Q1. The gemsbok is a large herbivore that lives in herds in desert areas of South Africa. Gemsboks feed on plants that are adapted to living in dry conditions. There are not many rivers, lakes or ponds that can provide drinking water for the animals. The desert areas are hot during the day but cool at night. As the air cools at night it becomes moist, and the plants absorb the moisture.

(a) A few lions live in the desert areas. They hunt and feed on the gemsboks.

Use information from the drawing of the gemsbok to suggest **two** ways in which it could avoid being killed by lions.

1 .....

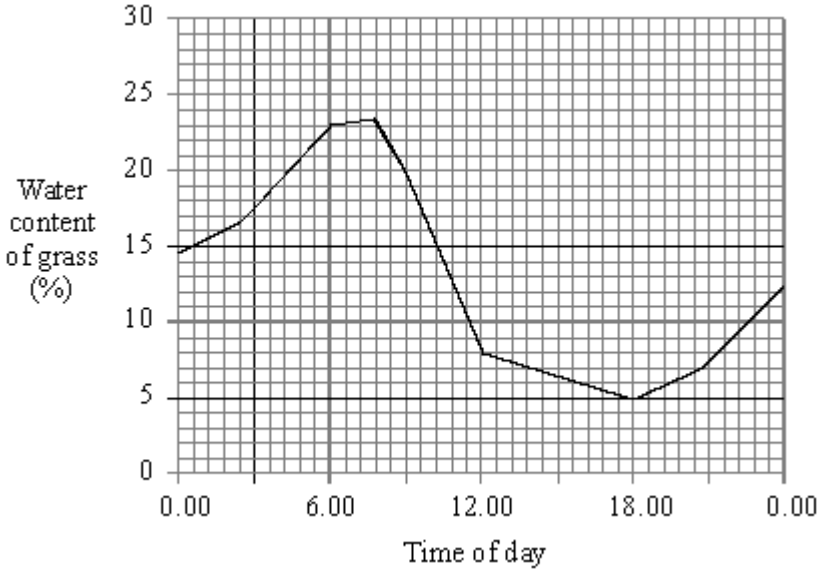
.....

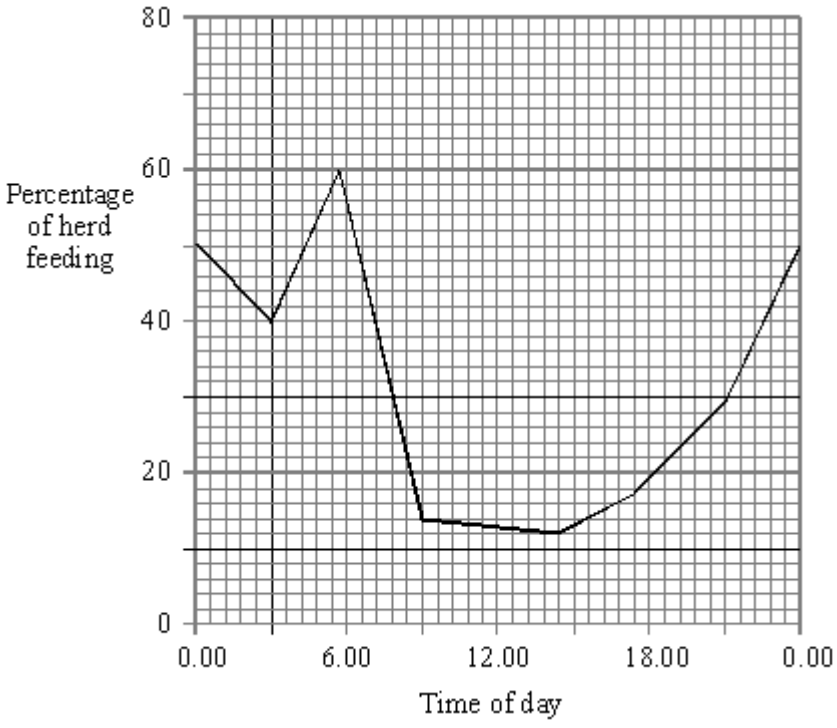
2 .....

.....

(2)

(b) The graphs show the water content of the desert grass and the times of day that the gemsboks feed.





(i) Describe how the water content of the grass changes during the day.

