Organisation part 3

headstartscience.co.uk

Name: _____

Class: _____

Date: _____

Time: **97 minutes**

Marks: **90 marks**

Comments:

Q1.

Amylase is an enzyme that digests starch in the digestive system.

(a) Explain why starch has to be digested.

_____

_____

_____

_____

(2)

A student used a colorimeter to investigate the rate of starch digestion.

A colorimeter measures the percentage of light passing through a liquid.

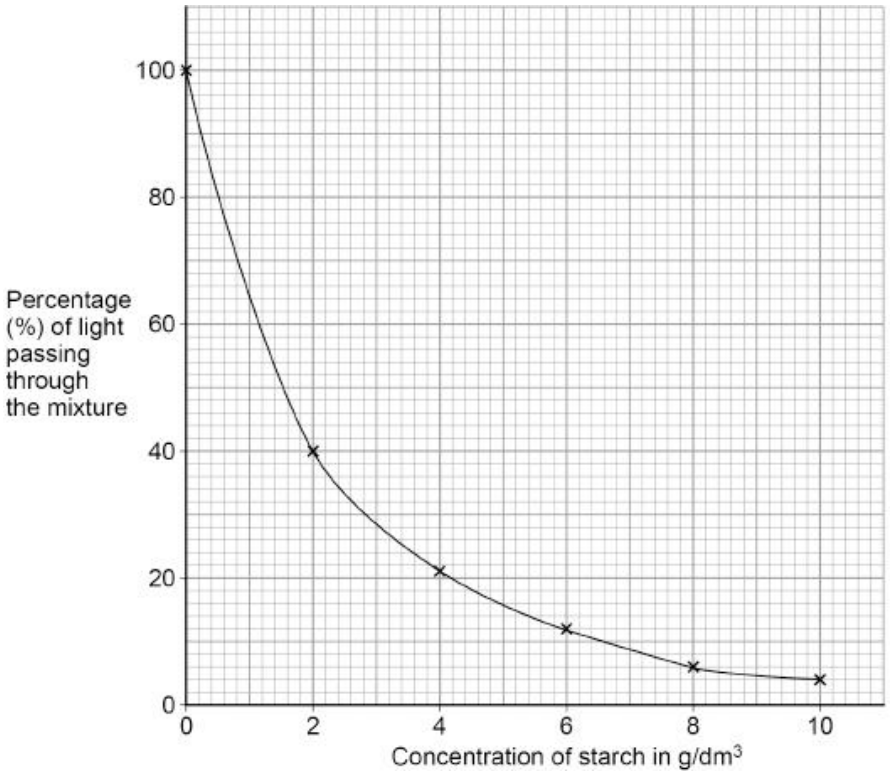
The darker the colour of the liquid, the less light passes through.

The student:

- mixed 1 cm^3 of starch suspension with 10 cm^3 of iodine solution
- measured the percentage of light passing through the mixture
- repeated with different concentrations of starch suspension.

Figure 1 shows the results.

Figure 1



(b) Suggest what liquid was used for the test with 0 g/dm^3 starch concentration.

_____

_____

(1)

(c) Explain the change in the percentage of light passing through the different concentrations of starch suspension in iodine solution.

Use **Figure 1**.

_____

_____

_____

_____

_____

_____

(3)

The student then investigated the rate of starch digestion using amylase.

This is the method used.

1. Put 10 cm^3 of starch suspension into a test tube.

2. Put 5 cm^3 of amylase solution into a separate test tube.

3. Put both test tubes into a water bath at 37 °C for 10 minutes.

4. Mix the contents of both test tubes together in a beaker.

5. Put the beaker into the water bath.

6. Remove 1 cm^3 of the mixture and add it to 10 cm^3 of iodine solution.

7. Measure the percentage of light passing through the liquid.

8. Repeat steps 6 and 7 every minute for 5 minutes.

(d) The starch suspension and the amylase solution were kept in the water bath for 10 minutes before being mixed together.

Give the reason why.

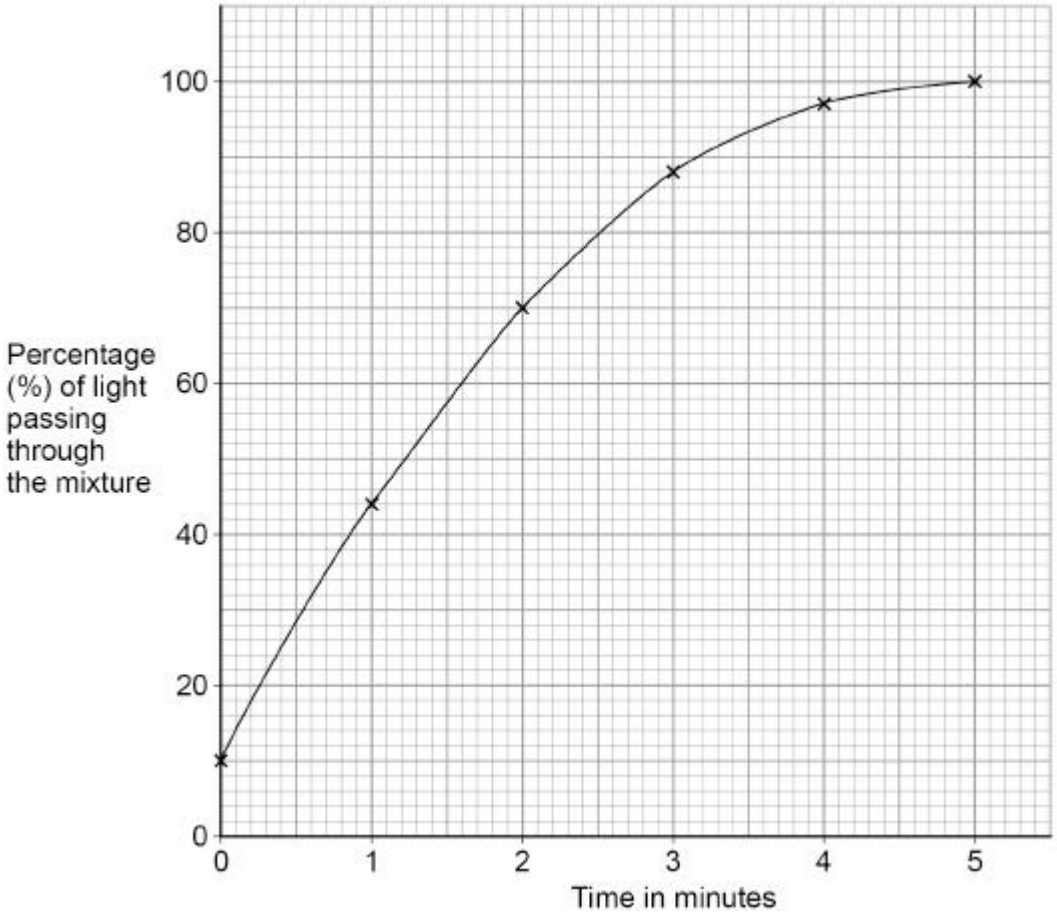
_____

_____

(1)

Figure 2 shows the results.

Figure 2



(e) The concentration of starch at 3 minutes was 0.3 g/dm^3.

Calculate the mean rate of starch digestion for the first 3 minutes.

Use **Figure 1** and **Figure 2**.

Mean rate = _____ g/dm^3 per minute

(4)

(f) The investigation was carried out at pH 7

Explain how the results would be different if the investigation was carried out at pH 1

Use **Figure 2**.

