Name: _____

Science Revision Session

Describe and explain

Class: _____

Date: _____

Time: **31 minutes**

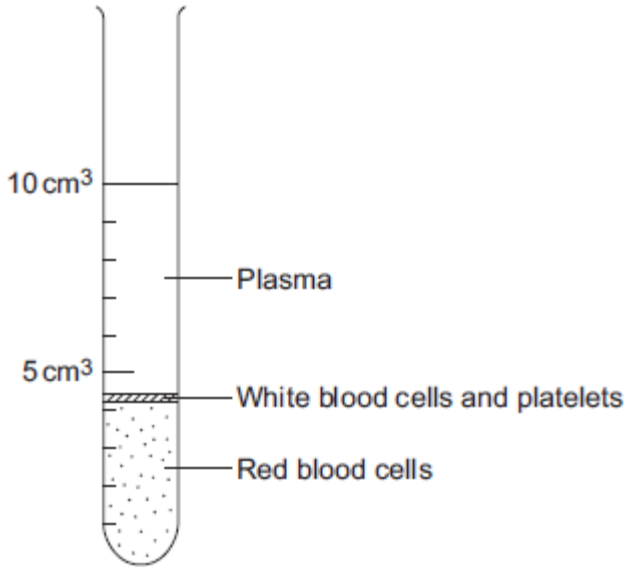
Marks: **31 marks**

Comments:

Q1.

The parts of the blood can be separated from each other by spinning the blood in a centrifuge.

The image below shows the separated parts of a 10 cm^3 blood sample.



(a) Calculate the percentage of the blood that is made up of plasma.

_____

_____

Answer = _____ %

(2)

(b) Name **three** chemical substances transported by the plasma.

1. _____

2. _____

3. _____

(3)

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

White blood cells are part of the immune system. White blood cells help the body to defend itself against pathogens.

Describe how pathogens cause infections **and** describe how the immune system defends the body against these pathogens.

_____

_____

_____

(6)

(Total 11 marks)

Q2.

(a) Complete the equation for photosynthesis.

_____ + water $\xrightarrow{\text{light energy}}$ _____ + _____

(3)

(b) The rate of photosynthesis in a plant depends on several factors in the environment.
These factors include light intensity and the availability of water.

Describe and explain the effects of **two other** factors that affect the rate of photosynthesis.

You may include one or more sketch graphs in your answer.

_____

_____

_____

_____

_____

_____

(5)

(Total 8 marks)

Q3.

(a) Complete the equation for photosynthesis.

(2)

(b) Scientists investigated how temperature affects the rate of photosynthesis.
The scientists grew some orange trees in a greenhouse.
They used discs cut from the leaves of the young orange trees.

The scientists used the rate of oxygen production by the leaf discs to show the rate of photosynthesis.

(i) The leaf discs did not produce any oxygen in the dark.

Why?

_____

_____

(1)

(ii) The leaf discs took in oxygen in the dark.

Explain why.

