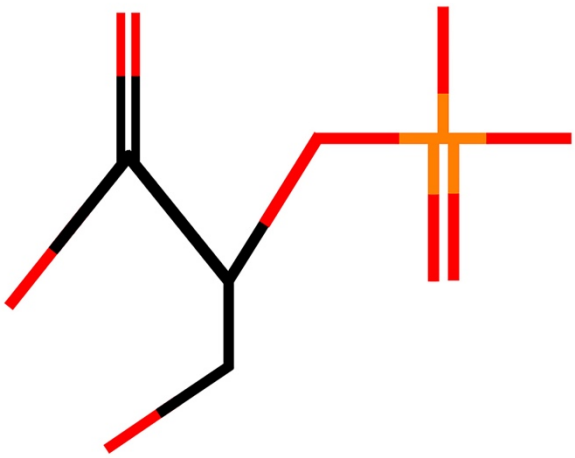
68 MILLION

12 Artworks.
1 Story.

Make ATP.



Lewis Andrews

68 Million

Introduction

'68 Million' brings attention to a vital process for all living things on our planet. The production of Adenosine Triphosphate (ATP for short). It is essential that your cells produce ATP. Cells require energy to carry out tasks within your body, all 30 Trillion of them. ATP acts as an energy transfer molecule for your cell to complete tasks such as transporting proteins, cell division & muscle contraction.

If you did not produce ATP, you would die.

'68 Million' brings to light the production of ATP through Aerobic respiration; a process requiring oxygen and producing carbon dioxide & water as waste molecules. The work displays the process across seven artworks. Each of them focuses on a specific part of the production line to make ATP. When all the artworks come together, they form '68 Million'.

In Lewis's previous artworks such as the Origins series & Carbon Drawings, the focus on understanding how we came to into existence came from looking light-years out into the cosmos across billions of years. Within '68 Million' the focus shifts to the opposite end of the scale and the present moment, zooming in on our bodies to attempt to find answers to questions like 'Why are we alive here and now?'

The process of producing ATP has turned into a story within the work. In a similar way, previous artworks by Lewis told the stories of stars billions of years ago. However, the '68 Million' story is constantly repeated every day, billions of times just to keep you alive at this very moment.

68 Million

Contents

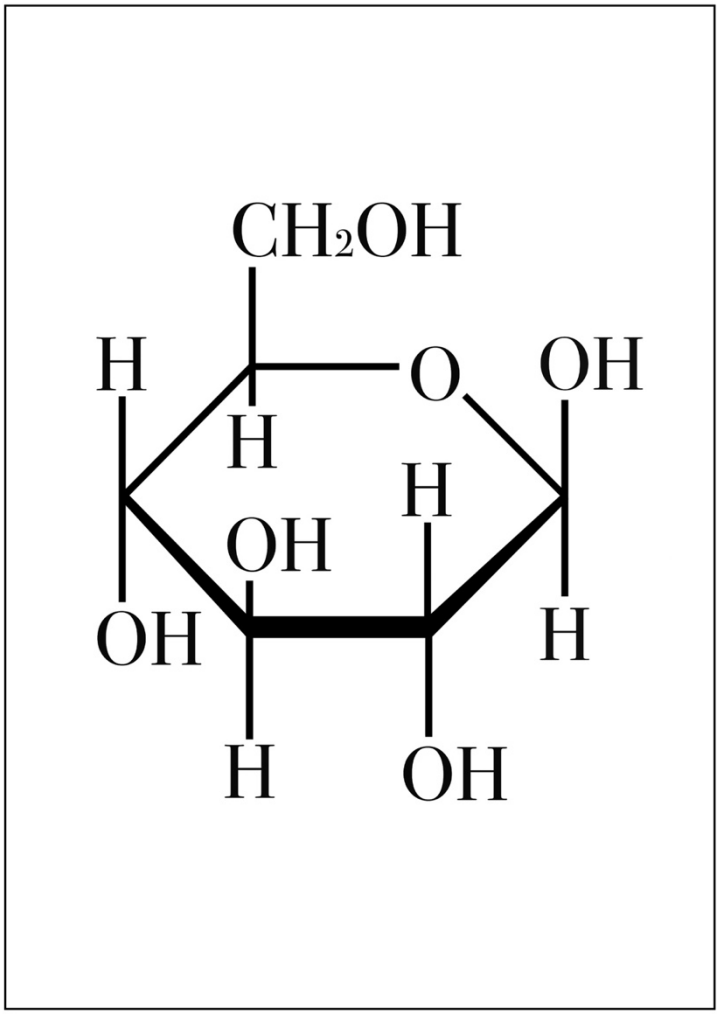
I: Source

Let′s start our story.