_____

_____

_____

_____

_____

_____

(3)

(Total 14 marks)

Q2.

Antibiotics are drugs used to treat bacterial infections.

Mutations in bacteria produce new strains.

Some strains of bacteria are resistant to antibiotics.

(a) Where do mutations happen in a **bacterial** cell?

_____

(1)

A scientist investigated which antibiotics (**A**, **B**, **C**, **D** and **E**) killed *Staphylococcus aureus*

(*S. aureus*) bacteria.

This is the method used.

1. Grow *S. aureus* bacteria in a Petri dish.

2. Cut five small discs of paper.

3. Soak each paper disc in a different antibiotic solution.

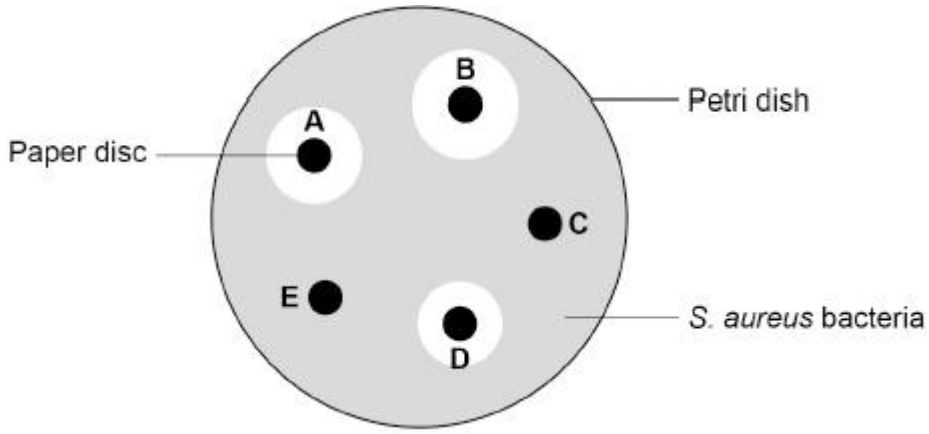
4. Put the five paper discs into the Petri dish.

5. Keep the Petri dish at 37 °C for 24 hours.

Figure 1 shows the results.

A clear area around a disc shows where the bacteria have been killed.

Figure 1



(b) The scientist concluded:

'*S. aureus* is resistant to antibiotics **C** and **E**'.

Explain the evidence for this conclusion.

Use **Figure 1**.

_____

_____

_____

_____

(2)

(c) The scientist later discovered that *S. aureus* is **not** resistant to antibiotic **E**.

Suggest how the method was developed and showed that *S. aureus* is **not** resistant to antibiotic **E**.

_____

_____

_____

_____

(2)

Broken bones are sometimes repaired using a metal implant.

The area around an implant can become infected with *S. aureus* bacteria. The infection is usually treated with a long-term course of antibiotics.

Long-term use of antibiotics has led to the development of antibiotic resistant bacteria. Research is being carried out into alternative treatments.

Stem cells from bone marrow and from fat tissue have antimicrobial properties.

A scientist investigated the effect of four treatments on the area of infection around metal implants. Each treatment was injected into the area around the implant.

The four treatments were:

- unreactive solution
- antibiotic solution
- stem cells from fat tissue
- stem cells from fat tissue containing antibiotic.

Each treatment was tested on 5 patients where an infection had developed around their metal implant.

After 7 days of treatment, the scientist calculated the ratio:

area of infection **:** total tissue area

(d) What was the independent variable in this investigation?

Tick (✓) **one** box.

The ratio of area of infection **:** total tissue area	☐
The treatment injected around the implant	☐
The type of antibiotic used	☐
The type of bacterial infection	☐

(1)

(e) Suggest **one** advantage of using stem cells from fat tissue, rather than using stem cells from bone marrow.

_____

_____

(1)

(f) Stem cells containing antibiotic were produced by growing the cells for 24 hours in a solution containing the antibiotic.

How did the antibiotic enter the stem cells from the solution?

Give a reason for your answer.

Tick (✓) **one** box.

By active transport	☐
By diffusion	☐
By osmosis	☐
By translocation	☐

Reason _____

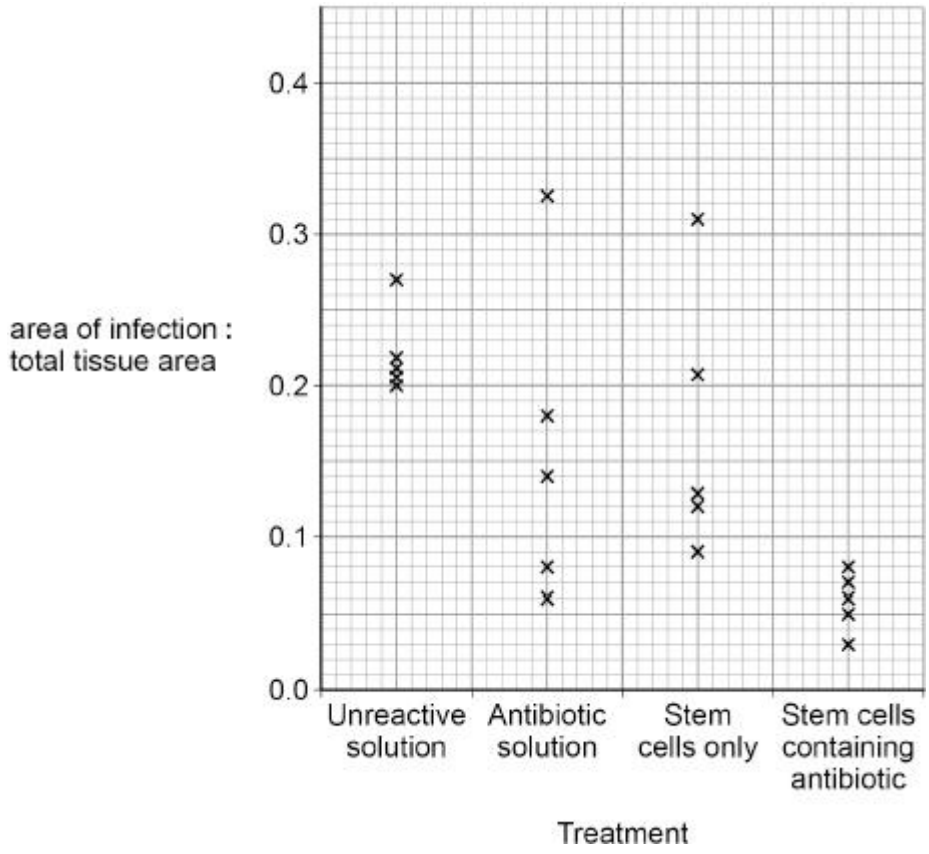
_

_____

(2)

Figure 2 shows the results.

Figure 2



(g) What is the range of results for the treatment with stem cells only?

From _____ to _____

(1)

(h) A student looked at the results and concluded:

'Injections of stem cells containing antibiotic should be used to treat **all** implant-related infections'.

Evaluate the student's conclusion.

Use **Figure 2**.

