

INTERNATIONAL ADVANCED LEVEL

BIOLOGY

**Exemplars with examiner
commentaries
Unit 1 - WBI11**



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Introduction

1.1 About this booklet

This booklet has been produced to support teachers delivering the Pearson Edexcel International Advanced Level in Biology specification. The Unit 1 exemplar materials will enable teachers to guide their students in the application of knowledge and skills required to successfully complete this course. The booklet looks at questions 1(b)(i), 4(a)(i), 5(b)(ii), 6(a), 6(b)(iii) and 7(c)(i) from the June 2019 examination series, showing real candidate responses to questions and how examiners have applied the mark schemes to demonstrate how student responses should be marked.

1.2 How to use this booklet

Each example covered in this booklet contains:

- Question
- Mark scheme
- Example responses for the selected question
- Example of the marker grading decision based on the mark scheme, accompanied by examiner commentary including the explanation for the decision and guidance on how the answer can be improved to earn more marks.

The examples highlight the achievement of the assessment objectives at lower to higher levels of candidate responses.

Centres should use this content to support their internal assessment of students and incorporate examination skills into the delivery of the specification.

1.3 Further support

A range of materials are available from the Pearson qualifications website to support you in planning and delivering this specification.

Centres may find it beneficial to review this document in conjunction with the [Examiner's Report](#) and other assessment and support materials available on the [Pearson Qualifications website](#).

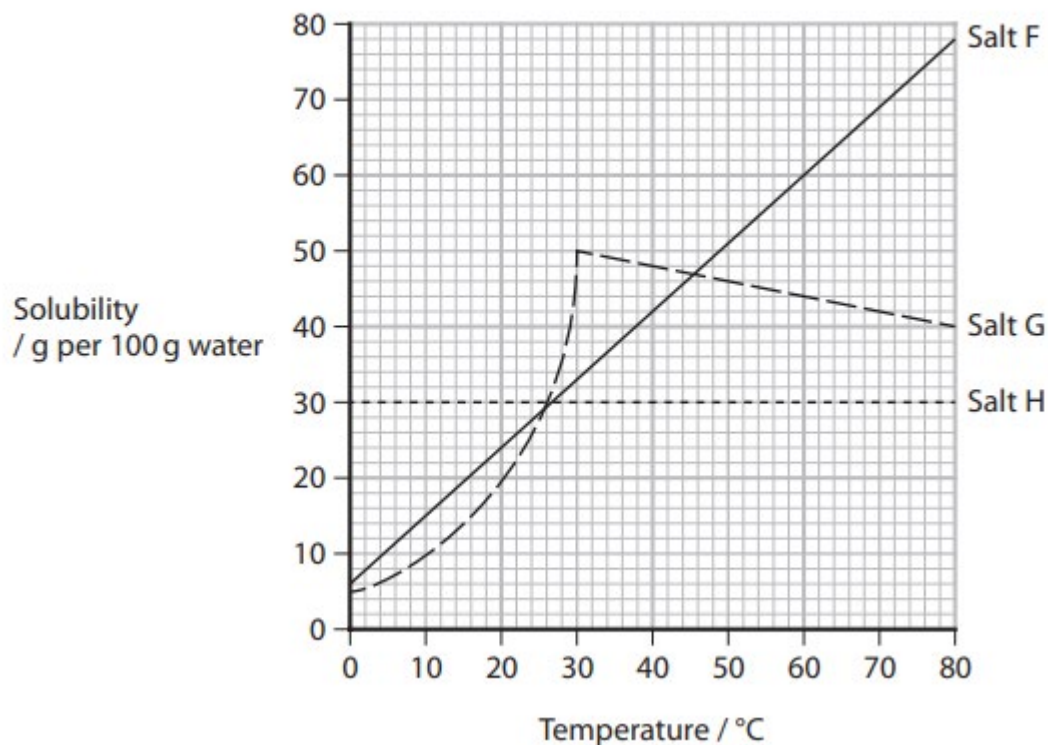
1.4 Assessment objectives

This document references the assessment objectives, which are as follows:

AO1	Demonstrate knowledge and understanding of science
AO2	(a) Application of knowledge and understanding of science in familiar and unfamiliar contexts. (b) Analysis and evaluation of scientific information to make judgments and reach conclusions.
AO3	Experimental skills in science, including analysis and evaluation of data and methods

Question 1(b)(i)

(b) The graph shows the effect of temperature on the solubility in water of three salts, F, G and H, in the human diet.



