

# Assignment brief

## Learning Outcomes and Assessment Criteria 2020-21



Sample number: 3

Unit Title: Human Biology: Genetics – RH4/3/AA/12G

### Overview of assessment task

Produce 1500-word essay answering the following questions.

What is the role of genetics in the modern world and what are the ethical and social issues associated with gene technology?

Within your answer you must explain what role genetics has in: gene cloning, recombinant DNA, Gene therapy, stem cells and the human genome project. You must also examine the ethical, social and moral issues associated with gene technology and the potential impacts on society of making modifications to human genomes. You should include, future developments, the management and regulations.

Your essay must include Reference and Bibliography pages, following the Harvard standard conventions.

### Learning outcomes and assessment criteria

Learning Outcomes	Assessment Criteria
2. Understand the role of genetics in the modern world	2.1. Explain the role of genetics in: (a) gene cloning (b) recombinant DNA technology (c) gene therapy (d) stem cells (e) the human genome project
3. Understand current ethical and social issues in genetics	3.1. Examine ethical and social issues associated with gene technology

# Grading Descriptors and Components 2020-21

Sample number: 3

Unit title: Human Biology: Generics – RH4/3/AA/12G

## GD 4: Use of information

Merit	Distinction
The student, student's work or performance:  d. shows a <b>very good</b> grasp of the meaning and significance of new information	The student, student's work or performance:  d. shows an <b>excellent</b> grasp of the meaning and significance of new information

## GD 7: Quality

Merit	Distinction
The student, student's work or performance:  b. puts forward arguments or ideas which are <b>generally</b> unambiguous but which are in a minor way limited or incomplete	The student, student's work or performance:  b. puts forward arguments or ideas which are <b>consistently</b> unambiguous and cogent



# HUMAN BIOLOGY GENETICS RH3/AA12G.

THE ROLE OF GENETICS, THE  
ETHICAL AND SOCIAL ISSUES  
WITH GENE TECHNOLOGY.

# WHAT IS THE ROLE OF GENETICS IN THE MODERN WORLD AND WHAT ARE THE ETHICAL AND SOCIAL ISSUES ASSOCIATED WITH GENE TECHNOLOGY?

For years us humans have been messing with nature's genetics and DNA as we have manipulated our pets into different types of breeds, colours and sizes and also in the ways we have developed cross breeding with plants and vegetable's giving us different varieties and abundance to supply our needs .



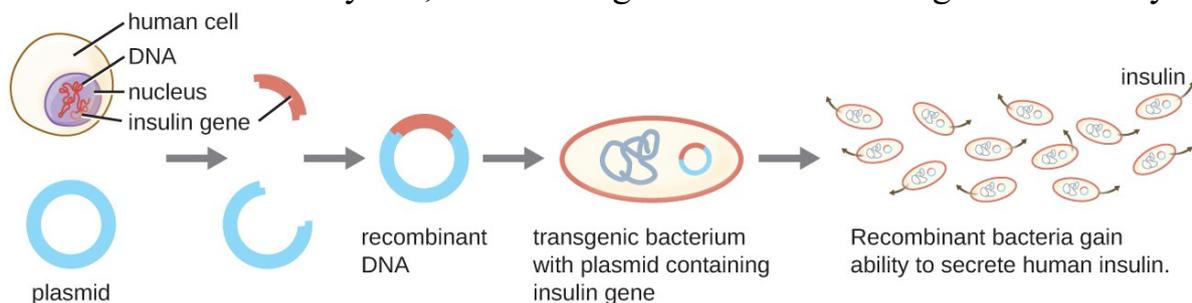
But in since an international scientific research project named (HGP) Human Genome Project from 1990-2003 where a complete mapping and understanding of all genes of human beings was identified and is the blueprint for building a person and what make us. It is 6ft of DNA and contains 30,000 genes each one the code for a part of our being.

Since the finding of the HGP medical science has been able to carry out a range of adaptations, in the hunt for new advances in treatments and understanding of medical conditions, some of which either are life threatening or were before any new findings were used.

