

Candidate Name

Candidate Number

Centre Name

Centre Number

Paper 2: Biology

For Examination June 2023

(2 hours)

It is necessary to respond on the answer sheets provided alongside this question paper. Additionally, you must have a soft pencil (preferably of type B or HB), a clean eraser and a dark blue or black pen.

INSTRUCTIONS:

- You must write your name, candidate number, centre name and centre number on the answer sheets in the designated spaces.
- Objective section consists of 25 questions, and it is essential that you attempt all of them.
- Each question has four options labelled A, B, C, and D. Select the option that you think is correct. Mark it on the multiple choice answer sheet using a soft pencil.
- Attempt all the questions from subjective section using a dark blue or black pen.
- It is important to follow the instructions provided on the answer sheets.
- Do not use correction fluid.
- Avoid writing on any bar codes.

INFORMATION:

- This paper has a total of 100 marks.
- In objective section there are 25 questions, each carries one mark. There is no negative marking for incorrect responses.
- In subjective section, 45 marks are for extended theory and 30 marks for practical component.
- The number of marks assigned for every question or its parts is indicated within brackets []

OBJECTIVE SECTION (MCQ)

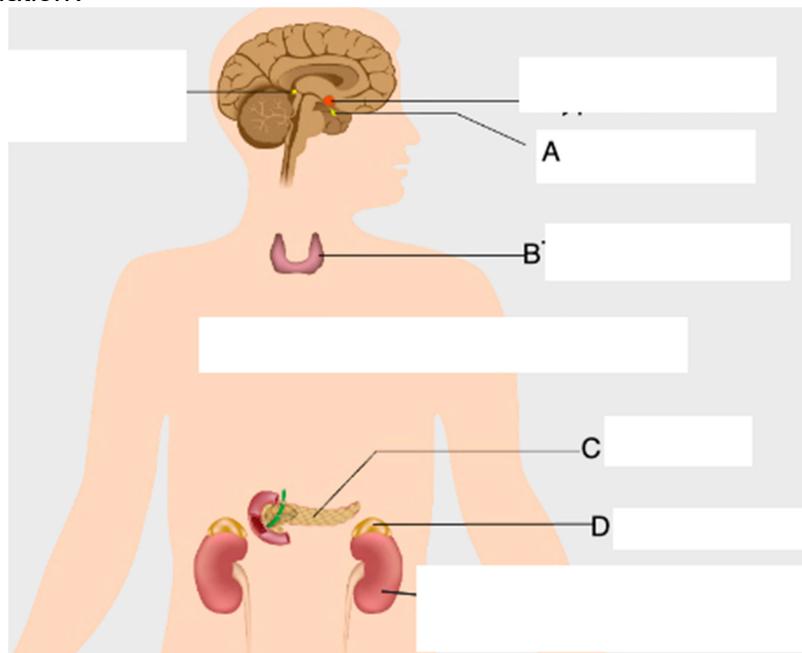
1. The eye is an important sense organ in detecting light giving organism the sense of sight. If light is shone on the eye and no pupil reflex is observed, which part of the eye is most likely to be affected?

- A: Pupil
- B: Ciliary muscle
- C: Optic nerve
- D: Fovea

2. Which row correctly describes the process of accommodation of a change of viewing a near object to a distant object?

	Ciliary muscle	Suspensory ligament	Lens shape
A	Contract	Shorten	Short and Fat
B	Relax	Lengthen	Long and Fat
C	Relax	Shorten	Long and Thin
D	Contract	Shorten	Long and Thin

3. Which gland is responsible for secreting the hormone involved in water regulation?



4. During exercise the body temperature increases, what is the correct mechanism to describe the actions that will return the core body temperature back to normal?

- A: Thermal conduction
- B: Positive feedback
- C: Negative feedback
- D: Vasoconstriction

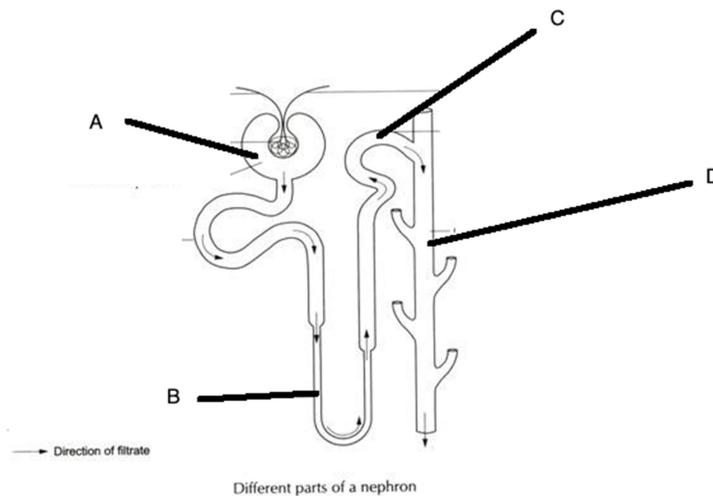
5. Individuals who have a diet of lychees often have low glycogen reserves; a chemical found in the lychee fruit affects hormone regulation. Suggest the most likely reason for this?

