Q1.

(a) $C_6H_{12}O_6$

1

(b) carbohydrase

1

(c) beaker

allow water bath

1

(d) so that both solutions could reach 10 °C

1

(e) 10 / ten (minutes)

1

(f) test the mixture with iodine solution every 30 seconds

1

(g) 35 °C

1

(h) enzyme / amylase is denatured **or** enzyme / amylase stops working

allow active site / enzyme has changed shape

*do **not** accept enzyme / amylase has died*

1

(so) starch is not broken down
or
starch is still present

1

[9]

Q2.

(a) less blood flows through **or** less blood flows to the heart (muscle / cells / tissue)

1

less oxygen (reaches the heart muscle)

allow less respiration

allow less energy released

*do **not** accept less energy produced / made / created*

1

(b) D

1

(c) B

1

(d) is more likely to get a blockage (with high cholesterol) **or**
blockage could be biggest

ignore has the highest blood cholesterol concentration

1

(e) 4 **and** 5.6

1

$\left(\frac{5.6}{4}\right) = 1.4$

allow correct division using
either 5.3 or 5.8 (for person D)

1

(f) opens / widens (artery)

allow pushes blockage to the side

1

so (more) blood can flow through

allow (more) oxygen(ated blood) can flow through

1

(g) platelets

1

(h) **Level 2:** A judgement, strongly linked and logically supported by a sufficient range of correct reasons, is given.

3–4

Level 1: Relevant points are made. They are not logically linked. 1–2

1–2

No relevant content

0

Indicative content:

Advantages:

- **only** have to take the tablet once a day
- **only** a tablet so easy to take **or only** a tablet so not painful to take
- (drugs are effective so) less likely to get a blood clot
- drugs are cheap so less cost to NHS **or** drugs are cheap so

(more) people can afford them

- drugs have been used for a long time so must be safe / trusted

Disadvantages:

- patients have to make sure they always have a supply of drugs
- patients could forget to take the drugs (every day)
- patients could still get a blood clot in the first week
- restrictions on lifestyle because patients have to have a blood test every few weeks
- restrictions on lifestyle because patient can't eat certain foods
- patients may get a blood clot if they eat the wrong food
- risks associated with puncturing skin / infection
- patient may have a fear of needles
- higher risk of bleeding / bruising

For **Level 2** students must evaluate, including consideration of, the advantage and disadvantage of anti-clotting drugs.

[14]

Q3.

(a) amino acid(s)

ignore monomers

1

(b) salivary gland

in any order

ignore mouth

pancreas

small intestine

*allow duodenum / ileum do **not** accept large intestine ignore intestine unqualified*

*all three correct for **2** marks two correct for **1** mark*

2

(c) starch / substrate binds to <u>active site</u> (of enzyme)

ignore starch / substrate fits <u>active site</u> (of enzyme)

1

(because) shape of active site and substrate are complementary

allow shape of starch / substrate and active site allow them to fit together

1

a chemical reaction occurs to produce smaller molecules **or**
bonds between the (starch) molecules are broken to produce smaller molecules

allow maltose / sugars for smaller molecules

1

(d) any **two** from:

- time before mixing (starch and amylase) solutions

  ignore time unqualified
- volume / 5 cm_3 of starch (solution)
- volume / 1 cm_3 of amylase (solution)
- volume / 1 drop of mixture added to spotting tile
- volume / 2 drops of iodine (solution)

allow amount as an alternative to volume once only

*do **not** accept temperature*

2

(e) to allow the solutions to reach the same temperature as the water **or**
to allow both solutions to reach 5 °C

allow so the solutions can equilibrate with the temperature of the water

1

(f) as temperature increases, (amylase / enzyme) activity increases, to 35 °C after which activity decreases

ignore reference to time

1

(g) (iodine is not yellow-brown because) starch is still present **or** starch has not been broken down

allow enzyme for amylase and substrate for starch throughout

1

at 5 °C amylase / starch / molecules have low (kinetic) energy

1

(therefore) there are fewer (enzyme-substrate) collisions

allow fewer enzyme-substrate complexes are formed

1

at 80 °C the amylase has been denatured

*do **not** accept the amylase is killed / has died*

allow the shape of the amylase / active site changes

1

(so) the starch can no longer fit

allow the bonds holding the amylase in its (3D) shape have broken

1

(h) keep temperature constant

1

(but) change named factor **and** test a range of values of named factor

*named factor e.g. pH **or** enzyme concentration **or** substrate concentration **or** inhibitor concentration*

1

[17]

Q4.

(a) cells grow / divide abnormally / uncontrollably *ignore mutation*

1

(b) has spread to other parts / organs of the body **or** has spread to the liver / lung **or** has formed a secondary tumour

allow tumour has metastasised

1

(c) **Level 3:** Relevant points (reasons/causes) are identified, given in detail and logically linked to form a clear account.

