

## Lesson 7

# Artificial Satellites and the Modern Professions II

## Worksheet

School: ..... Class: ..... Date: .....

### Activity 1: Presentation of the storytelling video (7 minutes)

Please watch the video with the storytelling.

### Activity 2: Projection of images (2 minutes)

Please watch the images and formulate your questions.

### Activity 3: Questions of the students (3 minutes)

Please formulate your questions based on the storytelling and the images you watched:

1.	
2.	
3.	

1

### Activity 4: Questions of the lesson-teacher (3 minutes)

1. How are the satellite images used in space missions?
2. How does a satellite work in the infrared, or how do the satellites see at night?
3. How can I construct an arrangement which detects the infrared?

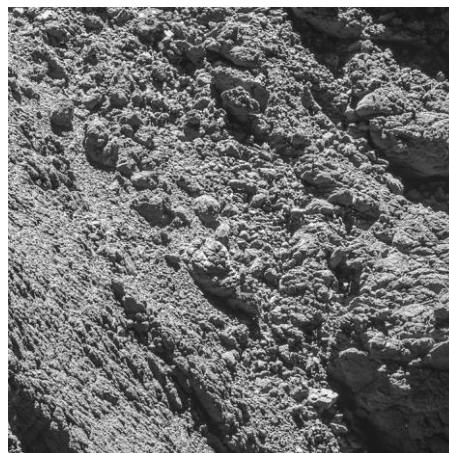
### Activity 5: Answers-hypotheses of the students (5 minutes)

Please write down your answers-hypotheses to the above questions.

1.	
2.	
3.	
4.	
5.	

### Activity 6: How are the satellite images used in space missions? (7 minutes)

Observe the satellite image of the Comet 67P/Churyumov-Gerasimenko, as taken from the spacecraft Rosetta. Observe the picture and try to locate the robotic lander Philae.



2

The Philae is located:

### Activity 7: How does the satellite work in the infrared, or how do the satellites see at night? (10 minutes)

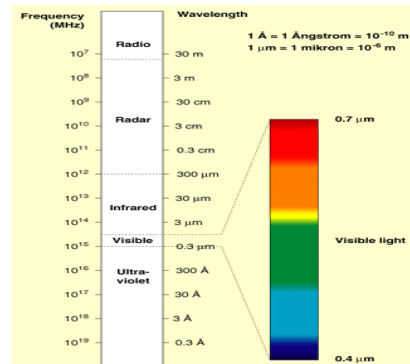
#### Materials:

- Remote control of electronic device

- Cell phone with camera

1. the electromagnetic spectrum is depicted in this picture.

a) Which colors do you see?



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b) Where is the infrared located, and in which everyday activities do we encounter it?

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2. Please activate the camera of the cell phone and aim at the remote control by pressing the buttons. What do you observe?

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**Activity 8: How can I construct a device which detects the infrared? (25 minutes)**

Some satellites function in the spectrum of the electromagnetic radiation that is not visible to the human eye. How is the detection of this radiation by the circuits of the satellites performed?

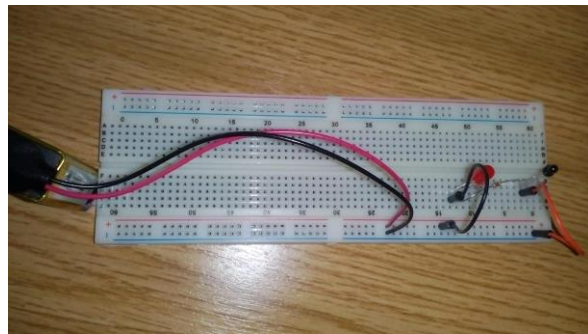
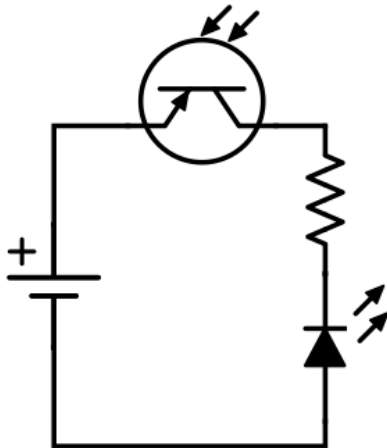
Materials:

1. Special board for the immediate assembling and disassembling of electric circuits

2. Resistor of 62 Ohm
3. LED lamp
4. Phototransistor of 850 nm
5. Connection cables
6. Voltage source of steady current, of 3 to 9V (batteries or power supply)
7. Remote control of electronic device

### Steps of the construction:

1. Construct the circuit, as presented in the diagram, with the given materials.



The circuit of the photodetector. Diagram and photo.

#### ATTENTION:

Always use for the circuit a voltage source of 3V!

About the connections on the board:

The columns inside the board, in the region defined by the letters ABCDE and FGHIJ are vertically short-circuited, which means that the 5 holes of each column have the same current. The rows on the upper and lower part of the board are horizontally short-circuited, which means that the 60 horizontal holes have the same current. In these, we connect the source. Some boards have at their middle an empty space. In these boards, the horizontal holes are short-circuited in two groups: from 0 to 30 and from 31 to 60.

The long leg of the LED lamp and the phototransistor corresponds to +.

2. Try to detect the infrared radiation by approaching the remote control (and pressing a button) to the phototransistor. What happens to the circuit? How does it work?

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3. Present your hypotheses to the classroom.

**Activity 9: Comparison between the final conclusions and the initial answers of the students (5 minutes)**

Please compare your initial answers with the final conclusions.

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**Activity 10: Extension-Application of the conclusions (2 minutes)**

In which everyday activities do you believe that the satellites, programmed to work with their infrared sensors, contribute?

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**Activity 11: Connection of the lesson with vocational guidance (10 minutes)**

In the municipality of a large city operates a meteorological station. Which STEM specialties (Astronomer, astrophysicist, physicist, electric engineer, aeronautical engineer, mechanics engineer, telecommunications engineer, computer engineer, technologist, meteorologist, geologist, mathematician, technician, chemist, biologist) could use the data taken from the station for the benefit of the local community, and in which ways?



Then, present your proposals to the rest of your classmates.

Stem specialty	Benefit