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

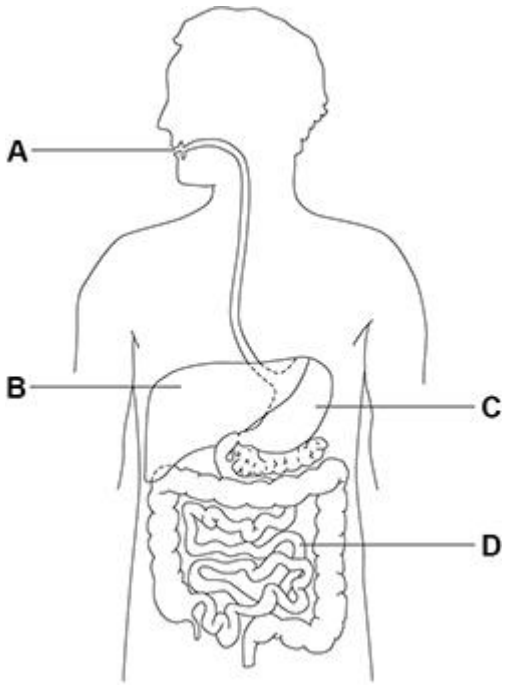
(4)

(Total 14 marks)

Q3.

Foods are digested before they are absorbed into the blood.

The diagram below shows organs in the human digestive system.



(a) Which organ is the stomach?

Tick (✓) **one** box.

A ☐ **B** ☐ **C** ☐ **D** ☐

(1)

(b) What type of enzyme is produced in the stomach?

Tick (✓) **one** box.

Carbohydrase ☐

Lipase ☐

Protease ☐

(1)

(c) Which term describes the pH in the stomach?

Give **one** reason why the stomach is this pH.

Tick (✓) **one** box.

Acidic ☐

Alkaline ☐

Neutral ☐

Reason _____

_

_____

(2)

(d) Which organ produces bile?

Tick (✓) **one** box.

Large intestine ☐

Liver ☐

Mouth ☐

Pancreas ☐

(1)

(e) How does bile help in the digestion of foods?

Tick (✓) **one** box.

It increases the surface area of fats. ☐

It is an enzyme that digests protein. ☐

It makes the pH in the small intestine acidic. ☐

(1)

A student tested different foods for the presence of protein, starch and sugar.

(f) Draw **one** line from each food molecule to the reagent used to test for the food molecule.

Food molecule	**Reagent**
Protein	Benedict's solution
Starch	Biuret reagent
Sugar	Iodine solution

(2)

(g) Give **one** safety precaution a student should take when using Benedict's solution.

_____

_____

(1)

(h) The table below shows the results for one food sample.

Test	**Benedict's test**	**Biuret test**	**Iodine test**
Colour after test	Red	Blue	Black

Which of the tests show positive results?

Tick (✓) **one** box.

All three tests ☐

Benedict's and Biuret tests only ☐

Benedict's and iodine tests only ☐

Biuret and iodine tests only ☐

(1)

(i) Starch molecules are **not** absorbed into the blood from the digestive system.

Give **one** reason why.

_____

_____

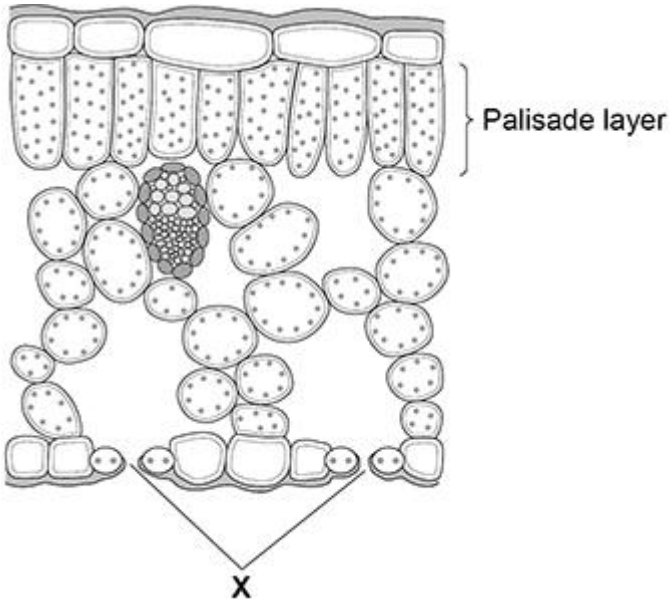
(1)

(Total 11 marks)

Q4.

Figure 1 shows a section through a leaf.

Figure 1



(a) Give **one** way that the palisade layer is adapted for photosynthesis.

_____

_____

(1)

(b) Gases pass into and out of the leaf through small pores in the surface of the leaf.

What are the small pores labelled **X** called?

Tick (✓) **one** box.

Guard cells ☐

Stomata ☐

Xylem vessels ☐

(1)

(c) A student viewed a section of a leaf using a microscope.

The student measured the length of one of the palisade cells.

The cell image measured 28 mm in length when viewed at a magnification of ×400

Calculate the real length of the palisade cell in millimetres (mm).

Use the equation:

$$\text{real length} = \frac{\text{image length}}{\text{magnification}}$$

Real length = _____ mm

Convert the real length of the cell from millimetres to micrometres (μm).

1 mm = 1000 μm

Real length = _____ μm

(3)

(d) Carbon dioxide can move into and out of cells.

What is the process by which carbon dioxide can move into and out of cells?

Tick (✓) **one** box.

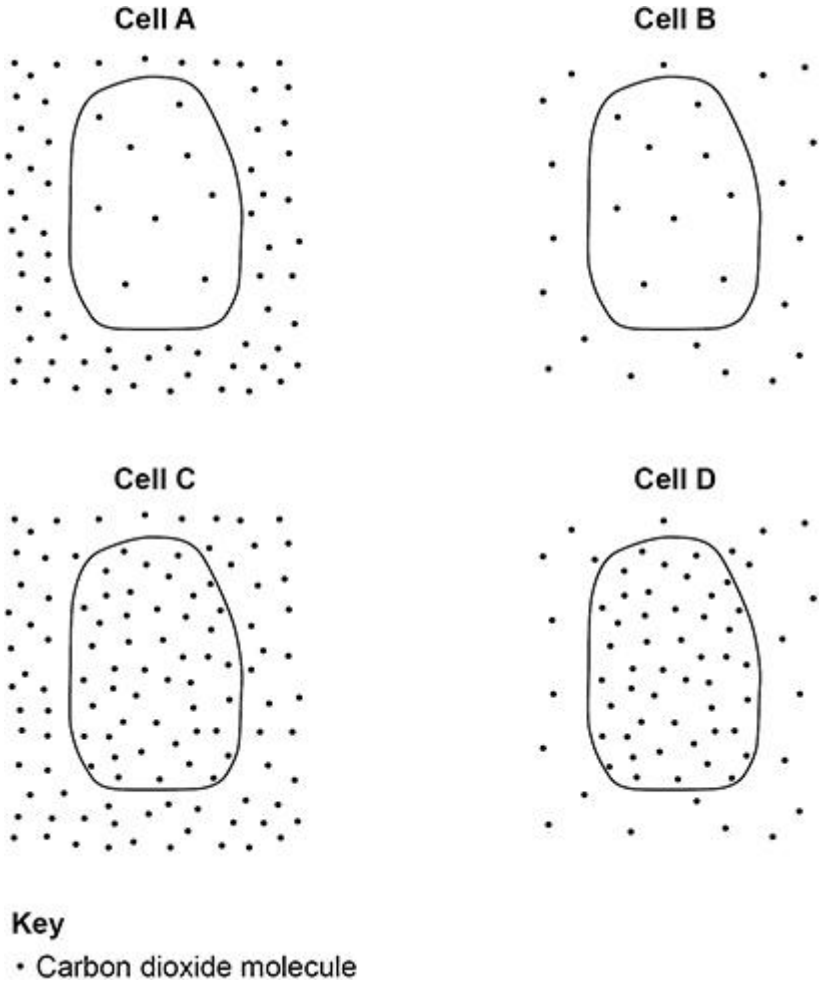
- Active transport ☐
- Diffusion ☐
- Osmosis ☐

(1)

Figure 2 shows a diagram of four cells.

