

**6<sup>th</sup> Year Continuation Biology Exam**

**Date: 29<sup>th</sup> September/1<sup>st</sup> October 2026**

**Total: 115 marks**

Name (first **AND** surname): Solutions - Green.

Topics:

- The Endocrine System
- The Musculoskeletal System
- Cell Division

## Question 1 (30 marks) .

Read the article and answer the questions that follow.

### ***A-Rod and HGH: Building a Better Athlete or Breaking the Rules?***

Alex Rodriguez, better known as A-Rod, was one of baseball's biggest stars. However, his career became linked with performance-enhancing drugs. Major League Baseball reported that Rodriguez had used and possessed prohibited substances, including testosterone and human growth hormone (HGH) (MLB, 2013).

HGH is a hormone that is naturally produced by the pituitary gland, a small gland found at the base of the brain. It plays an important role in growth and helps maintain normal tissues, organs and metabolism (Cleveland Clinic, 2022).

Athletes may misuse HGH because of the changes it can cause in the body. Taking synthetic HGH can increase lean body mass and reduce body fat. HGH also promotes growth and repair within body tissues. However, although HGH can increase muscle mass, research does not clearly show that this extra muscle produces greater strength in healthy adults (Mayo Clinic, 2024).

Increased lean body mass and reduced body fat could seem beneficial, while the effects of HGH on growth and tissues may make it attractive to athletes hoping to improve their bodies or recovery. However, the actual improvement in athletic performance is uncertain (Mayo Clinic, 2024).

HGH use in healthy adults can cause swelling, joint and muscle pain, high blood sugar and an increased risk of type 2 diabetes (Mayo Clinic, 2024). Therefore, artificially manipulating hormone levels may have consequences for an athlete's health.

Rodriguez was ultimately suspended for the entire 2014 season (MLB, 2013).

#### Sources

MLB (2013). A-Rod gets ban through 2014; 12 get 50 games.

Mayo Clinic (2024). Human growth hormone (HGH): Does it slow aging?

Cleveland Clinic (2022). HGH (Human Growth Hormone): What It Is, Benefits & Side Effects.

Both Cleveland Clinic and The Mayo Clinic are internationally respected medical treatment centers involved in advanced therapeutics and scientific research reviewed and supported by fellow healthcare professionals.

30

- a) Identify any one reason the information in the article is considered trustworthy and reliable.

written by experts  
research is peer reviewed

4

- b) Alex Rodriguez participated in the activity of Hormone Manipulation. Explain what is meant by the underlined term.

Chemical messages (hormones etc) used to change the normal function of a living organism.

- c) HGH is a hormone that travels around the human body dissolved in the blood. They are composed of either one of two groups of biomolecules. One of these is lipids. Identify the other possible biomolecule group and identify where the named biomolecule is manufactured in a cell.

|                      |                                         |
|----------------------|-----------------------------------------|
| Named biomolecule:   | Protein                                 |
| Site of manufacture: | Ribosome or rough endoplasmic reticulum |

3

3

- d) According to the article, what is the role of HGH in the human body?

growth or metabolism

2

- e) Based on the information provided, identify an advantage of Alex Rodriguez using HGH.

↑ lean body mass  
↓ body fat  
promotes growth and repair of tissue.  
Any one

2

- f) Identify a disadvantage associated with taking HGH.

swelling  
joint/muscle pain  
high blood pressure  
increased risk of type 2 diabetes.  
Any one

2

- g) Mention an ethical concern associated with hormone manipulation in sport.

