A Level Biology Transition Work

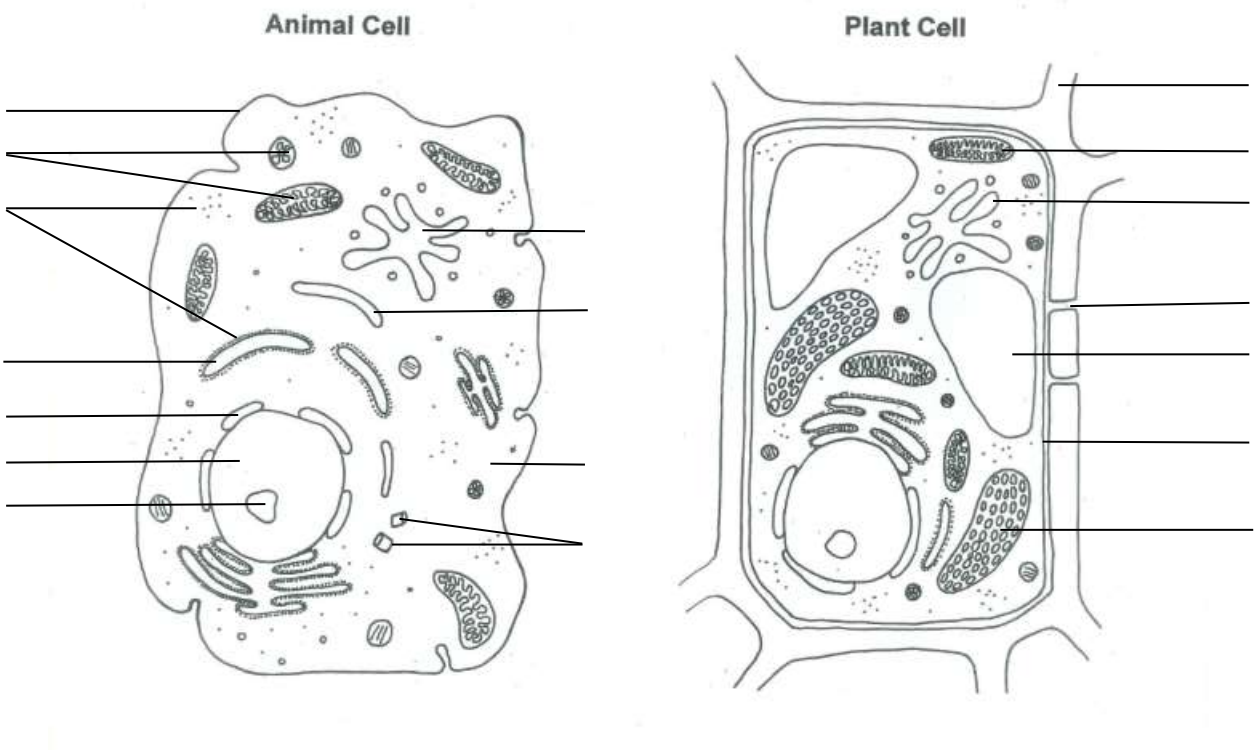
St George's Academy

July-September 2023

Name: _____

Topic 1- Cells and Cell Structure

1. Label the structures on the two cells below.



2. For each organelle (cell structures) complete the following table:

Organelle	Function	Plant or Animal cell or both?
Nucleus		
Chloroplast		
Mitochondria		
Cell wall		
Cell membrane		
Vacuole (permanent)		
Ribosomes		
Cytoplasm		
Nuclear envelope		
Centrioles		
Rough Endoplasmic reticulum		
Nucleolus		
Smooth endoplasmic reticulum		
Plasmodesmata		
Golgi body/apparatus		

3. Magnification; You are expected to be able to easily convert between units (orders of magnitude) and to be able to use the following formula: Image size = actual size ÷magnification.

Microscope slides and micrographs from an electron microscope give images that are magnified.

Light microscopes can magnify up to 1000 times with special lenses but the largest magnification used in schools is usually 400 times.

Magnification is calculated by using a simple equation.

$$\text{magnification} = \frac{\text{size of image}}{\text{size of object}}$$

You may be asked to calculate magnification, the size of an object or the size of an image in a question. This may require the equation to be rearranged.

$$\text{size of image} = \text{size of object} \times \text{magnification}$$

$$\text{size of object} = \frac{\text{size of image}}{\text{magnification}}$$

Before you can use the magnification equation, all the units must be the same. **Table 1** shows the different units of size and their standard form.

