



Additional Assessment Materials
Summer 2021

Pearson Edexcel GCSE in Biology (1BI0)
Higher

Resource Set Topic 5: Health, Disease and
the Development of Medicines

Questions

(Public release version)

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General guidance to Additional Assessment Materials for use in 2021

Context

- Additional Assessment Materials are being produced for GCSE, AS and A levels (with the exception of Art and Design).
- The Additional Assessment Materials presented in this booklet are an **optional** part of the range of evidence teachers may use when deciding on a candidate's grade.
- 2021 Additional Assessment Materials have been drawn from previous examination materials, namely past papers.
- Additional Assessment Materials have come from past papers both published (those materials available publicly) and unpublished (those currently under padlock to our centres) presented in a different format to allow teachers to adapt them for use with candidate.

Purpose

- The purpose of this resource to provide qualification-specific sets/groups of questions covering the knowledge, skills and understanding relevant to this Pearson qualification.
- This document should be used in conjunction with the mapping guidance which will map content and/or skills covered within each set of questions.
- These materials are only intended to support the summer 2021 series.

2 (a) Obesity increases the risk of a person developing cardiovascular disease.

Losing weight can reduce the risk of this disease occurring.

Explain why exercise can cause weight loss.

(2)

Fat is broken down to provide energy for exercise

Since fat amount / weight is reduced, overall weight is lost.

(b) Figure 2 shows a gastric band fitted to a stomach.

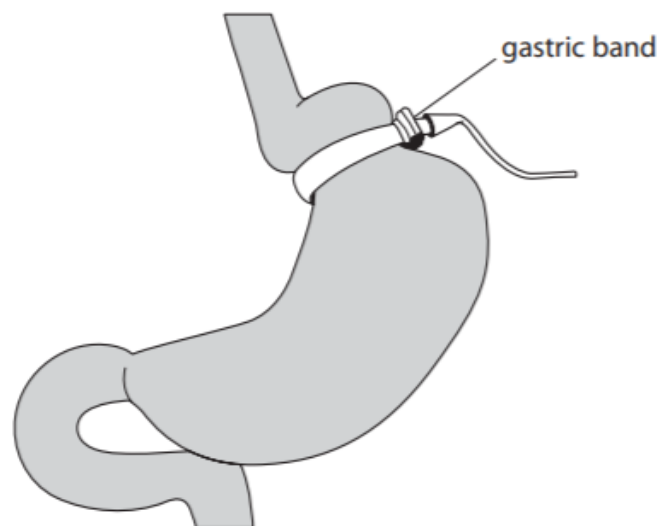


Figure 2

Explain how a gastric band helps a person to lose weight.

(2)

A gastric band reduce the volume of the stomach so less food is taken in, and fats stored is used for energy

The person would feel full faster with less food.

This prevents formation of fat due to extra energy.

(c) BMI and waist:hip ratio can be used to find out if a person is obese.

Figure 3 shows some data for two males.

male	BMI	waist:hip ratio
A	27.3	0.85
B	?	0.81

Figure 3

BMI is calculated using the equation:

$$\text{BMI} = \frac{\text{mass in kilograms}}{(\text{height in metres})^2}$$

(i) Male B has a mass of 72 kg and a height of 1.81 m.

Calculate the BMI of male B.

Give the answer to 3 significant figures.

$$\begin{aligned}\text{BMI} &= \frac{72}{(1.81)^2} \\ &= 21.977 \\ &\approx 22.0\end{aligned}$$

(3)

BMI = 22.0

(ii) Figure 4 shows the interpretation of BMI values.

BMI range	interpretation
below 18.5	underweight
18.5 – 24.9	normal
25.0 – 29.9	overweight
30.0 and above	obese

Figure 4

Males with a waist:hip ratio above 0.90 are defined as abdominally obese.

Explain what the BMI and waist:hip ratio for male A shows about his weight distribution.

(2)

His BMI shows that he is overweight but his waist:hip ratio shows that he is not abdominally obese. These show that his weight is not distributed in the abdomen area.

(iii) An autoclave is used to prepare the agar growth medium used in Step 2.

Explain why the agar growth medium is autoclaved.

