

Original statements of problems *Invent Yourself* for SF 3

9th IYNT 2021

Released on August 11, 2021

Bulgaria

13. Skin conductance. Investigate how the skin conductance depends on the emotional and physiological state of the organism.

14. Epidemiology. Use the data for the COVID-19 pandemic, available on the Internet, to estimate the numerical values of the parameters, describing the different waves in different countries. How can you explain the possible differences?

15. Hearing range. Investigate how the hearing range of humans is affected by their age and other external factors.

16. Weak signals. Make an investigation, based on data with a low signal-to-noise ratio to explore a distant Space object.

17. Standing waves. Design and perform an experiment, in which standing waves are used to measure how the sound speed depends on the air temperature.

Croatia

13. Skin conductance. When exposed to stimuli that people perceive as unpleasant, or that may cause physiological reactions, conductance of human skin (the galvanic skin response) changes. Investigate the change in the galvanic skin response when exposed to visual and auditory stimuli and the correlation between participant reaction.

14. Epidemiology. There are many parameters important for the spread of the COVID-19 pandemic. Find out how different parameters like temperature, humidity, epidemiological measures etc. influence spreading of the virus and investigate the effect.

15. Hearing range. Devise a way to examine the hearing range of different species of fish.

16. Weak signals. Controlling signal-to-noise ratio is important in computational neuroscience to distinguish a signal that caused an action potential from a statistical fluke. Propose a simulation of a given problem and investigate how filtering techniques help identify unknown parameters, e.g. ion channel conductance values, in electrophysiological recordings.

17. Standing waves. With right frequency played from an emitter, small balls can be levitated by standing waves between a speaker and a reflector. Investigate the phenomenon and parameters of the system.

Georgia

13. Skin conductance. Investigate how different genres of movies can affect the human mind and skin conductance.

14. Epidemiology. Human society has been profoundly affected by the COVID-19 pandemic. Propose a study involving analysis of available epidemiological data for the pandemic.

- Suggest a statistical method for analysis of available data. Study how COVID-19 cases depend on different factors such as: vaccination, quarantine.
- How ending time of pandemic depends on vaccination speed.

15. Hearing range. Investigate how mammal species with different lifestyles react to different frequencies.

16. Weak signals. Create a device that will distinguish seismic waves from random noise.

17. Standing waves. Consider a thin plate whose center starts to vibrate. If sand is placed on the plate, it will distribute in a complex pattern. Investigate how pattern depends on the relevant parameters.

Greece-Alliance

13. Skin conductance. Measurement of changes in the skin conductance levels to assess the stress levels of children during lockdown.

14. Epidemiology. The human society has been profoundly affected by the Covid-19 pandemic. I will study the effects of the pandemic-lock down in the mental health.

15. Hearing range. There is a considerable variation in the range of frequencies that can be heard by humans. We will investigate the lowest and highest audible frequencies, that human can hear, depending on their age, gender and the influence of otitis. Moreover, we will investigate how hearing of loud music can cause a drop of hearing ability.

16. Weak signals. Detection of weak signals in the case of electromagnetic leakage, to examine the risks to home computers.

17. Standing waves. Find the relationship between the length of a rope oscillating with a stable frequency and its linear mass density and tension.

Greece-Fryganiotis

13. Skin conductance. Find the skin conductance in relevance with the psychological condition of a person by using pioneering methods. Investigate how the age, gender and other relevant parameters affect it.

14. Epidemiology. Make full use of the space based data of Earth observations before the pandemic to see the correlation between SDOH and the real-time distribution of COVID-19 cases.

15. Hearing range. How does age affect the range of audible frequencies in humans?

16. Weak signals. Find a way to detect weak signals in noise by utilizing data in regard to the electromagnetic field of the audio source.

17. Standing waves. Find the relationship between the length of a rope oscillating with a stable frequency and its linear mass density and tension.