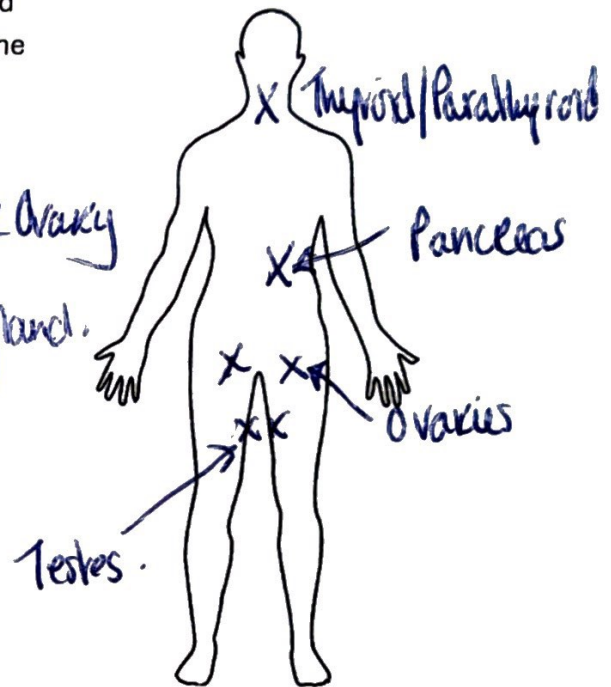
unfair advantage.

2

- h) Apart from the gland referenced in the article, name any other endocrine gland of the human body, identify the hormone secreted by the named gland and indicate its location on the diagram.

|                                 |                                                       |
|---------------------------------|-------------------------------------------------------|
| Name of Endocrine Gland:        | 1.0 L. St                                             |
| Associated Hormone:             | Thyroid or Parathyroid or Pancreas or Testes or Ovary |
| Hormone must match named gland. |                                                       |