5–6

Level 2: Relevant points (reasons/causes) are identified, and there are attempts at logical linking. The resulting account is not fully clear.

3–4

Level 1: Points are identified and stated simply, but their relevance is not clear and there is no attempt at logical linking.

1–2

No relevant content.

0

Indicative content:

Tiredness

- fewer red blood cells
- so less haemoglobin
- so less oxygen transported around the body

- so less (aerobic) respiration can take place
- so more anaerobic respiration takes place
- less energy released for metabolic processes **or** less energy released so organs cannot function as well
- lactic acid produced (during anaerobic respiration) causes muscle fatigue

Frequent infections
- fewer white blood cells / phagocytes / lymphocytes
- so fewer antibodies produced **or** less phagocytosis
- so fewer pathogens / bacteria / viruses killed

Bleeding
- fewer platelets
- so blood does not clot as easily

For **Level 3**, reference to all three symptoms must be made.

(d) anti-B antibodies in patient / receiver / recipient will bind to type B antigens on person's / donor's red blood cells

1

(so) red blood cells clump together and are wider than capillaries
or
(so) red blood cells clump together and block capillaries

allow (so) red blood cells clump together and capillaries burst

1

(so) cells have reduced supply of oxygen / glucose
or
(so) cells can't respire

ignore references to energy

*if no other mark awarded allow antibodies from patient and antigens from donor are matching / complementary shapes for **1** mark*

1

(e) no antigens (on type O red blood cells)

1

(so) antibodies cannot bind (to the antigens / red blood cells)

allow no clumping (of red blood cells)

1

(f) hepatitis C infection

1

(g) no / less bile reaches the small intestine

ignore less / no bile produced

1

(so) less / no emulsification of fat

allow correct description of

emulsification

*do **not** accept reference to chemical digestion*

1

(so) smaller surface area for lipase to break down fat

1

pH of small intestine is not neutralised / alkaline

allow pH of small intestine is acid / low

1

(so) lipase is not at its optimum pH to break down fat

pH (of small intestine) is not suitable for lipase to break down fat

1

[19]

Q5.

(a) increased (at first)

1

until 4 minutes **or** 50 breaths per minute

1

(then) stayed constant (from 4 minutes **or** at 50 breaths per minute)

1

(b) 175 (beats per minute)

1

(c) 140 (beats per minute)

1

(d) because his rate is lower than the maximum safe rate

allow ecf for incorrect values in question (b) and question (c)

1

(e) **Level 3:** Relevant points (reasons/causes) are identified, given in detail and logically linked to form a clear account.

5–6

Level 2: Relevant points (reasons/causes) are identified, and there are attempts at logical linking. The resulting account is not fully clear.

3–4

Level 1: Points are identified and stated simply, but their relevance is not clear and there is no attempt at logical linking.

1–2

No relevant content

0

Indicative content

- heart rate increased
  - to increase blood flowing to muscles / lungs
  - to provide more oxygen (to muscles)
  - to provide more glucose (to muscles)
  - to remove carbon dioxide more quickly (from the muscles / blood)
  - to remove lactic acid more quickly (from the muscles)

- breathing rate increased
  - supplies more oxygen / air to lungs
  - so more oxygen to blood
  - more carbon dioxide removed

- more oxygen to muscles
  - needed for (increased) respiration
  - to release / provide energy
  - for muscle contraction

- anaerobic respiration occurs
  - due to lack of oxygen
  - which causes a build-up of lactic acid
  - oxygen debt
  - muscle fatigue / pain

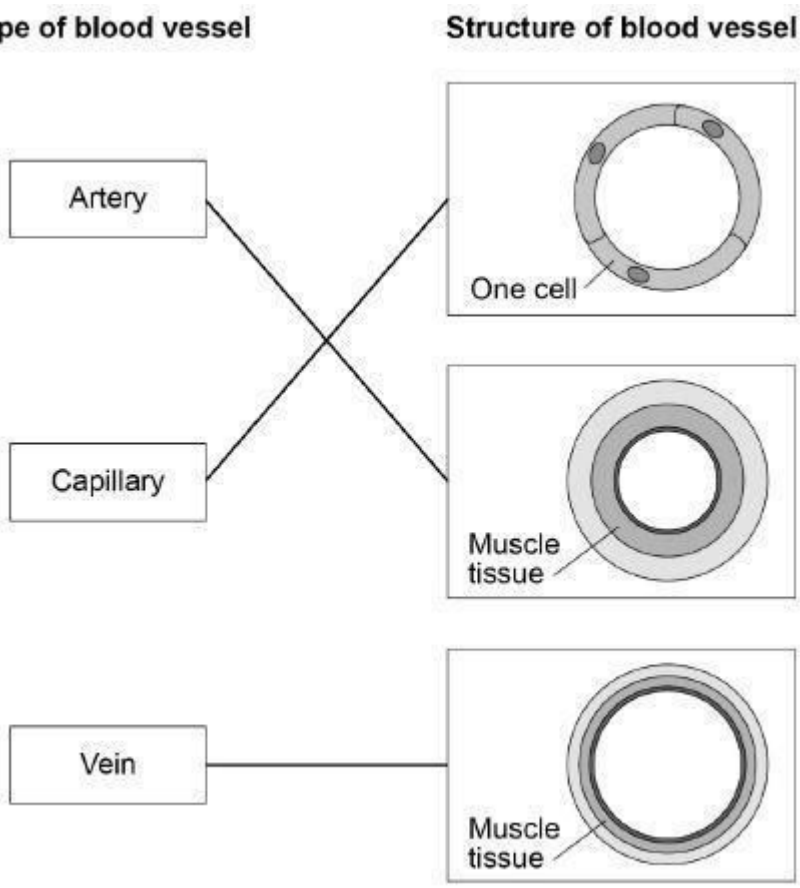
To reach **Level 3**, there must be reference to heart rate, breathing rate and respiration

