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TOTAL MARKS

NATIONAL SENIOR CERTIFICATE EXAMINATION
NOVEMBER 2022

LIFE SCIENCES: PAPER I

EXAMINATION NUMBER

Time: 3 hours 200 marks

ANSWER BOOKLET

There are 17 pages in the Answer Booklet (i–xvii). Please write your examination number in the blocks above.

QUESTION 1

1.1 Select the term in Column B that best matches the description in Column A. Write the letter of the term in the corresponding space provided between the brackets. Each letter may be used only once.

	COLUMN A		COLUMN B
[ ]	Male organ that produces sperm	A	Epididymis
[ ]	Muscular sac that surrounds the testes	B	Sperm duct
[ ]	State in which the penis is filled with blood under pressure and becomes rigid and enlarged	C	Ejaculation
[ ]	A coiled tube on the outside of a testis that carries and stores sperm	D	Foreskin
[ ]	The part on the penis that is removed during a circumcision	E	Testes
[ ]	The tube that carries sperm from the testes to the urethra	F	Semen
[ ]	A gland that produces a fluid that has fructose to provide energy for the sperm	G	Penis
[ ]	A fluid that contains sperm cells and secretions from the male reproductive glands	H	Erection
[ ]	Expulsion of semen from the male body	I	Seminal vesicle
		J	Scrotum

(9)

1.2 Six multiple-choice questions are given below. Choose the most correct option for each question and write the letter of your choice in the space provided in the table below.

Question	1.2.1	1.2.2	1.2.3	1.2.4	1.2.5	1.2.6
Answer						

1.2.1 Which of the following best describes a community?

A All the organisms in an area interacting with the environment
B An interacting group of many different species in a common area
C The specific roles of members in a population
D Populations that can interbreed with each other

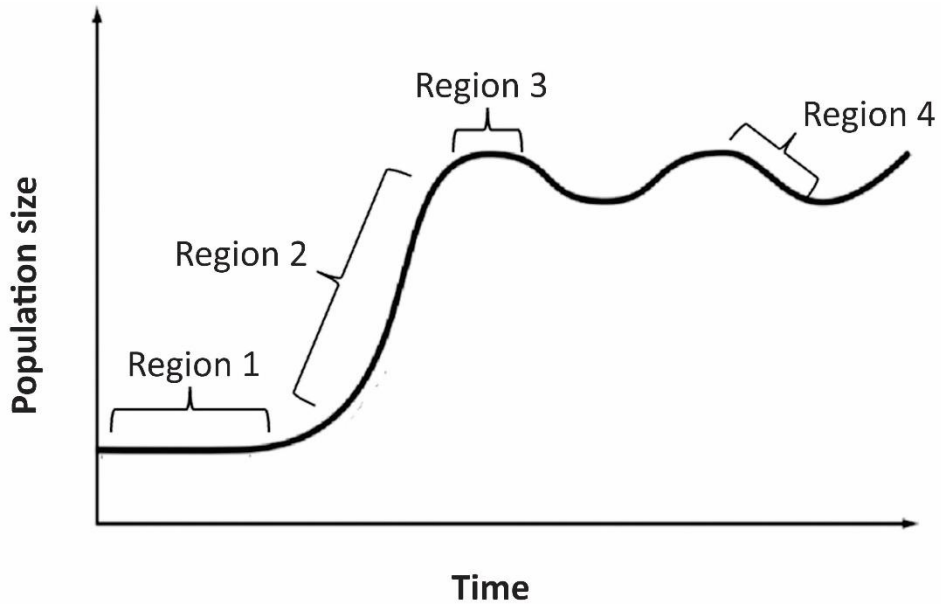
(1)

1.2.2 Which of the following terms refers to 'two different plant species requiring different amounts of sunlight' in a forest ecosystem?

A Primary succession
B Limiting factors
C Social organisation
D Resource partitioning (1)

Question 1.2.3 and 1.2.4 refer to the graph below (Figure 1.1) that shows the change in size of a population over time.