Eat a Grape. In about 20 - 30 Minutes, your body will follow this same story chapter by chapter. Although, it′s already in progress.

Glucose molecules are harvested from the food you eat. This is where our story starts with glucose entering our bodies.

I: Source
2020. Photograph & Digital Text. 297mm x 420mm & 297mm x 420mm.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II: Into the Cell

The glucose heads towards our cells where it enters through the membrane to begin the first stage of conversion.

It has a lot to pick from since you have 30 Trillion Cells in your body. More than all the stars in our milky way galaxy.

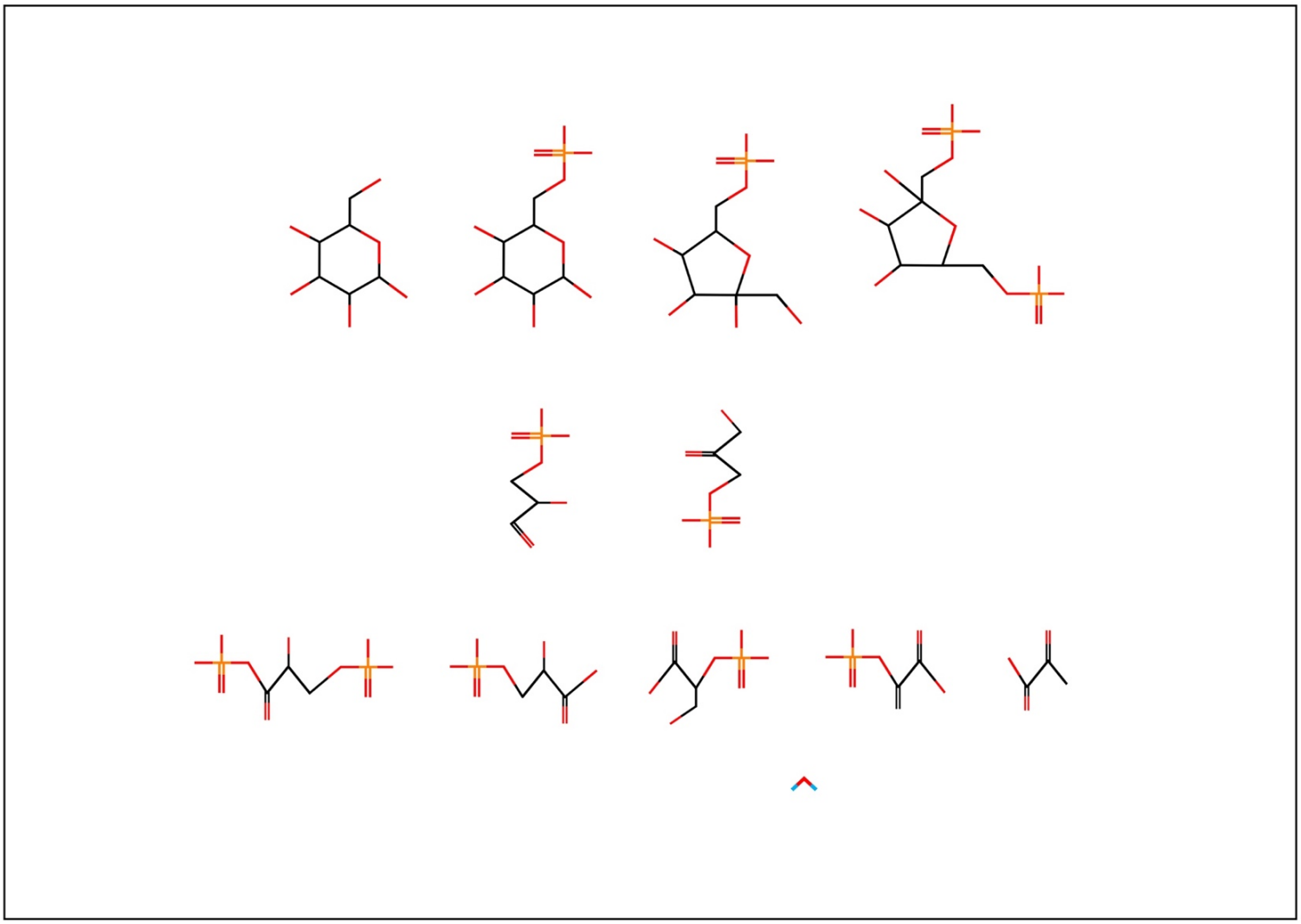
II: Into The Cell
2020. Ink on Watercolour Paper. 297mm x 420mm.

