

## Immunity, Infection and Forensics -5

Name: \_\_\_\_\_

Class: \_\_\_\_\_

Date: \_\_\_\_\_

Time:

Total Marks Available:

Total Marks Archived:

Level: Edexcel A level Biology

Subject: Biology

Exam Board: Pearson Edexcel Level 3 GCE AS and A level Biology A (Salters-Nuffield) and also Pearsons Edexcel AS and A Level Biology B (9BI0) - Is however suitable for use by AS and A level Biology Students of other Boards

Topic: Immunity, Infection and Forensics -5

Type: Topic Question

To be used by all students preparing for Edexcel AS and A level Biology A and Biology B - Students of other Boards may also find this useful

## Questions

Q1.

DNA synthesis in bacterial cell cultures has been investigated.

Describe how DNA is organised in a bacterial cell.

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(Total for question = 3 marks)

Q2.

Describe how DNA profiling could be carried out to show that these snakes are different species.

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**(Total for question = 4 marks)**

Q3.

Lysozyme is one component of the non-specific response to infection.

Describe what is meant by a non-specific response to infection.

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Q4.

Describe the changes that occur inside a body in the first week after death.

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(Total for question = 3 marks)

Q5.

Hospitals have developed practices in response to the increase in hospital acquired infections. Describe the infection control practices hospitals have introduced.

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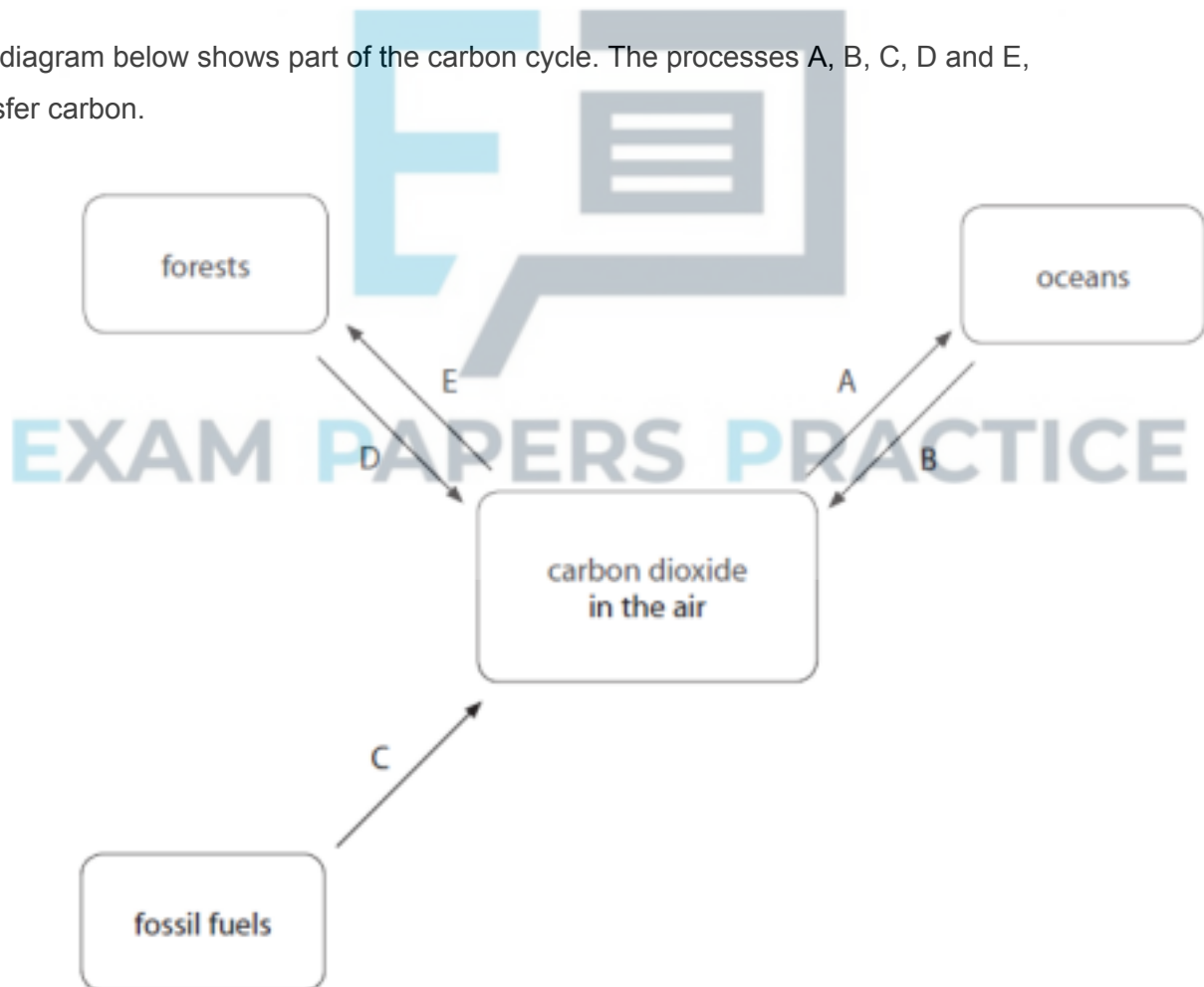
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(Total for question = 3 marks)

