QBT LTD.
QUANTUM BRAIN TUTORING LTD.
"TURNING BRAINS QUANTUM"

AQA GCSE Biology Answer Sheet – Cell Division

Model Answers and Mark Schemes | Total Marks: 30

Quick Check

Question 1 (1 mark)

> *1. (1 mark) How many chromosomes are in a normal human body cell?*

MODEL ANSWER

46 (or 23 pairs).

MARK SCHEME

- ✓ 46 / 23 pairs [1 mark]

Question 2 (2 marks)

> *2. (2 marks) What is a gene?*

MODEL ANSWER

A gene is a small section of DNA on a chromosome that codes for a specific sequence of amino acids to make a specific protein.

MARK SCHEME

- ✓ A small section of DNA on a chromosome [1 mark]
- ✓ That codes for a specific sequence of amino acids / specific protein [1 mark]

Question 3 (2 marks)

3. (2 marks) State two reasons why cell division by mitosis is important in multicellular organisms.

MODEL ANSWER

For growth and for the repair of damaged tissues.

MARK SCHEME

- ✓ Growth [1 mark]
- ✓ Repair (of damaged tissues) [1 mark]
- ✓ Accept: replacement of cells

Application

Question 4 (2 marks)

4. (2 marks) Describe what happens during the first stage of the cell cycle, before mitosis occurs.

MODEL ANSWER

The cell grows and increases the number of sub-cellular structures (like ribosomes and mitochondria). The DNA replicates to form two copies of each chromosome.

MARK SCHEME

- ✓ Cell grows / increases number of sub-cellular structures [1 mark]
- ✓ DNA replicates / chromosomes are duplicated [1 mark]

Quick Check

Question 5 (2 marks)

5. (2 marks) What is a stem cell?

MODEL ANSWER

An undifferentiated cell that is capable of dividing to produce many more cells of the same type, and can differentiate into certain other specialized cell types.

MARK SCHEME

- ✓ An undifferentiated cell [1 mark]
- ✓ Capable of giving rise to more cells of the same type / can differentiate into other cell types [1 mark]

Application

Question 6 (1 mark)

> *6. (1 mark) Give one difference between embryonic stem cells and adult stem cells.*

MODEL ANSWER

Embryonic stem cells can differentiate into most types of human cells, whereas adult stem cells can only differentiate into a limited number of cell types (like blood cells).

MARK SCHEME

- ✓ Embryonic stem cells can differentiate into most cell types OR adult stem cells can only differentiate into limited/specific cell types [1 mark]

Question 7 (2 marks)

> *7. (2 marks) Describe how stem cells from meristems can be used in agriculture.*

MODEL ANSWER

They can be used to produce clones of plants quickly and economically. This is useful for cloning crop plants with special features such as disease resistance.

MARK SCHEME

- ✓ To produce clones of plants quickly/economically [1 mark]
- ✓ To clone plants with desirable features (e.g. disease resistance) / save rare species [1 mark]

Question 8 (2 marks)

> *8. (2 marks) Explain what is meant by therapeutic cloning.*

MODEL ANSWER

Therapeutic cloning is the production of an embryo with the same genes as the patient. The stem cells from this embryo can then be used for medical treatment.

MARK SCHEME

- ✓ Producing an embryo with the same genes as the patient [1 mark]
- ✓ So stem cells can be used for medical treatment [1 mark]

Extended Response

Question 9 (4 marks)

9. (4 marks) A patient with paralysis is offered treatment using stem cells from a donor. Alternatively, they could be treated using therapeutic cloning. Evaluate the use of therapeutic cloning compared to using donor stem cells.

MODEL ANSWER

An advantage of therapeutic cloning is that the stem cells produced have the same genes as the patient, so they will not be rejected by the patient's immune system, unlike donor stem cells which might be rejected. A disadvantage of therapeutic cloning is that it involves creating and destroying a human embryo, which raises ethical objections that donor stem cells do not. Both methods carry a risk of transferring viral infections.

MARK SCHEME

- ✓ Advantage: Cells will not be rejected by the patient's immune system [1 mark]
- ✓ Because they have the same genes/DNA [1 mark]
- ✓ Disadvantage: Involves the creation/destruction of embryos [1 mark]
- ✓ Which raises ethical/religious objections [1 mark]
- ✓ Accept: Both carry risk of viral infection [1 mark] (Max 4)

Application

Question 10 (4 marks)

10. (4 marks) A scientist observes a cell undergoing mitosis. The initial cell has 8 chromosomes. Calculate the total number of chromosomes present in the two daughter cells combined. Explain your answer with reference to the events of the cell cycle.

MODEL ANSWER

The total number of chromosomes in the two daughter cells combined is 16. Before mitosis, in stage 1 of the cell cycle, the DNA replicates, so the 8 chromosomes are duplicated. During mitosis, one set of chromosomes is pulled to each end of the cell, and the cell divides to form two identical daughter cells. Each daughter cell will therefore have 8 chromosomes, making 16 in total.

MARK SCHEME

- ✓ Total of 16 chromosomes [1 mark]
- ✓ DNA replicates before mitosis [1 mark]
- ✓ Cell divides to form two identical daughter cells [1 mark]
- ✓ Each daughter cell has 8 chromosomes (same as original cell) [1 mark]

Extended Response

Question 11 (6 marks)

> *11. (6 marks) Discuss the advantages and disadvantages of using embryonic stem cells in medical research and treatments. You should include ethical and medical considerations.*

MODEL ANSWER

Advantages of using embryonic stem cells include their ability to differentiate into most types of human cells, making them highly versatile for treating a wide range of conditions such as diabetes and paralysis. They can be grown easily in a lab. Disadvantages include medical risks, such as the potential transfer of viral infections or the possibility of the cells causing tumors. Ethically, obtaining embryonic stem cells usually involves the destruction of a human embryo. Some people believe that an embryo has a right to life from the moment of conception, making this unacceptable. Others argue that curing suffering patients is more important than the rights of an early-stage embryo.

MARK SCHEME

- ✓ Level 3 (5-6 marks): A detailed and balanced discussion including both advantages and disadvantages, covering both medical and ethical points.
- ✓ Level 2 (3-4 marks): A reasonable discussion including some advantages and disadvantages, but may lack detail or focus heavily on one aspect.
- ✓ Level 1 (1-2 marks): Simple points made about stem cells, either advantages or disadvantages.
- ✓ Indicative content:
- ✓ - Advantages: Can differentiate into most cell types, can treat currently untreatable conditions (e.g. paralysis, diabetes), grow well in lab.
- ✓ - Disadvantages (Medical): Risk of viral infection transfer, risk of tumor formation.
- ✓ - Disadvantages (Ethical): Involves destruction of embryos, belief that life begins at conception / embryo has right to life.

Application

Question 12 (2 marks)

> *12. (2 marks) A student states: 'During mitosis, the cell simply splits in half to make two new cells.' Explain why this statement is incomplete and describe the full sequence of events in the cell cycle.*

MODEL ANSWER

The statement is incomplete because it ignores the crucial preparation steps. Before dividing, the cell must grow and replicate its DNA and sub-cellular structures. Only then do the chromosomes separate (mitosis) before the cytoplasm and cell membrane divide.

MARK SCHEME

- ✓ Must mention DNA replication / cell growth before division [1 mark]
- ✓ Must mention chromosomes separating / nucleus dividing before cytoplasm divides [1 mark]