

Natural Sciences Grade 9

Practical task / Investigation 2

Topic: Measuring and comparing the heart rate before and after exercise.

Total: 40 marks

Bring your running shoes to school for this activity. You are going to walk briskly or run for a few minutes. Ensure that you know HOW TO take your own pulse rate or the pulse rate of somebody else. **Your heart rate is the number of times your heart beats per minute.** It is also called **pulse rate**. This is how you do it: turn your hand, palm side up. Press your index finger and middle finger on the thumb side of the wrist. You will feel the pulse there. If you do not feel it the first time, keep on pressing in different places until you can find the pulse. Do not use your thumb, as there also is a faint pulse in your thumb. Your teacher or a classmate can be the timekeeper. As soon as you can feel your pulse, count the number of beats for 15 seconds. Multiply the number of beats for 15 seconds by 4 to calculate the number of beats per minute (60 seconds).

Instructions:

1. Identify a few learners who will be the runners (doing the exercises).
2. For each runner, identify (1) a person who will determine the runner's heart rate after each round of exercise and (2) a timekeeper.
3. Use the stopwatch or timer on your cell phone.
4. Determine the heart rate at rest while the person is relaxed and at rest. Record in the table next to zero seconds.
5. The runner must then walk briskly or jog for 1 minute (60 seconds). Immediately measure the runner's pulse rate again and record it in the table next to 1 minute. (You can also do this exercise by walking or running on one spot.)
6. Repeat walking/jogging for four more minutes and measure the pulse rate AFTER EVERY MINUTE (60 seconds). Record it in the table next to 2, 3, 4 and 5 minutes.
7. Sit down immediately after the 5 minutes of exercise.
8. Wait for 1 minute (60 seconds) and measure the pulse rate. Record it next to 6 minutes in the table.
9. Wait for another minute (60 seconds), determine the pulse rate and record next to 7 minutes in the table.
10. Wait for another 60 seconds, measure the runner's pulse rate and record next to 8 minutes in the table.
11. Wait for another 60 seconds, measure the runner's pulse rate and record next to 9 minutes in the table.

The radial pulse is felt on the wrist, just under the thumb



TABLE OF RESULTS:

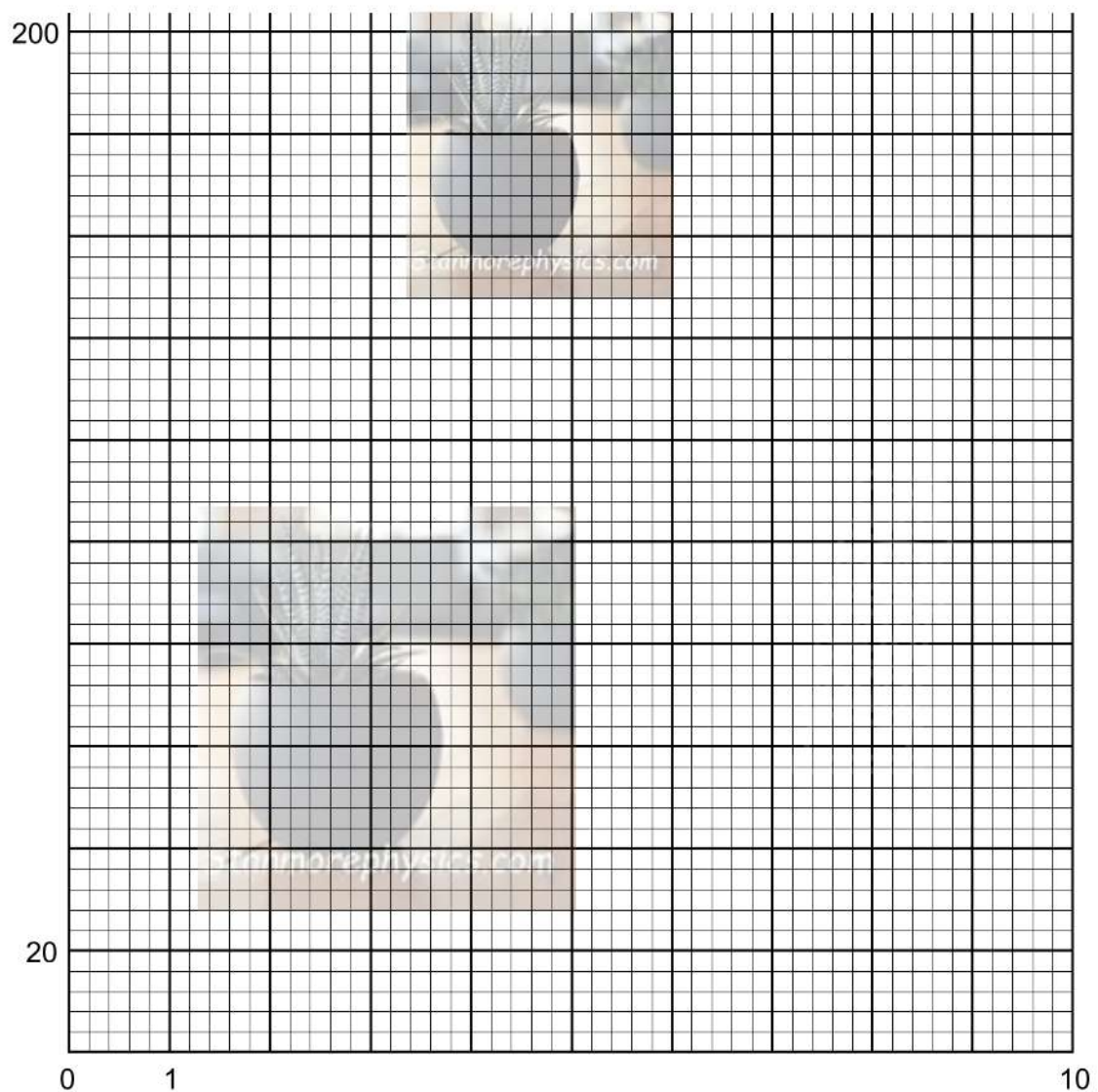
Complete the table of the pulse rates at different times before and after exercise.