(2)

To sterilise the agar growth medium so there will be no contamination.

5 *Streptococcus* bacteria can cause a sore throat or skin infection.

An illness called scarlet fever can also develop during an infection with this bacterium.

(a) (i) Give **two** precautions a doctor should take when treating a patient who is infected with *Streptococcus*.

(2)

wear a mask and gloves and dispose them immediately after use.

(ii) From September 2013 to March 2014 there were 2830 cases of scarlet fever in the UK.

From September 2014 to March 2015 there were 5943 cases of scarlet fever.

Calculate the percentage increase of the number of cases of scarlet fever between the periods September 2014 to March 2015 and September 2013 to March 2014.

(2)

$$\frac{5943 - 2830}{2830} \times 100 = 110\%$$

110 %

(b) Patients with scarlet fever can be treated with antibiotics.

New antibiotics need to be tested before they can be used in patients.

Which is the correct sequence for the development of a new medicine?

(1)

- A testing in healthy volunteers → testing using cultured cells → double blind trials on patients
- B testing using cultured cells → double blind trials on patients → testing in healthy volunteers
- C testing in healthy volunteers → double blind trials on patients → testing using cultured cells
- D testing using cultured cells → testing in healthy volunteers → double blind trials on patients

(c) Most cases of scarlet fever occur in children.

Adults have usually developed immunity to a toxin that the *Streptococcus* bacteria produce during infection.

Explain how an adult develops immunity to the toxin.

(3)

The adults had a previous infection of the *Streptococcus* bacteria during their childhood.

During the infection, an immune response is triggered by the antigen. Lymphocytes are produced and they divide to form memory cells.

Re-exposure to the same toxin during adulthood triggers the memory cells resulting a faster response with higher production of antibodies.

This prevents adults from getting scarlet fever.

10 A scientist was planning to compare the effectiveness of the antibiotic myxopyronin on two different species of bacteria.

Figure 18 shows the equipment the scientist can use.

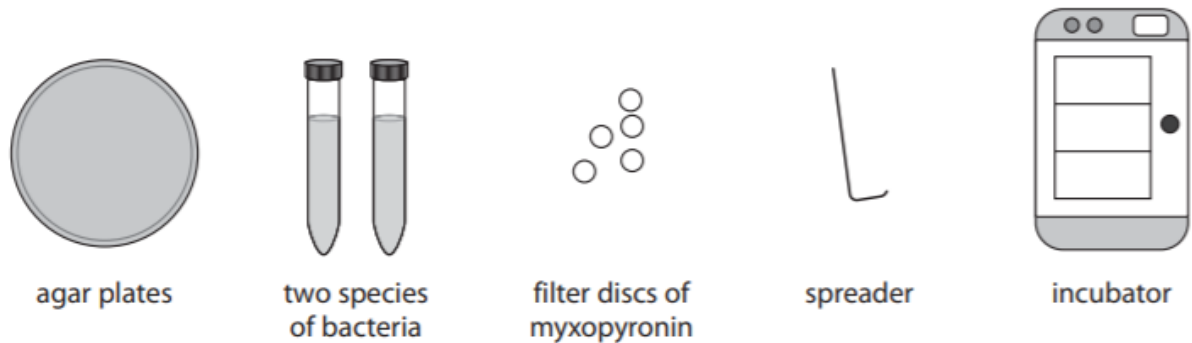


Figure 18

(a) (i) Describe how the scientist could determine the effectiveness of myxopyronin on the two species of bacteria.

(2)

In each agar plate, spread one of the species of bacteria using the spreader. Add the same amount of filter discs of myxopyronin to each plate and place the plates in the incubator. After incubation, compare the clear zone/zone of inhibition in the 2 plates. The greater the clear zone is, the more effective myxopyronin is to that species.

*(b) Infections can also be caused by viruses.

Describe the lytic pathway of a virus and how this causes the spread of infection through a population.

(6)

As virus cannot replicate on their own, they enter host cells and use their machinery to synthesise proteins and nucleic acid to replicate.

