Questions are for both separate science and combined science students

Q1.

Pathogens cause disease.

(a) How does the skin defend the human body against pathogens?

_____

_____

(1)

The stomach contains acid to kill pathogens.

A scientist investigated the effect of acid on the survival of bacteria.

This is the method used.

1. Prepare four test tubes each with 10 cm^3 of culture solution.

2. Use acid to adjust the pH of the solutions to be pH1, pH2, pH3 and pH5

3. Add 1 cm^3 of bacteria mixture to each test tube.

4. Take a 0.1 cm^3 sample from each test tube and record the number of live bacteria.

5. Keep the test tubes at 37 °C for 24 hours.

6. Repeat step 4.

The table below shows some of the results.

Time in hours	**Number of live bacteria**			
	pH1	**pH2**	**pH3**	**pH5**
0	210	210	210	216
24	23	**X**	63	185

(b) What fraction of the bacteria present at 0 hours for **pH3** survived for 24 hours?

Give your answer in its simplest form.

_____

_____

_____

Fraction surviving = _____

(2)

(c) How many more bacteria were killed at pH1 than at pH5 in 24 hours?

Complete the following steps.

Calculate the number of bacteria killed at pH1

_____

Calculate the number of bacteria killed at pH5

_____

Calculate how many more bacteria were killed at pH1 than at pH5

_____

_____

Number = _____

(3)

(d) A student calculated value **X** in above table to be 43

Suggest how the student calculated this value.

_____

_____

_____

_____

(2)

(Total 8 marks)

Q2.

Starch and sugar are two types of carbohydrate.

(a) Describe the chemical tests that a student could use to show if bread contains:

- starch
- sugar.

You should include the results of a positive test **and** a negative test for each type of carbohydrate.

(4)

A student investigated three types of bread.

For each type of bread, the student:

- put a square piece of bread into their mouth
- did **not** chew the bread
- recorded the time taken for the bread to taste sweet.

Table 1 shows the results.

Table 1

Type of bread	Time taken for bread to taste sweet in seconds
Brown	43
White	35
Wholemeal	57

(b) Complete the sentences.

Choose answers from the box.

amylase	fat	lipase	protease	sugar

The starch in the bread was broken down by the

enzyme _____ .

The enzyme broke down the starch into _____ .

(2)

(c) What was the independent variable in the investigation?

Tick (✓) **one** box.

The size of the piece of bread ☐

The temperature of the mouth ☐

The type of bread ☐

(1)

(d) Give **two** conclusions that can be made from the results in **Table 1**.

1 _____

_____

2 _____

_____

(2)

Table 1 is repeated below.

Table 1

Type of bread	Time taken for bread to taste sweet in seconds
Brown	43
White	35
Wholemeal	57

The student improved the investigation.

Table 2 shows the results.

Table 2

Type of bread	Time taken for bread to taste sweet in seconds			
	Test 1	Test 2	Test 3	Mean
Brown	38	43	45	42
White	35	31	39	35
Wholemeal	58	55	61	**X**

(e) What did the student do to improve the investigation?

Use **Table 1** and **Table 2**.

_____

_____

_____

_____

(2)

(f) Calculate value **X** in **Table 2**.

_____

_____

_____

X = _____ seconds

(2)

(g) Why should the student do the investigation with more people?

Tick (✓) **one** box.

Each person's sense of taste is different. ☐

More people would make the investigation safer. ☐

There are many different types of bread. ☐

(1)

(Total 14 marks)

Q3.

A person has coronary heart disease.

(a) Which blood vessels are affected by coronary heart disease?

Tick (✓) **one** box.

Arteries ☐

Capillaries ☐

Veins ☐

(1)

A person's heart stops beating.

The person stops breathing.

A first-aider pushes down on the person's chest.

Pushing down on the person's chest puts pressure on the heart.

(b) Explain why putting pressure on the heart helps the person.

_____

_____

_____

_____

(2)

(c) The first-aider also forces air into the person's lungs by blowing into their mouth.

