What happens in Cells (F)

1. When the enzyme lipase is mixed with a lipid which of the following will increase in concentration?

A Amino acids
B Fatty acids and glycerol
C Glucose and fructose
D Starch

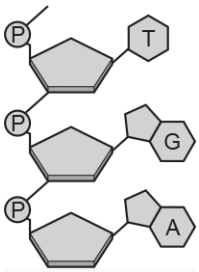
Your answer ☐ **[1]**

2. How many different bases are in DNA?

A 2
B 4
C 23
D 46

Your answer ☐ **[1]**

3. DNA is made of two complementary strands.



The diagram shows part of one strand of DNA.

Which base sequence would be found on the complementary strand of this DNA?

A A C T

B C A G

C G A C

D T G A

Your answer ☐

[1]

4. DNA is a polymer.

What is the name of the monomer in DNA?

A Base
B Deoxyribose sugar
C Nucleotide
D Phosphate

Your answer ☐

[1]

5. Hypercholesterolemia (HC) is caused by a dominant allele on chromosome 19. This allele has mutations which cause a change in the order of DNA nucleotides.

Write the words **allele, chromosome** and **nucleotide** in the boxes to show their size from smallest feature to largest feature.

Smallest feature	
Largest feature	

[1]

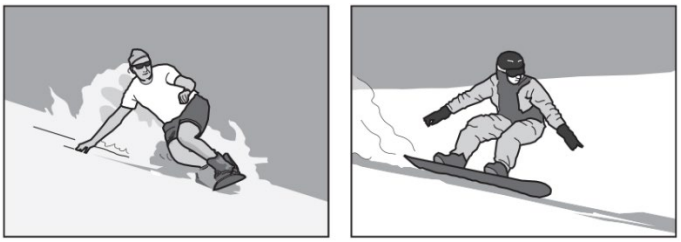
6.

i. Explain why overheating of the body may stop chemical reactions in cells.

[2]

ii. * Look at **Fig. 20.2** which shows two people riding on boards.

Person A is riding a board on sand in a hot desert. **Person B** is riding a board on snow.



Person A Person B

Fig. 20.2

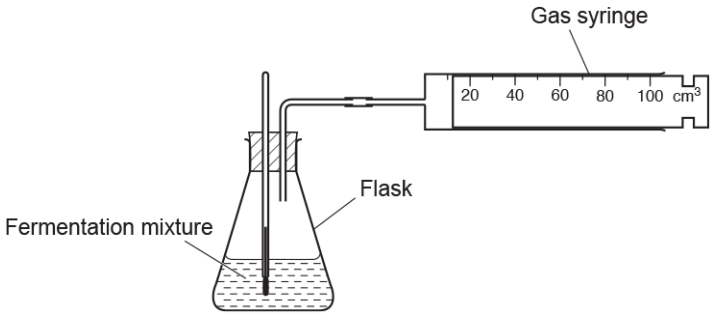
Explain the different problems of temperature regulation for these two people and give examples of the ways their bodies solve these problems.

[6]

7 (a). Fermentation involves enzymes breaking down sugar and releasing carbon dioxide gas.

The volume of carbon dioxide released can be used to measure how fast these enzymes are working.

A student investigates if fermentation works faster at 25 °C or 30 °C.
She measures the volume of carbon dioxide released in 10 minutes.
The diagram shows the apparatus she uses.



Using a Bunsen burner to heat a water bath is **one** way the student could keep the flask at a constant temperature.

i. What other way could be used to keep the flask at a constant temperature?

_____ **[1]**

ii. She chooses to use a Bunsen burner and water bath.

Give **one** safety precaution she should take.

_____ **[1]**

iii. Explain why using a Bunsen burner and water bath may introduce errors into her results.

_____

_____

_____

_____ **[2]**

(b). The table shows the student's results.

Temperature (°C)	Volume of carbon dioxide gas released in 10 minutes (cm^3)				
	Trial 1	**Trial 2**	**Trial 3**	**Mean**	**Range**
25	23	25	22	23	22–25
30	34	29	33	.....	29–34

i. Calculate the **mean** for the results at 30 °C and **complete the table**.