\* Pituitary Gland is the one mentioned in the article



Named Gland: 3

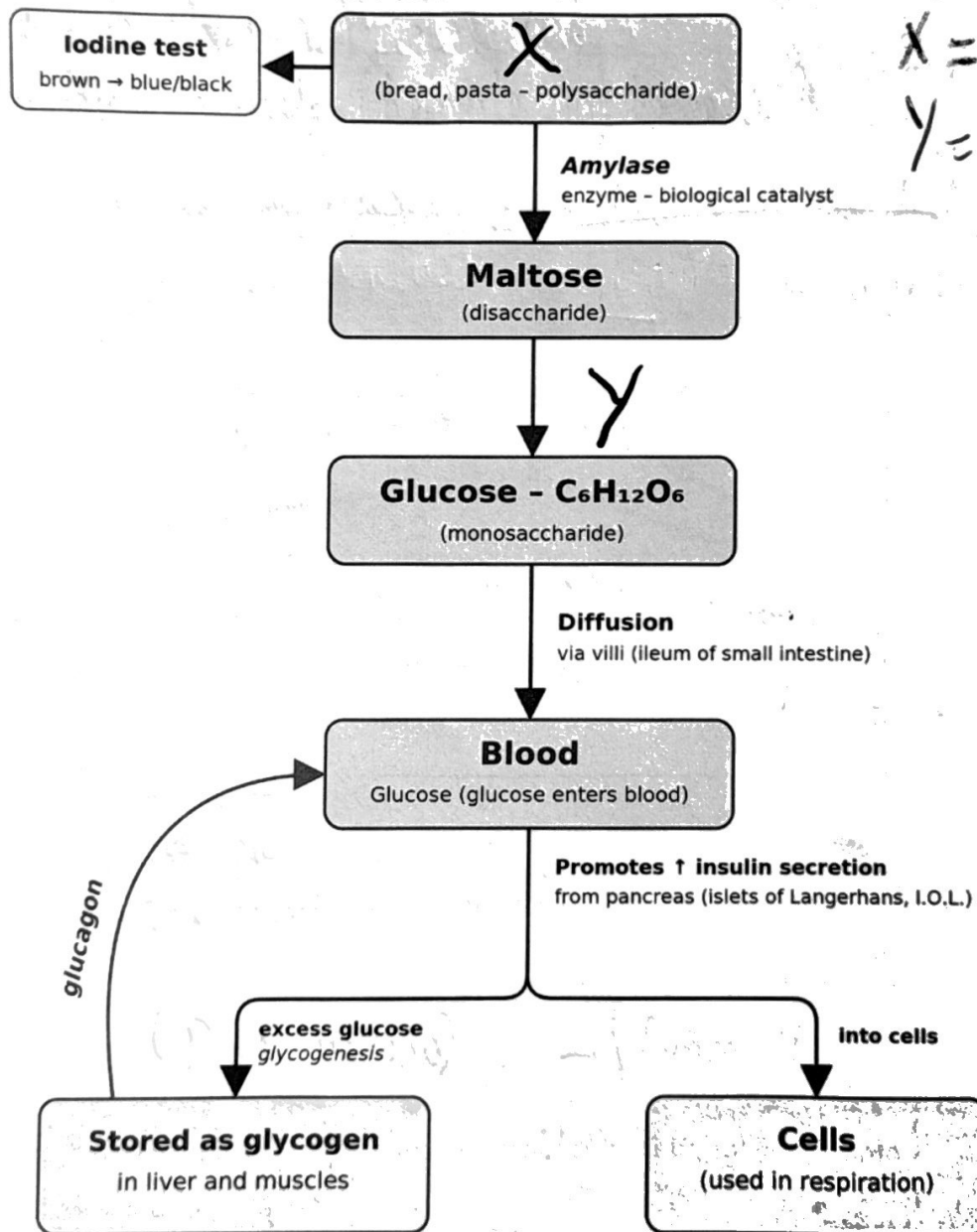
Named Hormone: 3

Location Identified: 3

25

Question 2 (25 marks).

The graphic below shows the digestion and absorption of glucose in the human body. Complete the missing words on the graphic.



X = starch 2  
Y = maltase 2

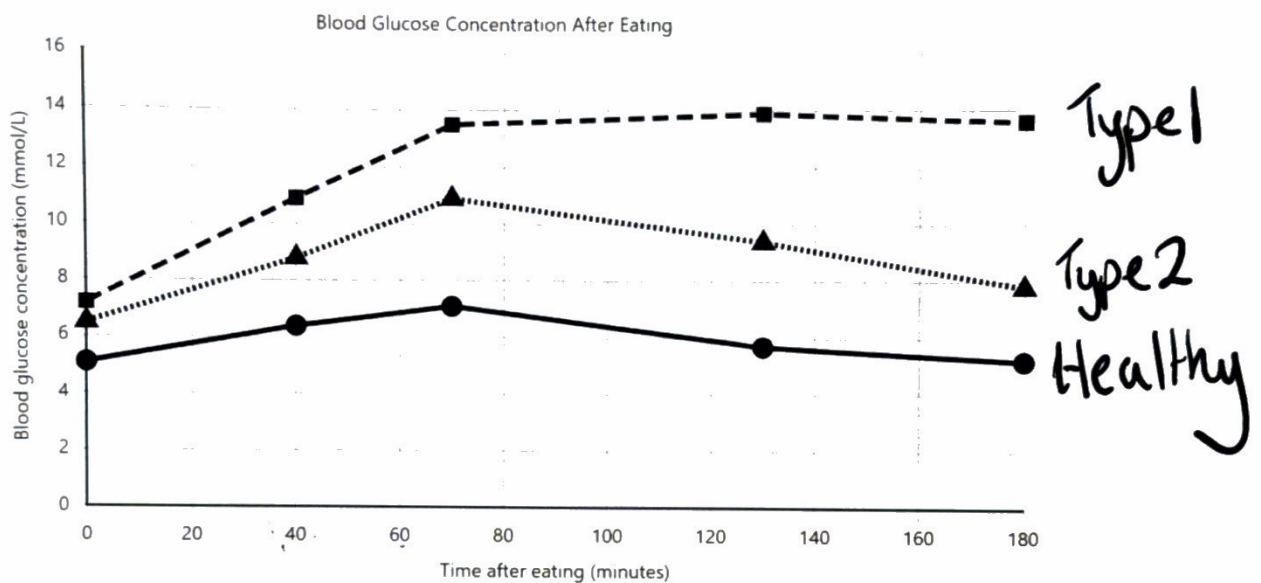
a) Glucose is a carbohydrate. Write out the **general** formula for carbohydrates.

