Grade 6  
Book 12  

Medicine Through Time
1

Medicine Through Time

“Suffering isn't ennobling, recovery is.”

– Christiaan Barnard
**Book 12 - Medicine Through Time**

**Grade 6**  
**Term 4**  
(**SS and NS**)

### THEMES
- Indigenous Healing in South Africa  
- Modern Western Scientific Discoveries  
- A Breakthrough in Surgery  
- Christiaan Barnard  
- Medicine and Technology

### ESSENTIAL QUESTIONS
1. How has the rapid growth in technology affected our lifespan?

### SKILLS
- **Thinking and Reasoning** - analysing sources and answering questions insightfully  
- **Investigation** - explore, deduce and record finds  
- **Creativity** - creative thought processing, seeking new connections, self-initiated discovery  
- **Problem Solving** - recognise problems, find workable means for solving those problems  
- **Summarising** - working with written sources to find key points, brainstorming

### CONCEPTS
- **Cause and Consequence** - every action has a reaction  
- **Evidence** - working with evidence and finding connections

### ATTITUDES AND VALUES
- **Group Processing** - Working effectively with peers  
- **Responsibility and Meeting Deadlines** - tasks completed on time, group and peer respect

### ASSESSMENTS, TASKS AND PROJECTS
- Indigenous Healing in South Africa (15)  
- Modern Western Scientific Discoveries Project (30)  
- A Breakthrough in Surgery Popplet (20)  
- Christiaan Barnard (15)  
- Medicine and Technology (10)
Indigenous Healing in South Africa

Traditional healers in South Africa fulfill different social and political roles in the community, including healing physical, spiritual and emotional illnesses, directing birth or death rituals, finding lost cattle, protecting warriors and counteracting witches.

There are **TWO** main types of traditional healers: the *diviner* or *sangoma* and the *herbalist* or *inyanga*. These healers are highly revered and respected. It is estimated that there are as many as 200,000 traditional healers in South Africa. Traditional healers are consulted by around 60% of the population, usually in conjunction with modern biomedical services.

For harmony between the living and the dead, vital for a trouble-free life, traditional healers believe that the ancestors must be shown respect through ritual and animal sacrifice.

Inyangas perform rituals by burning plants such as imphepo, dancing, chanting or playing drums. They will often give their patients muti - medication made from plants, animals and minerals. Muti often has powerful symbolism; for example, lion fat is thought to give children courage. There is muti for everything from physical and mental illness to potions for protection, love and luck.

Sangomas believe they are able to access advice and guidance from the ancestors for their patients through possession by an ancestor, or channelling, throwing bones, or by interpreting dreams.

The formal health sector has shown continued interest in the role of sangomas and the efficacy of their herbal remedies. Botanists and pharmaceutical scientists continue to study the ingredients of traditional medicines in use by sangomas. Well known contributions to world medicine from South African herbal remedies include aloe, buchu and devil's claw.
What are the main differences between Western and Traditional Medicine?

<table>
<thead>
<tr>
<th>WESTERN MEDICINE</th>
<th>TRADITIONAL MEDICINE</th>
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</thead>
<tbody>
<tr>
<td>Takes only the specific part of the body which has disease into account when treating.</td>
<td>Takes the whole body into account and treats it in a <strong>holistic</strong> manner.</td>
</tr>
<tr>
<td>Views illness as symptoms which need to be treated by prescribed medication.</td>
<td>Views illness as an imbalance in the body which needs to be restored.</td>
</tr>
<tr>
<td>Medication is potent and targeted towards specific symptoms and disease.</td>
<td>Medication is less potent, more natural and targeted towards healing the whole body.</td>
</tr>
<tr>
<td>Focused on destroying the disease.</td>
<td>Asks what can be learned from the disease.</td>
</tr>
<tr>
<td>The doctor’s recommendations and instructions are followed.</td>
<td>The person is empowered to take charge of their own self-care.</td>
</tr>
<tr>
<td>Knowledge and skill is very protected. Medications are all patented and not freely available.</td>
<td>There is open access to knowledge and medicines are normally freely available and can often be grown in your own garden.</td>
</tr>
<tr>
<td>Very tightly regulated.</td>
<td>Often not regulated at all.</td>
</tr>
</tbody>
</table>