DNA and protein coats are assembled together into new virus particles. When a lot of new viruses are formed, host cells undergo lysis. /burst. They can be found in bodily fluids such as saliva, and spread in airborne droplets from one host to another. The virus can also infect other nearby cells.

3 (a) *Clostridium tetani* is a bacterium that can be found in soil.

It causes the infection tetanus.

Children are vaccinated against tetanus.

Explain why these children do not get tetanus if the bacteria enter their body through a cut in the skin.

(3)

The children are immunised against tetanus through the vaccine, so they will have memory cells which recognise the antigen for tetanus and produce antibodies, before the bacteria can cause an infection. Vaccine contains antigens of *Clostridium tetani* which triggers an immune response specific to tetanus.

7 Measles is a disease caused by a virus.

(a) Describe the lytic pathway for a virus.

(3)

Virus binds to host cells and insert their genetic material. The virus uses the host cells' machinery to synthesise viral proteins and nucleic acids, which are used to form viral particles. The host cell undergoes lysis, releasing the viruses inside, which can infect other host cells.

(c) Measles is prevented by immunisation.

(i) State **two** reasons why people might not be immunised against measles.

(2)

1 risk of side-effects

2 due to their religious beliefs

(ii) The spread of measles is prevented by herd immunity.

Describe herd immunity.

(2)

In a population in which a high percentage are immunised against a certain contagious disease, it is more difficult for the disease to spread.

- 8 (a) LDL cholesterol is a type of cholesterol which increases the risk of heart disease. Statins are drugs used to reduce LDL cholesterol levels.

Figure 12 shows the cholesterol levels in the blood of a man.

He started taking statins at the beginning of February and stopped taking them four months later.

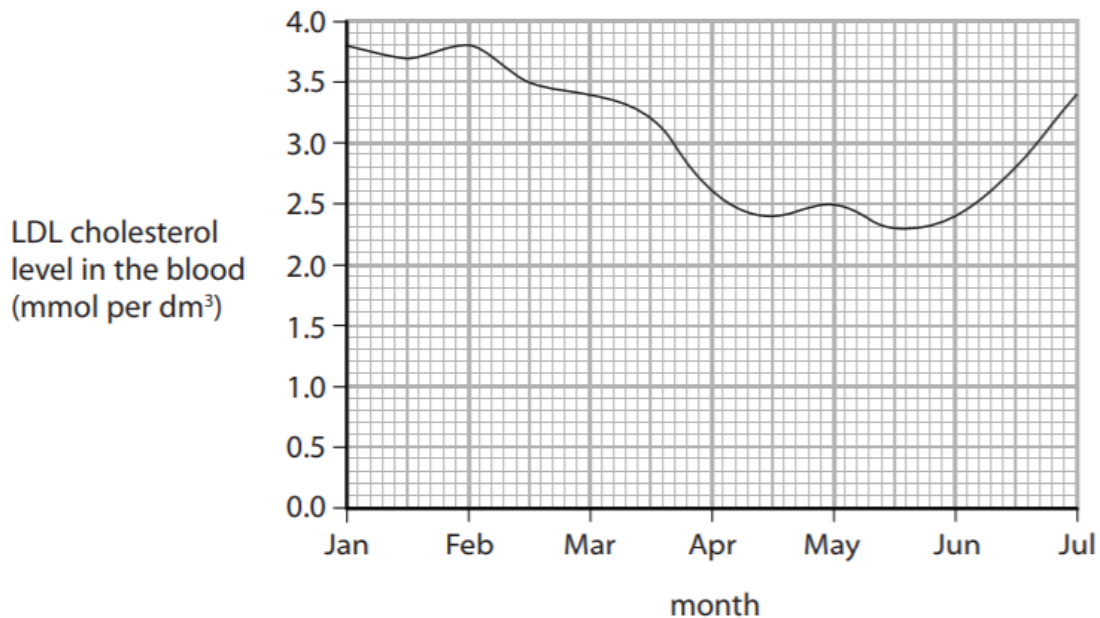


Figure 12

- (i) Describe the effect of statins on LDL cholesterol levels in the blood.

Use data from the graph to support your answer.

