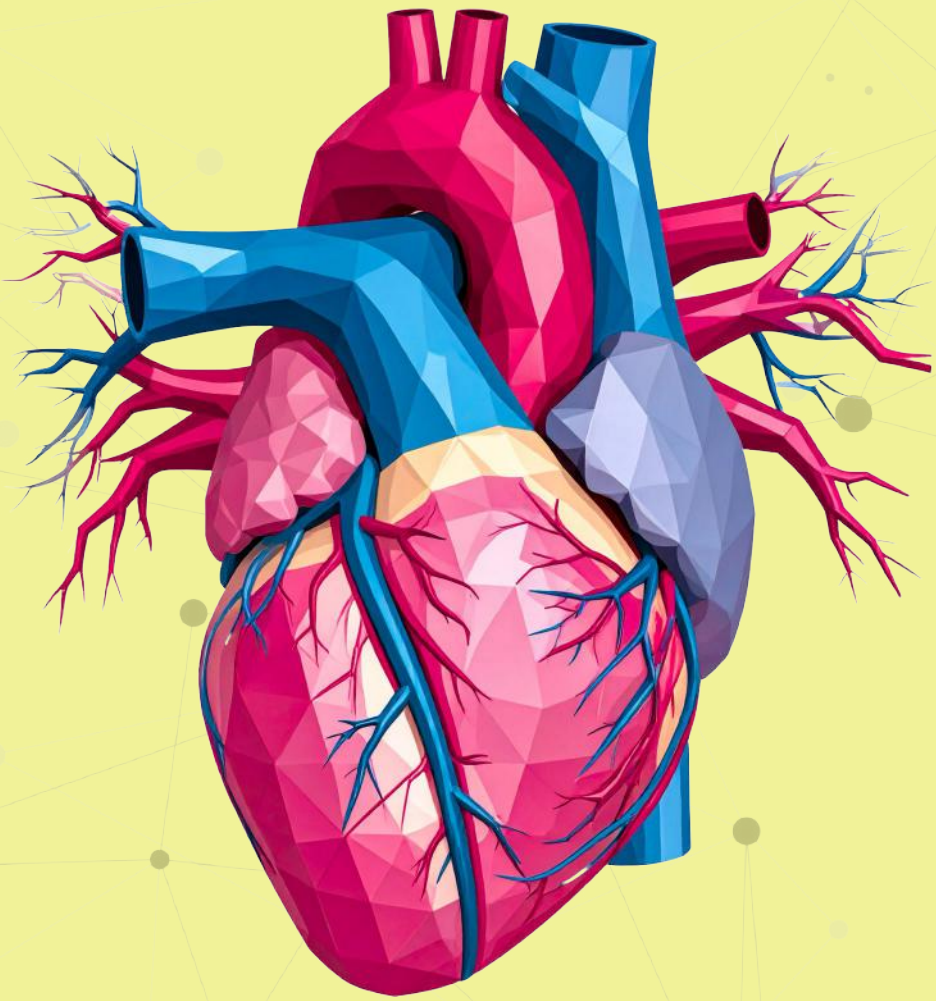
edexcel

AS Biology



LATEST SYLLABUS

Unit 1 Solved Past Papers

Edexcel IAL Biology

Unit 1 (WBI11/01) · Questions & Answers by Topic

Past-paper questions classified by topic · click a chapter to jump

Edexcel IAL Biology - Solved Past Paper

January 2026 · Unit 1 (WBI11/01) · Question 1

Movement of substances through the membrane

hard medium easy

1

Complete · [5 marks]

Complete the description of how substances move through the cell membrane (five blanks).

Model answer

✓ The phospholipid bilayer prevents large polar molecules from passing through the membrane (its non-polar core repels them). ✓ With a concentration gradient, these molecules pass through protein channels by facilitated diffusion. ✓ Substances moved against a concentration gradient go by active transport. ✓ This process requires ATP (energy) – using carrier proteins / protein pumps. ✓ Larger substances taken in by the membrane forming a vesicle around them enter by endocytosis.

