Past-paper walk-through

Biological molecules ▪ 4.1

eXercise

Questions in this set

- 0610/22 N25 Q5 ▪ 1 mark
- 0610/63 N25 Q1 ▪ 11 marks
- 0610/21 J25 Q5 ▪ 1 mark
- 0610/21 J25 Q6 ▪ 1 mark
- 0610/22 J25 Q21 ▪ 1 mark
- 0610/61 J25 Q2 ▪ 24 marks
- 0610/63 J25 Q1 ▪ 22 marks
- 0610/22 M25 Q8 ▪ 1 mark

Reading the mark scheme

- **B1** a mark that stands on its own – the point is either made or not.
- **M1** a *method* mark: the right approach, even if the number is wrong.
- **A1** an *answer* mark, and it usually needs its M mark first.
- **C1** a working mark on the way to the answer.
- // separates answers the examiner accepts equally.
- **ecf** = error carried forward: a later part is marked on your own earlier answer.
- **owtte** = "or words to that effect" – the wording need not match.

Question 5

0610/22 N25 ▪ Q5 ▪ 1 mark

5 The diagram shows the order of bases along part of one strand of DNA.

A—C—T—T—A—G—A—T

What is the order of bases on the complementary part of the other strand?

A A—C—T—T—A—G—A—T

B C—A—G—G—C—T—C—G

C T—A—G—A—T—T—C—A

D T—G—A—A—T—C—T—A

Solution 5

Answer: **D**

Why

- Bases pair A with T and C with G.
- So work along the strand replacing each base with its partner.
- A–C–T–T–A–G–A–T becomes T–G–A–A–T–C–T–A.

Question 1

0610/63 N25 ▪ Q1 ▪ 11 marks

1 Yeast cells produce an enzyme called invertase. Invertase catalyses the breakdown of sucrose into reducing sugars. Sucrose is **not** a reducing sugar.

A student investigated the effect of two different concentrations of invertase extract on a sucrose solution.

The student used this method:

Step 1 Label three test-tubes **A**, **B** and **W**.

Step 2 Use a syringe to put 2 cm^3 of sucrose solution into all three test-tubes.

Step 3 Use a clean syringe to put 2 cm^3 of 100% invertase extract into test-tube **A**.

Step 4 Use a clean syringe to put 2 cm^3 of 10% invertase extract into test-tube **B**.

Step 5 Use a clean syringe to put 2 cm^3 of distilled water into test-tube **W**.

Question 1

Step 6 Put all three test-tubes in a warm water-bath at 40 °C for 15 minutes.

Step 7 Measure the temperature of the liquid in the test-tubes.

(a) State the name of the piece of equipment that is used to measure temperature.

Question 1

Step 8 Use a clean syringe to add 4 cm^3 of Benedict's solution to all three test-tubes.

Step 9 Place all three test-tubes into a hot water-bath for five minutes.

Step 10 After five minutes, record the colour of the liquid in each test-tube.

Fig. 1.1 shows the notes the student made about their observations in step 10.

Question 1

W remains blue

Question 1

Fig. 1.1

(b) Prepare a table and record the results of this investigation using the information in Fig. 1.1.

Question 1

[3]

(c) State a conclusion for the results shown in test-tube **A** and test-tube **B**.

Question 1

(d) Explain the purpose of test-tube **W**.

Question 1

(e) State the independent variable in this investigation.

Question 1

(f) Explain why the test-tubes were placed in the warm water-bath in step 6.

Question 1

(g) Explain why a clean syringe was used in steps 3, 4 and 5.

Question 1

(h) Invertase is a protein.

State the reagent used to test for the presence of protein.

Question 1

[Total: 11]

Solution 1

(a)

Mark scheme

- thermometer ;
- 1

Solution 1

(b) Mark scheme

- table drawn with a minimum of two columns and a header
- line ;
- appropriate column / row headings ;
- three colours recorded correctly for tubes A, B and W ;
- 3 e.g.
- test-tube
- colour (of liquid)
- A

Solution 1

- B
- W
- brick-red
- green
- blue

Solution 1

(c)

Mark scheme

- the greater the (invertase/enzyme) concentration the greater
- the concentration of, reducing sugars / glucose, produced ;
- ora
- 1

Solution 1

(d)

Mark scheme

- as a control ;
- idea that, water does not break down sucrose / sucrose
- does not break down on its own ;
- 2