(i) Describe the effect of temperature on the solubility of these three salts.

(3)

Mark scheme

Question number	Answer	Additional guidance	Mark
1(b)(i)	<p>A description that includes the following points:</p> <ul style="list-style-type: none"> for F increase in temperature increases solubility (1) for G increase in temperature increases up to 30°C and then decreases the solubility (1) for H temperature has no effect (on solubility) (1) 	<p>ACCEPT 'It' for solubility throughout</p> <p>ACCEPT positive correlation</p> <p>Do not piece together</p> <p>ACCEPT solubility {remains constant / does not change} with an increase in temperature</p>	(3)

Exemplar response A

salt H the solubility is the same for all the temperatures. For salt F as you increase the temperature the solubility increases. For salt G it reaches it's maximum solubility (30/g per 100g of water) at 30°C then it's solubility decreases after 30°C.

Examiner's comments:

This response was given 2 marks.

When a question carries three marks and there are three lines on a graph to describe, a candidate should structure their answer by writing what each line on the graph shows separately.

On the first three lines, this response was awarded marking point 3 (see additional guidance) and marking point 1. Marking point 2 would have been awarded if the candidate had stated what the relationship is between the increase in temperature up to 30°C and the solubility. The candidate He only stated what the relationship is above 30°C. If the candidate had written 'For salt G the solubility increases as the temperature increases up to a maximum of 30°C and then decreases above 30°C', all marks could have been awarded.

Exemplar response B

(3)

Salt F shows a linear relationship with the effect of temperature on the solubility of salts. Salt G had an optimum temperature of 30°C for the solubility of 50 g per 100 g of water. After 30°C the solubility decreased to 40 g per 100 g water at 80°C . Salt H remained constant solubility across all temperatures.

Examiner's comments:

This response was given 1 mark.

This candidate approached the answer by dealing with each salt separately but did not specify the relationship between the temperature and the solubility.

In the first sentence for salt F, the candidate stated that there is a linear relationship which is true but have not said whether this relationship is a positive one or a negative one therefore the mark was not awarded.

In the description for salt G, this candidate made a similar mistake by stating that 30°C is the optimum temperature and that solubility decrease above this temperature but did not state that up to the optimum temperature the solubility increases with increase in temperature. Examiners can only mark on what has been written down by the candidates and cannot make assumptions.; It is possible that the solubility fluctuated as the temperature increased up to 30°C .

Finally, marking point 3 was awarded as the answer matched what is written in the additional guidance.

Question 4(a)(i)

- 4 Meselson and Stahl performed experiments that demonstrated semi-conservative replication of DNA.

(a) (i) State what is meant by the term semi-conservative replication.

(2)

Mark scheme

Question number	Answer	Additional guidance	Mark
4(a)(i)	<p>An answer that includes the following points:</p> <ul style="list-style-type: none">• an increase in the number of (DNA) {molecules / double helices} (1)• each (new molecule) consists of one {parent / original / old} strand and one new strand (1)	<p>ACCEPT {two / new} molecules are made (from one molecule)</p>	(2)

Exemplar response A

That means, the 2 new molecules of DNA formed
has ^{strand} one new nucleotide and one ^{strand} old, from the
original one initial one DNA molecule.

Examiner's comments:

This response was given 2 marks.

The term 'semi-conservative replication' has two components, semi-conservative and replication, and the question is allocated 2 marks. Therefore, for a question like this there will be a mark for each component.

This response has been awarded marking point 1 on the first line for stating that two new molecules will be formed - see the additional guidance. Then made it clear that there is one new and one original strand so the second marking point was awarded.

Exemplar response B

This is the process by which DNA molecules replicate. One strand remains concerned from the parent molecule while the other is a new daughter strand. Both strands are joined by hydrogen bonds between nitrogenous bases.

Examiner's comments:

This response was given 1 mark.

This response was awarded marking point 2 for their second sentence.

