PEARSON EDEXCEL GCSE BIOLOGY (HIGHER) · 1BI0

BIOLOGY



EXAM QUESTION PACK

TOPIC 9: ECOSYSTEMS AND MATERIAL CYCLES (PACK 1)

SCORE	PERCENTAGE
/63	%

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Q1.

Answer the question with a cross in the box you think is correct ☒. If you change your mind about an answer, put a line through the box ☒ and then mark your new answer with a cross ☒.

Figure 1 shows the sources of pollution and different levels of water pollution in a river.

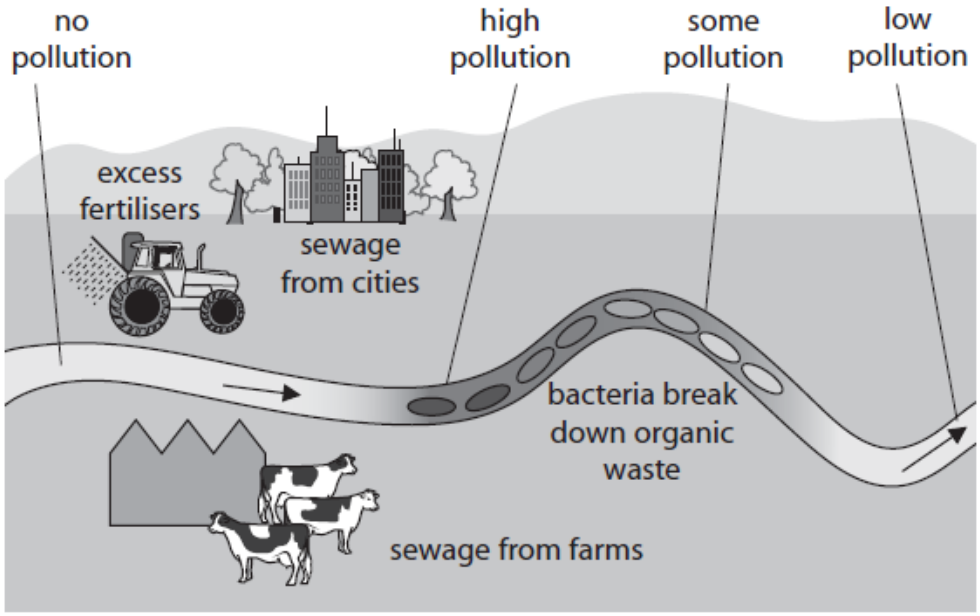


Figure 1

(i) Which part of the river will have the largest number of bloodworms?

(1)

☒ **A** no pollution

☒ **B** high pollution

☒ **C** some pollution

☒ **D** low pollution

(ii) Give the names of the **two** indicator species from the box which provide evidence for clean water.

	blackspot fungus	lichen
freshwater shrimp	sludgeworm	stonefly

(2)

1 .....

2 .....

(Total for question = 3 marks)

Q2.

* The survival of some organisms may depend on mutualism.

Explain, using **three** examples, how some organisms benefit from mutualism.

(6)

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Q3.

Since 2003, in France, people have been buying Siberian chipmunks as pets but then releasing them into the wild when they are no longer wanted.

They are now classified as an invasive species.

Figure 7 shows a Siberian chipmunk (*Tamias sibiricus*).



© 2011, Søren Brøndum Christensen

Figure 7

The black-legged tick (*Ixodes scapularis*) is a parasite that feeds on the blood of animals including Siberian chipmunks and humans.

The tick transmits the Lyme disease pathogen.

Figure 9 shows the number of cases of Lyme disease in humans in France in 2003 and 2015.

Number of cases of Lyme disease in humans in France	
2003	**2015**
9500	27000

Figure 9

(i) Calculate the percentage increase in the number of cases of Lyme disease in humans in France from 2003 to 2015.

(2)

..... %

(ii) Explain why there has been an increase in the number of cases of Lyme disease in humans in France.

(2)

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(Total for question = 4 marks)

Q4.

A student was investigating the populations of organisms in a garden.

Figure 2 shows the estimates of the number and biomass of some of the organisms in the garden.

organisms	number	mean biomass of each organism in grams	biomass of population in grams
cabbages (plants)	80	70	5600
earthworms	620	3.4	?
slugs	30	4.1	123
hedgehogs	1	620	620
squirrels	2	600	1200

Figure 2

(i) Calculate the biomass of the population of earthworms in the garden.

(1)

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(ii) Hedgehogs eat slugs and earthworms.

Slug pellets were used to kill the slugs.

Explain how killing the slugs would affect the population of earthworms in this garden.

(2)

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(iii) Describe a method that could be used to estimate the population of slugs in the garden.