Describe how forcing air into the person's lungs helps the person.

_____

_____

(1)

(d) The person's heart starts to beat again and the person starts breathing.

The person has a high level of cholesterol in their blood.

Name **one** type of drug that would decrease the level of cholesterol in the person's blood.

_____

(1)

(e) A doctor decides that the person needs to have a stent fitted.

Explain how a stent works to treat coronary heart disease.

_____

_____

_____

_____

(2)

The table below shows the effect of smoking on the risk of developing different cardiovascular diseases.

Cardiovascular disease	Percentage (%) increase in risk compared to people who have never smoked
E	14
F	20
G	29
H	70

(f) Give **two** conclusions that can be made from the data in the table above.

1 _____

_____

2 _____

_____

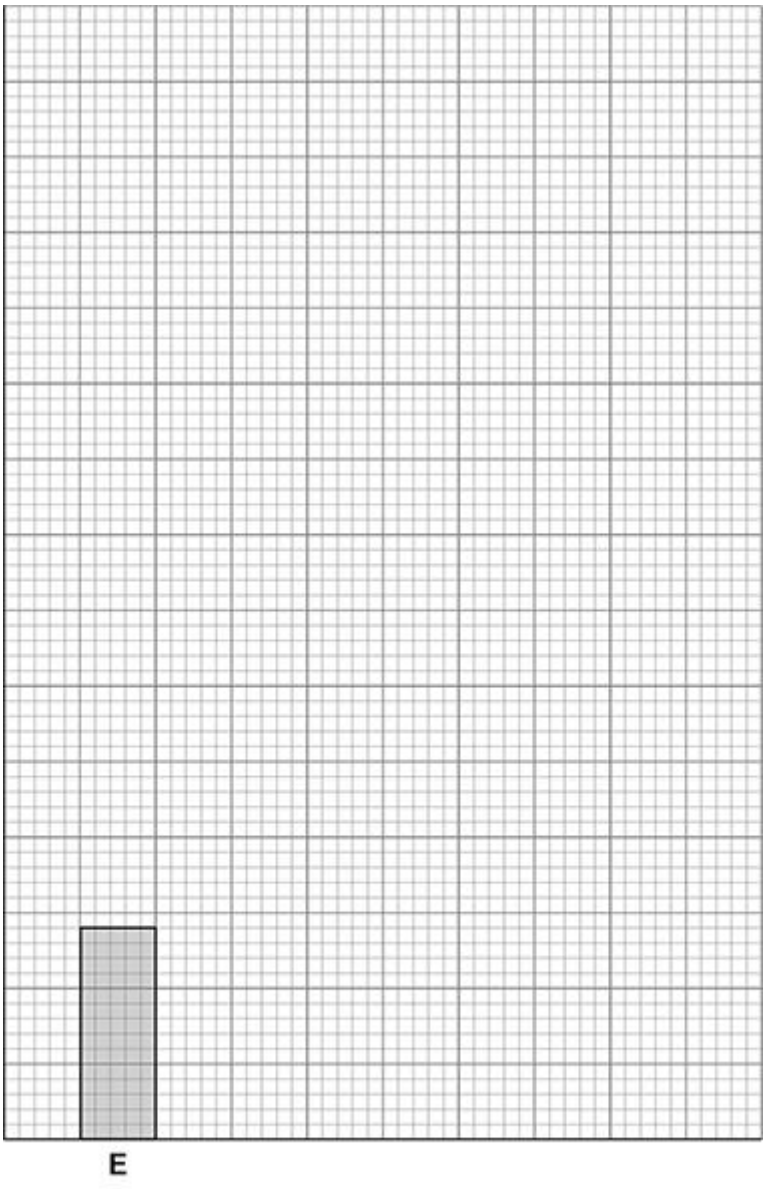
(2)

(g) Complete the graph below.

You should:

- label the y-axis
- add the correct scale to the y-axis
- plot the data from the table above
- label each bar.

