Biology A · Unit 3 · Level 2 (modified)

Biofuel & Energy



TODAY'S PLAN

- ⚡ Matter and energy
- 🔁 Energy transfer
- 🧈 Lipids and biodiesel
- 🌡️ Hot and cold reactions
- 🔄 Carbon cycle

Review · 5 minutes

Quick Review



🌿 Photosynthesis: sunlight + water + carbon dioxide → sugar + oxygen.

🧈 Algae turn some sugar into **oil** (lipids).

❓ Why do algae make good fuel? (fast growth, lots of oil)

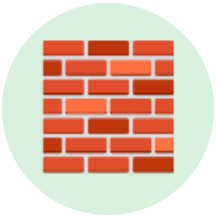
Words to Know

Words to Know



Energy

The ability to make things move or change. Energy has no mass.



Matter

Anything that has mass and takes up space (oil, water, air).



Potential energy

Stored energy, like a rock at the top of a hill or fuel in a tank.



Kinetic energy

The energy of motion, like a rock rolling down a hill.

Words to Know

More Words to Know



🍎 **Chemical energy**: Energy stored in the bonds of food and fuel. Living things use it.

🔥 **Thermal energy**: Heat energy. Burning fuel gives off thermal energy.

🧈 **Lipid**: Fats and oils. They store about 2.5 times more energy than sugar, gram for gram.

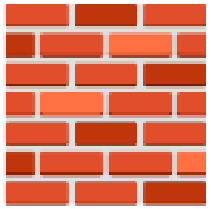
🛢️ **Biodiesel**: A renewable fuel made from plant or algae oil. It runs in diesel engines.

Compare

Matter vs Energy



Matter



Has mass
Takes up space
Oil, water, air

Energy



No mass
Makes things
move or change
Heat, light, motion

🃏 Check 1 of 4



Energy has mass. True or false?

Hold up 1, 2, or 3:

1️⃣ True

2️⃣ False

3️⃣ Only heat has mass



False

Energy has no mass. Matter has mass (Final Exam #9).

Compare

Potential and Kinetic



Potential



Stored energy
Boulder at a cliff edge
Water behind a dam

Kinetic



Energy of motion
Boulder rolling
Water let out of a dam

Learn

Forms of Energy



Chemical
in food and fuel bonds



Thermal
heat



Light
from the sun



Mechanical
moving parts

Learn

Transfer vs Transformation



🔁 **Transfer**: energy moves to another place (hot pan → hand).

🔀 **Transformation**: energy changes form (fuel → heat).

⚖️ Energy is never made or destroyed. Some always turns into wasted heat.

🃏 Check 2 of 4



A candle turns chemical energy into...

Hold up 1, 2, or 3:

1️⃣ Matter

2️⃣ Sound only

3️⃣ Light and heat



Light and heat

Chemical → light (useful) + heat.

Learn

Lipids: Fats and Oils

🧈 A fat = **glycerol** + **3 fatty acids**.

⚡ Lipids store about **2.5×** the energy of sugar.

🌿 Algae change sugar into oil to store energy.



Learn

Making Biodiesel (A6)

🌻 Canola oil + methanol + a catalyst → biodiesel + glycerol.

⚠️ Methanol and the catalyst are dangerous: **teacher only**.

👀 Our jobs: timer, recorder, photo taker.



🃏 Check 3 of 4



Biodiesel is renewable because…

Hold up 1, 2, or 3:

1️⃣ Plants and algae grow back fast

2️⃣ It is made of rocks

3️⃣ It takes millions of years



Plants and algae grow back fast

Renewable = can be made again in a short time.

Learn

Burning Fuel (Combustion)

🔥 Fuel + oxygen → carbon dioxide + water + energy.

🚌 Chemical energy → heat → mechanical energy (bus moves).



Compare

Hot and Cold Reactions (A7)



Exothermic



Releases heat
Temperature goes up
Baking soda solution + calcium chloride

Endothermic



Takes in heat
Temperature goes down
Baking soda + vinegar

🃏 Check 4 of 4



The thermometer goes down. The reaction is...

Hold up 1, 2, or 3:

1️⃣ Exothermic

2️⃣ Not a reaction

3️⃣ Endothermic



Endothermic

Down = energy taken in = endothermic.

Compare

Fuels



Renewable

♻️

Biodiesel, ethanol
From plants and algae

Non-renewable

⛏️

Coal, oil, natural gas
Fossil fuels: millions of years

Steps

Carbon Cycle with Algae Fuel



1. 💨 Carbon dioxide is in the air.
2. 🌿 Algae take it in (photosynthesis).
3. 🛢️ Algae oil becomes biodiesel.
4. 🔥 Burning puts carbon dioxide back. It is used **and** made, so it stays balanced.

Wrap-Up

Recap



Energy
no mass; changes form



Lipids
store the most energy



Exo / endo
hot up / cold down



Biofuel
renewable, balanced carbon

Wrap-Up

Exit Ticket



1️⃣ Name 2 forms of energy.

2️⃣ Is biodiesel renewable? Why?

3️⃣ Hot reaction or cold reaction: which is exothermic?