M1. (a) 3-layered triangular pyramid

as blocks or layered triangle, ignore (small) gaps between layers

1

(pyramid) labelled in food chain order

all three labels are required

*for **2** marks the pyramid must be fully correct*

1

(b) (i) C

1

(ii) shortest **or** fewest stages / transfers / (trophic) levels

allow only if (b)(i) is C or blank

1

less losses in waste / faeces / urine / CO_2 / excretion

allow smaller amount uneaten

1

less loss in respiration / heat / movement

allow less lost keeping warm

*do **not** allow energy for respiration*

*do **not** allow respiration makes energy*

*allow less loss (of biomass / energy) **or** less transfer (of biomass / energy) to surroundings if neither 2nd nor 3rd point given, for **1** mark*

1

[6]

M2. (a) (i) 6000

*award **2** marks for correct answer irrespective of working*
*allow **1** mark for 20 x 300 with incorrect or no answer*
allow answer in table if answer line blank

2

(ii) bar width 6000 **or** to match answer to (a)(i)

anywhere on scale
ignore depth / height of bar

1

drawn below slugs

*label **not** required*

1

(b) any **three** from:

ignore reference to size / mass / number of organisms
assume reference is to / of hedgehog unless stated otherwise

- respiration (by hedgehog)
  *do **not** accept idea that respiration uses / produces energy*
- (results in) loss of CO_2
- faeces (of hedgehog) **or** not digested
- excreted / urine / urea (by hedgehog)
  *accept waste for **1** mark if neither faeces nor excretion point made*
  ignore sweat alone
- not all slug(s) are eaten (by hedgehogs) **or** some slugs eaten by other things
  ignore some slugs die
  ignore reference to movement / heat / growth
  allow references to energy losses by these methods, rather than biomass losses

3

[7]

M3. (a) (i) wheat → humans chain transfers 10 times more energy than wheat → pigs → humans chain

allow 10% if given as a comparison e.g. one is 10% of the other

or

wheat → pigs → humans chain transfers 810 000 (kJ per hectare) less

ignore less unqualified

1

(ii) any **one** reason for energy loss from pigs e.g :

ignore respiration, growth

ignore heat unqualified

- movement
- (maintaining) body temperature
- waste materials

  allow named examples
- not all parts of pig eaten by human
- because there is an extra stage (pigs) in the food chain and energy is lost at each stage

  allow longer food chain so more energy lost

1

(b) Marks awarded for this answer will be determined by the Quality of Written Communication (QWC) as well as the standard of the scientific response. Examiners should also refer to the information in the Marking guidance, and apply a 'best-fit' approach to the marking.

0 marks No relevant content.

Level 1 (1-2 marks) There is a basic description of at least one factory farming method
or
identification of an advantage or disadvantage of factory farming.

Level 2 (3-4 marks) There is a description of at least one factory farming method

and
an advantage or disadvantage is explained.

Level 3 (5-6 marks) There is a description of factory farming methods
and
advantage(s) and disadvantage(s) are explained.

Examples of Biology points made in the response:

factory farming methods e.g.:

- Kept in cramped conditions / battery hens / calf crates / pig barns / fish tanks
- Controlled temperature / heating
- Controlled feeding / modified food given / growth hormones
- Controlled lighting
- Treated with prophylactic antibiotics

Advantages e.g.:

- Increased efficiency / profit / greater food production / cheaper food / faster growth
- Farmer can have more livestock
- Less energy is lost through movement
- Less energy is used keeping warm
- (Food is high in calories / protein) so animals will grow faster / lay more eggs
- Easier to vaccinate all the animals
- Easier to protect animals from predators
- Antibiotic treatment stops infections in animals

Disadvantages e.g.:

- Stress / cruelty / inhumane / unethical
- Restricted movement / overcrowding
- Faster spread of diseases
- Antibiotics in the food chain / residual chemicals in the food chain

- Wasting fossil fuels / increasing global warming
- Increased pollution from animal waste and from additional transport

6

[8]

