Appendix 1

LESSON PLANE

School : **PON-PES Mawaridussalam**
Subject : **PHYSICS**
Class / Semester : **XI / Odd**
Academic Year : **2019/2020**
Time allocation : **3x 40 Menit**

A. Core Competence

CC-1 andCC-2 **:** Live and practice the teachings of the religion they hold and behave in a way, discipline, polite, caring, responsible, responsive and pro-active in interacting effectively in accordance with the development of children in the environment, family, school, community and the natural environment around, nation, state, Regional and international areas.

CC-3 **:**Understanding, applying and analyzing factual, conceptual, procedural and metacognitive knowledge based on his curiosity about science, technology, art, culture, and humanities with human, nationality, state and civilization insights related to the causes of phenomena and events, as well as applying procedural knowledge in the field specific studies according to their talents and interests to solve problems

CC-4 **:**Cultivate, reason, and serve in the realm of concrete and abstract domains related to the development of what they learn in school independently, act effectively and creatively, and be able to use methods that are in accordance with scientific principles

B. Basic Competence and Competency Achievement Indicators

Basic Competence	Competency Achievement Indicators
1. Analyzing the elasticity of materials in everyday life	1. Identify the relationship between increasing the length of a single spring with the weight of a given load 2. Propose a hypothetical relationship between the addition of a single spring length and the weight of a given load 3. Identifying the problem of the relationship between the increase in spring length arranged in series with the weight of the given load 4. Propose a hypothesis of the relationship between the increase in spring length arranged in series with the weight of the given load 5. Identifying the problem of the relationship between the increase in spring length arranged in parallel with the weight of the given load 6. Propose a hypothesis of the relationship between the increase in spring length arranged in parallel with the weight of the given load
2. Conducting experiments on the elasticity of a material along with the presentation of experimental results and their use	1. Designing an experimental relationship between increasing the length of a single spring and the weight of a given load 2. Processing the experimental data the relationship between the addition of a single spring length with a given load weight 3. Communicate the relationship between increasing the length of a single spring with the weight of a given load 4. Make conclusions in the form of a graph of spring length increase with the weight of the load 5. Designing an experimental relationship between the increase in spring length arranged in series with the weight of the given load 6. Managing experimental data the relationship between the increase in spring length arranged in series with the weight of the given load

	7. Communicating the relationship between increasing spring length arranged in series with the weight of the given load 8. Make conclusions spring constant values arranged in series 9. Designing an experimental relationship between the increase in spring length arranged in parallel with the weight of the given load 10. Processing the experimental data between the increase in spring length arranged in parallel with the weight of the given load arranged in parallel with the weight of the given load 11. Communicating the relationship between increasing spring length arranged in parallel with the weight of the given load 12. Make conclusions spring constant values arranged in parallel

C. Learning Objectives

1. Competent students identify the problem of the relationship between increasing the length of a single spring with the weight of a given load
2. Competent students put forward a hypothesis of the relationship between the increment of a single spring length and the weight of a given load
3. Competent students design an experimental relationship between the increment of a single spring length and the weight of a given load
4. Competent students process experimental data relationship between the addition of a single spring length with a given load weight
5. Competent students communicate the relationship between increasing the length of a single spring with the weight of a given load
6. Competent students make conclusions in the form of a graph of spring length with weight loads
7. Students are competent to identify the problem of the relationship between increasing the length of a single spring with the weight of a given load

D. Approaches, Models and Learning Methods

Experimentation Class

Approach : Scientific

Model : Guided Inquiry

Method : Discussion, Question and Answer, Experimentation / Practicum

Control Class

Model : Conventional Learning

Methods : Lecture, Question and Answer, Assignment

E. Media / Tools and Materials

Experimentation Class

Media : Laptops and infocus, power points, whiteboards and markers

Tools and materials : Stative, iron wire springs, copper wire springs, ruler, loads, micrometer screws

Control class

Media : Whiteboard and Markers

F. Learning Steps

Steps for Experimental Class Learning Activities (3 x 40 Minutes)

No	Activity		AlokasiWaktu
	Teacher	Student	
Introduction	Say greetings, pray, absent students and convey learning objectives Facilitating media related to changes in	Answering greetings, praying and listening to the name called by the teacher to be absent and listening to the learning objectives conveyed by the teacher	5 menit

	spring length Directing students to define and organize learning tasks related to the problem Guiding students to formulate initial hypotheses (temporary answers to questions based on the problem presented)	**<u>Observe</u>** *Identification of problems* 1. Increased length on a single spring 2. Increased length in springs arranged in series 3. Increased length in springs arranged in parallel **<u>Enchanting</u>** *Question* 1. What causes a single spring to increase in length when under load? 2. What causes the springs arranged in series to increase in length when under load? 3. What causes the springs arranged in parallel to increase in Length when under load? *Formulate Hypothesis* The influence of the length increase on the spring due to the weight of the load given to the spring due to the weight of the load given to the tip of the spring	
Core Activities	Guide and facilitate students in conducting experiments to get explanations and solutions to these problems	**<u>Carry out experiments</u>** *Data Collection To Test Experiments* 1. Identify the increase in the length of a single	30 menit

	Guide students in making conclusions and presenting the results of investigations	spring when under load 2. Identify the increase in spring length arranged in series when given a heavy load 3. Identify the increase in spring lengths arranged in parallel when given a heavy load **<u>Associate</u>** *Processing Data Collected* 1. Meaning the increase in the length of the spring to the weight of a given load 2. Formulate an increase in the length of the spring to the weight of a given load 3. Graph the relationship between the addition of the Spring Length and the weight of the given load 4. Meaning identic spring design that has been arranged in series and the number of spring constants 5. Formulating identical spring designs that have been arranged in series and the number of spring constants	
		6. Understanding the	

		design of identical springs that have been arranged in series and the number of spring constants 7. Formulating identical spring designs that have been arranged in series and the number of spring constants 8. Make the number of spring constants in each spring arrangement	
Closing	Guide students to reflect on or evaluate them and the processes they use	**Communicating** *Investigation Results* 1. Make conclusions in the form of graphs according to observations regarding the relationship between the increase of the egas length and the weight of the load 2. Make conclusions about the number of spring constants arranged in series 3. Make conclusions about the number of spring constants arranged in parallel	5 menit

Steps of Control Class Learning Activities (3 x 40 Minutes)

No	**Activity**		**AlokasiWaktu**
	Teacher	**Student**	
Introduction	➢ The teacher greets ➢ The teacher checks the presence of students	➢ Answering greetings ➢ Students listen	5 menit

Core Activities	➢ The teacher gives short questions to students ➢ The teacher explains the nature of material elasticity ➢ The teacher explores examples of the application of the material's elasticity in daily life ➢ The teacher gives the opportunity for students to ask questions ➢ The teacher gives questions to students ➢ The teacher checks student answers	➢ Answering teacher questions ➢ Listen to the teacher's explanation ➢ Ask about lessons that are not understood ➢ Work on assignments from the teacher	30 menit
Closing	➢ The teacher gives home assignments to students ➢ The teacher ends the learning and says and says hello	➢ Students record homework assignments ➢ Students answer greetings	5 menit

G. Assessment

Assessment technique : Written test

Instrument form : Essay

Technique : Knowledge Assessment : Written test (LP-01)

: Skills Assessment : Practicum (LP-02)

Medan, 2019

Lesson Plans

RizqiAfnan

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Appendix 2

SHEET ACTIVITIES OF STUDENTS (1)

Subjects : **Physics**
Material : **Elasticity**
Soup material : **Hooke's Law**
Time : **40 Menit**

Group :
Name :

1.	**4.**
2.	**5.**
3.	**6.**

A. Learning Indicators

1. Identify the relationship between increasing the length of a single spring with the weight of a given load
2. Propose a hypothetical relationship between the addition of a single spring length and the weight of a given load
3. Identifying the problem of the relationship between the increase in spring length arranged in series with the weight of the given load
4. Propose a hypothesis of the relationship between the increase in spring length arranged in series with the weight of the given load
5. Identifying the problem of the relationship between the increase in spring length arranged in parallel with the weight of the given load
6. Propose a hypothesis of the relationship between the increase in spring length arranged in parallel with the weight of the given load

B. Learning Objectives

1. Competent students identify the problem of the relationship between increasing the length of a single spring with the weight of a given load

2. Competent students put forward a hypothesis of the relationship between the increment of a single spring length and the weight of a given load
3. Competent students design an experimental relationship between the increment of a single spring length and the weight of a given load
4. Competent students process experimental data relationship between the addition of a single spring length with a given load weight
5. Competent students communicate the relationship between increasing the length of a single spring with the weight of a given load
6. Competent students make conclusions in the form of a graph of spring length with weight loads

C. Main Material

Hooke's Law

The relationship between the force that stretches a spring and its length increase in the elastic region was first investigated by Robert Hooke (1235 - 1703). The results of his investigation were stated in a law that came to be known as Hooke's law.

$$F = -k.x \qquad (2.1)$$

Information :

k = Spring Force Constant(N/m)

F = Force (N)

x = Increase in Spring Length (m)

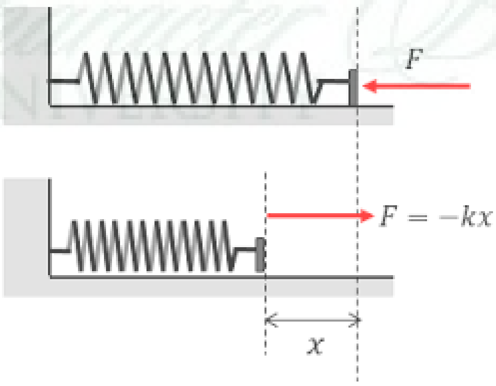


Figure 2.1 Relationship of Spring Force to Increase in Spring Length

Figure 2.1 when pulled, a spring holds a force the same magnitude as the pull force, but the direction is opposite (action = - reaction). If the force is called the spring force F_p then the spring force is proportional to the increase in the spring length

$$F_p = - F \qquad (2.2)$$

$$F = -k.x \qquad (2.3)$$

Information :

F_p= spring force (N)

Equations (2.1) and (2.3) Hooke's law can be stated as follows "on an elasticity of an object, the amount of length increase is proportional to the force acting on that object".

Properties of Spring Elasticity

If an object is exerted a force, then Hooke's law only applies along the elastic region to the point that indicates Hooke's legal boundary. If the object is exerted force beyond the Hooke legal limit and reaches the elasticity limit then the object's length will return to normal. If the applied force does not pass through the elasticity force. But Hooke's law does not apply to the area between Hooke's legal boundary and the elasticity limit, then the object will enter the plastic region and when the force is removed, the length of the object will not return as before, the object will change shape permanently. If the length of the object reaches the broken point, then the object will break.

Based on Hooke's legal equation above, length accretion (Δx) an object depends on the magnitude of the force exerted (F) and the constituent material and the dimensions of the object (expressed in constants (k). Objects formed by different materials will have different length increases even if given the same force, such as bone and iron), but has a different length and cross-sectional area then the object will experience an increase in length given even if given the same force. If we compare rods made from the same material but have different lengths and cross-sectional areas, when given the same force, the magnitude of the length increase is proportional to the length of the initial object and is inversely proportional to the cross-sectional area. The longer the length of an object, the greater the length increase, conversely the thicker the object, the smaller the length increase.