Mark scheme 5 marks · in order

- ✓ phospholipid bilayer (1)
- ✓ facilitated diffusion (1)
- ✓ active transport (1)
- ✓ ATP / energy / carrier proteins / protein pumps (1)
- ✓ endocytosis (1)

Accept: phonetic spellings of facilitated

Do not accept: "facilitated transport" (not the spec term); "fatty acids" for the first blank (they are components, not the whole bilayer)

Examiner's insight

Use the precise spec terms - "facilitated diffusion" (not facilitated transport) - and name the phospholipid bilayer, not just fatty acids, in the first gap.

Revise from your notes

- Passive transport & facilitated diffusion: 7.1 · 7.10
- Active transport; endocytosis & exocytosis: 7.11 · 7.12 · 7.13

Edexcel IAL Biology - Solved Past Paper

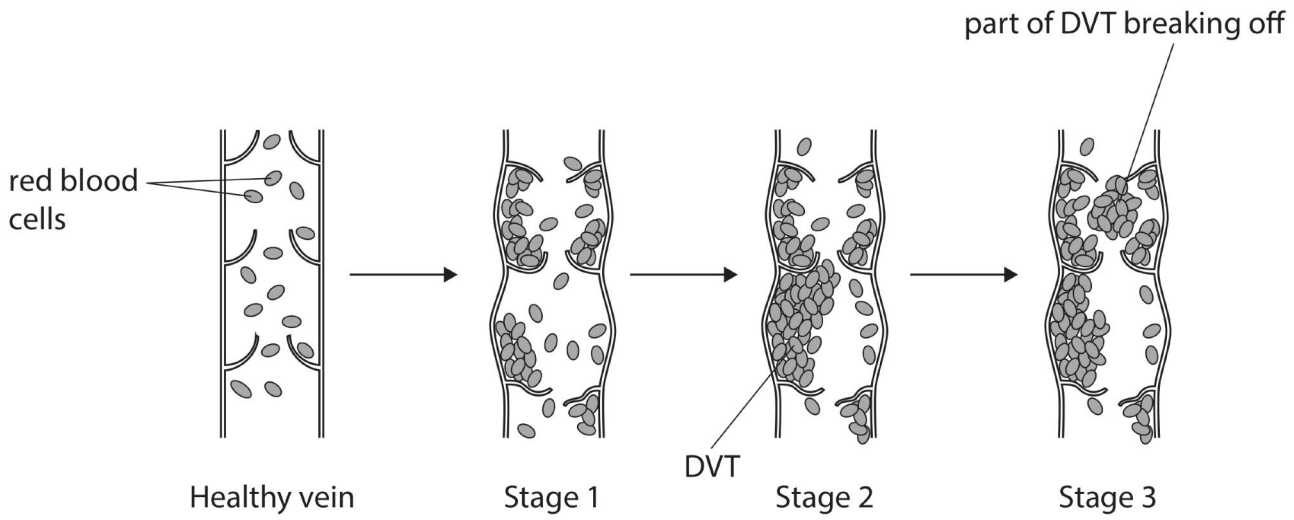
January 2026 · Unit 1 (WBI11/01) · Question 9 · Deep vein thrombosis & monitoring clotting

hard medium easy

*9 (a)

Explain · [6 marks]

Explain how the development of a DVT in the leg can result in death from a pulmonary embolism. Use the diagram and your knowledge of blood clotting and the circulatory system.



Model answer

✓ Sitting still slows blood flow in the leg (the skeletal muscles aren't pushing blood back to the heart), so red blood cells collect in the valve pockets and the clot builds up, stopping the valves closing properly. ✓ Damaged platelets release thromboplastin, which catalyses the conversion of prothrombin to thrombin, which converts soluble fibrinogen to insoluble fibrin - trapping blood cells and enlarging the clot. ✓ Part of the clot breaks off and travels in the veins / vena cava back to the heart, into the right atrium, through the tricuspid valve into the right ventricle, and is pumped out through the pulmonary artery. ✓ As the pulmonary arteries narrow towards the lungs the clot lodges and blocks one, so deoxygenated blood can't reach the lungs to be re-oxygenated. ✓ So too little oxygenated blood reaches the cells, they can't respire aerobically, not enough energy (ATP) is produced to sustain them, and this can cause death (e.g. a heart attack or stroke).