Each cell is surrounded by carbon dioxide molecules.

Figure 2



(e) Which cell will carbon dioxide move into at the fastest rate?

Give a reason for your answer.

Tick (✓) **one** box.

A ☐ **B** ☐ **C** ☐ **D** ☐

Reason _____

_

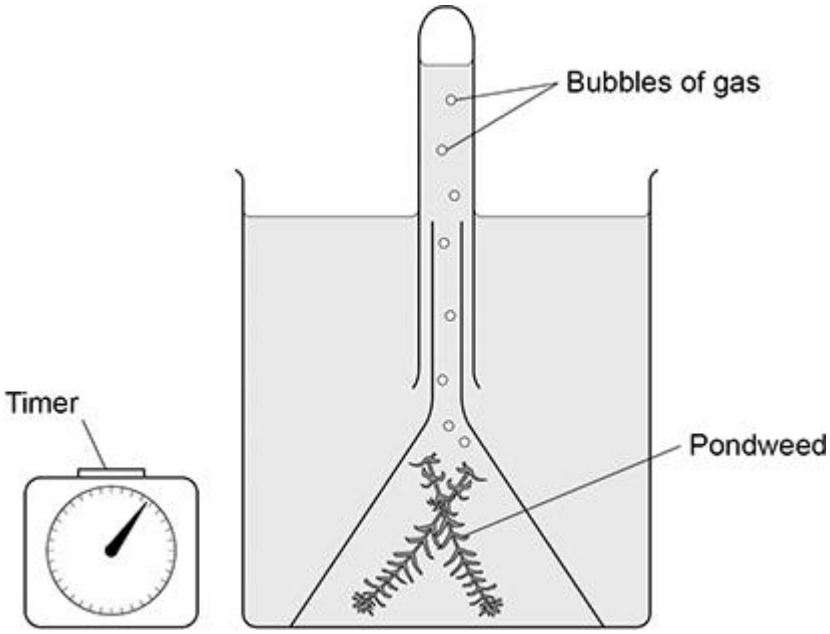
_____

(2)

A student investigated the effect of different colours of light on the rate of photosynthesis.

Figure 3 shows some of the apparatus the student used.

Figure 3



The student placed the apparatus in blue light, then in green light and then in red light.

The student measured the rate of photosynthesis in each colour of light.

(f) What **two** measurements should the student make to calculate the **rate** of photosynthesis?

1 _____

2 _____

(2)

(g) Give **two** variables the student should keep the same in this investigation.

1 _____

_____

2 _____

_____

(2)

The table below shows the results.

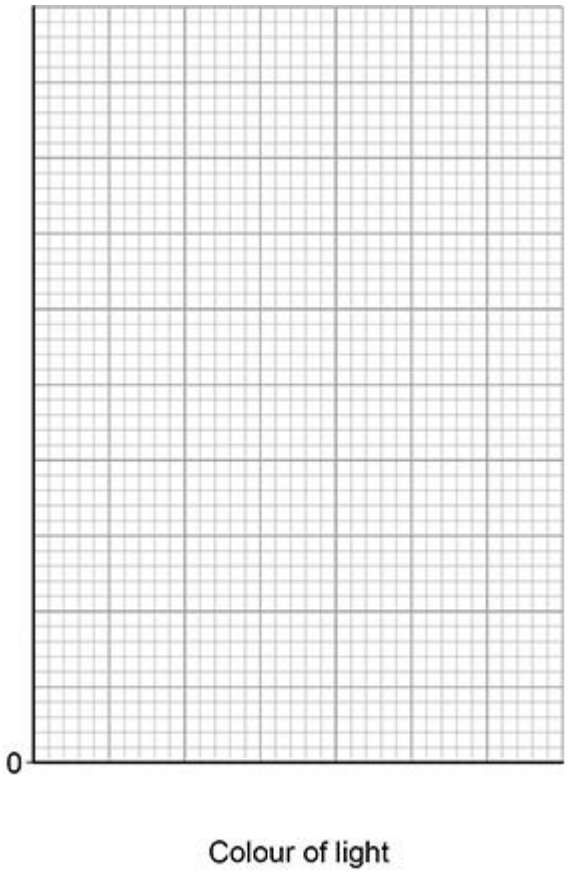
Colour of light	Rate of photosynthesis in arbitrary units
Blue	9
Green	1
Red	8

(h) Complete **Figure 4**.

You should:

- label the y-axis
- use a suitable scale
- plot the data from the table above as a bar chart
- label each bar.

Figure 4



(4)

(i) Look at the table above.

What colour of light should be used to grow plants in a greenhouse?

Tick (✓) **one** box.

Blue ☐ Green ☐ Red ☐

(1)

(Total 17 marks)

Q5.

Cigarette smoking is the main cause of cancer in the UK.

(a) Mutations in cells cause cancer.

Where in a cell do mutations happen?

Tick (✓) **one** box.

Cell membrane ☐

Cytoplasm ☐

Nucleus ☐

(1)

(b) Why do some cancers develop into large tumours?

Tick (✓) **one** box.

Cells never stop dividing ☐

Cell respiration is slowed down ☐

Enzyme activity is stopped ☐

(1)

Cigarette smoking has been linked to many different types of cancer.

(c) Lung cancer is the most common type of cancer caused by smoking.

Suggest **one** reason why.

_____

_____

(1)

(d) A person with lung cancer can develop secondary cancers in other parts of the body.

Describe how this can happen.

_____

_____

_____

(1)

(e) Sometimes a person may need a lung transplant.

The National Health Service (NHS) will **not** offer a lung transplant to a person who smokes.

Suggest **one** reason why.

