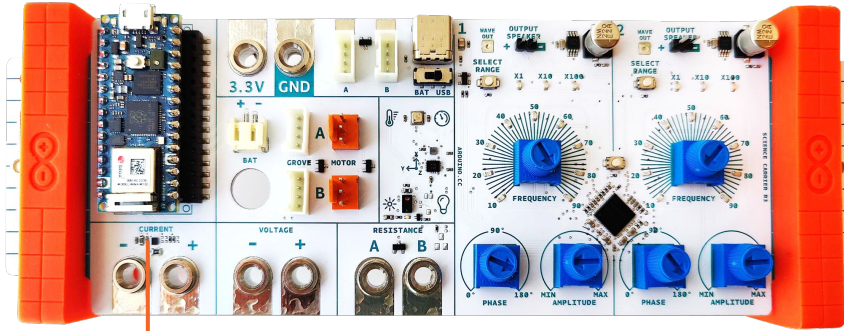# Arduino Science Kit R3

What is it included?

What components are included in the kit?

Arduino Science Carrier R3

The carrier is one of the main components of this kit and it contains an **Arduino Nano RP2040 Connect**.

The **Arduino Nano RP2040 Connect** comes with a preloaded program for it to work directly.

This kit will help teachers and students jumping into the experiments right away, without programming, the kit is about science and physics so most of the components are already integrated to not invest time in prototyping.

So no programming needed! The board is ready!

It also features Bluetooth® connectivity for easy data transmission from the Arduino board to the students' mobile devices.

Let's see what other features the carrier has, continue reading!
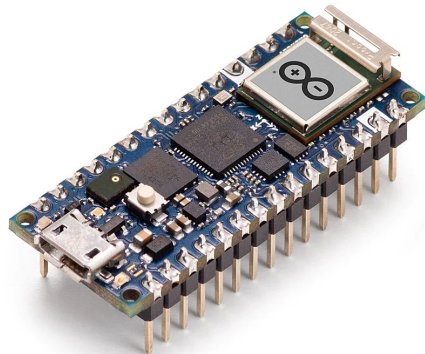
Arduino Science Carrier R3 - Sensors & power

USB-C© power connection, the USB cable is included within the kit, and a battery holder is also included in case you want to work wireless.
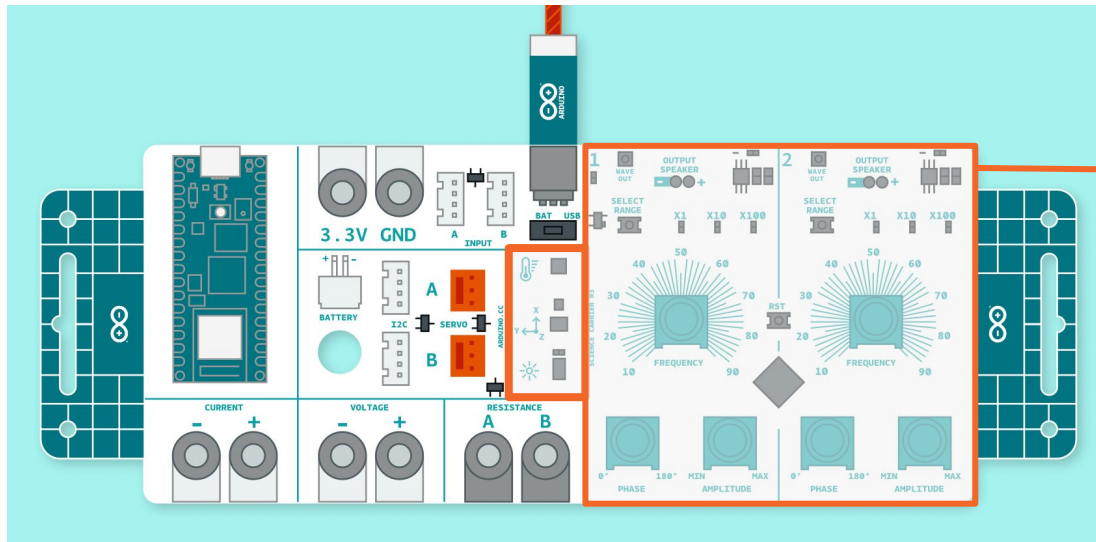
Embedded Sensors:

- Air temperature, humidity & pressure
- IMU: 6 axis linear accelerometer, gyroscope and magnetometer

- Proximity, light, light color temperature

- Voltage or electric potential difference

- Electrical current

- Electrical resistance

- Function generator to see and hear the effect of frequency and amplitude of a sound wave.

