Science Fair Project Planning Packet

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	Due Dates	Things To Do
	Nov. 12	Choose topic and write project question.
	Nov. 12	Get approval from your teacher.
	Nov. 16 - Nov. 19	Research your topic and write key words and paragraph.
	Nov. 20	Write a hypothesis.
	Nov. 21 - Nov. 23	Design an experiment; list variables and write procedure.
	Nov. 24 - Nov. 26	List and gather your materials (bring after winter break).
	Nov. 27 - Dec. 31	Conduct experiment and record data and observations.
	Jan - Jan. 3	Create a table, chart, or graph of the data.
	Jan 3	Draw conclusions.
	X	Make the project display.
	Jan 4 - Jan 5	Write and Print Abstract
	January 12 9	~~Turn in Planning Packet to teacher~~. Present in school
	April 10 - 12	Present your project at the science fair. (in class)

1. Think of a Question - Your question will drive your entire project. Make sure that your question is something that can be measured and answered by following the scientific process. Your question will also be the title of your project.

Project Question

Do people working in diffcent professions hear differently?

2. Research Your Topic - spend some time with your group learning more about your topic. Use reliable Internet sources, books from the library, your science book, or other resources. Not only do you want to be an expert on your topic, but you want to teach others about your topic.
    1. *Key Words* - locate at least 3 key science words related to your topic. Your science book is an excellent place to find these. Make sure that the words you choose are directly related to your topic. Provide a definition of each key word IN YOUR OWN WORDS.
    2. *A paragraph describing the science behind your project* - after you have completed your research give us (your audience) some background information on your topic in a complete and well-written paragraph (5-7 sentences). Give us specific, rather than general information. Use the space provided to write a draft. You will edit a final copy to place on your display

board.

Key Words

Key word	Definition
Hearing Frequency Range	Minimum to maximum sound frequency that human can hear (20 Hz - 20,000 Hz).
Hertz (Hz)	It is the unit by which we measure sound frequency.
Maximum Hearing Frequency	It is the maximum sound frequency that a person can hear.
Frequency	The rate at which something is repeated at a particular period of time.
Wavelength	The distance between the highest points of a wave or the length of a wave.
Decibal (db)	It is the unit by which we measur the intesity of sound.

Research Description

Outer Ear- sound wave enter through the ear canal and vibrate the ear drum. Middle Ear- three tiny bones amplify the sound vibrations. Inner Ear- vibrations move fluid inside the Cochlea and the fluid motion move the hair cells which creates an electric signal sent to the brain through auditory nerve.

What factors affect hearing?

1. Intensity of sound 2. Duration of exposure 3. Distance

Types of hearing loss: Sensorineural, Conductive, Mixed

Sensorineural- origin from the inner ear, caused by exposure to loud noises.

Humans' hearing range is 20 Hz to 20,000 Hz.

Loud sound exposure

- Military
- Musician
- Construction
- Manufacturing

Normal sound exposure

- IT professionals
- Librarians

3. State Your Hypothesis - In your group decide what you think the outcome of the project will be and make a good guess as to what you think the answer to your question will be. **Also explain WHY you think that will be the outcome.** Remember, it is ok if you don't have the right answer; that is how scientists make discoveries. Make sure that your hypothesis is written in a complete sentence.

Hypothesis

My hypothesis is that there is a (significant) difference in the maximum hearing frequency for professionals working in the high sound exposure professions like military, construction, manufacturing and music industry as compared to normal sound sound exposure professions like IT and librarians. (Age group 40-50 years)

Design Your Experiment - Clearly write out the procedure you are going to follow. Remember that your experiment needs to follow the scientific process and that you need to have one variable that you are going to change.

1. *Variables* - List the variables that you are going to keep the same and the one variable that you are going to change. You need to have at least one control (normal) variable and at least two to three other variables.
2. *Write your procedure* - Think through each step very carefully and list them in numbered order.

Variables

Variables to keep the same: Age group, Sound source, and Sound volume

Responding Variable: Maximum hearing frequency

Uncontrollable Variable: Random insignificant background noises.

Variable to change (Independent Variable): Profession

Procedure

1. Prepare a data capturing sheet for 30 people between the age 40-50 years with 5 people working in each of the six chosen professions. Six chosen professions are: Military, Musicians, Construction, Manufacturing, Information Technology and Librarians.
2. Ensure there is no noise in the room.
3. Play the sound using same sound web source to generate sound frequencies (Online Tone Generator - generate pure tones of any frequency (szynalski.com)) and maximum volume.
4. Start with 1000 Hz frequency and slowly increase the frequency till the person stops hearing the sound.
5. Capture the maximum hearing frequency and profession of the person on the log book.
6. Repeat the experiment for 5 people working in each of the chosen 6 professions.
7. Calculate the average maximum hearing frequency for people working in each 6 professions.
8. Compare the difference in the average maximum hearing frequency for people working in 6 professions to test the hypothesis.
9. Conclude the findings.