Figure 1.1 – Change in population size over time

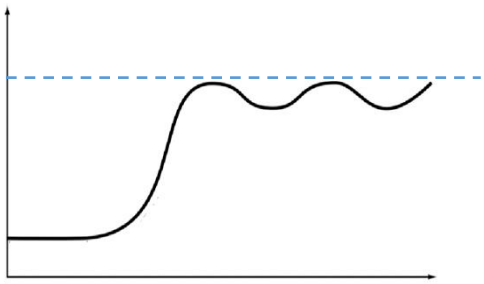
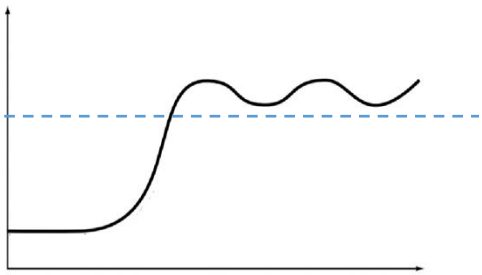
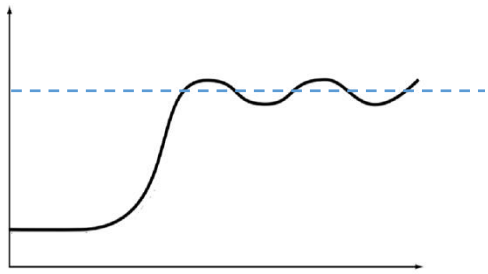
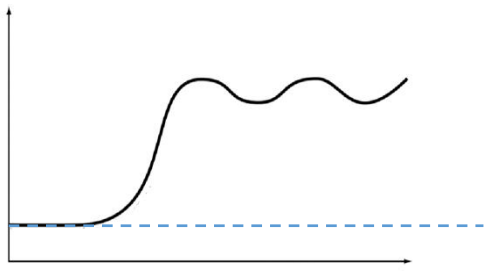


[Source: Examiner's own data]

1.2.3 In which region will the birth rate far exceed mortality?

A Region 1
B Region 2
C Region 3
D Region 4 (1)

1.2.4 Which of the following would represent the carrying capacity of the population in Figure 1.1?

A	
B	
C	
D	

(1)

1.2.5 Read the information in the text box below.

Figure 1.2 – Impala with ear tag

A biologist sampled impala in a fenced game reserve using mark-recapture. In the first capture, 62 impalas were trapped and marked with ear tags.

A second capture of 56 impalas occurred two weeks later, of which 28 impalas had ear tags.

[Source: <Examiner's own> and Image: <images.fineartamerica.com>]

What is the estimated size of the impala population?

A 25
B 31
C 118
D 124 (2)

1.2.6 Refer to the text below to answer the following question.

Figure 1.3 – Western Leopard Toads breeding in water

The Western Leopard Toad lives in the wetlands in the South-Western Cape of South Africa.

When breeding occurs, the female lays thousands of eggs in the water and the male deposits sperm where the female laid the eggs.

[Adapted: <https://www.capenature.co.za> and <www.capepointroute.co.za>]

Which of the following statements is true regarding the Western Leopard Toad?

A External fertilisation and oviparous
B Internal fertilisation and oviparous
C External fertilisation and ovoviviparous
D Internal fertilisation and ovoviviparous (2)

1.3 Study Figure 1.4 below that shows the members of different castes in a termite colony.

Figure 1.4 – Caste representatives of a termite colony (not drawn to scale)

A Queen

B Soldier

C Worker

[Images:<www.mypmp.net> and <www.indiamart.com> and <www.terminix.com>]

1.3.1 Fill in the table below to describe any ONE role of each caste in the termite colony.

Caste	Role in colony
A Queen	
B Soldier	
C Worker	

(3)

1.3.2 Identify and describe how any ONE structural feature of the soldier helps it perform its role effectively.

_____

_____

_____

_____

(2)

1.4 1.4.1 Study the following table that consists of two items (numbered 1 and 2) in the first column and a term in the second column. **Decide which item(s) relate to the term.**

