Year 9 Science

Term 4 Study Notes

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God is Protector

The Solar System and our changing Earth Chapter 5

Introduction

Our planet is just right

In the Bible, we read that when God had finished creating this earth and everything in it, he looked at all that all that he had made and said that it was good.

Scientists have discovered many special things about our earth. If any of them were slightly out of order, then life for us would not be good. But Creator God has chosen to place protective mechanisms in and surrounding our planet.

For example:

If the earth was closer to the sun, we would be warmer all the time, the ice at the poles would melt, and vast areas of land would be under water.

If the earth was further away from the sun, we would have more land, as more water would become ice. Less land though, would be warm enough to grow food and most of us would starve.

If the earth was smaller, we would have less atmosphere, less oxygen and more dangerous rays would reach us.

If the earth was bigger, gravity would be stronger. We couldn't fly aeroplanes and more fuel would be needed for our cars.

If the earth spun around every 12 hours instead of every 24 hours, we would have terrible winds. If it took 48 hours we would get very hot days, cold nights and probably less rain.

We have an ozone layer around the earth which absorbs cancer-producing cosmic rays from outer space. We have oxygen in the air and no poisonous gases. This is very different to other planets.

Even our moon is important. Without the moon we would not have tides. Without tides, plant nutrients would not be stirred up from the ocean floor. That means there would be less plant nutrients we would have less plants and less oxygen.

There are so many things that are just right. Could anyone but a loving, all-powerful God have organized all this?

Unit 1: Our Solar System p. 108

1. **List the eight planets in our Solar System in order of distance from the Sun.**
   (Remember this by: My Very Enthusiastic Mother Just Served Us Nachos).
   (Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus, Neptune)

2. **How do the planets maintain their orbit around the sun?**
   By the Sun's gravitational pull.

3. **How hot is the Sun?**
   6000 degrees C.

4. **What is a planet?**
   A planet is a body that orbits the Sun (or another star) and produces no light of its own. It reflects the light of the Sun or star.

5. **List 4 facts about each planet.**

6. **What is a satellite?**
   A satellite is any object that moves in an orbit around a planet. The Moon is the earth's only natural satellite.

7. **Why is the moon important to the Earth?**
   The moon is responsible for the Earth's tides, which keep the Oceans clean and stop then from becoming stagnant.

8. **List 4 facts about the moon.**

9. **Draw the phases of the moon.**

10. **What are artificial satellites?**
    Artificial satellites are classified according to their mission. There are six main types of artificial satellites namely scientific research, weather, communications, and navigation, Earth observing and military.

11. **What is an eclipse?**
    An eclipse occurs when the Earth or Moon moves into a shadow and appears dark instead of being lit by the Sun. A solar eclipse is an eclipse of the Sun. A lunar eclipse is an eclipse of the Moon.

12. **What causes day and night?**
    Day and night are the result of the rotation of the Earth on its own axis. The axis of the Earth is an imaginary line that passes through the North and the South poles. The

Earth takes approximately twenty-four hours to complete one rotation. The Sun is the source of light.

13. What causes the seasons?

The rotation of the Earth on its own axis not only results in day and night but also creates the four seasons (summer, winter, autumn and spring). The summers and winters are the result of the tilt of the axis of the Earth. When the southern hemisphere is tilted towards the Sun, the sunlight is stronger because the Sun is overhead, so it is warmer and experiences summer. At this time, it is winter at the Northern hemisphere, because the sunlight is at an angle and is weaker. When the Northern hemisphere has summer, the Southern hemisphere has winter.

Test Unit 1

1. List the eight planets in our Solar System in order of distance from the Sun.
2. What is a planet?
3. What is a satellite?
4. What causes the Earth's tides?
5. What are artificial satellites?
6. What is an eclipse?
7. What causes day and night?
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Unit 2 Our Changing Earth p. 121

The information in your text book is typical of the information we might hear on TV about Climate Change. There is an 'alarmist' agenda at work, implying that the world's climate is changing more than at any other time in history. But this is not the case. You only have to look back to the Ice Age. The Earth's climate has gone through many cycles of change, and none of these cycles were caused by human activity. Although it is our responsibility to care for the Earth, it is important to recognise extreme agendas. For example, some are saying that we should get rid of cattle because the methane they produce is causing climate change, and we should eat insects instead. Some are saying that we must cut out all fossil fuel, without investigating production methods that are 'clean'. Please consider the following article in addition to the information in your text book.