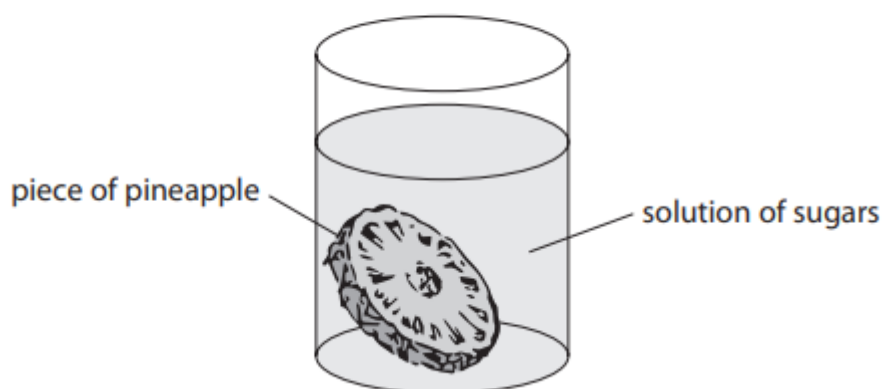
If, in the first sentence, a different term other than 'replicate' was used, mark point one could have been awarded. Candidates should always avoid using a term in their answer that is used in the question, especially if they are supposed to explain the meaning of the term.

Although not applicable here, it is worth stressing to candidates that a DNA molecule is double-stranded. They need to make it very clear if they are writing about a single polynucleotide (a strand) or the whole DNA molecule (two polynucleotides joined together by hydrogen bonds between the complementary base pairs).

Question 5(b)(ii)

- *(ii) Pineapples can be preserved by a process called osmotic dehydration in which pieces of pineapple are submerged in a solution of sugars.

The diagram shows how this process can be carried out.



Osmotic dehydration helps to preserve the pineapple by reducing the water content.

Osmotic dehydration also ensures that the concentration of each sugar in the pineapple does not change. This preserves the sweet taste of the pineapple.

Explain what the solution of sugars should contain to preserve pineapples.
Use the information in the table to support your answer.

(6)

Mark scheme

Question number	Answer
*5(b)(ii)	<p>Indicative content:</p> <ul style="list-style-type: none"> • sugar solution with a lower water potential than the cytoplasm of the cell (D) • sugar solution should be hypertonic (D) • so that water will pass out of the cytoplasm by osmosis (E) • concentration of sugar solution should be the same as the cytoplasm (D) • so that sugars will not diffuse out (E) • each individual sugar concentration should be the same as the cytoplasm (D) • mean concentration of sugars stated (fructose = 1.52, glucose = 1.08, sucrose = 8.55) (D) • range of sugar concentrations stated (from table) (D) • so that concentration of each sugar remains the same (E) • another solute needs to be used (D) • so that the sugar concentration remains the same but the water passes out (E) <p>Level 1 : description of conditions needed for osmosis and maintaining sugar concentration</p> <p>1 mark = a description of one condition</p>

2 marks = a description of each condition or an explanation of one condition

Level 2 : explanation of conditions needed for both osmosis and maintaining sugar concentration

3 marks = a description of one condition and an explanation of the other condition

4 marks = an explanation of each condition

Level 3 : indicates that concentration of each sugar needs to be the same as in the pineapple and another solute needs to be included.

5 marks = and includes one of the above

6 marks = and includes both of the above

Exemplar response A

The solution of sugars should firstly be a hypertonic solution, which is weaker than the pineapple (has less water / higher water potential). This would then make the water inside the pineapple transport ^{out of the pineapple} via osmosis through the partially permeable membrane down the water potential gradient (passively) - this preserves the pineapple. The solution should have an equal amount of the sugars found in the pineapple, so that no sugar diffuses out of the pineapple down the concentration gradient (needs to have an equal concentration to prevent passive diffusion). So, fructose needs to be approximately 1.52 g cm^{-3} (which is an average of all three pineapples tested), 1.08 g cm^{-3} of glucose and 8.55 g cm^{-3} of sucrose. This equal concentration would prevent diffusion. In conclusion, the sugar solution should be hypertonic to ~~prevent~~ ^{aid} osmosis of water out and should have an equal concentration of fructose, glucose and sucrose to the pineapple.

(Total for Question 5 = 10 marks)

Examiner's comments:

This response was given 5 marks.

Levels-based questions are a new style of questions which are worth 6 marks and will not be completely AO1 - they will always require the candidate to apply their knowledge to an unfamiliar context and / or analyse some data.