[2]

ii. The student repeated the experiment at two more temperatures, 20 °C and 35 °C, to get enough readings to plot a line graph.

Which measurement should the student plot on the **x-axis**?

_____ **[1]**

iii. Describe **one** way that the range would improve any conclusions made from the graph.

_____

_____ **[1]**

iv. The mean volume at a temperature of 20 °C was 15 cm^3 and for a temperature of 35 °C it was 27 cm^3.

Describe what the student's results show about the effect of temperature on enzyme activity.

_____

_____

_____

_____

_____ **[2]**

8. Some students make a model of DNA.

They use four different colours of round sweets to represent the bases and attach them to two candy laces. **Fig. 16.2** shows their model.

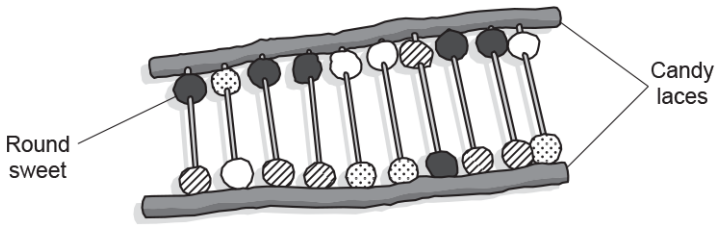


Fig. 16.2

i. Why did the students use four different colours of round sweets in their model of DNA?

---

[1]

ii. Write down the names of the **two** types of chemical group represented by the candy laces.

1

2

---

[2]

9. Drugs can be used to treat one type of diabetes. One drug prevents an enzyme working properly.

Suggest how a drug can stop an enzyme working.

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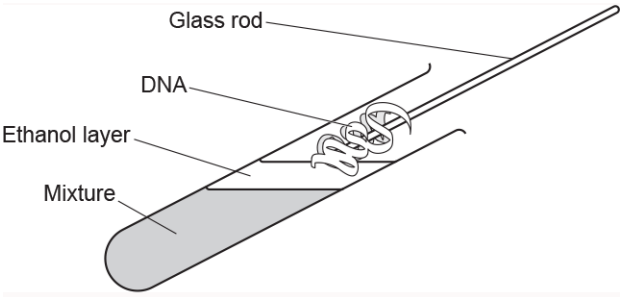
[2]

10(a). Students investigate how to extract DNA from peas.

This is a two stage process.

Stage 2 isolates the DNA.



- Pour the mixture collected from stage 1 into a test tube until a third full. Add protease enzymes to the test tube.
- Slowly pour cold ethanol at an angle of 45° into the tube. Ethanol will float on top.
- DNA is soluble in water, but salted DNA does not dissolve in ethanol and will form white clumps where the water and ethanol layers meet.
- Twirl a glass rod and the DNA will collect on the rod.
- Dry the sample on a pre–weighed filter paper and measure the mass of product.

Suggest **two** safety precautions which should be taken at stage **2**.

Explain why each safety precaution is needed.

1 Safety precaution: ---

Explanation: ---

2 Safety precaution: ---

Explanation: ---

[2]

(b). Students investigate how to extract DNA from peas.

Look at the table. It shows the results from the two groups of students in the investigation.

Type of water bath used	Mass of DNA collected (mg)			
	Test 1	**Test 2**	**Test 3**	Mean
Beaker of water and Bunsen burner				22.9
Electric	33.6	32.3	33.3	

i. Calculate the mean mass collected in the investigation using the electric water bath.

Give your answer to **1** decimal place.

Answer = _____ mg **[2]**

ii. The range of the three test readings for the beaker of water and Bunsen burner was 3.4.

Does the evidence support using an electric water bath instead of a beaker of water and Bunsen burner?

Explain your answer.

_____

_____

_____ **[2]**

(c). Students investigate how to extract DNA from peas.

