

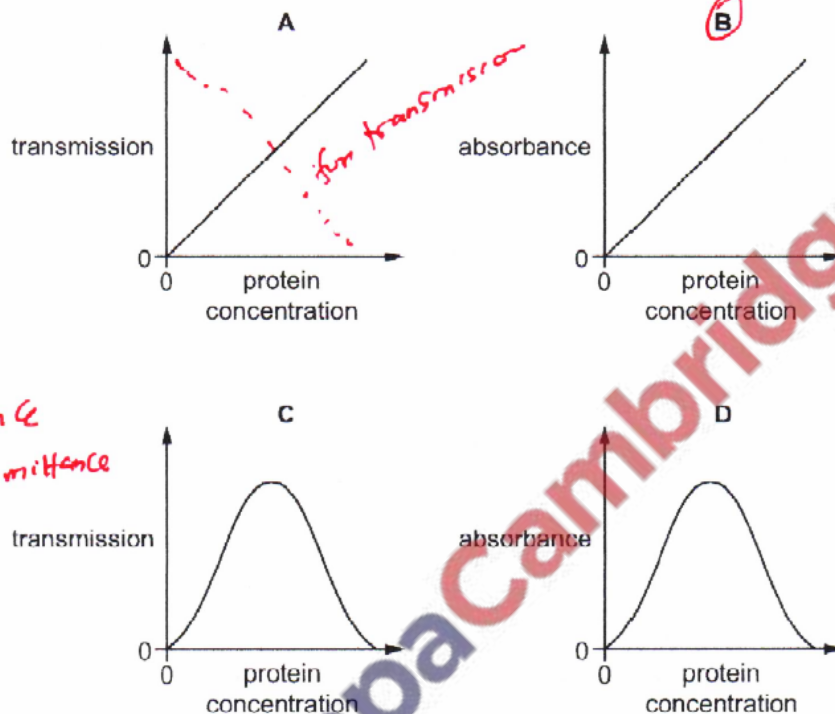
1. June/2022/Paper_11/No.12

A student used colorimetry to monitor the hydrolysis of a protein by a protease enzyme.

The student used biuret solution to determine the concentration of protein in the hydrolysis reaction.

The student produced a calibration curve using known concentrations of protein.

Which diagram shows the calibration curve?



The greater the concentration of protein, the greater the purple colour

So there is greater absorbance

greater the absorbance so

Cereal absorbance has zero transmittance

PapaCambridge

2. June/2022/Paper_11/No.13

A student completed an experiment to measure how increasing concentrations of substrate affects the rate of an enzyme-controlled reaction.

The student then repeated the experiment after adding a fixed quantity of a reversible competitive inhibitor.

Which row describes the effect of a reversible competitive inhibitor on enzyme activity?

	attachment of inhibitor at active site	effect of increasing substrate concentration on rate of enzyme-controlled reaction
A	no	little effect on the rate
B	yes	rate increases
C	no	rate increases
D	yes	little effect on the rate

Increasing substrate concentration reverse competitive inhibition. So rate increase

3. June/2022/Paper_11/No.20

Telomerase is an enzyme that adds nucleotides to telomeres.

Which statement about telomerase is correct?

Low telomeres leads to less growth

- A A high concentration of telomerase in a cell damages genes during DNA replication. *- false*
- B A high concentration of telomerase in cancerous cells limits the rate of tumour growth. *- false*
- C The low concentration of telomerase in stem cells means that these cells can divide an unlimited number of times. *- false*
- D** The low concentration of telomerase in body cells means that these cells can divide a limited number of times.

more concentration of telomeres leads to more growth

4. June/2022/Paper_12/No.11

Typical enzymes are large globular proteins with a specific tertiary shape.

Which molecular interactions are directly involved in maintaining the tertiary shape?

- 1 hydrogen bonding
- 2 disulfide bridges
- 3 hydrophobic interactions

- H bonds
- disulfide bonds
- ionic interaction
- hydrophobic interaction

molecular interactions holding proteins

- A** 1, 2 and 3
- B 1 and 2 only
- C 1 and 3 only
- D 2 and 3 only

5. June/2022/Paper_12/No.12

Which statement about the Michaelis-Menten constant (K_m) is correct for an enzyme with a low affinity for its substrate?