.....

.....

(1)

(ii) Suggest why the water content of the grass changes.

.....

.....

(1)

(c) (i) Between which times of day are more than 25% of the herd feeding?

..... and .....

(1)

(ii) Suggest an advantage to the gemsbok of feeding mainly at these times.

.....

.....

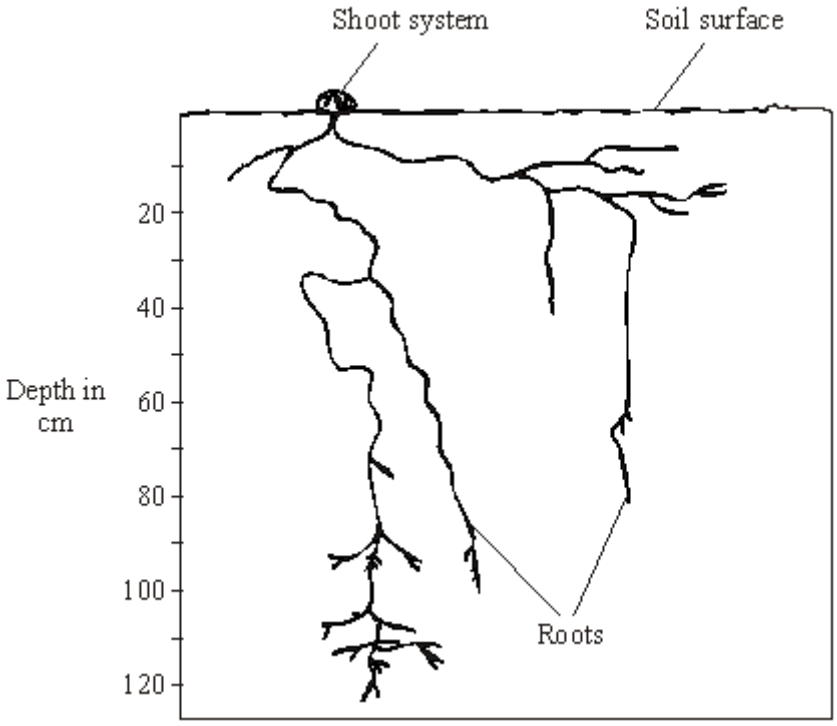
.....

.....

(2)

(Total 7 marks)

Q2. The diagram shows the desert plant, *Fredolia.*



Describe and explain **three** adaptations of *Fredolia,* which you can see in the diagram, that help it to survive in dry conditions.

1

.....
.....

.....
.

2

.....
.....

.....
.

3

.....
.....

.....
.

(Total 3 marks)

Q3. Kangaroo rats live in the hot, dry deserts of North America.
Their only water comes from the food they eat.
In these regions daytime temperatures are around 45°C.
At night temperatures can fall to below 30°C.

Explain how each of the following features makes these animals well adapted to survive in deserts.

(a) They are a sandy colour.

.....

(b) They are active at night and stay in burrows underground by day.

.....

(c) They produce dry droppings and very little urine. They do not sweat.

.....

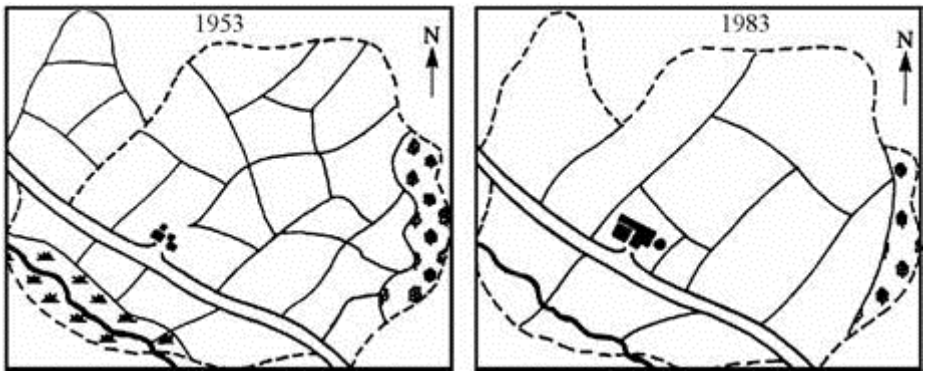
(d) Their large ears, feet and tail give their bodies a large surface area.