Each spring has elastic or flexible properties. This property is inherited from every spring. In engineering, the elastic nature of a spring is very important. For example, if the shock breaker of a vehicle is not elastic, it will cause the vehicle to be uncomfortable to ride. Because it is elastic, the forces caused by the wheel when passing through a damaged road will be damped by a spring contained in a shock breaker. A material such as a spring that is subject to a force will increase in length from its original size if it is subjected to a certain force such as in Figure 2.2

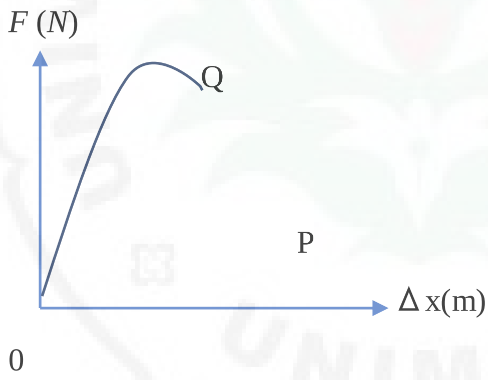


Figure 2.2 graphs the relationship between force and accretion of spring length

P = linearity limit

Q = elasticity limit

Based on the graph the relationship between force and accretion length is known:

1. Point O to point P or to the linear limit of the spring shape of the graph is a straight line so that in this area the spring stretches linearly
2. Point P to point Q linearity limit has been exceeded so that F is not proportional to Δx
3. Point O to Q the spring is still elastic and if the pulling force is removed, the spring will return to its original length

For the plastic region (not elastic) above the Q point. If it is pulled firmly, the spring cannot return to its original length because it has reached the linearity limit then the Hooke law will apply.

D. Puzzeling Even

Dita looks after her younger sister who is sleeping on a spring swing. While swinging his younger brother, inadvertently seized attention to the movement of the spring on the swing which when pulled down the spring increases in length then returns to its original shape and so on until the swing stops. Dita wondered why the springs could increase in length and return to their original shape. In your opinion, based on the events above what concept can be used to answer Dita's astonishment

E. Identification of Problems

What is the problem with the information above?

1. ……………………………………………………………………………………

F. Formulate Hypotheses

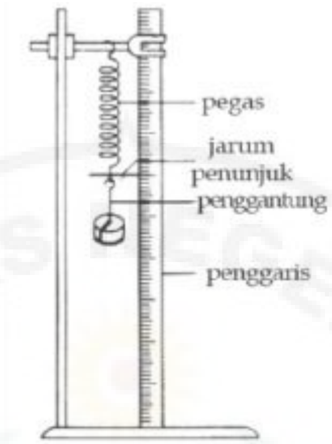
Make a hypothesis based on the problem that has been identified

1. ……………………………………………………………………………………

G. Tools and Materials

No	Tools and Materials	Amount
1	Selstatif	1 Piece
2	Pegas	1 Piece
3	Mistar	1 Piece
4	Load50 gr	1 Piece
5	Load100 gr	1 Piece
6	Load 150 gr	1 Piece

H. Experiment Scheme



I. Experiment Procedure

1. Arrange tools and materials according to the picture above!
2. Measure the length of the spring that was hung before being loaded and record the results in the table!
3. Hang the load with a mass of 50 grams, then measure the length of the spring after being given a load and record the results in the table!
4. Perform steps 2 and 3 with variations of mass 100gram and 150 grams!

J. Observation Table

No	Massa m (kg)	Force F (N)	Leng of spring l (m)		Spring Length Change$x$ (m)	$k = \frac{F}{x}$
			Earlyl_0	Last$l$		
1						
2						
3						
4						
5						

K. Question

1. What is the relationship between the increase in spring length and the force at work

   ………………………………………………………………………………………
   ………………………………………………………………………………………
2. Graph the relationship between the forces acting F with the increase in the length of the spring x! explain the meaning of the graph!

L. Hypothesis analysis from observing results

………………………………………………………………………………………
………………………………………………………………………………………

M. Conclusion

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Appendix 3

SHEET ACTIVITIES OF STUDENTS (2)

Subjects : **Physics**
Material : **Elasticity**
Soup material : **Series and Parallel Spring Arrangements**
Waktu : **40 Menit**

Group :
Name :

1.	**4.**
2.	**5.**
3.	**6.**

A. Learning Indicators

1. Identify the relationship between increasing the length of a single spring with the weight of a given load
2. Propose a hypothetical relationship between the addition of a single spring length and the weight of a given load
3. Identifying the problem of the relationship between the increase in spring length arranged in series with the weight of the given load
4. Propose a hypothesis of the relationship between the increase in spring length arranged in series with the weight of the given load
5. Identifying the problem of the relationship between the increase in spring length arranged in parallel with the weight of the given load
6. Propose a hypothesis of the relationship between the increase in spring length arranged in parallel with the weight of the given load

B. Learning Objectives

1. Students are competent to identify the problem of the relationship between increasing the length of the series and parallel springs with the weight of the given load

2. Competent students put forward hypotheses of the relationship between increment of series and parallel spring lengths with a given weight load
3. Competent students design an experiment of the relationship between increment of series and parallel spring lengths and the weight of a given load
4. Competent students process experimental data on the relationship between increment of series and parallel spring lengths and the weight of a given load
5. Competent students communicate the relationship between increment of series and parallel spring lengths and the weight of a given load

C. Main Material

Series Spring Arrangement

Matters relating to the spring replacement for the series arrangement are as follows:

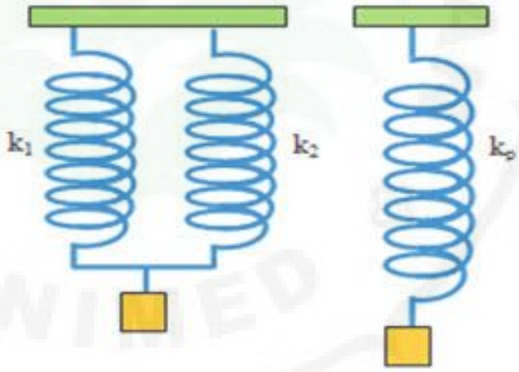

Figure 2.3 Spring Arrangements in Parallel and Series

1. The amount of pulling force of the replacement spring is equal to the amount of pulling force of each spring. For example, the tensile force experienced by each spring is F_1 and F_2, then the pull force on the replacement spring is F.

   $F_1 = F_2 = F_n = F$ (1)

   Because the force experienced by a spring is the gravity (the weight of the beam), then$F$ can also be sought with $F = k.\ \Delta x \rightarrow W = k.\ \Delta x \rightarrow m.g$

   Information:

   F =Replacement Spring Pull Force (N)

   F_1= Spring Pulled Force 1 (N)

F_2 =Spring Pulled Force 2 (N)

F_n=Spring Pulled Force to n (N)

k = Series Spring Constant (N/ m)

Δx= Increase in Length (m)

m = Mass of Things (kg)

g = Earth's gravity (m/ s^2)

2. The increase in the length of the spring replacement series $\Delta x$is equal to the total increase in the length of each spring.

$$\Delta x = \Delta x_1 + \Delta x_2 + \ldots + \Delta x_n \quad (2)$$

Information:

Δx =Increased Length in Series Replacement Springs (m)

Δx_1= Added Length in Spring 1 (m)

Δx_2=Added Length in Spring 2 (m)

Δx_n=Added Length in Spring n (m)

Using Hooke's law and the two principles of the series arrangement, it can determine the relationship between the fixed spring constants ks series with each spring constant. (k_1, k_2, andk_n).

$$F = k_s \Delta x \rightarrow \quad \Delta x = \frac{F}{ks} \quad \rightarrow F_1 = k_1 \Delta x_1 \quad (3)$$

$$F = k_1 \Delta x_1 \rightarrow \Delta x_1 = \frac{F}{k1} \quad \rightarrow F_2 = k_2 \Delta x_2 \quad (4)$$

Then enter the value Δx, Δx_1, and Δx_2above into the equation (2), obtained:

$$\Delta x = \Delta x_1 + \Delta x_2 + \ldots + \Delta x_n$$

$$\frac{F}{ks} = \frac{F}{k1} + \frac{F}{k2} + \cdots + \frac{F}{kn}$$

$$\frac{1}{ks} = \frac{1}{k1} + \frac{1}{k2} + \cdots + \frac{1}{kn} \quad (5)$$

It can be stated that the inverse of the spring constant instead of the series equals the total of the inverse of each spring constant

$$\frac{1}{\mathrm{ks}} = \sum_{i=1}^{n} \frac{1}{\mathrm{ki}}$$

$$\frac{1}{\mathrm{ks}} = \frac{1}{\mathrm{k1}} + \frac{1}{\mathrm{k2}} + \cdots + \frac{1}{\mathrm{kn}} \qquad (6)$$

For n identical springs with each spring having a constant k, the constant spring substitute k_s can be calculated by the formula.

$k_s = \frac{1}{n}$

Information:

k = Spring Replacement Constant Series (N/m)

k_s = number of springs

n = style constant (N)

$k_1 = \frac{k_1 k_2 k_3 \ldots k_n}{k_1 + k_2 + k_3 + \cdots + k_n}$

When compared with the spring arrangement and the resistor arrangement, it appears that the formulas for series springs are similar to the formulas for parallel resistors.

Prallel Spring Arrangement

Matters relating to the spring replacement for the series arrangement are as follows:

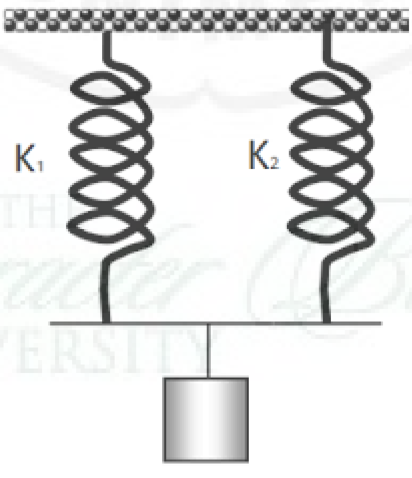

Figure 2.4 Parallel Spring Arrangement

1. Tensile force on replacement springs F equal to the total tensile force in each spring (F_1, F_2, andF_n).

   $F = F_1 + F_2 + \ldots + F_n \qquad (1)$

Because the force experienced by a spring is the gravity (the weight of the beam), then F can also be sought with

$F = k.\ \Delta x \rightarrow W = k.\ \Delta x \rightarrow m.\, g = k.\ \Delta x$ (2)

2. Increasing the length of each spring is equal and increasing the length is equal to increasing the length of the replacement spring.

$\Delta x_1 = \Delta x_2 = \Delta x_n = \Delta x$ (3)

Using Hooke's law and the two parallel principles of the spring arrangement of equations (1) and (3), show that the parallel replacement spring constants are equal to the total of the constants of each spring arranged in parallel. Mathematically stated as:

$k_p = \sum_{i=1}^{n} k_1 = k_1 + k_2 + k_3 + \cdots + k_n$ (4)

Identical springs arranged in parallel for n pieces, each spring has a force constant k, the constant spring force constant $k_p$can be calculated by the formula:

$k_p = nk$

Information:

k_p = Spring substitute force constant parallel (N/m)

n = Number of springs

k = Style setting (N)

D. Puzzling Even

In the morning when Ani was playing dolls outside the house, she called Ani and told her to keep her younger sister Ayu in the swing, as she was cooking for breakfast. Ani was swinging Ayu's swing using a leash, suddenly the swing was broken and Ayu's fat body fell and cried, hearing Ayu's cries of tears, the mother hurried to meet ani and her sister. Seeing the incident, Mother asked in her heart why it happened. Help my mother overcome her confusion.

E. Identification of Problems

What is the problem with the information above?