$C_x(H_2O)_y$  brackets missing 3  
Prom formula - 1 m.

- b) Identify the endocrine gland that produces insulin. Explain the conditions in the blood that stimulate insulin to be secreted from the gland named in the previous question.

|                  |                                                    |
|------------------|----------------------------------------------------|
| Endocrine Gland: | Pancreas (or Islets of Langerhans) 3               |
| Conditions:      | increased (or elevated) glucose levels in blood. 3 |

- c) Below is the data for insulin levels of 3 different individuals with and without diabetes



- i. Identify the blood glucose levels in the individual with type 1 diabetes at 40 minutes.

|                                            |
|--------------------------------------------|
| 11 mmol/L (accept 10-9) Ans: 2<br>units: 1 |
|--------------------------------------------|

- ii. Comment on the blood glucose levels between 60 and 180 minutes for the individual with type 1 diabetes.

|                                   |
|-----------------------------------|
| remains constant (or described) 3 |
|-----------------------------------|

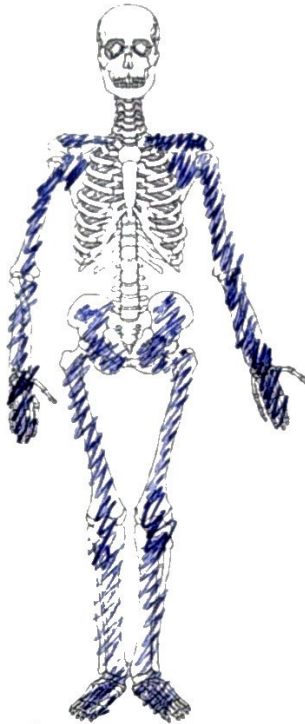
- iii. Using your knowledge of insulin, explain why blood glucose levels decrease after 60 minutes in a healthy person.

|                                                                   |
|-------------------------------------------------------------------|
| insulin promotes the movement of glucose from blood into cells. 3 |
|-------------------------------------------------------------------|

(30)

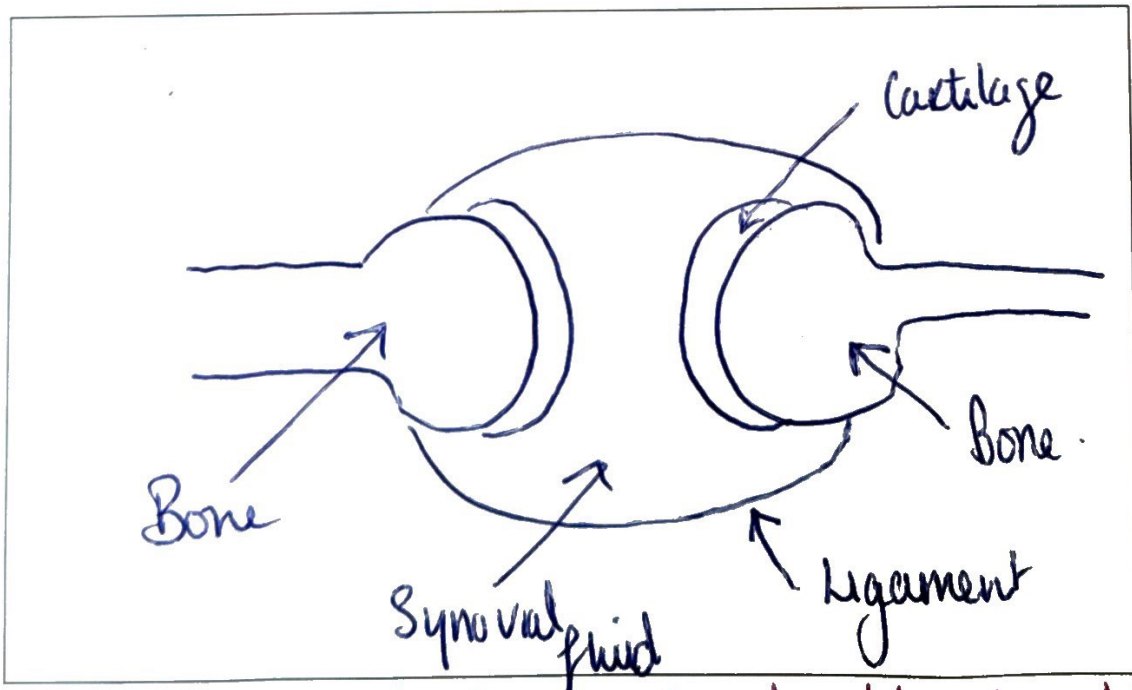
Question 3 (30 marks).