Mark scheme Indicative content (levels-marked)

Formation in the leg

✓ Clot forms in the leg: slow blood flow (muscles not pumping); RBCs lodge in valve pockets; clot builds, valves can't close

Clotting process

- ✓ Clotting cascade: platelets release thromboplastin -> prothrombin to thrombin -> fibrinogen to fibrin -> traps cells

Movement of the clot

- ✓ Movement: clot breaks off -> veins/vena cava -> right atrium -> right ventricle (tricuspid valve) -> pulmonary artery

Result & cause of death

- ✓ Blockage & death: narrowing arteries -> blocks pulmonary artery -> no blood to lungs -> cells lack O2 -> no aerobic respiration/ATP -> heart attack/stroke

Ignore: thinking the pulmonary artery carries blood back to the heart from the legs

How to reach full marks

Levels-marked 6-mark question. Full marks (Level 3) need a joined-up account across the stages: clot forming in the leg -> the blood-clotting cascade -> the clot breaking off and travelling through the right side of the heart to the pulmonary artery -> blockage stopping blood reaching the lungs -> cells starved of oxygen -> death.

9 (b)(i)

Explain · [2 marks]

Explain why people taking anticoagulants must monitor their blood clotting time.

Model answer

✓ If the dose is too high, the clotting time is too long / the blood doesn't clot fast enough, so too much blood could be lost (internal bleeding / haemorrhage). ✓ If the dose is too low, the clotting time is too short / the blood clots too fast, giving a risk of a heart attack, stroke, embolism or another DVT.

Mark scheme 2 marks

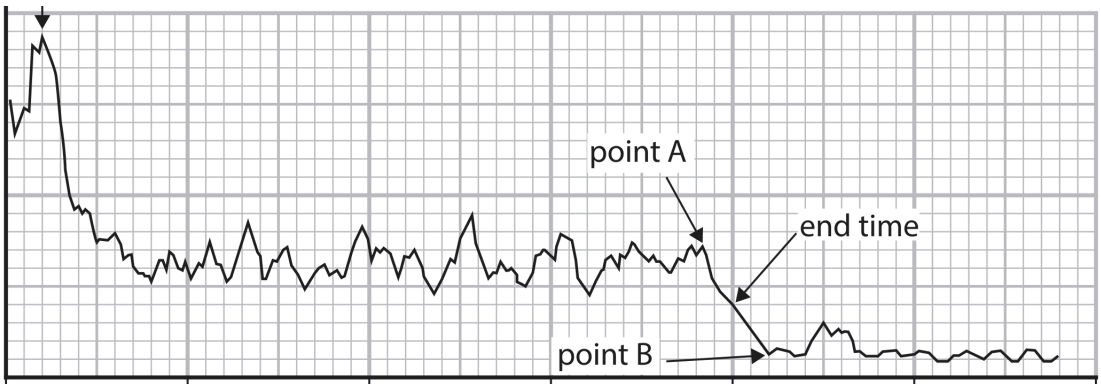
- ✓ if dose too high: clotting time too long / blood doesn't clot -> too much blood lost (1)
- ✓ if dose too low: clotting time too short / clots too fast -> risk of heart attack / stroke / embolism / DVT (1)

Accept: internal bleeding / excessive blood loss / haemorrhaging

9 (b)(ii)

Explain · [2 marks]

Explain why the copper particles will almost stop moving in the blood.



Model answer

✓ As the clot forms, the blood becomes thicker / jelly-like / sticky (a mesh of fibrin

fibres forms), ✓ which creates too much resistance for the copper particles to move (they become trapped).

Mark scheme 2 marks

- ✓ blood/clot becomes thicker / jelly-like / sticky (fibrin mesh) (1)
- ✓ too much resistance for the copper particles to move (1)

Accept: particles get stuck / trapped in the clot

9 (b)(iii)

Determine · [1 mark]

Determine the blood clotting time from the graph, using the end time shown.

Model answer

✓ The clotting activator is added after t = 0, so the clotting time = end time – time the activator was added = 19 seconds.

Mark scheme 1 mark

- ✓ 19 / 19.0 (seconds) (1)

Examiner's insight

Notice the clotting activator is not added at t = 0 - measure from when it was added to the end time.

9 (b)(iv)

Suggest · [2 marks]

Suggest why an end time halfway between points A and B was used to determine the clotting time.