2. ………………………………………………………………………………………

F. Formulate Hypotheses

Make a hypothesis based on the problem that has been identified

2. ………………………………………………………………………………………

G. Tools and Materials

No	Tools and Materials	Amount
1	Selstatif	1 Piece
2	Pegas	1 Piece
3	Mistar	1 Piece
4	Load 50 gr	1 Piece
5	Load 100 gr	1 Piece
6	Load 150 gr	1 Piece

H. Experiment Scheme

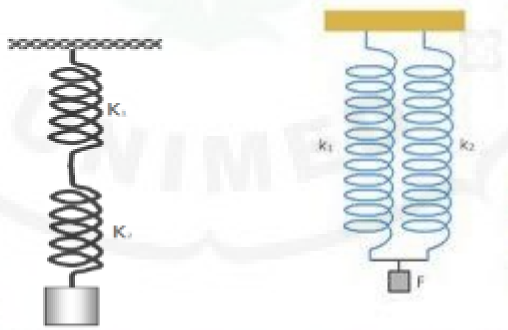

Figure 2.5 Trial Schematic Arrangement Schematic (a) Series and (b) Parallel

I. Experiment Procedure

1. Arrange tools and materials according to the picture above!
2. Measure the length of the spring that was hung before being loaded and record the results in the table!
3. Hang the load with a mass of 50 grams, then measure the length of the spring after being given a load and record the results in the table!
4. Perform steps 2 and 3 with variations of mass 100gram and 150 grams!

J.

K. Question

Seamless Order

1. How does the style of a sprocket work in series? Explain!

   ………………………………………………………………………………….
2. How to increase the length of the sprocket in series

   ………………………………………………………………………………….
3. How is the value of the spring constant of the spring constant arranged?

   ………………………………………………………………………………….

Parallel Peg Order

1. How does the style of the sprocket work in parallel? Explain !!

   ………………………………………………………………………………….
2. How to increase the length of the spring in parallel arrangement

   ………………………………………………………………………………….
3. How is the value of the spring constant of the spring constant parallel?

   ………………………………………………………………………………….

L. Hypothesis analysis from observing results

……………………………………………………………………………………
…………………………………………………………………………………….

M. Conclusion

……………………………………………………………………………………
……………………………………………………………………………………

Appendix 4

TEST QUESTIONS OF SCIENCE PROCESSING SCIENCE

Class : **XI**

Subject : **Physics**

Material : **Elasticity**

Material soup : **Hooke's Law**

Time : **40 Menit**

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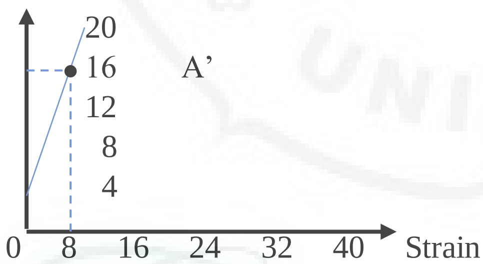
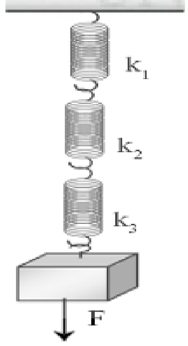
1. Silvi and Dilla are playing rubber band. The silvi drew a rubber band with a force of 5 N, the rubber stretched to a distance of x cm. Rubber drawn by Selvi and other similar dillas. Analyze and conclude about the elasticity of objects drawn by silvi and dilla.

2. The figure below is a graph of the relationship between stress (σ) and strain (e) of a wire. Determine the amount of Young (E) modulus of the wire and explain the meaning of point A '... ?!

Voltage



3. Based on experiments on the arrangement of the springs. Three springs with a constant of 1000 N / m are arranged as shown



The arrangement of springs is given a weight so that it increases in length by 6 cm. How big is the tensile force experienced by each spring, make a conclusion!

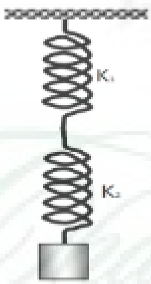
4. Class XI students IPA 1 will perform a combined sprint arrangement test to calculate the spring constant when given different masses. The tools and materials available are as follows:(Make the trial procedure)
   a. Satif 1 set
   b. Pegas identic 3 piece
   c. Neraca
   d. Load (100 gr) 4 piece

5. Draw a graph that shows the effect of the force (F) on the increase in Length (Δx) on an elastic object and make an analysis.

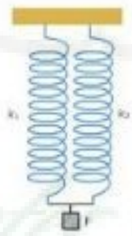
6. A spring that has a spring constant of 40 N / m is pressed so that the spring which is 5 cm long becomes 2 cm. how big is the spring reaction force on the object?

7. A homogeneous piece of wire is 140 cm in length and has an area of 2 mm2 when drawn in a force of 100 N, increasing the length by 1 mm. calculate the Elastic Modulus E of the wire material!

8. Two identical springs are arranged in series and the other two are arranged in parallel as shown in the figure



(a)



(b)

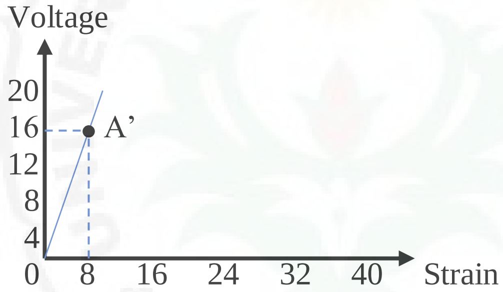
Observe the two pictures above and give the results of your observations …?!.

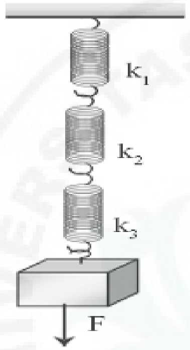
Appendix 5

GATEWAY OF SCIENCE PROCESS SKILLS

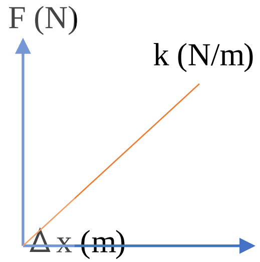
Lesson : Physics
Class : XI
Topic : Elasticity and Law Hooke

No	Aspects SPS	Indicator SPS	Quations	Answer	Score
1	Predictions	Predict changes in elastic objects given different forces	Silvi and Dilla are playing rubber bands. Silvi pulled a rubber band with a style of 5 N, it turns out that the rubber stretched as far as x cm, while dila pulled a rubber band with a style of 10N, it turned out that the rubber broke. The rubber that is drawn by Selvi and Dilla is of the same size and size. Make an analysis and conclusion about the elasticity of objects drawn by Silvi and Dilla.	When Silvi and Dilla are pulling the rubber with a different style, the two rubber will change shape. Where the first rubber drawn by Silvi will increase in length and then return to its original shape, because with the applied force, when pulled the rubber does not exceed its elasticity limit so that the rubber will return to its original shape. While the rubber drawn by Dilla will break because the style exceeds the elasticity limit.	3

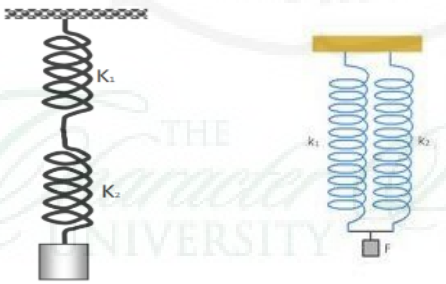
2	Conclude	Infer the relationship of stress and strain in finding modulus of elasticity	The figure below is a graph of the relationship between stress (σ) and strain (e) of a wire. Determine the amount of Young (E) modulus of the wire and explain the meaning of point A '... ?! 	Dik : σ = 16 x 10^7N/m^2 e = 8 x 10^{-4} Dit : E (Pa) = …? Conclusions = …? Answer : σ = 16 x 10^7N/m^2 e = 8 x 10^{-4} E = $\frac{\sigma}{e}$ $E = \frac{16 \text{ x } 10^7 \text{N}/m^2}{8 \; x \; 10^{-4}}$ E = 2 x 10^{11}N$/m^2$ E = 2 x 10^{11} Pa The value of 'A' is the limit of the flexibility of the wire if it is pulled from point 0 to A 'that is what is called the deformation of the wire or called elastic. And the elastic limit of the wire and if it exceeds the elastic limit then the wire will break.	3
3	Conclude	Summing up the length of	Based on experiments regarding the series spring arrangement. Three springs with 1000 N / m constant	Dik : $k_1 = k_2 = k_3$= 1000 N/m	3

		the spring arranged in series drawn by a force	are arranged as shown  The arrangement of springs is given a weight so that it increases in length by 6 cm. How big is the tensile force experienced by each spring, make a conclusion!	Δx = 60 cm = 0,06 m Dit : Δx_1, Δx_2, and Δx_3 = …? Answer : a. First calculate the combined constants of the three springs k_{tot} $\frac{1}{k_{tot}} = \frac{1}{k_1} + \frac{1}{k_2} + \frac{1}{k_3}$ $\frac{1}{k_{tot}} = \frac{1}{1000\ \mathrm{N/m}} + \frac{1}{1000\ \mathrm{N/m}} + \frac{1}{1000\ \mathrm{N/m}}$ $\frac{1}{k_{tot}} = \frac{3}{1000\ \mathrm{N/m}}$ k_{tot} = 333,3 N/m b. Calculate style F F = k_{tot}. Δx = $\frac{1000\ \mathrm{N/m}}{3}$. 0,06 m =20	

				N c. Calculate Δx_1, Δx_2, and Δx_3 $\Delta x_1 = \frac{F}{k_1} = \frac{20\ N}{1000\ \mathrm{N/m}} =$ 0,02 m $\Delta x_2 = \frac{F}{k_2} = \frac{20\ N}{1000\ \mathrm{N/m}} =$ 0,02 m $\Delta x_3 = \frac{F}{k_3} = \frac{20\ N}{1000\ \mathrm{N/m}} =$ 0,02 m Conclusion: Thus, the tensile force experienced by each spring arranged in series is as large and this tensile force is the same as the tensile force experienced by the substitute springs.	
4	Experiment	Designing a combined spring arrangement experiment (series - parallel)	Class XI students of Natural Sciences 1 will conduct a combined spring arrangement experiment lab to calculate the spring constant if given a different mass. The tools and materials available are as follows: (Make the trial procedure) e. Satif 1 set f. Pegas identic 3 buah g. Neraca	Dit : Procedure percobaan yang benarMake the trial procedure =…? Answer : The correct trial sequence is:	3

			h. Beban (100 gr) 4 buah	1. Arranging the tools and materials provided. 2. Weigh the load period. 3. Arranging tools using a load of 100 gr. 4. Measuring the increase in the length of the spring with an initial load of 100 gr. 5. Noting the observations that have been provided.	
5	Clarifying	Identifies the style relationship with the incremental length of the graph	Draw a graph showing the effect of the force (F) on the length increase (Δx) on the elastic body and make the analysis.	Answer :  Reason: According to Hooke's law, the length increase of an elastic object is proportional to the force applied to the spring.	3
6	Clarifying	Classifying problems with	A spring that has a spring constant of 40 N / m is pressed so that the spring which is 5 cm long becomes	Dik : k = 40 N/m	3

		examples of using the concept of Hooke's Law in everyday life.	2 cm. how big is the spring reaction force on the object?	x_1 = 0,05 m x_2 = 0,02 m Δx = 0,02 m – 0,05 = -0,03m Dit : Fx = …? Answer : Fx = -k . Δx = (- 40 N/m) . (- 0,03 m) = -1,2 N So, the force exerted so that the spring stretch is the same magnitude as the force of the spring remaining opposite. The amount of force that must be exerted - 1,2 N	
7	Applying the Concept	Use concepts to explain what is happening	A homogeneous piece of wire is 140 cm long and has an area of 2 mm2 when drawn with a force of 100 N, increasing the length by 1 mm. calculate the Elastic Modulus E of the wire material!	Dik : Lo = 140 cm A = $2mm^2$- 2.10^{-6} m^2 F = 100 N Δl = 1 mm = 1. 10^{-3} m Dit : E …? Answer :	3

				a) First calculate the voltage $Voltage = \frac{F}{A}$ $= \frac{100N}{2\,.\,10^{-6} m^2}$ $= 50\,.\,10^6 N/m^2$ b) Calculate the strain $Strain = \frac{\Delta l}{l_0} = \frac{10^{-3} m}{1{,}4\ m}$ c) Calculate elastic modulus $E = \frac{\sigma}{e} = \frac{50\,.\,10^6 N/m^2}{\frac{10^{-3} m}{1{,}4\ m}}$ $= 7\,.\,10^{10} N/m^2$	
8	Observe	Observe increasing spring length	Two identical springs are arranged in series and the other two are arranged in parallel as shown in the figure  (b) (b) Observe the two pictures above and give the results of	Hipotesis = …? Answer : A. Spring arrangement For series arrangement $\frac{1}{k_s} = \frac{1}{k_1} + \frac{1}{k_2} + \frac{1}{k_3} + \cdots + \frac{1}{k_n}$ For parallel arrangement $k_p = k_1 + k_2 + \cdots + k_n$ B. On two or more springs made from the same,	3

			your observations …?!	then 1. When arranged in series, the length is greater than in parallel 2. When arranged in series, the successor constants are smaller than when arranged in parallel	