## Gene Cloning

A clone is a genetically exact copy. It can be a clone of a gene, a cell or an organism even a human. The process goes by locating the gene in the DNA and then cutting out using a restriction enzyme. The Gene is then pasted into plasmid a piece of genetic material located outside the chromosome and have circular DNA. This plasmid this then inserted into an organism (bacteria).

These bacteria can then be grown, creating more plasmids with the desired gene. The issue of cloning of humans has many ethical issues associated with it and illegal throughout most of the world, the cloning of genes has been ongoing for well over 30 or 40 years, with cloning of animals occurring more recently.



Above is how Gene cloning is used in developing the secretion of human insulin.

## Recombinant DNA

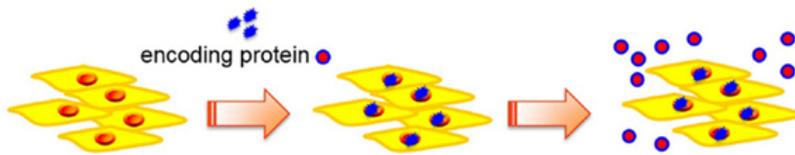
Is engineered through the combining of two or more DNA strands, combining DNA sequences which would not normally occur together. Selected DNA is inserted into an existing organismal genome, such as bacterial plasmid DNA, or some other sort of vector. The recombinant DNA can then be inserted into another cell, such as a bacterial cell, for amplification and possibly production of the resulting protein. (this is also presented in the 1<sup>st</sup> image)

## Gene Therapy

The insertion of genes into a person cells to cure a genetic disorder.

Gene therapy only works to fix disorders caused by a faulty gene. The individual would have had a defect from birth. Gene therapy is a treatment option for several diseases including inherited disorders, some types of cancers and certain viral infections. It is still risky and is still under study.

## Gene Therapy: rationale, pros & cons



### ADVANTAGES

- + Sustained, local delivery
- + Regulated gene expression
- + Protein is nascent and authentically processed
- + Suitable for intra-cellular gene products (RNA and protein)
- + Therapy may only need to be delivered once
- + Less expensive: one gene can give rise to large number of protein molecules

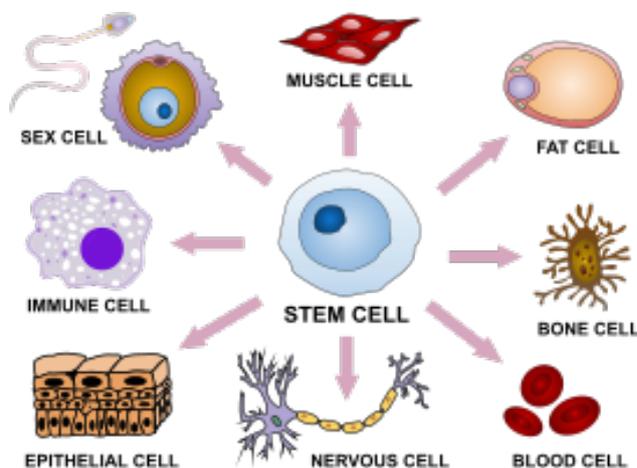
### LIMITATIONS

- Viral vectors raises safety concerns
- Many clinical trials failed
- Insufficient transport of pDNA into the nucleus by non-viral vectors

## Stem Cells

This an undifferentiated cell that can become a specialized cell type.

The introduction of new stem cells has always showed great promise in the treatment of many conditions.



Stem cell or Bone marrow transplants can be used to replace damaged cells with healthy ones.

A stem cell transplant will be carried out only if other treatments haven't been successful, with the potential benefits of a transplant working outweigh the risks and the patient is in relatively good health, despite the condition needing treatment.