III: Conversion Stage I

Once inside the cell′s membrane, the glucose undergoes a series of reactions in a process called Glycolysis. The end product is called Pyruvate. We also make two NADH molecules which will be important later in the story.

ATP is needed to actually start this process, but we also produce a small amount from this process and quickly make up the losses and make two additional ATP. Water is a waste molecule from this process.

III: Conversion Stage I
2020. Digital Drawing. 420mm x 594mm.



IV: Into The Mitochondria

The Pyruvate we received from glycolysis now heads towards the powerhouses of your cells; the Mitochondria.

Mitochondria were once bacteria a few billion years ago. Until one day they merged with the ancestors of our cells to essentially become one cell. They still have their own DNA to this day.

All animal life on this planet can be traced back to this moment when they merged.

IV: Into The Mitochondria
2020. Ink on Watercolour Paper. 297mm x 420mm.

V: Conversion Stage II

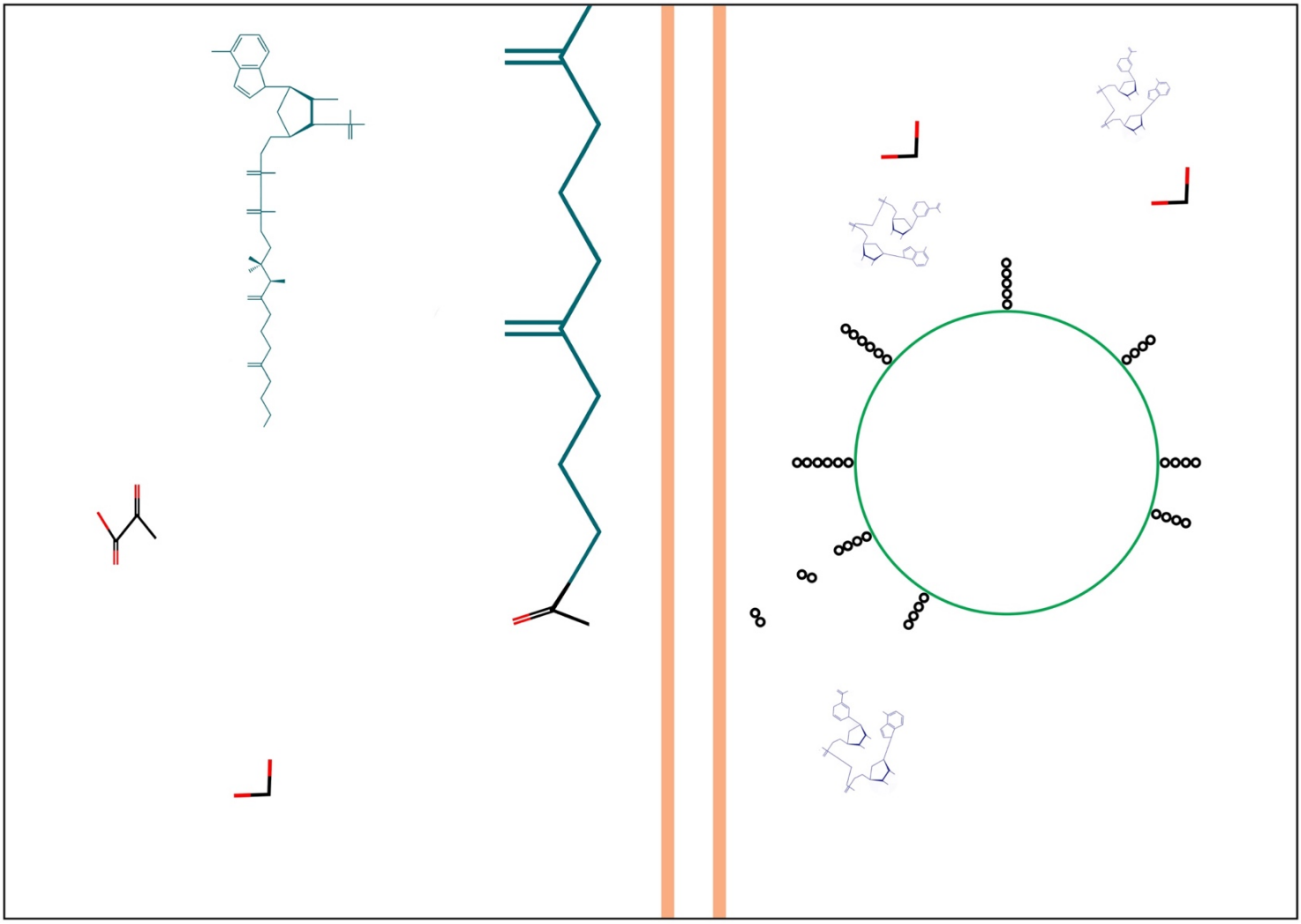
The Pyruvate we got from glycolysis now loses a carbon atom and binds with a coenzyme known as CoA. Think of CoA as a passport into the mitochondria. This makes Acetyl-CoA, which can now enter the mitochondria.

