

Q1. On a rocky shore, when the tide goes in and out, organisms are exposed to the air for different amounts of time.

- (a) On hot, windy days when the tide is out the concentration of the salt solution in rock pools may become very high.

What term is used to describe organisms that can survive in severe conditions such as very high concentrations of salt solution?

.....






(1)

- (b) Periwinkles are types of snail.
Students surveyed the different types of periwinkle living on a rocky shore.

The diagram shows the results of the students' survey.

The highest position that the sea water reaches on the shore is called the high tide level.

Each bar represents the range of habitats for each type of periwinkle.

Position on shore	Small periwinkle	Rough periwinkle	Common periwinkle	Flat periwinkle
High tide level  Low tide level				

- (i) Which **two** types of periwinkle are likely to compete with each other to the greatest extent?

.....

(1)

- (ii) Explain your answer to part (b)(i).

.....

.....

(1)

- (iii) The small periwinkle can survive much nearer to the high tide level than the flat periwinkle.

Suggest **two** reasons why the flat periwinkle cannot survive near to the high tide level.

1.....
.....
.....
2.....
.....
.....

(2)
(Total 5 marks)

Q2. The photograph shows a sand gazelle.



The sand gazelle lives in the Arabian Desert where temperatures often reach 45 °C.

(a) The sand gazelle feeds only at dawn and at dusk. At other times it stays in the shade.

Suggest how this helps the animal to conserve water.

.....
.....
.....

.....

(2)

- (b) During the dry season, the sand gazelle’s liver and heart shrink in size. This reduces the amount of oxygen that the body needs.

Suggest how needing less oxygen helps the animal to conserve water.

.....

(2)

(Total 4 marks)

Q3. Squirrels live in woodland.

Table 1 shows:

- the total area of England, Scotland and Wales
- the area of different types of woodland in these countries.

Table 1				
Country	Total area of country in thousands of km²	Area of woodland in thousands of km²		
		Coniferous woodland	Broadleaf woodland	Total
England	130	3.6	7.8	11.4
Scotland	79	10.4	3.0	13.4
Wales	21	1.9	0.9	2.8

- (a) Look at the data for the three countries. Estimate which country has the greatest proportion of its area suitable as a habitat for squirrels.

Support your answer with relevant figures.

.....

.....

.....

.....

.....

.....

(2)

(b) The maps show the distribution of grey squirrels and red squirrels in England, Scotland and Wales.