VALIDATION SHEET INSTRUMENT
(ESSAY TEST)

Subject : Physics
Topic : Elasticity
Class/Semester : XI /1
Education Unit : SMA
Name of Instrument Development : Rizqi Afnan

No	Criteria																				suggestion	value
	Follow the indictor				Questions were formulated clearly				Gives no clue answers				Questions are not double				Using appropriate language to Indonesian rule					
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4		
1				✓				✓				✓			✓					✓		3,8
2				✓				✓				✓				✓				✓		4,0
3				✓				✓				✓				✓				✓		4,0
4				✓				✓				✓			✓					✓		3,6
5				✓				✓			✓				✓					✓		3,6
6				✓				✓				✓			✓					✓		3,8
7				✓				✓				✓			✓					✓		3,8
8				✓				✓				✓			✓					✓		3,8
Amount of Value																						30,4

Assessment $= \frac{\textit{Amount of Value}}{\textit{Amount of Question}} = \frac{30,4}{8} = 3,8$

$= 3,8/4 \times 100$

$= 95.00$

Medan October 2019

Validator

Yulida Rahmawati, S.Si., MM.
NIP. 9036 7506603000 63

VALIDATION SHEET INSTRUMENT
(ESSAY TEST)

Subject : Physics
Topic : Elasticity
Class/Semester : XI /1
Education Unit : SMA
Name of Instrument Development : Rizqi Afnan

No	Criteria																				suggestion	value
	Follow the indictor				Questions were formulated clearly				Gives no clue answers				Questions are not double				Using appropriate language to Indonesian rule					
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4		
1				✓				✓				✓			✓					✓		3,8
2				✓				✓				✓				✓				✓		4,0
3				✓				✓				✓				✓				✓		4,0
4				✓				✓				✓			✓					✓		3,6
5				✓				✓			✓				✓					✓		3,6
6				✓				✓				✓			✓					✓		3,8
7				✓				✓				✓			✓					✓		3,8
8				✓				✓				✓			✓					✓		3,8
Amount of Value																						30,4

Assessment $= \frac{\text{Amount of Value}}{\text{Amount of Question}} = \frac{30{,}4}{8} = 3{,}8$ (enstrument this Research has a good validity to be Implemented.

$= \frac{3{,}8}{4} \times 100$

$= 95.00$

Medan October 2019

Validator

Drs. Rappel Sihotang, M.Si
NIP. 195703231988031002

VALIDATION SHEET INSTRUMENT
(ESSAY TEST)

Subject : Physics
Topic : Elasticity
Class Semester : XI /1
Education Unit : SMA
Name of Instrument Development : Rizqi Afnan

No	Criteria																				suggestion	value
	Follow the indictor				Questions were formulated clearly				Gives no clue answers				Questions are not double				Using appropriate language to Indonesian rule					
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4		
1				✓				✓				✓				✓				✓	The Ques-	20
2				✓				✓				✓				✓				✓	tions which	20
3				✓				✓				✓				✓				✓	are given	20
4				✓				✓				✓				✓				✓	to students	20
5				✓				✓				✓				✓			✓		should be	19
6				✓				✓				✓				✓				✓	Solved	20
7				✓				✓				✓			✓					✓	correctly	19
8				✓				✓				✓				✓				✓		20
Amount of Value																						158
Assessment $= \frac{\text{Amount of Value}}{\text{Amount of Question}} = \frac{158}{8} = 19,75/5$																						19,75

$= 3,95/4 \times 100$

$= 98,75$

Medan October 2019

Validator

H. ABDUL RAIS, S.Pd, ST, M.Si
NIP. 1970 0714 2008 01 1010

Nama : Afit syahputra.
Kelas : XI (IPA)
Mata pelajaran : Fisika

45,8

1). gaya menarik karet gelang sebesar 5 N maka karet gelang tersebut akan terjadinya perubahan merenggang sejauh sekitar 10 cm dan apabila karet tersebut ditarik lebih besar 10 N maka gelang karet tersebut akan putus. karena gelang karet tersebut tidak dapat menahan gaya sebesar 10 N.

2). E dibawah titik A artinya Regangan/10

E diatas titik A artinya adalah Tegangan /10 N/m

3). penyelesaian :

Dik : k_1 : 1000 N/m k_2 : 1000 N/m
k_3 : 1000 N/m F : 6 cm.

Dit : Δx ....?

Jawab : $\frac{1}{ks\ total} = \frac{1}{k_1} + \frac{1}{k_2} + \frac{1}{k_3}$

$= \frac{1}{1000} + \frac{1}{1000} + \frac{1}{1000} = \frac{3+2+1}{1000}$

$ks\ total = \frac{1000}{6} = 240\ N/m$

perubahan panjang pegas adalah $\Delta x = \frac{F}{ks\ total}$

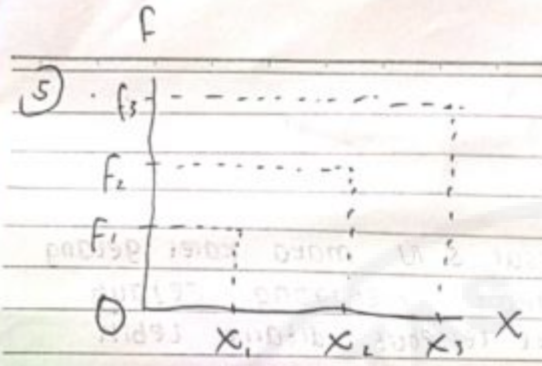
$\frac{6}{240} = 0,40$ cm.

Jadi, perubahan panjang susunan pegas tersebut adalah 0,40 cm.

4) a. ukurlah terlebih dahulu pegas pada suatu massa.
b. pegas dibagikan menjadi 3 bagian masing-masing
c. Pasangan 3 buah pegas tersebut dan catatlah
d. hasil kerja pegas tersebut menggunakan Neraca.
d. catatlah berapa beban yang terdapat pada suatu pegas tersebut.

SIDU

5)



6) Penyelesaian :

Dik : $\Delta x = 5$ cm $= 0{,}5$ cm $\quad \Delta x = 2$ cm $= 0{,}2$ cm

$m = 40$ N/m

Jawab :

$F = k \Delta x$ maka

$k = \frac{F}{\Delta x} = \frac{m}{\Delta x} = \frac{40}{0{,}5 - 0{,}2} = \frac{40}{3} = \underline{\underline{11}}$ N/m

7) Penyelesaian :

Dik : homogen = 140 cm, luas = 2 mm^2

gaya = 100 N, Panjang = 1 mm

Dit : H........?

Jawab :

$= \frac{2\,mm^2 \times 1\,mm}{100\,N} = \frac{2\,mm^3}{100\,N} = 2\,mm^3 \times 140\,cm = \frac{280\,cm}{100\,N}$

$= \frac{280\,cm}{100\,N} = \underline{\underline{2{,}8}}$ cm

a)

8) a. Rumusnya

$\frac{1}{k_s\,total} = \frac{1}{k_1} + \frac{1}{k_2} + \frac{1}{k_3} + \ldots\ldots + \frac{1}{k_n}$

b. Rumusnya :

$k_p\,total = k_1 + k_2 + k_3$

b). Pegas akan mengulurkan pegas tersebut dan pada pegas b, pegas b walaupun diberi pegas dia akan seimbang panjangnya.

Nama : Jearrens Sugito
Kelas : 5 B <11 ipa 1>
Pelajaran : Fisika

37,5

<1> analisis => apabila suatu karet gelang ditarik terlalu panjang maka karet tersebut merenggang dan mengakibatkan gelang tersebut terputus. 2

<2> untuk menerapkan dan mengontrol panjang suatu bangunan antara yang satu dan lainnya.

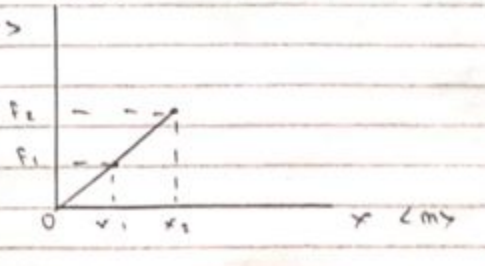
<3> a. masing - masing pegas memiliki perubahan dalam bentuk dan berat ~~...~~ pada neraca.
b. setiap neraca memiliki berat dan massa yang berbeda disebabkan adanya keterkaitannya dengan benda yang tergantung. 2

a. $k_1 = 1000$ N/m
$k_2 = 1000$ N/m
$k_3 = 1000$ N/m
$F = 6$ cm

$$k_{s} = \frac{1}{k_1} + \frac{1}{k_2} + \frac{1}{k_3}$$
$$= \frac{1}{1000} + \frac{1}{1000} + \frac{1}{1000} = \frac{10 + 10 + 10}{10.000} = \frac{30}{10.000} = \frac{3}{1000}$$
$$= 333,33$$

<4> - pertama, gantungkan neraca ke statif agar benda yang digantung tidak bergoyang.
- kedua, lakukan beban ke neraca tersebut dengan perlahan 2
- ketiga, perhatikan dan cermati bagaimana keadaan neraca ketiga telah diberi beban.

<5>



<6> $\frac{5\ cm - 2\ cm}{40\ N/m} = \frac{3\ cm}{40\ N/m}$

$= 13,33.$

<7>

<8> a. a. $\frac{1}{k_s\ total} = \frac{1}{k_1} + \frac{1}{k_2} + \frac{1}{k_3} + \dots + \frac{1}{k_n}$

b. $k_p\ total = k_1 + k_2 + k_3$

2

b. maka berat tarikan akan berbeda dikarenakan cara pemakaian pegas yang berbeda.