Climate change – another viewpoint

Reference: Anthropogenic Global Warming (AGW) —a biblical and scientific approach to climate change

Creation Ministries International (CMI), Don Batten, creation.com - updated: 30 November 2022

Scientifically, the issue is very complex. The matter has certainly become a significant Biblical worldview issue.

Our Christian (biblical) worldview compels us to revere the God of creation. Some of the relevant principles are that:

- The universe and earth were created through and for Jesus Christ (John 1:3; Colossians 1:15–16).
- The earth was created for mankind (Genesis 1, 2; Isaiah 45:18).
- We are called to be holy and blameless in Jesus Christ (Ephesians 1:4; Genesis 1:31, 2).
- Christ holds His creation together (Colossians 1:17).
- Mankind is called to steward God's creation (Genesis 1:27–29, 2:15, 9:1–7).
- We are to worship the Creator, not the creation (Romans 1:18ff), and not 'Mother Earth' as a god.

As Christians, we affirm that we have a responsibility to look after the environment (stewardship of God's creation). That is a given. We are also compelled to consider the poor and the general welfare of our neighbours.

1. The real history of the world from the Bible

We affirm the biblical time frame and the reality of the Flood. These provide a framework for thinking about the history of the climate as it relates to the current debate.

According to the Bible (Genesis 1:27–29), people were commanded to fill the earth. Thus, God created Earth to be productive, to feed the people, and to be full of people. Of course,

the Fall occurred when Adam sinned, causing the corruption of the creation (Genesis 3; Romans 8), and it would then have at times been difficult to get enough food to survive.

In the biblical view, from the beginning humans were created to care for and rule over the earth (Genesis chapters 1 and 2) and everything in it. This is called the Dominion Mandate. In the modern secular view, based as it is on the narrative of deep-time evolution, humans are latecomers in the process of evolution. Some then take the view that the environment worked perfectly well for hundreds of millions of years before humans arrived. Thus, they reason that if we get humans out of the equation the environment will function much better.

Nearly all today's coal was formed from vegetation buried during the Flood. The amount of vegetation suggests that the CO2 ('plant food') levels in the atmosphere between Creation and the Flood must have been very high compared to today's levels. Even secular geologists agree that ancient CO2 levels were much higher, even 15 times more. There is no evidence that Earth was cooked by this situation through a runaway 'greenhouse' effect.

The much higher CO2 levels would enhance plant productivity enormously, allowing also for much more animal biomass. There is evidence, such as the amount of coal and other fossils, that Earth was prolifically productive pre-Flood.

After the Flood, God promised: "While the earth remains, seedtime and harvest, cold and heat, summer and winter, day and night, shall not cease" (Genesis 8:22). This suggests that Earth would quickly recover from the catastrophic climate change that occurred with the Flood and the ensuing Ice Age.

Climate goes through natural cycles. In the past where temperatures were similar to today. In the Roman Warm Period (RWP) from AD 1–400, temperatures were 2°C above the current temperatures for that region of the earth. The 'Medieval Warm Period' (MWP from AD 950–1300), also known as the 'Medieval Climate Anomaly' (MCA) was also warmer than now.

Neither of these warm periods could have had anything to do with human-generated CO2. The RWP was a period of flourishing of the Roman empire. The MWP was a very productive time both for crops and the advance of science, logic, architecture, and the arts. On the other hand, the 'Little Ice Age' (AD 1300–1870) was a significant period of cold. The shorter crop-growing seasons caused famines, plagues, and widespread poverty.

The Bible in many places records weather events that God ordained as judgment or blessing on people; that is, the weather is under God's control. One well-known example is Joseph's seven years of plenty and seven years of famine in Egypt, recorded in Genesis 41. Also, under the Mosaic Law, Israel's idolatry invited crop failures (Leviticus 26; Deuteronomy 28).