- A: Increase insulin production
- B: Decrease insulin production
- C: Increase in glucagon production
- D: Decrease in glucagon production

6. Excretion is one of the life processes of all living organisms, which human organ is not involved in the excretion process?

- A: Skin
- B: Rectum
- C: Kidney
- D: Lungs

7. A sample of urine was collected from someone who suffered a kidney injury, using biurets solution on the sample it tested positive. Which structure of the nephron most likely damaged during this injury?



8. Urea is a metabolic waste, identify the correct site of production and the reactant involved in the reaction?

	Site of production	Reactants
A	Liver	Lactic acid + oxygen
B	Muscles	Amino acid + carbon dioxide
C	Muscles	Lactic acid + oxygen
D	Liver	Amino acid + carbon dioxide

9. Dialysis is method used to treat individuals who may have one or both kidneys damaged. Which processes is **not** occurring in the kidney dialysis machine?

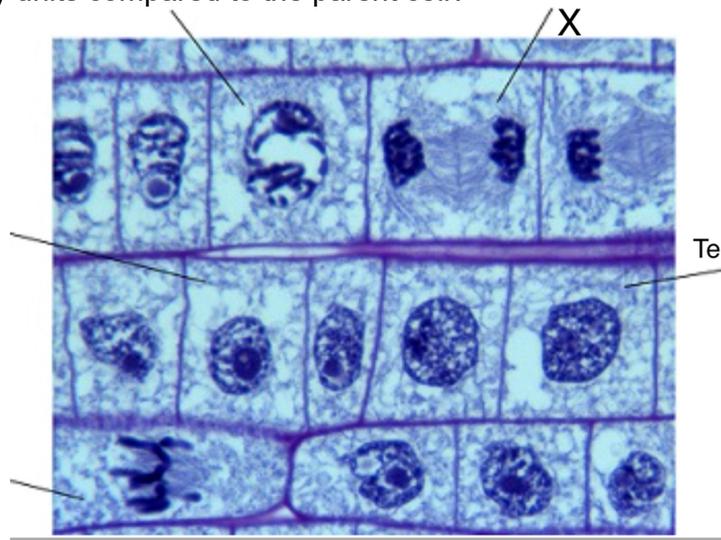
1. *Diffusion*
2. *Active transport*
3. *Osmosis*

- A: 3 only
B: 1 and 2
C: 2 and 3
D: 2 Only

10. During the cell cycle in which phase does the DNA get replicated?

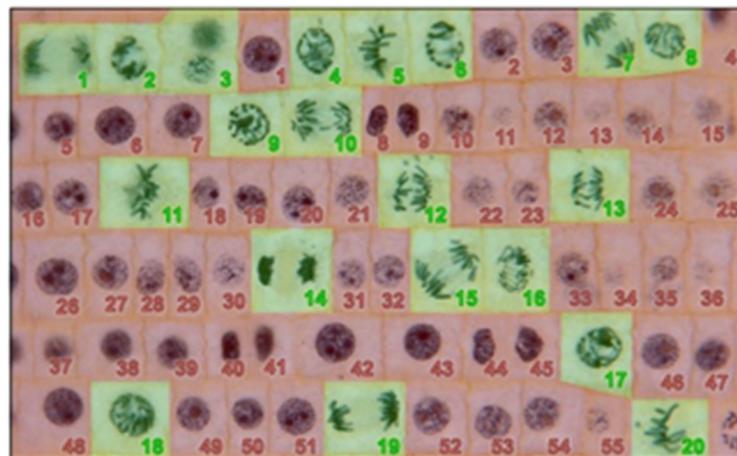
- A: Interphase
B: Metaphase
C: Prophase
D: Anaphase

11. Cell X is undergoing mitosis, what would you expect the mass of DNA to in arbitrary units compared to the parent cell?



