Trophic Levels & Ecosystems

Total marks: 19

Q1.

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)

.....

.....

(Total for question = 3 marks)

Q2.

Figure 25 shows the mass of meat eaten in the world from 1980 to 2010.

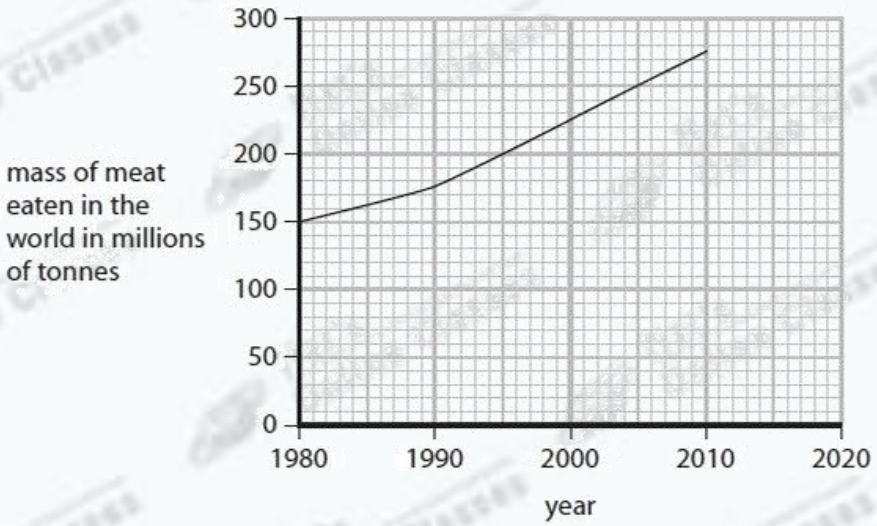


Figure 25

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

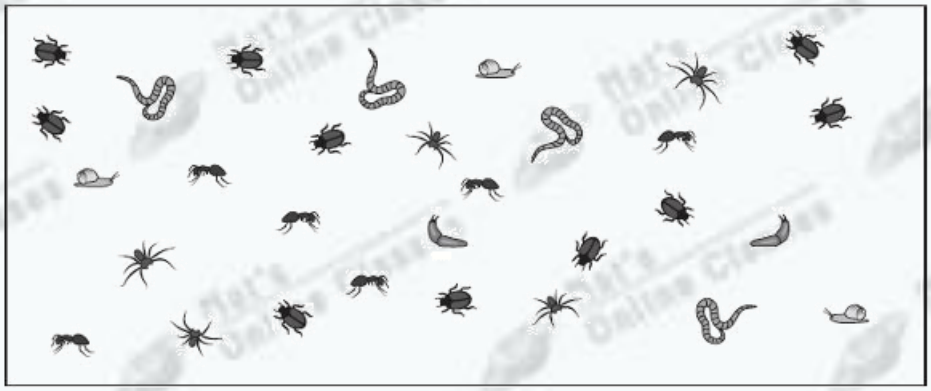
..... millions of tonnes per year

(Total for question = 2 marks)

Q3.

A scientist investigated the distribution of invertebrates found in a garden.

Figure 10 shows 30 invertebrates that the scientist collected.



key					
beetle	snail	ant	spider	slug	worm

(i) Complete the table by filling in the tally and number for the spiders and worms.

(2)

invertebrate	tally	number of invertebrates
ant	𝍸 |	6
beetle	𝍸 𝍸	10
slug	||	2
snail	|||	3
spider		
worm		

(ii) The scientist selected an invertebrate at random to observe it in more detail.

State the probability that the invertebrate selected is an ant.
Give your answer in its simplest form.

(2)

.....

(iii) State how the type of food used to bait the pitfall trap could affect the number of different invertebrates caught.

(1)

.....

.....

(Total for question = 5 marks)

Q4.

A scientist investigated the distribution of invertebrates found in a garden.

The scientist also counted the number of snails in four $1m^2$ areas of the garden.

The garden had a total area of 40 m^2.

Describe how the scientist can use this information to estimate the number of snails in the garden.

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(Total for question = 2 marks)

Q5.

Plankton, krill and cod are found in the Arctic ocean.

Figure 5 shows the mass of organisms in an area of the Arctic ocean.

Figure 5

(i) Draw an accurate pyramid of biomass for this food chain.