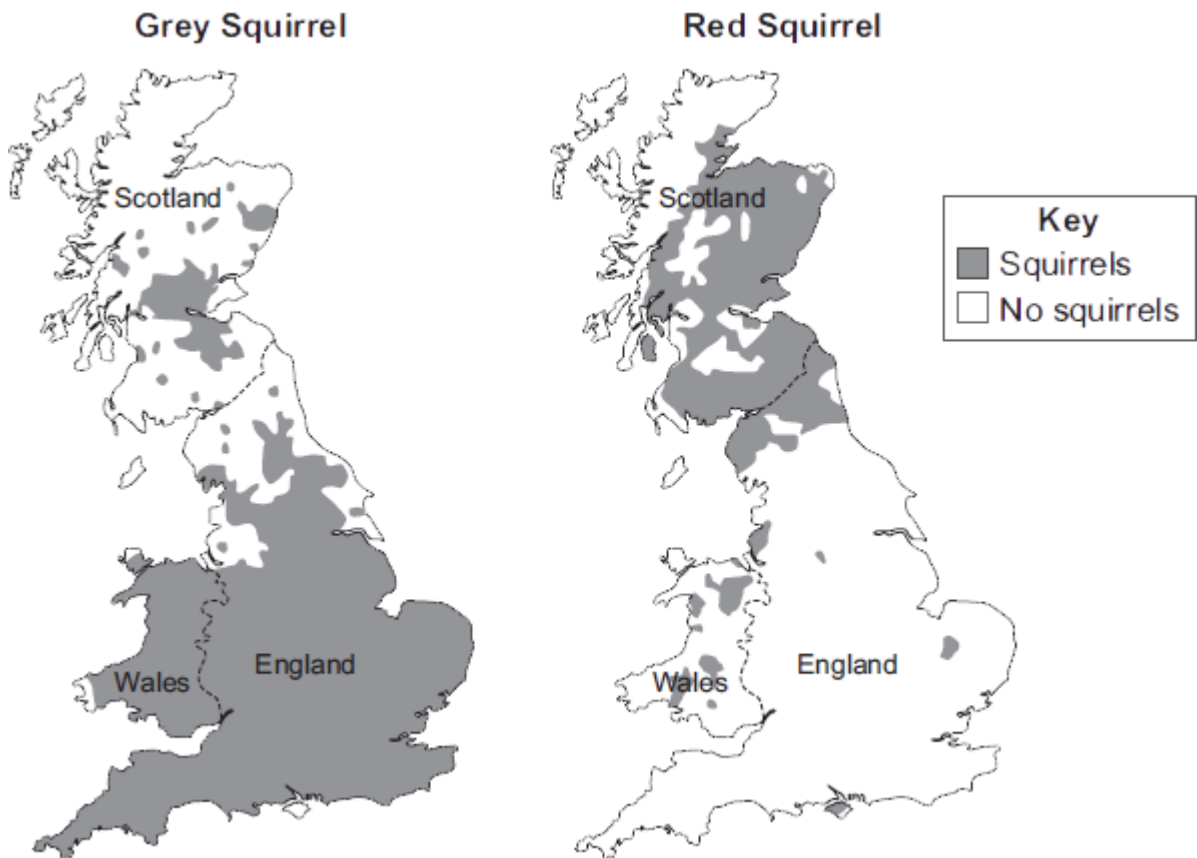


Image under Crown Copyright and courtesy of Pepper & Patterson, 2001. Contains public sector information licensed under the Open Government Licence v1.0

Scientists suggested that the distribution of grey squirrels and red squirrels is linked to the type of trees in woodlands.

(i) The information for England and Scotland supports this suggestion.

How?

.....

.....

(1)

(ii) Give **one** piece of evidence that contradicts this suggestion.

.....

.....

(1)

(c) Red squirrels are native to the UK.
 Grey squirrels were introduced to the UK from the USA over 100 years ago.

Table 2 gives information about the two types of squirrel.

Table 2		
	Grey squirrel	Red squirrel
Population in UK	2.5 million	140 000
Main food types	Seeds, nuts, tree bark, birds' eggs, young birds	Cones from coniferous trees, nuts, tree bark, berries
Health	Can become immune to parapox virus	Cannot become immune to parapox virus
Reproduction	Up to 9 young, twice a year	Up to 6 young, twice a year
Survival rate of young in mixed populations	41 %	14 %
Length of life	2 – 4 years	Up to 7 years

In most parts of the UK the population of grey squirrels is increasing, but the population of red squirrels is decreasing.

Suggest why.

Use information from **Table 2**.

.....

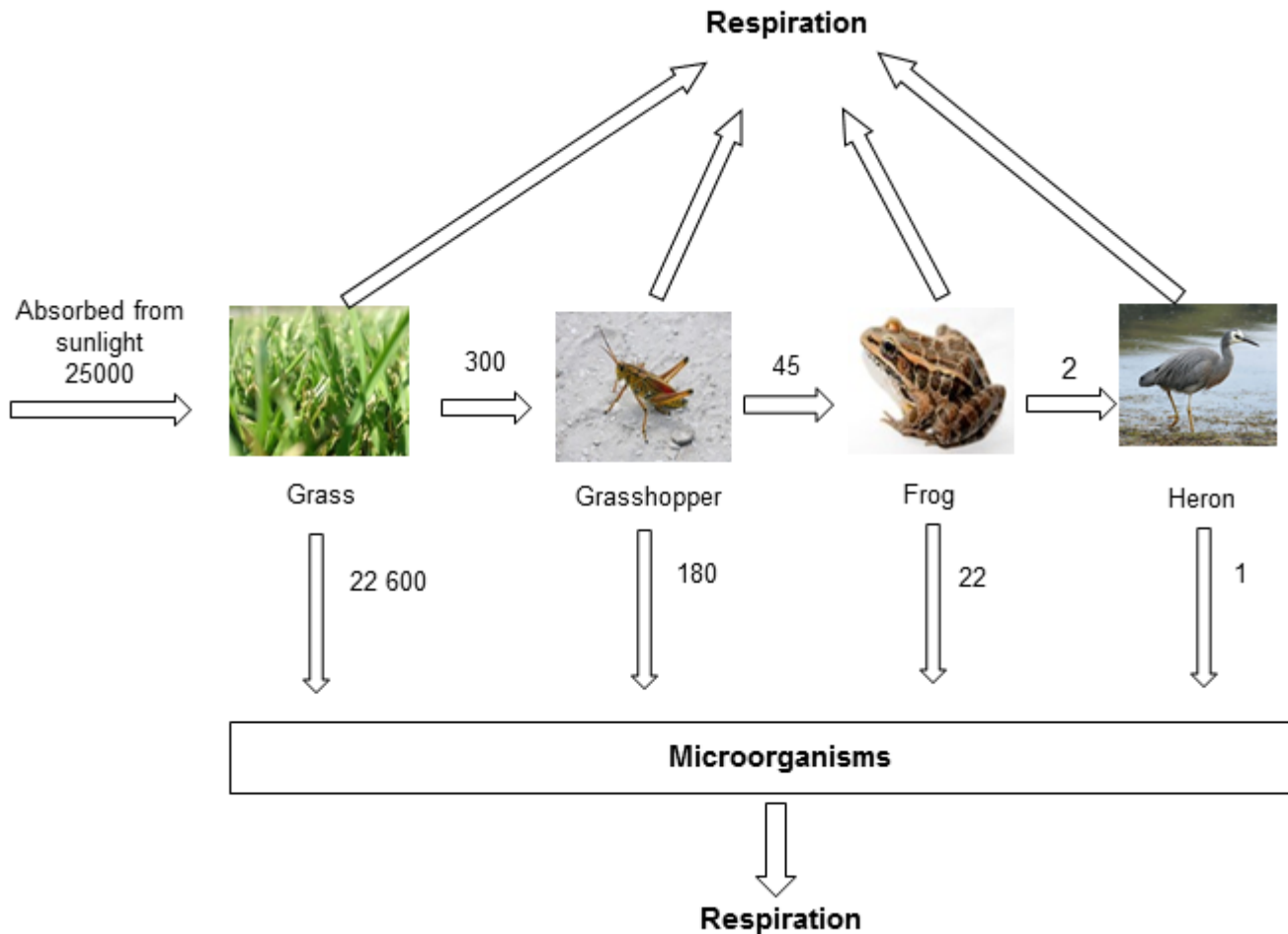
.....

