Biology

SAMPLE

Marking Scheme

This marking scheme has been prepared as a **guide only** to markers. This is not a set of model answers, or the exclusive answers to the questions, and there will frequently be alternative responses which will provide a valid answer. Markers are advised that, unless a question specifies that an answer be provided in a particular form, then an answer that is correct (factually or in practical terms) **must** be given the available marks.

If there is doubt as to the correctness of an answer, the relevant NCC Education materials should be the first authority.

Throughout the marking, please credit any valid alternative point.

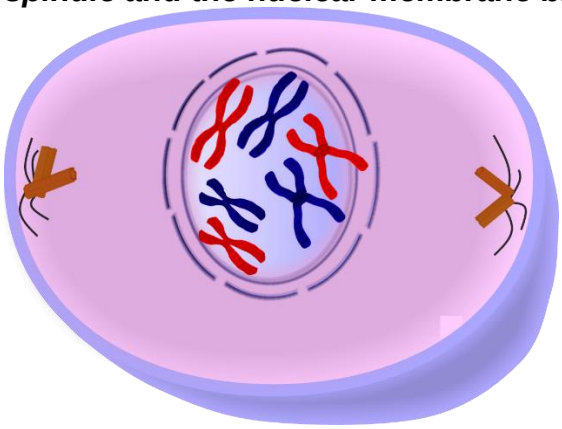
Where markers award half marks in any part of a question, they should ensure that the total mark recorded for the question is rounded up to a whole mark.

Answer all FIVE (5) questions

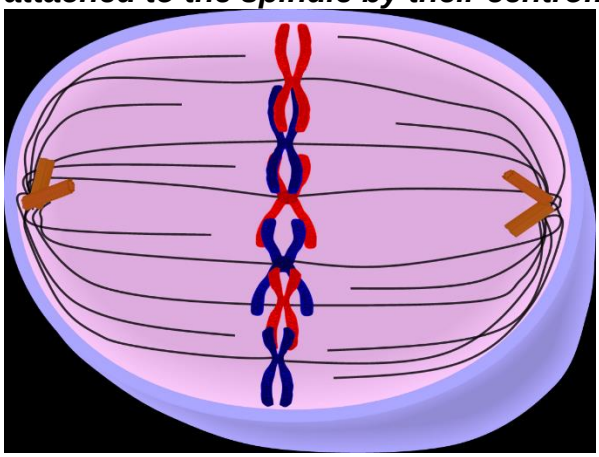
Question 1

a) With the aid of diagrams, describe each of the FOUR (4) main stages in the process of mitosis. **12**

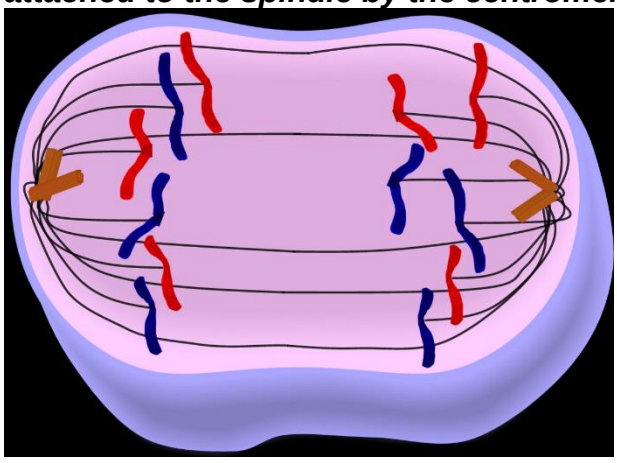
1 mark for each correctly labelled diagram and 2 marks for the description of each stage.
Mitosis has 4 stages. These are:
Prophase – the chromosomes are visible, the centromeres form a fibrous spindle and the nuclear membrane breaks down.



Metaphase – The chromatids line up across the middle of the cell, each attached to the spindle by their centromeres.