Name	Number	Symbol	Standard Form
deci	0.1m	d	10^{-1}
centi	0.01m	c	10^{-2}
milli	0.001m	m	10^{-3}
micro	0.000001m	μ	10^{-6}
nano	0.000000001m	n	10^{-9}
pico	0.000000000001m	p	10^{-12}

Table 1 *Unit prefixes and their standard form*

a) A drawing of a transection of an artery is 3 cm across. The real artery was 4 mm across. What is the magnification of the drawing?

_____

_____

_____

_____

b) A publisher wants to put a photograph of a weightlifter into her book. The athlete is 1.85 m tall. The photograph needs to be shrunk 50 times. What is the height of the weightlifter in the photograph?

_____

_____

_____

_____

c) A photograph taken of a white blood cell under the microscope is 3.2 mm wide. If the label of the photograph says ×200 what is the actual width of the white blood cell?

_____

_____

_____

_____

Topic 2- ENZYMES

Enzymes are incredibly important molecules in Biology and you will have learnt a lot about them already at GCSE.

The aim of this work is to revisit and revise what you have done at GCSE but also to research and extend this knowledge into some aspects that you will study at A level.

Please take time to read through your GCSE notes as a starting point.

Watch these 2 you tube clips as well:

https://www.youtube.com/watch?v=rlH1ym916Fo

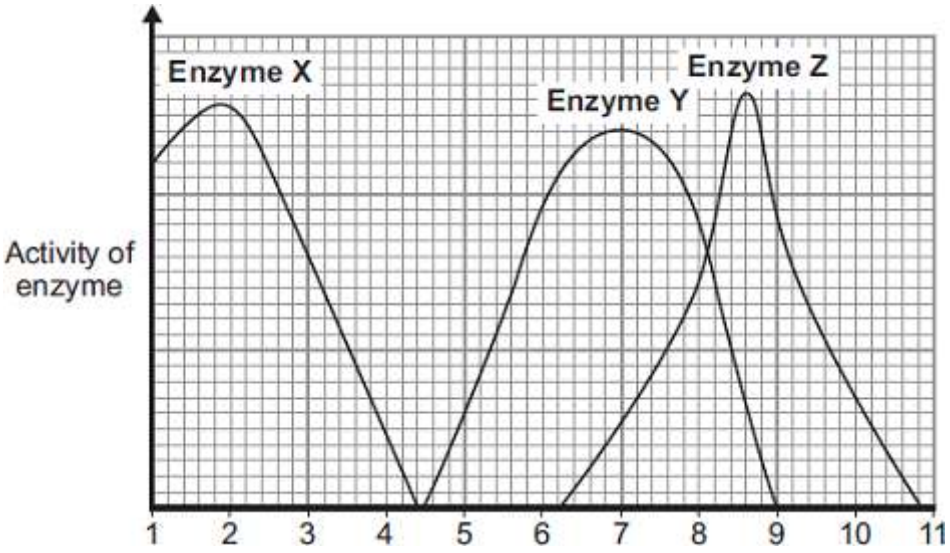
https://www.youtube.com/watch?v=qgVFkRn8f10

1. Complete the Exam Questions on Enzymes.

Enzymes Exam-style questions:

Q1.

(a) The graph shows the effect of pH on the activities of three enzymes, **X**, **Y** and **Z**.
These enzymes help to digest food in the human digestive system.
Each enzyme is produced by a different part of the digestive system.



(i) What is the optimum (best) pH for the action of enzyme **Z**?

_____

(1)

(ii) The stomach makes a substance that gives the correct pH for enzyme action in the human stomach.

Name this substance. _____

(1)

(iii) Which enzyme, **X**, **Y** or **Z**, will work best in the human stomach?

_____

(1)

(b) *In this question you will be assessed on using good English, organising information clearly and using specialist terms where appropriate.*

Different parts of the human digestive system help to break down molecules of fat so that they can be absorbed into the body.

Describe how.

To gain full marks you should refer to:

- the enzyme and where the enzyme is produced
- the products of digestion
- any other chemicals involved.