The lower the K_m , the higher the affinity for substrate molecules.

- A** It has a high K_m and reaches V_{max} at a high substrate concentration.
- B It has a high K_m and reaches V_{max} at a low substrate concentration.
- C It has a low K_m and reaches V_{max} at a high substrate concentration.
- D It has a low K_m and reaches V_{max} at a low substrate concentration.



V_{max} is reached at high substrate concentration

6. June/2022/Paper_12/No.13

Long chain, saturated fatty acids change from solid to liquid at higher temperatures compared with short chain, unsaturated fatty acids.

Which fatty acids would be more likely to form triglycerides in mammals that live in cold climates?

animals in cold environment needs ability to turn glyceride from solid to liquid

A long chain saturated

B long chain unsaturated

C short chain saturated

D short chain unsaturated

Long chain fatty acids dont turn to liquids easily.

Long chains are good for warm climate

7. June/2022/Paper_13/No.13

What is a feature of competitive enzyme inhibition?

Inhibitor fights for active site of the substrate.

A The inhibitor binds permanently to the active site. *- binds temporarily*

B Inhibition can be reversed by increasing the concentration of the substrate. *reversible*

C The inhibitor molecule changes the secondary structure of the enzyme. *- enzymes are globular*

D The substrate and the inhibitor are the same shape. *- enzyme and substrate have only complimentary shape. inhibitor does not have same shape*

The enzyme carbonic anhydrase has been found in a wide range of organisms and acts as a catalyst in many tissues.

Studies have shown that there are differences in the protein structure of the enzyme and differences in the number and organisation of introns and exons of the gene coding for the enzyme.

All carbonic anhydrase enzymes catalyse the same reversible reaction, shown in Fig. 4.1.

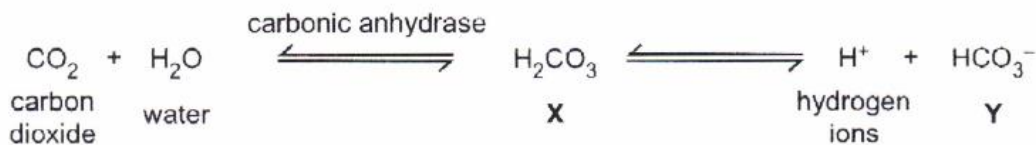


Fig. 4.1

- (a) With reference to Fig. 4.1, name X and Y.

X *Carbonic acid*
 Y *bicarbonate ions*

[2]

- (b) Carbonic anhydrase enzymes can have different primary structures.

Suggest how all carbonic anhydrase enzymes can catalyse the same reaction, even though they have different primary structures.

They have same quaternary structure and similar active site.

[1]

- (c) Genes coding for proteins in eukaryotes consist of introns and exons.

Outline the similarities and differences between the introns and the exons of genes coding for proteins such as carbonic anhydrase.

Exons and introns are nucleotide sequences that are transcribed during formation of mRNA. The exons are not removed from primary transcript while introns are removed from primary transcript. Exons are part of mRNA and so they leave the nucleus upto the ribosomes in the cytoplasm. The introns remain at the nucleus.

[3]

All mammals have the same type of carbonic anhydrase, known as α -carbonic anhydrase. Many different forms, or isoforms, of α -carbonic anhydrase have been identified in mammals.

There are 15 isoforms of α -carbonic anhydrase (CA) in humans. Cells of different tissues have one or more isoforms. Within cells the isoforms may be in different locations.

- (d) Red blood cells contain two isoforms, CA1 and CA2.

Suggest the location of CA1 and CA2 in red blood cells **and** give a reason for your answer.

They are found in the cytoplasm, closer to the haemoglobin. This is for faster transport of HCO_3^- ions out of the cell

[2]

- (e) Isoform CA6 forms part of human breast milk. Mammary gland cells package CA6 in Golgi vesicles for release from the cells.

Name the transport mechanism associated with CA6 secretion.

exocytosis

[1]

- (f) Human CA isoforms in some epithelial cells in the eye have a role in the formation of the clear fluid of the eye known as aqueous humour. Overactivity of the enzyme may lead to a harmful increase of pressure within the eye and cause a condition known as glaucoma.

Acetazolamide is a therapeutic drug that can be used in the treatment of glaucoma. It acts as a reversible non-competitive inhibitor.