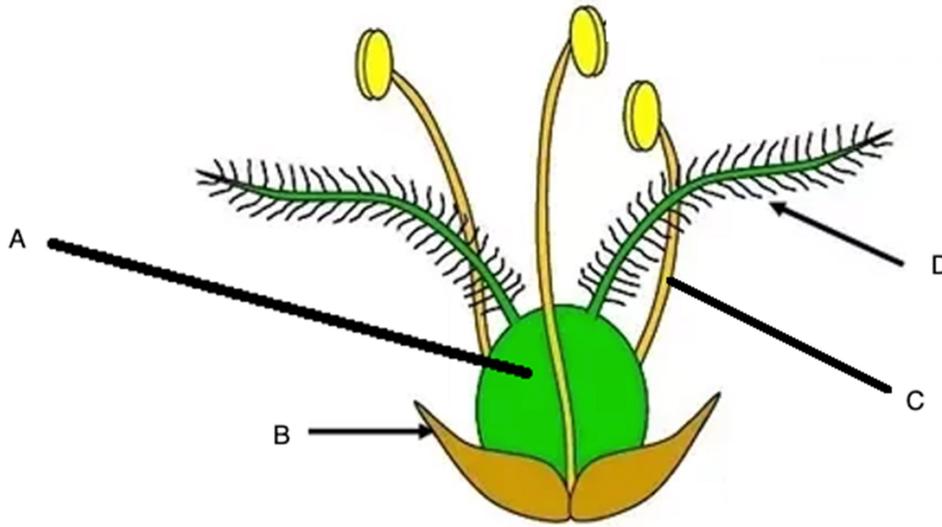
- A: Same mass of DNA
- B: Half the mass of DNA
- C: Double the mass of DNA
- D: Quarter the mass of DNA

12. Calculate the mitotic index of the following image? The image shows a total of 75 cells, the cell images highlighted green indicate the number of cells going through mitosis.



- A: 0.36
- B: 0.73
- C: 0.27
- D: 0.20

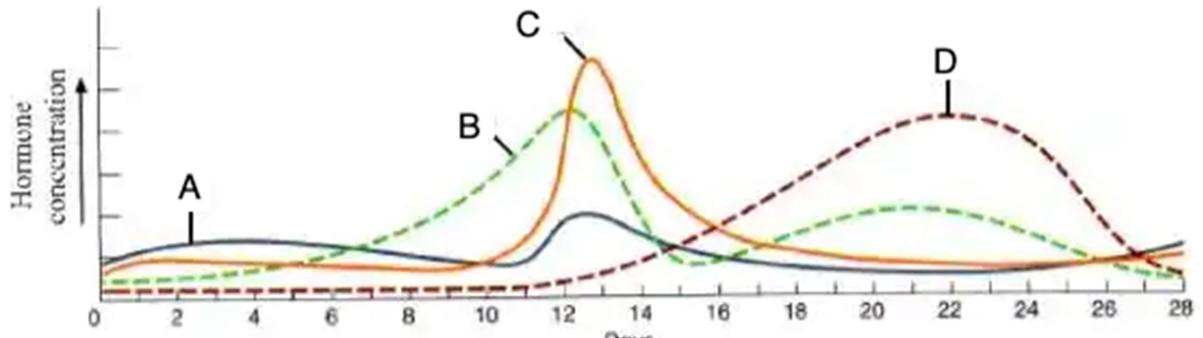
13. Which letter correctly identifies where you may find haploid nuclei cells being produced?



14. Which one of the following rows represents the correct description of asexual reproduction?

	Speed	Alleles	Type of cell division	Variation occurs
A	Fast	Advantageous alleles passed on	Mitosis	No
B	Slow	Disadvantageous alleles passed on	Meiosis	Yes
C	Slow	Advantageous alleles passed on	Meiosis	No
D	Fast	Disadvantageous alleles passed on	Mitosis	Yes

