Past-paper walk-through

Diffusion ▪ 3.1

eXercise

Questions in this set

- 0610/23 N25 Q5 ▪ 1 mark
- 0610/61 J25 Q1 ▪ 16 marks
- 0610/42 M25 Q1 ▪ 16 marks

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

0610/23 N25 ▪ Q5 ▪ 1 mark

5 Diffusion may be defined as the net movement of particles from a region of their .....1..... concentration, to a region of their .....2..... concentration, where movement is .....3..... a concentration gradient.

Which words complete gaps 1, 2 and 3?

	1	2	3
A	higher	lower	down
B	higher	lower	up
C	lower	higher	down
D	lower	higher	up

Solution 5

Answer: **A**

Why

- Diffusion is the net movement down a concentration gradient.
- So it runs from a *higher* concentration to a *lower* one.
- It needs no energy input – it happens because of the particles' own random motion.

Question 1

0610/61 J25 ▪ Q1 ▪ 16 marks

1 A student investigated the effect of concentration on diffusion.

The student used pieces of agar which contained universal indicator. Universal indicator is green in substances with a neutral pH and red in substances with an acidic pH.

The student placed the pieces of agar into different concentrations of hydrochloric acid solution and measured the time taken for the acid to diffuse to the centre of each piece of agar. At the start of the investigation the agar was green.

The student used this method:

Step 1 Label four test-tubes **0.4**, **0.6**, **0.8**, **1.0**.

Table 1.1 shows the volumes of 1.0 mol per dm^3 hydrochloric acid solution and distilled water used to make the different concentrations of hydrochloric acid solution.

Table 1.1

Question 1

concentration of hydrochloric acid solution / mol per dm^3	volume of 1.0 mol per dm^3 hydrochloric acid solution / cm^3	volume of distilled water / cm^3
0.4	4	6
0.6	6	4
0.8	8	2
1.0	10	0

Step 2 Use a 10 cm^3 syringe to put the volumes of 1.0 mol per dm^3 hydrochloric acid solution shown in Table 1.1 into the test-tubes labelled **0.4**, **0.6**, **0.8**, **1.0**.

Step 3 Use the 10 cm^3 syringe to put the volumes of distilled water shown in Table 1.1 into the test-tubes labelled **0.4**, **0.6**, **0.8**, **1.0**.

Step 4 A block of agar which measures approximately 1 cm × 2 cm × 2 cm is provided. Use the knife to cut the agar block into four pieces.

Question 1

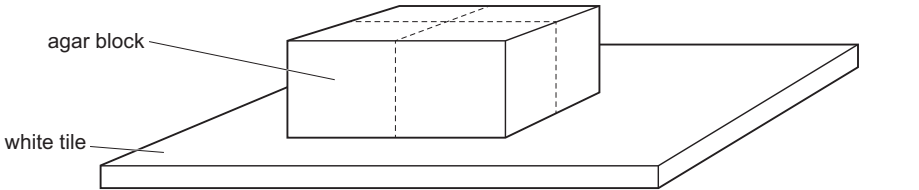


Fig. 1.1

Step 5 Place all the test-tubes into a warm water-bath.

Step 6 Put **one** agar piece into each of the test-tubes and immediately start the stop-clock. Observe the colour of the agar pieces as they change from green to red.

The student recorded the time taken for each piece of agar to become completely red.

Question 1

The stop-clocks from step 6 are shown in Fig. 1.2.

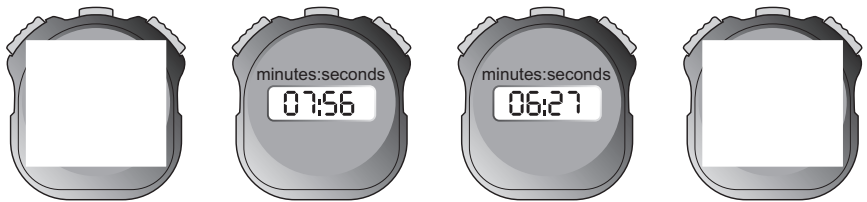


Fig. 1.2

(a) (i) Prepare a table to record the results of the investigation.

Convert the times on the stop-clocks shown in Fig. 1.2 to seconds and record these times in your table.

Question 1

Question 1

[4]

(ii) State a conclusion for the results.