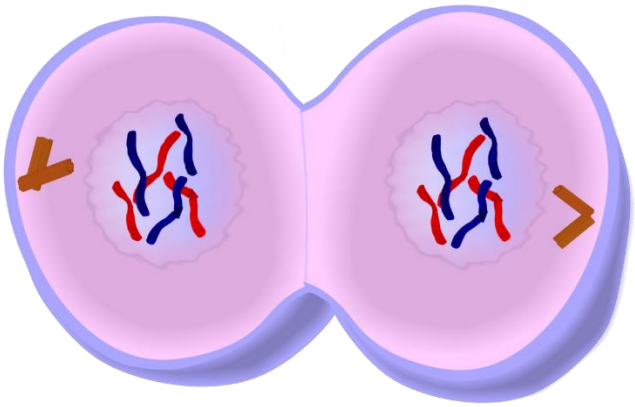
Anaphase- At this stage, the chromatids suddenly separate and are drawn apart by the spindle towards the two centrioles. The two chromatids are attached to the spindle by the centromere.



Telophase As the 2 sets of chromatids arrive at the opposite poles of the spindle, they become thin and long again and are once again called chromosomes. The nuclear envelopes reform around the chromosomes

Marks

and briefly there are 2 nuclei in the cell. The cell now splits by cytokinesis, and 2 fully functioning daughter cells are created



Illustrations from http://www.edupic.net/cells.htm

b) Describe FOUR (4) roles of Oestrogen in the female body. **8**

1 mark for each correct role identified and 1 mark for each description.

For example, 'Oestrogen is the primary female sex hormone, its increased production at the time of puberty stimulates the development of secondary characteristics, such as breast formation. Oestrogen also causes the repair of the uterine wall after menstruation, preparing for the next cycle and potential pregnancy by causing thickening and increased vascularity. During early pregnancy, oestrogen stimulates progesterone production in the placenta, this halts the menstrual cycle and both prepares the body for labour and prevents this occurring too early. Later in pregnancy it stimulates maternal breast production in preparation for lactation.'