**THINKING AND REASONING TASK - INDIGENOUS HEALING IN SOUTH AFRICA**

1. What is the main difference between a sangoma and an inyanga? (2)
2. Describe the different roles that sangomas and inyangas play in traditional healing. (4)
3. In what ways are Traditional and Western medicine linked? (2)
4. Describe **TWO** ways in which Traditional and Western medicine differ. (4)
5. What is muti? (2)
6. What does the word holistic mean? (1)

Total: 15
Modern Western Scientific Discoveries

In the fight against infectious disease, some important discoveries have been made:

<table>
<thead>
<tr>
<th>- The vaccination against smallpox (and the role of Edward Jenner)</th>
<th>- The connection between germs and disease (and the role of Louis Pasteur)</th>
</tr>
</thead>
<tbody>
<tr>
<td>What is smallpox? (causes and symptoms) Who was Edward Jenner (life history) and what role did he play in creating a vaccination against smallpox?</td>
<td>What are germs? What is the connection between germs and disease? Who was Louis Pasteur (life history) and what role did he play in this discovery?</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>- The germs that cause tuberculosis (and the role of Robert Koch)</th>
<th>- The first antibiotic, penicillin (and the role of Alexander Fleming)</th>
</tr>
</thead>
<tbody>
<tr>
<td>What is tuberculosis? (causes and symptoms) Who was Robert Koch (life history) and what role did he play in treating tuberculosis?</td>
<td>What are antibiotics, specifically penicillin? Who was Alexander Fleming (life history) and what role did he play in discovering an antibiotic?</td>
</tr>
</tbody>
</table>

These discoveries have made medicine more accessible. Careers opened to women as nurses (from the 1870s) and as physicians (especially after 1970). The 21st century is characterised by highly advanced research involving numerous fields of science. In most of the world, life expectancy has improved, and was about 67 years as of 2010, and well above 80 years in some developed countries.
Using the websites listed below (and others if needed), research **ONE** of the following scientists and try to answer the given questions. You need to present your answers in digital form - using **Keynote**. Each person in your co-operative group must research a different person as you will teach each other about your topic at a later stage.

**The vaccination against smallpox (and the role of Edward Jenner):**

Edward Jenner (1)  
Edward Jenner (2)

**The connection between germs and disease (and the role of Louis Pasteur):**

Louis Pasteur (1)  
Louis Pasteur (2)

**The germs that cause tuberculosis (and the role of Robert Koch):**

Robert Koch (1)  
Robert Koch (2)
The first antibiotic, penicillin (and the role of Alexander Fleming)

Your Keynote must include pictures and videos (if needed). It should be colourful, easy to read and in point form.

You will be assessed according to the following rubric:

<table>
<thead>
<tr>
<th>RUBRIC - MODERN WESTERN SCIENTIFIC DISCOVERIES</th>
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</thead>
<tbody>
<tr>
<td><strong>Investigation/ Research and Recording/Evidence</strong></td>
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<td><strong>Summarising</strong></td>
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<td><strong>Total</strong>:</td>
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</table>

Use your Keynote to teach your group about your particular scientist. They should make notes while listening to you speak.

Notepad:
A Breakthrough in Surgery

In 1967 Christiaan Neethling Barnard, a South African surgeon, was able to perform the world's first human-to-human heart transplant. His ability to perform this groundbreaking surgery was due in part to many major discoveries such as the invention of anaesthetics, antiseptics and x-rays.

**Anaesthetics**

Early operations caused patients a great deal of pain. They were often awake for surgery and had to be held or strapped down. A doctor had to work as quickly as possible.

Doctors found drugs, called ether and chloroform, that stopped people from feeling pain and put them into a deep sleep. Doctors had to be careful - too much of the drug could kill the patient. Doctor William Atherstone was the first doctor in South Africa to use ether to anaesthetise a patient.

Anaesthetists are doctors who have received specialist training in anaesthesia. They'll give you your anaesthetic and be responsible for your safety and wellbeing during your procedure. A local anaesthetic is often used during minor procedures where a small area of the body is numbed and you remain fully conscious. A general anaesthetic is often used for more serious operations where you're totally unconscious and unaware of the procedure.

**Antiseptics**

In 1834 a Scottish doctor, called Joseph Lister, decided to find out why so many people died after operations. He realised that improper hygiene practices were being used - a surgeon was not required to wash his hands before seeing a patient because such practices were not considered necessary to avoid infection. Lister encouraged surgeons and
nurses to use carbolic acid to clean wounds and their hands. Bandages and bedclothes were washed far more often.