- Sound intensity sensor that uses microphone on Arduino board

Arduino Science Carrier R3 - Connection Ports
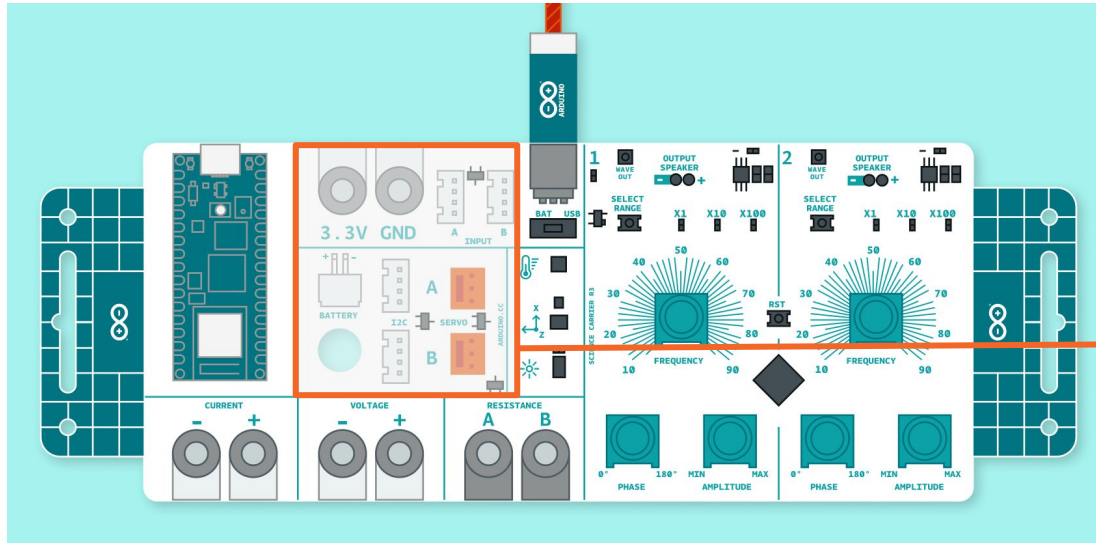
Ports:

2x Grove analog inputs (for external temperature sensor)

2x I2C ports (for external distance & ping-echo sensor)

1x Battery JST connector

2x Output ports connected to lower power signal from signal generators* (future generation)

1x 3.3 V output port and Ground

2x speaker ports connected to function generators

Other kit components

- 50 cm double-ended cable - blue - Crocodile Clips one end, banana plug the other
- 20 cm double-ended cable - black - Crocodile Clips one end, banana plug the other
- 20 cm double-ended cable - red - Crocodile Clips one end, banana plug the other
- VELCRO© strips

- Silicon Stands
- External temperature probe sensor
- Ultrasonic Distance Sensor
- Grove cable 4pin housing with lock x 2 L=200mm
- USB-C© Cable
- 50 cm double-ended cable - yellow - Crocodile Clips one end, banana plug the other
- Speakers (x 2)
- Cable for battery holder with JST connector
- Battery holder for 4 1v5 AA Batteries

Projects

Experiment with **forces**, **motion**, **conductivity**, **magnetism** with your classmates. Make your own hypotheses like a real scientist, then test your assumptions and log your data using the Arduino Science Journal app on your mobile device