A) On the diagram **shade** the bones included in the **appendicular** skeleton.



4m  
- For every incorrect  
part shaded  
(4 parts of  
axial) - 1m.

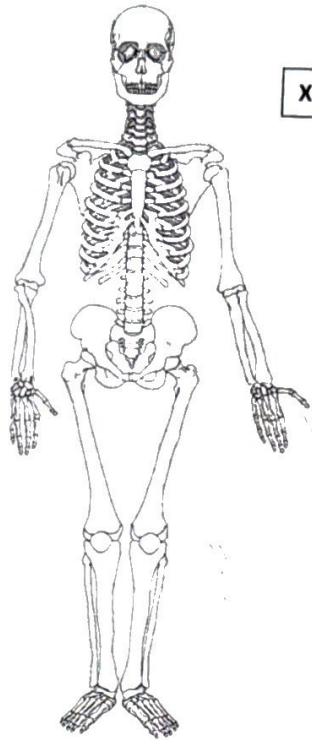
b) In the space provided draw a **labelled** diagram of a synovial joint. Ensure to include ligaments in your diagram.



D-3  
L-1  
↑  
Any 3  
correct.

\* Diagram must have a bone / cartilage / bone / ligament present to get diagram mark.

C) Identify on the diagram the location of an **slightly movable** joint by drawing an arrow from "X" to the appropriate location.



X

→ point  
at vertebrae  
OR  
wrists  
OR  
ankles.

d) The bicep and tricep are an example of an antagonistic muscle pair.

e) Based on the image identify the position of the **lower** arm when the muscles are at these points

Position:

• straightened  
• moved away from the body.



- f) List 3 constituents of a balanced diet essential for good bone health and a food source of each.

|   | Constituent | Source                              |
|---|-------------|-------------------------------------|
| 1 | Protein     | Chicken or Red Meat or A.O.V.       |
| 2 | Vitamin D   | Dairy or egg or oily fish or A.O.V. |
| 3 | Calcium     | Dairy or egg or A.O.V.              |

1+1  
1+1  
1+1

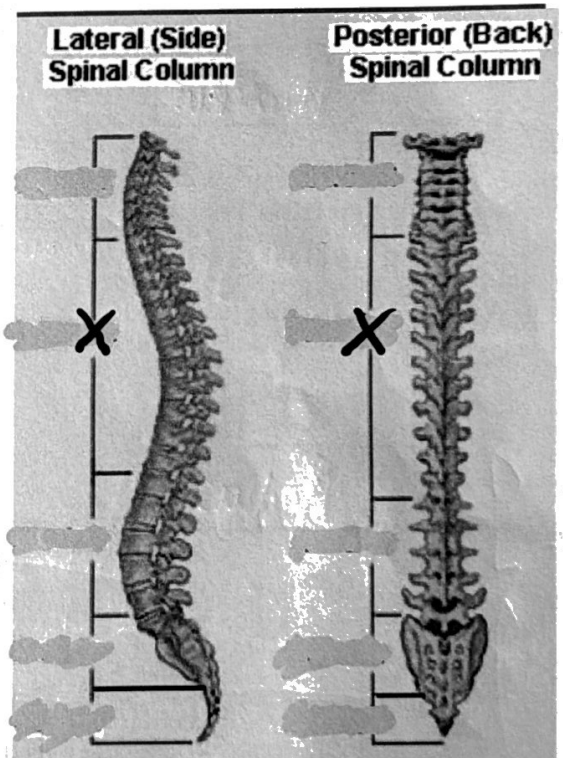
- G) Identify one bone disease due to an unbalanced diet.