The bar for cardiovascular disease **E** has been plotted for you.



(4)

(h) Describe **one** lifestyle factor that can increase the risk of cardiovascular disease.

Do **not** refer to smoking in your answer.

_____

_____

(1)

(Total 14 marks)

Q4.

Cystic fibrosis (CF) is an inherited disorder caused by a faulty gene.

(a) Where in a cell would the CF gene be found?

_____

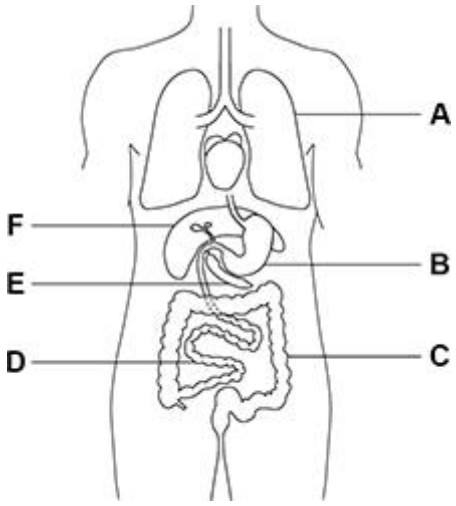
(1)

CF affects many organs in the body.

The main organs affected are:

- the lungs
- the pancreas
- the small intestine.

(b) The figure below shows organs of the human body.



Which letters in the figure above show the lungs, the pancreas and the small intestine?

Tick (✓) **one** box.

A, **D** and **E** ☐

A, **E** and **F** ☐

B, **C** and **D** ☐

B, **C** and **F** ☐

(1)

(c) The pancreas produces several digestive enzymes.

CF reduces the amount of each enzyme that reaches the small intestine.

Explain why a person with CF has:

- difficulty digesting food
- difficulty gaining body mass.

(6)

(d) Gas exchange happens in the alveoli in the lungs.

Describe **three** features of the alveoli that help maximise gas exchange.

1 _____

_____

2 _____

_____

3 _____

_____

(3)

(e) CF reduces the amount of oxygen that can enter the blood from the alveoli.

Explain how a reduced amount of oxygen entering the blood will affect the human body.

_____

_____

_____

_____

_____

_____

(3)

(Total 14 marks)

Q5.

Viruses cause disease.

(a) What name is given to microorganisms that cause disease?

Tick (✓) **one** box.

Pathogens	☐
Predators	☐
Producers	☐

(1)

(b) The body has defences to stop viruses entering.

Draw **one** line from each defence to the part of the body that provides the defence.

Defence	**Part of the body that provides the defence**
A physical barrier that stops viruses entering	Brain
	Heart
Mucus that traps viruses	Nose
	Skin

(2)

Some viruses can cause tumours to develop.

(c) Complete the sentence.

Choose the answer from the box.

digestion	**division**	**metabolism**

A tumour can form when changes to cells cause uncontrolled

cell _____.

(1)

(d) Malignant tumours are cancers.

Which **two** sentences describe malignant tumours?

Tick (✓) **two** boxes.

Malignant tumours are only found in the reproductive system. ☐

Malignant tumours contain digestive enzymes. ☐

Malignant tumours do not change in size. ☐

Malignant tumours have cells that can spread to other parts of the body. ☐

Malignant tumours may form secondary tumours. ☐

(2)

HPV is a virus that can cause one type of cancer in females.

In the UK since 2008, most 12 to 13-year-old females have been vaccinated against HPV.

Scientists investigated the percentage of 16 to 18-year-old females with HPV.

The table below shows the results.

Year	**Percentage (%) of 16 to 18-year-old females with HPV**
2010	8.2
2012	3.2
2014	2.0
2016	1.6

(e) What does the table above show about the percentage of females with HPV from 2010 to 2016?

_____

_____

(1)

(f) Suggest the reason for the change you described in part (e).

_____

_____

(1)

The HPV vaccine contains an inactive form of the virus.

The inactive form of the virus is injected into the body.

