Past-paper walk-through

Energy flow ▪ 19.1

eXercise

Questions in this set

- 0610/21 N25 Q32 ▪ 1 mark
- 0610/22 N25 Q35 ▪ 1 mark
- 0610/42 N25 Q4 ▪ 14 marks
- 0610/21 J25 Q34 ▪ 1 mark
- 0610/22 J25 Q35 ▪ 1 mark
- 0610/23 J25 Q36 ▪ 1 mark
- 0610/41 J25 Q1 ▪ 13 marks
- 0610/22 M25 Q34 ▪ 1 mark

Reading the mark scheme

- **B1** a mark that stands on its own – the point is either made or not.
- **M1** a *method* mark: the right approach, even if the number is wrong.
- **A1** an *answer* mark, and it usually needs its M mark first.
- **C1** a working mark on the way to the answer.
- // separates answers the examiner accepts equally.
- **ecf** = error carried forward: a later part is marked on your own earlier answer.
- **owtte** = "or words to that effect" – the wording need not match.

Question 32

0610/21 N25 ▪ Q32 ▪ 1 mark

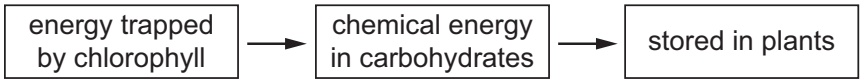
32 Which flowchart shows how energy is transferred from the Sun to an organism?

A chemical energy in carbohydrates → stored in plants → energy trapped by chlorophyll

B stored in plants → chemical energy in carbohydrates → energy trapped by chlorophyll

C stored in plants → energy trapped by chlorophyll → chemical energy in carbohydrates

Question 32

D 

Solution 32

Answer: **D**

Why

- Energy arrives from the Sun as light.
- Chlorophyll traps that light energy during photosynthesis.
- It is then converted into chemical energy stored in carbohydrates – so trapping comes before storing.

Question 35

0610/22 N25 ▪ Q35 ▪ 1 mark

35 Which unit could be used for the measurements needed to construct a pyramid of energy?

A kJ per g per m^2

B kJ per kg per year

C kJ per m^2 per year

D kJ per kg

Solution 35

Answer: **C**

Why

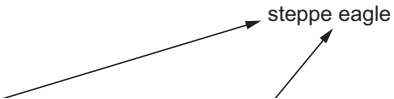
- A pyramid of energy shows energy *per unit area per unit time*.
- So the unit must include an area and a time.
- kJ per m^2 per year has both; the others are missing one or the other.

Question 4

0610/42 N25 ▪ Q4 ▪ 14 marks

4 Steppe ecosystems are large areas of grasslands found in central Asia.

(a) Fig. 4.1 is a food web from a steppe ecosystem.



Question 4

Question 4

Fig. 4.1

(i) State the name of **one** primary consumer from Fig. 4.1.

Question 4

(ii) Use the information in Fig. 4.1 to construct **one** food chain with four trophic levels that includes the steppe eagle.

Question 4

[1]

(iii) There are fewer grey wolves than marmots in this ecosystem.

Explain why the population size of organisms decreases from one trophic level to the next trophic level in this ecosystem.

Question 4

(b) Fig. 4.2 is a photograph of a wild horse. Przewalski's horse is a type of wild horse that nearly became extinct.

Question 4

Fig. 4.2

After a captive breeding programme, they have been successfully reintroduced to the steppe ecosystem.

The captive breeding programme started with 12 wild horses.

(i) Explain the risks to a species of a captive breeding programme that uses such a small number of individuals.

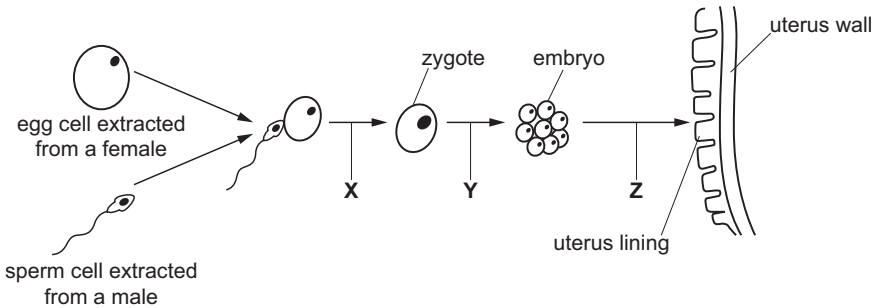
Question 4

(ii) Suggest ways of maintaining a population of Przewalski's horse in the wild after their reintroduction to the steppe ecosystem.