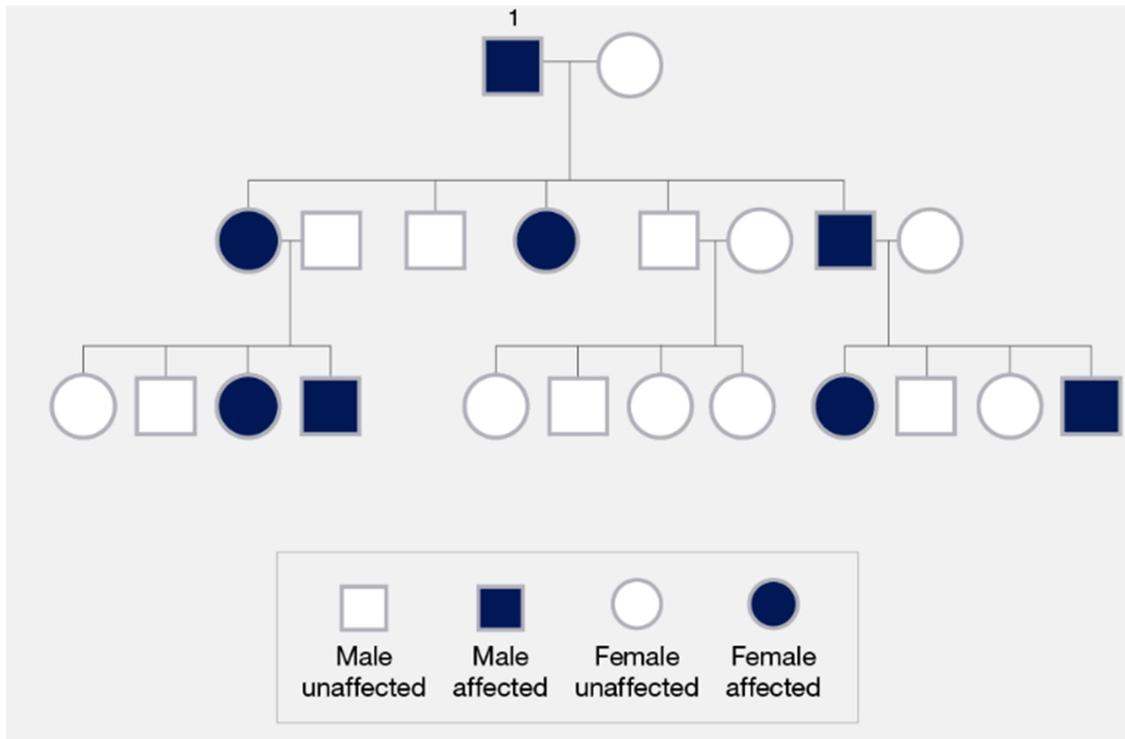
15. The menstrual cycle is an important role in the female reproductive cycle, which hormone is responsible for building the uterus lining?



16. Which one of the following is not an example of contraception?

- A: Prevents sperm and egg from meeting
- B: Kills the egg cells.
- C: Kills the sperm cells
- D: Stops production of the egg cells

17. An unknown disease is caused by a dominant allele (H), determine the genotype of individual 1.



- A: Hh
- B: H
- C: HH
- D: hh

18. Cystic fibrosis is a recessive condition that affects the thickness of the mucus of the membranes of the respiratory system. Two heterozygotes' parents are planning on having a child what is the probability of the child being not suffering with the condition and be male.

- A: 25%
- B: 37.5%
- C: 12.5%
- D: 50%

19. Sharks are a unique organism that are classified as fish but share a feature with mammals, using your knowledge which row correctly describes the classification of sharks?



	Reproduction	Gas exchange system	Ability to regulate their internal body temperature?	Produce milk?
A	Lay eggs in water	Gills	Yes	Yes
B	Give birth to live young	Lungs	Yes	No
C	Lay eggs in water	Lungs	No	Yes
D	Give birth to live young	Gills	No	No

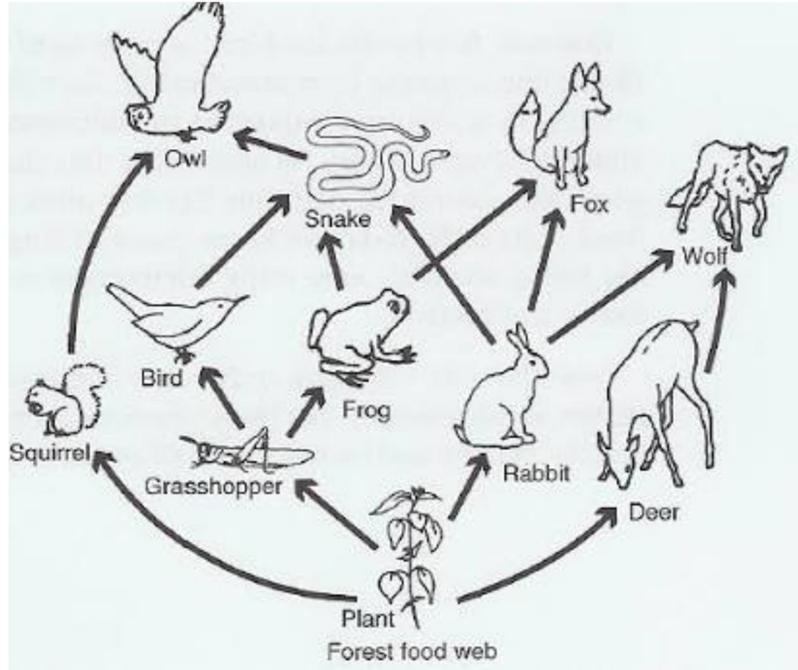
20. Human blood types are an example of which type of variation?