(2)

Statins lower LDL cholesterol levels in blood. When he started taking statins in February, LDL cholesterol level in blood dropped from about 3.8 mmol dm^{-3} to 2.3 mmol dm^{-3} at the lowest in mid-May, and increases back to about 3.4 mmol dm^{-3} in July when he stopped taking statins.

(ii) Use evidence from the graph to explain why statins are usually prescribed as life-long medication.

cholesterol (2)

When the man stopped taking statins, the LDL_x level in blood rises back from about 2.4 to 3.4 mmoldm⁻³ in a month to a dangerous level where the man would likely develop heart disease and even die.

(b) Which data can be used to calculate the man's BMI?

(1)

- A waist circumference and height
- B waist circumference and hip circumference
- C mass and height
- D mass and hip circumference

*(c) Gonorrhoea is a sexually transmitted bacterial infection.

Figure 13 shows the number of people diagnosed with gonorrhoea in the UK.

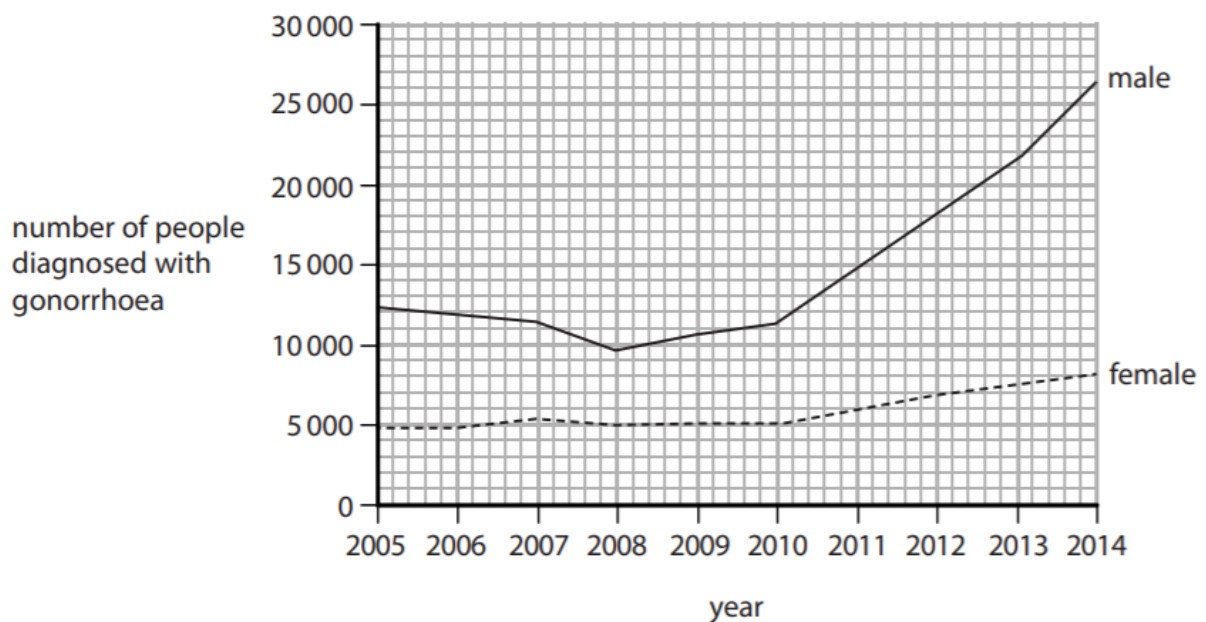


Figure 13

Explain how gonorrhoea is transmitted and how the number of people infected can be reduced.

Use data from the graph to justify why it is necessary to reduce the number of people infected.

(6)

Gonorrhoea is transmitted through sexual contact with the mouth, penis, vagina or anus of someone who is infected. The number of people infected can be reduced by encouraging the use of barrier contraceptions such as condoms. From 2005 to 2010, the number of people diagnosed with gonorrhoea fluctuates at around 12000 for male and 500 for female. From 2010 to 2014, there is a drastic increase in the numbers in both genders, from 11,000 to 26,000 in male and 5,000 to 8,000 in female. It is likely that the number of people infected will continue to increase.