5. Gather Materials - list all the materials that you will need to complete your experiment.

Materials

I used the following materials:

1. Phone Device and a website to play different sound frequencies.
2. Data sheet to capture the maximum hearing frequency.

6. Conduct experiment – when you do your experiment you need to collect data and make observations. You will complete these in your Experiment Log. After you have completed the experiment use your log to write down the data and observations below. In your log you will need to:
   1. *Collect Data* - you will need to collect numerical data; that means you need to take measurements during the experiment. It can be temperature, distance, height, etc. You will analyze the data later to determine the results of your experiment.
   2. *Make Observations* - as you conduct your experiment you will use your senses (sight, smell, touch, etc.) and write down any observations you make during the process.

Data

Maximum hearing frequency data was captured for five people working in each of the six professions within the age group 40-50 years.

Observations

1. I conducted 5 experiments for each of the 6 chosen professions for people in the age group 40-50 years.
2. I noted the readings in the data sheet for appropriate professions. See the data sheet at the end of packet.

7. Determine the Results - Now it is time to review your data and observations to find out what happened. Think about the best way to show your data: bar graph, line graph, chart, etc. and then create a table or a graph using your data. Write out the results of each test in the experiment in paragraph form using complete sentences. Make sure that you include the numerical data (measurements) as well as any other important observations that you made.

Results (graph or chart)

Use this space, or a separate sheet in your notebook, to sketch 1 or more tables, charts, or graphs to analyze your data.