- A: Environmental
- B: Continuous
- C: Discontinuous
- D: Random

21. Mutations occur randomly for a variety of reasons, which one of the following is not an example of an effect of a mutation on an organism.

- A: Causes cancer
- B: Beneficial alleles produced
- C: Leads to incorrect lipids being made
- D: Change in the base sequence of DNA

22. Below is a food web of a forest habitat:



Which of the following correctly describes the trophic level of the frog?

- A: Predator
- B: Tertiary consumer
- C: 3
- D: Secondary consumer

23. Which of the following is not an effective method of sampling motile organisms?

- A: Quadrats
- B: Pooters
- C: Pitfall trap
- D: Tullgren funnel

24. Which one of the following is the main contributor to eutrophication?

- A: Over irrigation
- B: Overuse of pesticides
- C: Overuse of fertilizers
- D: Acid rain

25. Below is a picture of an African watering hole.



Which word would best describe what is being observed in this picture?

- A: Intraspecific competition
- B: Community
- C: Natural Selection
- D: Ecosystem

26. Microorganisms are easily modified genetically to enable the synthesizing of human hormones such as insulin. Which enzyme is used to attach the new DNA to a plasmid to form recombinant DNA?

- A: Lipase
- B: Restriction enzymes
- C: DNA polymerase
- D: Ligase

[Total 25 marks]

[End of MCQ 25 marks]

Extended Theory:

Q1) Humans have a central nervous system that help carry out coordination of the human body. This involves the major organs of the brain and spinal cord.

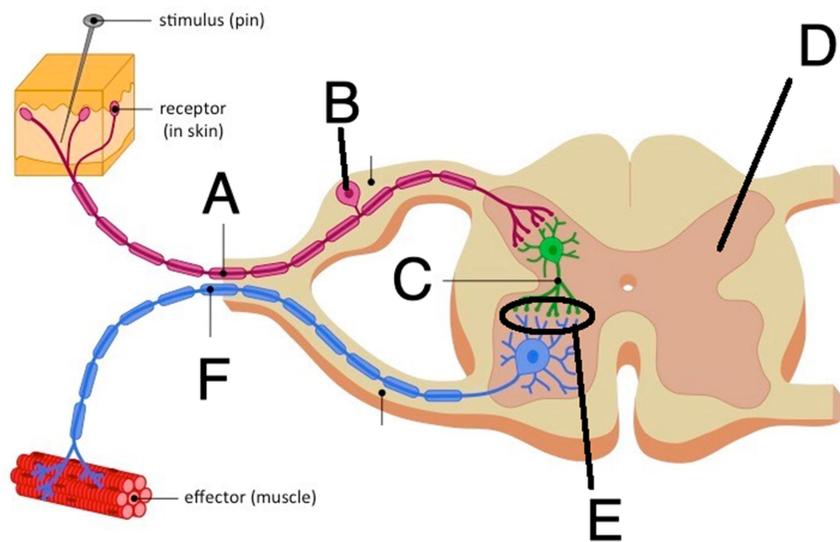


Fig 1

1a) Describe what the image of Fig 1 represents? [1 mark]

b) Complete the table below relating to the different structures in Fig 1, some letters may be used once, more than once or not at all [4 marks]

Letter:	Description
	If this structure is damaged, you would lose the ability to detect changes in environment.
	Region which is described as having neurones without myelinated neurones
	Promotes unidirectional transmission of electrical impulses.
	Diffusion of neurotransmitters occurs here.

c) Neurones are examples of specialised cells, describe and explain how neurones are adapted to their function? [3 marks]

d) Painkillers can be applied as a moisturizer on the skin, describe and explain how the cream will help provide pain relief in the event of an injury? [4 marks]

[Total 12 marks]

Q2) Humans carry out sexual reproduction which is an essential life process for all organisms.