.....

.....

(3)
(Total 7 marks)

Q4. The diagram shows the annual energy flow through 1 m² of a habitat.
The unit, in each case, is kJ per m² per year.



(a) Calculate the percentage of the energy absorbed by the grass from sunlight that is transferred to the frog.

Show clearly how you work out your answer.

.....

.....

Answer %

(2)

- (b) All of the energy the grass absorbs from the sun is eventually lost to the surroundings.

In what form is this energy lost?

.....

(1)

- (c) Food chains are usually **not** more than five organisms long.

Explain why.

To gain full marks you must use data from the diagram.

.....

.....

.....

.....

(2)

- (d) In this habitat microorganisms help to recycle materials.

Explain how.

.....

.....

.....

.....

.....

.....

(3)

(Total 8 marks)

Grass by Catarina Carvalho from Lisboa, Portugal (Flickr) [CC-BY-2.0], via Wikimedia Commons. Grasshopper by Daniel Schwen [GFDL, CC-BY-SA-3.0], via Wikimedia Commons. Frog by Brian Gratwicke (Pickerel Frog) [CC-BY-2.0], via Wikimedia Commons. Heron by Glen Fergus (Own work, Otago Peninsula, New Zealand) [CC-BY-SA-2.5], via Wikimedia Commons.

Q5. A gardener pulled up weeds and used them to start a compost heap. The compost heap soon became colonised by large numbers of earthworms and slugs. The gardener then noticed a hedgehog rooting through the compost heap, eating the earthworms and slugs. Every so often the hedgehog stopped to scratch itself. This was because it had large numbers of fleas which fed by sucking the hedgehog's blood.

(a) Use **only** information from the passage to answer the following.

Construct and label a pyramid of **biomass** for your food chain.

(2)

(b) Gardeners put plant material onto compost heaps so that it will decay. They then put the decayed compost onto soil where they are growing their plants.

Give **three** conditions which are needed for plant material to decay rapidly.

1

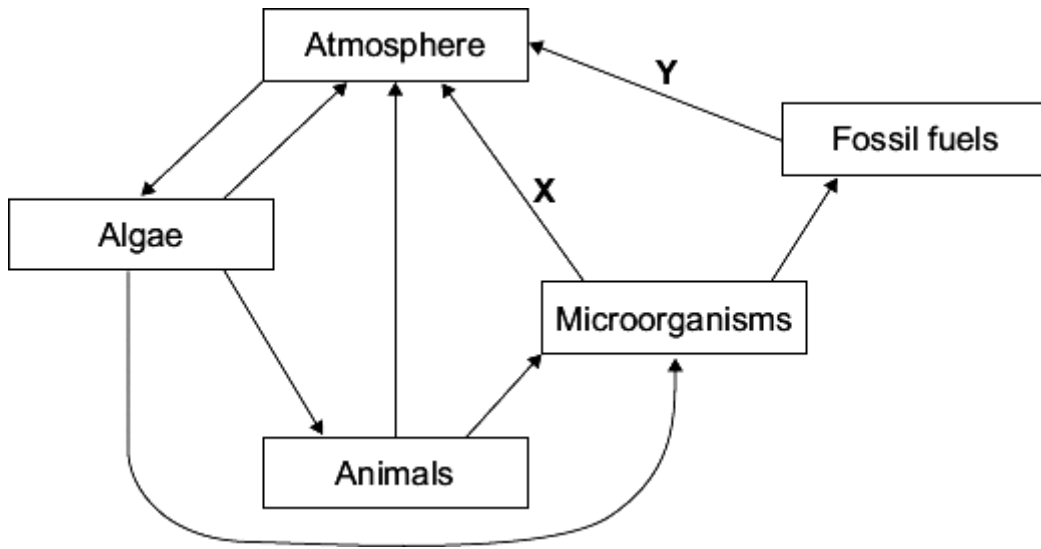
2

3

(3)

(Total 5 marks)

Q6. The diagram shows part of a carbon cycle in a habitat.