Stage 1:

- Chill 10 cm^3 of ethanol. Keep it on ice throughout the method for use in stage 2.
- Make a thick 'soup' by blending 100 cm3 of peas with salt and cold water. Blend for 15 seconds in an electric blender.
- Strain the 'soup' through a mesh strainer and collect the liquid part in a beaker.
- Add 30 cm^3 of washing–up liquid and swirl to mix.
- Let the mixture settle for 5–10 minutes in a water bath at 60°C.

One group of students made a water bath using a beaker of water, thermometer and Bunsen burner. Another group used an electric water bath.

Write down **two** advantages of using an electric water bath.

1 _____

_____

2 _____

_____ **[2]**

(d). Low temperatures protect DNA by slowing down the activity of enzymes that destroy DNA. High temperatures break down membranes in the cell.

To extract DNA, some methods use a water bath at 60°C but other methods do not use an increased temperature.

Suggest **two** reasons for the different methods.

_____

_____

_____ **[2]**

11 (a). Erythromycin is an antibiotic drug.

It is important to get the dose of erythromycin right.

Too much erythromycin can be harmful.

However, recently some strains of bacteria have developed resistance to low concentrations of erythromycin.

To see how effective erythromycin is, it is tested using bacteria grown on agar plates.

This method is used:

- A petri dish is used that has the bacteria growing evenly over the surface.
- A disc of filter paper is soaked in erythromycin.
- The disc is placed on the agar in the centre of the petri dish using sterile forceps.
- The dish is incubated at 37°C.

i. Why did the scientists incubate the dish at 37°C rather than at higher or lower temperature?

_____

_____ **[2]**

ii. Why is the filter paper disc moved using sterile forceps?

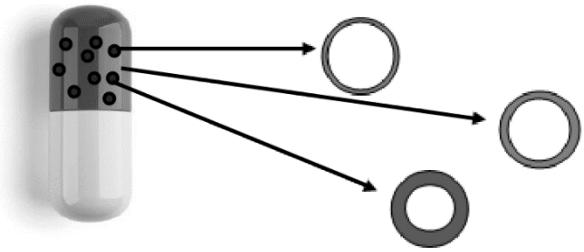
_____ **[1]**

(b). Erythromycin is usually given to patients in a capsule.

The capsule has lots of small spheres containing the drug.

The walls of the spheres are different thicknesses.

They are made of a carbohydrate polymer.



i. Explain why the drug is released from the spheres in the small intestine.

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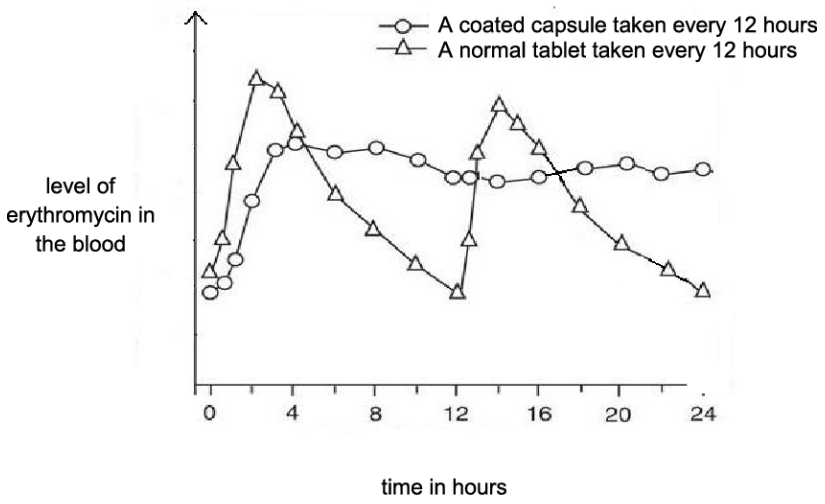
[2]

ii. * The graph shows the levels of erythromycin in the blood when given using this capsule and in a normal tablet.



Explain the shape of the two graphs and why it is better to give erythromycin in capsules.