Once inside, the CoA breaks off and our Acetyl joins the Citric Acid Cycle. At this stage, we are after one thing; High energy electrons.

Remember our NADH molecules from earlier, they are like carriers taking these high energy electrons to the next step of our story. NADH molecules are produced in this cycle along with FADH2 (Another carrier-like molecule). ATP is also produced along with waste molecules of CO2.

IV: Conversion Stage II
2020. Digital Drawing. 420mm x 594mm.

68 Million



VI: Donors & ETC

NADH & FADH2, now carrying our high energy electrons, head towards a series of protein complexes called the electron transport chain. Once at the first complex NADH donates its electron to the complex to become NAD. NAD will go back to one of the previous chapters to take electrons and become NADH again.

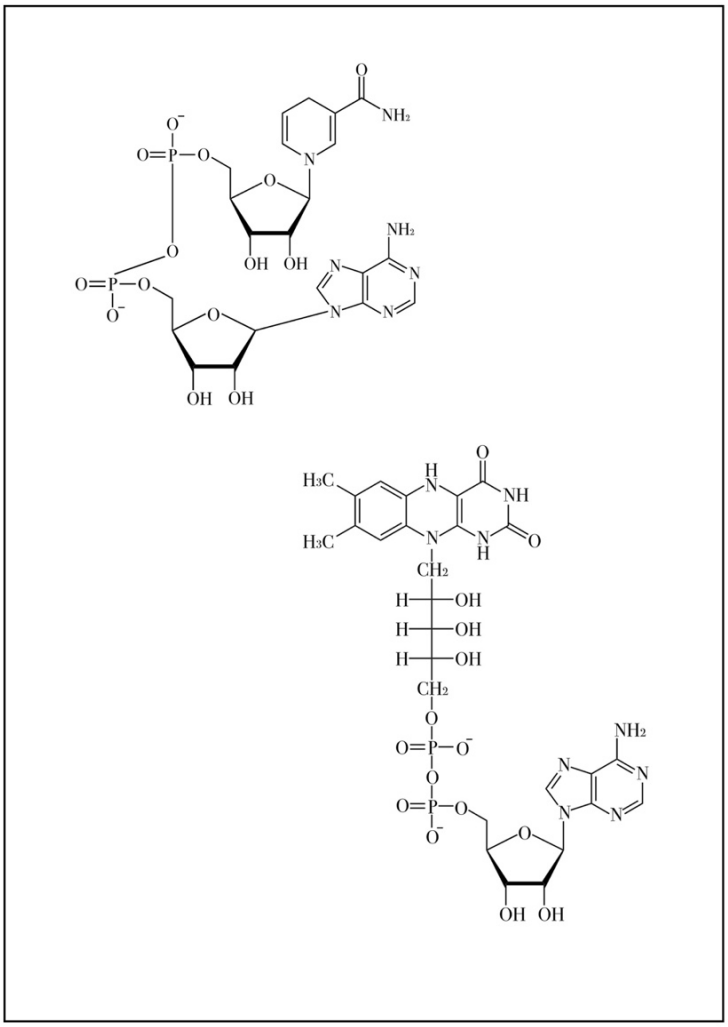
FADH2 arrives at protein complex two, donates an electron, and turns into FAD. This once again will go back to a previous chapter to take electrons and become FADH2 again.