Write down your choice in the space provided in the **ANSWER** column, making use of the following codes:

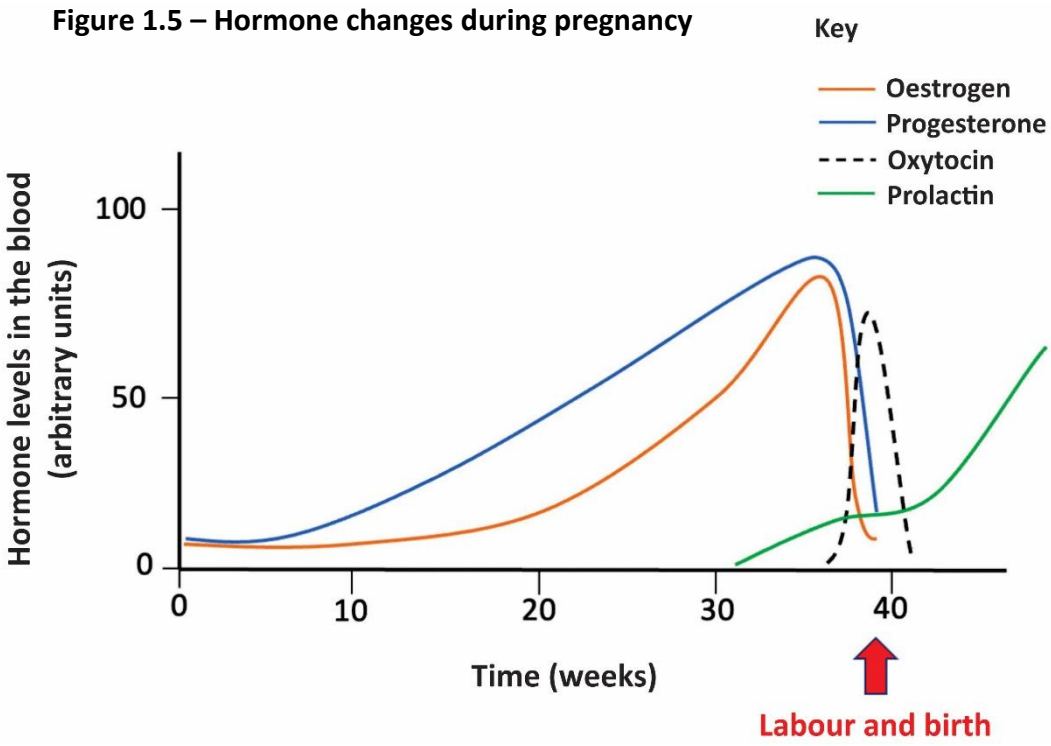
A only item 1 relates to the term
B only item 2 relates to the term
C both items 1 and 2 relate to the term
D neither item 1 nor item 2 relates to the term

Item	Term	Answer
1. Contains oxygenated blood 2. Transports blood from the amnion to the foetus	Umbilical artery	
1. Attached to the wall of the uterus 2. Produces hormones to maintain pregnancy	Placenta	
1. Has fully developed organ systems 2. Formed after implantation of the blastocyst	Embryo	
1. Protects the foetus by absorbing shock 2. Maintains the temperature around the foetus	Amniotic fluid	
1. Is the target organ of prolactin 2. Secretes FSH	Mammary gland	

(5)

1.4.2 Study Figure 1.5 below that shows the levels of four hormones during pregnancy and birth. Use this information to answer the following question.