_____

_____

_____

_____

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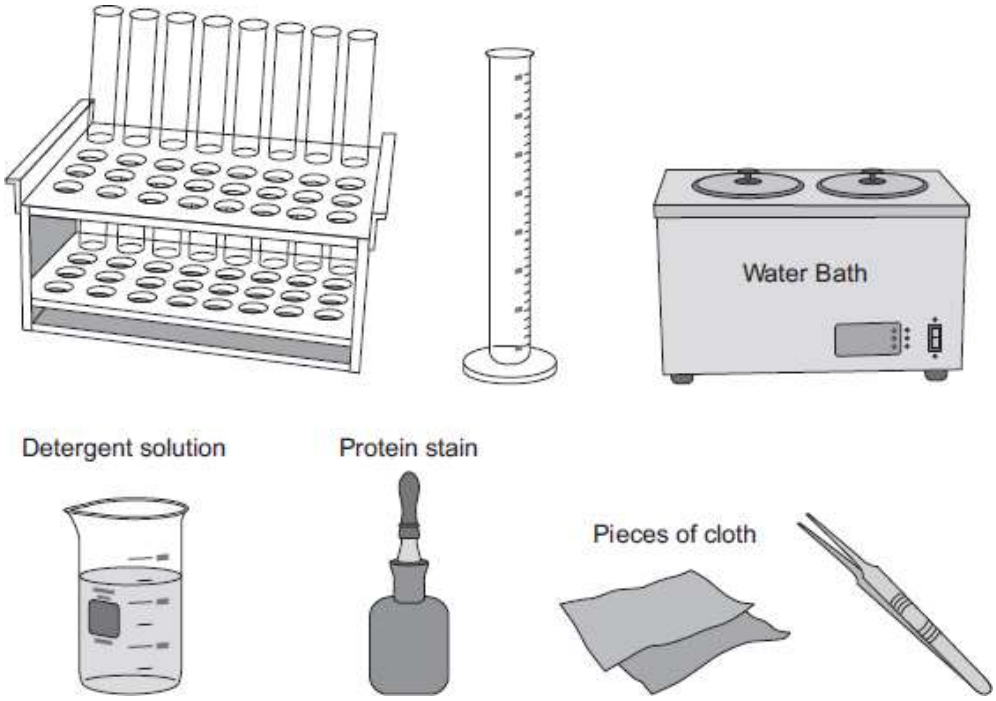
_____

(6)

Q2.

Biological detergents contain protease enzymes.

(a) The drawings show some apparatus and materials.



In this question you will be assessed on using good English, organising information clearly and using specialist terms where appropriate.

Describe how you would use the apparatus and materials shown in the drawings to find the best temperature for removing stains from clothing. You should include how you would make the investigation a fair test.

(6)

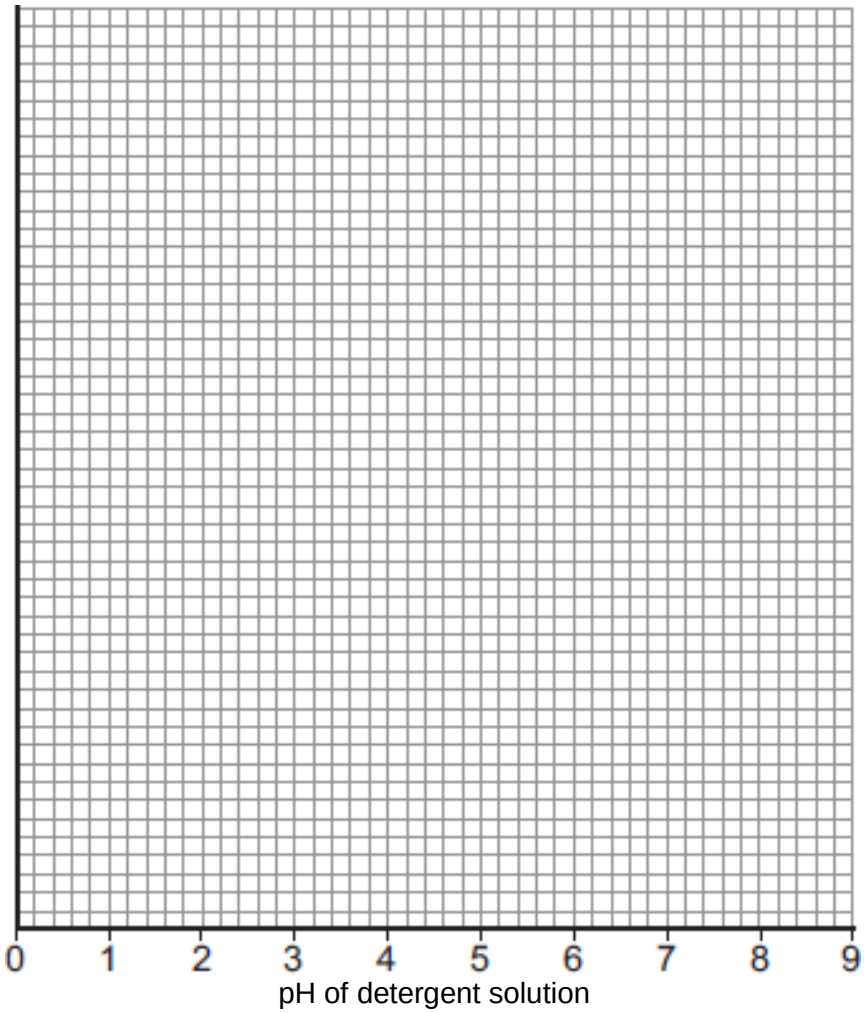
(b) In a similar investigation a student investigated the effect of pH on the time taken to remove a stain from pieces of cloth.