1 Between 2013 and 2016 there was an outbreak of a disease called Ebola.

Ebola is estimated to have caused the deaths of more than 11 000 people.

(a) (i) Why is the number of deaths from Ebola only an estimate?

(1)

- A many people were immune to Ebola
- B many deaths were not confirmed to be caused by Ebola
- C Ebola does not spread easily
- D Ebola does not cause any symptoms

(ii) State how Ebola is spread from person to person.

(1)

contact with infected blood or bodily fluids

- (iii) The lytic pathway is part of the lifecycle of the Ebola virus.
After infection of the host cell, components of the virus are produced.
Describe the next stages of the lytic pathway.

(2)

The components are assembled to form viruses. The host cell undergoes lysis and the virus particles are released.

- (b) The genetic material of a virus can also be inserted into the genome of the host.
(i) Name this type of pathway.

(1)

lysogenic pathway

- 2 (a) The human immunodeficiency virus (HIV) can cause AIDS.

Which type of cell is destroyed by the HIV virus?

(1)

- A red blood cell
- B nerve cell
- C white blood cell
- D sperm cell

- (b) Describe how the specific immune system defends the body against disease.

(3)

The specific immune system recognises the specific antigen causing the disease. Lymphocytes produce antibodies and antitoxins which are specific to the antigen. They also produce memory cells which can recognise the antigen quicker in the next infection.

- (c) Figure 1 shows the number of people per million **of the population** in five European countries who were diagnosed with measles in one year.

country	number of people diagnosed with measles per million of the population
Belgium	21.00
France	15.63
Germany	8.42
Italy	20.06
Norway	0.05

Figure 1

- (i) The population of Belgium in that year was 11.18 million.

Calculate the number of people in Belgium diagnosed with measles.

Give your answer to three significant figures.

(3)

$$21.00 \times 11.18 = 234.78$$

$$\approx 235$$

235 people

- (ii) Countries do not report the total number of people diagnosed with measles. Countries report the number of people diagnosed with measles per million of the population.

Give **one** reason why this is better.

(1)

To allow better comparison between countries with different numbers of people in the population.

(iii) Give **one** reason why the number of people per million diagnosed with measles is different in these countries.

(1)

In some countries the people are vaccinated so fewer people have measles.

7 Bacteria grown in a liquid medium is called a bacterial culture. As the number of bacteria increases the bacterial culture becomes opaque. This is because light is absorbed by the bacterial culture.

(a) To measure the increase in the number of bacteria, a scientist took a sample from the culture every 20 minutes.

The apparatus shown in Figure 7 detects the amount of light transmitted through the bacterial sample and uses it to calculate the amount of light absorbed.

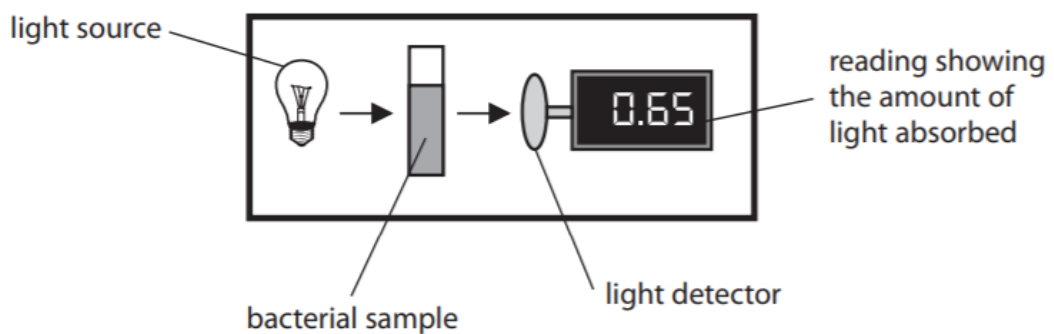


Figure 7

(i) Give **two** aseptic techniques the scientist should use when taking samples from the bacterial culture.

(2)

1 wash hands and wear gloves

2 sterilise equipment

(ii) Figure 8 shows the amount of light absorbed by the bacterial sample.