Solution 1

(e)

Mark scheme

- concentration of invertase/enzyme (extract) ;
- 1

Solution 1

(f)

Mark scheme

- any one from:
- to make sure test-tubes are at the same temperature ;
- to give a sufficient / high rate of reaction / AW ;
- so that the test-tubes are at the same temperature as the
- water-bath ;
- 1

Solution 1

(g)

Mark scheme

- to prevent contamination / AW ;
- 1

Solution 1

(h)

Mark scheme

- biuret ;
- 1
- 0610/63
- October/November 2025
- Guidance

Question 5

0610/21 J25 ▪ Q5 ▪ 1 mark

5 A DNA molecule contains pairs of bases.

What is a correct combination of a pair of bases?

A A and G **B** C and A **C** G and T **D** T and A

Solution 5

Answer: **D**

Why

- In DNA the bases pair A with T and C with G.
- So a purine always pairs with a pyrimidine.
- T and A is the only valid pairing offered.

Question 6

0610/21 J25 ▪ Q6 ▪ 1 mark

6 What is the test for protein?

	name of the test	heat	colour change
A	Benedict's	yes	blue to purple
B	biuret	yes	blue to red
C	biuret	no	blue to purple
D	Benedict's	no	blue to red

Question 6

Solution 6

Answer: **C**

Why

- The test for protein is the biuret test.
- No heating is needed – that is what separates it from Benedict's.
- A positive result changes the colour from blue to purple.

Question 21

0610/22 J25 ▪ Q21 ▪ 1 mark

21 What is the chemical formula of glucose?

A $C_6H_6O_6$ **B** C_6HO_6 **C** $C_6H_{12}O_6$ **D** $C_{12}H_{12}O_6$

Solution 21

Answer: **C**

Why

- Glucose is a simple sugar with six carbon atoms.
- Its formula is $C_6H_{12}O_6$ – twice as many hydrogens as carbons or oxygens.
- $C_{12}H_{22}O_{11}$ would be a disaccharide such as sucrose or maltose.

Question 2

0610/61 J25 ▪ Q2 ▪ 24 marks

2 **(a)** A student used DCPIP solution to compare the concentration of vitamin C in five solutions.

The student used this method:

- Put 1 cm^3 of 1% DCPIP solution into a test-tube.
- Use a syringe to add drops of 125 mg per dm^3 vitamin C solution to the test-tube.
- Keep adding drops of vitamin C solution until the DCPIP solution becomes colourless.
- Record the total volume of the 125 mg per dm^3 vitamin C solution added.

This method was repeated with four other concentrations of vitamin C solution.

(i) State the expected colour of the DCPIP solution **before** the vitamin C solution was added.

Question 2

(ii) State **two** variables that were kept constant by the student in this investigation.

Question 2

Question 2

[2]

The results of the investigation are shown in Table 2.1.

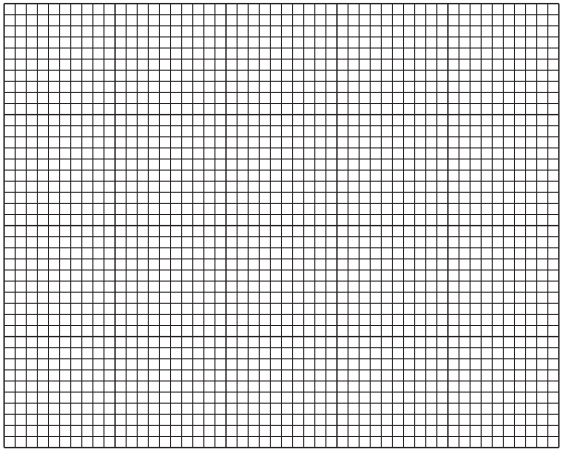
Table 2.1

concentration of vitamin C / mg per dm^3	total volume of vitamin C solution added / cm^3
125	1.6
250	1.4
500	1.1
750	0.8
1000	0.5

(b) (i) Plot a line graph on the grid of the data in Table 2.1.

Question 2

Question 2



Question 2

Question 2

[4]

(ii) The student tested a sample of orange juice.

They found that 1.2 cm^3 of orange juice was needed to react with 1 cm^3 of 1% DCPIP solution.

Use your graph to estimate the vitamin C concentration of the orange juice.