The table shows the student's results.

	pH of detergent solution								
	1	2	3	4	5	6	7	8	9
Time taken to remove stain in minutes	20	19	17	14	10	4	8	12	16

(i) On the graph paper below draw a graph to show the student's results.

- Add a suitable scale and label to the y axis.
- Plot the student's results.
- Draw a line of best fit.



(4)

(ii) Which is the best pH for using the detergent?

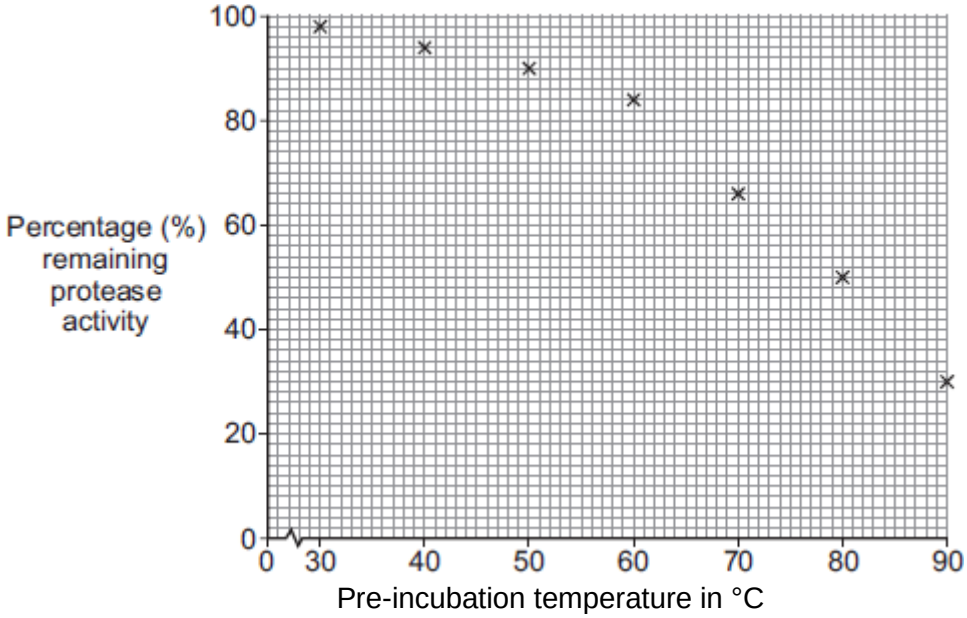
pH _____ **(1)**

(c) Scientists investigated the stability of a protease enzyme. The protease enzyme was extracted from plants.

The scientists:

- pre-incubated samples of the enzyme at various temperatures for 30 minutes
- put each sample on ice for a further 10 minutes
- measured the percentage (%) remaining activity of the enzyme in each sample. This was done by incubating each sample with protein at 37 °C for 6 hours.

The graph shows the scientists' results.



The scientists recommended that the enzyme could be used in detergents at a temperature of 60 °C.

Suggest why the scientists recommended a temperature of 60 °C.
Use information from the graph and your own scientific knowledge in your answer.

(3)

Topic 3 - Types of Transport

LO

a) Define the term ‘diffusion’.
b) Give examples of substances that diffuse into and out of cells.
c) Explain factors which affect the rate of diffusion.
d) Define the terms ‘osmosis’ and ‘active transport’
e) Apply knowledge of osmosis to unfamiliar situations.
f) Describe how active transport takes place.