.....

.....

(4)
(Total 4 marks)

Q4. The drawings show changes to a farm between 1953 and 1983.



Key

Hedges
Boundary
River
Buildings
Trees
Marsh

The fields on the farm are separated by hedges.

(i) Give **two** major changes which were made to the land on this farm between 1953 and 1983.

1 .....

.....

2 .....

.....

(2)

(ii) How would these changes affect the number of wild animals which live on the farmland?

.....

Explain your answer.

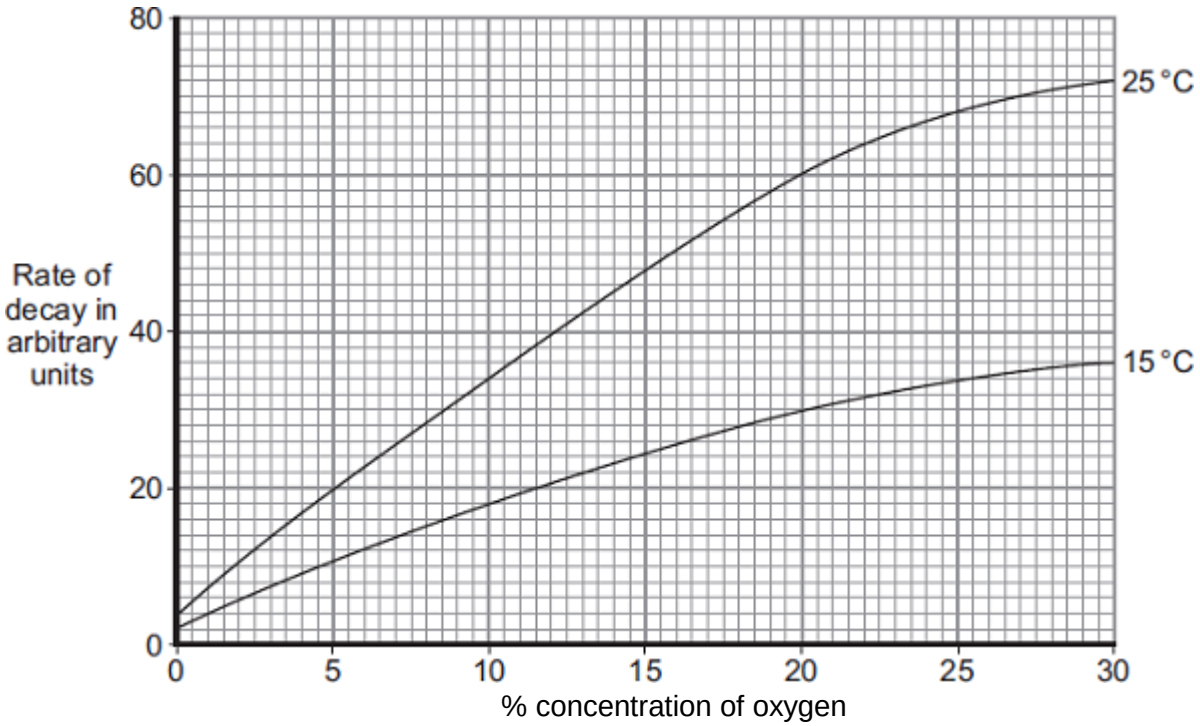
.....

.....

(2)
(Total 4 marks)

Q5. Gardeners often put waste material onto compost heaps.

The graph shows how the conditions in a compost heap affect how quickly waste material in the compost heap decays.



(a) (i) Describe the effect of increasing the temperature from 15°C to 25°C on the rate of decay at 20% oxygen concentration.

.....

.....

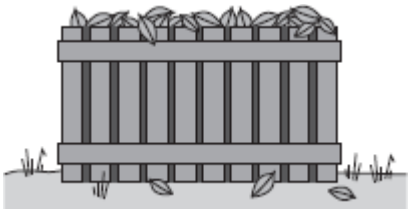
.....

.....

.....

(2)

(ii) Gardeners are advised to put waste materials into special compost bins. These bins have holes in their sides.



Holes in the sides of the compost bin help the waste materials to decay faster.

Explain why.

.....

.....

.....

.....