Question 4

(c) *In vitro* fertilisation (IVF) can be used in captive breeding programmes.

Fig. 4.3 shows some of the stages involved in IVF.



not to scale

Question 4

Question 4

Fig. 4.3

State the names of the processes occurring at **X**, **Y** and **Z** in Fig. 4.3.

Question 4

Question 4

Question 4

[3]

[Total: 14]

Solution 4

(a)(i)

Mark scheme

- grasshopper / marmot ;
- 1

Solution 4

(a)(ii)

Mark scheme

- grass → grasshopper → marmots / (corsac) fox → (steppe) eagle ;
- 1
- 0610/42
- October/November 2025
- Guidance

Solution 4

(a)(iii)

Mark scheme

- any two from:
- idea that energy is lost between each trophic level ;
- named example of energy loss ;
- if less energy available then less biomass can be supported ;
- 2

Solution 4

(b)(i) Mark scheme

- any three from:
- 1
- little genetic variation ;
- 2
- increased risk of, genetic / inherited, disease ;
- 3
- inbreeding / inbred ;
- 4

Solution 4

- decreased heterozygosity / greater chance that an organism may be
- homozygous (recessive) ;
- 5
- less likely to adapt to changes in the, environment /
- AW ;
- 6
- increased susceptibility to (transmissible) disease ;
- 7
- AVP ;
- 3

Solution 4

(b)(ii) Mark scheme

- any four from:
- 1
- (named) protection of habitat ;
- 2
- ref to legislation protecting species / banning hunting ;
- 3
- monitoring / tracking / named example of monitoring ;
- 4

Solution 4

- education / awareness campaigns ;
- 5
- provision of (named), food / nutrients / veterinary care ;
- 6
- removal of predators ;
- 7
- removal of invasive species ;
- 4

Solution 4

(c) Mark scheme

- X – fertilisation ;
- Y – mitosis / cell division ;
- Z – implantation ;
- 3
- 0610/42
- October/November 2025
- Guidance

Question 34

0610/21 J25 ▪ Q34 ▪ 1 mark

34 Which statement about a pyramid of energy for a food chain is correct?

A It shows how energy is lost at each trophic level.

B It shows the energy stored at each trophic level.

C It shows the input of energy from the principal source.

D It shows the total energy stored within an ecosystem.

Solution 34

Answer: **B**

Why

- A pyramid of energy has a bar for each trophic level, drawn to scale.
- The length of each bar shows the energy stored in that level.
- The *difference* between bars shows the loss, but the bars themselves show what is stored.

Question 35

0610/22 J25 ▪ Q35 ▪ 1 mark

35 Which row describes the energy flow into and through a food chain that starts with a plant?

	energy entering a food chain	energy transferred between organisms in a food chain
A	chemical	chemical
B	chemical	heat
C	light	chemical
D	light	heat

Solution 35

Answer: **C**

Why

- Energy enters a food chain as *light* energy, captured by the plant.
- Photosynthesis converts it into chemical energy stored in the plant's molecules.
- From then on it is transferred between organisms as chemical energy in food.

Question 36

0610/23 J25 ▪ Q36 ▪ 1 mark

36 The diagram shows the flow of energy, in units of energy, through a food chain.

producers	→	primary consumers	→	secondary consumers	→	tertiary consumers
1000 units		100 units		10 units		1 unit

Which percentage of energy is lost between the producers and secondary consumers?

A 1% **B** 10% **C** 90% **D** 99%

Solution 36

Answer: **D**

Why

- Compare each level with the one before: $1000 \to 100 \to 10 \to 1$.
- Each step passes on only one tenth of the energy – about 10% efficiency.
- The rest is lost in respiration, movement and excretion, which is why food chains are short.

Question 1

0610/41 J25 ▪ Q1 ▪ 13 marks

1 **(a)** Fig. 1.1 shows a pyramid of energy for an ecosystem.