(a) Name the processes shown by arrows X and Y.

X

Y

(2)

(b) Describe the part played by algae in this carbon cycle.

.....

.....

.....

.....

.....

.....

(3)

(c) In tropical rainforests process X is much faster than in most other habitats.

Suggest why.

.....

.....

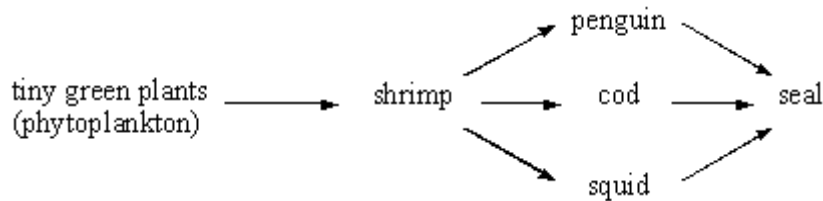
.....

.....

(2)

(Total 7 marks)

Q7. Scientists have found the following food web in the cold Antarctic Ocean.



(a) Humans are removing large numbers of the cod.

Some scientists argue that this could lead to a decrease in the numbers of squid and penguins.

Others argue that the numbers of squid and penguins will stay the same.

Carefully explain each argument.

Why they might decrease.

.....
.....
.....

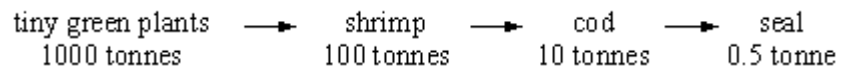
(1)

Why they might stay the same.

.....
.....
.....

(2)

(b) The following information is about the biomass of the organisms in one of the food chains in the web.



Draw and label a pyramid of biomass for this chain.

(2)

- (c) Explain, as fully as you can, why the conversion of shrimp biomass into cod biomass is more efficient than that of cod biomass into seal biomass in the cold Antarctic Ocean.

.....
.....
.....
.....

(3)

- (d) Boats from many countries fish the Antarctic Ocean. The cod are being overfished. If the numbers of cod are to increase, the population must be carefully managed.

- (i) Suggest **two** control measures which would prevent a further drop in numbers,

.....
.....

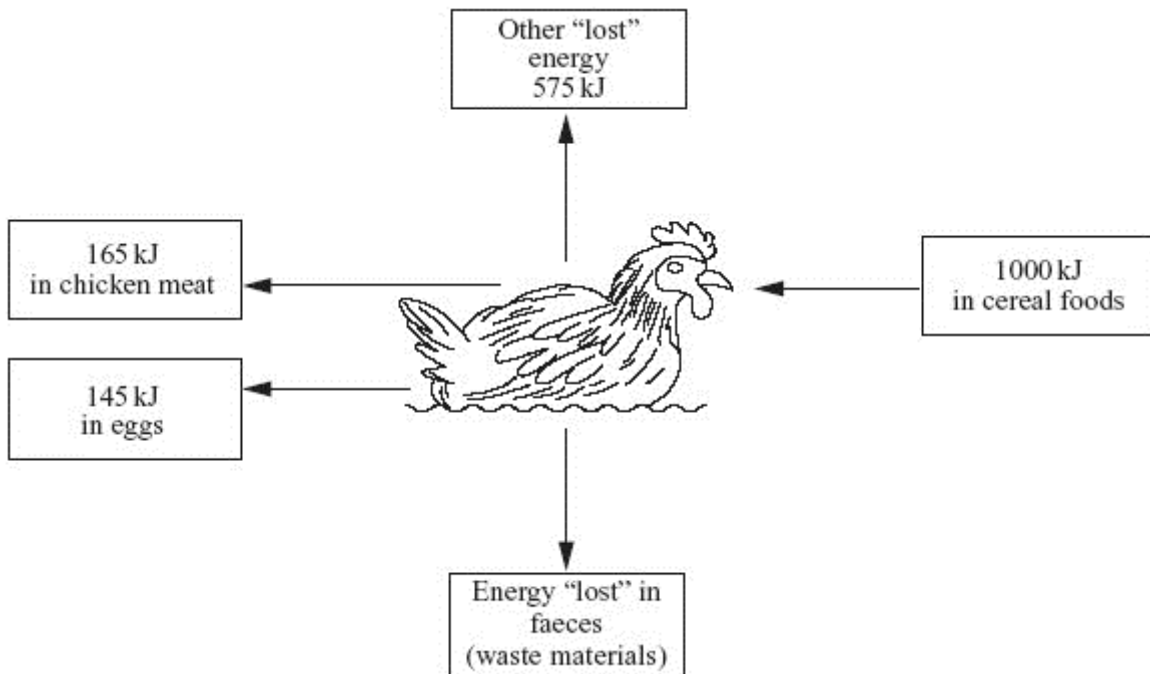
(2)

