

GCSE Combined Science: Trilogy

Worksheet: Formulations

TIME 35 min	TOTAL 32 marks	CALCULATOR Allowed	DIFFICULTY Easy, Medium
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Topics: Formulations

NAME	CLASS	DATE
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- Use black ink or black ball-point pen. Pencil should only be used for drawing.
- Answer all questions in the spaces provided.
- In all calculations, show clearly how you work out your answer.
- The marks for questions are shown in brackets.

0	1
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0	1	.	1
---	---	---	---

What is a formulation?

Tick (✓) **one** box.

A mixture that has been designed as a useful product

☐

A pure compound made in a laboratory

☐

Any mixture of substances found in nature

☐

An element that has been purified

☐

[1 mark]

0	1	.	2
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Which **two** of the following are formulations?

Tick (✓) **two** boxes.

Distilled water

☐

Paint

☐

Oxygen gas

☐

Medicine tablet

☐

Copper wire

☐

[2 marks]

0 1 . 3

Formulations are made by mixing the components in carefully measured quantities.

Give the reason why.

[1 mark]

0 2

0 2 . 1

Which of these is an example of a formulation?

Tick (✓) **one** box.

A pure element

☐

A pure compound

☐

Petrol

☐

An unidentified mixture of soil

☐

[1 mark]

0 2 . 2

Explain why the substance you ticked is a formulation.

[1 mark]

0 3

A company makes a car de-icer. Table 1 shows the percentage by mass of each component.

Table 1

Component	Percentage by mass
alcohol	45
glycol	12
surfactant	0.5
water and other minor components	?

0 3 . 1

Calculate the percentage by mass of water and other minor components in the car de-icer.

.....

.....

.....

Percentage = %

[1 mark]

0 3 . 2

Explain why the car de-icer is described as a formulation.

.....

.....

[1 mark]

0 4

A company makes a shampoo. Table 2 shows the percentage by mass of each component.

Table 2

Component	Percentage by mass
surfactant	15
conditioning agent	3
thickener	1.5
water and other minor components	?

0 4 . 1

Calculate the percentage by mass of water and other minor components in the shampoo.

.....

.....

.....

Percentage = %

[1 mark]

0 4 . 2

Explain why the shampoo is described as a formulation.

.....

.....

[1 mark]

0 5

Formulations include fuels, cleaning agents and fertilisers.

0 5 . 1

Give **two** other examples of formulations.

.....

.....

.....

.....

[2 marks]

0 5 . 2

Explain why a formulation is not simply 'any mixture'.

.....

.....

[1 mark]

0 6

Table 3 compares two formulations of a sun cream, A and B.

Table 3

Formulation	Percentage of UV filter	Percentage of moisturiser	Time to absorb into skin in s	Protection factor (SPF)
A	8	10	40	30
B	12	4	25	50

0 6 . 1

A parent wants a sun cream that gives the highest protection and absorbs quickly.

Which formulation should the parent choose?

Justify your answer using Table 3.

.....

.....

.....

.....

[2 marks]

0 6 . 2

Suggest **one** reason why a sun cream formulation includes a moisturiser as well as a UV filter.

.....

.....

[1 mark]

0 6 . 3

Explain why a sun cream is described as a formulation.

.....

.....

.....

.....

[2 marks]

0 7

Paint is a formulation.

Table 4 shows the components of one paint.

Table 4

Component	Percentage by mass	Purpose
Pigment	22	gives the paint its colour
Binder	30	sticks the pigment to the surface as the paint dries
Solvent	45	?
Additives	3	stop mould growing in the paint

0 7 . 1

Suggest the purpose of the solvent in the paint.

.....

.....

[1 mark]

0 7 . 2

A tin contains 2.5 kg of the paint.

Calculate the mass of pigment in the tin.

.....

.....

.....

.....

Mass of pigment = kg

[2 marks]

0 7 . 3

Explain why paint is described as a formulation.

.....

.....

.....

.....

[2 marks]

0 8

A company makes tablets to relieve pain. Each tablet has a mass of 500 mg.
Table 5 shows the components of one tablet.

Table 5

Component	Purpose	Mass in one tablet in mg
Active ingredient	relieves pain	325
Filler	makes the tablet a convenient size	?
Binder	holds the powder together	40
Disintegrant	helps the tablet break up in the stomach	15
Lubricant	stops the powder sticking to the machine	5

0 8 . 1

Calculate the mass of filler in one tablet.

.....

.....

.....

Mass of filler = mg

[1 mark]

0 8 . 2

Calculate the percentage by mass of the active ingredient in the tablet.

.....

.....