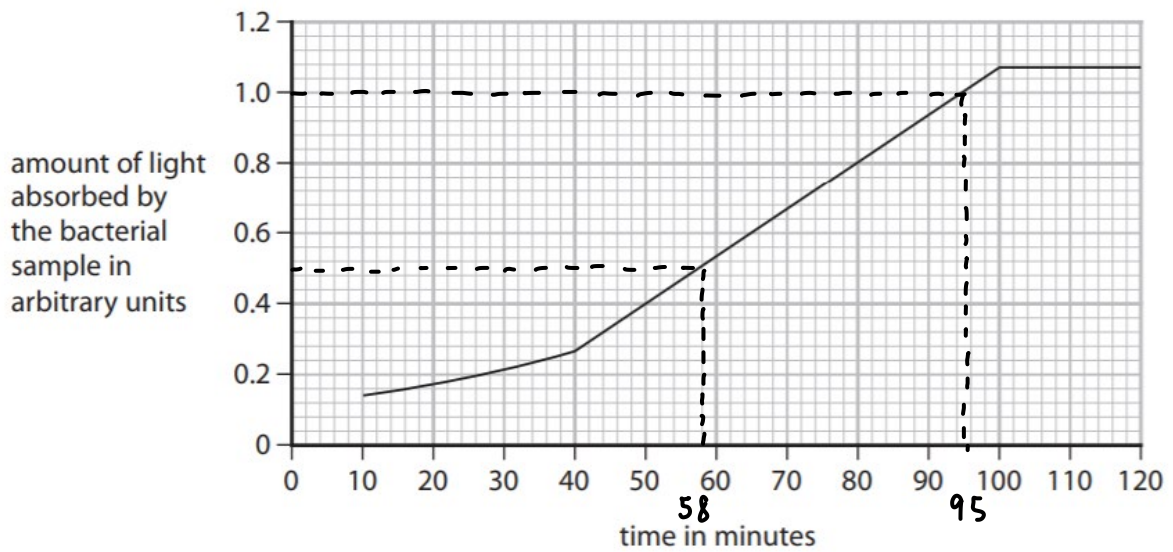


Figure 8

The bacterial population increases rapidly between 40 and 100 minutes.

Calculate the time taken for the amount of light being absorbed by the bacterial sample to double from 0.5 to 1.0 arbitrary units.

(2)

$$95 - 58 = 37$$

37

minutes

(iii) The scientist put a small sample of the bacteria on a microscope slide and used a magnification of $\times 1000$ to view the sample.

The bacteria could not be seen very clearly.

Give **one** improvement the scientist could make to view the bacteria more clearly.

(1)

use the focusing knob to focus

- 9 Cancer Research UK found that many people do not realise that obesity is linked to an increased risk of developing cancer.

In the body, fat tissue sends signals that cause other cells to divide.

- (a) (i) Describe how this could cause cancer to develop.

(3)

Cancer is caused by cell dividing uncontrollably, forming a tumour. If the tumour is malignant, the cancer cells can break apart from the tumour and spread to other parts of the body through metastasis.

Cancer is caused by a mutation in genes

- (iii) Obesity is linked to 1 in 20 cases of **all** types of cancer.

Approximately 13% of cases of bowel cancer are caused by obesity.

Determine how the impact of obesity on bowel cancer compares to the impact of obesity on all types of cancer.

(2)

percentage of all types of cancer linked to obesity: $\frac{1}{20} \times 100 = 5\%$

$5\% < 13\%$

\therefore Obesity has a greater impact on bowel cancer than all types of cancer.

(b) Two men have the same mass of 80 kg.

One man's BMI is categorised as normal weight, the other man's BMI is categorised as obese.

Explain why the men have different BMI values.

(2)

BMI is calculated from weight and height. The man with a BMI categorised as normal weight is taller.

(c) Obesity can also cause cardiovascular disease to develop.

Describe the different treatments available for cardiovascular disease.

(3)

Medicines can be prescribed to help lower cholesterol level and blood pressure. If the coronary arteries are blocked, a coronary bypass can be done in which veins from the patient's leg can be grafted into the heart to bypass the blocked area. Heart valves which have worn out can be replaced by mechanical valves. A heart transplant can also be done to replace the damaged heart.

TOTAL = 77 MARKS