SiDU

Appendix 7

Pretest Problem Solving Skills

a. Experiment class

NO	Name of Student	No. quation								Score	Value (x)
		1	2	3	4	5	6	7	8		
		3	3	3	3	3	3	3	3	24	100
1	K.F	2	0	0	0	0	0	0	0	2	8,33333333
2	P.A	2	0	0	3	0	0	0	0	5	20,8333333
3	M.F	0	0	0	1	0	1	0	0	1	4,16666667
4	M.A.U	1	0	0	1	0	0	0	0	2	8,33333333
5	N.A	1	0	0	0	0	0	0	0	1	4,16666667
6	M.A	1	0	0	0	0	0	0	0	1	4,16666667
7	D.A	3	0	0	2	0	0	0	0	5	20,8333333
8	Z.S	0	0	0	2	0	0	0	0	2	8,33333333
9	A.R.M	1	0	0	1	0	0	0	0	2	8,33333333
10	D.R	3	0	0	2	0	0	0	0	5	20,8333333
11	D.S.D	2	2	0	3	0	0	0	0	7	29,1666667
12	M.S.H	1	0	0	3	0	0	0	0	4	16,6666667
13	A.H.S	1	0	0	2	0	0	0	0	3	12,5

14	A.S	1	0	0	3	0	0	0	0	4	16,6666667
15	M.H.B.H	1	0	0	0	0	0	0	0	1	4,16666667
16	A.M.P	2	1	0	0	0	0	0	0	3	12,5
17	J.S	3	0	0	0	0	0	0	0	3	12,5
18	R.N.F	2	0	0	1	0	0	0	0	3	12,5
19	A.D.A.H	3	2	0	0	0	0	0	0	5	20,8333333
20	M.F	1	0	0	2	0	0	0	0	3	12,5
21	R.K.Q.N	3	0	0	2	0	0	0	0	5	20,8333333
22	R.R.S	1	0	0	3	0	0	0	0	4	16,6666667
23	M.A	1	0	0	0	0	0	0	1	2	8,33333333
24	M.J	I	1	0	3	0	0	0	0	5	20,8333333
Sum											325
Average											13,5416667
Deviation											6,8685466
Varians											47,1769324

b. Control class

NO	Name of Student	No. quation								Score	Value (x)
		1	2	3	4	5	6	7	8		
		3	3	3	3	3	3	3	3	24	100
1	S.A	2	0	0	1	0	0	0	0	3	12,5
2	T.C	1	1	0	2	0	0	0	1	5	20,8333333
3	A.M	1	0	0	3	0	0	0	0	4	16,6666667
4	F.A.L	2	0	0	2	0	0	0	0	4	16,6666667
5	D.A.I	1	0	0	0	0	0	0	1	2	8,33333333
6	A.P	1	0	0	0	0	0	0	0	1	4,16666667
7	A.I.H	1	0	0	0	0	0	0	1	2	8,33333333
8	I.A.B.B.R	1	0	0	0	0	0	0	0	1	4,16666667
9	M.I.T	2	0	0	1	0	0	0	0	3	12,5
10	F.F	3	0	0	1	0	0	0	0	4	16,6666667
11	A.A.P.S	2	0	0	2	0	0	0	1	5	20,8333333
12	R.N.D	2	0	0	1	0	0	0	0	3	12,5
13	F.M	2	0	0	2	0	0	0	1	5	20,8333333
14	C.F.R	1	1	0	2	0	0	0	0	4	16,6666667
15	A.S	2	0	0	2	0	0	0	1	5	20,8333333
16	M.L	2	0	0	2	0	0	0	0	4	16,6666667
17	M.A	1	0	0	2	0	0	0	0	3	12,5
18	A.P	2	0	0	1	0	0	0	0	3	12,5

Sum	254,166667
Average	14,1203704
Deviation	5,37386728
Varians	28,8784495

Appendix 8

Posttest Creative Thinking Skills

a. Experiment Class

NO	Name of Student	No. quation								Score	Value (x)
		1	2	3	4	5	6	7	8		
		3	3	3	3	3	3	3	3	24	100
1	M.A.R	3	1	1	3	0	0	2	2	12	50
2	M.R.A.L	2	2	0	2	0	0	1	0	7	29,1666667
3	P.A	3	0	1	3	0	0	0	2	9	37,5
4	A.R.M	2	2	0	3	0	0	1	0	8	33,3333333
5	R.K.Q.N	3	0	2	2	0	0	0	2	9	37,5
6	M.T.S	3	0	0	2	0	0	1	1	7	29,1666667
7	M.F.F	2	0	2	3	0	0	0	2	9	37,5
8	A.H.S	3	2	0	1	0	0	0	1	7	29,1666667
9	M.S.P	2	0	0	2	0	0	0	0	4	16,6666667
10	Z.S	1	2	2	2	0	0	0	2	9	37,5
11	M.F	3	0	1	2	0	0	1	1	8	33,3333333
12	A.M.P	2	0	0	3	0	1	0	2	8	33,3333333
13	A.D.A.H	2	0	2	0	0	0	0	0	4	16,6666667
14	M.A.A	3	1	2	3	1	1	0	1	12	50
15	A.S	3	0	0	3	2	1	0	2	11	45,8333333
16	D.S.D	2	0	1	3	0	0	0	1	7	29,1666667

17	M.S.H	3	0	1	3	2	0	2	1	12	50
18	R.R.S	2	1	1	2	1	0	1	2	10	41,6666667
19	D.U.A.Z	3	0	2	3	1	0	1	2	12	50
20	M.J	2	0	1	3	1	0	0	0	7	29,1666667
21	M.H.B.H	3	1	1	3	0	1	1	2	12	50
22	M.D.A	3	0	2	3	0	0	0	0	8	33,3333333
23	M.A	2	0	2	2	1	0	1	0	8	33,3333333
24	K.F	3	1	1	3	0	0	1	2	11	45,8333333
Sum											879,166667
Average											36,6319444
Deviation											9,82786377
Varians											96,5869062

b. Control Class

NO	**Name of Student**	**No. quation**								**Score**	**Value (x)**
		1	2	3	4	5	6	7	8		
		3	3	3	3	3	3	3	3	24	100
1	M.F.F	2	1	1	3	0	0	0	0	7	29,1666667
2	F.A.L	2	1	0	2	0	0	0	0	5	20,8333333
3	M.A	2	0	0	0	0	0	0	0	2	8,33333333
4	A.S.Z	2	1	0	2	0	0	0	0	5	20,8333333

5	F.M	0	0	2	1	0	0	0	0	3	12,5
6		2	0	1	0	0	0	0	1	4	16,6666667
7	C.F.R	2	0	2	2	0	0	0	0	6	25
8	T.C	2	0	2	2	0	0	0	1	7	29,1666667
9	A.A.M	1	0	2	0	0	0	0	0	3	12,5
10	S.A.D	2	0	1	1	0	0	0	2	6	25
11	M.R.M	2	0	0	0	0	0	0	0	2	8,33333333
12	M.A	1	0	3	0	0	0	1	2	7	29,1666667
13	R.N.D	1	0	1	1	0	0	3	1	7	29,1666667
14	A.I.H		1	2	1	0	0	0	0	4	16,6666667
15	M.R.A.S	2	0	0	0	0	0	0	0	2	8,33333333
16	A.P	2	0	1	0	0	0	0	0	3	12,5
17	S.A.R	2	0	0	3	0	0	0	1	6	25
18	M.L	2	0	1	2	0	0	0	0	5	20,8333333
Sum											350
Average											19,4444444
Deviation											7,69623454
Varians											59,2320261

Appendix 9

Calculation of Average, Varian and Standard Deviation

1. **Classroom Learning Outcomes Data Experiment**

   a) **Value Pretest**

   - Range

     Biggest Data – Smallest Data = 29.16– 4.16 = 25

   - Many classes

     Many Class = 1 + (3.3) log n

     = 1 + (3,3)log 24

     = 1 + 4.62

     = 5.62 = 6

   - Interval Class Length

     $P = \frac{Range}{Many\ Class} = 4.16 = 4$

     $\sum Xi = 325$ $\sum Xi^2 = 105625$ n= 24

   - Average

     $\bar{X} = \frac{\sum Xi}{n} = \frac{325}{24} = 13.54$

   - Standard Deviation

     $S = \sqrt{\frac{n\sum Xi^2 - (\sum Xi)^2}{n(n-1)}}$

     $S = \sqrt{\frac{24(105625^2) - (325)^2}{24(24-1)}}$

     $S = \sqrt{48507114.0126} = 6.86$

   - Variance

     $S^2 = 47.17$

   b) **Value Postes**

   - Range

     Biggest Data – Smallest Data = 50–16.66 = 33.34

   - Many classes

     Many Class = 1 + (3.3) log n

= 1 + (3,3)log 24

= 1 + 4.62

= 5.62 = 5 or 6

IntervalClass Length

P =$\frac{Range}{Many\ Class}$= 5.55 = 5 or 6

$\sum$Xi =879.1667 $\sum Xi^2$ = 772934.0863 n=24

- Average

$\bar{X} = \frac{\sum Xi}{n} = \frac{879.1667}{24}$ =36.63

- Standard Deviation

$S = \sqrt{\frac{n\sum Xi^2 - (\sum Xi\ )^2}{n(n-1)}}$

$S = \sqrt{\frac{24(772934.0863^2) - (879.1667)^2}{24(24-1)}}$

S =$\sqrt{96.4324}$= 9.82

- Variance

S^2 = 96.58

2. Classroom Learning Outcomes Data Control

a) Value Pretest

- Range

Biggest Data– Smallest Data = 20.83–4.16 = 16.67

- Many Classes

Many Class = 1 + (3.3) log n

= 1 + (3.3) log 18

= 1 + 4.14

= 5.14 = 5

- Interval Class Length

P =$\frac{Range}{Many\ Class}$= = 3,33 = 3

$\sum$Xi =254.1666 $\sum Xi^2$ =64600.6605 n=18

- Average

$\bar{X} = \frac{\sum Xi}{n} = \frac{254.1666}{18} = 14.12$

- Standard Deviation

$S = \sqrt{\frac{n\sum Xi^2-(\sum Xi)^2}{n(n-1)}}$

$S = \sqrt{\frac{18(64600.6605^2)-(254.1666)^2}{18(18-1)}}$

$S = \sqrt{28.83} = 5.37$

- Variance

$S^2 = 28.87$

b) Value Postes

Range

Biggest Data –Smallest Data = 29.16 –8.33 = 20.83

- Many Classes

Many Class = 1 + (3.3) log n

= 1 + (3.3) log 18

= 1 + 4.14

= 5.14 = 5

- Interval Length Grade

$P = \frac{Range}{Many\ Class} == 4.16 = 4$

$\sum Xi = 350$ $\sum Xi^2 = 122500$ n=18

- Average

$\bar{X} = \frac{\sum Xi}{n} = \frac{350}{18} = 19.44$

- standard Deviation

$S = \sqrt{\frac{n\sum Xi^2-(\sum Xi)^2}{n(n-1)}}$

$S = \sqrt{\frac{18(122500^2)-(350)^2}{18(18-1)}}$

$S = \sqrt{59.1361} = 7.69$

- Variance

  $S^2 = 59.23$

Appendix 10

Calculation of normality Test Data

1. Normality Test of Data

Testing normality of data of each variable has done research using Liliefors technique to check distributing of the data as normal distribution.

a) Pre-test of Student in Experiment Class

Calculation procedure:

1) The list until the data from the smallest to the biggest and Determine the observation frequency (fi) and cumulative frequency (fk).
2) Changes the sign of the score Becomes raw number (Zi).

   Using this formula:

   $$Zi = \frac{X_1 - \bar{X}}{S}$$

   Example of calculation:

   known

   X = 13.54

   S = 6.86

   For X1 = 4.16, obtainable:

   $$Zi = \frac{4.16 - 13.54}{6.86} = -1.36$$

3) To Determine F (Zi) value used under the standard normal curve. Example, for F (-1.36) = 0.0859. The way to see it with a mark on the first column to the -1.3 (table list of values under the standard normal curve) while the top line mark with 0:01, so the coordinates of the two Gives the number extents under the standard normal curve as big as 0.0859.

4) Determine S (Zi) by calculating proportion of fk based on the number of fi entirely. For S (-1.36) = 0.0859 Obtained by calculating$\frac{fk}{\sum fi} = \frac{4}{24} = 0.16$.
5) The last step determines the difference │F (Zi) -S (Zi) │by taking the Reviews largest absolute value that called L0. Then for N = 24Obtained the value of L_{table} = 0.147, on α= 0:05 (list of critical value for Liliefors).