A chemical substance that slows or stops the growth of germs is called an antiseptic. The name comes from the Greek words anti (against) and sepsis (poison). They are used in hand washing, wound disinfection and treating infections.

**X-rays**

An X-ray is an invisible beam that can pass through a person’s body onto photographic film, passing through soft tissue but not hard tissue. In 1895 Wilhelm Conrad Roentgen accidentally figured out that his cathode-ray tube lamp made photographic film turn dark. When a body is placed between them, the shadows appear. He named it X-ray because he didn’t know what the ray was called so he used X to mean unknown. Since then, scientists have used x-rays to determine if bones, organs, teeth and other parts of the body have problems. Doctors also have used x-rays to destroy cancer cells since x-rays can damage human body cells.
Create a **Popplet** to summarise each of the following breakthroughs:

- Anaesthetics (10)
- Antiseptics (5)
- X-rays (5)

Use **point form** instead of long, complex sentences. You can also add pictures to your Popplet to emphasise key points.

Total: 20

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**200th Heart transplant at the Netcare Christiaan Barnard Memorial Hospital:**
Christiaan Barnard

Christiaan Neethling Barnard (8 November 1922 – 2 September 2001) was a South African cardiac surgeon who performed the world's first successful human-to-human heart transplant.

Barnard grew up in Beaufort West. His father, Adam Barnard, was a minister in the Dutch Reformed Church. One of his four brothers, Abraham, died of a heart problem at the age of five. Barnard matriculated from Beaufort West High School in 1940, and went to study medicine at the University of Cape Town.

In 1956, he received a two-year scholarship for postgraduate training in cardiothoracic surgery at the University of Minnesota under open-heart surgery pioneer Walt Lillehei.

Upon returning to South Africa in 1958, Barnard was appointed cardiothoracic surgeon at Groote Schuur Hospital, establishing the hospital's first heart unit. Over time, Barnard became known as a brilliant surgeon. He was promoted to Professor of Surgical Science in the Department of Surgery at the University of Cape Town in 1972.

Following the first successful kidney transplant in 1953, in the United States, Barnard performed the second kidney transplant in South Africa in October 1967, the first being done in Johannesburg the previous year. Barnard experimented for several years with animal heart transplants. More than 50 dogs received transplanted hearts. Barnard had a patient willing to undergo the procedure, but as with other surgeons, he needed a suitable donor.

He performed the world's first human heart transplant operation on 3 December 1967, in an operation assisted by his brother, Marius Barnard. The operation lasted nine hours and used a team of thirty people. The patient, Louis Washkansky, was a 54-year-old grocer, suffering from diabetes and...
incurable heart disease. Barnard later wrote, "For a dying man it is not a difficult decision because he knows he is at the end. If a lion chases you to the bank of a river filled with crocodiles, you will leap into the water, convinced you have a chance to swim to the other side."

The donor heart came from a young woman, Denise Darvall, who had been rendered brain damaged in an accident on 2 December 1967, while crossing a street in Cape Town. After securing permission from Darvall's father to use her heart, Barnard performed the transplant. Rather than wait for Darvall's heart to stop beating, at his brother, Marius Barnard's urging, Christiaan had injected potassium into her heart to paralyse it. Twenty years later, Marius Barnard recounted, "Chris stood there for a few moments, watching, then stood back and said, 'It works.'" Washkansky survived the operation and lived for 18 days. However, he succumbed to pneumonia. Though the first patient with the heart of another human being survived for only a little more than two weeks, Barnard had passed a milestone in a new field of life-extending surgery.

Barnard was celebrated around the world for his accomplishment. He continued to perform heart transplants. Another transplant operation was conducted on 2 January 1968, and the patient, Philip Blaiberg, survived for 19 months. Dirk van Zyl, who received a new heart in 1971, was the longest-living recipient, surviving over 23 years.

Barnard was an outspoken opponent of South Africa's laws of apartheid, and was not afraid to criticise his nation’s government. Rather than leaving his homeland, he used his fame to campaign for a change in the law.