The protein complexes use the energy of the electron we just donated to pump a hydrogen proton from one section of the mitochondria into an area with a dense amount of hydrogen protons (This will be important in the next chapter). Our electrons flow through all the complexes pumping protons & losing energy each time.

Once it's pumped a proton at protein complex four, it's now a low energy electron and will bind with oxygen and hydrogen to become waste molecules of water. The protons we pumped through the protein complexes now go on to the next part of our story.

VI: Donors & ETC
2020. Photograph & Ink on Watercolour Paper.
297mm x 420mm & 297mm x 420mm.

68 Million



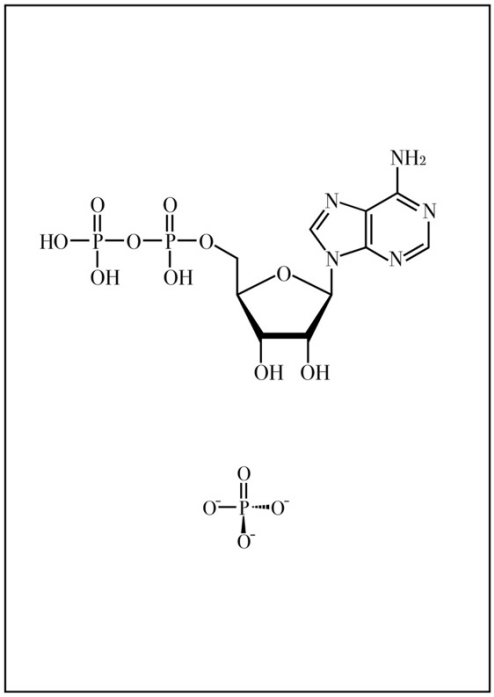
VII: Assembly Point

Those protons we pumped through to the denser regions of protons now flow into and power an Enzyme called 'ATP Synthase'. Think of this enzyme as a factory and our protons the power to run the machine.

ATP synthase rotates as the protons flow through back into the less dense region. As it rotates, the ATP Synthase combines a molecule called ADP and a phosphate group to form ATP. Water is also produced from this process.

VII: Assembly Point
2020. Photograph & Ink on Watercolour Paper.
297mm x 420mm & 297mm x 420mm & 297mm x 420mm.

68 Million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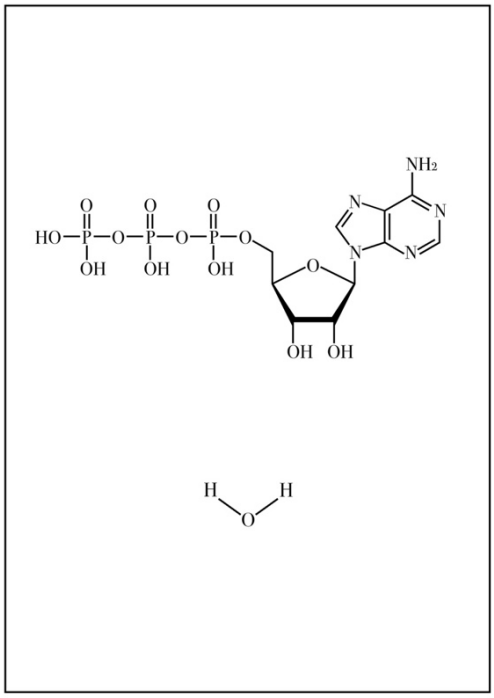
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68 Million

VIII: Cellular Currency

Here it is, what we've wanted from the start of our story.

