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.

Measles is caused by a virus.

(a) The measles vaccine is given to children to prevent them becoming ill with measles.

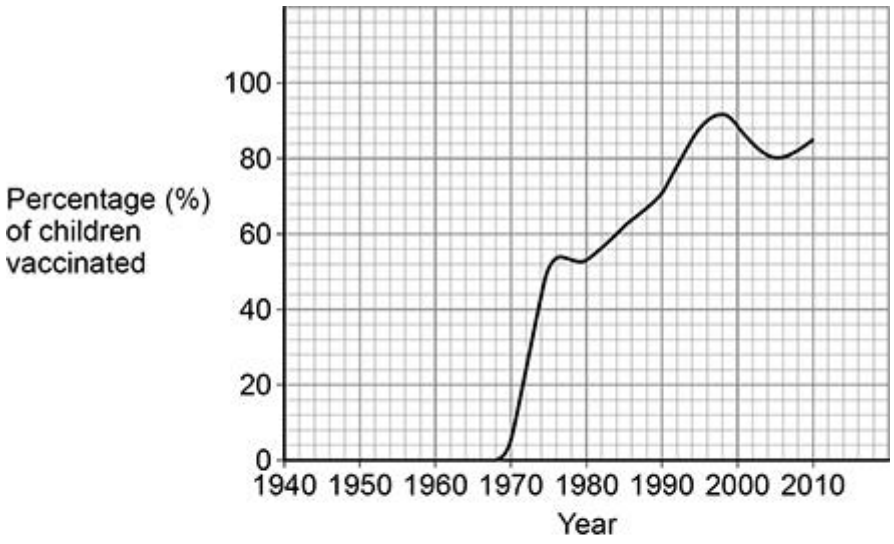
Draw **one** line from each blood component to its function when someone is vaccinated against measles.

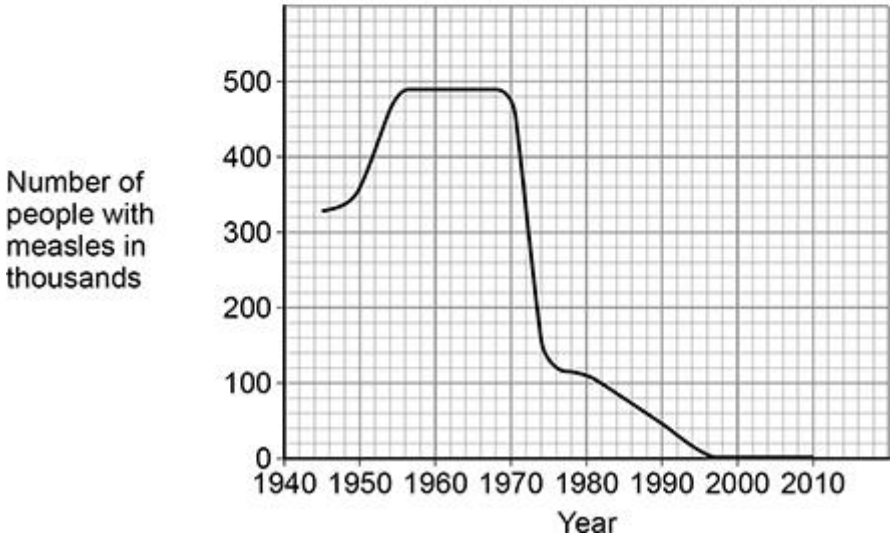
Blood component	Function
	Help clot the blood where the vaccine was injected
Platelets	
	Produce antibodies to the measles virus
	Produce the measles skin rash
White blood cells	
	Transport oxygen to the measles virus

(2)

The figure below shows information about trends in the UK for:

- percentage of children vaccinated
- the number of people with measles.





(b) What year was the measles vaccine first used?

Use the figure above.

_____

(1)

(c) Describe the trend in the **number of people with measles** from 1945 to 1975.

Use the figure above.

_____

_____

_____

_____

_____

_____

(3)

In **1998**, a scientific paper was published suggesting a link between condition **X** and one type of measles vaccine.

(d) What happened to the **percentage of children vaccinated** against measles after the scientific paper was published in 1998?

Use the figure above.

_____

_____

(1)

(e) Why might the claims made in the scientific paper have affected the percentage of children vaccinated?

Tick (✓) **one** box.

The measles pathogen did not exist in the UK anymore. ☐

Parents were worried their children would get condition **X**. ☐

The health service in the UK did not have any vaccines. ☐

(1)

(f) In 2010, the scientific paper linking condition **X** and the measles vaccine was shown to be based on false claims.

What should scientists do with scientific research to help detect false claims?

Tick (✓) **one** box.

Have the research peer reviewed. ☐

Publish the research on the internet. ☐

Send a research questionnaire to the public. ☐

(1)

(g) The person who wrote the scientific paper was paid to research the link between condition **X** and the measles vaccine.

Why are the claims in the scientific paper likely to be considered **not** valid?

_____

_____

(1)

(Total 10 marks)

Q3.

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)

Q4.

Malaria is caused by a protist.