Show on the graph how you obtained your estimate.

[2]

(c) The student wanted to investigate the effect of storage on the vitamin C concentration in apple juice.

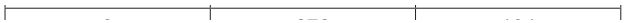
Three samples of fresh apple juice and three samples of stored apple juice were tested.

The results are shown in Table 2.2.

Table 2.2

sample	concentration of vitamin C in fresh apple juice / mg per dm^3	concentration of vitamin C in stored apple juice / mg per dm^3
1	281	170
2	276	96

Question 2



Question 2

3	272	104

(i) State a conclusion for the data shown in Table 2.2.

Question 2

(ii) The student decided that the result of one sample shown in Table 2.2 was anomalous.

State what is meant by an anomalous result.

Question 2

(iii) Draw a circle around the anomalous result in Table 2.2. [1]

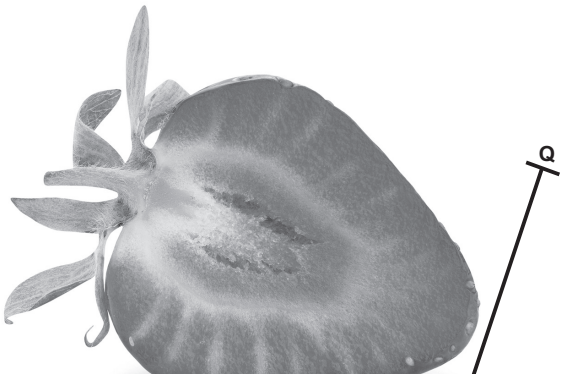
(iv) Using the data for **sample 3** in Table 2.2, calculate the percentage change in the vitamin C concentration of the apple juice when it is stored.

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

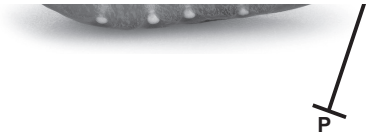
Space for working.

Question 2

(d) Fig. 2.1 is a photograph of a fruit from a strawberry plant, *Fragaria ananassa*, that has been cut in half.



Question 2



magnification ×1.8

Fig. 2.1

(i) Draw a large diagram of the strawberry fruit shown in Fig. 2.1.

Question 2

[4]

Question 2

(ii) Line **PQ** in Fig. 2.1 represents the maximum diameter of the strawberry fruit.

Measure the length of line **PQ** in Fig. 2.1.

length of **PQ** ..... mm

Calculate the actual diameter of the strawberry fruit using the formula and your measurement.

$$\text{magnification} = \frac{\text{length of line } \mathbf{PQ} \text{ in Fig. 2.1}}{\text{actual diameter of the strawberry fruit}}$$

Give your answer to **three** significant figures.

Space for working.

Question 2

Question 2

[3]

(e) Describe a method the student could use to test a strawberry fruit for reducing sugars.

Question 2

[Total: 24]

Solution 2

(a)(i)

Mark scheme

- blue ;
- 1

Solution 2

(a)(ii)

Mark scheme

- volume of DCPIP ;
- concentration of DCPIP ;
- 2

Solution 2

(b)(i)

Mark scheme

- axes labelled with units ;
- suitable linear scale and data occupies at least half the grid in both
- directions ;
- five points plotted accurately $\pm$ half a small square ;
- suitable line drawn ;
- 4

Solution 2

(b)(ii)

Mark scheme

- intercept indicated on the candidate's graph at 1.2 cm3 ;
- concentration correct for intercept at 1.2 cm3 $\pm$ half a small square ;
- 2

Solution 2

(c)(i)

Mark scheme

- storing decreases the vitamin C content (of apple juice) ;
- 1

(c)(ii)

Mark scheme

- a result that does not fit the, pattern / trend / AW ;
- 1

Solution 2

(c)(iii)

Mark scheme

- 170 (circled) ;
- 1

Solution 2

(c)(iv) Mark scheme

- – 61.8 ;;;
- 3 MP1 correct selection of data from table 272
- and 104 OR 168
- MP2 correct calculation of percentage decrease
- indicated with a negative sign to any number of
- decimal places
- MP3 correct rounding to 1 decimal place
- ecf from previous step