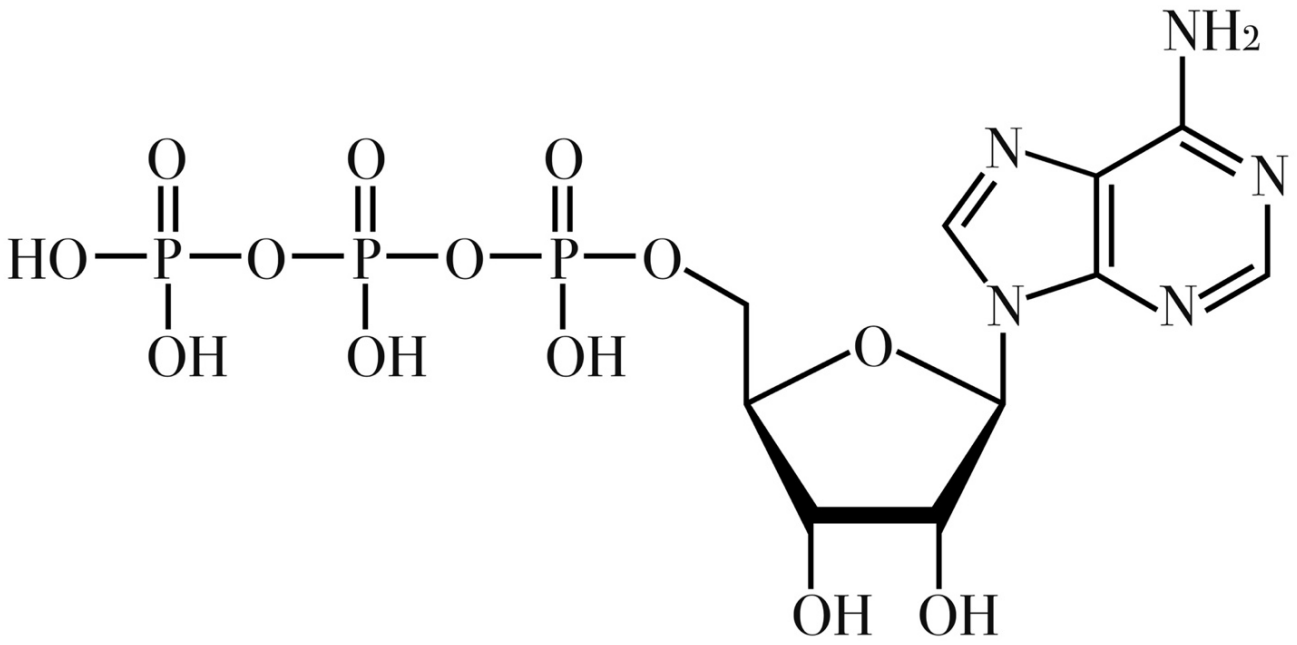
Adenosine Triphosphate (ATP).

The cell can now use this molecule when it needs energy. To do this, the cell will break off the third phosphate group & harness the energy released. This will make ADP again which in turn will go back to the ATP Synthase to be fused into ATP again.

Every single day you produce roughly 90,000,000,000,000,000,000,000,000 molecules of ATP. In other words, you make your own body weight in ATP every day.

Roughly 68 Million ATP per cell. per second.

VIII: Cellular Currency
2020. Digital Drawing. 420mm x 594mm.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Story End.

'68 Million'

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III: Conversion Stage I
IV: Into The Mitochondria
V: Conversion Stage II
VI: Donors & ETC
VII: Assembly Point
VIII: Cellular Currency

Lewis Andrews
2020
Ink on Watercolour Paper, Digital Text, Digital Drawing & Photograph.

www.lewisandrewsartwork.com

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