Q6.

The diagram below shows part of the carbon cycle. The processes A, B, C, D and E, transfer carbon.



Describe the role of bacteria in process D in the diagram.

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Q7.

One method of estimating the time of death is to determine the age of blowfly maggots on a dead body.

Microorganisms are also found on a dead body.

Describe the role of decomposers, such as microorganisms, in the carbon cycle.

EXAM PAPERS PRACTICE

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**(Total for question = 2 marks)**

Q8.


The scientific article you have studied is adapted from several sources.

Use the information from the scientific article and your own knowledge to answer the following questions.

There are 'trillions of microbes' found in the gut, 'as well as others living elsewhere in and on the body'.

Describe the role of the microbes that are normally found on the skin surface of humans (paragraph 40).

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(Total for question = 2 marks)

Q9.

# EXAM PAPERS PRACTICE

The skin contains a fibrous protein. This protein forms a barrier to the entry of microorganisms.

(i) Place a cross  in the box next to the name of this protein.

(1)

- A cytokine
- B interferon
- C keratin
- D lysozyme

(ii) The primary structure of a protein is important in determining its final structure and properties.

Describe the structure and properties of fibrous proteins.

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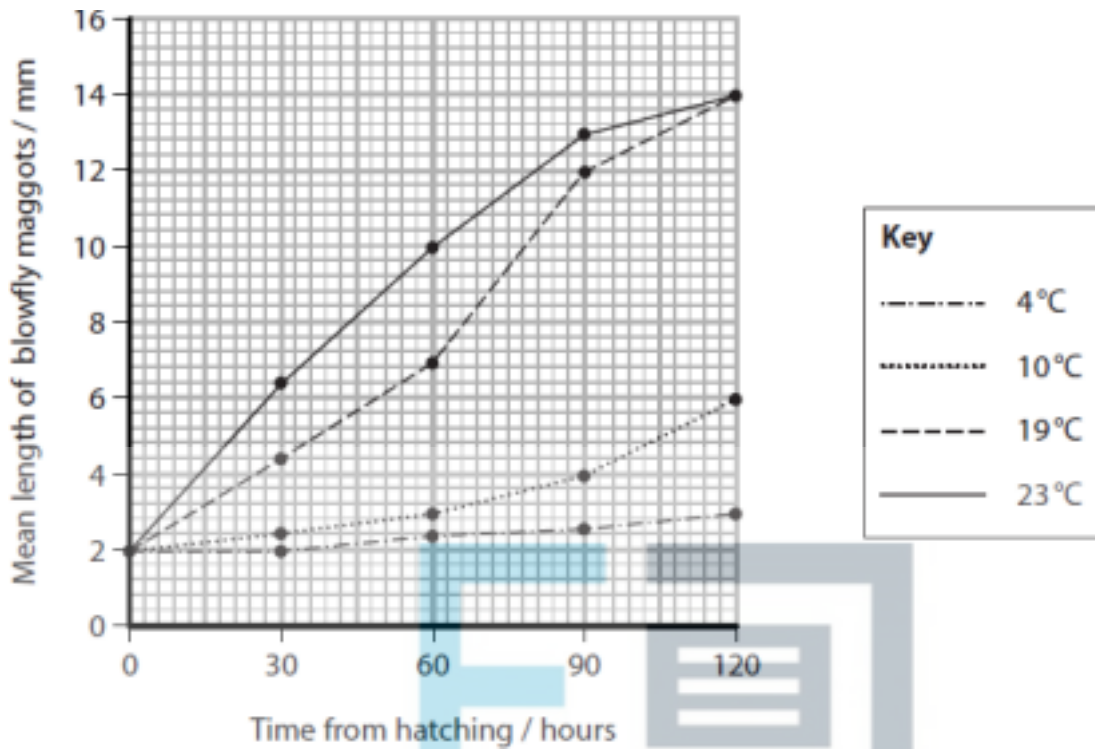
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Q10.