(3)

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(Total for question = 6 marks)

Q5.

Figure 13 shows a food chain for organisms in a stream.



Figure 13

(i) In the food chain there is 2.1×10^4 J of energy in the biomass of stonefly larvae. 90% of the energy is lost between each trophic level of the food chain.

Calculate the energy value that enters the birds.

(2)

..... J

(ii) State the impact of this energy loss on the length of the food chain.

(1)

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(Total for question = 3 marks)

Q6.

Figure 7 shows the world human population from 1800 to 2015.

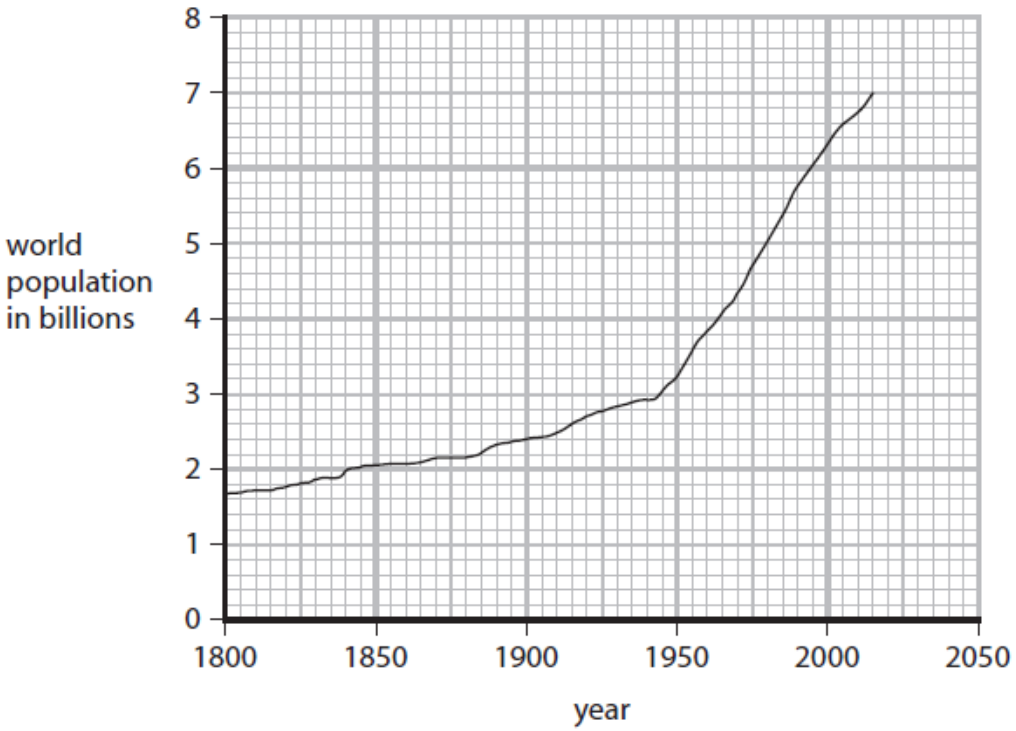


Figure 7

In 2015, 13% of the world human population were classified as malnourished.

Calculate, using Figure 7, how many people were classified as malnourished in 2015.

.....billion

(Total for question = 2 marks)

Q7.

Scientists use a technique called mark and recapture to estimate animal populations in a habitat.

A sample of the population is captured and a harmless mark is added to each animal.

These animals are released and after a period of time the population is sampled again.

This second sample includes some recaptured animals that have marks on them.

The population can be estimated using this equation

$$\text{population size} = \frac{\text{number marked in the first sample} \times \text{size of the second sample}}{\text{number recaptured in the second sample}}$$

A scientist used this technique to determine the change in the population size of snails in a pond from March to July.

Figure 14 shows the results.

month	number marked in the first sample	size of the second sample	number of recaptured animals	population size
March	18	22	8	50
July	12	18	10	

Figure 14

(i) Using data from Figure 14, calculate the difference in the population size from March to July.

(3)

Difference in the population size .....

(ii) State **two** factors the scientist should control when sampling the habitat in March and July.

(2)

1 .....

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2 .....

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(Total for question = 5 marks)

Q8.

Figure 12 shows the global movement of carbon into or out of the atmosphere.

process	movement of carbon into or out of the atmosphere in gigatonnes per year
photosynthesis	120.1
respiration	119.6
ocean uptake	92.8
ocean loss	90.0
combustion of fossil fuels	6.4

Figure 12

Calculate the net mass of carbon added to the atmosphere each year.

(2)

..... gigatonnes

(Total for question = 2 marks)

Q9.

Figure 8 shows the mass of meat eaten in the world from 1980 to 2010.

