

Surname:

First name:

VASM

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University of Cape Town

Department of Physics

Views About Scientific Measurement Questionnaire

Instructions:

Write your name in the box above.
Inside this envelope there are 16 pages.
Answer the questions on each sheet.
It should take you no longer than
3 minutes to answer each question.
**Answer the questions in order and do
not skip any sheet.**
**When you have completed a question,
put the sheet inside this envelope and
do not take it out again, even if you
want to change your answer.**
Never erase or change what you have
already written. Simply write any new
answers **below** the old ones.





3. You continue to think about science.

New scientific knowledge is based on the results from scientific experiments.



A

No, new scientific knowledge can result from existing scientific theories.



B

I have a different idea.



C

With whom do you most closely agree? (Circle ONE):

A	B	C
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Explain your choice.



5. You continue to think about scientific measurement.

Sometimes only one scientific measurement is sufficient for an exact result.



A

No, for a scientific measurement result to be exact, the experiment needs to be repeated many times and the average calculated.



B

I have another idea.



C

With whom do you most closely agree? (Circle ONE):

A	B	C
---	---	---

Explain your choice.



6. You now think about whether or not there is a difference between scientific measurements and measurements made in everyday life (for example: weighing the mass of a chemical produced in a chemistry experiment, compared to weighing some flour required for baking a cake).

Both scientific measurements and everyday measurements can be exact.

I think that scientific measurements can be exact, but everyday measurements are never exact.

No. Both scientific measurements and everyday measurements are never exact.

I have a different idea.

A B C D

With whom do you most closely agree? (Circle ONE):

A	B	C	D
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Explain your choice. In particular, explain carefully what you mean by “exact”.



You now decide that you should go and watch some scientists in action. You and your friends go to the Magnetic Observatory. Scientists are making very sensitive measurements of the Earth's magnetic field and compare these measurements with theories about the composition of the Earth. You go into one of the laboratories where a group of scientists are busy with an experiment to measure the magnetic field of the Earth on that day.

7. You observe that the scientists are discussing what they should do in their experiment.

I think that scientists always strictly follow the "Scientific Method" which prescribes a sequence for carrying out an experiment.

No, I think that scientists also use their creativity when carrying out an experiment.



A



B

With whom do you most closely agree? (Circle ONE):

A	B
---	---

Explain your choice.



8. The scientists now start taking measurements. They first use a **very sensitive instrument** with a digital scale to measure the Earth's magnetic field. What they see is shown below.



You discuss what the scientists now know about the Earth's magnetic field.

I think that the scientists now know that the Earth's magnetic field is exactly 0.137 mT.



A

I think that the scientists only have an approximate value of the Earth's magnetic field.



B

I don't agree with either of you.



C

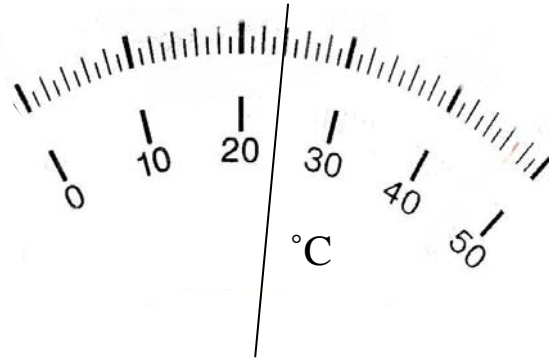
With which group do you most closely agree? (Circle ONE):

A	B	C
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Explain your choice.



9. The scientists also need to know the temperature in the laboratory. They use a **special thermometer** and what they see on the display of the thermometer is shown below.



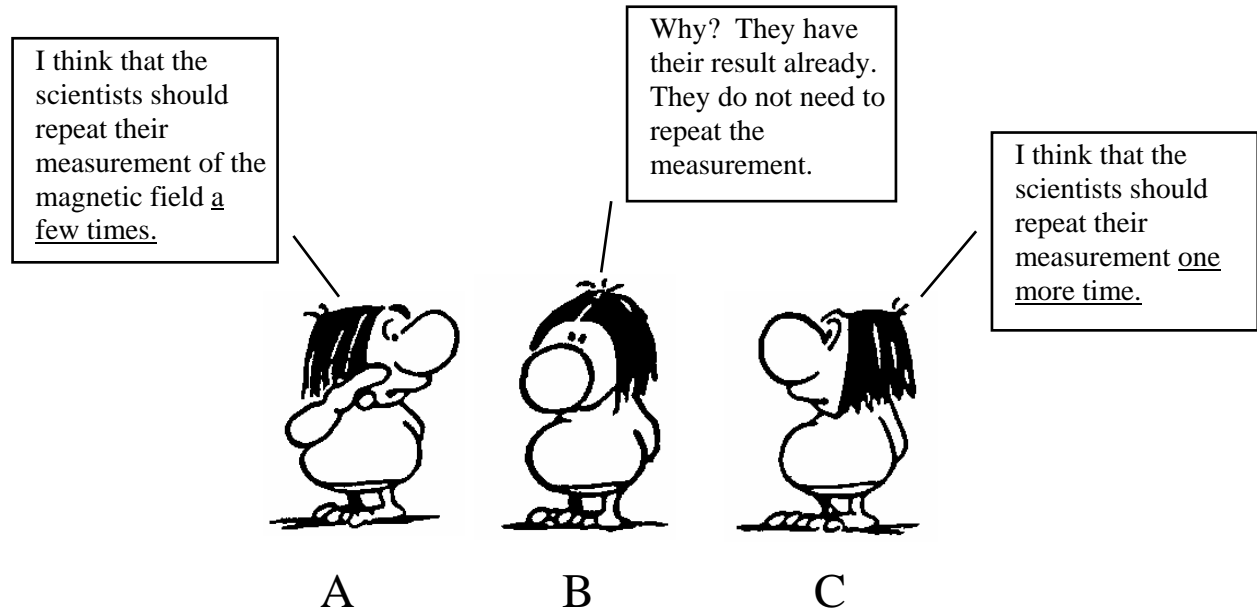
What is the temperature in the laboratory?