Tasks

You might find the following site useful for revision before you attempt the tasks:

https://www.bbc.co.uk/bitesize/guides/zc7k2nb/revision/1

1. **Research and answer the following questions.**

a) State three factors which will affect the rate of diffusion **(1)**

b) Describe the difference between a dilute and a concentrated solution. **(2)**

Write a definition for each of the following terms: **(6)**

a) Diffusion

b) Osmosis

c) Active transport

c) Draw lines to connect the correct term with the definition: **(3)**

Isotonic	If the concentration of the solutes in the solution outside the cell is **higher** than the internal concentration.
Hypertonic	If the concentration of the solutes in the solution outside the cell is lower than the internal concentration.
Hypotonic	If the concentration of the solutes in the solution outside the cell is the same as the internal concentration.

d) Describe how active transport differs from both osmosis and diffusion **(3)**

_____

_____

_____

_____

e) State the difference between diffusion and osmosis **(2)**

_____

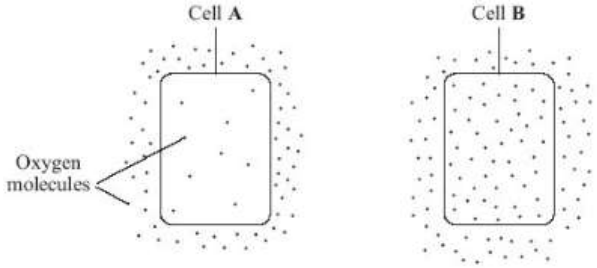
_____

_____

_____

2. Answer the following questions:

a) In which cell will diffusion happen fastest?



b) Water moves into and out of cells by _____. The water moves through a _____ _____ membrane.

c) <u>Which factor will decrease the rate of diffusion across a membrane?</u>

Increasing the surface area of the membrane

Increasing the differences in concentration outside and inside the membrane

Decreasing the temperature

d) <u>What happens to red blood cells when they are placed in water?</u>

They shrivel as water is lost by osmosis
The cells are unchanged as water moves in and out by osmosis
The cells swell up and burst

e) <u>Which of the following is a correct statement about osmosis?</u>

Water moves from a concentrated solution to a dilute solution across a partially permeable membrane
Water moves from a region of high water concentration to a low water concentration across a partially permeable membrane
Water moves from a region of high water concentration to a low water concentration across a partially permeable membrane

f) The mass of a cylinder of beetroot was 2.5 g. If its final mass in an osmosis experiment was 2.7 g, what was the increase in mass in per cent?

g) By which two processes does glucose enter cells in the human body?

A student investigated the effects of osmosis in potato tissue by placing potato cylinders in different concentrations of sugar solution.

Their results are shown below (as a percentage).

Experiment	1	2	3	4	5	6	7	8	9
Sugar solution - low concentration	+4	+5	+4	+6	+5	+6	+5	+6	+6
Sugar solution - high concentration	-12	-13	-15	-11	-16	-2	-15	-17	-15

h) Calculate the mean change in mass for each concentration. Do not include the anomalous result from Experiment 6 in your calculations.
Give your answer to one decimal place. **[2 marks]**

i) Explain why the student expressed change in mass as a percentage.

Topic 4- Immunity, Immunisation, and the use of Monoclonal Antibodies

An infectious disease is, in effect, an interaction between a pathogen, and the bodies various defence mechanisms against it. Sometimes a pathogen overwhelms the body's defences and the individual dies. Sometimes the bodies defence mechanisms overwhelm the pathogen and the body recovers from the disease. The body's defence mechanisms are then better prepared for a second infection from the same pathogen, and can destroy it before it causes harm in the future; this is known as IMMUNITY.

The body has a range of defences to protect itself, including three different types of white blood cells which we study at A level:

- **Phagocytes**
- **T Lymphocytes**
- **B Lymphocytes**

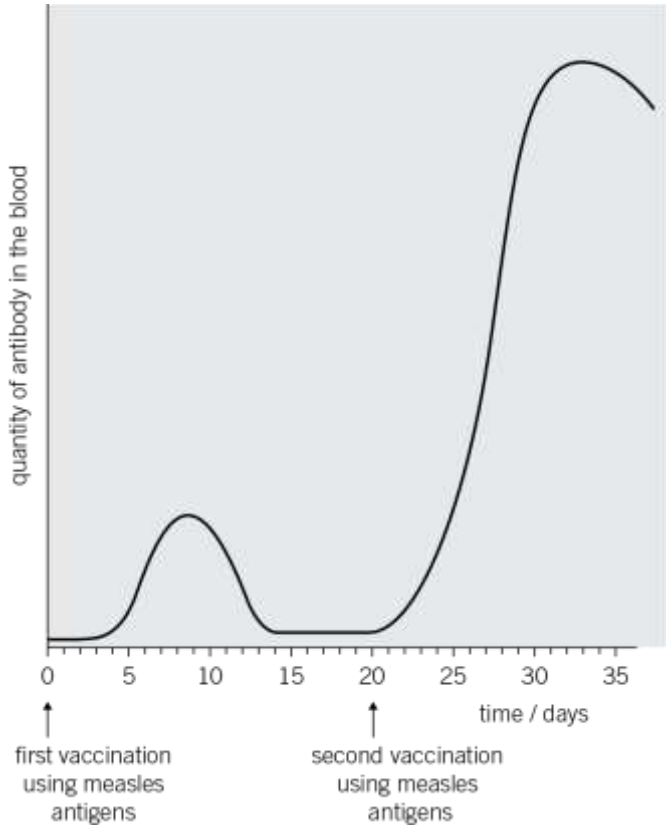
Research the above three types of white blood cell and then consider the statements below. In each box, indicate which type of white blood cell it referring to (using the letters P, T or B)

Hint-some statements are true for more than one type of white blood cell ☺

Formed in bone marrow	Activated by antigen binding to receptor	Contain antibodies in cell membrane
Reproduce by mitosis	Secrete antibodies	Part of the specific immune response
Humoral immunity	Formed from stem cells	Activated in the Thymus gland
Mature in bone marrow	Part of the non-specific immune response	Can only be activated by a single type of antigen
Cell mediated immunity	Produce memory cells	Perform phagocytosis
Activated by T helper cells	Provide immunity	Produce a protein that makes holes in cell membranes
Stimulate phagocytes	Kill infected cells	Use lysosomes to destroy pathogen cells

The Primary and Secondary Immune Response:

A child was given two vaccinations consisting of antigens from the virus which causes measles. The graph shows the concentration of antibodies in the child's blood resulting from these vaccinations:



a Describe what a measles antigen is:

.....

.....

(*2 marks*)

b Describe and explain the difference in the child's response to the two vaccinations shown in the graph.

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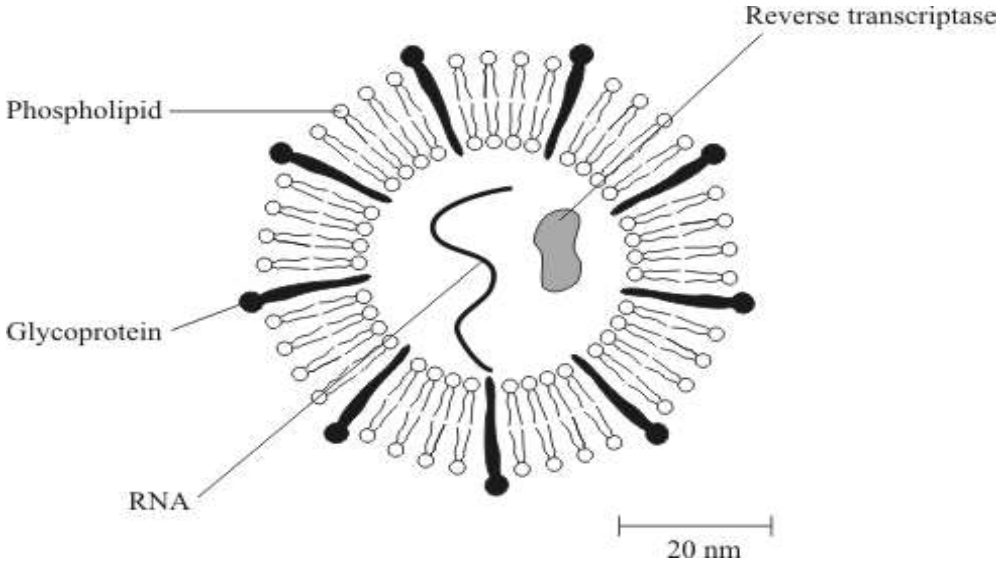
(*3 marks*)

(c) The diagram shows some components of a human immunodeficiency virus (HIV).



(i) Suggest which labelled component of the virus is most likely to act as an antigen. Give a reason for your answer.

Component .....

Reason .....

.....

(1)

(ii) A cell that HIV infects is 15 µm in diameter. Calculate how many times larger in diameter this cell is than an HIV particle. Show all of your working:

Answer ..... times larger

(2)