Named Bone Disease:

Osteoporosis or Osteomalacia or Arthritis  
(Brittle bones not ok → it is genetic)

- h) Part of the axial skeleton contain the vertebral column composed of 33 vertebrae.  
Identify the region **above** X and state the number of vertebrae contained here.

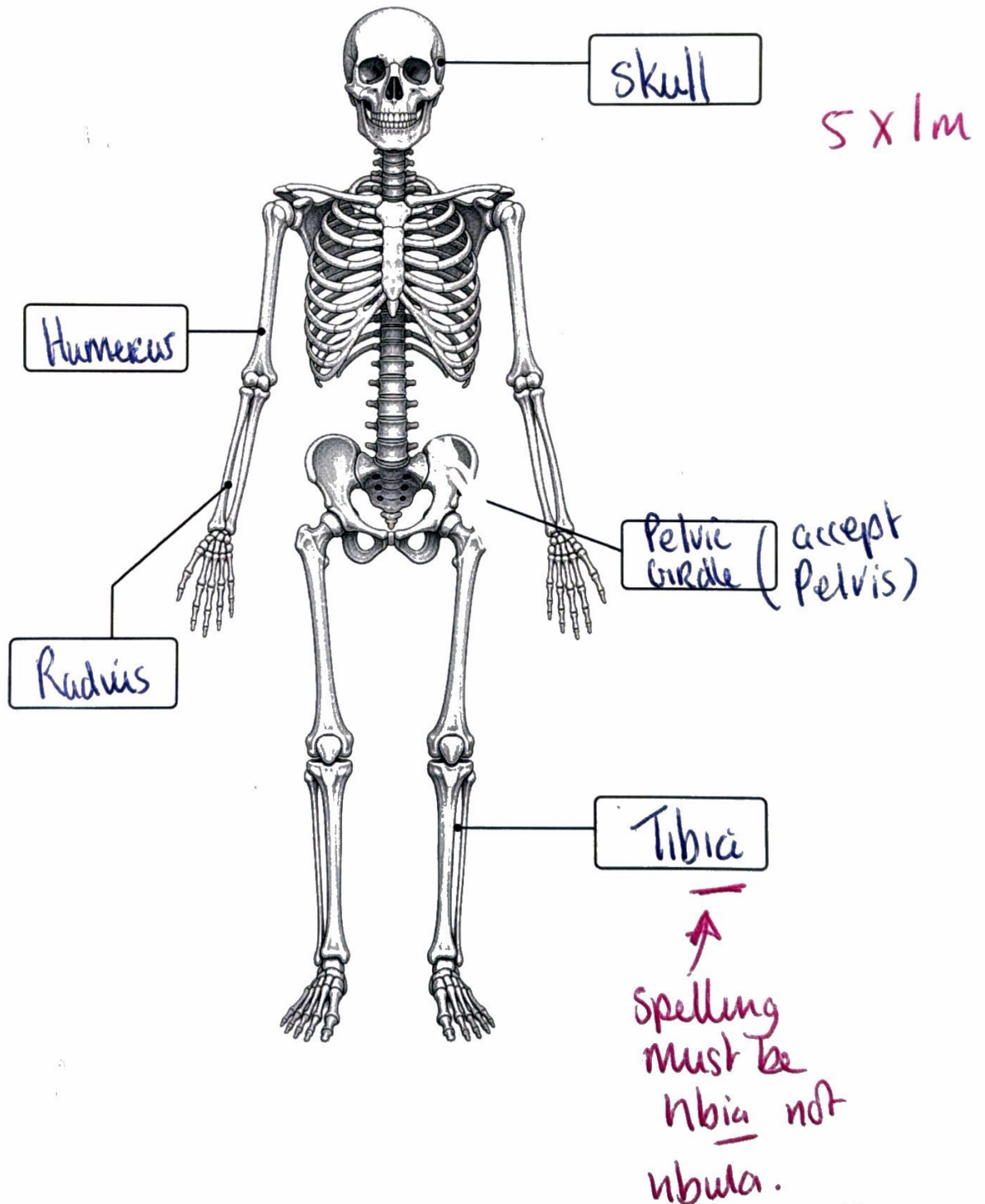
|          |          |   |
|----------|----------|---|
| Above X: | Cervical | 1 |
| Number:  | 7        | 1 |



i)