One method of estimating the time of death is to determine the age of blowfly maggots on a dead body.

The effect of environmental temperature on the growth of blowfly maggots is shown in the graph.





(i) Blowfly maggots found on a dead body had lengths between 3 and 8 mm. The body had been at a constant environmental temperature of 19 °C since death.

Determine the maximum time since these maggots hatched.

EXAM PAPERS PRACTICE

(1)

..... hours

(ii) Determine the fastest rate of growth of a blowfly maggot at a temperature of 19 °C. Give your answer to 2 significant figures.

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..... mm hour<sup>-1</sup>

(iii) Explain the effect of temperature on the rate of growth of blowfly maggots.

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(Total for question = 6 marks)



Q11.

Skulls can be used as evidence for human evolution.

The only type of human present today is the modern human. In the past, another type of human, called Neanderthal, occupied the same geographical area.

The photograph shows the skulls of both types of human.



Modern human skull

Neanderthal skull

© hairyuseummatt/DrMikeBaxter

Genetic studies now show that these two types of human have interbred. Only small quantities of DNA can be extracted from the remains of Neanderthal humans. The quantity of extracted DNA is amplified using

(1)

- A DNA profiling
- B polymerase chain reaction
- C RNA profiling
- D translation chain reaction

(Total for question = 1 mark)

Q12.

Grey tree frogs are found in the USA.

The photograph below shows a grey tree frog.



Magnification  $\times 1$

Cope's grey tree frog and the eastern grey tree frog are both found in the USA. These species of grey tree frog are very similar in appearance, but have different mating calls.



A number of scientists believe that the eastern grey tree frog evolved from Cope's grey tree frog during the last ice age.

These species have different numbers of chromosomes in their nuclei. Cope's grey tree frog has two copies of each chromosome. The eastern grey tree frog has four copies of each chromosome. As a result, the cells of the eastern grey tree frog are larger.

(a) The genetic relationship between these two species of grey tree frog has been studied using DNA profiling (DNA fingerprinting).

A small sample of DNA was taken from each species of grey tree frog. This DNA was amplified, fragmented and used to produce a DNA profile (DNA fingerprint) for each species.

\* (i) Describe how a DNA profile was produced from this small sample of DNA.

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(ii) Suggest how these DNA profiles were compared.

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(b) Scientists in different parts of the USA are investigating the possibility that the difference in cell size is responsible for the different mating calls. This is contributing to an understanding of the evolution of grey tree frogs.

Suggest **two** ways in which the results of their investigations can be shared.

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(Total for question = 11 marks)

Q13.

The Atlantic tomcod is a fish found in the rivers of North America.

The photograph below shows an Atlantic tomcod.



Magnification  $\times 1$

Atlantic tomcod in the Hudson River are able to survive high levels of polychlorinated biphenyls (PCBs). PCBs enter the water from industrial processes.

One group of scientists identified a mutation in the DNA of these fish. They found that the AHR2 gene had six bases missing. This mutation was rarely found in Atlantic tomcod in the unpolluted St. Lawrence River.

(a) Suggest how scientists in other countries learnt of these findings.