(5)

Time (minutes)	Pulse rate / Heart rate (beats per minute)
0 (At rest)	
1	
2	
3	
4	
5	
6	
7	
8	
9	

GRAPH: Use the information in the results table and draw a LINE GRAPH to show how the pulse rate changes over time before and after exercise. Provide the graph with a heading (include both variables), clearly label the axes and provide the correct units. Complete the scale on the axes and plot the points.

(10)



Questions:

1. Write down the investigative question. (2)

2. Write down a hypothesis for the investigation. (2)

3. State the following:

3.1 Dependent variable: _____ (1)

3.2 Independent variable: _____ (1)

3.3 Controlled variable: _____ (1)

4. What trend do you notice in your graph? Explain this trend. (4)

5. Why does the heart rate increase when you do exercise? Explain. (5)

6. Except for exercise, name TWO other causes for an increased heart rate. (2)

7. What kind of tissue makes up the heart? _____ (1)

8. Why is exercise recommended to prevent cardiac diseases? (4)

9. Of which body system is the heart a component of? (1)

10. Name TWO health issues (illnesses) associated with the body system mentioned in question 9. (2)

TOTAL: 40



Natural Sciences Grade 9

MEMORANDUM

Practical task / Investigation 2

Topic: Measuring and comparing the heart rate before and after exercise.

Total: 40 (Mark out of 40 ÷ 2 = Mark out of 20)

TABLE OF RESULTS:

The following is a set of pulse rates determined for one learner.
Readings will depend on the fitness level of the participant.

Note:

The whole class can use the same set of readings **OR** each group can use their own set of readings. In this case, different groups will have different graphs.

The **average readings** for the different runners can also be recorded.

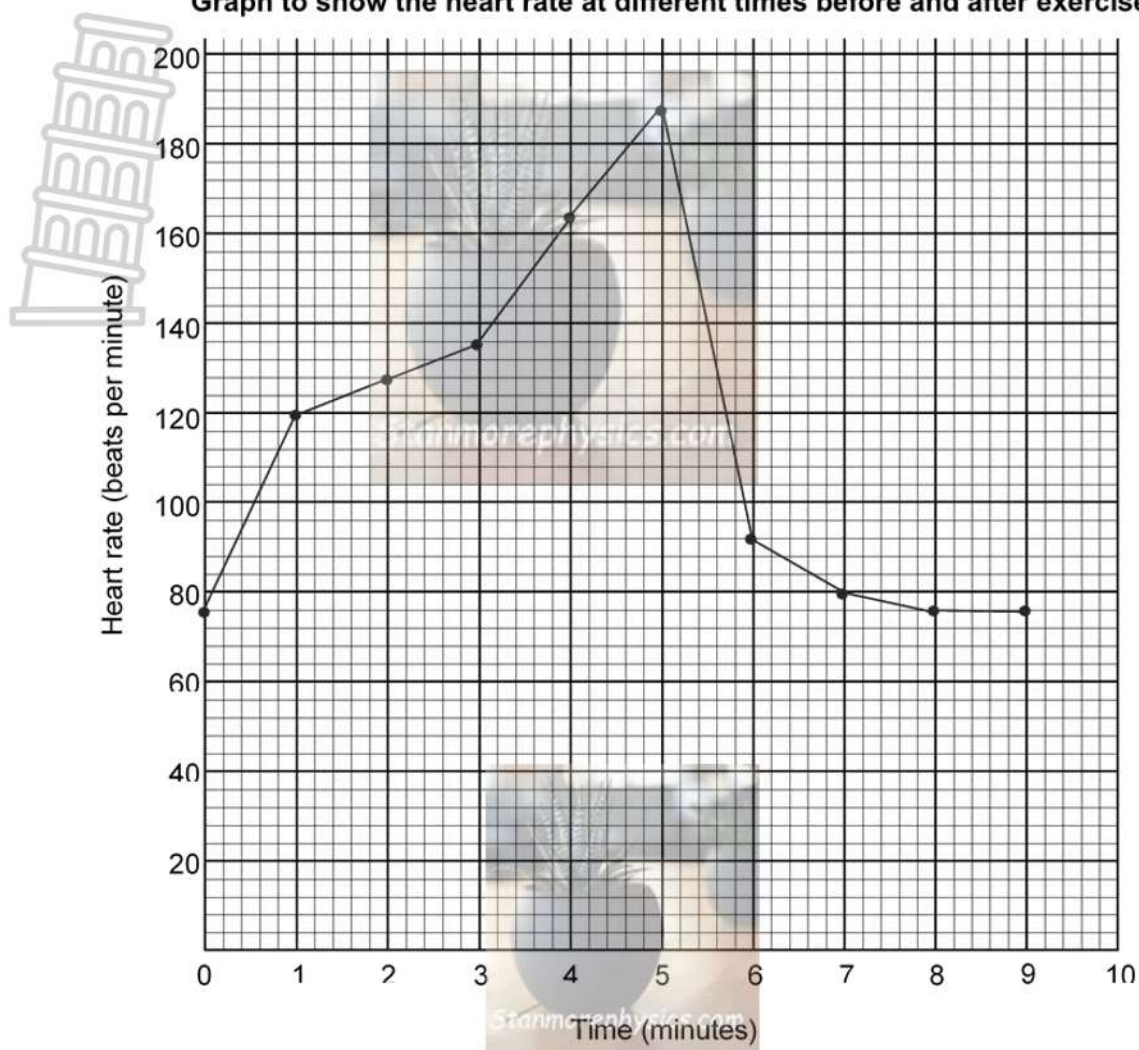
Table of pulse rate at different times before and after exercise.