Foundationally, the issue of climate change involves a deep-seated worldview conflict. Christians should be concerned about ecology and we do have a duty to care for the environment. However, the fake, anti-Bible evolutionary history of planet Earth, based on naturalism (the belief that nature is all there is), feeds into a radical environmentalist ideology and alarmism. This has now embraced climate change.

2. 97% of scientists agree … fact or fiction?

The claim that 97% of scientists agree that human-generated CO2 will cause catastrophic warming to planet earth is fake news. Even if it were accurate, it would not prove that it is correct. It is 'argument from consensus'. If it's consensus, it isn't science.

This argument has strong parallels to a major argument for evolution, that because most scientists accept it then it must be true, which of course evolution is not, as a growing wealth of evidence from modern science shows.

In the USA, the Global Warming Petition Project has gathered the signatures of some 31,500 scientists resident in the USA alone, including over 9,000 with PhDs, who dispute the claim that CO2 will cause serious problems. This alone casts serious doubt on the 97% figure.

The justification for '97%' has been a 2013 paper, based on information from climate scientists who expressed an ***opinion*** that "humans are causing global warming". Based on this, former President Obama's twitter account declared, "Ninety seven percent of scientists agree: climate change is real, man-made and dangerous." Note how the paper's claim morphed from 'humans are causing some global warming' into all climate change is man-made and dangerous. This is deceitful.

Moreover, the study was conducted by members of an activist group, *Skeptical Science*, which exists to promote public acceptance of climate change being caused by humans. When the raw data is examined, according to the authors' own ratings, only 64 of the nearly 12,000 papers actually claimed that most of the warming is caused by human activity.

The survey did not address the question of climate change being 'dangerous' or a 'crisis' or anything like that. Such claims are made by politicians and activists.

So, the 97% figure is a dishonest twisting of statistics, and the activists' own raw data show that very few scientists agree even that most of the warming is due to human activity, let alone that it is dangerous.

3. Scientists who disagree with the claimed consensus:

In 2016 alone, over 500 papers were published in peer-reviewed science journals that seriously questioned the supposed 'consensus' on climate change. Some high-profile scientists disputed the alarmism.

A major test of any scientific mathematical model is the accuracy of predictions. Nearly all the models seriously over-predict global surface temperature response to rising CO2. The fact that recent temperature measurements have diverged from nearly all climate models, on the low side, is a serious blow to all the modelling efforts. The models are simply wrong. Thus, the dire predictions about a coming global temperature crisis are also wrong.

What is our response?

1. What are our responsibilities in looking after the planet?
2. When in history have there been major climatic events?

3. If climatic events occur in cycles, how sure can we be that today's climate will be the same (or worse) in the future?
4. If all use of coal was immediately stopped, what negative effects might this have?
5. List some negative effects of alternative fuel generation (not coal or gas), e.g., reliability; effects of windfarms on birds; slave labour used to mine lithium for our batteries, e.g. in Africa; long-term disposal of batteries.
6. Explain why 'argument by consensus' is not true science?
7. How could climate change alarmism be a problem, if it is not based on true science?
8. What if the burning of coal could be continued, but using science technology to avoid the pollutants that result from burning? Read the following article and make a comment.

What is "clean" coal?

By Deborah Halber December 12, 2008

"Clean" coal does not mean running the black sooty stuff through the washer. The phrase refers to technologies that mitigate or avoid pollutants or CO2 emissions generated by converting coal for electric energy…

The phrase refers to technologies that mitigate or avoid pollutants or CO2 emissions generated by converting coal to electric energy, says János M. Beér, professor emeritus of chemical and fuel engineering.

Low-cost, easily transportable and widely available, coal is the primary fuel for generating electricity in the US and many other countries. The problem is that coal combustion contributes to global warming by adding more carbon dioxide to the atmosphere per unit of electricity than other fossil fuels.