Solution 2

- BRAILLE PAPER
- renumbered as 2(b)(i)(i)–(iv)
- (i) correct axes labels: concentration
- of vitamin C / mg per dm3
- AND (total) volume of vitamin C
- (added) / cm3 ;
- (ii) and (iii) five correct plots ± half a
- square ;; (five correct = 2 marks, 3 or
- 4 correct = 1 mark)
- (iv) suitable line drawn ;

Solution 2

- BRAILLE PAPER
- 170 written not circled
- 0610/61
- May/June 2025
- Guidance

Solution 2

(d)(i)

Mark scheme

- Outline is a single clear line with no shading ;
- Size –at least half the available space used ;
- Detail 1: six sepals and a stalk ;
- Detail 2: (at least) five white stripes on the lower side, radiating out and
- shown as double lines and four seeds shown as circles / ovals ;
- 4

Solution 2

(d)(ii) Mark scheme

- PQ = 61 ± 1 (mm) ;
- 33.9 (mm) ;;
- 3 MP1 correct measurement of line PQ
- MP2 correct calculation of the actual size to any
- number of significant figures
- MP3 correct rounding to three significant figures
- ecf from previous step
- PQ of 60 mm = 33.3 (mm)

Solution 2

- PQ of 62 mm $= 34.4\,(\text{mm})$

Solution 2

(e) Mark scheme

- add Benedict's (reagent / solution) ;
- heat ;
- 2
- BRAILLE PAPER
- AW throughout
- any four from:
- single clear unbroken lines ;
- no shading ;

Solution 2

- use a pencil ;
- do not use a compass or ruler ;
- parts drawn in correct proportions ;
- size big enough to show details ;

Question 1

0610/63 J25 ▪ Q1 ▪ 22 marks

1 Potato cells contain the enzyme catalase. Catalase catalyses the breakdown of hydrogen peroxide into water and oxygen gas. The oxygen gas forms a foam. The height of the foam indicates how active the enzyme is.

A student investigated the effect of temperature on the activity of the enzyme catalase.

The student used this method:

Step 1 Label three test-tubes **C**, **R** and **H**.

Step 2 Use a syringe to add 4 cm^3 of hydrogen peroxide solution to each of the test-tubes labelled **C**, **R** and **H**.

Step 3 Place test-tube **C** into a cold water-bath.

Step 4 Place test-tube **R** in a test-tube rack to keep it at room temperature.

Step 5 Place test-tube **H** into a hot water-bath.

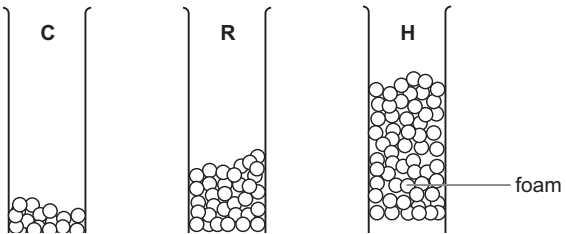
Question 1

Step 6 Leave the test-tubes for five minutes.

Step 7 After five minutes, use a clean syringe to add 1 cm^3 of potato extract to test-tube **C**. Start the stop-clock.

Step 8 Repeat step 7 for test-tube **R** and test-tube **H**.

Fig. 1.1 shows the test-tubes 30 seconds after adding the potato extract.



Question 1

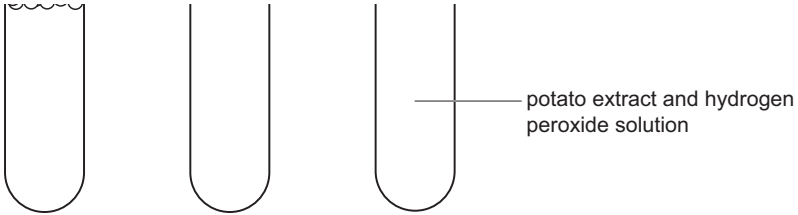


Fig. 1.1

(a) (i) Prepare a table for the results of the investigation.

Measure the maximum height of the foam, in mm, in each of test-tubes **C**, **R** and **H** shown in Fig. 1.1.

Record these measurements in your table.

Question 1

[4]

(ii) State a conclusion for these results.

Question 1

(iii) State the independent and dependent variables in the investigation.

Question 1

Question 1

Question 1

[2]

(iv) Explain why test-tube **C** and test-tube **H** were kept in the water-baths for five minutes in step 6.

Question 1

(v) The student suggests repeating the investigation twice more.

Explain how this would give you more confidence in these results.