Barnard retired as Head of the Department of Cardiothoracic Surgery in Cape Town in 1983 after developing rheumatoid arthritis in his hands which ended his surgical career.
1. What do the following words (which appear in coloured italics in the comprehension on pages 11 and 12) mean? As a word can have more that one definition, ensure that you read each sentence carefully and identify the correct meaning. (5)

- transplant
- postgraduate
- cardiothoracic
- rendered
- recipient

2. Name **TWO** places where Barnard completed his tertiary studies. (2)

3. How did Barnard practice heart transplants before attempting one on a human? (1)

4. What does the following quote from the comprehension mean: “For a dying man it is not a difficult decision because he knows he is at the end. If a lion chases you to the bank of a river filled with crocodiles, you will leap into the water, convinced you have a chance to swim to the other side.” (2)

5. Discuss why Barnard’s first human-to-human transplant was considered a success despite the patient dying after 18 days. (1)

6. Which of Barnard’s transplant patients lived the longest and for how long did he live? (2)

7. How do we know that Barnard was nervous about performing the first human-to-human heart transplant? Quote a sentence from the comprehension to answer this question. (1)

8. Why would Barnard not have been able to work with rheumatoid arthritis? (1)

Total: 15
Medicine and Technology

3-D Printing:

3D printing is already making its presence felt. Ninety-five percent of all hearing aids today are 3D printed. This technology is also pushing into prosthetics. There are custom-made back braces for scoliosis patients and casts for broken bones (perforated with holes so people can finally scratch through their casts) and, in the latest development, 3D printed facial prosthetics (noses, ears, etc.).

The biggest news is in organ printing. While the bioprinting of whole organs is still a little ways off, already Organovo, a California-based research company, has printed human liver tissue for drug toxicity testing purposes. And once we’re capable of whole organ printing, dying patients will no longer suffer an interminable wait while they discover if they’ve been selected to receive a life-saving organ. Instead, soon, we’ll be able to make organs from our own stem cells and replace them when needed, and all without the fear of rejection or lifelong dependence on harsh drugs.

Artificial Intelligence:

Now loaded up with everything from journal articles to medical textbooks to actual information culled from patient interviews, the supercomputer has emerged as an incredibly robust diagnostic aid that is already being used for everything from training medical students to managing the treatment of lung cancer.
Of course, this is only the beginning. Pretty soon we’ll all have access to supercomputers capable of evaluating and analysing a blistering array of data—all your current symptoms, biometric data, environmental data and personal data (i.e. diet and activity level) and your entire genome. Imagine what this will do for quality of care.

**Robotics:**

The da Vinci Surgical System has performed over 20,000 operations since its 2000 debut. Newer developments like nanobots can swim through our bloodstream and scrape plaque from our arteries. Service robots are expected to enter the healthcare sector early next year, doing everything from distributing patient meds to picking up dirty laundry. And, as many of these service bots are able to do the work of three humans for the cost of less than one, no doubt they’ll be spreading quickly as well.

Finally, exoskeletons—which are sort of external strap on robots—are now market ready. In February of 2012, Ekso Bionics introduced the first commercialized robotic exoskeleton that allows paraplegics to stand and walk independently. By December 2012, over 1 million steps had been taken by patients wearing the their devices—that’s a million steps that were never before possible.

**Point-of-Care Diagnostics.**

In medicine, one of the major promises of technology is patient empowerment—especially when it comes to diagnostics. The XPRIZE Tricorder Challenge is a $10 million incentivised prize for the development of a hand-held, non-invasive electronic device that can diagnose patients better than a panel of doctors. Suddenly, patients no longer have to go to the doctor’s office or hospital. Instead, in the comfort of your home, the Tricorder will analyse data, diagnose the problem, and send that information to a doctor who, quite possibly, can treat you remotely. In the developed world, where doctors make diagnostic errors 10 percent of the time, this will make a significant difference in quality-of-care. In the developing world, this will make healthcare far more accessible.
Think of a medical problem/condition that you would like to cure/solve and a way to use technology to do so.

For example: a specific condition such as quadriplegia, cancer or HIV/AIDS or a problem such as the cost of hospital care or a lack of qualified doctors or nurses...

Give a brief description of the problem/condition you would like to solve:

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How is this problem/condition currently dealt with today?

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________________________________________________________________________________
How do you think that technology could be best used to solve/cure this problem/condition?

________________________________________________________________________________
________________________________________________________________________________
________________________________________________________________________________
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________________________________________________________________________________

Draw a picture to illustrate the technology you wish to implement:
Robot Surgeons are the Future of Medicine

Medical Revolution - The Future

Finished with your work? Can you find all of the words?
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