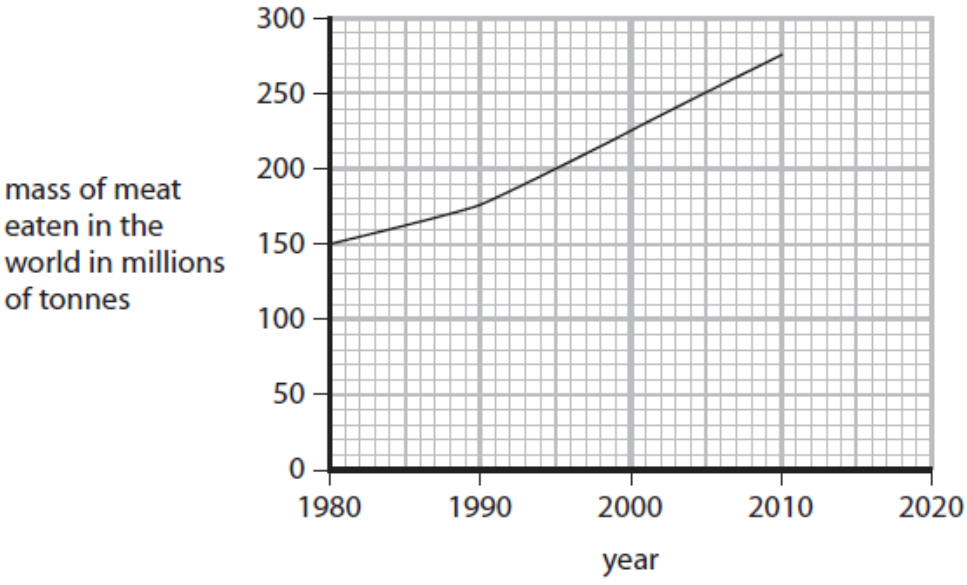


Figure 8

Calculate the rate of increase in the mass of meat eaten in the world from 2000 to 2010.

.....millions of tonnes per year

(Total for question = 2 marks)

Q10.

Tuna are carnivorous fish.

In the wild, tuna eat smaller fish called mackerel.

Some tuna living in the wild can grow larger than 350 kg.

When a tuna eats 1 kg of mackerel the tuna gains 60 g in mass.

Calculate the mass of mackerel a tuna would have to eat to increase its mass by 300 kg.

(2)

..... kg

(Total for question = 2 marks)

Q11.

Climacteric fruits are fruits that can ripen after they have been removed from the plant.

(i) Which plant hormone can be used to ripen climacteric fruit?

(1)

☒ **A** auxin

☒ **B** ethene

☒ **C** gibberellin

☒ **D** insulin

(ii) When climacteric fruits ripen, they release a gas during respiration.

Which gas is released by these fruits during respiration?

(1)

- ☒ **A** carbon dioxide
- ☒ **B** carbon monoxide
- ☒ **C** oxygen
- ☒ **D** nitrogen

(Total for question = 2 marks)

Q12.

Figure 2 shows an area of woodland with some small plants growing in the ground between the trees.



(Source: © Maksym Holovinov/Shutterstock)

Figure 2

The scientist selects an area near the edge of the woodland where many stinging nettles are growing.

This area is partly shaded by the trees.

Describe how the scientist should use a belt transect to investigate how light intensity affects the growth of stinging nettles.

(3)

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(Total for question = 3 marks)

Q13.

Nitrogen is cycled through the environment.

Describe the roles of bacteria in the nitrogen cycle.

(4)

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(Total for question = 4 marks)

Q14.

Since 2003, in France, people have been buying Siberian chipmunks as pets but then releasing them into the wild when they are no longer wanted.

They are now classified as an invasive species.

Figure 7 shows a Siberian chipmunk (*Tamias sibiricus*).



© 2011, Søren Brøndum Christensen

Figure 7

Siberian chipmunks eat acorns which, are the seeds of oak trees.

In Siberia, the natural predators of Siberian chipmunks are wild dogs.

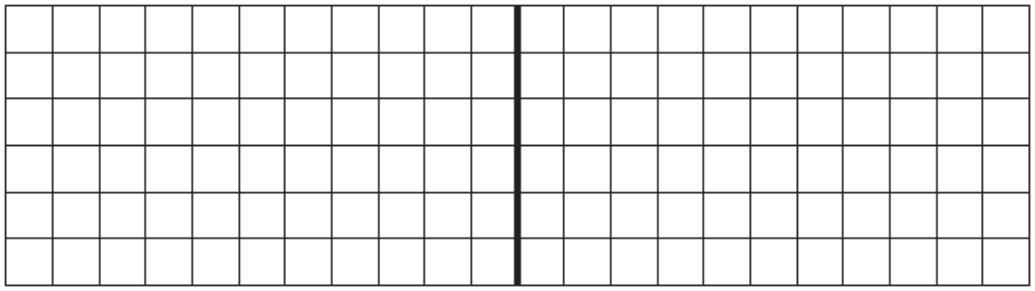
(i) Figure 8 shows the biomass of three organisms in a food chain from one area of Siberia.

organisms	biomass in kg
acorns	20650
chipmunks	2200
wild dogs	230

Figure 8

Draw a pyramid of biomass for this food chain.