Model answer

✓ The copper particles do not all stop moving at exactly the same time, so there is no single clear end point (the movement is dropping rapidly between A and B), ✓ so the halfway (median/middle) point between them is taken as a fair, consistent measure of the end time.

Mark scheme 2 marks · any two

- ✓ the particles do not all stop moving at the same time (1)
- ✓ there is a large/rapid change in movement (no clear end point) (1)
- ✓ a reason for choosing the halfway point (median / middle value) (1)

Accept: values drop below the normal range; mid-point between slowing and stopping; median/mean/middle time

Do not accept: mode

9 (b)(v)

Comment on · [2 marks]

Comment on the blood clotting times measured using the smartphone method and a conventional method (each point = one person; the line = no difference).

7 DNA is a very important molecule in living organisms as it carries the genetic code. Before a cell divides, the DNA molecule replicates so that each resulting daughter cell is genetically identical to the original parent cell.

(a) Explain the nature of the genetic code.

(2)

The code is made of 4 bases: A, T, C and G
The genetic code is described as being a triplet code
The code is non-overlapping (3 bases to each code)
Each triplet of bases codes for one amino acid
And universal (same code for all living organisms)
The code is degenerate (one amino acid can be coded by more than one triplet)

*(b) Describe the process of DNA replication.

(5)

DNA replication is semi-conservative
The original DNA molecule unwinds by breaking hydrogen bonds
This is catalysed by the enzyme helicase
Mononucleotides line up along both strands
According to the complementary pairing rules (A=T and C=G)
New hydrogen bonds are formed between bases
Phosphodiester bonds form between adjacent mononucleotides
This reaction is catalysed by DNA polymerase
Through condensation reaction

(Total for Question 7 = 7 marks)

Edexcel IAL Biology - Solved Past Paper

June 2023 · Unit 1 (WBI11/01) · Question 8 · CVD risk-assessment calculators

hard medium easy

8 (a)

Identify · [1 mark]

How many of the risk factors listed in the table are not influenced by lifestyle?

- ☒ **A** 1
- ☒ **B** 2
- ☒ **C** 3
- ☒ **D** 4

Information	Information required by the calculators	
	RAC-1	RAC-2
Age	✓	✓
Blood pressure	✓	✓
Smoking	✓	x
Total cholesterol	✓	✓
HDL cholesterol	x	✓

Model answer

✓ Just one - age. Blood pressure, smoking, total cholesterol and HDL cholesterol can all be influenced by lifestyle - answer A.

Mark scheme 1 mark

✓ A - 1 (age) (1)

8 (b)

Explain · [6 marks]

*Explain the effectiveness of these two calculators in assessing risk and whether other factors should be considered.

Model answer

✓ Each listed factor affects risk: increasing age stiffens arteries; high blood pressure damages the endothelium and triggers plaque; smoking raises blood pressure; more blood cholesterol means more plaque build-up; and HDL allows the HDL:LDL ratio to be judged. ✓

Comparing the two: RAC-1 omits HDL cholesterol while RAC-2 omits smoking - both are important, so RAC-1 is arguably more effective for a smoker, but each is incomplete. ✓ Other factors not listed should also be considered - BMI/mass, exercise, diet (salt, saturated fat, fibre), alcohol, stress, sex, and family history all affect CVD risk. ✓ Overall, because both calculators miss important factors and rely on accurate (often guessed) inputs, the results will be estimates and tend to underestimate the true risk.

Mark scheme Indicative content · levels-marked (factors listed / factors not listed / comparing RAC-1 & RAC-2)

- ✓ explain how each listed factor (age, BP, smoking, cholesterol, HDL) affects risk
- ✓ factors not listed: BMI, exercise, diet, alcohol, stress, sex, family history
- ✓ RAC-1 omits HDL; RAC-2 omits smoking - both important
- ✓ both miss factors and depend on accurate inputs -> underestimate

How to reach full marks

Full marks (6) need real EXPLANATION (how each factor increases risk), a comparison of the two calculators USING the data, and other factors explained - not just listed. Structure it: information the calculators use -> their effectiveness -> other factors. Listing risk factors without explaining 'why' caps at level 1.

