In context

Subject area: Organic chemistry
Level: 14–16 years (Foundation)
Topic: Natural polymers
Source: rsc.li/3iF4Lvm

1. Salmon, french beans, basil, eggs and some nuts are some examples of superfoods.

   These types of food contain many important nutrients.

a) What is a ‘nutrient’?

   Answer: A substance in the diet that is important for good health and growth.

b) Give two examples of important nutrients needed in our diet.

   Answer: Two from – carbohydrates, fats, proteins, water, and in smaller amounts: vitamins and minerals.

Many important nutrients are polymers made from many smaller molecules.

c) Describe a polymer.

   Answer: A very long chain molecule made of many smaller molecules bonded or joined together.

d) Give the term to describe the small molecules that make a polymer.

   Answer: Monomers.
e) State the name of the polymer being formed.

**Answer:** Starch or cellulose.

f) What type of polymerisation takes place when glucose forms the polymer in part e)?

Why does it have this name?

**Answer:** Condensation polymerisation.

A small molecule of water is formed as well as the polymer.
Another important type of polymer is made from amino acids.

g) Complete this diagram to show a polymerisation taking place.
   Use the previous diagram to help you.

![Diagram showing polymerisation of amino acids](image)

h) What is the name of this type of polymer?
   Answer: A protein.

i) Give one similarity between the polymer in part g) and the one in part e).
   Answer: Both are condensation polymers.
2. This question is about chicken eggs.

The diagram shows the mass of different nutrients in 100 g of chicken eggs.

Use the diagram to answer the questions.

**CHICKEN EGG NUTRITION**

![Chicken Egg Nutrition Diagram](source)

**MINERALS**

- P (198 mg)
- Na (142 mg)
- K (138 mg)
- Ca (56 mg)
- Mg (12 mg)
- Fe (1.75 mg)
- Zn (1.29 mg)
- Cu (0.072 mg)
- Mn (0.028 mg)

**ENERGY**

- 143 kcal

**VITAMINS**

- B₁
- B₂
- B₅
- B₆
- B₉
- D
- E
- B₃

**CARBOHYDRATES**

- 0.72g

**FAT**

- 9.51g

**PROTEIN**

- 12.56g

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a) **What is the mass of fat in 100 g of chicken eggs?**

**Answer:** 9.51 g

b) **What percentage of chicken eggs, by mass, is due to protein?**

**Answer:** 12.56%

c) **Write the mass of iron in grams.**

**Answer:** 0.00175 g
d) Write the mass of vitamin A in grams.

**Answer:** 0.16 g

e) Write the mass of manganese in grams and in standard form.

**Answer:** $2.8 \times 10^{-5}$ g

f) State the name of a nutrient in chicken eggs that is a polymer.

**Answer:** Protein

g) Which of the nutrients in the diagram has the:

i) largest mass?

**Answer:** Protein

ii) smallest mass?

**Answer:** Vitamin D

h) Why is the total mass of all of the nutrients in the diagram not equal to 100 g?

**Answer:** Water is not included.