Question 1

(vi) Potato extract can be prepared by cutting a potato into pieces and then grinding it with a mortar and pestle and some water.

Describe a safety precaution that would reduce the hazards in producing potato extract using this method.

Question 1

(b) **(i)** Another student did the same experiment and measured the height of the foam in one of the test-tubes as 29 mm. The diameter of the test-tube was 25 mm.

Calculate the volume of foam produced, and give your answer in cm^3 to **one** decimal place.

Use 3.14 as the value for π.

Question 1

(ii) Suggest a more accurate method of measuring the volume of oxygen gas produced.

Question 1

(c) Potatoes are a source of starch and vitamin C.

(i) Iodine solution was used to test a sample of potato for starch.

State the result of a positive test for starch.

Question 1

(ii) State the name of a reagent that can be used to test for vitamin C.

Question 1

(d) Photosynthesis also produces oxygen gas.

Plan an investigation to determine the effect of light intensity on the rate of photosynthesis in aquatic plants.

Question 1

[Total: 22]

Solution 1

(a)(i) Mark scheme

- table drawn with minimum two columns and a header line ;
- appropriate column / row headings with units ;
- three values recorded ;
- three correct measurements in mm, ± 1 mm ;
- 4
- e.g.
- test-tube
- OR

Solution 1

- temperature
- height of the
- foam / mm
- C
- R
- H
- 8
- 15
- 27

Solution 1

(a)(ii)

Mark scheme

- increased temperature increases the activity of, catalase / enzyme
- / ora ;
- 1

Solution 1

(a)(iii)

Mark scheme

- independent variable: temperature ;
- dependent variable: height (of the foam) ;
- 2

Solution 1

(a)(iv)

Mark scheme

- to equilibrate / to allow the temperature of the test-tube contents to
- become the same as the water / AW ;
- 1

Solution 1

(a)(v)

Mark scheme

- identify / exclude / ignore, anomalous results ;
- 1

Solution 1

(a)(vi) Mark scheme

- any one from;
- cut, away from body / on a white tile / on a hard surface / AW ;
- keep fingers out of the grinder ;
- 1
- 0610/63
- May/June 2025
- Guidance

Solution 1

(b)(i) Mark scheme

- 14.2 (cm3) ;;;
- 3 MP1 correct calculation of volume in mm3
- or cm3
- 14228.125 mm3
- MP2 correct conversion to cm3 at any point in
- the calculation.
- 14.228125 cm3
- MP3 correct rounding to 1 d.p.

Solution 1

- ecf from previous step

Solution 1

(b)(ii)

Mark scheme

- use a (gas) syringe / a (upturned) measuring cylinder over water / AW ;
- 1

Solution 1

(c)(i)

Mark scheme

- blue-black ;
- 1

Solution 1

(c)(ii)

Mark scheme

- DCPIP ;
- 1
- 0610/63
- May/June 2025
- Guidance

Solution 1

(d) Mark scheme

- independent variable:
- 1
- at least two different light intensities ;
- dependent variable:
- 2
- volume of oxygen produced in a set time / time to produce a set
- volume of oxygen ;
- method ;;;

Solution 1

- 3
- method of changing light intensity
- 4
- method of measuring volume of oxygen produced
- 5
- method of keeping temperature constant / use of heat shield / LED
- bulb explained
- 6 and 7 from variables kept constant ;;
- ▪
- same (species / type of) plant

Solution 1

- ▪
- surface area / size / amount, of plant
- ▪
- pH
- ▪
- temperature
- ▪
- carbon dioxide concentration of the water / same conc(entration) of
- sodium hydrogencarbonate
- ▪

Solution 1

- light wavelength
- 8
- two or more replicates / repeat investigation two or more times ;
- 9
- safety precaution – gloves / keep lamp away from water / do not
- touch hot lamps / cutting (if cutting up plant) ;
- 6
- 0610/63
- May/June 2025
- Guidance

Question 8

0610/22 M25 ▪ Q8 ▪ 1 mark

8 Which chemical element is found in proteins but **not** in carbohydrates?

A carbon

B hydrogen

C nitrogen

D oxygen

Solution 8

Answer: **C**

Why

- Carbohydrates contain carbon, hydrogen and oxygen only.
- Proteins contain those three plus nitrogen, in every amino acid's amino group.
- So nitrogen is the element present in proteins but not in carbohydrates.