In this question, the candidate had to explain two aspects of pineapple preservation. Firstly, how the pineapple can be dehydrated and secondly how the level of the sweetness can be maintained, for each sugar. The stem of the question indicates this in the two paragraphs just before the actual question.

Osmotic dehydration helps to preserve the pineapple by reducing the water content.

Osmotic dehydration also ensures that the concentration of each sugar in the pineapple does not change. This preserves the sweet taste of the pineapple.

Explain what the solution of sugars should contain to preserve pineapples. Use the information in the table to support your answer.

(6)

This indicates that how the pineapple is dehydrated needs explaining.

This indicates that how the sweetness is maintained needs explaining.

This word is the clue that each individual sugar needs its concentration maintained.

This is the command word and tells the candidate that they must use some A level knowledge to say why each step is needed.

In this response, the candidate worked logically through the conditions necessary for pineapple preservation. In the first seven lines the candidate described what needed to be done to dehydrate the pineapple and then explained why it would work - this gives the candidate level 1. In the next four lines the candidate described how to maintain sweetness and to explain why this would work, giving the candidate a level 2. At the end, it was clear that the candidate knew that each individual sugar concentration would have to be kept the same, pushing them up to a level 3. However, this candidate did not state that another solute would need to be included for all this to work and so was awarded 5 marks and not the full 6.

Exemplar response B

The solution of sugars should contain the same concentration of each sugar for the particular pineapple. If pineapple # 1 is being preserved, the solution should contain 1.71 gcm^{-3} of fructose, 1.22 gcm^{-3} of glucose and 9.08 gcm^{-3} of sucrose. If the concentration of sugar is the same, there will be no net movement of sugar outside or inside the pineapple. The solution should have a larger water concentration than inside the pineapple so that water diffuses out of the pineapple since diffusion occurs from an area of high concentration to low concentration.

Examiner's comments:

This response was given 2 marks.

This response only partially answers the question, using correct AS level knowledge and terminology.

In the first six lines, this candidate explains how the sweetness of the pineapple can be maintained giving them a level 1, 2 marks.

Reference to 'water concentration' is an inappropriate terminology at this level – reference should have been to water potential, solute potential or osmotic potential. Reference to hypertonic / hypotonic / isotonic and solute concentration was also acceptable. The response was unclear in which direction the water was going. Also, at this level, the term 'osmosis' was expected to be used.

Question 6(a)

6 Dietary antioxidants may reduce the risk of cardiovascular disease (CVD).

(a) Explain how dietary antioxidants reduce the risk of CVD.

(3)

Mark scheme

Question number	Answer	Additional guidance	Mark
6(a)	<p>An explanation that includes the following points:</p> <ul style="list-style-type: none">• because antioxidants reduce free radicals (1)• free radicals cause {cell damage / oxidative stress} (1)• (antioxidants) reduce {plaque / atheroma} formation (1)	<p>ACCEPT neutralise / stabilise / donate electrons</p> <p>ACCEPT antioxidants {prevent cell damage / reduce oxidative stress}</p> <p>ACCEPT reduces cholesterol build up</p>	(3)

Exemplar response A

Dietary antioxidants reduce the risk of CVD as when it takes up free radical in the blood stream and makes it stable which reduces or prevents further damage of the endothelial lining, which if damaged may lead to bursting & plaque formation in the blood stream which may lead to high bp blood pressure & heart attack. so dietary antioxidants prevents this and it also ^{reduces} ~~take~~ circulating ^{cholesterol} in ~~away~~ blood stream reducing high cholesterol levels.

Examiner's comments:

This response was given 2 marks.

This candidate achieved marking point 1 in the first three lines; the wording was not that accurate but it was felt that this candidate clearly knew that the free radicals were removed.

Marking point 2 was then awarded for the damage that the free radicals cause to cells, and they named the appropriate cell type to answer the question. The candidate clearly linked the cell damage to plaque formation.

Exemplar response B

Dietary antioxidants will bind with free radicals in the body, preventing them from causing damage to the circulatory system leading to CVDs. This is because free radicals are very reactive, and so antioxidants can bind to them. Preventing damage.

Examiner's comments:

This response was given 1 mark.

The wording in this response was vague but the candidate knew that antioxidants were linked to free radicals which were linked to cell damage.

Question 6(b)(iii)

(iii) Describe how a study could be designed to collect valid and reliable data on the effects of eating chocolate on the risk of CVD.