See at the end of packet

Day 1

Date: December 15, 2024

Experiment 1

Person 1

Profession - Military

Age - 48

Maximum HF (Hz) - 9820

Experiment 2

Person 2

Profession - Manufacturing

Age - 47

Max. HF (Hz) - 10682

Day 2

Date: December 17, 2024

Experiment 3

Person 3

Profession - Librarian

Age - 45

Max HF (Hz) - 14807

Experiment 4

Person 4

Profession - IT professional

Age - 41

Max HF (Hz) - 13543

Day 3 Date: December 18, 2024

Experiment 5

Person 5

Profession - Construction

Age - 43

Max HF (Hz) - 11272

Experiment 7

Person 7

Profession - IT professional

Age - 43

Max HF (Hz) - 14654

Experiment 6

Person 6

Profession - Musician

Age - 48

Max HF (Hz) - 10103

Day 4

Date: December 21, 2024

Experiment 8

Person 8

Profession- Construction

Age - 45

Max HF (Hz) - 11600

Experiment 10

Person 10

Profession - Musician

Age - 44

Max HF (Hz) - 10583

Experiment 9

Person 9

Profession - Manufacturing

Age - 44

Max HF (Hz) - 10792

Day 5

Date: December 22, 2024

Experiment 11

Person 11

Profession - Military

Age - 47

Max HF (Hz) - 10482

Experiment 12

Person 12

Profession - Librarian

Age - 49

Max HF (Hz) - 12793

Day 6

Date: December 24, 2024

Experiment 13

Person 13

Profession- It professional

Age - 45

Max HF(Hz) - 13402

Experiment 15

Person 15

Profession - Librarian

Age - 47

Max HF(Hz) - 13528

Experiment 14

Person 14

Profession - Construction

Age - 49

Max HF(Hz) - 11529

Day 7

Date- December 27, 2024

Experiment 16

Person 16

Profession- Manufacturing

Age ~ 48

Max HF(Hz) - 10901

Experiment 18

Person 18

Profession- Military

Age - 43

Max HF(Hz) - 9505

Experiment 17

Person 17

Profession- Musician

Age - 45

Max HF(Hz) - 10379

Day 8

Date: December 28, 2024

Experiment 19

Person 19

Profession - Librarians

Age - 46

Max HF(Hz) - 13817

Experiment 21

Person 21

Profession - It professional

Age - 44

Max HF(Hz) - 13792

Experiment 20

Person 20

Profession - Construction

Age - 42

Max HF(Hz) - 10895

Day 9

Date: December 29, 2024

Experiment 22

Person 22

Profession - Musician

Age - 43

Max HF (Hz) - 9672

Experiment 24

Person 24

Profession - Military

Age - 42

Max HF (Hz) - 10109

Experiment 23

Person 23

Profession - Manufacturing

Age - 46

Max HF (Hz) - 9771

Day 10

Date: January 4, 2025

Experiment 25

Person 25

Profession- Musician

Age- 42

Max HF(Hz) - 10608

Experiment 27

Person 27

Profession - Librarian

Age- 41

Max HF(Hz) - 13204

Experiment 26

Person 26

Profession- IT professional

Age- 47

Max HF(Hz)- 13505

Day-11

Date: January 5, 2025

Experiment 28

Person 28

Profession- Manufacturing

Age - 41

Max HF(Hz) - 11102

Experiment 30

Person 30

Profession - Military

Age - 45

Max HF(Hz) - 9681

Experiment 29

Person - 29

Profession - Construction

Age - 47

Max HF(Hz) - 9929

Data Sheet

Number of People	Person	Age	Profession	Max HF (Hz)	Average (Hz)
1	Person 1	48	Military	9820	
2	Person 2	42	Military	10109	
3	Person 3	43	Military	9505	9919.4
4	Person 4	47	Military	10482	
5	Person 5	45	Military	9681	
6	Person 6	44	Manufacturing	10792	
7	Person 7	41	Manufacturing	11102	
8	Person 8	47	Manufacturing	10682	10649.6
9	Person 9	46	Manufacturing	9771	
10	Person 10	48	Manufacturing	10901	
11	Person 11	43	Construction	11272	
12	Person 12	49	Construction	11529	
13	Person 13	42	Construction	10845	11045
14	Person 14	45	Construction	11600	
15	Person 15	47	Construction	9929	
16	Person 16	44	Musician	10583	
17	Person 17	42	Musician	10608	
18	Person 18	48	Musician	10103	10269
19	Person 19	43	Musician	9672	
20	Person 20	45	Musician	10379	
21	Person 21	47	Librarian	13528	
22	Person 22	49	Librarian	12793	
23	Person 23	46	Librarian	13817	13629.8
24	Person 24	41	Librarian	13204	
25	Person 25	45	Librarian	14807	
26	Person 26	43	IT professional	14654	
27	Person 27	44	IT professional	13792	
28	Person 28	45	IT professional	13402	13779.2
29	Person 29	47	IT professional	13505	
30	Person 30	41	IT professional	13543	

