Questions are for both separate science and combined science students unless indicated in the question

Q1.

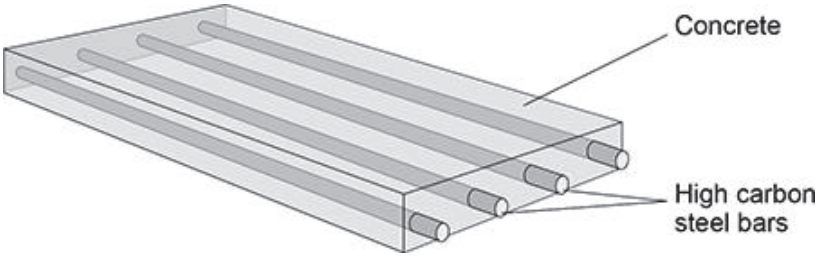
This question is about materials.

Pre-stressed concrete is a composite material.

The concrete is strengthened using high carbon steel bars.

Figure 1 shows the structure of a piece of pre-stressed concrete.

Figure 1



(a) Which **two** words describe the high carbon steel bars?

Tick (✓) **two** boxes.

Alloy	☐
Binder	☐
Matrix	☐
Ore	☐
Reinforcement	☐

(2)

Limestone is mainly calcium carbonate.

Limestone is a raw material used in the production of concrete.

(b) In the first part of the production of concrete:

- air is heated by burning methane
- the hot air is used to heat limestone
- the limestone decomposes.

The equation for the decomposition of limestone is:

calcium carbonate → calcium oxide + carbon dioxide

Give **two** ways in which a greenhouse gas is released in this process.

1 _____

_____

2 _____

_____

(2)

(c) How could a sample of limestone be tested to show the presence of carbonate ions?

Complete the sentences.

Choose answers from the box. **(chemistry only)**

barium chloride	**hydrochloric acid**	**limewater**
sodium hydroxide	**universal indicator**	

The substance added to the limestone is _____.

The gas produced is identified using _____.

(2)

The table below gives some information about plain concrete and pre-stressed concrete.

	Plain concrete	**Pre-stressed concrete**
Cost in £ per m^3	75	225
Density in kg per m^3	2300	2500
Strength in arbitrary units	600	3000

(d) Explain why pre-stressed concrete rather than plain concrete is used to make bridges that carry heavy lorries.

Use the table above.

_____

_____

_____

_____

(2)

(e) **Figure 2** shows a garden path made of plain concrete slabs.

Figure 2

Suggest **two** reasons why plain concrete rather than pre-stressed concrete is used to make slabs for garden paths.

Use the table above.

1 _____

_____

2 _____

_____

(2)

(Total 10 marks)

Q2.

This question is about greenhouse gases and climate change.

(a) Which **two** gases are greenhouse gases?

Tick (✓) **two** boxes.

Argon	☐
Carbon dioxide	☐
Nitrogen	☐
Methane	☐
Oxygen	☐

(2)

(b) Why are greenhouse gases essential for supporting life on Earth?

_____

_____

(1)

The percentage of greenhouse gases in the Earth's atmosphere today is increasing.

Many scientists think that this increase is causing global climate change.

(c) What is a cause of the greenhouse effect?

Complete the sentence.

Greenhouse gases absorb long wavelength _____.

(1)

(d) Which **two** are potential effects of global climate change?

Tick ✓ **two** boxes.

Fewer droughts	☐
Fewer storms	☐
Higher sea levels	☐
Less coastal flooding	☐
Melting polar ice	☐

(2)

(e) Water vapour is a greenhouse gas.

The percentage by mass of water vapour in the Earth's atmosphere is 0.25%.

Calculate the mass of water vapour in 350 kg of the Earth's atmosphere.

Give your answer in grams.

_____

_____

_____

_____

_____

Mass = _____ g

(3)

(Total 9 marks)