Conditions such as severe aplastic anaemia (bone marrow failure), blood cancers, sickle cell anaemia and immunodeficiency are some that can have stem cell treatments considered. The treatment has 5 stages: -

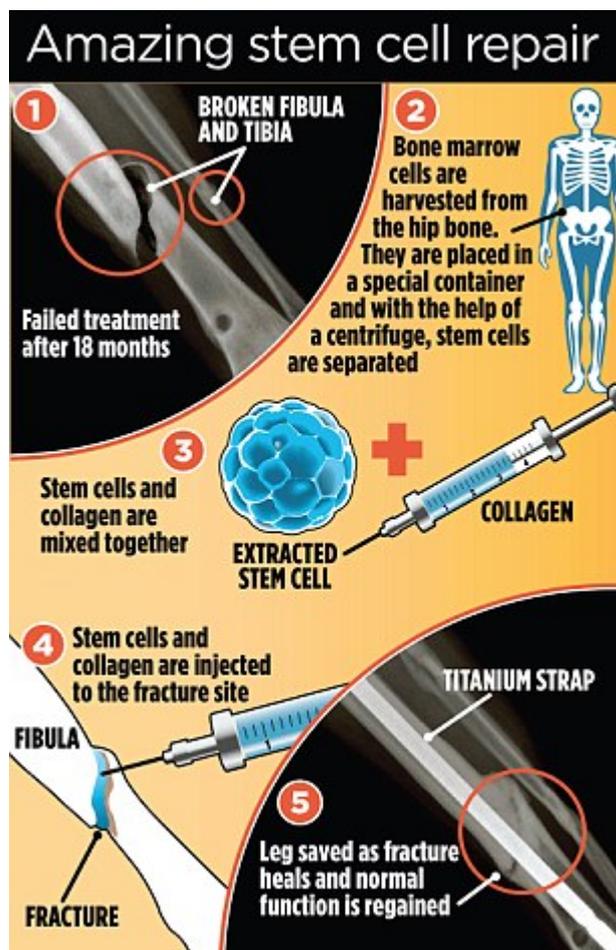
The first stage involves tests and examinations are carried out to assess if a patient is in general levels of good health for example, blood tests and CT scans.

The second stage is the harvesting process of obtaining the stem cells to be used in the transplant, either from the patient or from a suitable donor. This involves a large needle being inserted through the bone to extract bone marrow. The stem cells can then be extracted from the bone marrow.

The third stage is where the conditions is treatment with Chemotherapy or Radiotherapy to prepare the system for the transplant. This kills all damaged cells in the patient.

The fourth stage involves transplanting the stem cell back into the patient where they can develop into healthy cells. To replace those killed by chemotherapy.

Then stage five is the recovery while the patient stays in hospital.



But as humans who have our own minds and voices, we do have ethical, social and moral issues associated with our man-made methods of gene technology. These can stem back to religion and are we trying to play the hands of God or deconstruct the ways of human nature. If Adam and Eve knew they could have had a boy with blue eyes or brown eyes would they have made a choice?

There are and always will be ethical, social and moral issues associated with gene technology and these can come in the form of many different parties i.e. political, relations even human rights to animal rights when it comes to animals used in medical research. A few examples I have found are that stem cells could be used for heart disease and arteries problems. But instead of aiding the arteries to clear or repair they made the arteries narrower much more causing more damage and danger to the patient's life expectancy.

In November 2018, the international scientist community was shocked by the announcement by He Jiankui, a CRISPR scientist, that he and his team had created the first "gene-edited babies". The genetic material of these babies had been edited to make them resistant to HIV, smallpox and cholera. (World economic forum, Marie-Valentine Florin). This event has raised many reactions and controversies, and demonstrated deep arguments surrounding the risks and implications of research on genome editing which could fundamentally change how humans are "fabricated". The question is how we outweigh the potential medical benefits along with possible negative consequences.

Who has the right to make judgment over whether the risk is acceptable or not?

I found the term "unmet medical needs" which means, if there are people who suffer and others who claim to have the ability to relieve their pain, free riding will happen.

## **References**

Kurzgesagt (YouTube) 2017 Genetic Engineering will change everything  
The Friendly Brain (YouTube) 2019 Designer babies  
Paul Knoepfler 2016 what if my neighbour's kid was genetically modified.

## **Bibliography**

Images (Bing)

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Theguardian.com