(3)

Mark scheme

Question number	Answer	Additional guidance	Mark
6(b)(iii)	<p>An answer that includes three of the following points:</p> <ul style="list-style-type: none"> two groups of people one eating chocolate and one {control / not eating chocolate} (1) who {have no (known) risk of / do not have} CVD (1) credit description of control variable (1) incidence of heart disease recorded (over a period of time, at least a year) (1) 	<p>ACCEPT 3 groups if one has no chocolate, one has milk chocolate and one has dark chocolate</p> <p>ACCEPT healthy</p> <p>e.g. same sex, similar {size / age / lifestyle}</p> <p>ACCEPT same mass of chocolate if comparing dark with milk chocolate</p> <p>IGNORE amount</p> <p>ACCEPT monitor risk factors / examples e.g. blood pressure, cholesterol levels, BMI</p>	(3)

Exemplar response A

A group of 200 people ^{without any} with same age, gender ~~exercise level~~ is used. ~~Each~~ 100 people are given equal mass of ~~total~~ dark chocolate to eat, the other 100 people are eating milk chocolate if equal mass ~~to~~ (e.g. 20g). Chocolates are from the same brand. (e.g. brand 1).

Over 10 years, all 200 people eat 200g of chocolates and their ~~the~~ health status are recorded to see if they developed CVD.

Examiner's comments:

This response was given 2 marks.

On this question, candidates were expected to think about the design of a specific study and therefore required them to read the question carefully first. This candidate assumed that the question wanted a study to compare the two types of chocolate, therefore could not be awarded all the marks.

On the very first line, the candidate indicated that the participants must not have CVD which is our second marking point. On the same line they have listed two factors that have to be controlled. Finally, the candidate stated what should be looked for.

Exemplar response B

- have a control group of people who don't eat chocolates
- have a groups of people of people which consume different ~~amount~~ amounts of chocolate.
- ~~compare~~ compare the relative risk of CVD and ~~some~~ amount of chocolate consumed for each group in a line graph.

Examiner's comments:

This response was given 1 mark.

This candidate had read the question carefully and was awarded mark point 1 as they stated that one group would have chocolate and the other one would not.

If we ask for 'valid' data, then we need an indication of the variables that would be kept constant. Even if this candidate had listed at least one variable that needed controlling, they went wrong by stating that the people would consume different amounts of chocolate (NB 'amount' is a word that is not specific enough in candidate responses).

At the end of the response the candidate has tried to say what would be looked for in the study but they have effectively repeated what was in the stem of the question, 'risk of CVD' so could not be awarded the fourth marking point.

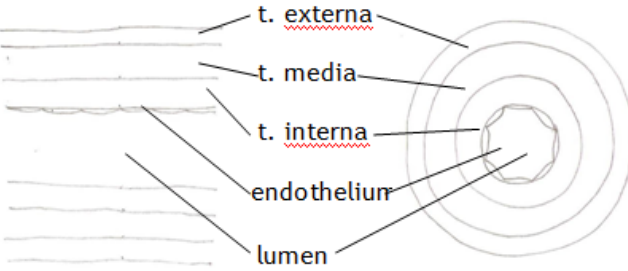
Question 7(c)(i)

(c) The arteries near the heart of a giraffe are highly elastic.

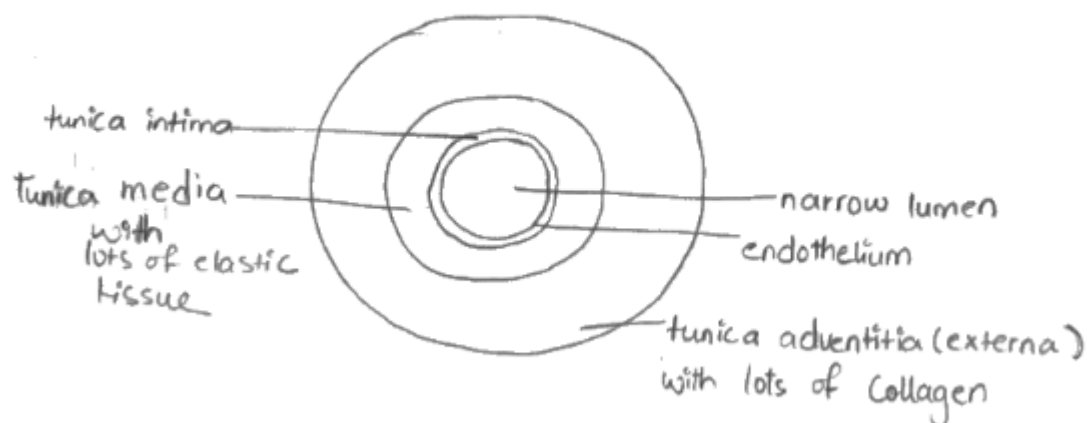
(i) Draw a labelled diagram of an artery, as seen in section.