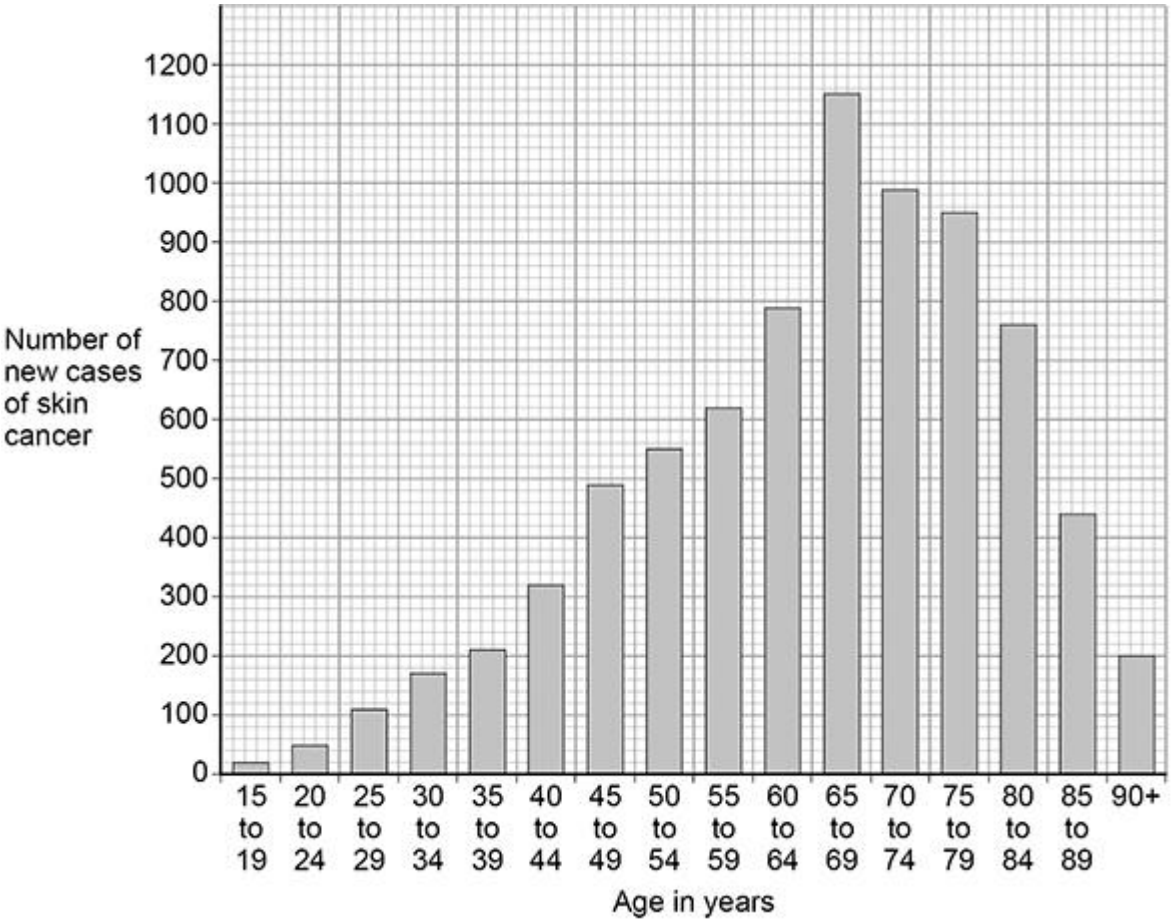
_____

_____

(1)

The figure below shows data about skin cancer in males for different age groups in the UK.

The data shows the number of new cases of skin cancer in one year.



(f) How many more new cases of skin cancer are there in males aged 40 to 44 than in males aged 15 to 19?

_____

_____

Number of new cases = _____

(1)

(g) There are no new cases of skin cancer diagnosed in males younger than 15 years of age.

Suggest **one** reason why.

_____

_____

(1)

(h) Give **one** conclusion from the data in the figure above.

_____

_____

(1)

(i) Survival rates for all types of cancers have improved over the last 20 years.

Suggest **two** reasons why.

1 _____

2 _____

(2)

(Total 10 marks)

Q6.

Bacteria can cause a variety of diseases in humans.

(a) What are **two** similarities between a bacterial cell and an animal cell?

Tick (✓) **two** boxes.

Both have a cell membrane.	☐
Both have a cell wall.	☐
Both have a nucleus.	☐
Both have cytoplasm.	☐
Both have plasmids.	☐

(2)

(b) Salmonella food poisoning is caused by bacteria in food.

Give **one** symptom of salmonella food poisoning.

Do **not** refer to vomiting or diarrhoea in your answer.

_____

_____

(1)

(c) What is the name of the first antibiotic developed?

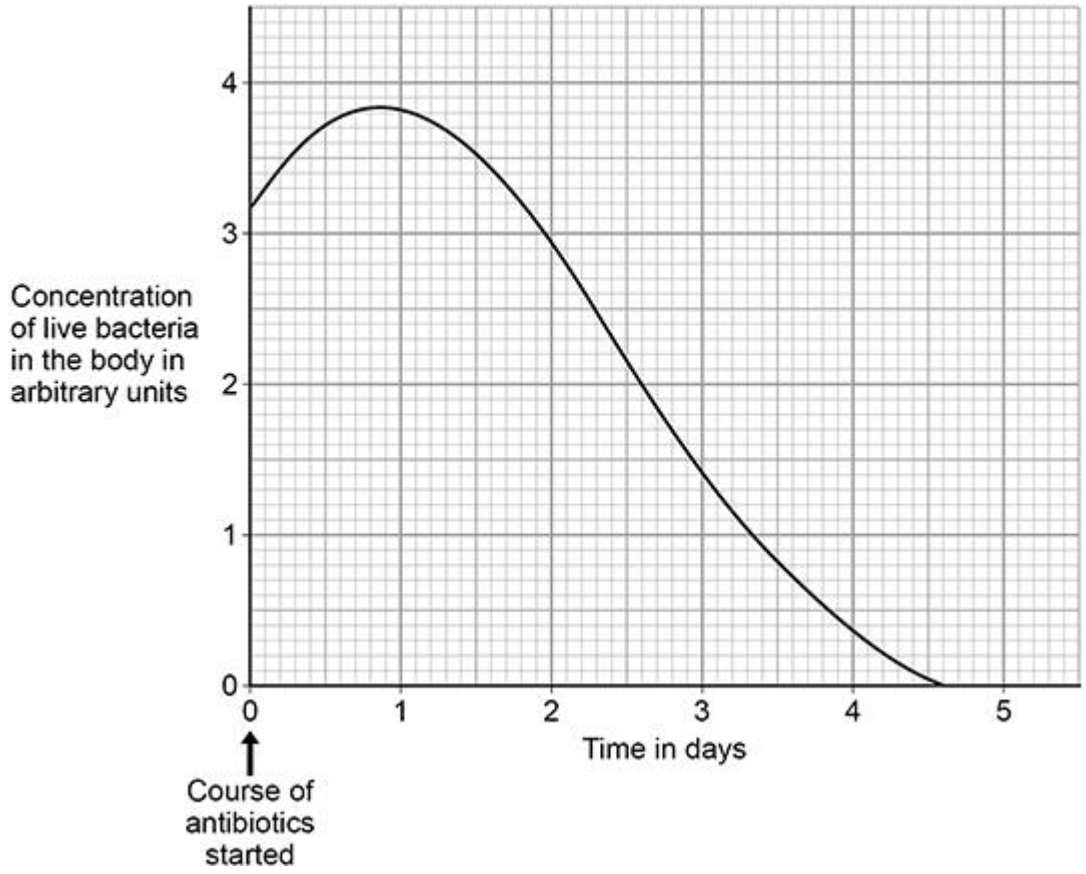
_____

(1)

A child with a severe bacterial infection was given a course of antibiotics.

Figure 1 shows how the concentration of live bacteria in the child's body changed when taking the course of antibiotics.

Figure 1



(d) The concentration of live bacteria in the body continued to increase after starting the course of antibiotics.

Suggest **one** reason why.

_____

_____

(1)

(e) After 3 days of taking the antibiotic:

- the child felt better
- there were still bacteria in the child's body.

Why did the child feel better?

Tick (✓) **one** box.

Bacteria had become immune to the antibiotic. ☐

The child had become resistant to the bacteria. ☐

There were fewer toxins in the body than at day 0 ☐

(1)

(f) Suggest why doctors do **not** give antibiotics to patients with minor infections.

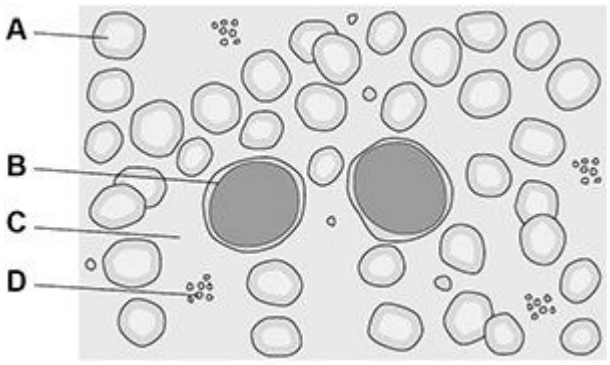
_____

_____

(1)

Figure 2 shows blood viewed using a microscope.