In the first part of course "**Explore Physics**" we've created **15 hands-on experiment** to complete either in class, in the lab or outside, (to experiment with different conditions)
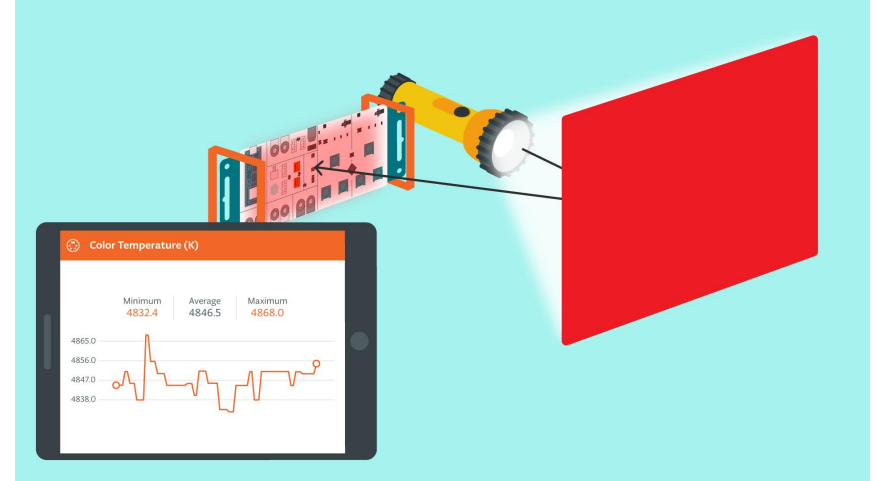
Curriculum alignments:
AP PHYSICS - 1: 4.A.1.1; 1: 3.B.1.1; 2: 2.D.2.1; 2: 7.A.3.⅔;
IB DIPLOMA - A.1, A.2, A.3, C1, C.2, C.4, C.5, B.3, B.5, D.2
NGSS - HS-PS4-1, HS-PS2-5, HS-PS3-3,, HS-PS3-4
NYS - HS-PS2-1, HS-PS3-3, HS-PS2-5, HS-PS1-9/HS-PS3-4, HS-PS1/PS4-3/ESS1-3, HS-PS4-1
UK(E) - KS3/4/5

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Projects

- **Color and Temperature** - To investigate the relationship between color-temperature and color of a surface.

- **The inclined plane** - To investigate the effect of incline angle on the component of the acceleration of an object along an incline.

- **The refrigerator door** - To explore the effects of air temperature on air pressure.

- **SHM: Spring-mass system** - To investigate the influence of mass on the period of oscillation of a spring-mass system

- **Simple Pendulum** - To investigate the effect of pendulum length on its period of oscillation

- **Time of Flight** - To investigate the effect of initial horizontal speed on the time of flight for a 2-dimensional projectile.

- **Magnetic Effects of DC and AC Currents** - To explore the effect of an electrical current flowing through a solenoid on the magnetic field produced by the solenoid

- **Coefficient of Restitution** - To measure the effect of bouncing on the kinetic energy of a basketball.

- **Internal Resistance of a Battery** - To investigate the effect of the current flowing through a battery on the effective voltage across an external resistor and to measure the internal resistance and electromotive force (emf) of a battery

- **Electrical properties of Components** - To measure the current-voltage characteristics of resistors, bulbs and diodes

- **Melting Point of a Solid** - To measure the melting point of a solid from its cooling curve as it changes state from a liquid to a solid

- **Specific Heat Capacity** - To measure the effect of adding a hot metal block to cold water on the temperature of the water-block mixture and to find the specific heat capacity of the metal block

- **Speed of Sound** - Investigate the effect of target distance on ping-echo time for an ultrasonic sound wave and to measure the speed of sound

- **Wave Properties** - To investigate the effect of sound wave amplitude on loudness and sound wave frequency on pitch

- **Wave Interference** - To investigate the effect of the phase difference between two sound waves on their combined loudness

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Software - Science Journal app

The Arduino Science Journal is a _**free**_ app that allows you to gather data about the world around you by harnessing the sensors in your smartphone as well as sensors connected to Arduino. The Science Journal transforms smartphones, tablets, and Chromebooks into science notebooks that encourage students to explore their world.

The **app is needed to run the experiments** so the students will need a tablet or phone to learn with this kit.

The Arduino Science Journal app available for download from the main app stores: Play Store (Android) and iOS app store