(3)

Mark scheme

Question number	Answer	Additional guidance	Mark
7(c)(i)	<p>A drawing that shows :</p> <ul style="list-style-type: none"> {3 layers / 3 layers and endothelium} + lumen (1) <p>Any two from:</p> <ul style="list-style-type: none"> lumen (1) endothelium / epithelium (1) tunica {interna / intima} (1) tunica media (1) tunica {externa / adventitia} (1) 	 <p>ACCEPT inside line labelled if 2 layer diagram with no endothelium labelled</p> <p>IGNORE smooth muscle</p> <p>ACCEPT (smooth) muscle (cells) and elastic fibres</p> <p>ACCEPT collagen fibres</p> <p>N.B. If one incorrect label, max of 1 label mark If two incorrect labels then no label marks can be awarded</p>	(3)

Exemplar response A



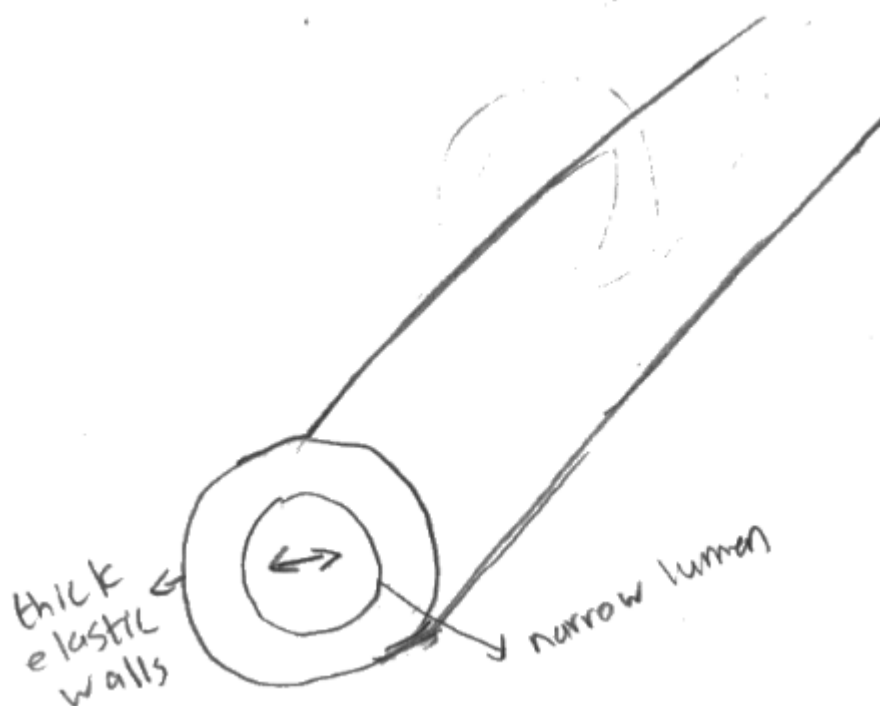
Examiner's comments:

This response was given 3 marks.

The mark scheme for this question shows that although knowing the names of each layer of the artery is preferable, a description of what is found in the layer is acceptable at this level. In this response, the candidate has covered all grounds, and both named and described the structure of each layer.

The diagram clearly shows three layers which is marking point 1. As there are three marks allocated for this diagram, we only expect two structures to be labeled. As there are no mistakes in the labeling, both label marks can be awarded.

Exemplar response B



Examiner's comments:

This response was given 0 marks.

This diagram does not meet requirements for this level. However, it could have been awarded one label mark for the lumen had the end of the line been in the lumen and not touching the inside edge. Diagrams require some thought to ensure that they illustrate the appropriate level of knowledge, and care.

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