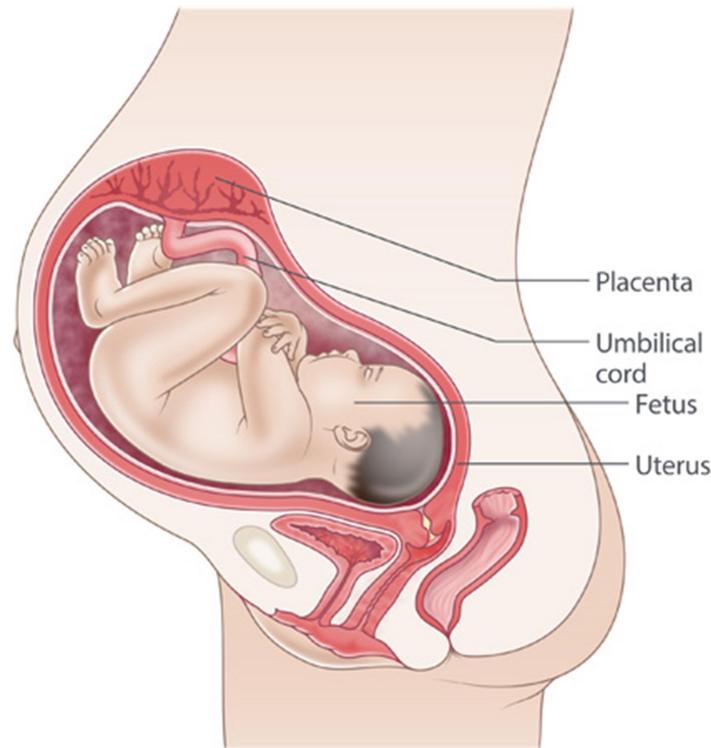


Fig 2

2a) The average time from fertilization in humans is approximately 9 months, what correct term to describe this? [1 mark]

b) Describe in detail the various events that occur from when sperm meets the egg in the oviduct to implantation? [5 marks]

ci) Women who struggle to get pregnant can take additional fertility drugs, state the main hormone contained within these drugs? [1 mark]

cii) Explain why taking this drug can result in multiple pregnancies? [4 marks]

ciii) In the event of a woman not being able to become pregnant by taking fertility drugs describe and explain another potential method of being able to have a child that is genetically related to the mother and father? [4 marks]

[Total 15 marks]

Q3) Nutrient cycles are essential to sustaining life of Earth.