M4. (a) (i) triangular pyramid with 3 layers

may be as blocks or as triangle

ignore food chains and arrows

1

layers appropriately labelled:

bean / plant

aphid,

ladybird

*labelled in food chain order must **not** contradict correct pyramid*

*allow correctly labelled inverted pyramid for **2** marks*

1

(ii) any **two** from:

(for aphid / ladybird)

ignore energy

- not all digested / faeces
- loss in urine
- loss of CO_2

  ignore loss of CO_2 from bean plant
- not all eaten

  *if none of first 3 points given then allow waste (materials) / excretion for **1** mark*

2

(b) microorganisms / microbes / bacteria / fungi / decomposers / detritivores /named

*do **not** accept germs*

allow mould

ignore aphids

1

decay / breakdown / digest / decompose / rot (bean plant)

ignore eat

1

respiration (of microorganisms etc / aphids)

allow burning / combustion

1

carbon dioxide released (from respiration of microorganisms etc / aphids)

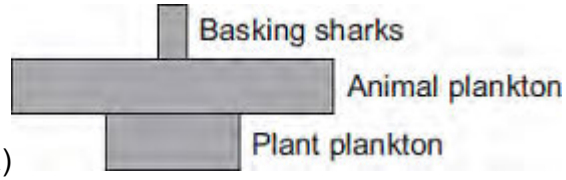
allow carbon dioxide released / produced (from burning / combustion)

ignore other parts of the carbon cycle
ignore formation of fossil fuels

1

[8]

M5. (a)



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 <u>plant</u> (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]

M6.(a) Sun / sunlight / light

accept radiation from the Sun / solar energy

1

(b) (i) 2 (.0)

1

8 (.0)

1

(ii) 3 layers of decreasing size as they go up

1

labelled wheat grains, field mice, red kites <u>in correct order of food chain</u>

1

sizes correct (showing half on each side)

*allow ecf from **(b)(i)***

error ± half square

1

(c) any **two** from:

- not all the field mice are eaten
- not all parts of eaten mice are absorbed / some passed as faeces (of red kite)
- due to respiration (of red kites) / production of CO_2

allow reference to uric acid / urea / urine (of red kite)

*reference to waste / excretion alone gains **1** mark*

2

(d) any **two** from:

- cannot find all wheat grains / too many to count
- field mice hiding / in hedgerows

allow ref to hibernation / nests / burrows

- red kites / mice come and go all the time

allow count an organism more than once

2

[10]

M7. (a) (i) 1800(g)

1

(ii) triangular pyramid with four layers

accept ecf from (a)(i)
allow inverted pyramid

1

correctly labelled in order of food chain

1

(b) any **two** from:

- (lost as) crab faeces / not all digested

  *allow waste / excretion for **one** mark if neither faeces nor urine are given*

- (lost as) crab urine / urea

- loss of carbon dioxide by crab

  accept (lost via) respiration

- not all the limpet is eaten eg don't eat the shell

- not **all** limpets are eaten (by crabs)

  *allow not enough crabs to eat **all** the limpets / the limpet population*

  ignore energy losses, such as movement

2

[5]

M8.(a) (i) 6000

*award **2** marks for correct answer irrespective of working*
*allow **1** mark for 60 × 100 with incorrect or no answer*
allow answer in table if answer line blank

2

(ii) bar width 6000 **or** to match answer to (a)(i)

anywhere on scale ignore depth / height of bar

1

drawn below slugs

label not required

1

(b) any **three** from:

ignore references to number / size / mass of organisms
assume reference is to / of hedgehog unless stated otherwise

- respiration (by hedgehog)

  *do **not** accept idea that respiration uses / produces energy*

- faeces (of hedgehog) **or** (slug) not absorbed (by hedgehog) **or** (slug) not digested (by hedgehog)

- excreted / urine / urea (by hedgehog)

*accept waste for **1** mark if neither faeces nor excretion point made*

- not all slug (s) eaten (by hedgehogs) **or** some slugs eaten by other things **or** not all parts (of slug) eaten

  ignore (some) slugs die

- movement (by hedgehog)
- heat (from hedgehog)

  allow appropriate references to biomass lost by these methods, rather than energy losses

3

[7]