(2)



(ii) In France, Siberian chipmunks have very few natural predators.

Describe how this affected the Siberian chipmunk population in France.

(2)

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(iii) The percentage of energy transferred from the acorns to the chipmunks is 9.5%.

The energy contained in the acorns is 97 500 kJ.

Calculate the amount of energy transferred to the chipmunks.

Give your answer to the nearest whole number.

(3)

..... kJ

(Total for question = 7 marks)

Q15.

The bar chart shows the presence of organisms in six lakes.

Each lake has a different pH.

The bars show if a particular organism is present at a certain pH.

	pH of lake					
organism	6.5	6.0	5.5	5.0	4.5	4.0
trout						
bass						
perch						
frogs						
salamanders						
clams						
crayfish						
snails						
mayfly						

(i) Describe how pH affects the variety of organisms in these lakes.

(2)

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(ii) Acid rain can affect the pH of a lake.

Complete the sentence by putting a cross (☒) in the box next to your answer.

The main pollutant that causes acid rain is

(1)

☒ **A** carbon dioxide

☒ **B** carbon monoxide

☒ **C** oxygen

☒ **D** sulfur dioxide

Q16.

(a) A group of students investigated the level of pollution in two different streams, A and B.

Figure 14 shows the student's results.

indicator species	total number in	
	stream A	stream B
Mayfly nymph	4	0
Caddis fly larva	29	0
Stonefly larvae	74	1
Water louse	34	4
Bloodworm	10	45
Sludge worm	2	100

Figure 14

Mayfly nymphs, caddis fly lavae and stonefly larvae are indicators of clean water.

(i) Calculate the percentage of organisms in stream A that are clean water indicators.

Give your answer to two significant figures.

(2)

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(ii) Use the results to explain which stream is more polluted.

(2)

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The students investigated a third stream, which is very slow flowing and runs through an area where intensive farming methods are used.

Figure 15 shows the thick layer of algae formed on top of this stream.



Figure 15

(b) Explain the effect of this algal growth on the organisms in the stream.

(4)

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(Total for question = 8 marks)

Q17.

The food chain shows the energy transferred between organisms.

oak tree —7760 kJ→ caterpillars —620 kJ→ blue tits —50 kJ→ sparrowhawk

(i) The oak tree is the producer in the food chain.

Complete the sentence by putting a cross (☒) in the box next to your answer.

The oak tree obtains energy

(1)

☒ **A** autotrophically

☒ **B** heterotrophically

☒ **C** parasitically

☒ **D** saprophytically

(ii) The energy available in the oak tree that could be transferred to the caterpillars was 97 000.

Calculate the percentage loss of energy between the oak tree and the caterpillars.

(3)

..... %

(iii) Suggest how energy is lost between trophic levels in this food chain.

(2)

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Q18.

Figure 9 shows an energy pyramid.

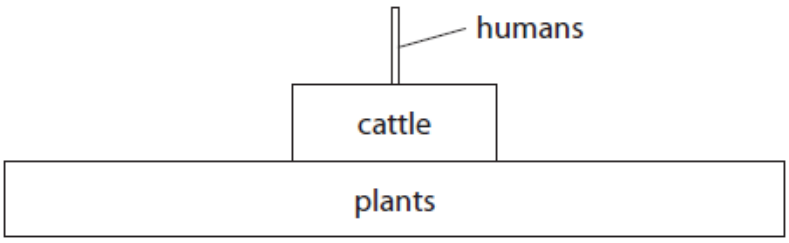


Figure 9

(i) Explain why the area labelled cattle is smaller than the area labelled plants.

(2)

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(ii) The World Health Organisation uses this definition of food security.

> *'When all people at all times have access to sufficient, safe, nutritious food to maintain a healthy and active life'*

Explain how a large increase in the mass of meat eaten will decrease food security in the future.

(3)

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(Total for question = 5 marks)

Q19.

Explain how cabbages, earthworms and squirrels contribute to the carbon cycle.

(3)

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(Total for question = 3 marks)

Q20.

Explain how the concentration of oxygen in a compost bin would affect the rate of decomposition.

(2)

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(Total for question = 2 marks)