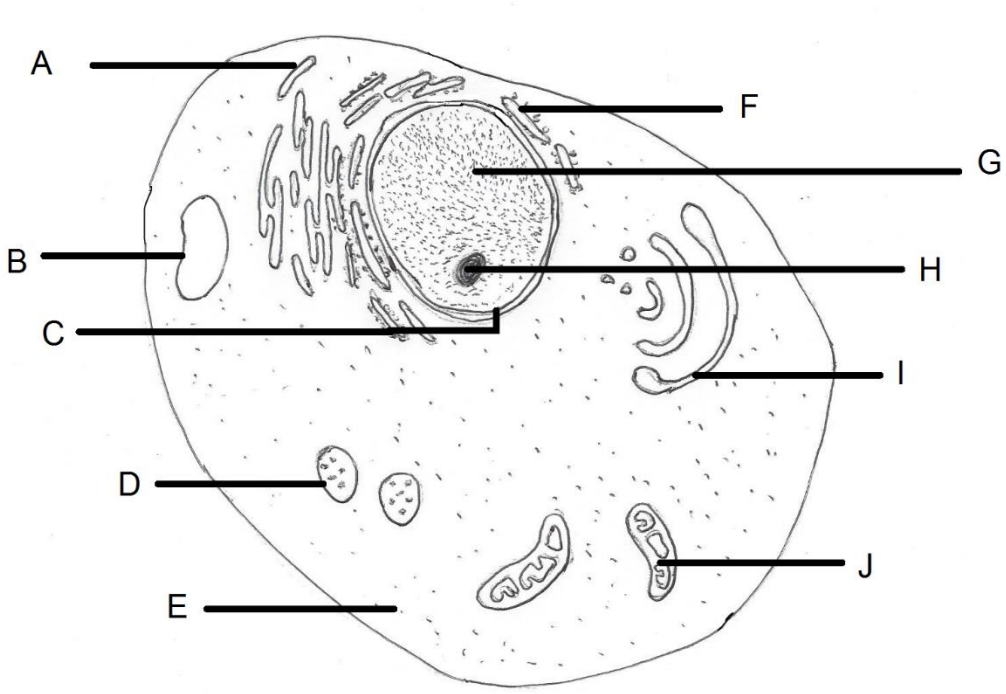
Total 20 Marks

Marks

Question 2

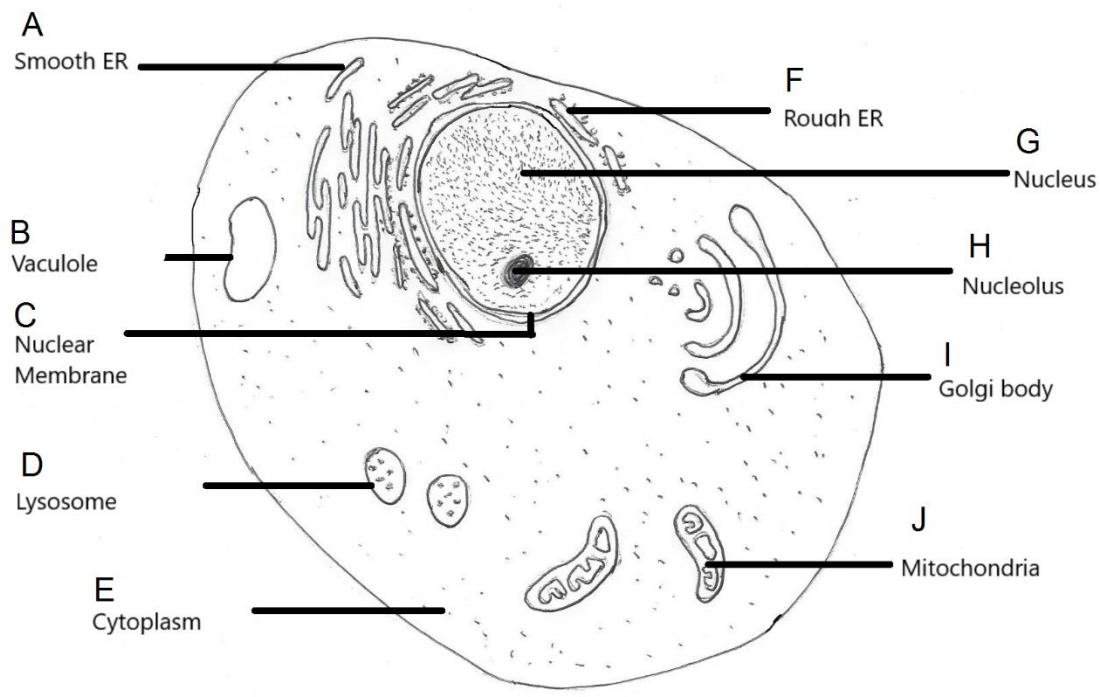
a) The drawing below shows a typical human cell. Identify the following in the drawing and match these to the correct label: **10**

- cytoplasm
- Golgi body
- lysosome
- mitochondria
- nuclear membrane
- nucleolus
- nucleus
- rough endoplasmic reticulum (rough ER)
- smooth endoplasmic reticulum (smooth ER)
- vacuole



Marks

One mark for each item correctly label.



b) Describe the role of each of the cellular components you have drawn in Question 1a. **10**

1 mark for each correct explanation of the organelle's role. For example, '.
cytoplasm – fluid which fills the space within the cell. Rich in dissolved substances
Golgi body – has a role in storage and transport of things produced within the cell
lysosome – sack like structures that digest macromolecules
Mitochondrion - convert glucose into ATP (adenosine triphosphate) for the cell, which provides energy for the cell
Nuclear membrane - the membrane that surrounds the nucleus
Nucleolus - within the nucleus - produces ribosomal RNA
Nucleus – controlling organelle for cell. Contains DNA
Ribosome - sites of protein synthesis
Rough ER - appearance is given by presence of ribosomes. Mainly involved in protein transport
Smooth ER – involved in digestion, production and transport of fats

Total 20 Marks

Marks

Question 3

a) Identify and describe the FIVE (5) main functions of the skeleton. **10**

1 mark for each correct function named, 1 mark for each description. For example 'One of function of the skeleton if to protect the internal organs, (1 mark) for example it provides a hard case which protects the brain from impact (1 mark).'

b) Explain, with reference to FIVE (5) adaptations, how the lungs maximise gas exchange between air and blood. **10**

For up to 5 adaptations, award one mark for each adaptation named, and one mark for each explanation.