_____

_____

_____

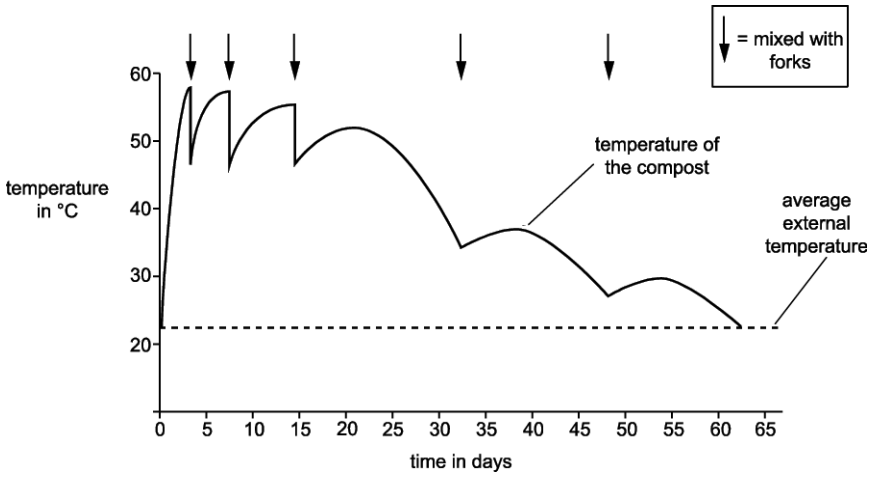
_____ **[6]**

12. Some students measured the temperature inside a compost heap.

They also measured the external temperature.

On five occasions they mixed up the compost heap with garden forks.

The graph shows their results.



i. The compost took 63 days to completely decompose.

Explain how the students could tell this from their graph.

_____

_____

_____ **[1]**

ii. The rate of temperature increase is greatest before the compost is mixed for the first time.

Explain how the rate of temperature change can be calculated.

_____

_____

_____ **[1]**

13 (a). A group of students investigate the effect of temperature on the breakdown of the fat in milk by the enzyme lipase.

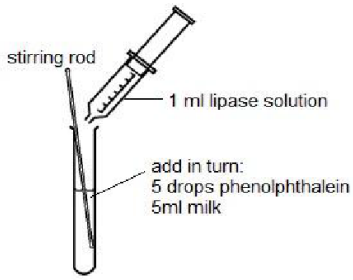
In their investigation they use an indicator called phenolphthalein.

Phenolphthalein is pink in alkali conditions but becomes colourless when the pH falls below pH 8.

A student puts 5 drops of phenolphthalein and 5 ml of full fat milk in to a test tube.

She adds 1 ml of lipase, stirs the mixture and times how long it takes to lose the pink colour.

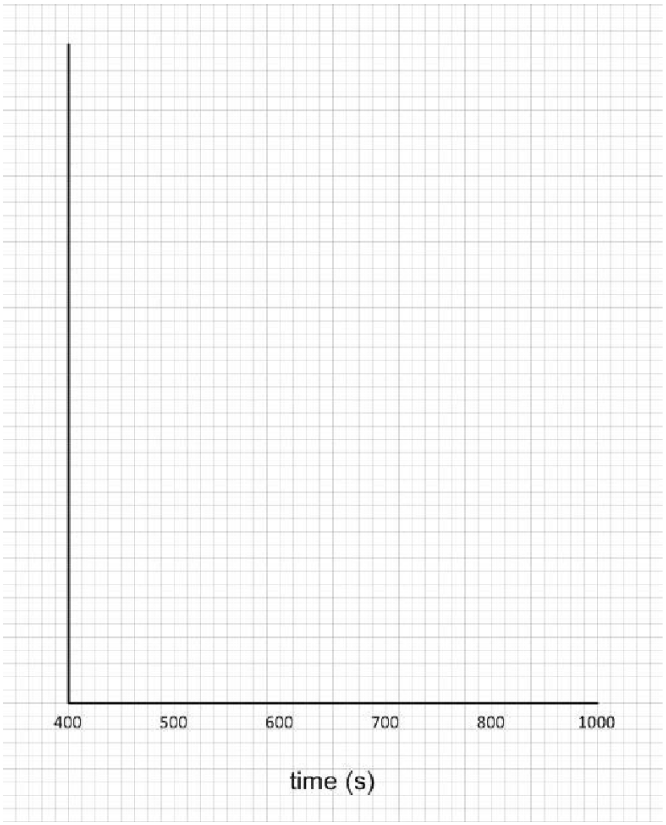
Other students repeat this but at different temperatures.