EXAM PAPERS PRACTICE

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\*(b) (i) Describe how the DNA and protein of Atlantic tomcod from the Hudson River could be compared with the DNA and protein of Atlantic tomcod from the St. Lawrence River.

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(ii) Suggest **one** similarity in the DNA of the Atlantic tomcod from these two rivers.

Give an explanation for your answer.

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(iii) Suggest **one** difference in the protein of the Atlantic tomcod from these two rivers.

Give an explanation for your answer.

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**(Total for question = 12 marks)**

Q14.

Skulls can be used as evidence for human evolution.

The only type of human present today is the modern human. In the past, another type of human, called Neanderthal, occupied the same geographical area.

The photograph shows the skulls of both types of human.



© hairy-museum-matt/DrMikeBaxter

Genetic studies now show that these two types of human have interbred.

Explain how the results of electrophoresis could provide evidence for interbreeding between the two types of human.

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**(Total for question = 2 marks)**





Q15.

Ebola haemorrhagic fever is a life-threatening disease caused by the Ebola virus.

(a) Explain why antibiotics are not used to treat Ebola haemorrhagic fever.

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(b) Some of the blood plasma of individuals who have survived infection with Ebola can be collected. This can be used in the treatment of individuals currently infected with Ebola.

Explain why the blood plasma from survivors can be used to treat new cases of Ebola infection.

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(c) A study of the 2014 Ebola outbreak in Sierra Leone found that the Ebola virus was evolving rapidly.

Explain why the evolution of the virus might reduce the effectiveness of any vaccine being developed.

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**(Total for question = 9 marks)**

Q16.

DNA synthesis in bacterial cell cultures has been investigated.

Antibiotics can be used to control bacterial infections.

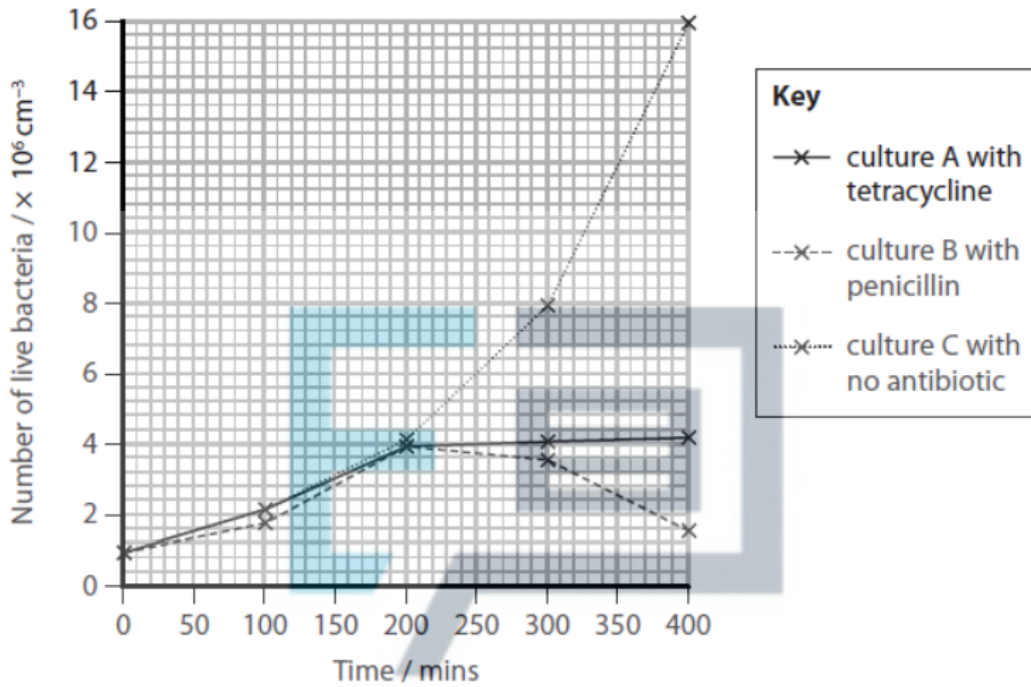
In an experiment, a culture of bacteria was grown in nutrient broth. The culture was then divided into three separate cultures, A, B and C. The bacterial cultures were grown for 200 minutes.