For example 'The diffusion distance is reduced by the exchange surfaces being only 1 cell thick. There are many capillaries providing a large supply of blood, the removal of blood by the capillaries maintains the concentration gradient to ensure maximisation of gas exchange. The surface of the lungs is covered in a water-based mucus which helps oxygen to dissolve prior to absorption. The lungs also have a large surface are due to the folded and branched shape of the alveoli. An efficient ventilation system powered by the muscles of the chest and diaphragm ensures waste gases are effectively replaced with fresh, oxygen rich air.'

Total 20 Marks

Marks

Question 4

a) State FOUR (4) types of macronutrients required by the human body, and for each give examples of dietary sources. **8**

1 mark for macronutrient suggested, 1 mark for each correct source. For example, proteins are obtained from fish and meat, complex carbohydrates from wheat products such as bread and pasta, lipids from milk, fibre from vegetables and unrefined grains. Water is obtained from drinks and is also found in foods such as fruit and vegetables.

b) For the macronutrients listed in Question 1a, explain how they are used by the body. **8**

Up to 2 marks for how each named macronutrient is used in the body. For example, protein is used to build muscle tissue, and it is also found in cell membranes where proteins are involved in active transport. Fats are the muscles primary source of energy, they are also essential for cell membranes and the production of many hormones. Fats also provide padding and protection to the body's organs. Water is an vistal component of all the body's fluids and is essential for every biological process from digestion to circulation to excretion. All the body's systems are affected by a shortage of water. Carbohydrates are the primary source of energy for the CNS. They can also be used to provide additional energy to the muscles, if the fat metabolism cannot meet energy demands. Carbohydrates are also found in cell membranes and combined with proteins to form mucus.

c) Explain the role of the stomach in digestion **4**

Up to four marks for correct explanation of the stomach's role in digestion. For example, the lining of the stomach secretes proteases which start the digestion of protein. The churning action of the stomach muscles physically breaks down the food. The stomach also holds the for several hours before releasing small amounts in the small intestine for further digestion. The stomach also produces an acidic secretion, which helps to break down food.

Total 20 Marks

Marks

Question 5

a) Define the terms *pathogen*, *antibodies* and *antigens*. **6**

A up to 2 marks for each term correctly defined.

Pathogens are microscopic organisms which cause disease. They include bacteria, viruses and fungi.

Antigens are chemicals found on the surface of cells and pathogens. They help to identify the organism on a microscopic level.

Antibodies are produced by the body to recognise and interact with antigens found on pathogens. This interaction in some helps the body's immune system to deal with the pathogen on infection.

b) Describe the body's primary response to invasion by a pathogen, with reference to the roles of the following cell types: **10**

T lymphocyte
T helper cells
T killer cells
T regulator cells
T memory cells

Marks

1 mark for each role correctly described, and up to 5 marks for a description of the process and how these cells work together.