Figure 1.5 – Hormone changes during pregnancy

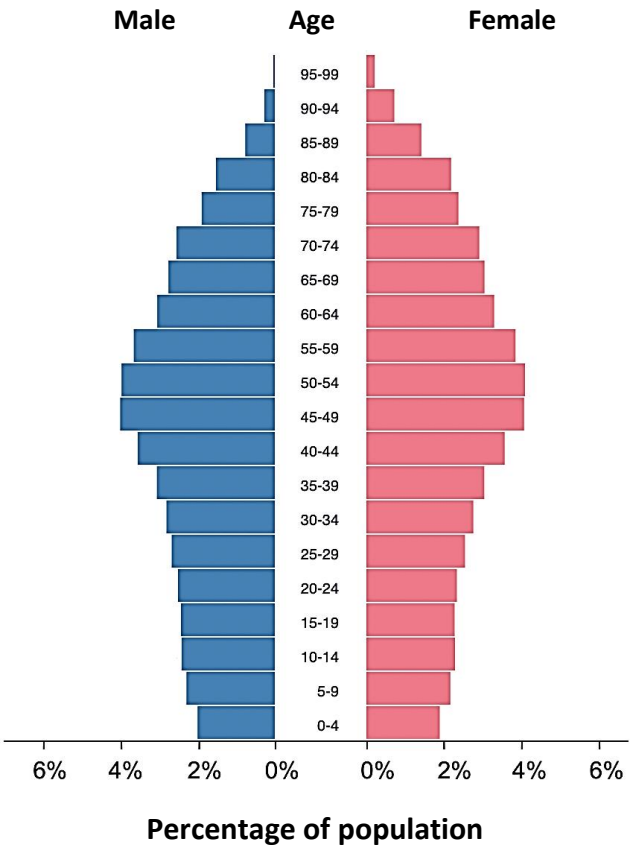


Describe and explain a reason for the changes in hormone levels of oxytocin and prolactin between weeks 30 and 40 of pregnancy.

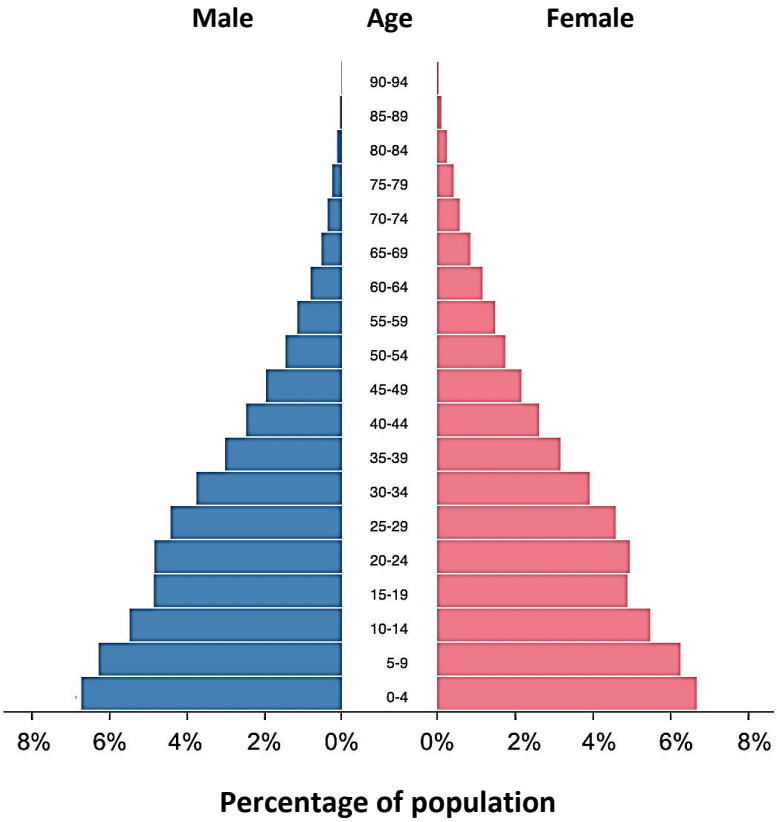
(4)

1.5 Study the two population pyramids below.

Population Pyramid of country A



Population Pyramid of country B



[Adapted: <https://www.populationpyramid.net>]

1.5.1 The six statements in the table below relate to the population pyramids on page viii.

For each statement decide whether:

A the statement is supported by the information
B the statement is contradicted by the information
C the statement is neither supported nor contradicted by the information

	Statement	**A, B or C**
(a)	In country B, the percentage of the female population aged between 20 and 24 is between 4% and 6%.	
(b)	There are more males than females between ages 80 and 84 in country A.	
(c)	The life expectancy of the population in country A is lower than in country B.	
(d)	The pyramid of country A represents a more developed country.	
(e)	Countries A and B have the same ecological footprint.	
(f)	Country A has a lower birth rate than country B.	