Time (minutes)	Pulse rate / Heart rate (beats per minute)
0 (At rest)	76
1	120
2	128
3	136
4	164
5	188
6	92
7	80
8	76
9	76

Marking criteria	Marks
Resting pulse rate (0 minutes).	✓
Sharp increase in pulse rate between 1 and 4 minutes	✓
Maximum pulse rate after 5 minutes	✓
Decrease in pulse rate from 5 to 7 minutes	✓
Pulse rate stabilizing from 7 to 9 minutes	✓

(5)

Graph to show the heart rate at different times before and after exercise



	Marking criteria	Marks
1	Heading (containing both variables) Graph of heart rate versus time OR Graph of pulse rate versus time OR Graph to show the heart rate at different times before and after exercise	✓
2	Label on x-axis (Time)	✓
3	Unit on x-axis (Minutes)	✓
4	Label on y-axis (Heart rate OR Pulse rate)	✓
5	Unit on y-axis (Beats per minute)	✓
6	Scale on x-axis completed correctly	✓
7	Scale on y-axis completed correctly	✓
8	First 5 points plotted correctly	✓
9	Last 5 points plotted correctly	✓
10	Points connected with a line	✓

Scale on y-axis: There are 5 lines (divisions/spaces) from 0 to 20. Therefore, every space indicates 4 heart beats per minute. Starting at 0, then 4, 8, 12, 16 and 20. Points **MUST BE** plotted correctly according to this scale. (10)

Questions:

1. **Write down the investigative question.**
What effect will exercise have on the heart rate?

Marking criteria	Marks
BOTH variables mentioned. Exercise and heart rate.	✓
Question about the relationship between variables.	✓

(2)

2. **Write down a hypothesis for the investigation.**
Heart rate/Pulse rate will increase with exercise.
OR
If exercise is done, then the heart rate will increase.

Marking criteria	Marks
BOTH variables mentioned. Exercise and heart rate.	✓
The relationship between variables is indicated.	✓

(2)

3. **State the following:**

3.1 **Dependent variable:** Heart rate **OR** Pulse rate ✓ (1)

3.2 **Independent variable:** Duration of exercise **OR** Time taken ✓ (1)

- 3.3 **Controlled variable:**

Type of exercise; walking or jogging. ✓

OR

Same person's pulse is taken throughout. ✓ (1)

4. **What trend do you notice in your graph? Explain this trend.**

When doing exercise, ✓ the heart rate increases. ✓

After exercising the heart rate decreases ✓ until it becomes stable again. ✓ (4)

5. **Why does the heart rate increase when you do exercise? Explain.**

During exercise:

- the muscles work harder ✓
- the muscles need more energy ✓ (released through cellular respiration)
- the heart beats faster ✓
- to circulate more blood ✓ to the muscles to provide
- them with more oxygen and nutrients. ✓

(5)

6. **Except for exercise, name TWO more things that can increase the heart rate.**

Fear / Stress / Anxiety / Excitement. ✓

Stimulants like caffeine, cocaine, alcohol. ✓

Fever. ✓

(ANY TWO)

(2)

7. **What kind of tissue makes up the heart?**

Muscle tissue✓

(1)

8. **Why is exercise recommended to prevent cardiac diseases?**

- The muscle tissue of the heart needs to contract or relax.✓
- More activity will lead to easier✓
- and more efficient contraction and relaxation.✓

(3)

9. **Of which body system is the heart a component of?**

Circulatory system✓

(1)

10. **Name TWO health issues associated with the body system mentioned in question 9.**

High blood pressure✓

Stroke✓

Heart attack✓

(ANY TWO)

(2)

TOTAL: 40