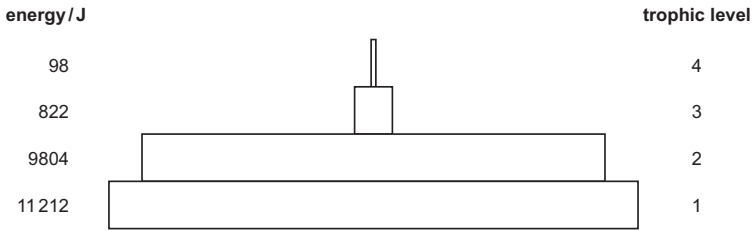


Fig. 1.1

(i) State where the organisms in trophic level 1 in Fig. 1.1 get their energy from.

Question 1

(ii) Calculate the percentage of energy transferred between trophic levels 2 and 3 in Fig. 1.1.

Give your answer to **one** significant figure.

Question 1

(iii) State **two** reasons why the energy decreases between trophic levels 1 and 4, as shown in Fig. 1.1.

Question 1

Question 1

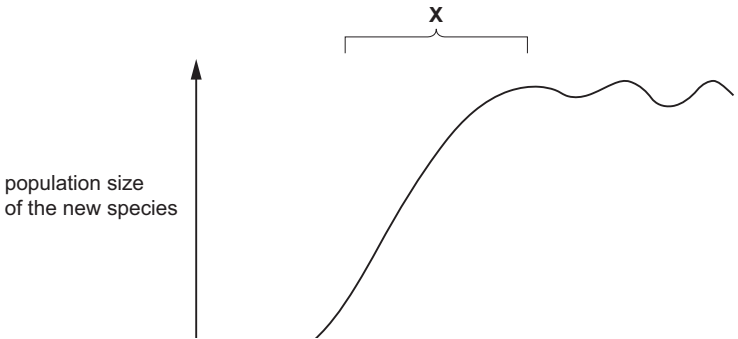
[2]

(iv) Describe the advantages of representing food chains using a pyramid of energy compared with a pyramid of biomass.

Question 1

(b) A new species was introduced to an ecosystem.

Fig. 1.2 shows the changes in the population as the species established itself in the ecosystem.



Question 1

Fig. 1.2

(i) Complete the sentence to describe the term population.

A population is a group of organisms of one species living in the same

Question 1

(ii) Describe **and** explain the reasons for the shape of the graph at **X** in Fig. 1.2.

Question 1

[Total: 13]

Solution 1

(a)(i)

Mark scheme

- Sun ;
- 1

Solution 1

(a)(ii)

Mark scheme

- 8 ;;
- 2 MP1 correct calculation to any number of
- significant figures
- MP2 correct rounding to one significant
- figure
- ecf from previous step

Solution 1

(a)(iii) Mark scheme

- any two from:
- (energy lost as) heat / respiration ;
- (named other) metabolic processes ;
- (energy lost in) movement / muscle contraction ;
- not all of the organism is, eaten ;
- not all of the organism is digested or (energy lost in) faeces / egestion ;
- not every organism in that trophic level is eaten ;
- 2

Solution 1

(a)(iv) Mark scheme

- any two from:
- more accurate representation of energy, transfer / loss ;
- idea of accounts for (different) rate of reproduction ;
- idea of accounts for (different) life spans ;
- idea of accounts for different, sizes / body composition, of organisms ;
- idea of accounts for, time / seasonal variations ;
- allows (better) comparisons between ecosystems ;
- 2

Solution 1

(b)(i)

Mark scheme

- area (at the same) time ;
- 1
- 0610/41
- May/June 2025
- Guidance

Solution 1

(b)(ii) Mark scheme

- any five from:
- 1
- (population) increases and plateaus ;
- 2
- birth rate exceeds mortality rate / AW ;
- 3
- plenty of (named) resources / no competition for (named) resources / lack
- of predation ;

Solution 1

- 4
- (then) slowing / decreasing rate, of population growth ;
- 5
- (named) resources become limited / competition for resources / increased
- predation / (new) disease ;
- 6
- birth rate and mortality rate become more equal ;
- 7
- AVP ;
- 5

Solution 1

- Guidance

Question 34

0610/22 M25 ▪ Q34 ▪ 1 mark

34 The food chain shows how energy is transferred to a human.

lettuce → snails → duck → human

Where did the energy in the lettuce come from?

A snails

B soil

C the Sun

Question 34

D water

Solution 34

Answer: **C**

Why

- Energy enters almost every food chain through the producer.
- Lettuce is a green plant, so it captured the energy by photosynthesis.
- The original source is therefore sunlight.