(6)

1.5.2 Name and describe the sampling method that the South African government uses to collect the information that is needed to construct a population pyramid for South Africa.

(2)

1.5.3 Suggest TWO reasons why it is important for the government to collect the information about the age and sex distribution of the population.

(2)

1.6 Read the information in the text box below and use it and your own knowledge to answer the questions that follow.

Figure 1.6 – Reproduction in sugarcane plants

Sugarcane flowers consist of the following:

- carpel (female parts) that have two feathered stigmas.
- three very long stamens (male parts) that are attached to the carpel at the ovary.

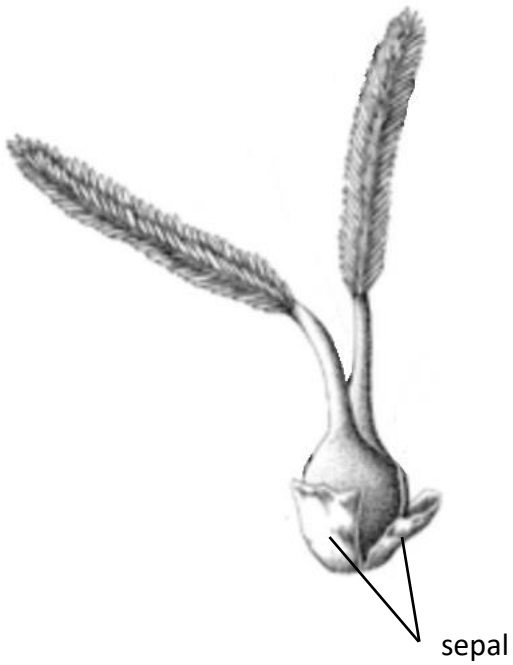
Sexual reproduction in sugarcane occurs at low rates – few seeds are produced and are often unable to germinate.

It is a cross-pollinating species. The pollen is very small and wind dispersed.

Photograph of sugarcane flowers

[Adapted: <http://www.news.uct.ac.za> and <www.frontiersin.org>]

The diagram below shows only the **carpel** (female parts) of the sugarcane flower.



[Adapted: <https://media.springernature.com>]

1.6.1 On the diagram of the carpel of the sugarcane flower, complete the following:

(a) Draw in the stamens to complete the sugarcane flower as described in the text box on page x. (3)

(b) Label the *filament* and *anther* of any one stamen you have drawn. (2)

(c) Place the letter **P** on any part of the diagram where pollination would occur. (1)

(d) Label the ovary of the flower. (1)

1.6.2 Complete the table of differences between asexual and sexual reproduction shown below. **CIRCLE** the correct option in the brackets.

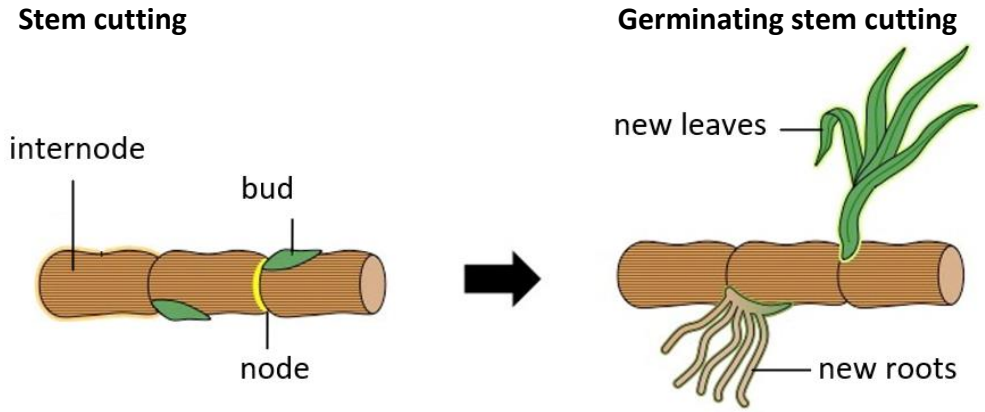
	Asexual	**Sexual**
Energy use	[low / high]	[low / high]
Number of parents	[one / two]	[one / two]
Gametes produced	[yes / no]	[yes / no]

