Sugar

*This play is about the carbon cycle.*

*It’s a play about how plants and animals absolutely depend on each other.*

*It’s about carbon dioxide, glucose and oxygen.*

*It’s about the carbon cycle, which is really beautiful.*

*(Well, I think so anyway.)*

*See what you think!*

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Student: What are you writing?

*Tutor: A play.*

A play?

*Yes.*

What about?

*Sugar.*

Sugar?

*Well, a sugar molecule.*

You’re writing a play about a sugar molecule?

*A glucose molecule, actually.*

How will that work?

*It’s not very easy.*

Doesn’t sound it.

*No.*

Why are you writing a play about a glucose molecule?

*I thought it would be fun.*

Fun?

*I’m not so sure now.*

Why would anyone write a play about a glucose molecule?

*Because the glucose molecule is very interesting.*

Is it?

*Yes.*

Why?

*Well, for a start, all carbohydrates are built from glucose molecules.*

So?

*Well, we get our energy from carbohydrates. From glucose, in fact.*

Right.

*Without glucose we wouldn’t have any energy.*

OK.

*Because glucose is our fuel.*

Fuel?

*Yes.*

How do you mean “fuel”?

*Well, it’s a store of energy.*

The glucose molecule?

*Yes. A glucose molecule is a tiny store of energy.*

How do we get energy from it?

*We break it down. We break it down into carbon dioxide and water.*

Carbon dioxide and water?

*Yes. And when a glucose molecule breaks down, its energy is released.*

Oh.

*Together with water and CO2. Carbon dioxide is CO2 you know.*

Yes*.* I know.

*So we get our energy from glucose molecules.*

Yes.

*When we break them down into CO2  and water.*

Glucose is a form of sugar, isn’t it?

*Yes. Glucose is the simplest form of sugar.*

Sports people drink glucose, when they need a lot of energy.

*Because it gives them energy fast.*

Because glucose is such a simple sugar?

*Yes. Our basic fuel.*

Right.

*And the basic building block of all carbohydrates.*

I remember learning about all this.

*Me too. In school.*

About proteins, fats and carbohydrates.

*The three main kinds of food.*

Sugar is a basic carbohydrate.

*Yes.*

‘Carbohydrate’ just means something made from CO2 and water.

*From the Latin for coal and the Greek for water.*

Really?

*Yes. Carbo and hudor.*

Interesting!

*Well, yes, it is.*

And glucose is the simplest form of sugar.

*Yes. And therefore the very simplest form of carbohydrate.*

Are all carbohydrates are made from glucose?

*Yes. Lots of glucose molecules stuck together make a carbohydrate.*

Like starch? Like potato starch? Is that made from glucose molecules?

*Starch is made from a very large number of glucose molecules stuck together.*

And is ordinary sugar made from glucose?

*That’s sucrose. It’s made from just two glucose molecules bound to each other.*

So this play is about glucose?

*Yes. Because it’s the simplest carbohydrate.*

OK.

*It’s the one plants make first.*

Before they can make any other carbohydrate?

*Yes. They have to start with glucose.*

So this play is about glucose and carbohydrates?

*Yes. How plants make glucose and how we use it.*

OK.

*Plants need CO2 and water, as you know.*

They do. CO2 and water are like food for plants.

*Well, yes. Plants need CO2 and water to make glucose.*

Right.

*And when they make glucose like this, they also produce oxygen.*

Correct!

*In their leaves. They do all this in their leaves.*

Yes. They absorb CO2 and produce oxygen.

*Yes.*

In their leaves.

*Which is just so cool.*

Why?

*Well, it’s the exact opposite of what we do.*

I suppose it is. We breathe CO2 out and we breathe oxygen in.

*Plants use CO2 and water to make glucose molecules.*

True.

*And doing this releases oxygen.*

Also true.

*We eat glucose.*

For energy. It’s where we get our energy from.

*Yes. We break down glucose molecules and get their energy.*

And this releases CO2 and water.

*But we need oxygen to do this.*

And plants produce oxygen when they make glucose molecules.

*From CO2 and water.*

Which we breathe out.

*And that’s the Carbon Cycle.*

The Carbon Cycle?

*In a nutshell.*

We breathe in oxygen, break down glucose, and breathe out CO2 and water.

*Plants breathe in CO2 and water, make glucose, and release oxygen.*

That’s the Carbon Cycle.