- (ii) Suggest why **one** of your control measures would be difficult to put into practice.

.....

(1)
 (Total 11 marks)

Q8. Chickens are kept as farm animals to produce food. Free-range chickens are allowed to feed in a large space outside. The diagram shows how energy supplied in food to a free-range chicken is transferred.



(a) Calculate the amount of energy “lost” in faeces.

.....

Energy “lost” = kJ

(1)

(b) Some farmers use the battery method. They keep large numbers of chickens in a small indoor space. The food yield from these chickens is higher than that from

free-range chickens. Explain why, as fully as you can.

.....

.....

.....

.....

.....

.....

.....

.....

.....

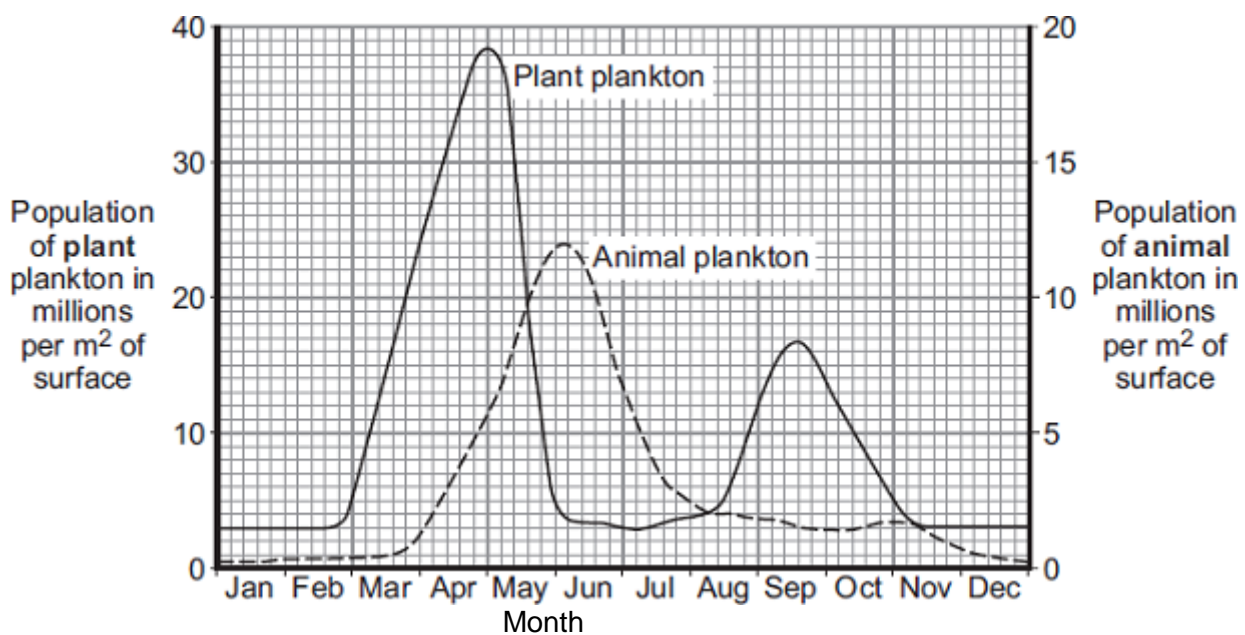
.....

(4)
(Total 5 marks)

Q9.Plankton live in the sea.Animal plankton eat plant plankton.

Graph 1 shows how the populations of the plankton change through the year in the seas around the UK.