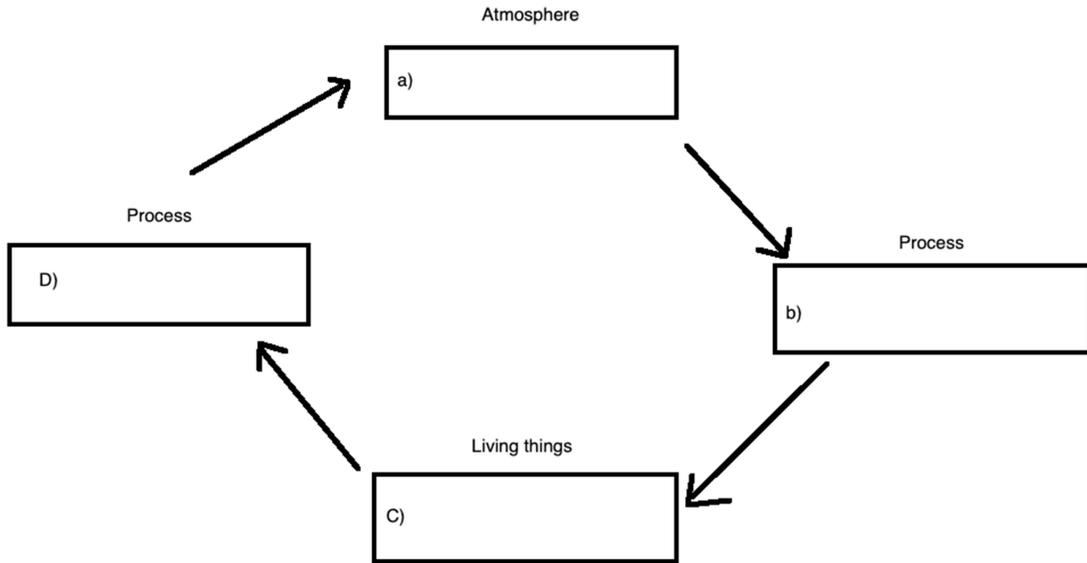


Fig 3

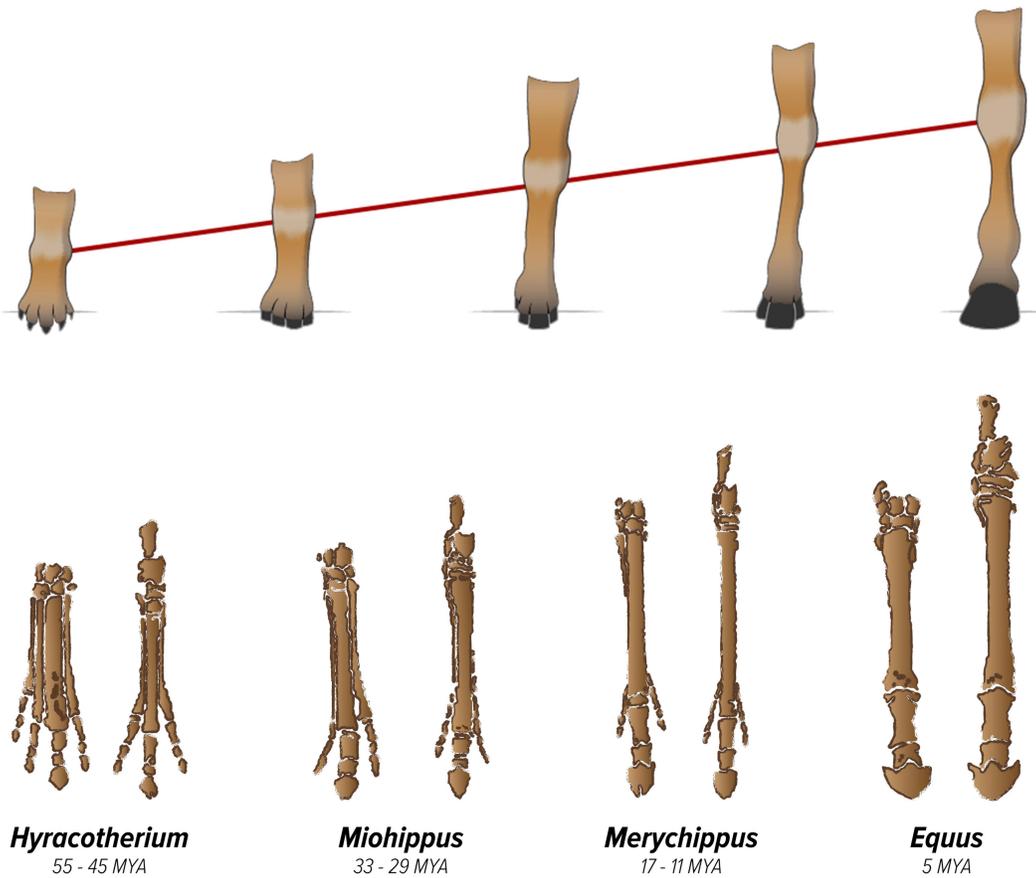
a) Correctly complete the cycle of a named cycle? [2 marks]
 Cycle: _____

b) The Earth has naturally gone through periods of warming and cooling, this has led to changes in environments globally. In modern history humans have been a contributing factor to these changes by a variety of activities.

Fill in the missing gaps of the passage:

Human activities have led to the increase in _____ of fossil fuels, this has released large quantities of _____ in the atmosphere. This has led to the environmental problem known as accelerated global warming. Accelerated global warming has had a major consequence on the world causing _____. Governments have decided to act by actively reducing emissions by signing agreement such as _____. [2 marks]

- c) Global warming has led to a change in environment, for example swamplands changed to more solid ground, and as a result the horse's foot had evolved to its current form, as shown in the diagrams below by looking at fossil evidence.



MYA = Million years ago
Figure 4

ci) Calculate the duration of observed the maximum estimated process in standard form? [1 mark]

cii) Describe the process being observed through fossil evidence fig 4? [4 marks]

[Total 9 marks]

Q4) As human population has continued to grow and estimated to be at a total of 8 Billion people as of 2023.

Year	Population
2023	8,045,311,447
2022	7,975,105,156
2021	7,909,295,151
2020	7,840,952,880
2019	7,764,951,032
2018	7,683,789,828
2017	7,599,822,404
2016	7,513,474,238
2015	7,426,597,537
2014	7,339,013,419
2013	7,250,593,370

- a) Calculate the percentage change of the human population over the last decade? [3 marks]

The continued pressures on the Earth's natural resources have led to a constant battle between humans and the natural environment. This has led to the extinction of many species.