Iran-Innovative Researchers

13. Skin conductance. Important parameters in skin conductivity:

- The type of living thing
- race
- Skin type
- Psychological conditions

What is the electrical conductivity of the skin? Do our emotions affect the conductivity of the skin? Why and what effect do they have? Do sweat and moisture of human skin affect the conductivity of the skin?

14. Epidemiology. Parameters:

- Population
- Time
- Race
- Place
- Pathogens

How to perform a test? Name some Coronaviruses that was transmitted from animals to human.

- What is Epidemiological Data?
- Can you explain more about Covid-19?
- How can Covid-19 infect us?

15. Hearing range. Effective parameters on auditory differences. Frequent use of headphones. Example of an animal that can hear beyond the face. What is the importance of frequency in this issue and why should we know it? What causes some animals to hear ultrasonic sounds? Explain the structure of the ear. What is Sound?

16. Weak signals. In alternating signals, the necessary and effective factors in obtaining the signal-to-noise ratio are the calculation of the signal proportionality period.

Parameters:

- Signal
- Mapping
- Visual cues
- Functions
- What do weak signals include?
- What are the methods for doing this test?
- What is Signal-to-noise ratio? Where is it used?
- How we can detect very weak signals?

17. Standing waves. Why are standing waves produce? Measuring the volume of the sound. Effective parameter such as frequency and wave length. Standing waves definition. Waves are a vibration or oscillation that transmits energies. The main characteristics of a wave.

Iran-Valeh

13. Hearing. What is skin conductance used for? Where is the main source of skin conductance response? Are areas with higher concentrations of sweat glands? How these areas help to find skin conductance response? Is frequency higher in this area? Can we measure skin conductance by heart rate responses? It is suggested to include measurements of personality especially related to anxiety. we all know that the amount of sweat secretion from Exocrine

gland towards the skin depend on our emotions, our health condition. When we are scared of something, we get cold, or when we have a fever our body temperature gets high.

Experiments we can do:

- skin conductance
- using lie detector
- checking eyes
- Digital thermometer
- Strip thermometer

14. Epidemiology. What are Coronaviruses? Analysis of available epidemiological data for the pandemic. What is Epidemiological Data? What is Epidemic and Pandemic? Name some Coronaviruses that was transmitted from animals to human. Health policies of each country, based on controlling the spread of the disease. Epidemiological data that can be analyzed:

The most common symptoms of the disease

Geographical spread:

- 1 - Spatial distance and proximity
- 2 - The average age of a country
- 3 - Health policies of each country, based on controlling the spread of the disease

15. Hearing range. Explain the structure of the ear. What is Sound? Two important properties of sound. Suggest a problem to investigate the lowest and highest audible frequencies for specific species of societal groups. Experiments that can be done for finding hearing of animals and humans. Checking the range of hearing between different animals.

The human ear is the auditory and balance organ that detects and analyzes sound by transmitting or converting sound waves into electrochemical impulses and creates a sense of balance in us. Two important properties of sound are frequency and intensity.

16. Weak signals. What is Signal-to-noise ratio? Where is it used? How it is measured? What is statistical fluke? How we can detect very weak signals? In alternating signals, the necessary and effective factors in obtaining the signal-to-noise ratio are the calculation of the signal proportionality period. In the signal-to-noise ratio, it is important to consider the modulation signals to the average noise power. When the signals interfere with the noise, we reduce the noise by obtaining the harmonics created. One of the factors affecting meaningful signals is the presence of magnetic fields that can be reduced or eliminated to prevent the reduction of meaningful signals.

17. Standing waves. What is wave? What are the general classification of wave types? Explanation of the main characteristics of a wave. Standing waves definition. Different experiments about standing waves. Test equipment in experimental design.

Kazakhstan-Bobek

13. Skin conductance. We ask to study the factors that influence skin conductance.

14. Epidemiology. Even though coronavirus did a lot of bad impact, it still had a good side. It helped to recover to our nature . And we hope that people learnt their lesson and became more responsible for our world.

15. Hearing range. The audibility by the human ear varies between all individuals. The audible frequency range on average is between 16 Hz to 20 KHz, and the intensity detected by the average person is between -10dB to 130 dB.