Briefly Obtained the following result:

No.	Xi	Fi	FKUM	Zi	F(Zi)	S(Zi)	[F(Zi)-S(Zi)]
1	4,16	4	4	-1,3658882	0,08598703	0,166666667	**0,080679636**
2	8,33	2	6	-0,7587728	0,223994225	0,25	0,026005775
3	12,5	5	11	-0,1516575	0,439728536	0,458333333	0,018604797
4	16,6	3	14	0,20627567	0,581712209	0,583333333	0,001621124
5	20,8	6	20	1,05674952	0,854687041	0,833333333	0,021353708
6	29,16	4	24	2,27389203	0,98851376	1	0,01148624
$\bar{X}$ = 13.54			S = 6.86			L tabel = 0.147666	

Based on the table above was Obtained L_{count} = 0.0806, and based on Liliefors-test by significant standard = 0:05, n = 24, Obtained the L_{table} = 0.147. Therefore Obtained L_{count}<L_{table} (0.0806<0149). By this result was concluded that the data were in the normal distribution.

b) Pre-test of Student in Control Class

No.	X	F	FKUM	Zi	F(Zi)	S(Zi)	[F(Zi)-S(Zi)]
1	4,16	2	2	-1,85348276	0,0319066	0,08333333	0,051426736
2	8,33	2	4	-1,07750528	0,1406273	0,16666667	0,02603937
3	12,5	5	9	-0,3015278	0,38150603	0,375	0,006506028
4	16,66	5	14	0,47258883	0,68174672	0,58333333	0,098413389
5	20,83	4	18	1,24856631	0,89408813	0,75	**0,144088129**

$\bar{X}$ = 14.12	S = 5.37	L tabel = 0.147666

Based on the table above was Obtained L_{count} = 0.1440, and based on Liliefors-test by significant standard = 0:05, n = 18, Obtained the Ltable = 0.147. Therefore Obtained $L_{count}<L_{table}$ (0.1440<0.147). By this result was concluded that the data were in the normal distribution.

c) Post-test of Students in Experiment Class

Calculation procedure:

1) The list until the data from the smallest to the biggest and Determine the observation frequency (fi) and cumulative frequency (fk).
2) Changes the sign of the score Becomes raw number (Zi).

   Using this formula:

   $$Zi = \frac{X_1 - \bar{X}}{S}$$

   Example of calculation:

   known

   X = 36.63

   S = 9.82

   For Xi = 16.66, obtainable:

   $$Zi = \frac{16.66 - 36.63}{9.82} = -2.03$$

3) To Determine F (Zi) value used under the standard normal curve. Example, for F (-2.03) = 0.021. The way to see it with a mark on the first column to the -2.03 (table list of values under the standard normal curve) while the top line with 0:04 mark, so the coordinates of the two Gives the number extents under the standard normal curve as big as 0.021.

4) Determine S (Zi) by calculating proportion of fk based on the number of fi entirely. For S (-2.03) = 0.0833 Obtained by calculating$\frac{fk}{\sum fi} = \frac{2}{24} = 0.0833$.
5) The last step determines the difference │F (Zi) -S (Zi) │by taking the Reviews largest absolute value that called L0. Then for N = 24 Obtained the value of Ltabel = 0.147, on α= 0:05 (list of critical value for Liliefors).

Briefly Obtained the following result:

No.	X	F	FKUM	Zi	F(Zi)	S(Zi)	[F(Zi)-S(Zi)]
1	16,66	2	2	-2,032175549	0,021067944	0,083333333	0,06226539
2	29,16	5	7	-0,760281646	0,223543125	0,291666667	0,068123542
3	33,33	5	12	-0,33597784	0,368443788	0,5	**0,131556212**
4	37,5	4	16	0,088325965	0,535191199	0,666666667	0,131475468
5	41,66	1	17	0,511612256	0,695538797	0,708333333	0,012794536
6	45,83	2	19	0,935916062	0,825341797	0,791666667	0,03367513
7	50	5	24	1,360219868	0,913119821	1	0,086880179
$\bar{X}$ = 36.63			S = 9.82			L tabel = 0.147666	

Based on the table above was Obtained Lcount = 0.1315, and based on Liliefors-test by significant standard = 0:05, n = 24, Obtained the Ltable = 0.147. Therefore Obtained Lcount<Ltable (0.1315<0.147). By this result was concluded that the data were in the normal distribution.

d) Post-test of Students in Class Control

No.	X	F	FKUM	Zi	F(Zi)	S(Zi)	[F(Zi)-S(Zi)]
1	8,33	3	3	-1,44414056	0,074349721	0,125	0,050650279
2	12,5	3	7	-0,90231715	0,183444208	0,291666667	0,108222459
3	16,66	2	9	-0,36179309	0,35875333	0,375	0,01624667
4	20,83	3	12	0,180030318	0,571435617	0,5	0,071435617
5	25	3	15	0,721853723	0,764807792	0,625	0,139807792

6	29,16	3	18	1,26237779	0,896593561	0,75	**0,146593561**
$\bar{X}$ = 19.44			S = 7.69			L tabel = 0.147666	

Based on the table above was Obtained L_{count} = 0.1465, and based on Liliefors-test by significant standard = 0:05, n = 24, Obtained the L_{table}= 0.147. Therefore Obtained L_{count}<L_{table} (0.1465<0.147). By this result was concluded that the data were in the normal distribution.

Appendix 11

Homogeneity Test Calculation Of Data

Homogeneity test of the data done using F test on the pre-test the data of both samples with this formula

$F = \frac{S_1{}^2}{S_2{}^2}$

1. **Pre-Test of Both classes**

From tabulation get

$S_1{}^2$ (Biggest variance) = 47.17

$S_2{}^2$ (Lowest variance) = 28.57

Thus:

$F = \frac{S_1{}^2}{S_2{}^2} = \frac{47.17}{28.57} = 1.65$

In the level of $\alpha = 0.10$ and dKnumerator =24-1=23 and dKdenumerator= 18-1 = 17, seen $F_{0.05\ (35.35)}$ in the list of table F distribution, we get $F_{0.05\ (30.36)} = 1.78$ and $F_{0.05\ (40.30)} = 1.72$.

Thus:

$F_{table} = 1.78\frac{36-30}{40-30}(1.72 - 1.78)$

$F_{table} = 1.78 - 0.036$

$F_{table} = 1.74$

Testing criterion:

- If $F_{count} < F_{table}$ thus variant of pre-test both group is homogeneous

- If Fc_{ount}>F_{table}thus variant of pre-test both the group is not homogeneous

Then compare both values, we get F_{count}<F_{table} (1.65 <1.74). This situation means that a variant of the pre-test both samples is from the homogenous population.

2.Post-test of both classes

From tabulation get:

$S_1{}^2$ (Biggest variance) = 96.56
$S_2{}^2$ (Lowest variance) = 59.23

Thus:

$$F = \frac{S_{1^2}}{S_{2^2}} = \frac{96.56}{59.23} = 1.63$$

In the level of$\alpha = 0.10$ and dKnumerator = 24-1 = 23 and dKdenumerator = 18-1 = 17, seen $F_{0.05\ (35.35)}$ in the list of table F distribution, we get $F_{0.05(30.36)}$ = 1.78 and $F_{0.05\ (40.30)}$ = 1.72

Tus:

$F_{table}$$= 1.78\frac{36-30}{40-30}(1.72 - 1.78)$

F_{table} = 1.78 - 0.036

F_{table} = 1.74

Testing criterion:

- If F_{count}<F_{table}thus variant of pre-test both group is homogeneous
- If F_{count}>F_{table}thus variant of pre-test both the group is not homogeneous

Then compare both values, we get $F_{count} < F_{table}$ (1.63 <1.74). This situation means that a variant of the pre-test both samples is from the homogenous population.

Appendix 12

Hypothesis Test

To determine whether there is the implementation of Guided Inquiry learning model on improving student learning outcomes,mean the data pretest and posttest do test two similarity on average (t test) .In the pretest to see the similarity of the initial capabilities of the student t test the two sides and the post-test to see differences in learning outcomes of students using cooperative learning model *Guided Inquiry Learning* through brainstorming method with conventional study of the hypothesis test two parties. Testing the hypothesis with t test with the formula:

$$t = \frac{\bar{X}^1 - \bar{X}_2}{S.\sqrt{\frac{1}{n_1} + \frac{1}{n_2}}}$$

where S is a joint variance calculated by the formula:

$$S^2 = \frac{(n-1)S_1{}^2 + (n-1)S_2{}^2}{n_1 + n_2 - 2}$$

The data were obtained:

A. On the Pretest

Class Experiment: X = 13.54 $S_1{}^2$ = 47.17 n = 24

Class Controls: X = 14.12 $S_2{}^2$ = 28.87 n = 18

With:

$$S^2 = \frac{(n-1)S_1{}^2 + (n-1)S_2{}^2}{n_1 + n_2 - 2}$$

$$S^2 = \frac{(24-1)47.17 + (18-1)28.87}{24 + 18 - 2}$$

$$S^2 = \frac{1084.91 + 490.79}{40}$$

$$S^2 = 39.39$$
$$S = 6.27$$

Then

t count= $\frac{\bar{X}^1 - \bar{X}_2}{S\sqrt{\frac{1}{n_1}+\frac{1}{n_2}}}$

t count= $\frac{13.54-14.12}{6.27\sqrt{\frac{1}{24}+\frac{1}{18}}}$

t count= $\frac{-0.58}{1.88}$

t count= -0.3

From t distribution list forα = 0:05 or t $_{(1-1\,/\,2\alpha)}$ = $t_{0.975}$ and df = 24 + 18 -2 = 40 is not present on t_{table} therefore t_{count} had been calculated by linear interpolation used.

Because df = 20 and dk = 120 on the table, then:

For df = 60 and α= 0:05 we get t(1- α) = 2.00

For df = 120 and α= 0:05 we get t(1- α) = 1.98

Thus:

$$t_{(0.975)(70)} = t_{(0.975)(120)} \frac{70-60}{120-60}\left(t_{(0.975)(120)} - t_{(0.975)(60)}\right)$$

$t_{(0.975)(70)}$ =2.00 $\frac{40-60}{120-60}$ (1.98 − 2.00)

$t_{(0.975)(70)}$ =2.00 +0.16 (-0.02)

$t_{(0.975)(70)}$ = 2:00 - 0.0032

$t_{(0.975)(70)}$ = 1,996

Because $-t_{table} < t_{count} < t_{table}$ (-1996 <-1.92 <1.996), it can be concluded that H_0 which means the ability of the students in the experimental class beginning at the initial ability of students in the control class.

B. On the Postest

Class Experiment: X = 36.63 $S_1{}^2$ = 96.58 n=24

Class Controls : X = 19.44 $S_2{}^2$= 59.23 n=18

With:

$$S^2 = \frac{(n-1)S_1{}^2 + (n-1)S_2{}^2}{n_1 + n_2 - 2}$$

$$S^2 = \frac{(24-1)96.58 + (18-1)59.23}{24 + 18 - 2}$$

$$S^2 = \frac{2221.34 + 1006.91}{40}$$

$$S^2 = 80.7$$

$$S = 8.9$$

Then :

$$t_{count} = \frac{\bar{X}^1 - \bar{X}_2}{S\sqrt{\frac{1}{n_1} + \frac{1}{n_2}}}$$

$$t_{count} = \frac{36.63 - 19.44}{8.9\sqrt{\frac{1}{24} + \frac{1}{18}}}$$

$$t_{count} = \frac{17.19}{2.67}$$

t_{count}= 6.43

From t distribution list for α = 0:05 or $t_{(1-1/2\,\alpha)}$ = t0.95 and df = 24+ 18-2 = 40 is not present on t_{table} therefore tc_{ount} had been calculated by linear interpolation used.