(3)

1.6.3 Sugarcane is a commercially important crop in South Africa.

It is usually grown from stem cuttings as shown in Figure 1.7 below, rather than from seed.

Figure 1.7 – Stem cuttings



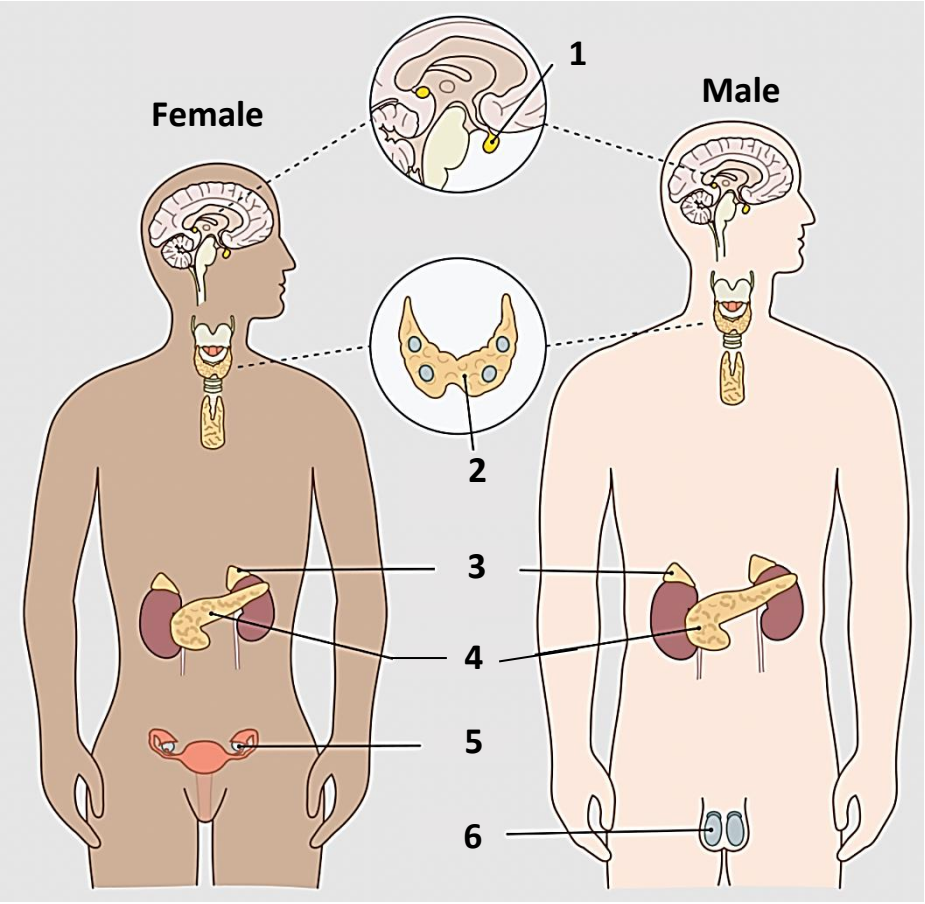
[Adapted: <https://ib.bioninja.com.au>]

Explain the advantages for a farmer to grow sugarcane from stem cuttings rather than from seed.

(4)

1.7 Figure 1.8 shows some of the endocrine glands in males and females.

Figure 1.8 – Endocrine glands in the human body



[Source: <https://upload.wikimedia.org>]

Select the number on Figure 1.8 that best matches the statement/description in the table below. Numbers may be used more than once.