After 200 minutes the antibiotic tetracycline was added to culture A and the antibiotic penicillin was added to culture B. No antibiotics were added to culture C.



The three cultures were grown for a further 200 minutes.

The results of the experiment are shown in the graph.



Deduce the effects of these antibiotics on the growth of the bacterial cultures.

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(Total for question = 2 marks)

Q17.

Skulls can be used as evidence for human evolution.

The only type of human present today is the modern human. In the past, another type of human, called Neanderthal, occupied the same geographical area.

The photograph shows the skulls of both types of human.



© hairy-museum-matt/DrMikeBaxter

Genetic studies now show that these two types of human have interbred.

Devise a procedure, using electrophoresis, to compare the amplified DNA from these two types of human.

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**(Total for question = 4 marks)**

Q18.

The scientific article you have studied is adapted from *Scientific American*.

Use the information from the scientific article and your own knowledge to answer the following question.

Describe how evasion mechanisms can enable pathogens to become drug-resistant (paragraph 20).

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EXAM PAPERS PRACTICE

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**(Total for question = 2 marks)**

Q19.

A newborn baby can respond to infections.

Inflammation is a non-specific response to an infection.

Explain how changes in the blood vessels result in the redness and swelling seen at the site of inflammation.

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EXAM PAPERS PRACTICE

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**(Total for question = 4 marks)**

Q20.

A deer was found dead on National Trust land. Some people thought that the wounds that led to the deer's death could have been caused by a big cat such as a black panther.



The DNA produced by PCR was analysed to find out if a black panther was involved.  
Explain how gel electrophoresis could be used to find out if this DNA came from a black panther.

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(Total for question = 5 marks)



Q21.

The scientific article you have studied is adapted from several sources.

Use the information from the scientific article and your own knowledge to answer the following questions.

'Bacterial molecules pass into the bloodstream where they do not belong, triggering an immune response' (paragraph 32).

Explain how the bacterial molecules could trigger a specific immune response.

(4)

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(Total for question = 4 marks)



Q22.

The scientific article you have studied is adapted from *The Biologist*.

Use the information from the scientific article and your own knowledge to answer the following question.

Tissue rejection can occur in organs transplanted from other individuals (paragraph 22).

Explain how the immune system is involved in tissue rejection.

(4)



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**(Total for question = 4 marks)**

Q23.

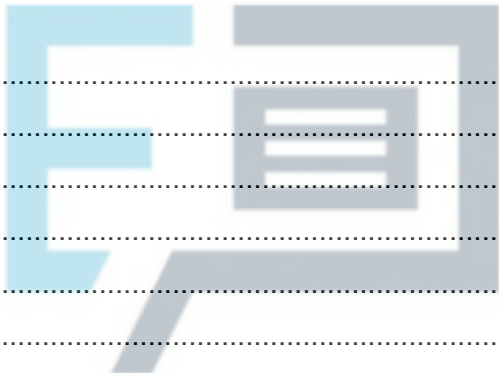
The scientific article you have studied is adapted from *The Biologist*.

Use the information from the scientific article and your own knowledge to answer the following question.

The Zika virus can cause microcephaly. This condition is a result of brain tissue not developing in the foetus (paragraphs 20 and 21).

Explain how the Zika virus can cause microcephaly.

(3)



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(Total for question = 3 marks)

Q24.


The extent of decomposition is important in helping to determine the time of death of a mammal.

Body farms are outdoor laboratories where experiments take place to investigate the changes that take place after death in a range of conditions. Body farms use the bodies of pigs or donated human bodies.

The effects of factors such as temperature, moisture and position of the body on the rate of decomposition can be studied.

Explain the effect of ambient temperature on the rate of decomposition.

(3)



EXAM PAPERS PRACTICE

(Total for question = 3 marks)

Q25.

Phagocytosis is a non-specific response of the body to infection.

Explain the meaning of each of the following terms.

(i) Phagocytosis

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(ii) Non-specific response

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(iii) Infection

EXAM PAPERS PRACTICE

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