_____

_____

_____

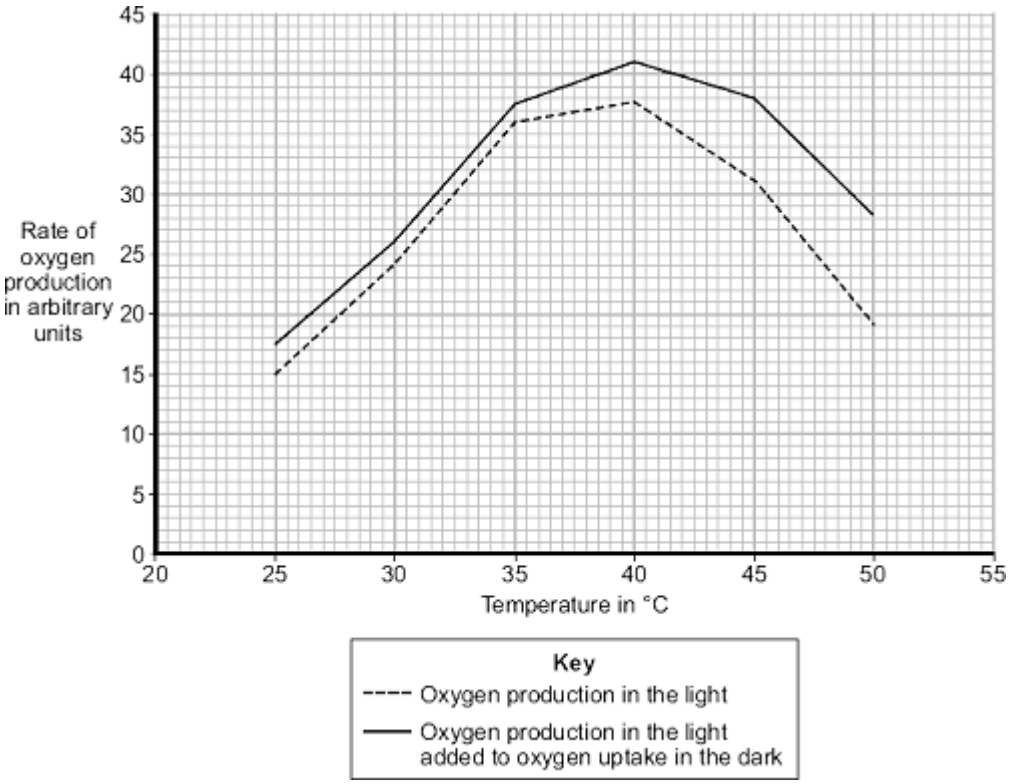
_____

(2)

(c) In their investigation, the scientists measured the rate of oxygen release by the leaf discs in the light. The scientists then measured the rate of oxygen uptake by the leaf discs in the dark.

The graph shows the effect of temperature on

- oxygen production in the light
- oxygen production in the light added to oxygen uptake in the dark.



Use the information from the graph to answer each of the following questions.

(i) Describe the effect of temperature on oxygen production in the light.

_____

_____

_____

_____

(2)

(ii) Explain the effect of temperature on oxygen production in the light when the temperature is increased:

from 25 °C to 35 °C

_____

_____

_____

from 40 °C to 50 °C.

_____

_____

(2)

(d) A farmer in the UK wants to grow orange trees in a greenhouse. He wants to sell the oranges he produces at a local market.
He decides to heat the greenhouse to 35 °C.

Explain why he should **not** heat the greenhouse to a temperature higher than 35 °C.
Use information from the graph in your answer.

(3)

(Total 12 marks)

Q1.

(a) 55%

2 marks for correct answer alone
accept 54 − 56
*5.5 / 10 × 100 alone gains **1** mark*

2

(b) any **three** from:

- amino acids
- antibodies
- antitoxins
- carbon dioxide
- cholesterol
- enzymes
- fatty acid
- glucose
- glycerol
- hormones / named hormones
- ions / named ions
- proteins
- urea
- vitamins
- water.

ignore blood cells and platelets
ignore oxygen
max 1 named example of each for ions and hormones
allow minerals

3

(c) Marks awarded for this answer will be determined by the Quality of Communication (QC) as well as the standard of the scientific response. Examiners should also refer to the information in the Marking Guidance and apply a 'best-fit' approach to the marking.

0 marks
No relevant content.

Level 1 (1 – 2 marks)
There is a description of pathogens with errors or roles confused.
or
the immune response with errors or roles confused.

Level 2 (3 – 4 marks)
There is a description of pathogens **and** the immune response with some errors or confusion
or
a clear description of either pathogens **or** the immune response with few errors or little confusion.

Level 3 (5 – 6 marks)
There is a good description of pathogens **and** the immune response with very

few errors or omissions.