.....

(2)

(b) A gardener noticed that some of his plants were growing poorly.

The gardener put some decayed compost onto the soil, around the plants. One month later the plants were growing well.

Explain why.

.....

.....

(1)
(Total 5 marks)

##

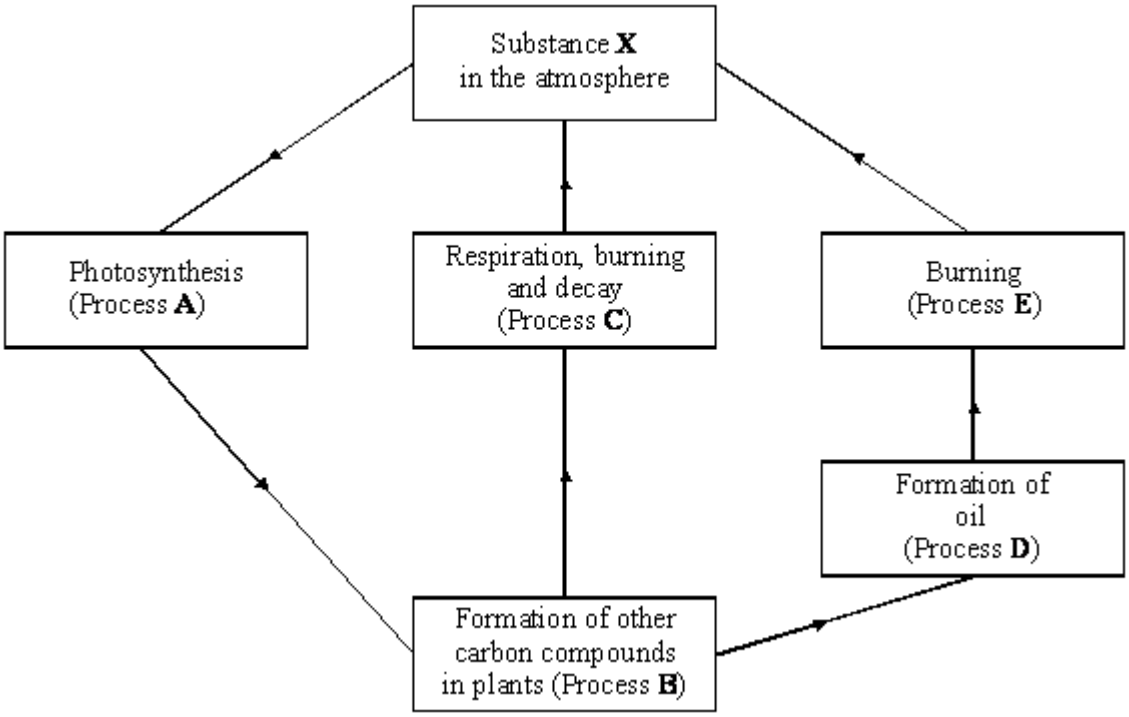
(a) Use words from the box to complete the sentences about the water cycle.

boils	**condenses**	**evaporates**	**freezes**	
melts	**rain**	**sea**	**Sun**	**wind**

Water ..... from the surface of the ..... . Heat from the ..... speeds up this process and so does the ..... . Water vapour in the atmosphere cools down and ..... to form billions of tiny water droplets. Some of the droplets join together and fall as ..... .

(6)

(b) The diagram shows some processes in the carbon cycle.



(i) What is the name of substance **X**?

.....

(1)