Label the bones of the skeleton

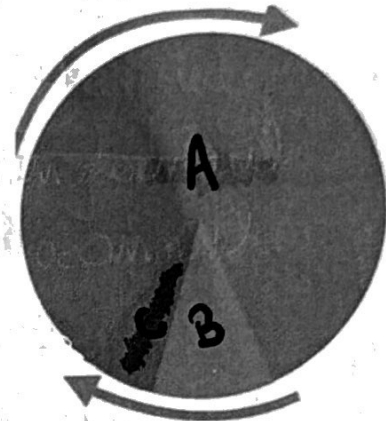
## THE SKELETON



Question 4 (30 marks):

a) List the 3 stages of the cell cycle.

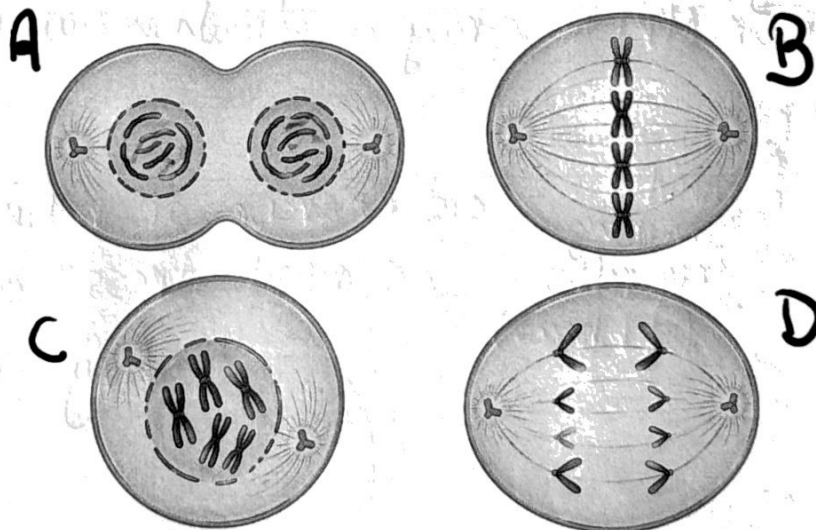
|    |             |   |
|----|-------------|---|
| A: | Interphase  | 2 |
| B: | Mitosis     | 2 |
| C: | Cytokinesis | 2 |



b) Identify one event that occurs during stage A.

Respiration or Photosynthesis or Protein Synthesis or DNA Replication or Cell Organelle replication. Any one 2

c) Stage B can be further divided into four stages. These stages are not in the correct sequential order in the image below. Identify the correct order using the letters provided.

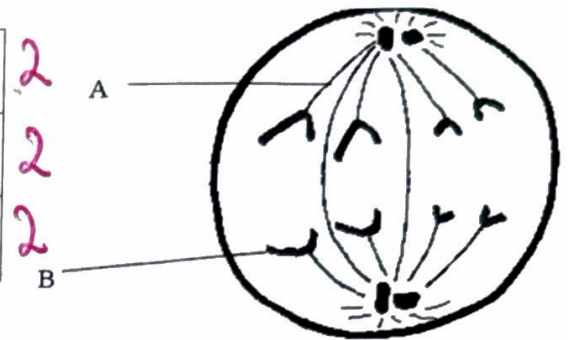


Order: C, B, D, A

4 x 1m.