Figure 2



Blood viewed using a microscope © jarun011 / iStock

(g) A vaccine will stimulate the production of antibodies.

Which part of the blood in **Figure 2** produces antibodies?

Tick (✓) **one** box.

A ☐ **B** ☐ **C** ☐ **D** ☐

(1)

(h) Which part of the blood in **Figure 2** starts the clotting process?

Tick (✓) **one** box.

A ☐ **B** ☐ **C** ☐ **D** ☐

(1)

(Total 9 marks)

Q7.

Amylase is an enzyme that digests starch.

(a) Which organs in the human digestive system produce amylase?

Tick (✓) **one** box.

Liver, small intestine and large intestine ☐

Salivary glands, stomach and liver ☐

Salivary glands, pancreas and small intestine ☐

Stomach, pancreas and large intestine ☐

(1)

A student investigated the effect of pH on the activity of amylase.

This is the method used.

1. Prepare amylase solution at pH 5
2. Mix the amylase solution with starch in a boiling tube.
3. Remove a drop of the amylase-starch mixture every 30 seconds and test it for the presence of starch.
4. Record the time when all the starch has been digested.
5. Repeat steps 1 to 4 using amylase solution prepared at pH 6, then at pH 7 and then at pH 8

(b) What was the independent variable in this investigation?

_____

_____

(1)

(c) Describe how the student would know when all the starch had been digested.

_____

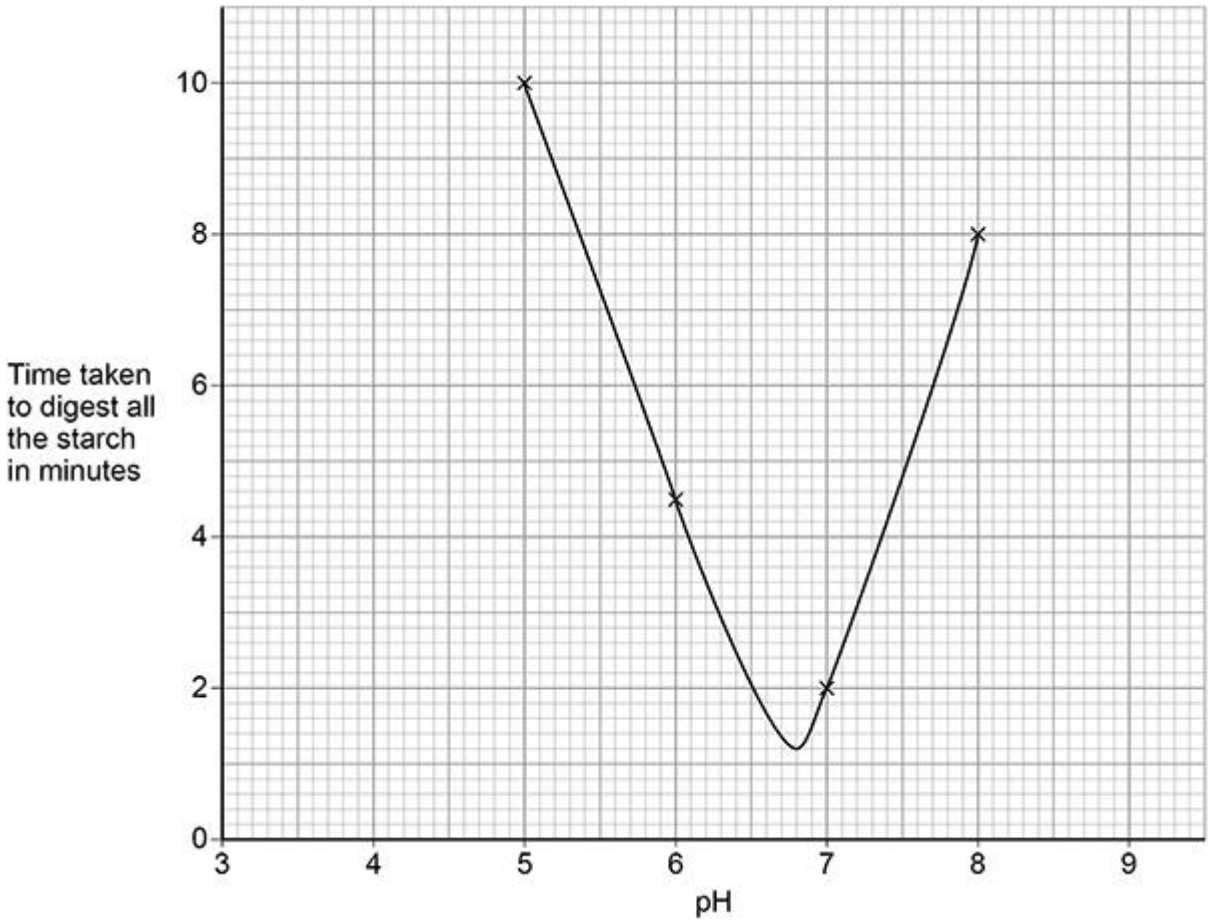
_____

_____

(1)

(d) **Figure 1** shows the student's results.

Figure 1



What was the optimum pH for the amylase?

Use **Figure 1**.

Optimum pH = _____

(1)

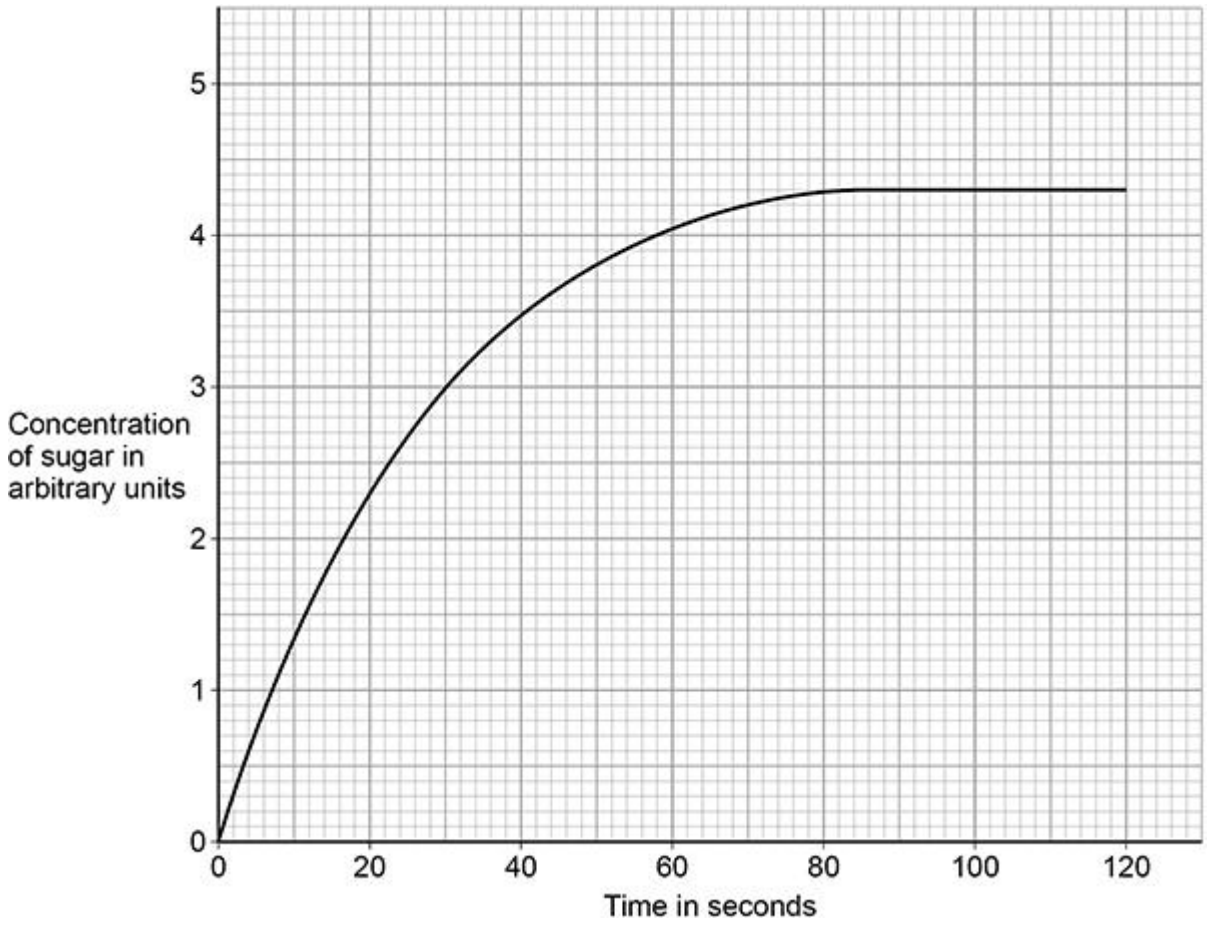
A scientist did a different investigation.