[12]

Q6.

(a) all lines correct = **2** marks

1 **or** 2 lines correct = **1** mark



additional line from a box on the left negates the credit for that box

2

(b) any **one** from:

- thick(er) (muscle) walls / tissue (1)

  to push blood (all) around the body (1)

  allow to withstand high (blood) pressure

  *do **not** accept to pump blood (all) around the body*

or

- thick(er) elastic walls / tissue (1)

  to maintain / withstand high (blood) pressure
  or to retain / regain shape (1)

or

- narrow lumen (1)

  to maintain high (blood) pressure (1)

2

(c) (A) – white (blood) cell(s)

allow any named white (blood) cell(s)

1

(B) – platelet(s)

1

(d) (no nucleus) more space for haemoglobin / oxygen

allow to carry more oxygen

1

(has haemoglobin) to bind / carry oxygen

ignore carries carbon dioxide

1

(e) plasma

1

(f) platelets

1

(g) any **one** from:

- (continued) bleeding

  allow described

  allow blood does not clot (at cuts)

- (more) bruising

  *allow ecf from answer to question **(f)***

1

[11]

Q7.

(a) movement / spreading out of molecules / particles

allow movement / spreading out of (named)

substances / chemicals / gases / liquids

ignore reference to membranes / cells

1

from (an area of) high(er) concentration to (an area of) low(er) concentration

allow down / with the concentration gradient

ignore along / across the concentration gradient

*do **not** accept movement from / to a concentration gradient*

1

(b) increased carbon dioxide concentration in the air

1

increased number of stomata that are open

1

(c) **Level 3:** Relevant points (reasons / causes) are identified, given in detail and logically linked to form a clear account.

5–6

Level 2: Relevant points (reasons / causes) are identified, and there are attempts at logical linking. The resulting account is not fully clear.

3–4

Level 1: Points are identified and stated simply, but their relevance is not clear and there is no attempt at logical linking.

1–2

No relevant content

0

Indicative content

- (many) alveoli
  - provide a large(r) surface area (**:** volume)
- capillaries are thin
  - **or** alveoli / capillary walls are thin **or** one cell thick
  - **or** capillaries are close to the alveoli
  - which provides short diffusion path (for oxygen / carbon dioxide)
- breathing (mechanism) moves air in and out **or** lungs are ventilated
  - to bring in (fresh) oxygen
  - to remove carbon dioxide
  - to maintain a concentration / diffusion gradient
- large capillary network (around alveoli) **or** good blood supply
  - to remove oxygen(ated blood) quickly
  - to bring carbon dioxide to the lungs quickly
  - to maintain a concentration / diffusion gradient

(d) Osmosis

allow diffusion

1

(e) active transport

1

(because) energy is needed

1

(to move nitrate ions) from a low(er) concentration (in the soil) to a high(er) concentration (in the root / cell)

allow (to move nitrate ions) against / up the concentration gradient

allow (because) there is a lower concentration (of nitrate ions) in the soil ***or*** *(because) there is a higher concentration (of nitrate ions) in the root*

/ cell

ignore reference to amount / number of nitrate ions

ignore along / across the concentration gradient

*do **not** accept if reference to molecules / atoms moving*

1

[14]

Q8.