Because df = 20 and dk = 120 on the table, then:

For df = 60 and α= 0:05 we get t $_{(1-\alpha)}$ = 2.00

For df = 120 and α= 0:05 we get t $_{(1-\alpha)}$ = 1.98

Thus:

$$t_{(0.95)(70)} = t_{(0.95)(120)} \frac{40-60}{120-60}\left(t_{(0.95)(120)} - t_{(0.95)(60)}\right)$$

$$t_{(0.95)(70)} = 2.00 \frac{70-60}{120-60}(1.66-1.67)$$

$$t_{(0.95)(70)} = 2.00 + 0.16\ (-0.01)$$

$$t_{(0.95)(70)} = 2{:}00 - 0.0016$$

$$t_{(0.95)(70)} = 1{,}998$$

The hypothesis tested were:

H_0: The average student learning outcomes in the same experimental class with student learning outcomes in the control class means there is no difference in learning outcomes by applying the learning model of Group Investigation Cooperative mode with brainstorming methods to increase student learning outcomes.

H_a: An average student learning outcomes in experimental class is larger than the control class student learning outcomes, means there is a significant difference by applying the model of Guided Inquiry Learning to increase student learning outcomes.

Based on these calculations showed that $t_{count} > t_{table}$ (6.43 > 1998), then H_0 is rejected and H_a accepted. This suggests that the learning outcomes of students in the experimental class that implement of Guided Inquiry Learning Model is better than student learning outcomes in the control class by applying conventional learning so that it can be concluded that the average student learning outcomes higher menggunakan Guided Inquiry Learning Model by the method of elasticity topic in class XI PONPES MAWARIDUSSALAM A.Y 2019/2020.

Critical Value for Liliefors Test

Ukuran Sampel	Taraf Nyata (α)				
	0,01	0,05	0,10	0,15	0,20
n = 4	0,417	0,381	0,352	0,319	0,300
5	0,405	0,337	0,315	0,299	0,285
6	0,364	0,319	0,294	0,277	0,265
7	0,348	0,300	0,276	0,258	0,247
8	0,331	0,285	0,261	0,244	0,233
9	0,311	0,271	0,249	0,233	0,223
10	0,294	0,258	0,239	0,022	0,215
11	0,284	0,249	0,230	0,217	0,206
12	0,275	0,242	0,223	0,212	0,199
13	0,268	0,234	0,214	0,202	0,190
14	0,261	0,227	0,207	0,194	0,183
15	0,257	0,220	0,201	0,187	0,177
16	0,250	0,213	0,195	0,182	0,173
17	0,245	0,206	0,189	0,177	0,169
18	0,239	0,200	0,184	0,173	0,166
19	0,235	0,195	0,179	0,169	0,163
20	0,231	0,190	0,174	0,166	0,160
25	0,200	0,173	0,158	0,147	0,142
30	0,187	0,161	0,144	0,136	0,131
n > 30	$\frac{1{,}031}{\sqrt{n}}$	$\frac{0{,}886}{\sqrt{n}}$	$\frac{0{,}805}{\sqrt{n}}$	$\frac{0{,}768}{\sqrt{n}}$	$\frac{0{,}736}{\sqrt{n}}$

source:

Sudjana, (2005), Statistical Methods, Bandung: Tarsito

Table of normal area curve 0 to z

z	0.00	0.01	0,02	0.03	0,04	0.05	0.06	0,07	0,08	0,09
-3,4	0,0003	0,0003	0,0003	0,0003	0,0003	0,0003	0,0003	0,0003	0,0003	0,0002
-3,3	0,0005	0,0005	0,0005	0,0004	0,0004	0,0004	0,0004	0,0004	0,0004	0,0003
-3,2	0,0007	0,0007	0,0006	0,0006	0,0006	0,0006	0,0006	0,0005	0,0005	0,0005
-3,1	0,0010	0,0009	0,0009	0,0009	0,0008	0,0008	0,0008	0,0008	0,0007	0,0007
-3,0	0,0013	0,0013	0,0013	0,0012	0,0012	0,0011	0,0011	0,0011	0,0010	0,0010
-2,9	0,0019	0,0018	0,0018	0,0017	0,0016	0,0016	0,0015	0,0015	0,0014	0,0014
-2,8	0,0026	0,0025	0,0024	0,0023	0,0023	0,0022	0,0021	0,0021	0,0020	0,0019
-2,7	0,0035	0,0034	0,0033	0,0032	0,0031	0,0030	0,0029	0,0028	0,0027	0,0026
-2,6	0,0047	0,0045	0,0044	0,0043	0,0041	0,0040	0,0039	0,0038	0,0037	0,0036
-2,5	0,0062	0,0060	0,0059	0,0057	0,0055	0,0054	0,0052	0,0051	0,0049	0,0048
-2,4	0,0082	0,0080	0,0078	0,0075	0,0073	0,0071	0,0069	0,0068	0,0066	0,0064
-2,3	0,0107	0,0104	0,0102	0,0099	0,0096	0,0094	0,0091	0,0089	0,0087	0,0084
-2,2	0,0139	0,0136	0,0132	0,0129	0,0125	0,0122	0,0119	0,0116	0,0113	0,0110
-2,1	0,0179	0,0174	0,0170	0,0166	0,0162	0,0158	0,0154	0,0150	0,0146	0,0143
-2,0	0,0228	0,0222	0,0217	0,0212	0,0207	0,0202	0,0197	0,0192	0,0188	0,0183
-1,9	0,0287	0,0281	0,0274	0,0268	0,0262	0,0256	0,0250	0,0244	0,0239	0,0233
-1,8	0,0359	0,0351	0,0344	0,0336	0,0329	0,0322	0,0314	0,0307	0,0301	0,0294
-1,7	0,0446	0,0436	0,0427	0,0418	0,0409	0,0401	0,0392	0,0384	0,0375	0,0367
-1,6	0,0548	0,0537	0,0526	0,0516	0,0505	0,0495	0,0485	0,0475	0,0465	0,0455
-1,5	0,0668	0,0655	0,0643	0,0630	0,0618	0,0606	0,0594	0,0582	0,0571	0,0559
-1,4	0,0808	0,0793	0,0778	0,0764	0,0749	0,0735	0,0703	0,0708	0,0694	0,0681
-1,3	0,0968	0,0951	0,0934	0,0918	0,0901	0,0885	0,0869	0,0853	0,0838	0,0823
-1,2	0,1151	0,1131	0,1112	0,1093	0,1075	0,1056	0,1038	0,1020	0,1003	0,0985
-1,1	0,1358	0,1335	0,1314	0,1292	0,1271	0,1251	0,1230	0,1210	0,1190	0,1170
-1,0	0,1587	0,1562	0,1539	0,1515	0,1492	0,1469	0,1446	0,1423	0,1401	0,1379
-0,9	0,1841	0,1814	0,1788	0,1762	0,1736	0,1711	0,1685	0,1660	0,1635	0,1611
-0,8	0,2119	0,2090	0,2061	0,2033	0,2004	0,1977	0,1949	0,1922	0,1894	0,1867
-0,7	0,2420	0,2388	0,2358	0,2327	0,2296	0,2266	0,2236	0,2206	0,2177	0,2118
-0,6	0,2742	0,2709	0,2676	0,2643	0,2611	0,2578	0,2546	0,2514	0,2482	0,2451
-0,5	0,3085	0,3050	0,3015	0,2981	0,2946	0,2912	0,2877	0,2843	0,2810	0,2776
-0,4	0,3446	0,3409	0,3372	0,3336	0,3300	0,3264	0,3228	0,3192	0,3156	0,3121
-0,3	0,3821	0,3783	0,3745	0,3707	0,3669	0,3632	0,3594	0,3557	0,3520	0,3483
-0,2	0,4207	0,4168	0,4129	0,4090	0,4052	0,4033	0,3974	0,3936	0,3897	0,3859
-0,1	0,4602	0,4562	0,4522	0,4483	0,4443	0,4404	0,4364	0,4325	0,4286	0,4246
-0.0	0,5000	0,4960	0,4920	0,4880	0,4840	0,4801	0,4761	0,4721	0,4681	0,4641
0,0	0,5000	0,5040	0,5080	0,5120	0,5160	0,5199	0,5239	0,5279	0,5319	0,5359
0,1	0,5398	0,5438	0,5478	0,5517	0,5557	0,5596	0,5636	0,5675	0,5714	0,5754
0,2	0,5793	0,5832	0,5871	0,5910	0,5948	0,5967	0,6026	0,6064	0,6103	0,6141
0,3	0,6179	0,6217	0,6255	0,6293	0,6331	0,6368	0,6406	0,6443	0,6480	0,6517
0,4	0,6554	0,6591	0,6628	0,6664	0,6700	0,6736	0,6772	0,6808	0,6844	0,6879
0,5	0,6915	0,6950	0,6985	0,7019	0,7054	0,7088	0,7123	0,7157	0,7190	0,7224
0,6	0,7258	0,7291	0,7324	0,7357	0,7389	0,7422	0,7454	0,7486	0,7518	0,7549
0,7	0,7580	0,7612	0,7642	0,7673	0,7704	0,7734	0,7764	0,7794	0,7823	0,7882
0,8	0,7881	0,7910	0,7939	0,7967	0,7996	0,8023	0,8051	0,8078	0,8106	0,8133
0,9	0,8159	0,8186	0,8212	0,8238	0,8264	0,8289	0,8315	0,8340	0,8365	0,8389
1,0	0,8413	0,8438	0,8461	0,8485	0,8508	0,8531	0,8554	0,8577	0,8599	0,8621
1,1	0,8642	0,8665	0,8686	0,8708	0,8729	0,8749	0,8770	0,8790	0,8810	0,8830
1,2	0,8849	0,8869	0,8888	0,8907	0,8925	0,8944	0,8962	0,8980	0,8997	0,9015
1,3	0,9032	0,9049	0,9066	0,9082	0,9099	0,9115	0,9131	0,9147	0,9162	0,9177
1,4	0,9192	0,9207	0,9222	0,9236	0,9251	0,9265	0,9297	0,9292	0,9306	0,9319
1,5	0,9332	0,9345	0,9357	0,9370	0,9382	0,9394	0,9406	0,9418	0,9429	0,9441
1,6	0,9452	0,9463	0,9474	0,9484	0,9495	0,9505	0,9515	0,9525	0,9535	0,9545
1,7	0,9554	0,9564	0,9573	0,9582	0,9591	0,9599	0,9608	0,9616	0,9625	0,9633
1,8	0,9641	0,9649	0,9656	0,9664	0,9671	0,9678	0,9686	0,9693	0,9699	0,9706
1,9	0,9713	0,9719	0,9726	0,9732	0,9738	0,9744	0,9750	0,9756	0,9761	0,9767
2,0	0,9772	0,9778	0,9783	0,9788	0,9793	0,9798	0,9803	0,9808	0,9812	0,9817
2,1	0,9821	0,9826	0,9830	0,9834	0,9838	0,9842	0,9846	0,9850	0,9854	0,9857
2,2	0,9861	0,9864	0,9868	0,9871	0,9875	0,9878	0,9881	0,9884	0,9887	0,9890
2,3	0,9893	0,9896	0,9898	0,9901	0,9904	0,9906	0,9909	0,9911	0,9913	0,9916
2,4	0,9918	0,9920	0,9922	0,9925	0,9927	0,9929	0,9931	0,9932	0,9934	0,9936
2,5	0,9938	0,9940	0,9941	0,9943	0,9945	0,9946	0,9948	0,9949	0,9951	0,9952
2,6	0,9953	0,9955	0,9956	0,9957	0,9959	0,9960	0,9961	0,9962	0,9963	0,9964
2,7	0,9965	0,9966	0,9967	0,9968	0,9969	0,9970	0,9971	0,9972	0,9973	0,9974
2,8	0,9974	0,9975	0,9976	0,9977	0,9977	0,9978	0,9979	0,9979	0,9980	0,9981
2,9	0,9981	0,9982	0,9682	0,9983	0,9984	0,9984	0,9985	0,9985	0,9986	0,9986
3,0	0,9987	0,9987	0,9987	0,9988	0,9988	0,9989	0,9989	0,9989	0,9990	0,9990
3,1	0,9990	0,9991	0,9991	0,9991	0,9992	0,9992	0,9992	0,9992	0,9993	0,9993
3,2	0,9993	0,9993	0,9994	0,9994	0,9994	0,9994	0,9994	0,9995	0,9995	0,9995
3,3	0,9995	0,9995	0,9995	0,9996	0,9996	0,9996	0,9996	0,9996	0,9996	0,9997
3,4	0,9997	0,9997	0,9997	0,9997	0,9997	0,9997	0,9997	0,9997	0,9997	0,9998