(g) Which part of the blood responds to the inactive virus?

Tick (✓) **one** box.

- Platelets ☐
- Red blood cells ☐
- White blood cells ☐

(1)

(h) What is produced by the body in response to the inactive virus?

Tick (✓) **one** box.

- Antibiotics ☐
- Antibodies ☐
- Antiseptics ☐

(1)

(i) Suggest **one** reason why some **parents** refuse to allow their children to have the HPV vaccine.

Do **not** refer to the pain of the injection in your answer.

_____

_____

(1)

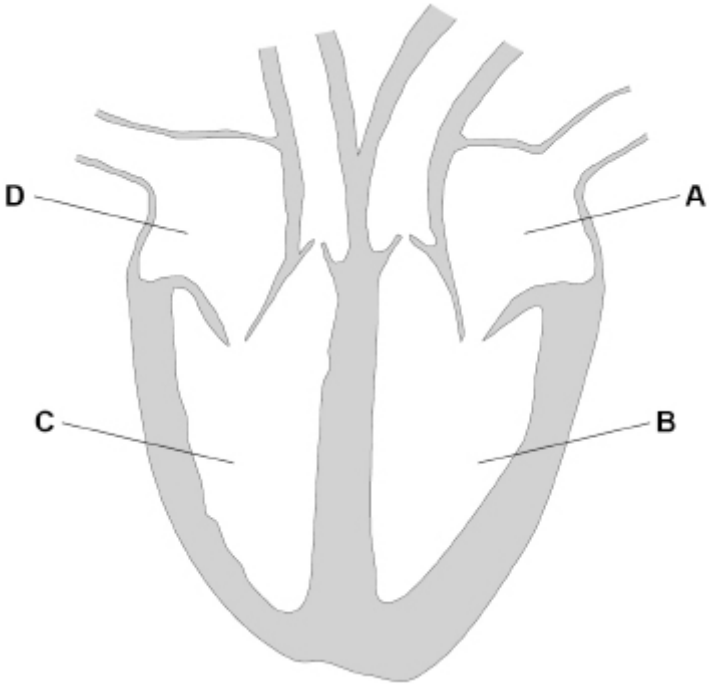
(Total 11 marks)

Q6.

This question is about the circulatory system.

Figure 1 shows the human heart.

Figure 1



(a) Which part of the heart receives oxygenated blood from the lungs?

Tick (✓) **one** box.

A ☐ **B** ☐ **C** ☐ **D** ☐

(1)

(b) Which part of the heart pumps deoxygenated blood to the lungs?

Tick (✓) **one** box.

A ☐ **B** ☐ **C** ☐ **D** ☐

(1)

(c) A group of cells called the pacemaker controls the resting heart rate.

Where in the heart is the pacemaker found?

Tick (✓) **one** box.

Left atrium ☐

Left ventricle ☐

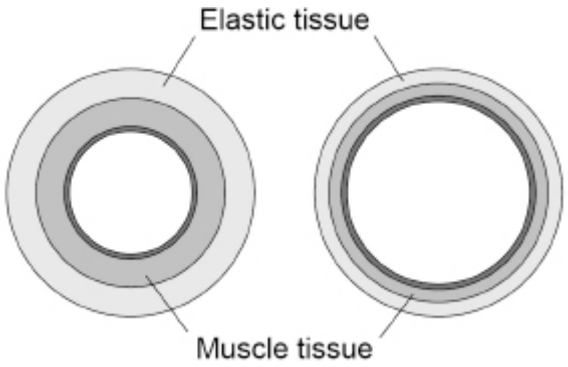
Right atrium ☐

Right ventricle ☐

(1)

(d) **Figure 2** shows a cross section of an artery and of a vein.

Figure 2



Describe **two** ways that the structure of an artery is different from the structure of a vein.

1 _____

_____

2 _____

_____

(2)

(e) In coronary heart disease, the coronary arteries become narrower.

A build-up of fatty material can cause a blockage in a coronary artery.