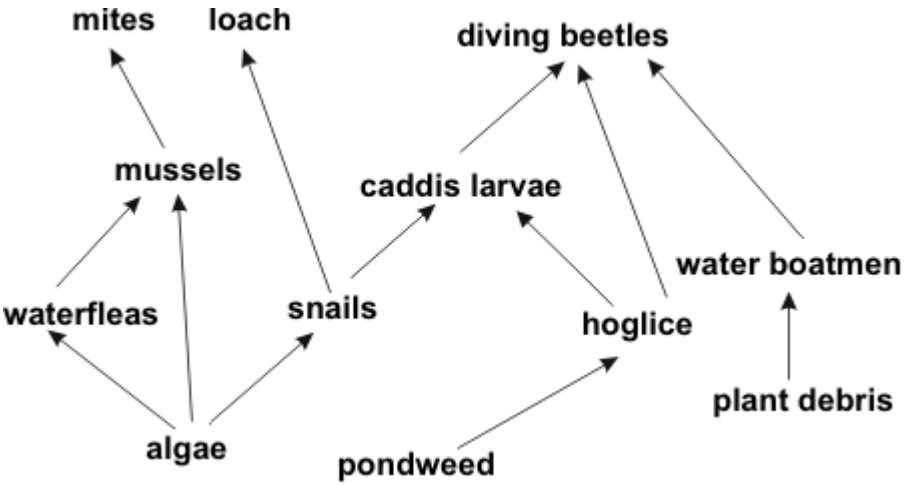
(ii) Which process, **A**, **B, C**, **D** or **E**, takes the **longest** and approximately how long does it take?

.....

(2)

(Total 9 marks)

Q7. The diagram below shows a food web for some of the organisms which live in a pond.



(a) (i) Name **one** secondary consumer in this food web.

.....

(1)

(ii) The algae are small green plants.

Give **three** conditions needed by green plants to produce sugars.

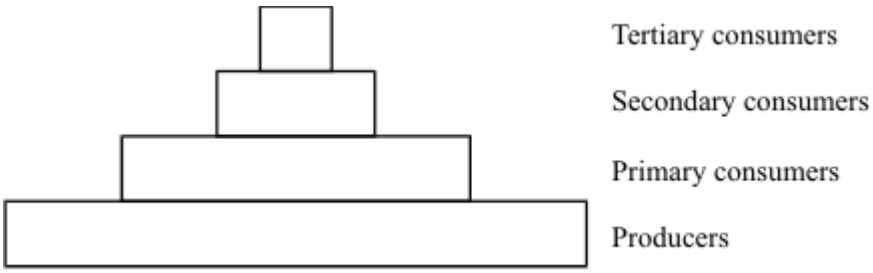
1 .....

2 .....

3 .....

(3)

(b) This is a pyramid of biomass for the organisms in the aquarium.



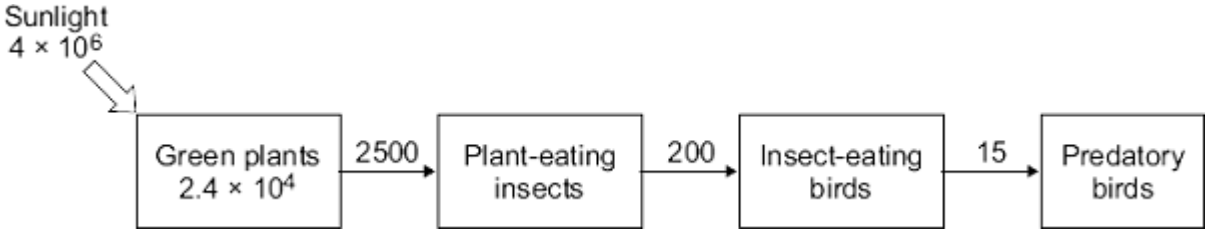
Some of the biomass of the producers is **not** transferred to the tertiary consumers.

Explain, as fully as you can, what happens to this biomass.

(6)
(Total 10 marks)

Q8. The diagram shows the annual flow of energy through a habitat.

The figures are in kJ m^{-2}.



(a) (i) Calculate the percentage of the energy in sunlight that was transferred into energy in the green plants.

Show clearly how you work out your answer.

.....

.....

.....

.....

Answer = ... %

(2)

(ii) Suggest reasons why the percentage energy transfer you calculated in part (a)(i) was so low.

.....

.....

.....

.....

(2)

(b) Compare the amount of energy transferred to the insect-eating birds with the amount transferred to the predatory birds.

Suggest explanations for the difference in the amount of energy transferred to the two types of bird.

.....

.....

.....

.....

.....

.....

.....

.....