(a) fatty acids

1

glycerol

1

(b) enzyme binds to the substrate because they are complementary (shapes)

allow enzyme joins to the substrate because they fit together exactly

allow enzyme joins to the substrate because the substrate fits the active site

*ignore reference to specificity do **not** accept same shape*

1

(so) substrate is broken down (into products)

allow (so) substrate splits (into products)

ignore products are formed, unqualified

1

(so) products are released **or** enzyme is not changed

allow enzyme is not used up

*allow reference to activation energy for either marking point 2 **or** marking point 3*

1

(c) each <u>active site</u> has a specific shape (so only fits one type of lipid molecule)

allow each <u>active site</u> is a different shape

*do **not** accept reference to the substrate having an active site*

1

(d) add Benedict's (solution / reagent to the liquid)

1

boil / heat

allow any temperature of 65 °C or

above

1

(if glucose is present the blue) colour changes to yellow / green / orange / brown / (brick) red

1

(e) add iodine solution / reagent (to the liquid)

allow add a drop of iodine

ignore iodine unqualified

1

(if starch is present) it changes colour to blue / black (from yellow / orange / brown)

1

(f) glucose from photosynthesis

*do **not** accept starch made in photosynthesis*

1

(excess) glucose converted to starch

allow (excess) glucose is stored as starch

1

(g) starch (stores) have been converted to glucose

ignore reference to residual glucose from previous photosynthesis

1

(so the glucose can be) used for respiration / (named) metabolic reactions
or (so the glucose can be) used to release energy

*do **not** accept idea of energy being produced / created / made*

1

(because) there is no light to make (new / more) glucose by photosynthesis

1

(h) any **one** from:

- test roots / stems of plants (in the light and dark)

  *do **not** accept reference to changing the independent variable*

  allow test other parts of the plants
- test other species of plant

  allow test other types of plant
- measure the concentrations of glucose **and** starch

  ignore mass / amount
- vary the time in the dark / light
- test variegated leaves

  allow any other valid extension ignore

repeats

1

[17]

Q9.

(a) any **two** from:

ignore genetic factors

- BMI / morphology / obesity level
  *allow mass / weight **and** height*
- smoking habits
- diet
  allow previous drinking habits
- medication
  allow medical conditions
  allow drug use
- family history of liver disease
- fitness levels
  allow level of exercise
- ethnicity
  allow race
- area of UK they live in

2

(b) 2.55 – 1.60 (= 0.95)

allow 1.60 − 2.55 (= −0.95)

allow value for with meals in range 1.60 to 1.65 (for 1.60)

1

$\left(\frac{0.95}{2.55} \times 100 = \right)$

37 (.2549019608…) (%)

allow answer correctly calculated from values in ranges 1.60 to 1.65 and 2.50 to 2.60

allow – 37(.2549019608...)(%)

1

(c) 12 × 2 × 7 = 168 (g/week)

1

1.8

allow in range 1.8-1.9

*allow correct reading from a calculation that omits the 2 **or** the 7*

*do **not** accept if a unit is given*

1

(d) any **two** from:

- consuming alcohol increases the RR (with / without meals) **and** supporting data

  allow risk for RR throughout

  allow data in terms of number of glasses of wine

  allow increasing alcohol consumption increases the RR at an increasing rate

- consuming less than 50 g/week of alcohol with meals does not increase the RR

  allow any value between 35 and 60 g / week

- even (small amounts of alcohol at) 25 g / week increases the RR if not with meals

2

(e) any **two** from:

- large number in survey
- long term / 15 year survey

  allow 800 000 in survey

  if neither mark awarded allow large study
- well controlled

  allow many controls

2

(f) any **one** from:

- people underestimate / overestimate alcohol consumption

  allow people lie about alcohol consumption
  ***or** people lie about other named control variables*
- people may change (lifestyle / drinking) habits over time
- some people may drink all their weekly alcohol at once

  ignore survey only tested women

1

(g) **Level 2:** Scientifically relevant facts, events or processes are identified and given in detail to form an accurate account.

3–4

Level 1: Facts, events or processes are identified and simply stated but their relevance is not clear.

1–2

No relevant content

0

Indicative content

Responses may refer to either total or partial liver failure

- no bile made (in the liver)

- fats / lipids are not emulsified
- surface area of fats / lipids not increased
- pH of small intestine will not be alkaline / neutralised
- enzymes (in small intestine) will not work effectively **or** (named) food not digested / absorbed
- so may lose weight

- lactic acid not broken down / oxidised
  - accumulation of lactic acid in blood / body
  - lactic acid is toxic **or** body will be poisoned
  - oxygen debt higher / prolonged
  - so muscle pain / fatigue

- proteins / amino acids will not be broken down (in liver)
  - (amino acids) not deaminated
  - amino acids not made into urea **or** will not form ammonia
  - (however) any ammonia formed is toxic
  - so accumulation of amino acids in blood / body

- liver does not break down / remove other toxins (like alcohol)
  - toxins accumulate in blood / body
  - body will be poisoned
  - so pain **or** jaundice **or** swollen liver **or** portal hypertension occurs

- glycogen stores will not be formed
  - cannot control blood glucose
  - so hyperglycaemia / hypoglycaemia / diabetes / coma may occur

[15]