Question 1

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

Question 1

Question 1

Question 1

Question 1

[2]

(iv) Suggest **two** improvements to the method used for this investigation.

Question 1

Question 1

[2]

(v) Identify **two** hazards in this investigation.

Question 1

(b) Plan an investigation to determine the effect of temperature on osmosis in potato plant tissue.

Question 1

[Total: 16]

Solution 1

(a)(i)

Mark scheme

- table drawn with a minimum of two columns and a header line ;
- appropriate column / row headings with units for concentration and time ;
- recording of four correct concentrations linked to any four times ;
- four correct conversions to seconds ;
- 4

Solution 1

(a)(ii)

Mark scheme

- as the concentration (of hydrochloric acid) increases, the rate of diffusion
- increases / ora ;
- 1

Solution 1

(a)(iii)

Mark scheme

- Independent: concentration (of hydrochloric acid) ;
- dependent: time (for the whole cube to change colour / for diffusion) ;
- 2

Solution 1

(a)(iv) Mark scheme

- any two from:
- repeat (at least) twice more / multiple times ;
- cut the agar to equal size pieces / AW ;
- use white, card / background, to help determine the, end-point / AW ;
- idea of testing each cube, individually / not all at the same time ;
- use, clean / different, syringes ;
- keeping temperature constant / using a thermostatically controlled water-
- bath ;

Solution 1

- 2

Solution 1

(a)(v) Mark scheme

- any two for one mark ;
- ▪
- using a knife / cutting
- ▪
- acid
- ▪
- (universal) indicator
- 1

Solution 1

- BRAILLE PAPER
- renumbered as 1(a)(i)(i)–(iv):
- (i) hydrochloric acid ;
- (ii) mol per dm3 ;
- (iii)and (iv) four correct conversions ;;
- (1 mark per two correct conversion)
- 0610/61
- May/June 2025
- Guidance

Solution 1

(b) Mark scheme

- independent variable
- 1
- (at least) two different temperatures ;
- dependent variable
- 2
- (measuring) length / mass / volume, of the potato pieces
- before and after ;
- 3 & 4 & 5 details of method ;;;

Solution 1

- ▪
- drying / removing excess water, before weighing
- ▪
- ref. to use of a cork borer / potato chipper, to prepare the piece of
- potato
- ▪
- ref. to peeling the potato / using potato without skin
- ▪
- putting potato pieces in (a beaker containing) water / sugar
- solution / salt solution / solution

Solution 1

- ▪
- ref. to making sure potato is covered by the solution / submerged
- ▪
- ref. to, equilibration time, AW, before adding potato (if putting the
- potato into a beaker that is then put into the water-bath)
- ▪
- method of maintaining at least one of the temperatures
- 6 & 7 variables kept constant ;;
- ▪
- type / species / age, of potato / plant tissue

Solution 1

- ▪
- initial, surface area / dimensions / mass
- ▪
- concentration of solution / same water potential
- ▪
- time (in solution) / stated time, e.g. left for one hour
- 8
- at least three trials / repeat investigation (at least) twice more ;
- 9
- relevant safety measure ;

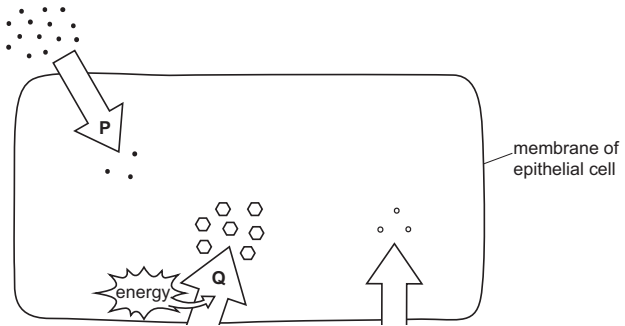
Solution 1

- 6
- 0610/61
- May/June 2025
- Guidance

Question 1

0610/42 M25 ▪ Q1 ▪ 16 marks

1 Fig. 1.1 shows the movement of particles through an epithelial cell in the small intestine.



Question 1

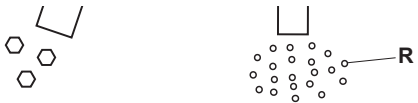


Fig. 1.1

(a) In Fig. 1.1, arrow **P** represents the diffusion of oxygen molecules.

(i) Describe what is meant by the term diffusion.