(3)
(Total 7 marks)

M1. (a) long / pointed horns ***and*** for defence
long legs ***and*** to run away *reject strong / powerful legs*
long legs ***and*** to kick predator
tall ***and*** can see predators a long distance away but accept
eyes on side of head ***and*** to see predator approaching
large ears ***and*** to hear predators approaching
pattern ***and*** for camouflage any

two for 1 mark each

2

(b) (i) fall in morning / day and rise at night or any reasonable

for 1 mark
description of whole pattern for one mark

1

(ii) loss due to evaporation or transpiration <u>in day</u> / absorbed from air <u>at night / when cool</u>

for 1 mark

1

(c) (i) 19.30 – 20.30 **and** 07.30 – 08:30

for 1 mark

1

(ii) highest moisture content in grass
needs water in desert conditions / response to shortage of drinking water
sensible reference to less chance of predation

any two for 1 mark each

2

[7]

M2. any **three** from adaptation **and** effect:

ignore references to ions throughout ignore animals eating plant

few leaves / no leaves / little growth above ground / low surface area above ground so less water loss

*do **not** accept zero water loss*

deep roots

so can reach water **or** because surface soil is likely to dry out

accept 'moisture' for water

roots near surface so can obtain water when it does rain

widespread roots or many roots so can obtain water from a large area

swollen stem so can store water

[3]

M3. (a) idea of camouflage / blend in with / protection against predators

for 1 mark

1

(b) only active when it is cool / stay out of the heat by day / avoid predators / it is cooler

for 1 mark

1

(c) conserve / do not waste water / do not lose water / avoid dehydration / can't obtain water easily / only get water from food

for 1 mark

1

(d) release body heat / keep cool

(*allow* feet / tail stop rat sinking into sand / keep balance / for stability / easier movement in sand / run faster)

for 1 mark

1

[4]

M4. (i) fewer hedges
marsh drained
less woodland/trees

more farm buildings

any 2 for 1 mark each

2

(ii) fewer
e.g. fewer habitats

for 1 mark each

2

[4]

M5.(a) (i) increase / higher / faster / quicker

1

numerical comparison eg from 30 to 60 **or** by 30 **or** it is 30 at 15°C *and* 60 at 25°C

*award **2** marks for doubles / goes twice as fast or 30 units <u>more</u>*

1

(ii) any **two** from:

- oxygen / air (in)
  ignore air out
  *do **not** accept lets oxygen*
  ignore reference to other substances / light passing in or out
- for microorganisms / bacteria / microbes / fungi / decomposers
  ignore microorganisms passing in
  ignore worms / germs / bugs / other detritivores
- (for aerobic) respiration (of microorganisms)
- let excess heat out
  ignore heat in

2

(b) compost contains minerals / nutrients / elements / ions / named

allow improve drainage / moisture
allow contains nitrogen
ignore CO_2 / food / goodness / fertiliser
*do **not** accept vitamins / glucose*

1

[5]

M6. (a) evaporates

1

sea

1

sun

accept sun

1

wind

1

condenses

1

rain

1

(b) (i) carbon dioxide

accept CO_2 provided it is correct in every detail

1

(ii) (process) D

1

millions of years

a million years upwards

1

[9]

M7. (a) (i) e.g. mussels/caddis loach

for 1 mark

1

(ii) 3 of:
carbon dioxide
water
chlorophyll/chloroplasts
light

any 3 for 1 mark each

3

(b) 6 of e.g.
some plant/animal material not digested by consumers passes out with faeces
respiration releases energy used in movement lost as heat
some 'lower' organisms die energy transferred to decomposers/detritivores
thence to environment

any 6 for 1 mark each

6

[10]

M8. (a) (i) 0.6 **or** 6 x 10^{-1}

for correct answer

if no / incorrect answer $\frac{2.4 \times 10^4}{4 \times 10^6} \times 100$

or

0.006 ***or*** *6 x* 10^{-3} *gains* ***1*** *mark*

2

(ii) any **two** from:

- reflected
  ignore some of light is green
- not absorbed **or** misses chloroplasts / chlorophyll
  *allow transmitted **or** passes through leaves*
  allow hits other plant parts
- wrong wavelength
- photosynthesis inefficient
  accept other limiting factors / named

- allow some lost through respiration / as heat (from respiration)

2

(b) energy lost via faeces / not digested / waste / excreted (of insect-eating birds)

1

energy loss via respiration / movement / muscle contraction / heat (by insect-eating bird)

accept examples of muscle contraction
*do **not** accept energy used for respiration*

1

some of (insect eating) bird not eaten <u>but</u> all / most / more of insect is eaten

1

[7]