Explain your answer carefully.



10. You see that the scientists discuss what to do after taking one measurement of the magnetic field.

You wonder whether or not they need to repeat their measurement.



With whom do you most closely agree? (Circle ONE):

A	B	C
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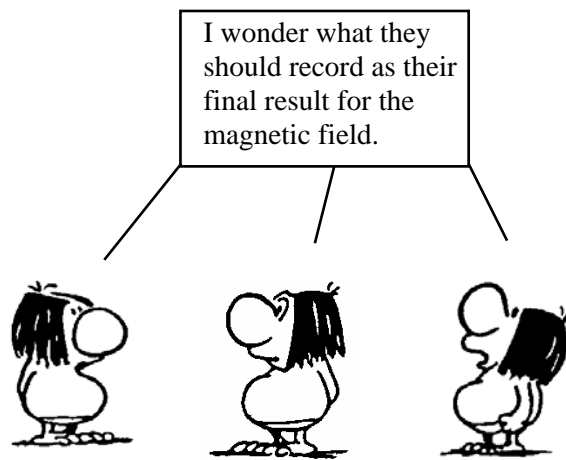
Explain your choice.



11. The scientists decide to repeat their measurement of the magnetic field five times. Their results are shown below.

<u>Measurement</u>	<u>Magnetic field (mT)</u>
1	0.137
2	0.128
3	0.138
4	0.128
5	0.134

You then discuss what the scientists should record as their final result for the magnetic field.



Write down what you think the scientists should record as their final result for the magnetic field.

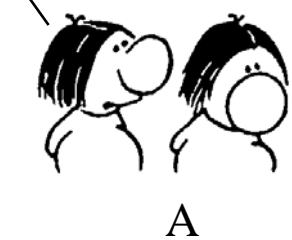
Explain your choice.



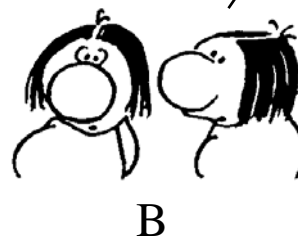
12. The scientists now decide to compare their results with the results obtained by another group of scientists for the same experiment. The data are shown below.

<u>Measurement</u>	<u>Group A</u> <u>Magnetic field (mT)</u>	<u>Group B</u> <u>Magnetic field (mT)</u>
1	0.137	0.128
2	0.128	0.140
3	0.138	0.134
4	0.128	0.127
5	0.134	0.126
Average:	0.133	0.131

The results of groups A and B agree with each other.



No, the results do not agree with each other.



With which group do you most closely agree? (Circle ONE):

A	B
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Explain your choice. Do not use the word "results" in your explanation.



13. After analysing their data, the scientists find that their measurement of the Earth's magnetic field does not agree with the value predicted by their theory. You discuss what the scientists should do.

I think that the scientists might now have to revise their theory.

No, the scientists should reject the value obtained from their experiment.

I have another idea about what they should do.

A B C

With which group do you most closely agree? (Circle ONE):

A	B	C
---	---	---

Explain your choice.



14. Finally, you think about how the scientists may improve their measurement.

With enough money and the best equipment, the scientists can design an experiment that would give them the true value of the magnetic field.

I do not agree! I think that the scientists will never know the true value of the magnetic field, no matter what they do.



A



B

With whom do you most closely agree? (Circle ONE):

A	B
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Explain your choice.



15. How familiar are you with laboratory practical work from school?
(Tick all options that apply for each science subject.)

	Physics	Chemistry	Biology
I have never conducted a laboratory experiment in ...			
I have conducted a few laboratory experiments in ...			
I have conducted many laboratory experiments in ...			
My teacher used to demonstrate experiments to the class in ...			
I have read about experiments in ...			

16. Please describe your school experience concerning laboratory work.

17.



In this laboratory questionnaire, I thought that the cartoon figures were (tick one):	male	female	mixed gender
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