The table below shows how a blockage in a coronary artery affects blood flow.

Percentage (%) of coronary artery that is blocked	**Blood flow in cm^3/minute**
0	100
10	64
20	42
50	8
80	2

Describe the trend shown in the table.

_____

_____

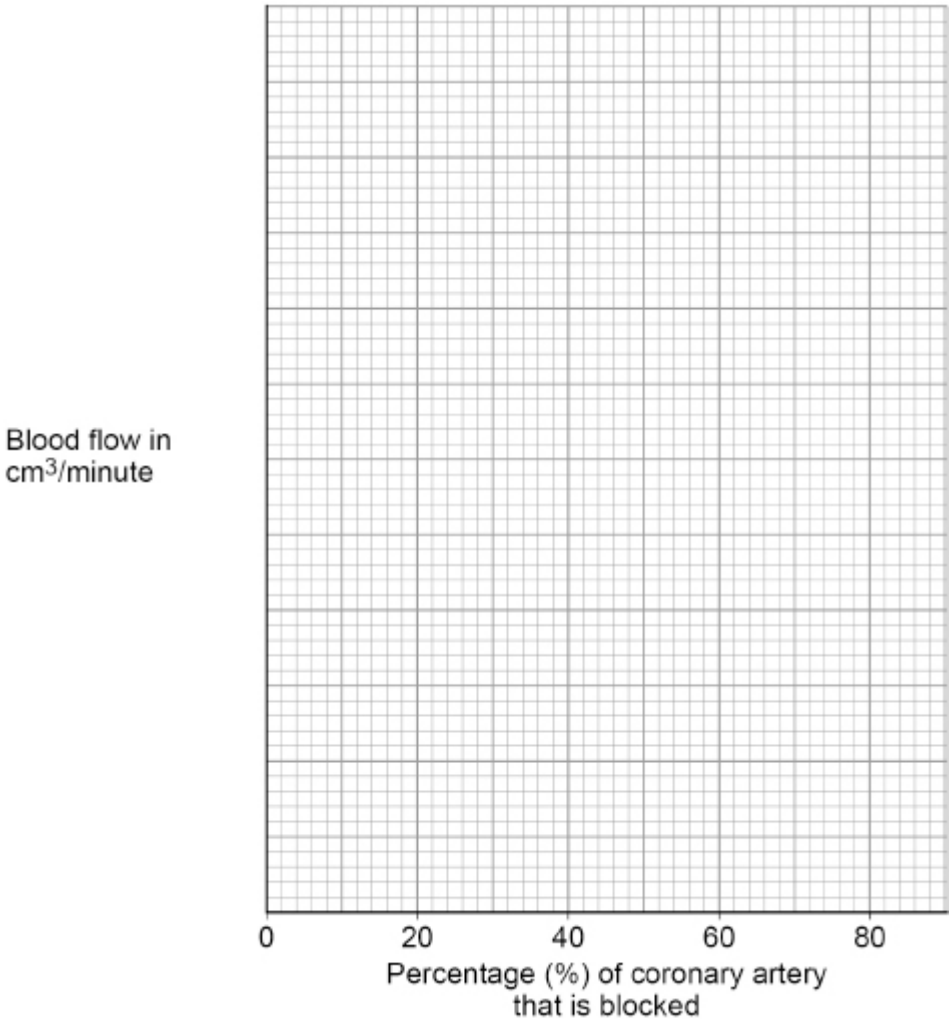
(1)

(f) Complete **Figure 3**.

You should:

- use a suitable scale for the y-axis
- plot the data from the table above
- draw a line of best fit.

Figure 3



(4)

(g) Predict the blood flow in a coronary artery with a 35% blockage.

Use **Figure 3**.

Blood flow = _____ cm^3/minute

(1)

(h) Explain the effect of a partly blocked coronary artery on the human body.

(6)

(i) There are different treatments for a blockage in a coronary artery.

Explain how **one** treatment for a blockage in a coronary artery works.

(2)

(Total 19 marks)