This is the method used.

1. Prepare amylase solution at the optimum pH.
2. Mix the amylase solution with starch in a boiling tube.
3. Measure the concentration of sugar every 10 seconds for 2 minutes.

Figure 2 shows the scientist's results.

Figure 2



(e) How much time did it take for the amylase to digest all the starch?

Use **Figure 2**.

Time to digest all the starch = _____ seconds

(1)

(f) Determine the rate of sugar production per minute at 40 seconds.

_____

_____

_____

_____

_____

_____

_____

Rate = _____ arbitrary units per minute

(4)

(g) Explain how the structure of enzyme molecules is related to the effect of pH on the activity of amylase.

(6)

(Total 15 marks)

Q1.

(a) starch (molecules) are large / insoluble

1

(so) cannot be absorbed (into the blood)

allow (so) cannot pass through the wall of the (small) intestine / gut

allow (so) cannot diffuse into the blood

allow sugar (molecules) are small / soluble (1)

(so) can be absorbed into the blood

or

(so) can pass through the wall of the (small) intestine / gut (1)

1

(b) (10 cm^3 dilute) iodine solution and (1 cm^3 of) water

allow (10 cm^3 dilute) iodine solution

allow water

ignore iodine unqualified

1

(c) percentage of light passing through the liquid decreased with increasing starch concentration

allow the more concentrated the starch (suspension) the less light could pass through

1

(because iodine) solution was darker (in colour)

allow (iodine) solution was blacker

allow the more (insoluble) starch the more cloudy the mixture

1

(so) absorbed more light

ignore less light passes through

1

(d) any **one** from:

- to allow them to reach 37 °C

  allow to allow them to reach body temperature
- so they would be at the optimum / same temperature

  allow to equilibrate

1

(e) 6.6 (g/dm^3)

allow answer in range 6.5 to 6.7 (g/dm^3)

1

6.6 - 0.3

or

6.3 (g/dm^3)

allow correctly calculated value consistent with range allowed in step 1

1

$\frac{6.3}{3}$

allow correct subtraction of answer to step 1 minus 0.3 for 6.3 in this equation

1

2.1 (g/dm^3 per minute)

allow correctly calculated rate using incorrectly calculated value for 6.3

1

*if no other marks awarded allow **1** mark for the concentrations 1.8 **and** 0.8 (g/dm^3*

(f) (at pH 1) shape of active site would be altered

allow (at pH 1) enzyme / amylase would be denatured

1

(so) starch would not be digested

allow (so) enzyme / amylase would not work

allow (so) no reaction would occur

allow (so) reaction would be (a lot) slower

1

(so) percentage of light passing through liquid would stay at 10

allow (so) percentage of light passing through liquid would not change / increase

1

[14]

Q2.

(a) any **one** from:

- plasmid

  *do **not** accept nucleus*
- chromosome
- DNA / genes

  allow alleles

  allow genetic material

1

(b) no clear area (around C and E)

1

(so) no bacteria killed (by antibiotic)

allow (so) antibiotic did not work

1

if no letters are given assume they are referring to antibiotics C and E

(c) increased the concentration of antibiotic

allow increased the dose of antibiotic

ignore increased the volume of antibiotic

ignore left it longer

ignore used a different temperature

ignore used a different sized disc

1

clear area seen (around disc)
or
bacteria (around disc) killed

mark dependent on describing a change to the method

1

(d) the treatment injected around the implant

1

(e) any **one** from:

ignore reference to cost

(stem cells from fat tissue)

- easier to obtain

allow quicker to obtain

- less invasive

allow fewer side effects

allow less painful

ignore reference to rejection

1

(f) by diffusion

no marks if incorrect process selected

1

concentration of antibiotic lower inside cells than in solution
or
concentration of antibiotic higher in solution than inside cells

allow 'it' for antibiotic

allow correct reference to concentration gradient

1

(g) 0.09 to 0.31

allow 0.31 to 0.09

1

(h) any **two** from:
Pros:
stem cells containing antibiotic had:

- smallest area of infection (**:** total tissue area)
- small(est) range of results
- no overlap with unreactive solution (suggesting significant effect)

2

any **two** from:
Cons:

- only tested on 5 patients

  allow small sample size
- some results for antibiotic treatment similar to stem cells containing antibiotic
- some results for stem cell treatment similar to stem cells containing antibiotic
- age / health of patients not controlled
- only tested on one type of bacterium

  ignore only tested on one infection
- only tested on one type of implant
- only collected results after 7 days
- may lead to antibiotic resistance (in *S. aureus* bacteria)
- rejection of stem cells
- need donors for stem cells
- allergic reaction to antibiotic

  ignore cost

  ignore religion

  ignore use of embryonic stem cells

  ignore references to viruses

  ignore side effects unqualified

2

[14]

Q3.