Examiner's insight

The command is 'explain' - say HOW each factor increases risk rather than just naming it, and USE the table to compare RAC-1 and RAC-2 rather than describing it. Don't just list the missing factors - explain them.

8 (c)(i)

Explain · [2 marks]

Explain why the information entered may lead to an underestimate of the 10-year risk.

Model answer

✓ The calculator does not capture how many cigarettes a person smokes or for how long - and people may guess or understate these, ✓ and a person may not know (so guesses low) their blood pressure, cholesterol or HDL level, or have other risk factors not on the calculator.

Mark scheme 2 marks · any two

- ✓ does not include number of cigarettes / how long smoked (1)
- ✓ person may not know / guessed their blood pressure / cholesterol / HDL (1)
- ✓ other risk factors not on the calculator (1)
- ✓ their LDL / LDL:HDL ratio may be very high (1)

Accept: people guess or lie about cigarettes; 'estimate' only if used to mean 'guess'

8 (c)(ii)

Suggest · [2 marks]

Suggest why these two risk calculators may not be suitable for everybody to use.

Model answer

A scientist analysed a section of DNA from a sea urchin. The section was 249 base pairs long and 17.5% of the bases were cytosine.

Put a cross ☒ in the box to complete each of the following statements.

(i) The maximum number of amino acids this section of DNA could code for is

(1)

☐ **A** 82

☑ **B** 83

249 ÷ 3

☐ **C** 164

☐ **D** 166

(ii) The percentage of thymine bases present in this section of DNA is

(1)

☐ **A** 17.5%

☑ **B** 32.5%

☐ **C** 35.0%

☐ **D** 65.0%

(c) The sequence of some of the bases in a section of DNA from a sea urchin is shown below.

A	C	C	G	A	C	T	T

Describe the roles of RNA molecules in the synthesis of a protein using this section of DNA as a template.

(5)

A complementary mRNA strand formed from the DNA template

The mRNA moves out of the nucleus to the cytoplasm

mRNA associates with the ribosomes

tRNA with its anticodon pairs up with the codons on mRNA

Adjacent amino acids on the tRNA molecules bind together by peptide bonds

(Total for Question 16 = 9 marks)

Edexcel IAL Biology - Solved Past Paper

January 2024 · Unit 1 (WBI11/01) · Question 5 · Obesity, digestion & correlation

hard medium easy

5 (a)(i)

Name · [1 mark]

Name one other obesity indicator (besides BMI).

Model answer

✓ Waist-to-hip ratio (or waist circumference / skin-fold thickness / percentage body fat).

Mark scheme 1 mark

✓ waist-to-hip ratio / skin-fold thickness / waist circumference (1)

Accept: WHR / waist measurement / % body fat

Ignore: BMI; pinch test; mass / weight; cholesterol; LDL:HDL

5 (a)(ii)

Which · [1 mark]

Which is the BMI of a person of mass 65 kg and height 165 cm?

- ☒ **A** 23
- ☒ **B** 24
- ☒ **C** 39
- ☒ **D** 40

Model answer

✓ B = 24 - height 165 cm = 1.65 m, so BMI = 65 ÷ 1.65^2 = 65 ÷ 2.7225 = 23.9 ~ 24.

Mark scheme 1 mark

✓ B (24) (1)

Ignore: A (23, rounded down); C/D (dividing by height not $height^2$)

5 (a)(iii)

Which · [1 mark]

Which describes the body mass of a person who is obese?

- ☒ **A** BMI $>$ 30
- ☒ **B** BMI $\geqslant$ 30
- ☒ **C** BMI $<$ 30
- ☒ **D** BMI $\leqslant$ 30

Model answer

✓ B - a BMI of 30 or above (>= 30); overweight is 25 up to but below 30.

Mark scheme 1 mark

1 Albinism is a genetic trait resulting from the inheritance of recessive alleles.

(a) (i) Distinguish between the terms **allele** and **gene**.