*In a nutshell.*

The Carbon Cycle in a nutshell.

*It’s very neat. The way it all fits together.*

Animals need plants.

*Well, we eat them.*

For the carbohydrates they’ve made.

*And plants need animals.*

For CO2 and water.

*Exactly.*

They’re the raw materials of carbohydrates.

*And then there’s the CO2 / oxygen thing too.*

We breathe out the CO2 they need.

*They produce the oxygen we need.*

In their leaves.

*That’s what’s so neat.*

So it’s a circle.

*Yes. It fits together beautifully. The way it goes round and round.*

And the whole thing is based on energy from sunlight.

*It is.*

Plants turn the sun’s energy into glucose and oxygen, using CO2.

*And then we use glucose and oxygen to get that energy back.*

But why do you want to write a play about it?

*Because it’s beautiful.*

The way it fits together so well?

*The way it all goes round and round – plants, us, plants, us, plants, us.*

Right.

*I’ll show you the chemistry later.*

The chemistry?

*Yes. The way the chemistry actually works.*

The way we do the exact opposite to plants?

*Yes, but written down in chemical formulae.*

Right.

*It takes energy to make a glucose molecule.*

Yes. And that comes from sunlight.

*Plants catch this energy.*

And store it in glucose molecules.

*Exactly.*

And we get the energy back from the glucose molecule.

*Yes.*

So it all goes round and round.

*And round. Yes.*

We’re going round and round a bit, too, I think.

*We are a bit. Sorry!*

That’s OK.

*But that’s the Carbon Cycle, I guess.*

All driven by sunlight.

*Yes. All driven by sunlight.*

We keep saying that plants catch the sun’s energy.

*Because that’s what they do.*

But how do they do that?

*They have a chemical in their leaves.*

Oh?

*It’s called chlorophyll.*

Chlorophyll. Right.

*And it catches the energy in sunlight.*

And stores it as glucose.

*Yes. And this process is called photosynthesis.*

Oh yes. Photosynthesis. I’ve heard of that.

*All plants do this.*

All driven by sunlight.

*Caught by chlorophyll.*

That’s photosynthesis.

*And it’s green.*

Pardon?

*Chlorophyll is green.*

Oh. Right. Yes.

*That’s why plants have green leaves.*

Because chlorophyll is green?

*Exactly!*

So we get our energy from glucose.

*Sort of stored sunlight, it is.*

So we’re running on sunlight, really.

*I guess we are!*

Now I can see why you might want to write a play about it.

*Good!*

Sort of.

*Except that I haven’t actually written it yet.*

I suppose not.

*Better get started, I guess.*

Mmmm…

*Better try to get it written.*

Why don’t you just write down what we’ve been saying.

*Write down what we’ve been saying?*

Then you’d have a play, wouldn’t you?

*I suppose so.*

Go on then.

*Mmmm…?*

Write it all down, and say it’s a play.

*Write down what we’ve been saying?*

Yes. Just write down our conversation.

*Nobody would want to read that.*

They might.

*Do you think so?*

It might be quite a good play.

*Do you think so?*

We’ve had an interesting conversation.

*I suppose so.*

It’ll have to have a title.

*Mmmmm…?*

A play must have a title.

*I suppose so.*

A play has to have a title.

*Yes, of course.*

What will we call it?

*We could call it “How green chlorophyll in leaves turns sunlight into glucose”.*

No, no, no!

*No?*

No!

*How about “Photosynthesis, chlorophyll and the Carbon Cycle”?*

That’s no good either!

*No good?*

That’s no good at all.

*Too long?*

Far too long.

*Oh.*

And clunky.

*Clunky?*

Why not just call it ‘Sugar’?

*Sugar?*

Yes. ‘Sugar’.

*Do you think so?*

It’s a nice, short title.

*Mmmm…*

Eye-catching. Snappy.

*Well…*

‘Sugar’ is a very good title. Trust me…

*Alright then.*

Call it ‘Sugar’.

*Alright then, I will.*

In other words:

What plants do:

***energy***(sunlight) + carbon dioxide + water **->** glucose

Or

***energy*** + 6CO2 + 6H2O **->** C6H12O6

What animals do:

Glucose **->**  carbon dioxide + water *+* ***energy***

Or

C6H12O6 **->** 6CO2 + 6H2O *+* ***energy***