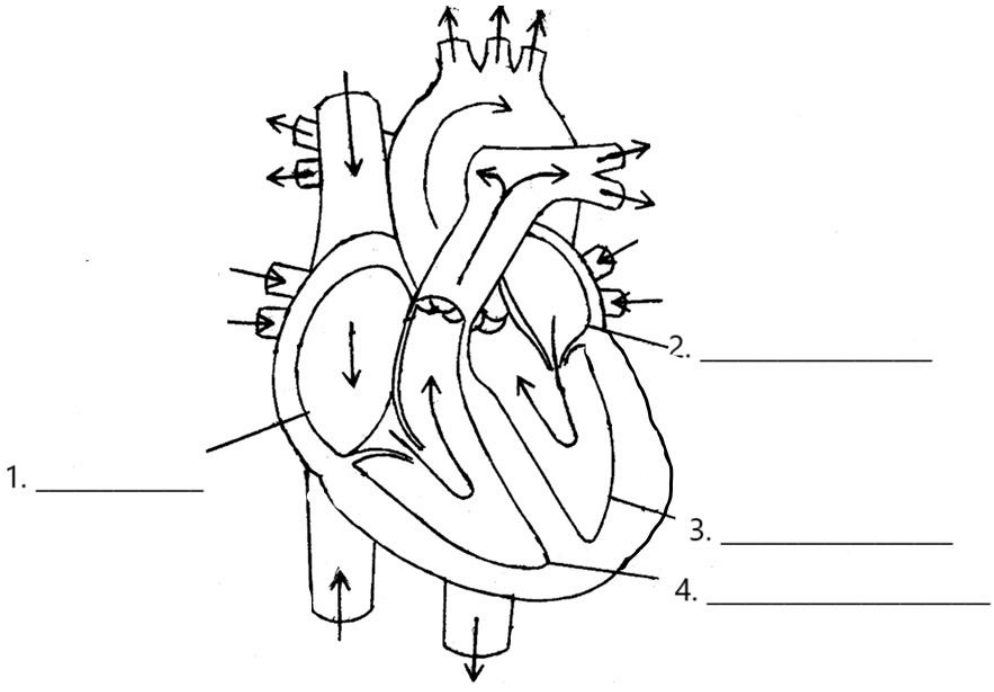
Once a phagocyte has engulfed and digested a pathogen, it moves the distinctive antigens to its surface and becomes an Antigen Presenting Cell or APC.
APCs activate another type of white blood cell called a T Lymphocyte. This white blood cell binds to the APC, creating a receptor which is unique to the antigen and therefore the pathogen which has entered the body.

Once a T lymphocyte has been 'programmed' with a specific antigen it can then only respond to that specific antigen.
The T cell then undergoes a rapid period of replication to produce different type of T cells with different functions.

T helper cells – release substance to help killer T cells and active B lymphocytes (discussed later).
T Killer cells – attach to and kill cells which are infected with a virus.
T regulator cells – help prevent the immune system mistakenly attacking the body's own cells.
T memory cells – these cells act as a living record of the antigen and will remember it in the case of a future infection.

Question is specific in stating INITIAL response. No marks are awarded for any detail on secondary response or vaccination for example

c) Identify the FOUR (4) main chambers of the heart, labelled in the diagram below. **4**



Marks

Suggested answer

1. **Right Atrium**
2. **Left Atrium**
3. **Left Ventricle**
4. **Right Ventricle**

Total 20 Marks

End of paper

Marks

Learning Outcomes matrix

Question	Learning Outcomes assessed	Marker can differentiate between varying levels of achievement
1	2, 6	Yes
2	1	Yes
3	3	Yes
4	4	Yes
5	5, 3	Yes

Grade descriptors

Learning Outcome	Pass	Merit	Distinction
Understand cell Structure	Demonstrate adequate level of understanding	Demonstrate robust level of understanding	Demonstrate highly comprehensive level of understanding
Understand the systems involved in coordination and control of the body	Demonstrate adequate level of understanding	Demonstrate robust level of understanding	Demonstrate highly comprehensive level of understanding
Understand the systems involved movement and energy release in the body	Demonstrate adequate level of understanding	Demonstrate robust level of understanding	Demonstrate highly comprehensive level of understanding
Understand how the body obtains the nutrients it needs and disposes of waste products	Demonstrate adequate level of understanding	Demonstrate robust level of understanding	Demonstrate highly comprehensive level of understanding
Understand the body's defences against disease and infection	Demonstrate adequate level of understanding	Demonstrate robust level of understanding	Demonstrate highly comprehensive level of understanding
Understand the process of reproduction	Demonstrate adequate level of understanding	Demonstrate robust level of understanding	Demonstrate highly comprehensive level of understanding