(2)

An allele is a the different form a of a gene

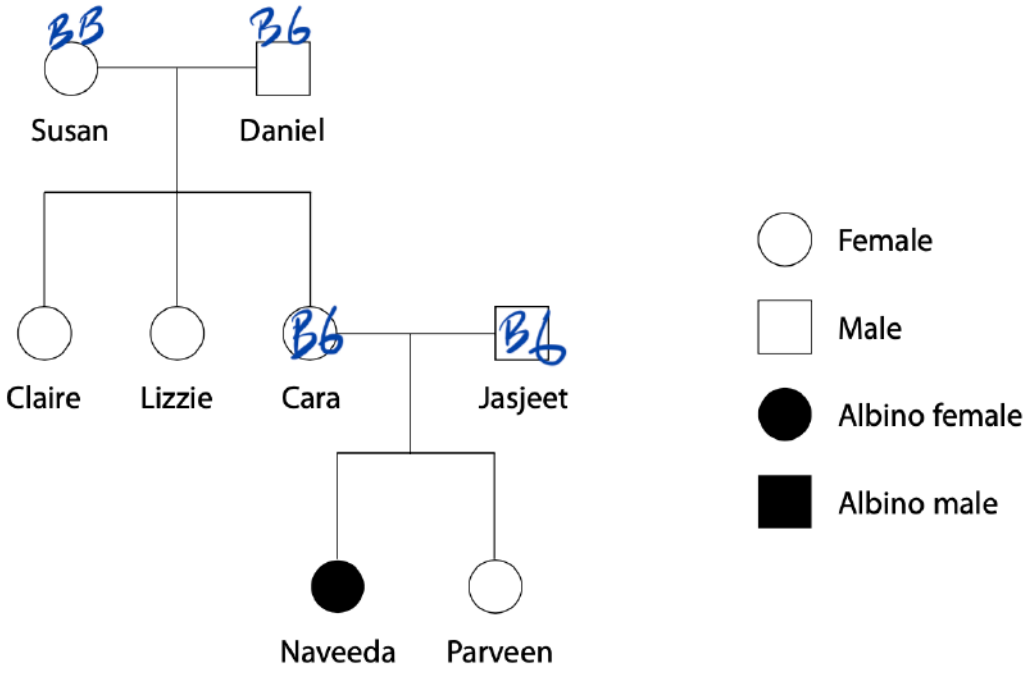
A gene is a section of DNA (occupies a locus on a chromosome) that codes for a protein

(ii) Explain the meaning of the term **recessive** allele.

(1)

An allele that is only expressed in the phenotype of an organism if the dominant allele is not present

(b) The pedigree diagram below shows the inheritance of albinism in one family.



(i) Naveeda is homozygous. Explain the meaning of the term **homozygous**.

(1)

Both alleles of a particular gene are the same

2 Many animals have a heart and circulatory system.

(a) Give **one** reason why many animals have a circulatory system.

(1)

To overcome the limitation of diffusion

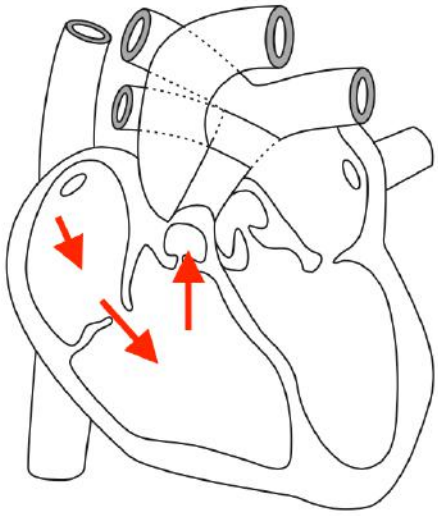
To transport materials around tissues

For heat transfer

(b) The diagram below shows a section through a mammalian heart.

On the diagram, draw arrows to show the flow of blood into and through the right side of the heart during one beat of the heart.

Right side



Left side

(3)

(c) Explain why a mammalian heart is divided into a right side and a left side.

(2)

To keep oxygenated and deoxygenated blood separate

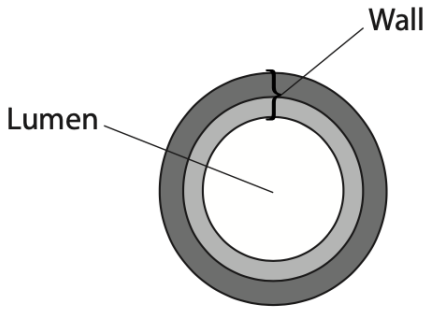
This helps to deliver as much oxygen as possible to the tissues

To pump blood at two different pressures

(Total for Question 2 = 6 marks)

THE CIRCULATORY SYSTEM

(d) The diagram below shows a cross-section of an artery.