- b) Describe and explain 3 strategies that can help prevent the extinction of species in future? [6 marks]

[Total 9 marks]

[Total 45 marks]

[End of Extended theory marks]

Practical Theory:

- 1) Plants carry out the life process sensitivity by reacting to a variety of different changes to their environment.
 - a) State the name given to plant responses? [1 mark]

A student wants to investigate the affect light on the directional growth of seedlings. Before carrying out the experiment seeds are grown in petri dishes. Below is the image of the prepared sample.



Fig 5:

- Bii) Figure 5 represents 6 sample plates in preparation for the germination of seeds. State two conditions needs to stimulate germination. [2 marks]

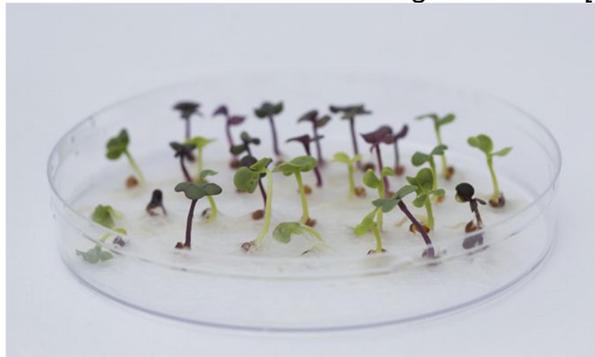


Fig 5: Germinated seedlings

- Bii) With the seedling sample prepared describe a suitable method in which a student could use these seedlings to plant response to light? [4 marks]

- Biii) Using your knowledge sketch the before and expected observed result of this experiment, including directional stimulus. [2 marks]

- c.) Describe and explain this plant response to the stimulus of light? [5 marks]

[Total 14 marks]

- 2) Decomposition is an important part of nutrient cycling. In the natural environment decomposition breaks down organic matter and releases nutrients back into the environment to be available for other organisms. Rate of decay is greater in tropical climates than cold temperate climates.

Students wishes to investigate the effect on temperature on the rate of decay, using full fat milk, enzyme B and sodium carbonate solution.

2ai) Complete the table:

	Identify the correct variable?	Apparatus used in the experiment
Independent variable		
Dependent variable		
Control Variables	1. 2.	1. 2.

[4 marks]

Below is what the setup may look like:



Aii) After adding milk, and sodium carbonate solution to a test tube, phenolphthalein is added. The students took a picture but was in black and white. State the correct colour that should be observed? [1 mark]

Aiii) After adding enzyme B to the mixture the fats in the milk are broken down, which of the products will lead to a the decolourisation of the phenolphthalein? [1 mark]

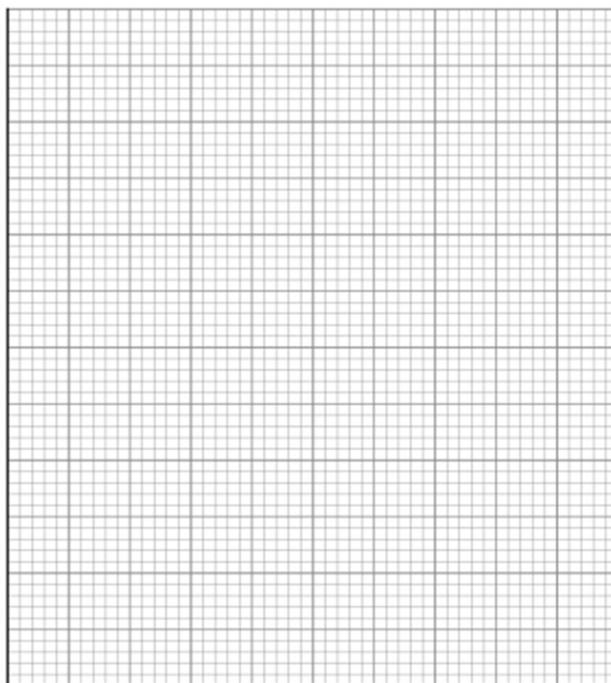
Aiv) The investigation should be repeated to increase the reliability of the experiment? Explain why this is important? [2 marks]

- b) For larger organisms the rate of decay can be measured due to mass change.
Below is the results of mass change of an organism over a period of 30 days

Time (days)	Mass (Kg)
0	10.0
5	9.5
10	8.0
15	6.5
20	5.0
25	4.0
30	4.0

bi) Complete the graph by:

- Suitable scale
- Correct plotting of data
- Drawing straight lines between the plots:



(Put mass in kg on the y axis do not put a scale)
(Put time in days on x axis do not put a scale)

[4 marks]

Bii) Describe and explain the relationship of graph? [4 marks]

[Total marks 16]

[Total 30 marks]

[End of Practical Theory]