(a) C

1

(b) **Mark with (c)**

protease

1

(c) **Mark with (b)**

acidic

1

reason:
any **one** from:

- produces (hydrochloric) acid

  allow contains (hydrochloric) acid

- optimum / best conditions for enzyme / protease to act

  allow optimum / best condition to digest food / protein

  allow ecf from (b)

  allow to kill microorganisms / bacteria / pathogens

1

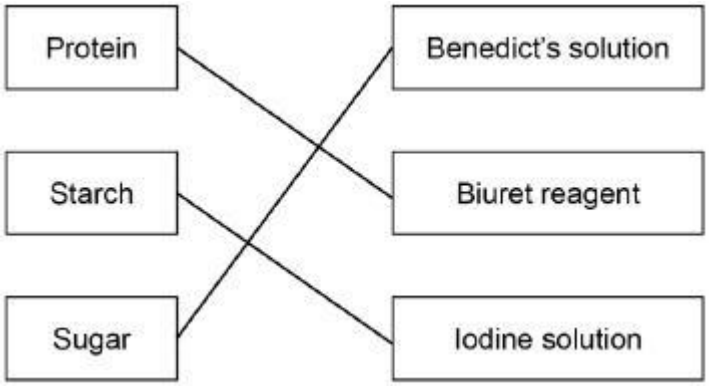
(d) liver

1

(e) it increases the surface area of fats

1

(f)



*all three correct for **2** marks*
*one or two correct for **1** mark*
extra line from a box negates that box

2

(g) any **one** from:
- wear goggles
- use a water bath to heat the solution / mixture
- wash spills from bench / skin

allow wash hands

allow wear gloves

ignore examples such as tie hair back or move bags under bench

1

(h) Benedict's and iodine tests only

1

(i) any **one** from:
- starch (molecule) is (too) large

allow idea that starch needs to be broken down into small / soluble molecules

- starch (molecule) is insoluble

1

[11]

Q4.

(a) cells contain (many) chloroplasts

allow positioned nearest to the light

or

at the top of the leaf

allow cells are closely packed

or

no gaps between cells

allow chlorophyll for chloroplast

1

(b) stomata

1

(c) (real length) = $\frac{28}{400}$

1

(real length in mm =) 0.07

1

(real length in μm =) 70

allow answer given for length in mm correctly multiplied by 1000

1

(d) diffusion

1

(e) A

no marks if wrong cell chosen

1

Reason any **one** from:

- steeper (diffusion) gradient
- bigger difference in concentration of carbon dioxide inside and outside the cell

allow higher concentration of carbon dioxide outside the cell than inside the cell

allow particles / molecules for carbon dioxide

1

(f) (number / amount of) bubbles

allow volume of gas / oxygen

1

time

allow suitable time eg 1 / 5 / 10 minutes

1

(g) any **two** from:

- temperature (of water)
- light intensity

allow amount of light

ignore light unqualified

or

- distance of light (from pondweed)
- concentration of carbon dioxide (in water)

allow amount / mass of sodium hydrogen carbonate (in water)

allow type / size of plant

ignore volume of water / solution

*do **not** accept colour of light*

ignore time

2

(h) y-axis labelled: rate of photosynthesis in arbitrary units

1

suitable scale

1

all **bars** plotted correctly

allow ± ½ a small square the bars can be in any order

1

all bars labelled correctly

1

(i) blue

1

[17]

Q5.

(a) nucleus

1

(b) cells never stop dividing

1

(c) any **one** from:

- chemicals enter the lungs (first)
- chemicals are inhaled
- chemicals are more concentrated in the lungs

allow smoke / tar / carcinogens for chemicals

ignore nicotine unqualified

1

(d) (cancer cells transported) in the blood

1

(e) any **one** from:

- (smoking) will damage the new lung

allow poor chance of success

allow (smoking) will increase the risk of cancer developing in the new lung

allow wastes a healthy lung

- (NHS has) limited financial resources
- the lung could be used for someone else (who does not smoke)
- illness is self-inflicted **or** person is not attempting to help themselves

1

(f) 300

answer line takes precedence

1

(g) any **one** from:

- little exposure to ionising radiation

allow do not use sunbeds

- little exposure to the sunlight / UV (light)
- more use of sunscreen

allow better sunscreen

- little exposure to carcinogens

allow named carcinogen

- little cell / DNA / gene damage
  allow skin cancer takes a long time to develop
  ignore references to smoking

1

(h) any **one** from:
- most new cases each year are in males / people aged 65-69 (years)
- new cases per year increases (from age 15) up to 69 (years)
  allow any upper age of 65-69
- new cases per year decreases from age 69 to 90 (+ years)

1

(i) any **two** from:
- improved treatment / drugs
- earlier diagnosis
- improved cancer screening
  allow improved technology / machinery
- improved patient / doctor knowledge (of dangers / treatments)
  allow improved patient diet / lifestyle

2

[10]

Q6.

(a) both have a cell membrane

1

both have cytoplasm

1

(b) any **one** from:
- fever
  allow high temperature
  allow sweating / chills
- abdominal / stomach cramps
  ignore vomiting / sickness / diarrhoea
  ignore feel unwell unqualified
  ignore rashes

1

(c) penicillin
allow phonetic spelling

1

(d) any **one** from:
- only a few bacteria killed so live bacteria continued to reproduce
  allow bacteria reproducing when course started
- time delay before antibiotic reached bacteria
  allow takes time (for antibiotic) to travel through the body

- time delay before antibiotic could kill bacteria
  allow takes time (for antibiotic) to work

1

(e) there were fewer toxins in the body than at day 0

1

(f) to reduce / prevent resistant strains / bacteria developing
ignore references to bacteria becoming immune

or

to reduce / prevent antibiotic resistance (in bacteria)
allow because they will get better without taking any antibiotics
ignore body will fight the infection unqualified
allow some infections are caused by viruses
allow because they have been told not to by NHS / NICE

1

(g) B

1

(h) D

1

[9]

Q7.

(a) salivary glands, pancreas and small intestine

1

(b) pH (of amylase / solution / buffer)
ignore upper and lower case letters
allow hydrogen ion / H^+ concentration
ignore acidity / alkalinity

1

(c) iodine (solution / reagent) would **not** turn black / blue-black
*allow iodine (solution / reagent) would **not** turn dark blue / dark purple*
ignore iodine solution / reagent would not turn blue / purple

or

iodine solution / reagent would stay orange / brown
allow iodine (solution / reagent) would not change colour

1

(d) 6.8
answer line takes precedence
allow answer in range 6.75 to 6.85

1

(e) 82 (seconds)

answer line takes precedence

allow answer in range 80 to 84 (seconds)

1

(f) **View with Figure 2**

tangent drawn at 40 seconds

1

$$(\text{rate} =) \quad \frac{\text{value for dy}}{\text{value for dx}}$$

eg

$$(\text{rate} =) \quad \frac{2.25}{60}$$

1

calculation of rate at 40 seconds

(rate =) 0.0375 (arbitrary units per second)

allow an answer in the range 0.035 to 0.042 (arbitrary units per second)

1

(0.0375 × 60 =) 2.25 (arbitrary units per minute)

allow an answer in the range 2.1 to 2.5 (arbitrary units per minute)

if no other marks awarded allow 1 mark for

$$\left(\frac{3.5}{40} \times 60 =\right)$$

5.25 (arbitrary units per minute)

allow an answer in the range 5.175 to 5.25 (arbitrary units per minute) for this mark only

1

(g) **Level 3:** Relevant points (reasons/causes) are identified, given in detail and logically linked to form a clear account.

5–6

Level 2: Relevant points (reasons/causes) are identified, and there are attempts at logical linking. The resulting account is not fully clear.

3–4

Level 1: Points are identified and stated simply, but their relevance is not clear and there is no attempt at logical linking.

1–2

No relevant content

0

Indicative content

- enzymes are protein molecules
- (so) have a 3D structure
- lock and key theory
- have an active site
- (which) has a specific shape
- shape of active site will only match shape of substrate

- starch is substrate for amylase

- at pH values above or below the optimum the shape of active site is changed (in some molecules)
- (so) substrate can no longer fit the active site
- at extreme pH values enzyme is denatured
- (so) shape of active site is changed

- (so) amylase can no longer digest starch
- (so) rate of digestion decreases

For Level 3 reference to enzyme structure and effect of pH on enzyme activity are needed

[15]