D) Identify the diploid number of the cell participating in stage B of the cell cycle.  
Identify the parts labelled A and B

|                 |                                       |
|-----------------|---------------------------------------|
| Diploid Number: | 4                                     |
| A:              | <del>Chromosomes</del> Spindle fibres |
| B:              | Chromosomes.                          |



e) What name is given to the membrane formed in a **animal** cell during stage C.

|                 |
|-----------------|
| Cleavage furrow |
|-----------------|

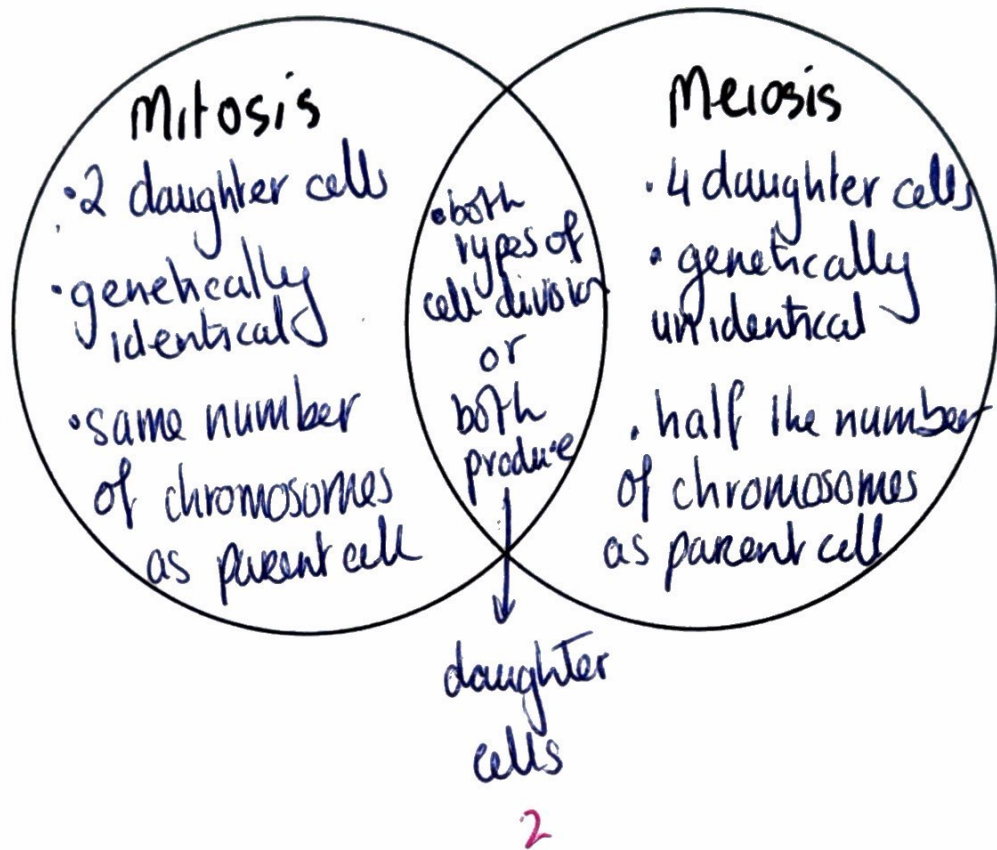
f) Some cancers are unavoidable for a number of reasons including the possess of oncogenes. The impact of these cancers can be reduced with early detection. Suggest a method of early ~~intervention~~ detection.

|                                                                                                          |
|----------------------------------------------------------------------------------------------------------|
| Screening programmes or self-examination or blood test or MRI or x-ray or education (awareness campaign) |
|----------------------------------------------------------------------------------------------------------|

g) Other cancers are avoidable. Suggest a **lifestyle** choice that can be made to prevent the onset of cancer.

|                                                        |                                                        |
|--------------------------------------------------------|--------------------------------------------------------|
| avoid alcohol or avoid smoking cigarettes (or tobacco) | or exercise or balanced diet or avoid stress or A.O.V. |
|--------------------------------------------------------|--------------------------------------------------------|

- g) Using the graphic, identify one similarity and two differences between mitosis and meiosis.



2 correct  
for mitosis  
2x1m

must have  
the corresponding  
correct for  
meiosis 2x1m.