(i) The diameter of the lumen of this artery is 1.9 mm.

Calculate the cross-sectional area of the lumen. Show your working.

The area of a circle is calculated using the formula πr^2, where r is the radius of the circle and $\pi = 3.14$.

(2)

1.9 / 2 = 0.95

0.95^2 x 3.14

Answer 2.83 mm^2

(ii) Explain how the structure of an artery is related to its functions.

(3)

1. Wall of arteries contains elastic fibres
2. To allow stretching to accommodate higher pressure
3. And to recoil and maintain pressure
4. Endothelium is folded which allows stretching at high pressures
5. Wall also contains smooth muscles which contract to exert pressure
6. Smooth endothelium to reduce friction and minimise resistance to blood
7. Narrow lumen to maintain high blood pressure
8. Collagen fibres in the wall to prevent rupture

(Total for Question 3 = 12 marks)

✓ A patient's genotype affects the warfarin dose they need, so one dose is not appropriate for everyone – because both gene M and gene V have several alleles. ✓ An allele of gene M that slows warfarin breakdown means the drug lasts longer, so a lower dose is needed; conversely a faster-breakdown allele needs more. ✓ An allele of gene V that gives less mRNA makes less enzyme V, so less vitamin K is activated and less clotting occurs – so a lower warfarin dose is appropriate. ✓ Screening the genotype could also reveal other predispositions (high cholesterol, high blood pressure), but factors other than genotype – body mass, liver function (drug half-life) – must still be taken into account, e.g. dosing in mg per kg. ✓ Warfarin works on the clotting cascade: thromboplastin converts prothrombin into thrombin, which converts fibrinogen into fibrin to trap platelets – so matching the dose to the genotype fine-tunes how much this cascade is suppressed. ✓ However, genetic screening raises ethical, religious and social issues – patients or families may not want to learn of other underlying genetic problems, and false positive/negative results are possible.

Mark scheme Indicative content (levels-marked) · advantages, other factors, screening issues and the clotting process:

advantages

- ✓ genotype affects the warfarin dose, so one dose is not appropriate for all (both genes have several alleles)

advantages

- ✓ slow-breakdown gene M allele -> less warfarin needed; low-mRNA gene V allele -> less enzyme V so less warfarin

other factors

- ✓ other factors matter too: cholesterol, body mass (mg per kg), liver function / half-life

blood clotting

- ✓ clotting: thromboplastin -> thrombin -> fibrin traps platelets

screening issues

- ✓ ethical / religious / social issues of genetic screening; false positive/negative results

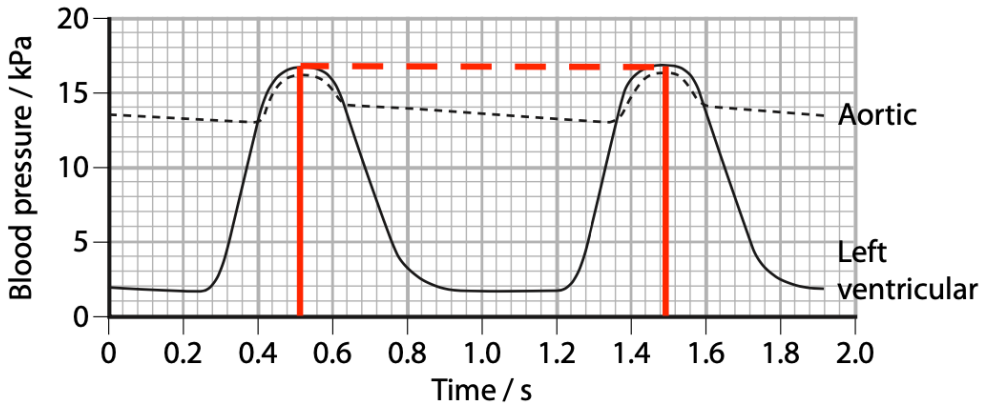
How to reach full marks

For full marks (Level 3) use the term ALLELE correctly (not 'gene'), and cover: how genotype affects the dose (a slow-breakdown gene M allele -> less warfarin needed; a low-mRNA gene V allele -> less enzyme V so less warfarin needed); that other factors (cholesterol, body mass, liver function) also matter; the ethical/social issues of genetic screening (and false results); AND - as instructed above the answer lines - the blood-clotting process (thromboplastin -> thrombin -> fibrin) and genetic screening.