Graph 1

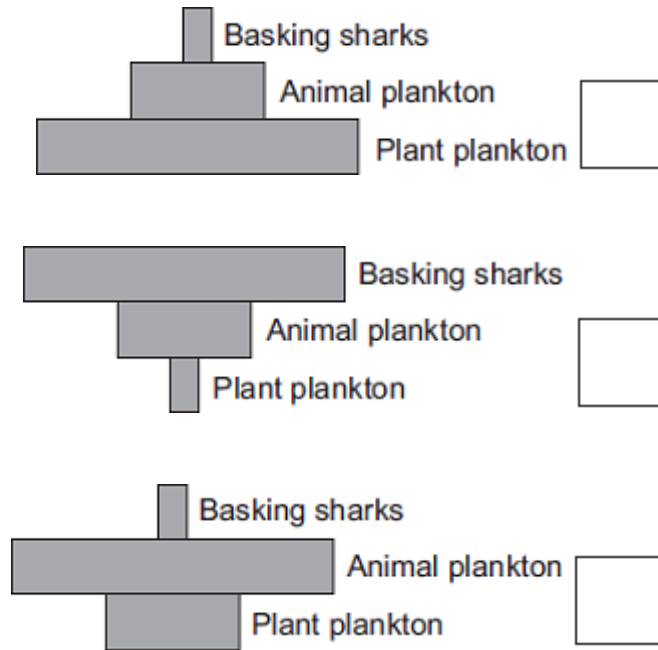


(a) Basking sharks eat animal plankton. Basking sharks grow up to 8 metres long.

Look at the diagram and **Graph 1**.

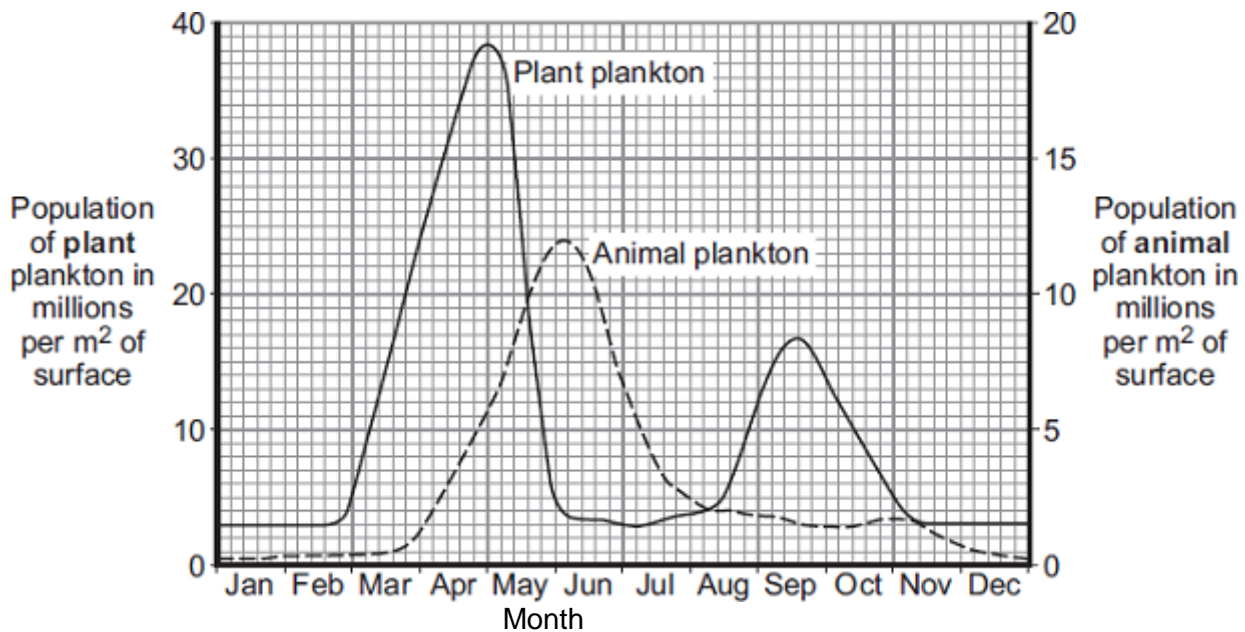
Which is the correct shape for the pyramid of biomass to show the relationship between plant plankton, animal plankton and basking sharks, in June?

Tick (✓) **one** box.