.....

.....

Percentage = %

[2 marks]

0 8 . 3

Explain why the mass of active ingredient in each tablet must be carefully controlled.

.....

.....

.....

.....

[2 marks]

0 8 . 4

Use the information in Table 5 to explain why the tablet is a formulation.

.....

.....

[1 mark]

.....

0 9

A company makes a hand sanitiser gel. Table 6 shows the percentage by mass of each component.

Table 6

Component	Percentage by mass
ethanol	68
glycerol (moisturiser)	1
thickener	1
water and other minor components	?

0 9 . 1

One bottle contains 500 g of hand sanitiser gel.
Calculate the mass of glycerol in one bottle.

.....

.....

.....

.....

Mass = g

[2 marks]

0 9 . 2

Suggest why the manufacturer must measure out the thickener accurately, rather than adding roughly the right amount.

.....

.....

[1 mark]

END OF QUESTIONS

Original practice questions written to match the specification. Not produced by, affiliated with or endorsed by AQA.

Mark scheme

GCSE Combined Science: Trilogy · Worksheet: Formulations · 32 marks

Question 1 (4 marks)

01.1 [1 mark]

Correct: A mixture that has been designed as a useful product

01.2 [2 marks]

Correct: Paint; Medicine tablet

01.3 [1 mark]

- so that the product has the required properties / so each component can do its job (1)
-

Question 2 (2 marks)

02.1 [1 mark]

Correct: Petrol

02.2 [1 mark]

- it is a mixture designed to have useful properties, made by mixing components in carefully measured (controlled) quantities (1)
-

Question 3 (2 marks)

03.1 [1 mark]

Answer: 42.5%

- 42.5 (%) (1)
-

03.2 [1 mark]

- it is a mixture that has been designed as a useful product, with each component added in a measured / controlled amount for a particular purpose (1)
-

Question 4 (2 marks)

04.1 [1 mark]

Answer: 80.5%

- 80.5 (%) (1)

04.2 [1 mark]

- it is a mixture that has been designed as a useful product, with each component added in a measured / controlled amount for a particular purpose (1)

Question 5 (3 marks)

05.1 [2 marks]

- paints (1)
- medicines / tablets (1)
- alloys (1)
- foods (1)

Any 2 of the points above.

Notes: Allow other correct examples, e.g. cosmetics, toothpaste, washing powder, sun cream. Do not credit fuels, cleaning agents or fertilisers, which are given in the question.

05.2 [1 mark]

- a formulation is a mixture that has been deliberately designed, with each component present in a measured / controlled quantity to give useful properties (1)
-

Question 6 (5 marks)

06.1 [2 marks]

Answer: B

- B (1)
- B has a higher SPF (50 compared with 30) and absorbs more quickly (25 s compared with 40 s) (1)

06.2 [1 mark]

- to stop the skin drying out / to keep the skin moist and soft (1)

Notes: Allow: it makes the cream easier to spread or more pleasant to use.

06.3 [2 marks]

- it is a mixture of components (e.g. UV filter, moisturiser), each added for a specific purpose (1)
- the components are mixed in carefully controlled / measured quantities to give the required properties (e.g. a stated SPF) (1)

Question 7 (5 marks)

07.1 [1 mark]

- makes the paint runny / easy to spread / dissolves or carries the binder (and then evaporates) (1)

07.2 [2 marks]

Answer: 0.55 kg

- $22 \div 100 \times 2.5$ (1)
- 0.55 (kg) (1)

Notes: An answer of 0.55 kg scores 2 marks. Allow 550 g.

07.3 [2 marks]

- it is a mixture that has been designed as a useful product (1)
 - each component has a particular purpose / the components are mixed in measured quantities to give the required properties (1)
-

Question 8 (6 marks)

08.1 [1 mark]

Answer: 115 mg

- 115 (mg) (1)

08.2 [2 marks]

Answer: 65%

- $325 \div 500 \times 100$ (1)
- 65 (%) (1)

Notes: An answer of 65 scores 2 marks.

08.3 [2 marks]

- too much could be harmful / could cause an overdose (1)
- too little would not be effective / would not relieve the pain (1)

Notes: Allow 'so each tablet gives the correct dose' for 1 mark.

08.4 [1 mark]

- it is a mixture (of several substances) in which each component has a particular purpose (1)

Question 9 (3 marks)

09.1 [2 marks]

Answer: 5 g

- $1 \div 100 \times 500$ (1)
- 5 (g) (1)

09.2 [1 mark]

- too much or too little would change the properties of the hand sanitiser gel, so it might not work as intended (or could be unsafe) (1)
-