Describe the mechanism of action of acetazolamide as a reversible non-competitive inhibitor of carbonic anhydrase.

Acetazolamide binds to allosteric site other than the active site. This changes the shape of the active site. Therefore the active site is no longer complementary to the substrate. So no product forms. Then the acetazolamide leaves the allosteric site and the enzyme reversibly binds.

[3]

[Total: 12]

Fig. 5.1 is a photomicrograph of a transverse section through part of the bronchus of the human gas exchange system. The image is of a good resolution for a light microscope.

The bronchial epithelium is a single layer of cells lining the lumen of the bronchus.

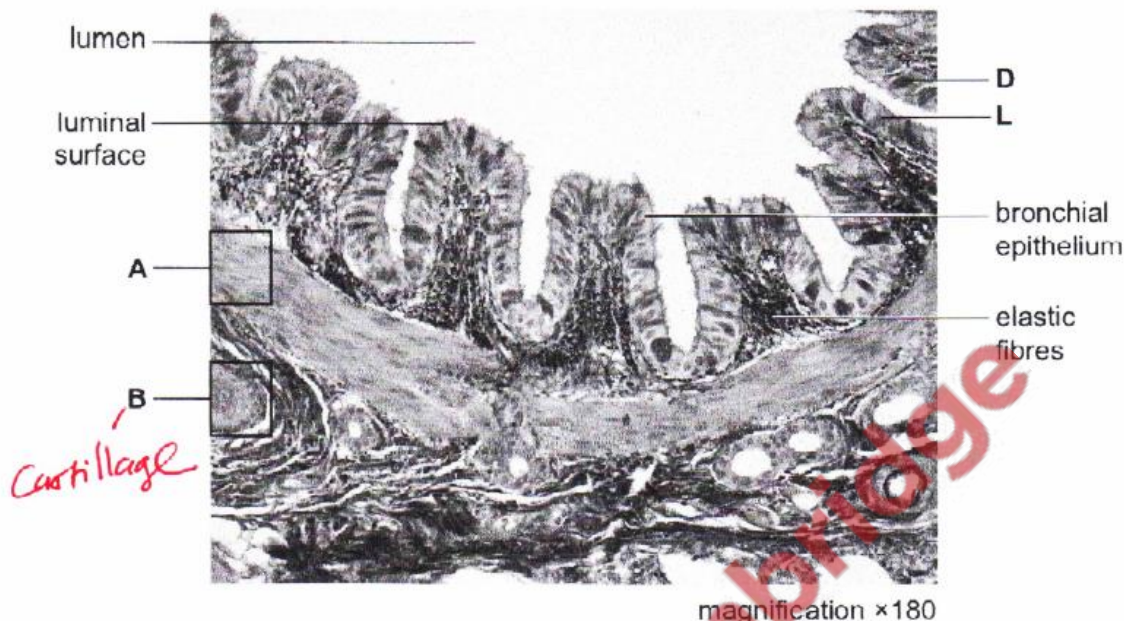


Fig. 5.1

- (a) The luminal surface shown in Fig. 5.1 is not clearly defined and appears slightly blurred.

State why the luminal surface of the bronchial epithelium appears slightly blurred, even though the resolution of the image is good.

Mucus on the surface of epithelial cells
make details not easily seen.

[1]

- (b) Some cells of the bronchial epithelium shown in Fig. 5.1 appear darker than others. For example, cell D appears darker than cell L.

With reference to the bronchial epithelium shown in Fig. 5.1, explain why some cells, such as cell D, appear darker and other cells, such as cell L, appear lighter.

The epithelium has goblet and ciliated cells.
These cells have different densities and so
they will have different shades upon
staining. In both cells, the nucleus is dominant
because it has a greater density than other
cell organelles.

[2]

(c) In Fig. 5.1 the tissue in box **B** is cartilage.

The tissue shown in box **A** is different from the tissue in box **B**.

Outline the differences in the structure **and** function of tissue **A** compared with tissue **B**.

It is made of smooth muscle cells and has chondrocytes. Cartilage has chondrocytes but has no smooth muscle cells.

- Cells are closer in A while at B the cells are more isolated.

- A controls the size of lumen by re-coiling while cartilage provides support.

[3]

[Total: 6]