To burn coal more cleanly, a number of technologies — some already in commercial use — have been developed. These include:

- using new high-temperature, high-strength alloys to increase coal plants' boiler pressure and temperature, resulting in an increase in efficiency of up to 25 percent, so that less coal is used and less pollutant emitted per unit of electricity generated;
- converting coal to a "synthesis gas" of mainly carbon monoxide and hydrogen, which is cleaned of contaminants before being used in a gas turbine;
- capturing CO2 from fossil fuel combustion or gasification, compressing it and storing it deep underground.

"Well-funded research, development, and demonstration of successful deployment are critical for the timely success of clean coal technologies," Beér said.

9. Comment on the information found on p. 125 of your science text book, as follows:

Are there any human activities listed here that could be classified ‘alarmism’? Keep in mind that the two key gas emissions taking the blame for global warming are **1.** CO2 (carbon dioxide) from burning fossil fuels, and **2.** methane emitted by cow and sheep.

Greenhouse gases and human activity

Greenhouse gases produced by human activities have a profound effect on the balance of greenhouse gases in the atmosphere. Such activities include:

- burning of fossil fuels, such as coal, oil or gas
- using energy generated by burning fossil fuels
- some aspects of farming, such as raising cattle and sheep,
- using fertilizers and growing some crops
- clearing land, including logging
- the breakdown of food and plant wastes and sewerage
- some industrial processes, such as making cement and aluminum.

God is Truth

Introduction

More than ever, in this day and age, Christians need to be closely weighing up the things they hear and see around them. Is it true or is it false? Is it a conspiracy theory or is it being called a conspiracy theory by those who are trying to trick us into believing another agenda?

How can we tell what is true?

1. Does it align with Biblical thinking?
2. Does it align with TRUE Science. (Note that there are many who call themselves Scientists but are pedaling their own opinions)
3. Does it weigh up with what you see around you. (Example: if you were told that a medicine was safe and effective to take, but you saw people around you becoming sick by taking it, would you still take it?)
4. The witness in your heart, having asked the Holy Spirit for discernment

Most people walk through life with their eyes shut. They open their ears to what the media tells them but do no thorough research for themselves. Hence, they stumble and fall. We must do our own research and always ask the Holy Spirit to guide us into all truth.

What is the Scientific Method?

The scientific method is defined as a method of research in which a problem is identified, relevant data is gathered, a hypothesis is formulated from this data, and the hypothesis is empirically tested.

What does that mean?

In simple terms, the scientific method is a way for scientists to study and learn things. It doesn't matter what the scientist is trying to learn, using the scientific method can help them come up with an answer.

The first thing to do with the scientific method is to come up with a question. You can't find the answer until you know the question after all!

Next you need to observe and gather information in order to come up with a guess (called a hypothesis) or a number of guesses to the answer.

Next, you run experiments to see if your guess is right. A key to good experiments is to only change one thing, or variable, at a time. This way you can check your results and know what you changed that changed the answer. Carefully controlling your experiments is an important part of the scientific method.

Finally, after running all the tests you can think of, you analyze your data. If you find that the results do not fit with your original hypothesis, you can now change your hypothesis and run more tests, if necessary.

By going through this process, scientists have a way to verify their guesses and to double check each other. Another scientist can take a look at your tests and add some more tests and continue to refine your answer to the question.

The scientific method is a process for experimentation that is used to explore observations and answer questions.

Do all scientists follow the scientific method exactly? No. Some areas of science can be more easily tested than others. For example, scientists studying how stars change as they age or how dinosaurs digested their food cannot fast-forward a star's life by a million years or run medical exams on feeding dinosaurs to test their hypotheses. When direct experimentation is not possible, scientists modify the scientific method. But even when modified, the goal (and many of the steps) remains the same: to discover cause and effect relationships by asking questions, carefully gathering and examining the evidence, and seeing if all the available information can be combined into a logical answer. New information or thinking might also cause a scientist to back up and repeat steps at any point during the process. Understanding the steps of the scientific method will help you focus your scientific question and work through your observations and data to answer the question as well as possible.

Steps of the Scientific Method

1. Ask a Question

The scientific method starts when you ask a question about something that you observe: How, What, When, Who, Which, Why, or Where?