Military

9820 + 10109 + 9505 + 10482 + 9681 = 49,597

49,597 ÷ 5 = 9919.4

Average = 9919.4

Manufacturing

10792 + 11102 + 10682 + 9771 + 10901 = 53,248

53,248 ÷ 5 = 10649.6

Average = 10649.6

Construction

11272 + 11529 + 10895 + 11600 + 9924 = 55,225

55,225 ÷ 5 = 11,045

Average = 11,045

Musician

10583 + 10608 + 10103 + 9672 + 10379 = 51,345

51,345 ÷ 5 = 10269

Average = 10269

Librarians

13528 + 12793 + 13817 + 13204 + 14807 = 68149

68149 ÷ 5 = 13630.8

Average = 13630.8

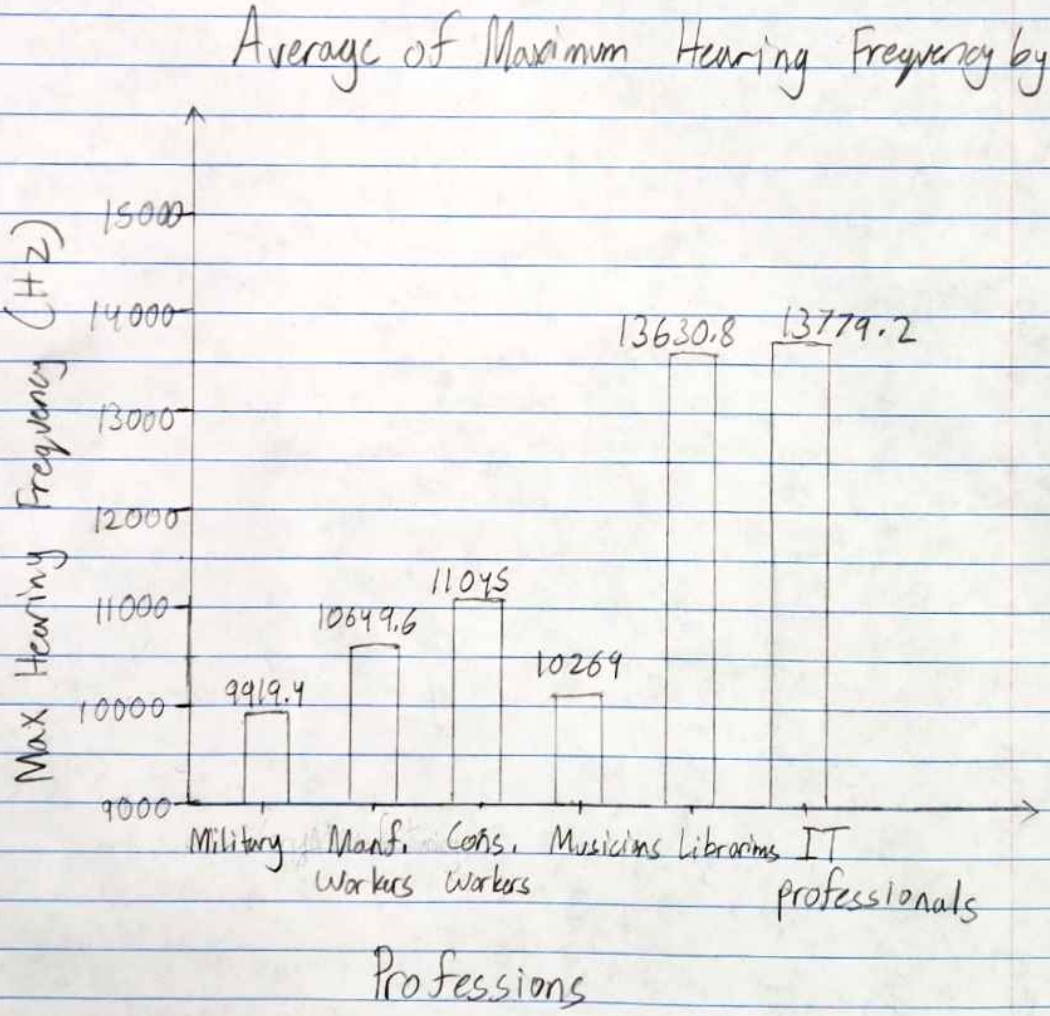
IT professional

14654 + 13792 + 13402 + 13505 + 13543 = 68896

68896 ÷ 5 = 13779.2

Average = 13779.2

Results


Average of Maximum Hearing Frequency by Profession
Max Hearing Frequency (Hz)
15000
14000
13000
12000
11000
10000
9000
9919.4
10649.6
11045
10269
13630.8
13779.2
Military
Manf. Workers
Cons. Workers
Musicians
Librarians
IT professionals
Professions

Results (paragraph)

1. The average maximum hearing frequency was calculated for 5 people working in each of the 6 chosen professions.
2. The maximum hearing frequency is significantly less (24%) for people working in the experimental group professions as compared to control group professions.

8. Draw Conclusions - After you have determined the results it is time to decide the answer to your original question. Write your answer in a complete sentence using the question to begin your answer. You also need to tell whether your hypothesis was correct or incorrect. If it was incorrect explain why you think so. End this paragraph by saying how you could change or improve your experiment in the future.

Conclusions

Answer to your original question: The average maximum hearing frequency for the experimental group professions was 24% (3234 Hz) lower than than the controlled group professions.

You're your hypothesis correct or incorrect? If incorrect, why?