Question 1

(ii) State the type of energy needed for diffusion.

Question 1

(b) Carbon dioxide molecules also move by diffusion.

(i) State the name of the process in human cells that produces carbon dioxide.

Question 1

(ii) On Fig. 1.1, draw an arrow to show the direction of diffusion of carbon dioxide molecules.

[1]

(c) In Fig. 1.1, arrow **Q** represents another type of particle movement.

Identify the type of particle movement represented by arrow **Q**.

Explain your answer.

Question 1

Question 1

[3]

(d) In Fig. 1.1, particle **R** moves from the lumen of the small intestine into the epithelial cell.

Suggest why particle **R cannot** be starch.

Question 1

(e) Fig. 1.2 is a photomicrograph of red onion cells.

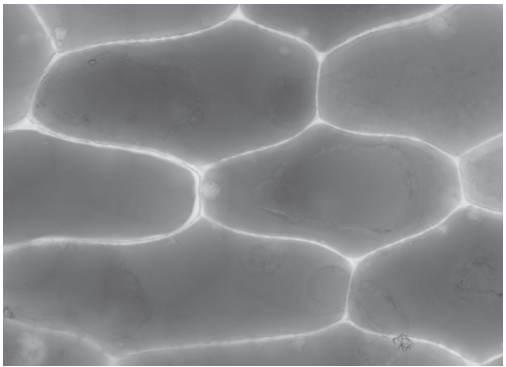


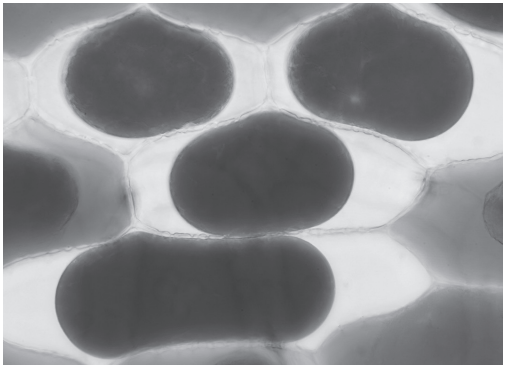
Fig. 1.2

Question 1

Fig. 1.2

Question 1

Fig. 1.3 is a photomicrograph of the same red onion cells after being immersed in a salt solution.



Question 1

Question 1

Fig. 1.3

Using Fig. 1.2 and Fig. 1.3, describe **and** explain the difference in appearance of the cells before and after immersion in salt solution.

Question 1

[Total: 16]

Solution 1

(a)(i)

Mark scheme

- net movement / AW, of particles ;
- from a region of higher concentration to a region of their lower concentration
- (as a result of their random movement) ;
- 2

Solution 1

(a)(ii)

Mark scheme

- kinetic (energy) ;
- 1

Solution 1

(b)(i)

Mark scheme

- aerobic respiration ;
- 1

(b)(ii)

Mark scheme

- arrow drawn from inside to outside of epithelial cell ;
- 1

Solution 1

(c)

Mark scheme

- type:
- active transport ;
- explanation:
- (particles move from) low(er) concentration to high(er) concentration ;
- uses energy ;
- 3

Solution 1

(d) Mark scheme

- any two from:
- starch is insoluble ;
- starch is (too) large ;
- starch has already been broken down / AW ;
- 2
- 0610/42
- February/March 2025
- Guidance

Solution 1

(e) Mark scheme

- any six from:
- 1
- idea of before immersion cells are turgid / idea of after immersion cells
- are flaccid or plasmolysed ;
- 2
- idea of before immersion cell membrane or cytoplasm pushes against
- cell wall / idea of after immersion cell membrane or cytoplasm pulls
- away from cell wall ;

Solution 1

- 3
- idea of before immersion increased turgor pressure / idea of after
- immersion decreased turgor pressure ;
- 4
- ref to osmosis ;
- 5
- salt solution is concentrated or has a lower water potential / cytoplasm is
- dilute or has a higher water potential ;
- 6
- water moves from high water potential to low water potential ;

Solution 1

- 7
- through a partially permeable membrane ;
- 8
- cytoplasm / vacuole / cell contents, is darker (after immersion) / ora ;
- 9
- cytoplasm / vacuole / cell contents, are more concentrated (after
- immersion) / ora ;
- 6
- 0610/42
- February/March 2025

Solution 1

- Guidance