trees where an exchange of nutrients occurs (a mutualistic relationship).

5. Explain what would happen to the carbon cycle if there were no decomposers present in an ecosystem:

\_\_\_\_\_

\_\_\_\_\_

6. Study the diagram on the previous page and identify the processes represented at the points labelled [A] and [B]:

(a) Process carried out by the diatoms at label A: \_\_\_\_\_

(b) Process carried out by the decomposers at label B: \_\_\_\_\_

7. Explain how each of the three organisms listed below has a role to play in the carbon cycle:

(a) Dung beetles: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

(b) Termites: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

(c) Fungi: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

8. In natural circumstances, accumulated reserves of carbon such as peat, coal and oil represent a **sink** or natural diversion from the cycle. Eventually the carbon in these sinks returns to the cycle through the action of geological processes which return deposits to the surface for oxidation.

(a) Describe what effect human activity is having on the amount of carbon stored in sinks: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

(b) Explain two global effects arising from this activity: \_\_\_\_\_

\_\_\_\_\_

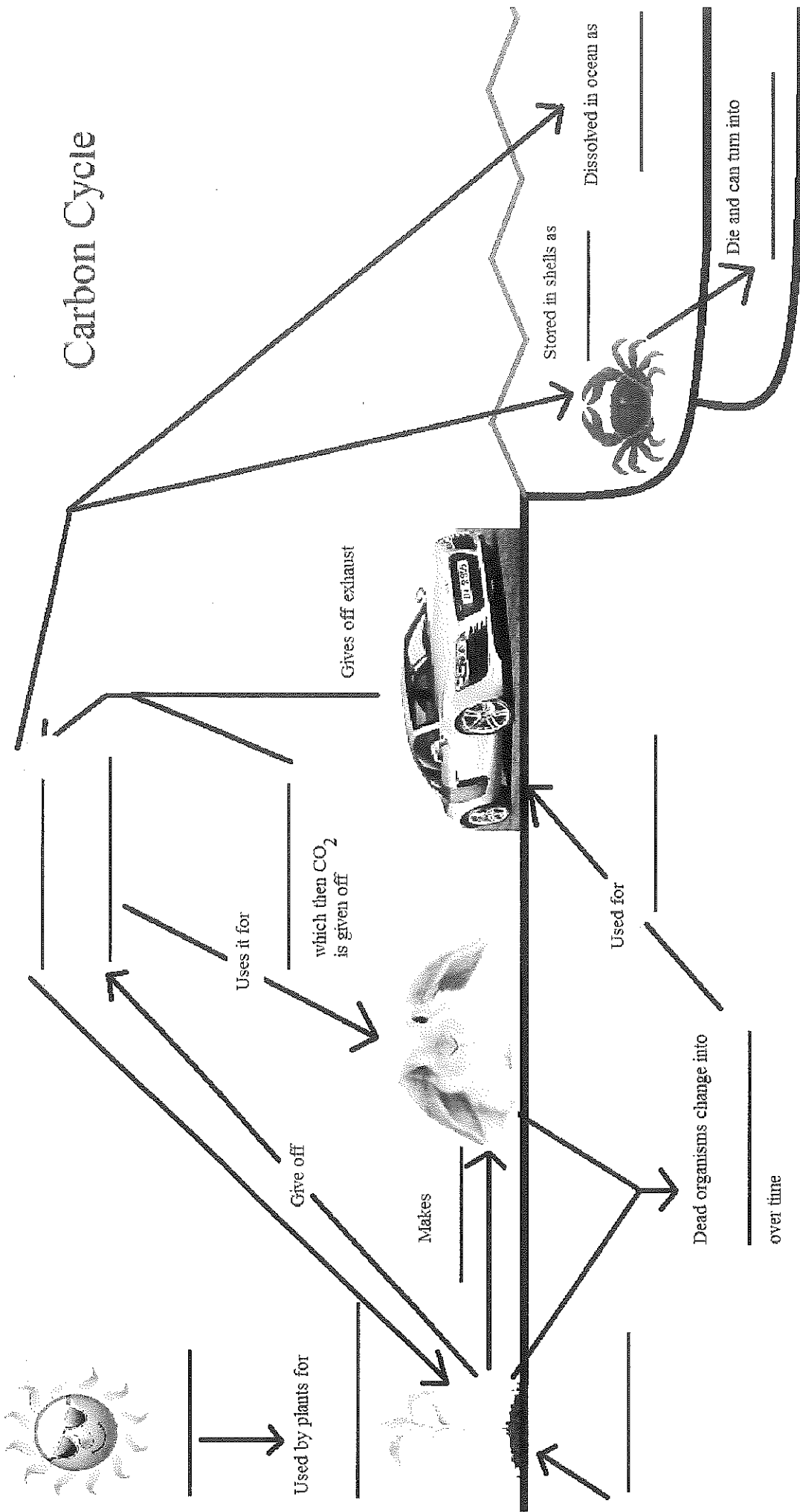
\_\_\_\_\_

(c) Suggest what could be done to prevent or alleviate these effects: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

# Carbon Cycle



Fill in the blanks using the following words:

- |                     |   |
|---------------------|---|
| 1. H <sub>2</sub> O | 6. Glucose (C <sub>6</sub> H <sub>12</sub> O <sub>6</sub> ) |
| 2. CO <sub>2</sub>  | 7. Bicarbonate  |
| 3. O <sub>2</sub>   | 8. Calcium Carbonate  |
| 4. Combustion       | 9. Sunlight   |
| 5. Fossil Fuel      | 10. Limestone   |
|                     | 11. Photosynthesis  |
|                     | 12. Cellular Respiration                                    |

