**1.** The figure below represents the transfer of energy through a woodland ecosystem.



(a) Of the 800 000 kJ of energy which reaches the producers, only 10 000 kJ of energy is converted to growth in the producers.

(i) Calculate the percentage of the energy reaching the producers that is converted to growth in the producers. Show your working.

Answer = .................................. % [2]

(ii) Explain what happens to the energy reaching the producers that is **not** converted to growth.

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(iii) Name **one** decomposer.

................................................................................................................ [1]

 (iv) State two ways in which energy is transferred from primary consumers to decomposers at **C**.

1 .............................................................................................................

2 ............................................................................................................. [2]

(b) Suggest why the percentage energy transfer between producers and primary consumers at **A** is less than that between the primary consumers and secondary consumers at **B**.

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[3]

[Total 10 marks]

**18.** Fig. 1 shows the transfer of energy through a food chain in a wood.

 The figures represent the energy in the levels of the ecosystem in MJ m–2 y–1.



**Fig. 1**

 Fig. 2 shows what happens to the food available to caterpillars in the food chain shown in Fig. 1.



**Fig. 2**

(i) Fig. 1 shows that each trophic level has less energy flowing through it than the previous trophic level.

 Use the information in Fig. 2 to explain why this is the case.

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[3]

(ii) Explain the differences in the **percentage** of energy transferred between the trophic levels shown in Fig. 1.

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[2]

[Total 5 marks]

**22.** In this question, one mark is available for the quality of spelling, punctuation and grammar.

 The diagram below represents the energy flow through an ecosystem.



 Explain how energy is transferred through food chains and food webs in an ecosystem.
You should refer to the efficiency of this transfer in your answer.
You will gain credit if you make use of the information in the diagram.

[9]

Quality of Written Communication [1]

[Total 10 marks]

**ANSWERS**

**1.** (a) (i) *award both marks for correct answer*

 10 000 / 800 000 (× 100);
1.25 / 1.3 / 1(%); 2

(ii) **R** *any reference to energy / light missing the plant*

 reflected (off plant) / only certain wavelengths of light can be, absorbed /
used; ora
absorbed by / hits, non-photosynthetic parts; e.g. bark
passes through leaf / misses chlorophyll / misses chloroplasts;
some is heat that is used in evaporation / respiration; max 2

(iii) bacteria / named bacterium decomposer; (*Nitrobacter*, *Nitrosomonas*) 1

(iv) *take the first 2 answers*:

 death / dead remains;
excretion; **R** *waste products*egestion;
other suitable method; e.g. insects moulting
 hatched eggs
 moulting (fur / feathers)
 **R** *leaves* 2

(b) *Primary consumers are eating and*…

 producers have, cell walls / cellulose; ora
difficult to digest / much material, wasted / egested;
energy used by gut microorganisms; ora
much material cannot be eaten (by primary consumer); ora 3

[10]

**18.** (i) **1** some food not, eaten / accessible; **A** *an example*

**2** some**,** food / energy,not digested / egested / lost as faeces;

**3** (some assimilated) food / energy,lost in excretion;

**4** ref to decomposers;

**5** (some assimilated) food / energy, lost in respiration;

**6** energy lost**,** as heat / in movement / in metabolism;

**7** small proportion energy used for**,** growth / material**,**and is available to next trophic level; 3max

(ii) **1** plant material difficult to digest / animal material can be digested
easily;

**2** ref to, cellulose / lignin / wood;

**3** no cellulase;

**4** (animal) gives similar spectrum of amino acids (as consumer);

**5** less of the producer available to the 1° consumer than 1° consumer
available to the 2° consumer;

**6** AVP;e.g. ref to gut bacteria

 *ignore references to numbers of organisms eaten or size of organisms* 2 max

[5]

**22.** **1** sun is the energy source (for the system);

**2** producers / (green) plants, trap / use / absorb (sun’s energy);

**3** photosynthesis;

**4** not all energy trapped and reason;

**5** energy used for,plant metabolism / plant processes / e.g.; **A** respiration

**6** so this energy not,passed on / available, to consumer;

**7** (some energy) used for, growth / storage;

**8** so this energy is, passed on / available,to consumer;

**9** 1o consumer / herbivore, eats, producer / plant;

**10** some producer, not edible / not accessible / e.g.;

**11** some,not digested / egested / lost as faeces;

**12** 2o consumer / carnivore / omnivore, eats, 1o consumer / herbivore;

**13** some parts of animal not edible / e.g.;

**14** energy used by animal in moving (to feed);

**15** energy, used / lost, in,digestion / excretion / sweating /
e.g.; **A**respiration

**16** transfer / loss, to, decomposers / bacteria / fungi / saprotrophs;

**17** energy lost as heat from respiration;

**18** net productivity = gross productivity – respiration;

**19** some ref to estimate of efficiency of transfer (a general statement);

**20** quote of (comparative) figures from diagram;

**21** manipulation of figures to illustrate a point; **NOT** 6612 and 14198

**22** AVP;

**23** AVP;e.g. loss out of ecosystem
 another manipulation of figures
 available energy limiting length of chain max 9

 **QWC – legible text with accurate spelling, punctuation and grammar**; 1

[10]