2. Do Background Research and gather information

Rather than starting from scratch in putting together a plan for answering your question, you can use library and Internet research to help you find the best way to do things and ensure that you don't repeat mistakes from the past.

3. Construct a Hypothesis (guess the answer)

A hypothesis is an educated guess about how things work. It is an attempt to answer your question with an explanation that can be tested. A good hypothesis allows you to then make a prediction:

"If I do this, then this will happen."

State both your hypothesis and the resulting prediction you will be testing. Predictions must be easy to measure.

4. Test Your Hypothesis by Doing an Experiment

Doing an experiment means your hypothesis is **testable**.

Your experiment tests whether your prediction is accurate and thus your hypothesis is supported or not. It is important for your experiment to be a fair test. You conduct a fair test by making sure that you change only one factor at a time while keeping all other conditions the same. The experiment is **observable**. This means you can **see** what's happening.

You should also repeat your experiments several times to make sure that the first results weren't just an accident. The experiment must be **repeatable**. If you don't come up with the same results every time, then your hypothesis is **falsifiable**, (able to be proved false).

5. Analyze Your Test Results and Draw a Conclusion

Once your experiment is complete, you collect your measurements and analyze them to see if they support your hypothesis or not.

Scientists often find that their predictions were not accurate and their hypothesis was not supported, and in such cases they will communicate the results of their experiment and then go back and construct a new hypothesis and prediction based on the information they learned during their experiment. This starts much of the process of the scientific method over again. Even if they find that their hypothesis was supported, they may want to test it again in a new way.

6. Retest (often done by other scientists)

7. Communicate Your Results

Professional scientists publish their final report in a scientific journal or by presenting their results on a poster or during a talk at a scientific meeting. They also publish a report on their experiment in a scientific journal.

Revision: What are the six steps of the scientific method?

The six steps of the scientific method include: 1) asking a question about something you observe, 2) doing background research to learn what is already known about the topic, 3) constructing a hypothesis, 4) experimenting to test the hypothesis, 5) analyzing the data from the experiment and drawing conclusions, and 6) communicating the results to others, 7) Retesting

History of the Scientific Method

The scientific method wasn't invented by one person, but was developed by different scientists and philosophers over the years. For something that sounds so simple and basic, there are still long scientific papers written about the method and scientists who disagree on exactly the best way to implement it.

Francis Bacon, Rene Descartes, and Isaac Newton all helped contribute to the development of the scientific method as a good way to learn about nature and science. They wrote papers and discussed how using experiments and changing variables can help to determine if a guess (or hypothesis) is correct.

Why is the Scientific Method Important?

The scientific method is the cornerstone to modern science. Without a formal method of determining questions and their answers, we wouldn't have science or the knowledge we have today.

Do scientists actually use the scientific method?

While experimenting is considered the best way to test explanations, there are areas of science, like paleontology and astronomy, where this is not always possible.

References

https://www.ducksters.com/science/scientificmethod.php

https://www.sciencebuddies.org/science-fair-projects/science-fair/steps-of-the-scientific-method

Practical Science

Carry out some science experiments following the Scientific Method.

Design your own experiment.

What do you want to find out?

Types of question beginnings:

How does/do …?

What effect does …?

Which type of …?

What happens to …?

Examples of different types of questions for investigation:

- Which brand of paper towel is stronger?
- What happens when you add different liquids to yeast and flour?
- What is the best material to muffle a sound?
- What material protects an egg the most?
- Which material blocks magnetic attraction the best?
- Which take away cup insulates heat best?

- What sort of stone makes the biggest splash?
- What shape parachute will take the longest to fall?
- Can you make bubbles different colours?
- Which fruits will float?
- Which ball drops to the ground the quickest?
- Which design of paper aeroplane travels the furthest?
- Do mirrors always reflect?
- What ball goes further if it is kicked or thrown?
- Does the contents of a can affect how it rolls?
- How does the distance from the light source affect the shadow?
- Does weight affect the number of rotations of a paper spinner?
- Which tennis ball goes further – a wet one or a dry one?
- Which is the strongest bridge design?