Sudjana, (2005), Statistical Methods, Bandung: Tarsito

List of Percentile Value For t Distribution

v = df

(Numbers In Board List Declare tp)

v	$t_{0.995}$	$t_{0.99}$	$t_{0.975}$	$t_{0.95}$	$t_{0.90}$	$t_{0.80}$	$t_{0.75}$	$t_{0.70}$	$t_{0.60}$	$t_{0.55}$
1	63,66	31,82	12,71	6,31	3,08	1,376	1,000	0,727	0,325	0,158
2	9,92	6,96	4,30	2,92	1,89	1,061	0,816	0,617	0,289	0,142
3	5,84	4,54	3,18	2,35	1,64	0,978	0,765	0,584	0,277	0,137
4	4,60	3,75	2,78	2,13	1,53	0,941	0,741	0,569	0,271	0,134
5	4,03	3,36	2,75	2,02	1,48	0,920	0,727	0,559	0,267	0,132
6	3,71	3,14	2,45	1,94	1,44	0,906	0,718	0,553	0,265	0,131
7	3,50	3,00	2,36	1,90	1,42	0,896	0,711	0,549	0,263	0,130
8	3,36	2,90	2,31	1,86	1,40	0,889	0,706	0,546	0,262	0,130
9	3,25	2,82	2,26	1,83	1,38	0,883	0,703	0,543	0,261	0,129
10	3,17	2,76	2,23	1,81	1,37	0,879	0,700	0,542	0,260	0,129
11	3,11	2,72	2,20	1,80	1,36	0,876	0,697	0,540	0,260	0,129
12	3,06	2,68	2,18	1,78	1,36	0,873	0,695	0,539	0,259	0,128
13	3,01	2,65	2,16	1,77	1,35	0,870	0,694	0,538	0,259	0,128
14	2,98	2,62	2,14	1,76	1,34	0,868	0,692	0,537	0,258	0,128
15	2,95	2,60	2,13	1,75	1,34	0,866	0,691	0,536	0,258	0,128
16	2,92	2,58	2,12	1,75	1,34	0,865	0,690	0,535	0,258	0,128
17	2,90	2,57	2,11	1,74	1,33	0,863	0,689	0,534	0,257	0,128
18	2,88	2,55	2,10	1,73	1,33	0,862	0,688	0,534	0,257	0,127
19	2,86	2,54	2,09	1,73	1,33	0,861	0,688	0,533	0,257	0,127
20	2,84	2,53	2,09	1,72	1,32	0,860	0,687	0,533	0,257	0,127
21	2,83	2,52	2,08	1,72	1,32	0,859	0,686	0,532	0,257	0,127
22	2,82	2,51	2,07	1,72	1,32	0,858	0,686	0,532	0,256	0,127
23	2,81	2,50	2,07	1,71	1,32	0,858	0,685	0,532	0,256	0,127
24	2,80	2,49	2,06	1,71	1,32	0,857	0,685	0,531	0,256	0,127
25	2,79	2,48	2,06	1,71	1,32	0,856	0,684	0,531	0,256	0,127
26	2,78	2,48	2,06	1,71	1,32	0,856	0,684	0,531	0,256	0,127
27	2,77	2,47	2,05	1,70	1,31	0,855	0,684	0,531	0,256	0,127
28	2,76	2,47	2,05	1,70	1,31	0,855	0,683	0,530	0,256	0,127
29	2,76	2,46	2,04	1,70	1,31	0,854	0,683	0,530	0,256	0,127
30	2,75	2,46	2,04	1,70	1,31	0,854	0,683	0,530	0,256	0,127
40	2,70	2,42	2,02	1,68	1,30	0,851	0,681	0,529	0,255	0,126
60	2,66	2,39	2,00	1,67	1,30	0,848	0,679	0,527	0,254	0,126
120	2,62	2,36	1,98	1,66	1,29	0,845	0,677	0,526	0,254	0,126
∞	2,58	2,33	1,96	1.645	1,28	0,842	0,674	0,524	0,253	0,126

<u>source</u>:

Sudjana, (2005), Statistical Methods, Bandung: Tarsito

Appendix 13

DOCUMENTATION


KIMIA

KEMENTERIAN RISET, TEKNOLOGI, DAN PENDIDIKAN TINGGI
UNIVERSITAS NEGERI MEDAN
FAKULTAS MATEMATIKA DAN ILMU PENGETAHUAN ALAM
Jl. Willem Iskandar Psr V – Kotak Pos No.1589 Medan 20221 Telp.(061) 6625970
Laman : www.fmipa.unimed.ac.id

Nomor : 1661/UN33.4.1/LT/2019 Medan 22 Februari 2019
Lampiran : -
Perihal : Izin Melaksanakan Observasi

Yth. Kepala Sekolah Pon-Pes Mawaridussalam Deli Serdang
di
Tempat

Dengan hormat, kami memohon bantuan Saudara agar dapat memberikan izin melaksanakan Observasi di Sekolah yang Saudara pimpin kepada mahasiswa tersebut di bawah ini :

Nama : Rizqi Afnan
NIM : 4153322020
Jurusan : Fisika
Prodi : Pendidikan Fisika
Dosen Pembimbing : Dr. Derlina, M.Si

Perlu kami informasikan bahwa hasil observasi ini akan digunakan untuk keperluan penyusunan proposal penelitian mahasiswa yang bersangkutan.

Demikian kami sampaikan, atas perhatian dan kerjasama yang diberikan di ucapkan terima kasih.

a.n. Dekan
Wakil Dekan Bidang Akademik,

FMIPA

Prof. Dr. Herbert Sipahutar, M.S., M.Sc.
NIP. 19610626 198710 1 001

Madrasah Aliyah
Pondok Pesantren Mawaridussalam
NSM : 131212070030 NPSN : 10264715 Email : mappmawaridussalam@yahoo.com
Jl. Peringgan Desa Tumpatan Nibung Kec. Batang Kuis Kab. Deli Serdang Sumatera Utara 20372

SURAT KETERANGAN

Nomor :42/Ma-PP.MASA/II/2019

Sesuai Surat Kementrian Riset, Teknologi dan Pendidikan Tinggi Universitas Negeri Medan Nomor : 1661/UN33.4.1/LT/2019 tentang Permohonan Izin Observasi, maka dengan ini saya yang bertanda tangan bawah ini Kepala Madrasah Aliyah Pon-Pes Mawaridussalam Kab. Deli Serdang menerangkan bahwa :

Nama	: Rizqi Afnan
NIM	: 4153322020
Universitas	: Universitas Negeri Medan
Jurusan/Prodi	: Fisika / Pendidikan Fisika

Adalah benar telah selesai melaksanakan Observasi di Madrasah Aliyah Pondok Pesantren Mawaridussalam.

Demikianlah Surat Keterangan ini diberikan untuk dapat dipergunakan sebagaimana mestinya.

Batang Kuis, 25 Februari 2019
Kepala Madrasah Aliyah
PP MAWARIDUSSALAM

MADRASAH ALIYAH PESANTREN MAWARIDUSSALAM DELI SERDANG TUMPATAN NIBUNG BATANG KUIS PROVINSI SUMATERA UTARA

Arief Persada Angkat, S.Pd.I, MM

KEMENTERIAN RISET, TEKNOLOGI, DAN PENDIDIKAN TINGGI
UNIVERSITAS NEGERI MEDAN
FAKULTAS MATEMATIKA DAN ILMU PENGETAHUAN ALAM
Jl. Willem Iskandar Psr V – Kotak Pos No.1589 Medan 20221 Telp.(061) 6625970
Laman : www.fmipa.unimed.ac.id

Nomor : 6202/UN33.4.1/LT/2019 Medan, 24 September 2019
Lampiran : 1 (satu) berkas Proposal Penelitian
Perihal : Izin Melaksanakan Penelitian

Yth. Kepala PON-PES MAWARIDUSSALAM
di
Tempat

Bersama ini kami mohon dengan hormat bantuan Saudara agar dapat memberikan izin melaksanakan Penelitian di instansi yang Saudara pimpin kepada mahasiswa kami tersebut di bawah ini :

Nama	: Rizqi Afnan
NIM	: 4153322020
Program Studi	: S-1 Pendidikan Fisika Bilingual
Dosen Pembimbing	: Dr. Derlina, M.Si
Judul Penelitian	: THE EFFECT OF GUIDED INKUIRY LEARNING MODEL TOWARDS STUDENTS SCIENCE PROCESS SKILLS ABOUT ELASTICITY TOPIC IN CLASS XI MAWARIDUSSALAM

Perlu diketahui bahwa kegiatan ini dilaksanakan untuk memperoleh data yang akan digunakan dalam penyusunan skripsi mahasiswa tersebut guna memenuhi salah satu syarat memperoleh gelar Sarjana Pendidikan (S.Pd) di FMIPA Unimed.

Demikian kami sampaikan, atas perhatian dan kerja sama yang baik diucapkan terima kasih.

a.n. Dekan
Wakil Dekan Bidang Akademik

Prof. Dr. Herbert Sipahutar, M.S., M.Sc
NIP. 19610626198710 1 001

Madrasah Aliyah
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SURAT KETERANGAN

Nomor :098 /Ma-PP.MASA/XI/2019

Sesuai surat Universitas Negeri Medan, Nomor : 6202/UN33.4.1/LT/2019 tanggal 24 September 2019 tentang permohonan izin penelitian, maka dengan ini saya yang bertanda tangan bawah ini Kepala Madrasah Aliyah PP Mawaridussalam Kab. Deli Serdang menerangkan bahwa :

Nama	: Rizqi Afnan
NIM / NPM	: 4153322020
Universitas	: Universitas Negeri Medan
Jurusan	: Pendidikan Fisika Bilingual
Judul Penilitian	: **THE EFFECT OF GUIDED INKUIRY LEARNING**

MODEL TOWARDS STUDENTS SCIENCE PROCESS SKILLS ABOUT ELASTICITY TOPIC IN CLASS XI MAWARIDUSSALAM.

Telah kami setujui untuk melaksanakan penelitian di Madrasah Aliyah Pondok Pesantren Mawaridussalam dalam rangka Penyusunan Skripsi.

Demikianlah Surat Keterangan ini diberikan untuk dapat dipergunakan sebagaimana mestinya.

Batang Kuis, 15 September 2019
Kepala Madrasah Aliyah
PP Mawaridussalam

MADRASAH ALIYAH PESANTREN MAWARIDUSSALAM DELI SERDANG TUMPATAN NIBUNG BATANG KUIS PROVINSI SUMUT

Ariel Ressada Angkat, S. Pd.I, MM
NIP. -

BIOGRAPHY

Rizqi Afnan was born in Lhokseumawe , Aceh Utara on Juni 23^{rd} 1996. Father's name is Erliadi, S.Pd and Mother's name is Umi Rismawati. Rizqi is the second from four siblings. In 2002, author entered at SDN 13 Lhokseumawe and graduated in 2008. In 2008, author continued his education at SMP Pondok Pesantren Raudlatul Hasanah Medan, and graduated in 2011. In 2011 author continued his education at Pondok Pesantren Mawaridussalam Deliserdang, and graduated in 2014. In 2015, author was accepted in Bilingual Physics Education Study Program in Department of Physics, Faculty of Mathematics and Natural Sciences in State University of Medan.