(2)

(ii) Give **two** reasons why all the biomass from the krill is not transferred to the cod.

(2)

1 .....

.....

2 .....

.....

(Total for question = 4 marks)

Q6.

Algae are green plants.

Figure 10 shows the number of algae in a lake in the United Kingdom during one year.

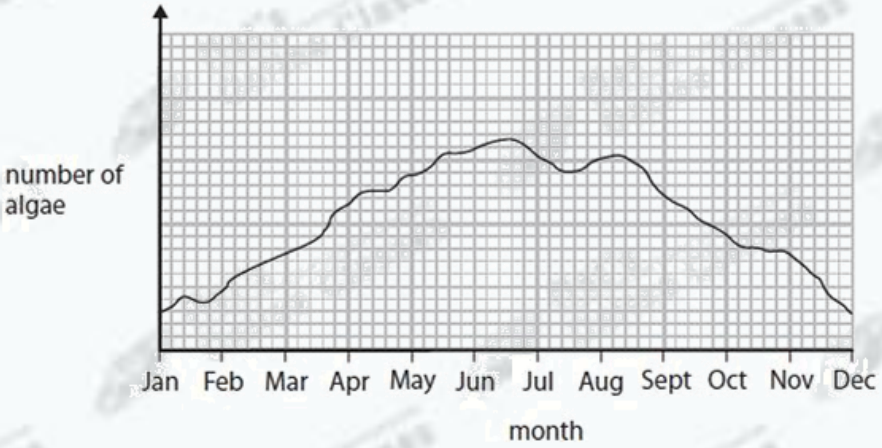

Figure 10

Explain the changes in the number of algae in the lake from February to June.

(3)

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.....

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.....

.....

(Total for question = 3 marks)

Mark scheme:

Q1.

Question number	Answer	Additional guidance	Mark
(i)	• $2.1 \times 10^4 = 21\,000 \times 0.1 = 2\,100$ in the water beetle (1) • 210 J in the bird (1)	award full marks for correct numerical answer without working	(2)

Question number	Answer	Mark
(ii)	it limits the length of the food chain	(1)

Q2.

Question number	Answer	Additional guidance	Mark
	substitution (from graph) increase = 275 – 225 (= 50) (1) evaluation rate = 50 ÷ 10 = 5	 accept tolerance +/- 2 for graph readings accept values of 4.6 to 5.4 award full marks for answer without working	(2) AO2.1

Q3.

Question number	Answer	Mark
(i)	spider | 𝍸 | 5 worm | 𝍸 | 4 • Spider line correct (1) • Worm line correct (1)	(2) AO1.2

Question number	Answer	Additional guidance	Mark
(ii)	Substitution 6 out of 30 / 6 in 30 / 6/30 (1) Simplest form 1 in 5 / 1/5 / 0.2 / 20%	accept there are 6 ants and there are 30 invertebrates. award full marks for correct answer with no working.	(2) A03.1

Question number	Answer	Mark
(iii)	One type of food may only attract some invertebrates / some foods may attract many different types of invertebrates.	(1) A03.2

Q4.

Question number	Answer	Mark
	A description including: • Calculate a mean / average (1) • Multiply mean by 40 / the area (1) OR • Add together the number of snails in the 4 areas (1) • Multiply by 10 (1)	(2) AO1.2

Q5.

Question number	Answer	Additional guidance	Mark
(i)	An accurately drawn pyramid of biomass: • pyramid shaped with all three stages shown (1) • accurate dimensions for the diagram (1)	6 small squares cod 2 large squares krill 10 large squares plankton	(2)

Question number	Answer	Mark
(ii)	Any two of the following points: • not all the krill is eaten (1) • parts of the krill cannot be digested (1) • the krill has used some biomass to provide energy for movement/heat/respiration (1)	(2)

Q6.

Question number	Answer	Mark
	An explanation that combines identification via a judgment (1 mark) to reach a conclusion via justification/reasoning (2 marks): Judgement: • the number of algae increase (1) Two reasons: • increased {temperature / light intensity} / longer daylight (1) • for (more) photosynthesis (for growth) (1) OR • increased minerals / nitrate ions / eutrophication in the lake (1) • (more) protein / chlorophyll (for growth) (1)	(3) AO 3 2a AO 3 2b