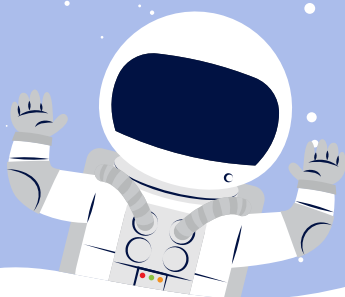


Activity sheet (Primary level)

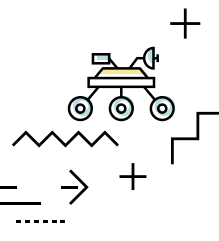
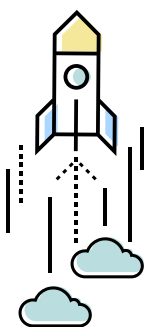
"China's Lunar and Mars Exploration"
Special Exhibition



Rovers for Lunar and Mars Exploration

The rovers that have landed on Moon and Mars help scientists study these celestial bodies.

Through this project learning, we will get to know more about the Moon and Mars, and understand how the scientific instruments installed on the rovers help uncover the secrets of Moon and Mars.



Project Learning

Task 1: Get to know Moon and Mars

Choose either Moon or Mars for research and answer the following questions.

How is the atmosphere of Moon / Mars differ from Earth's atmosphere?

The lunar atmosphere is extremely thin and cannot provide protection to Moon like Earth's atmosphere does.
The Martian atmosphere is thinner than that of Earth, with a volume that is only 1% of Earth's.
(or other reasonable answer)

What natural resources can be found on Moon / Mars?

Moon: rare-earth elements, helium, minerals, etc.
Mars: minerals, water-ice, soil, etc.
(or other reasonable answer)

What are the average temperatures of Moon / Mars during the day and night?

Moon: The daytime temperature is about 120°C, while the nighttime temperature drops to about -170°C.
Mars: The daytime temperature in summer can reach about 20°C, while the nighttime temperature can fall to about -150°C.
(Temperatures will vary at different latitudes and seasons. Teachers can determine the answer based on the students' reference sources.)

How long is a day on Moon / Mars in terms of Earth hours?

A lunar day is approximately 708.7 hours.
A Martian day is approximately 24.6 hours.

Name some landscape features of Moon / Mars.

Moon: mountains, basins, valleys, etc.
Mars: mountains, plains, canyons, volcanoes, etc.
(or other reasonable answer)



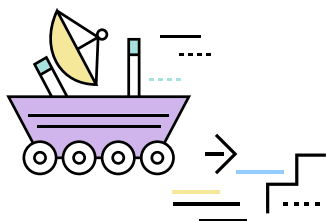
Activity sheet (Primary level)

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Project Learning

Task 2: Study the rovers

Rovers can move on rough surfaces, withstand tough environmental conditions, and collect valuable scientific data for researchers.



Based on your selection of the research subject in task 1, study the missions, functions and features of the lunar rover Yutu or the Mars rover Zhurong, and answer the following questions:

What scientific instruments are installed in the rover?

Yutu: Panoramic camera, lunar penetrating radar, visible and near-infrared imaging spectrometer, active particle-induced X-ray spectrometer
Zhurong: multispectral camera, penetrating radar, surface composition detector, magnetometer, climate station, navigation and terrain camera

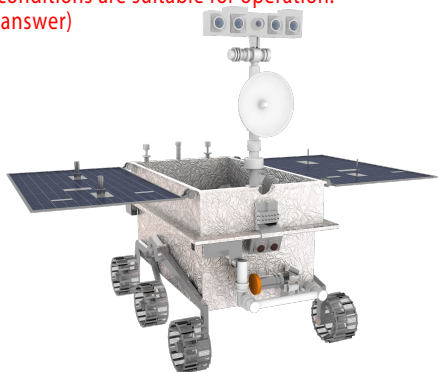
What special features of the rover allow it to move on rough surfaces?

Yutu: wheels, rocker suspension
Zhurong: wheels, active suspension, different modes of movement

How does the rover obtain energy?
Why can it withstand extreme temperatures?

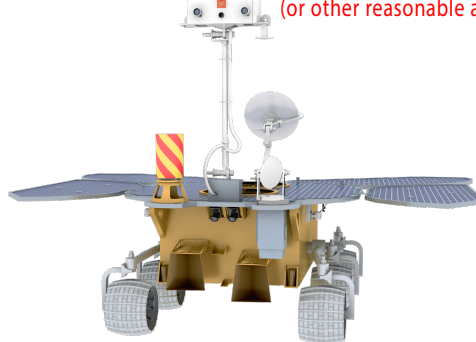
Yutu: It retrieves solar energy using solar panels. When facing the severe cold of the lunar night, Yutu retracts its mast and one of the solar panels and switches to sleep mode. During the daytime, to prevent the instruments from overheating, Yutu can adjust the angle of the solar panel to avoid direct sunlight.

Zhurong: It uses solar panels to obtain solar energy and is equipped with heat-collecting device. The chemical inside the device absorbs heat during the day and releases it at night, keeping Zhurong warm. The rover also uses nano-aerogel for thermal insulation. When encountering an extremely low-temperature environment, Zhurong enters dormant mode until conditions are suitable for operation.
(or other reasonable answer)



What achievements has the rover made?

Yutu achieved China's first in situ exploration of celestial bodies beyond Earth. The data obtained from Yutu's lunar penetrating radar successfully created the first-ever lunar geological cross-section profile. Data from the visible and near-infrared imaging spectrometer, as well as the active particle-induced X-ray spectrometer, allowed scientists to discover a new type of lunar mare basalt. The landing of Zhurong on Mars made China the second country to successfully send a rover to Mars. Zhurong obtained a large amount of scientific data on the surface magnetic field, meteorology, topography, and other aspects of the roving area. For example, it revealed evidence that supports the existence of an ocean in the northern part of Mars.
(or other reasonable answers)

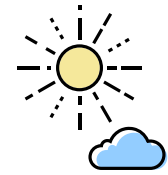


Let's explore the achievements China made in its lunar and Mars exploration!



Activity sheet (Primary level)

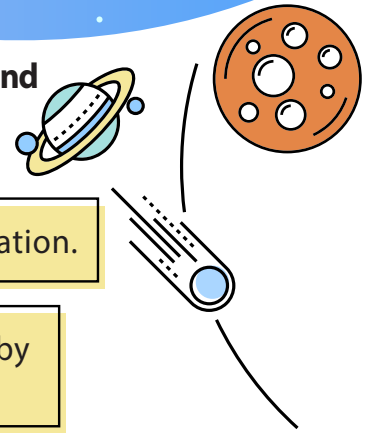
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Project Learning

Task 3: Become an adventurous friend

Let's design and make a rover.



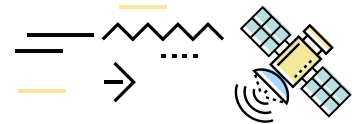
1. Pick a challenge that the rover may face during Moon / Mars exploration.

2. Find out how scientists and engineers cope with this challenge by making corresponding design of the rover.

3. Design or modify the current rover so that it can cope with the challenge more effectively.

4. Make a prototype rover using materials like cardboard, wheels and solar panels. Alternatively, you can use design and engineering apps like Tinkercad to create a virtual prototype.

5. Show the class your design and explain the strategies used to cope with the challenge.



Draw the rover design in the space below.