The protist is passed from one person to another person by mosquitos.

(a) Which term describes the mosquito?

Tick (✓) **one** box.

Bacterium ☐

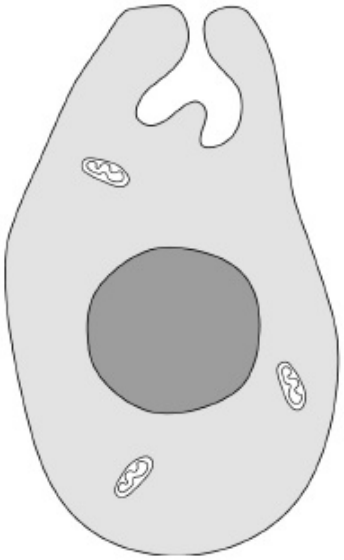
Gene ☐

Vector ☐

(1)

(b) The malarial protist is a eukaryotic cell.

The figure below shows a malarial protist.



Give **two** features of the malarial protist that show the cell is eukaryotic and **not** prokaryotic.

1 _____

_____

2 _____

_____

(2)

(c) Which organism is prokaryotic?

Tick (✓) **one** box.

Cow ☐

Grass ☐

Salmonella ☐

(1)

(d) The malarial protist reproduces asexually.

What is a feature of asexual reproduction?

Tick (✓) **one** box.

Only one parent is involved. ☐

The offspring show genetic variation. ☐

Two gametes fuse. ☐

(1)

(e) Mitosis occurs in the malarial protist during asexual reproduction.

The protist has 14 chromosomes.

How many chromosomes will each new protist cell have after mitosis?

Tick (✓) **one** box.

7 ☐ 14 ☐ 21 ☐ 28 ☐

(1)

(f) When a person has malaria, the protists destroy red blood cells.

What change would happen in the blood of a person with malaria?

Tick (✓) **one** box.

Decreased antibodies	☐
Decreased haemoglobin	☐
Increased plasma	☐
Increased platelets	☐

(1)

(g) It is estimated that 210 million people are infected with malaria every year. Half of these infected people survive the disease.

Calculate how many people would survive the disease in 3 years if the estimate is correct.

Give your answer in standard form.

Number of people (in standard form) = _____

(4)

(h) The spread of malaria can be controlled by using mosquito nets to avoid being bitten.

Describe **two** other ways that people can reduce the chance of being bitten by mosquitos.

Do **not** refer to mosquito nets in your answer.

1 _____

_____

2 _____

_____

(2)

(i) Different types of disease may interact.

Scientists studied how having disorder **S** interacts with malaria.

The scientists calculated the chance of children with disorder **S** getting malaria.

The table below shows the results.

Age in years	**Percentage (%) chance of children with disorder S getting malaria**
2	70
4	65
6	50
8	45

Describe the trend shown in the table.

Use data from the table above.

_____

_____

_____

_____

(2)

(Total 15 marks)

Q5.

HIV (Human Immunodeficiency Virus) is a pathogen.

(a) How is HIV spread from one person to another person?

Tick (✓) **one** box.

Coughing ☐

Sexual intercourse ☐

Touching door handles ☐

(1)

The table below shows information about new cases of HIV diagnosed in the UK.

Year	**Number of new HIV cases**
2010	2642
2014	2767
2018	1530

(b) Describe what happened to the number of new cases of HIV from 2010 to 2018.

_____

_____

_____

_____

(2)

(c) What could cause a **decrease** in the number of new HIV cases in the future?

Tick (✓) **one** box.

A higher population of people in the UK	☐
A lower number of trained HIV nurses	☐
Better education on how to prevent the spread of HIV	☐

(1)

(d) Scientists have been working to produce a vaccine for HIV for many years.

How could a vaccine work to prevent a person being infected with HIV?

Write the stages **A**, **B**, **C**, **D** and **E** in the correct order.

The first stage has been completed for you.

A Antibodies attach to the inactive virus.

B Antibodies destroy the inactive virus.

C An inactive form of the virus is injected into the body.

D If the active virus enters the body, antibodies are produced quickly.

E White blood cells produce antibodies to the inactive virus.

C ⟶ _____ ⟶ _____ ⟶ _____ ⟶ _____

(3)

(e) When scientists produce a vaccine for a disease the vaccine is tested on live animals.

What is the next stage in testing the vaccine?

Tick (✓) **one** box.

Testing on cells in a laboratory	☐
Testing on healthy volunteers	☐
Testing on the whole human population	☐

(1)

(f) A vaccine for HIV is important because it is difficult to develop safe drugs to destroy viruses.

Why is it difficult to develop safe drugs to destroy viruses?

Tick (✓) **one** box.

Drugs that destroy viruses also damage body tissues.	☐
There are too many viruses for the drugs to destroy.	☐
Viruses are too big for the drugs to destroy.	☐

(1)

(g) Some drugs originated from plants.

Draw **one** line from each drug to the plant the drug originated from.

Drug	**Plant the drug originated from**
Aspirin	Foxglove
Digitalis	Rose
	Tobacco
	Willow

(2)

(Total 11 marks)