16. Weak signals. We ask to study different examples of weak signals.

17. Standing waves. We study an ordinary tube with cork dust in it and drive 660 Hz into this pipe.

Kazakhstan-RFMS

13. **Skin conductance.** Study the effect of stress and adrenaline production on skin conduction.
14. **Epidemiology.** Study the impact of quarantine on the spread of covid 19.
15. **Hearing range.** Study the parameters affecting the hearing range of different creatures.
16. **Weak signals.** Examine the effect of materials on the WIFI signal. Under what conditions will the signal be weak and how to pick it up?
17. **Standing waves.** Study of various parameters affecting the occurrence and shape of Faraday waves.

New Zealand

13. **Skin conductance.** Levels of skin conductance can vary depending on the presence of emotional stimuli. Investigate this phenomenon in the viewing of a short horror film.
14. **Epidemiology.** Is it possible to reach herd immunity through vaccination?
15. **Hearing range.** Humans and dogs have different ranges of audible frequency. Investigate and compare the highest and lowest audible frequencies for the two societal groups.
16. **Weak signals.** Gravitational waves were predicted by Einstein many years ago but have only been detected in the last few years using sophisticated observatories. Compare light interferometer data to predicted models of stellar collisions to determine if gravitational waves signals can be separated from background noise. Explain the techniques used to minimise noise and improve the strength of the signal.
17. **Standing waves.** A plastic ruler is fastened to an oscillator at its center and oscillated at different frequencies, at certain frequencies nodes are formed. Investigate relevant parameters that affect the position of the nodes.

Romania-LIMITLESS

13. **Skin conductance.** Measure the emotional impact of different entertainment forms (video games, music, movies etc.) using a GSR (galvanic skin response) sensor.
14. **Epidemiology.** COVID-19 pandemic is a significant psychological stressor. Psychiatric consequences to SARS CoV 2 infection can be caused by psychological stressors. Depression, anxiety, trauma-related symptoms etc. have been associated with Covid 19. Explain the possible mechanisms that contribute to the psychiatric consequences and the incidence of anxiety and depression after documented clinical Covid 19 infection.
15. **Hearing range.** Analysis of the audiograms depending on the hearing problem of the subject.
16. **Weak signals.** Interpret meaningful weak signals from statistical flukes in different fields (stock market, audio recordings, etc.)
17. **Standing waves.** Observation and study of the presence of standing waves with a technical setup applied in a household environment.

Romania-NITRO

- 13. Skin conductance.** Skin conductance depends on how much sweat the human body produces, which can be stimulated by many physical and emotional factors. Suggest a way to induce an emotional state to a person and investigate how the skin conductance is influenced by it.
- 14. Epidemiology.** In 2020, humanity was taken by surprise by the Covid-19 pandemic. At the beginning, it was considered that mass testing of the population is one of the most important actions that can limit or even stop the transmission of the disease. The subsequent evolution of the pandemic only partially confirmed this approach. Investigate the importance and limitations of mass testing.
- 15. Hearing range.** Humans hear weaker frequencies better than the higher ones. Perform an experiment to outline the limits of the human hearing. Compare the results to the ones from the other investigated species.
- 16. Weak signals.** Test peoples accuracy in detecting common examples of weak signals.
- 17. Standing waves.** Investigate the physics of standing waves and standing waves on guitar strings. Can you play harmonics on guitar strings? Which standing wave patterns you can produce on a guitar string by playing harmonics?

Russia-Unartificial Intelligence

- 13. Skin conductance.** Explore the correlation of electrochemical parameters and the psychosomatic state of biological objects.
- 14. Epidemiology.** The COVID-19 pandemic has had a huge impact on human society. Suggest a study requiring an analysis of the available epidemiological data for this pandemic.
- 15. Hearing range.** Let's try to measure how the audibility of high and low frequencies changes in people of different ages.
- 16. Weak signals.** How to use software for analyzing and correction of sound frequency signal?
- 17. Standing waves.** Standing Waves in Musical Bottles.