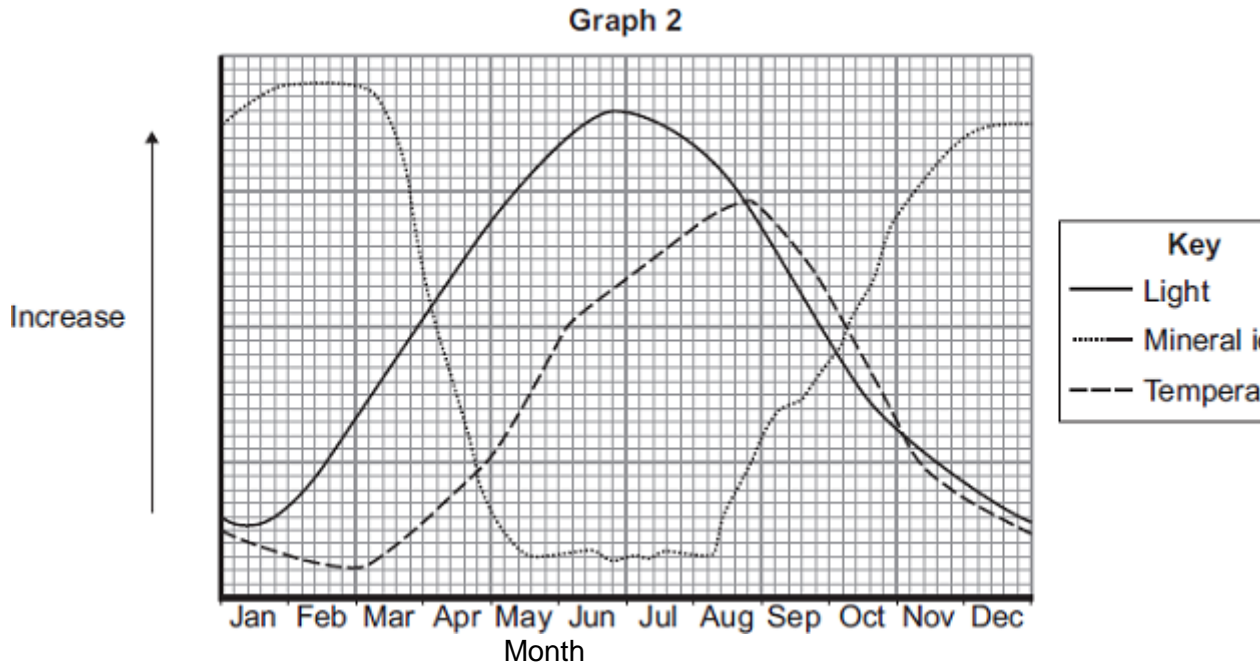


(1)

Graph 1 is repeated here to help you answer the following questions.



Graph 2 shows changes in some of the conditions in the upper layers of the sea around the UK.



(b) The population of plant plankton increases between February and April.

Suggest **one** reason for the increase.

Explain your answer.

.....

.....

.....

.....

(2)

(c) The population of animal plankton changes between April and July.

Suggest explanations for the changes.

.....

.....
.....
.....
.....

(2)

- (d) The concentration of mineral ions changes between February and December.
Suggest explanations for the changes.

.....
.....
.....
.....
.....
.....
.....

(3)

(Total 8 marks)

M1.(a)	extremophile(s)		1
	(b) (i)	common (periwinkle) and flat (periwinkle) <i>either order, both required</i>	1
	(ii)	(common and flat) both live in the same habitat / area / named area <i>allow habitats overlap the most</i>	1
	(iii)	any two from: <ul style="list-style-type: none"> • would have wrong food • would otherwise be exposed to (specific) predators • cannot tolerate extended exposure to air or reduced submersion in seawater <i>allow cannot tolerate temperature / dehydration</i> • cannot tolerate high salt concentration (in rock pools) <i>allow low salt concentration (in rock pools)</i> • cannot compete with small periwinkle 	2
			[5]
M2.	(a)	stays cool <i>ignore shade</i>	1
		less sweat	1
	(b)	any two from: <ul style="list-style-type: none"> • breathing rate less 	

- less water lost via breath
less can be implied
- less water from respiration

2

[4]**M3.** (a) Scotland

1

any **one** from

- Scotland 15 to 20% / about 1/5th to 1/7th but England and Wales / the others are less / lower / reasonable estimated figures

- $\frac{13.4}{79}$ is greater than England / $\frac{11.4}{130}$ and Wales / $\frac{2.8}{21}$

1

- (b) (i) broadleaf woodlands have more grey squirrels **or** broadleaf woodlands have less red squirrels

allow converse referring to conifers

1

- (ii) Wales has more conifers and / but more grey squirrels
or
Wales has less broadleaf and / but more grey squirrels
allow converse for red squirrels

1

- (c) any **three** from:

answers must be comparative they = grey squirrels

grey squirrels

allow converse arguments for red squirrels

- have wider range/ more types of food

- are resistant to parapox (virus) but reds are not
ignore reference to other disease
- have more young each year / litter
- young more likely to survive (in mixed populations)

3

[7]

M4. (a) 0.18

*award both marks for correct answer irrespective of working
if no answer or incorrect answer
allow 1 mark for $45 \times 100 / 25000$*

2

(b) heat / thermal

allow heat from respiration

1

(c) energy / mass / biomass lost / not passed on **or** energy / mass / biomass is used **or** not enough energy / mass / biomass left

ignore reference to losses via eg respiration / excretion / movement / heat

1

a sensible / appropriate use of figures including heron

eg only 2 from frog / to heron

ignore units

1

(d) any **three** from:

accept marking points if candidate uses other terms for microorganisms

- (microorganisms) decay / decompose / digest / breakdown / rot
ignore eat
- (breakdown) releases minerals / nutrients / ions / salts / named
ignore food