Examples of biology points made in the response:

- bacteria and viruses are pathogens
  credit any ref to bacteria and viruses
- they reproduce rapidly inside the body
- bacteria may produce poisons / toxins (that make us feel ill)
- viruses live (and reproduce) inside cells (causing damage).

white blood cells help to defend against pathogens by:

- ingesting pathogens / bacteria / (cells containing) viruses
  credit engulf / digest / phagocytosis
- to destroy (particular) pathogen / bacteria / viruses
- producing antibodies
- to destroy particular / specific pathogens
- producing antitoxins
- to counteract toxins (released by pathogens)
  credit memory cells / correct description
- this leads to immunity from that pathogen.

6

[11]

Q2.

(a) LHS – carbon dioxide / CO_2
allow CO2
ignore CO^2

1

RHS
in either order

glucose / carbohydrate / sugar
allow starch
allow $C_6H_{12}O_6$ / C6H12O6
ignore $C^6H^{12}O^6$

1

oxygen
allow O_2 / O2
ignore O^2 / O

1

(b) any **five** from:

- factor 1: CO^2 (concentration)
- effect - as CO_2 increases so does rate and then it levels off or shown in a graph
- explanation:
  (graph increases) because CO_2 is the raw material or <u>used</u> in photosynthesis / converted to organic substance / named eg

or
(graph levels off) when another factor limits the rate.
accept points made via an annotated / labelled graph

- factor 2: temperature
allow warmth / heat

- effect – as temperature increases, so does the rate and then it decreases or shown in a graph
allow 'it peaks' for description of both phases

- explanation:
(rise in temp) increases rate of chemical reactions / more kinetic energy
allow molecules move faster / more collisions

or
(decreases) because the enzyme is denatured.
context must be clear = high temperature

allow other factor plus effect plus explanation:
eg light wavelength / colour / pigments / chlorophyll / pH / minerals / ions / nutrients / size of leaves
2nd or 3rd mark can be gained from correct description and explanation

5

[8]

Q3.

(a) LHS: carbon dioxide **AND** water
in either order
*accept CO_2 **and** H_2O*
allow CO2 and H2O
if names given ignore symbols
*do **not** accept CO^2 / H^2O / Co / CO*
ignore balancing

1

RHS: sugar(s) / glucose / starch / carbohydrate(s)
accept $C_6H_{12}O_6$
allow C6H12O6
*do **not** accept $C^6H^{12}O^6$*

1

(b) (i) light is needed for photosynthesis

or

no photosynthesis occurred (so no oxygen produced)

1

(ii) oxygen is needed / used for (aerobic) respiration
full statement
*respiration occurs **or** oxygen is needed for anaerobic respiration gains **1** mark*

2

(c) (i) (with increasing temperature) rise then fall in rate

1

use of figures, ie

max. production at 40 °C
or maximum rate of 37.5 to 38

1

(ii) <u>25 – 35 °C</u>

either faster movement of particles / molecules / more collisions
or particles have more energy / enzymes have more energy

1

or temperature is a limiting factor over this range

<u>40 – 50 °C</u>

denaturation of proteins / enzymes

ignore denaturation of cells
ignore stomata

1

(d) above 35 °C (to 40 °C) – little increase in rate
or > 40 °C – causes decrease in rate

1

so waste of money **or** less profit / expensive

1

because respiration rate is higher at > 35 °C
or
respiration reduces the effect of photosynthesis

1

[12]

Q1.

(a) Over three quarters of students were able to complete the calculation correctly. However, many students misread the scale or did not attempt this question.

(b) This question provided a good range of discrimination between students. Almost half the students were able to name three chemical substances transported in the blood. The most common incorrect responses were: red blood cells, white blood cells and platelets.

(c) This six-mark question produced a broad range of marks and it was very well answered by some students. Many students were able to access level 2 by either describing the pathogens or defence mechanisms in detail.

A considerable number of students however, misread the question and spent a lot of time and effort describing how pathogens are prevented from entering the body. Many wrote at length about skin being a barrier, stomach acid and tears. They also described clotting of blood at wounds and formation of scabs. None of this was creditworthy.

A number of students, when describing how pathogens cause infections wrote in general terms and failed to use the words 'bacteria' or 'virus'. Those who did, usually went on to describe viruses living in cells and bacteria producing toxins and so were able to gain more marks.