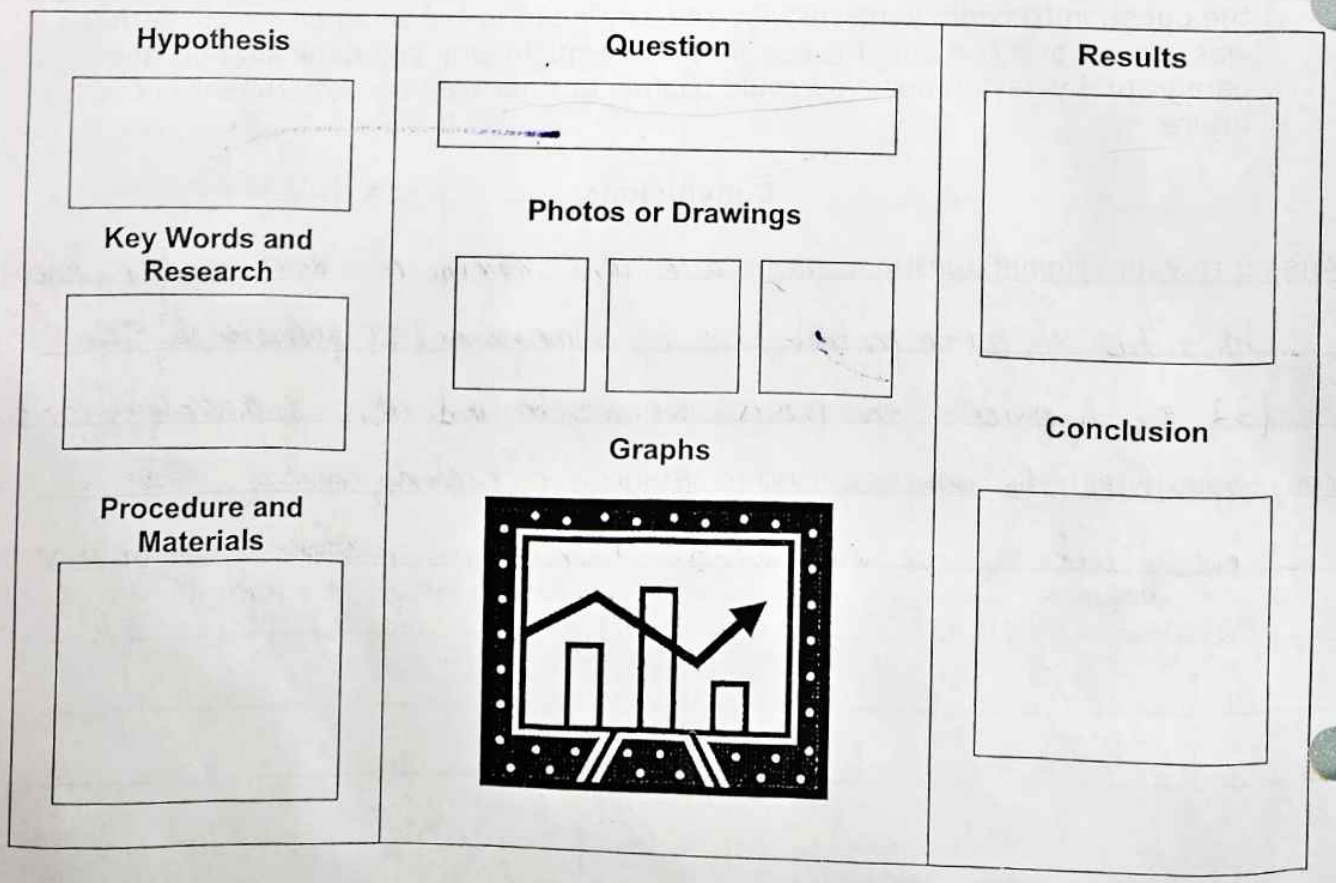
The hypothesis is validated! There is 24% difference in the average maximum hearing frequency for professionals working in the high sound exposure professions like military, construction, manufacturing, and music industry as compared to normal sound exposure professions like IT and librarians. (Age group 40- 50 years)

If you were to complete this experiment again, what changes would you make? How would you improve this experiment?

I would like to test the hearing abilities of this age group and professions by gender to test whether there is a significant difference in the maximum hearing frequency. This would help shine some light on any potential gender-based programs needed at workplaces in case the hypothesis is validated.

9. Display board - Now that you have completed your experiment you will begin setting up your display board to communicate the results of your experiment to others. Remember, the board is graded on the information not how colorful or pretty it looks. Your display board must have ALL of the following components located in the same places. Other board guidelines:
   - Font should be easy to read and at least a size of 16pt or greater.
   - Photos should not include faces of students
   - Information on the board can be typed or written neatly by hand.

Display Board



10. Abstract – The abstract is a short version of your science fair final report. It should be no more than 250 words. Most of the information you will put in your abstract is already written, you will just need to copy it over. You must have the following five components in your abstract:

- Introduction
- Project Question
- Procedures
- Results
- Conclusions

The only new thing you will need to write it the **Introduction**. This is where you describe the purpose for doing this experiment or project. Tell why people should care about the work you did. How does your experiment give us new science information? Can this information be used to improve our lives? If so, how? This is where you want to interest the reader in your project and motivate them to read the rest of it.

Abstract Introduction

This study aimed to investigate whether there is a significant difference in the maximum hearing frequency among professionals working in different occupations within the age group of 40-50 years. A total of 30 trials were conducted, with 5 trials for each of six different proffessions including military personnel, musicians, librarians, and IT professionals. The participants' maximum hearing frequencies were recorded and analyzed. Results showed that individuals in professions exposed to higher noise levels, such as the military and musicians, had a lower average maximum hearing frequency compared to those in quieter occupations, such as librarians and IT professionals. These findings support the hypothesis that prolonged exposure to loud noise is associated with a decline in the maximum hearing frequency. The study concludes that individuals in noisy professions are more likely to experience a reduction in their maximum hearing frequency, and should use hearing protection devices in such professions.

Finally, you will type up the abstract, edit and revise it, and then print it. Make sure that your abstract is written in Times New Roman or Arial font at size 12pt.