Statement/Description	Number
(a) Regulates blood glucose levels	
(b) Produces testosterone	
(c) Produces hormones that regulate many other endocrine glands	
(d) TSH targets this gland	
(e) Stops producing insulin, which results in diabetes type 1	
(f) Secretes thyroxin to regulate metabolism	
(g) The adrenal gland	

(7)

1.8 Study the table below that shows the average brain volumes of several hominid species.

Figure 1.9 – Table showing average brain volume of some hominid species

Hominid species	**Average brain volume (cm^3)**
Australopithecus afarensis	380
Australopithecus africanus	400
Homo habilis	600
Homo erectus	1 000
Homo sapiens	1 350

[Source: <https://www.britannica.com>]

1.8.1 Plot a bar graph of the data in the table (Figure 1.9) on the graph paper provided below. *(Ensure that the hominids are plotted in order of increasing brain volume.)*

(8)

1.8.2 Name the hominid listed in the table (Figure 1.9) that was known to first use and control fire.

_____

(1)

1.8.3 Explain why the ability to use and control fire is considered a significant development in hominid evolution.

_____

_____

_____

_____

_____

(2)

1.8.4 Place an X on YOUR graph between the bars to show the most likely place where *Australopithecus sediba* would be positioned according to brain volume.

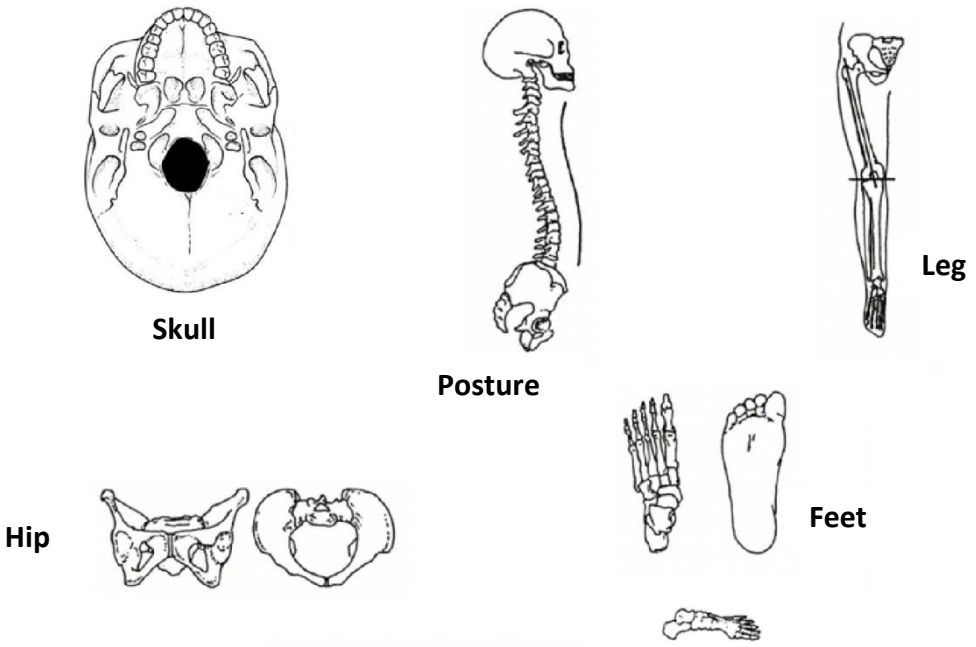
(1)

1.9 Read the information below and use it and your own knowledge to answer the questions that follow.

A distinguishing feature of the hominid species listed in the table (Figure 1.9) is bipedalism.

The images in Figure 1.10 show some of the important physical features of the skeleton that are associated with bipedalism.

Figure 1.10 – Physical features of the skeleton associated with bipedalism



[Adapted: <https://www.researchgate.net>]

Select any THREE features of the skeleton that are shown in the images in Figure 1.10 and complete the table below. Describe the physical feature in column A and state the importance of the feature for bipedalism in column B.

	A. Description of the physical feature of skeleton	**B. Importance of the skeletal feature for bipedalism**
1		
2		
3		

(6)
[80]