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

Q1.

Cancer is caused by changes in cells that result in uncontrolled cell division.

(a) Before a cell begins to divide, its DNA replicates to form two copies of each chromosome.

Describe **one other** change that occurs in a cell **before** the cell begins to divide.

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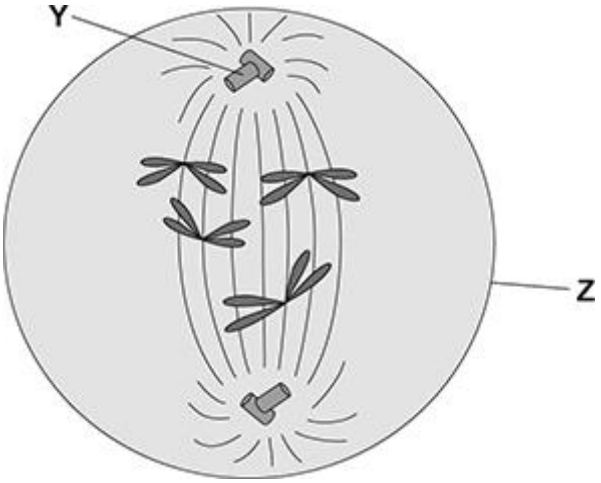
(1)

Figure 1 shows a cell during one of the stages of cell division.

Figure 1



(b) Name structure **Z** in **Figure 1**.

_____

(1)

(c) Structure **Y** in **Figure 1** is a cylinder.

For structure **Y**:

- real volume = 24 500 000 nm^3
- real radius = 125 nm.

The length of a cylinder is calculated using the equation:

$$\text{length} = \frac{\text{volume}}{\pi \times \text{radius}^2}$$

The length of the image of structure **Y** in **Figure 1** is 4 mm.

Calculate the magnification of structure **Y** in **Figure 1**.

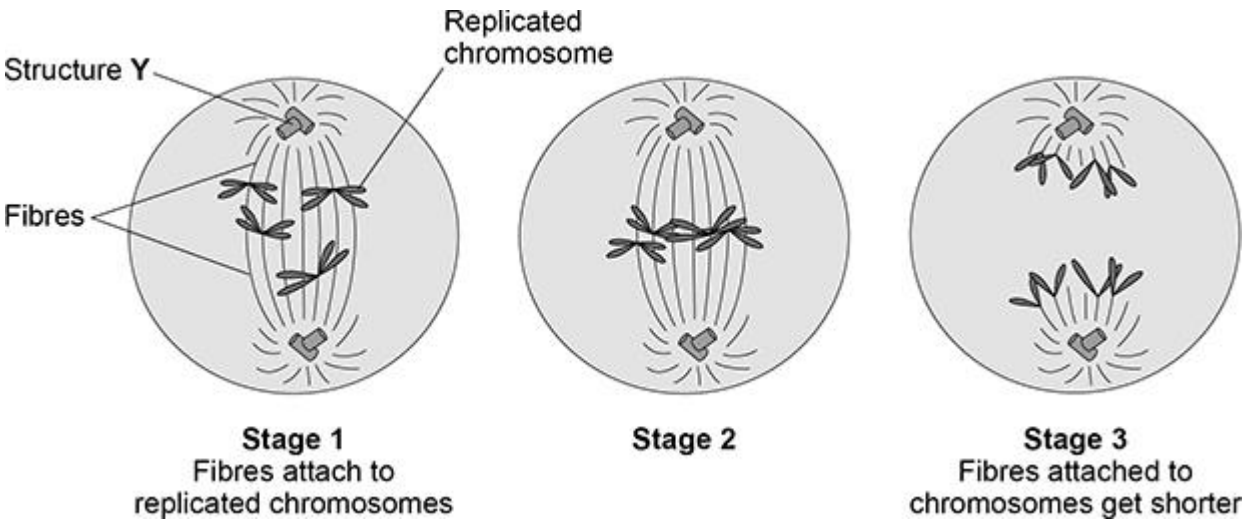
Use $\pi = 3.14$

Magnification = × _____

(6)

Figure 2 shows some of the stages of cell division.

Figure 2



Some cancer drugs prevent cell division.

Drug **X** prevents the fibres from attaching to the replicated chromosomes in **stage 1**.

(d) Explain why a cell **cannot** complete division when affected by drug **X**.

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(2)

(e) Give the reason why a drug that stops cell division helps to treat cancer.

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(1)

(f) New cancer drugs are tested in clinical trials.

Preclinical testing happens before clinical trials.

What is involved in preclinical testing of drugs?

Tick (✓) **one** box.

Testing the drugs for side effects	☐
Testing the drugs on live tissues in a laboratory	☐
Testing the drugs to find the optimum dose	☐
Testing the drugs with chemicals in a laboratory	☐

(1)

(Total 12 marks)

Q2.

Plants and animals have many defence responses.

(a) The table below shows some plant defences.

Identify whether each defence is a chemical response or a physical response.

Tick (✓) **one** box in each row. **(biology only)**

	Type of response	
Plant defence	**Chemical**	**Physical**
Thick, waxy layer on leaf surface		
Berries that are poisonous		
Bark on trees that falls off		

(2)

Mimicry is a mechanical adaptation seen in both plants and animals.

Figure 1 shows two insects.

Figure 1

Hornet Hornet Moth

(b) Hornets are insects that sting other animals and cause pain.

Hornet moths do **not** sting other animals.

Suggest how mimicry helps the **hornet moth** survive.

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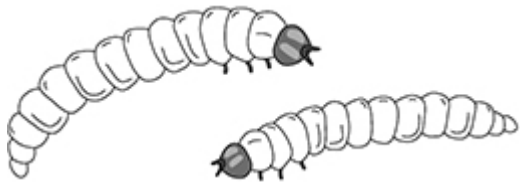
(1)

Adult hornet moths lay eggs that hatch into larvae.

Figure 2 shows the larvae of a hornet moth.

Figure 2



(c) The larvae of the hornet moth:

- live inside the roots of trees
- use the tree roots as a source of food
- cause damage to the tree roots.

Explain why a tree might die if the roots of the tree are damaged.

(6)

(d) The larvae of the hornet moth form when fertilised eggs divide by mitosis.

Describe how mitosis produces two genetically identical cells.

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(4)

(e) The cells which are first formed from the fertilised eggs of the hornet moth are stem cells.

Name the process by which these stem cells then form specialised cells.

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(1)

(Total 14 marks)