The second part of the question was generally better answered. Most students understood phagocytosis and antibody production. Few, however, talked about the specificity of antibodies. Antitoxin production was well described but few went on to mention about future immunity as a result of previous exposure to a pathogen. However, this was not required to gain full marks. A number of students used rather weak language e.g. 'fight' pathogens, 'kill' toxins, although many were familiar with the terms 'phagocyte' and 'lymphocyte'. One fairly common confusion was between the words 'antigen' and 'antibody'. Nevertheless, the question was generally well answered.

Q2.

(a) The vast majority of students had no problem with completion of the word equation for photosynthesis by naming the three missing substances. Students were at liberty to use chemical formulae if they wished, but only *correct* formulae were credited – e.g. for oxygen, O_2 is correct, but 'O' and 'O^{2}' are not.

(b) In this section, students had to describe and explain the effects of two factors, apart from light intensity and the availability of water, that affect the rate of photosynthesis. Most students correctly selected temperature and carbon dioxide, but a minority included one of the factors that were excluded by the question, usually light intensity – no marks were available for this. Students were informed that they were at liberty to include one or more sketch graphs in their answers. However, many did not include any graphs and had the much harder task of describing the effects of their chosen factors in a prose account. Those that did include simple, correct graphs often scored 4 out of the 5 marks available just from their graphs. Students found explanations of their described effects to be more challenging. For example, simply to state that carbon dioxide was 'needed for' photosynthesis was regarded as inadequate, but if it was used as a raw material or converted into some organic

substance, this was considered to be satisfactory. The explanation for the effect of temperature usually centred on the denaturation of enzymes at higher temperatures. Relatively few students mentioned the effect of speeding up chemical reactions at more moderate temperatures. A few students chose other factors, such as the pH of the soil, the availability of nutrients / ions, the wavelength of the light, the amount of chlorophyll in the leaves and the size of the leaves. These were given credit, but students often found description of the effect and its explanation rather more challenging for these factors.

Q3.

(a) The vast majority of students were able to complete the equation for photosynthesis correctly.

(b) (i) Just over three-quarters of students understood that, since oxygen was a product of photosynthesis, no oxygen would be produced by the leaf discs in the dark as light was needed for photosynthesis. Some students threw the mark away through careless expression and others invoked an incorrect reason, such as a lack of carbon dioxide.

(ii) Less than a third of students were able to explain that the leaf discs took in oxygen in the dark because it was used in respiration. Some had some very strange ideas, such as oxygen, being O_2, would be a part of carbon dioxide (CO_2); or that, because the plant could not produce oxygen by photosynthesis, it had to take it in instead (for some unstated purpose).

(c) (i) The command word was 'Describe'. This did not prevent many students attempting an explanation – usually in terms of enzymes being denatured at higher temperatures – for which *no marks* were available. Many students described the increase in rate of oxygen production but forgot to mention the decrease at higher temperatures. Others described an increase up to 35°C and then a "decrease" between 35 and 40°, which was incorrect as the rate was still increasing and did not decrease until above 40°C. Full marks were easily available for simply stating that the rate increased up to 40°C and decreased above 40°C.

(ii) This part asked students to 'Explain' the results for two temperature ranges, most merely *described* the trend. Answers for the range 25 to 35°C were particularly weak as a reference to energy and molecules , or to temperature being a limiting factor, was needed. More success was gained for the 40 to 50°C range as many students realised that enzymes or proteins would be denatured (although weaker students thought the plant would be denatured). Over two-thirds of students scored no marks for this question.

(d) The most common point rewarded in answer to this question was the economic argument. Very few students backed this up with an adequate explanation relating to the marginal increase in rate between 35 and 40°C. Indeed, some students appeared to believe that 35° was the optimum temperature. Unfortunately, even fewer students appreciated that the respiration rate increased faster than that of photosynthesis between 35 and 40°C, as evidenced by the widening gap between the two lines on the graph, which would reduce the effect of photosynthesis.