The table shows the group's results.

Temperature (°C)	Time for pink colour to disappear (s)
20	480
40	240
60	270
80	960

Plot a graph of the results and draw a line of best fit.



[5]

(b). Explain the difference between the results at 20°C and 40°C.

_____

_____

_____

_____

_____ **[3]**

(c). Explain the difference between the results at 80°C and 40°C.

_____

_____

_____

_____

_____ **[3]**

(d).

i. One student says that the results show that the optimum temperature for the lipase is 40°C.

The teacher says that she **cannot** say for certain that it is 40°C.

Explain why.

_____

_____ **[1]**

ii. Give **two** reasons how the students could modify their method to find out the optimum temperature more accurately.

_____

_____ **[2]**

(e). The students rounded their times to the nearest 10 seconds.

They did this because they found it difficult to judge exactly when the pink colour had disappeared.

Describe and explain **two** ways the method could be improved to give more accurate measurements.

1

_____

_____

2

_____

_____ **[2]**

14. Which molecule is **not** a polymer?

A. DNA
B. lipid
C. protein
D. starch

Your answer ☐

[1]

15. Insulin is a protein made of 51 amino acids.

How many bases are in the length of DNA coding for insulin?

A. 51
B. 102
C. 153
D. 204

Your answer ☐

[1]

16. In DNA, which base does T (thymine) pair with?

A. T
B. C
C. G
D. A

Your answer ☐

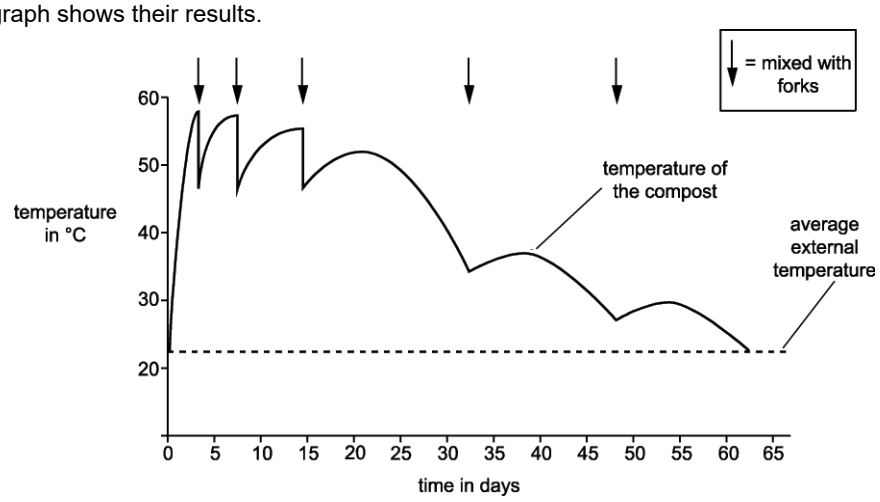
[1]

17. Some students measured the temperature inside a compost heap.

They also measured the external temperature.

On five occasions they mixed up the compost heap with garden forks.

The graph shows their results.



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Explain how the students could tell this from their graph.

_____

_____

_____ **[1]**

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Explain how the rate of temperature change can be calculated.

_____

_____

_____ **[1]**

18. Which molecule is **not** a polymer?

A. DNA
B. lipid
C. protein
D. starch

Your answer ☐

[1]

19. How many strands are in a DNA molecule?

A. 1
B. 2
C. 3
D. 4

Your answer ☐

[1]

20. In DNA, which base does A (adenine) pair with?

A. A
B. C
C. G
D. T

Your answer ☐

[1]

END OF QUESTION PAPER