Examiner's insight

Use 'allele' not 'gene' (this was the main thing capping answers at Level 1), and follow the instruction above the answer lines to include the blood-clotting process and genetic screening.

(c) The graph below shows changes in the blood pressure in the aorta and the left ventricle during two complete cardiac cycles.



(i) Use the information in the graph to calculate the heart rate. Show your working.

(3)

Time to complete the cardiac cycle = 0.96 0.98 sec

Every 1 cycle takes 0.96 sec

X cycle occurs 60 sec

60/ 0.96

Answer ..... 62.5 bpm .....

(ii) During the cardiac cycle, the pressure in the right ventricle rises to a maximum of about 3.3 kPa. Suggest reasons for the difference between this pressure and the maximum pressure in the left ventricle, as shown in the graph.

(3)

Pressure in the left ventricle is significantly higher

As the left ventricle pumps blood to the entire body

This results from the higher amount of muscles in the left ventricle

The right ventricle pumps blood only to the lungs

Blood under high pressure would damage the lung tissues

(Total for Question 6 = 13 marks)

(ii) Describe **two** differences between the structure of a capillary and the structure of a vein.

(2)

1 Capillary wall is only one cell thick and without elastic fibres or collagen

Capillary walls contains pores

2 Lumen is narrow in capillaries and there are no valves

(b) (i) Suggest how the location of the atheroma results in the position and size of this region of dead heart muscle.

(3)

The area of dead heart muscle will be downstream of the atheroma

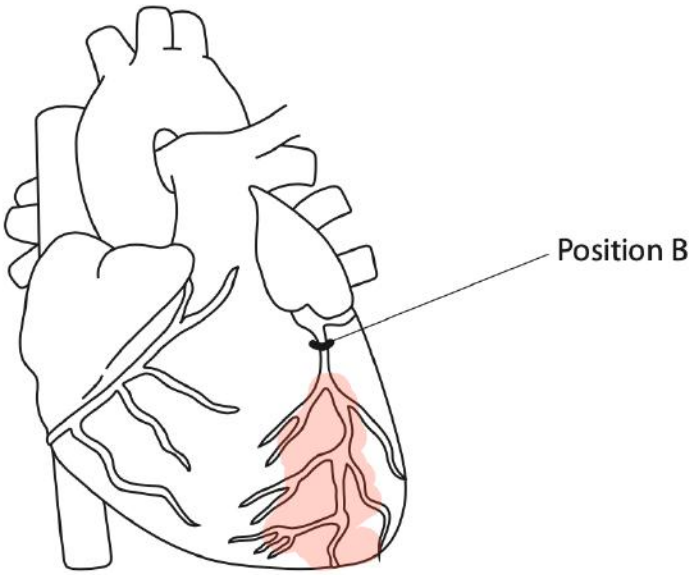
Coronary arteries supply cardiac tissues with oxygen and glucose

Lack of respiration will cause those tissues to die

However, in this case, the atheroma is located near the end so only a small section of the cardiac muscle is likely to die

(ii) On the diagram below, shade an area to show the position and size of dead heart muscle, if the atheroma occurred at position B.

(2)



(Total for Question 11 = 10 marks)

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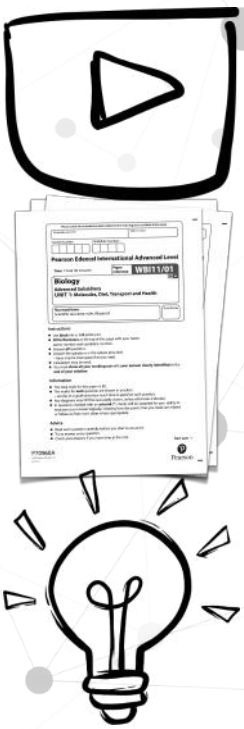

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