- (microorganisms) respiration
ignore other organisms respiring
- (microorganisms / respiration) release of carbon dioxide

3

[8]

M5. (a) pyramid correct shape labelled

2

- (b) warm
moist
oxygen

3

[5]

M6. (a) **X** respiration

correct order only
allow decay / decomposition / rotting
ignore breakdown / disintegrate

1

Y combustion / burning

1

(b) any **three** from:

- photosynthesis / absorb carbon dioxide
*accept are producers **or** produce / make biomass / glucose / other named*
*do **not** accept photosynthesis releases CO₂*
- release carbon dioxide / respire
- eaten by animals

- fed on / decayed by microorganisms
ignore eaten by microorganisms

3

(c) any **two** from:

(in tropical rainforest conditions are)

- warm(er) / hot
- damp / moist / wet / humid
ignore rain
- a lot of microorganisms
- a lot of material to decay
allow warm(er) so enzymes work faster for 2 marks

2

[7]

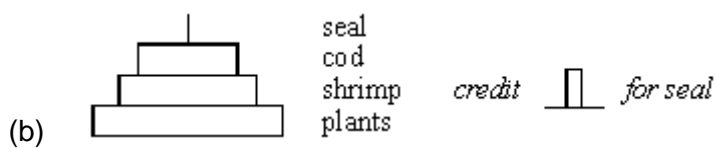
M7. (a) Decrease: seals will eat more squid and penguins
for 1 mark

1

Stay the same:

- more shrimp/food for squid and penguins
ideas that
- increase in squid and penguins balances the extra eaten by seals
- seals find other prey (allow start to eat shrimps)
any two for one mark each

2



allow



- correct shape (doesn't need to be to scale)
- correctly with organisms

*(if wholly correct but inverted then credit 1 mark)
each for 1 mark*

2

(c)

- seals are mammals
- *idea that seals have (to maintain) a constant body temperature [allow warm blooded]*
- heat losses to cold seas
- more of food eaten used to replace heat loss

*(credit use of figures i.e. 95% loss compared to 90%
or 5% efficient compared to 10%
or 20 : 1 conversion ratio compared to 10 : 1
with 1 mark)*

any three for 1 mark each

3

(d) (i) *ideas that*

- reduce number of fishing boats allowed
- breed in captivity and then release
- agree quotas [not an unqualified 'ban']
- avoid breeding areas
- avoid breeding seasons
- increase size of net mesh/don't catch small fish
- limit catches of shrimps
- cull seals

*any two for 1 mark each
[allow any other reasonable answer]*

2

(ii)

- breeding areas closer to some countries than others
- difficult to police/easy to cheat/'poach'
- difficult to agree quotas
- some countries eat more fish than others
- best weather for fishing maybe in breeding seasons
- fisherman/trawlers need employment
- big demand for cod

*any one for 1 mark**[allow any other sensible response]*

1

[11]**M8.** (a) 115

1

(b) any **four** from

less energy lost / used

as heat lost to the atmosphere

since warm indoors

accept temperature controlled

(less energy lost) in movement

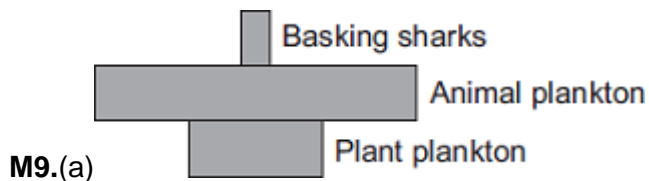
since movement restricted

more growth / eggs

*accept prevents loss of body mass **or** gets fatter / weight gain*

4

[5]



if more than one box is ticked award no mark

1

- (b) increasing / higher light / temperature

*ignore references to months other than February – April
do **not** accept mineral / ions increase*

1

more / increased photosynthesis

*for both marks there must be a reference to 'more' at least once (e.g. 'more light for photosynthesis' gains 2 marks)
allow 1 mark for reference to light **and** photosynthesis without an idea of 'more'*

1

- (c) increase due to increase in plant plankton / food

ignore references to months other than April – July

1

decrease due to fall in plant plankton / food **or** decrease as eaten by (basking) sharks

allow decrease as eaten by predators / animals / fish

1

- (d) fall due to use / intake by plant (plankton)

*ignore ref to no change section of graph
for fall allow March / April
ignore May / February*

1

increase due to decay / decomposition / breakdown

for increase allow any month in range August to November

ignore December

1

of dead (plant / animal) plankton

allow of dead organisms / waste

1

[8]