AQA GCSE BIOLOGY (HIGHER) · 8461

BIOLOGY



MARK SCHEME

4.2.2 ANIMAL TISSUES, ORGANS AND ORGAN SYSTEMS (PACK 1)

SCORE	PERCENTAGE
/351	%

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Q1.

(a) (A) stomach

1

(B) small intestine

allow ileum
ignore intestine unqualified

1

(C) liver

1

(b) soluble

1

catalyse

1

denatured

1

this order only

(c) amino acids

1

(d) any **one** from:
- for growth

  allow for enzymes / hormones / antibodies
- for repair / replacement (of cells / tissues / organs)

  allow to strengthen bones

  ignore for energy

1

(e) stomach

1

(f) **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
- grinding up the food
- add Biuret reagent (allow $CuSO_4$ and NaOH) to food (sample)
- protein turns solution (from blue) to purple / lilac
- wear goggles to protect eyes
- clean up spills immediately
- Biuret / NaOH is an irritant / corrosive / poisonous

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for **level 2** a reference to Biuret, a positive result and reason for a safety precaution is required

(g) fat

1

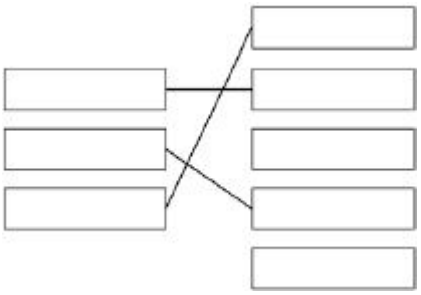
(h) type 2 diabetes

1

[15]

Q2.

(a)



additional line from a blood component negates the mark for that component

1
1
1

(b) C

1

(c) (vessel) B

thick walls **or** thick muscle / elastic tissue

*do **not** accept ref to 'cell walls'*

1

or
lumen is small / narrow

allow description of 'lumen'

1

(d) 95

1

(e) (because coronary) arteries / they are narrower

allow (because the coronary) arteries are blocked / clogged (with fat)

1

(f) 250 × 60 (= 15 000)

or
15 000

allow 0.25 × 60

1

15

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allow $\frac{\text{answer to marking point 1}}{1000}$

an incorrect conversion to dm³ in calculation does not negate marking point 1

1

*an answer of 15 scores **2** marks*

(g) any **two** from:

- no need to stay as long in hospital (after procedure) **or** can go home sooner / same day

  allow only need to stay 2–3 hours in hospital (after procedure)
  allow less scarring
  allow less chance of infection
  allow only a small cut needed

- not as / less invasive **or** no need for a major operation **or** no need for general anaesthetic
- shorter recovery time **or** can get back to normal lifestyle quicker **or** less time needed off work

  allow only 7 days recovery

- lower risk of a heart attack (during procedure)

  ignore reference to cost
  ignore idea that it takes less time overall

2

(h) lower chance of failure (within one year)

allow only a 5% chance of failure

1

only need one operation to treat multiple blockages **or** can treat multiple blockages at one time

ignore ref to anaesthetic or CABG being a long-term treatment

1

[14]

Q3.

(a) diffusion

1

(b) A

1

(c) B

1

(d) (earthworm) can absorb more oxygen (in a given time)
or
increases / more gas exchange

allow get / obtain / take in more oxygen
ignore easier absorption of oxygen
ignore references to food

1

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(e) lipase

1

(f) more oxygen (in soil with earthworms)

allow earthworms bring oxygen to soil

1

(for) more (aerobic) respiration

*do **not** accept anaerobic respiration*

1

(of) bacteria / fungi / microorganisms / microbes / decomposers

1

reference to more is only needed once for the first two marking points

(g) fertilisation

ignore sexual reproduction

1

(h) asexual (reproduction)

allow cloning

1

[10]

Q4.

(a) (for calcium)

$$\frac{500}{605} \times 1000 = 826.446281\,(cm^3)$$

allow any correct rounding to minimum 3 significant figures
allow alternative route with correct rounding

1

(for vitamin B-12)

$$\frac{500}{4.5} \times 2.4 = 266.67\ (cm^3)$$

allow alternative route with correct rounding

1

560 / 559.8 / 559.78 / 559 (cm^3)

allow only correct answer based on values given for vitamin B-12 and calcium

1

*an answer of 560 / 559.8 / 559.78 / 559 (cm^3) scores **3** marks*

an incorrect answer for one step does not prevent allocation of marks for subsequent steps

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

4–6

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

1–3

No relevant content

0

Indicative content

- Biuret reagent (allow $CuSO_4$ and NaOH) tests for protein
- add Biuret reagent to milk
- solution will turn (from blue) to lilac if positive

- iodine solution tests for starch (ignore iodine unqualified)
- add iodine solution to milk
- solution will turn (from orange / brown) to blue / black if positive

- Benedict's reagent tests for sugars
- add Benedict's reagent to milk and boil / heat (allow any temperature above 60 °C)
- solution will turn (from blue) to (brick) red / brown / orange / yellow / green if positive

for **level 2**, reference to all three food tests is required

(c) lipase breaks down fat into fatty acids (and glycerol)

*do **not** accept if 'glycerol' is contradicted*

1

(and) fatty acids lower the pH

1

(and when) fatty acids cause the pH to be below 10 (the indicator becomes colourless)

1

(d) observation of colour change is subjective / based on opinion

ignore human error unqualified
ignore experimental error or examples of this

1

(e) bile emulsifies fats

allow a correct description of emulsification (i.e. breaks fat from large droplets into smaller droplets)

*do **not** accept a description of chemical breakdown*

1

creates a larger surface area (of fat)

1

(so) lipase can break down fat (to produce fatty acids) more quickly / effectively

allow fatty acids produced by action of lipase more quickly

1

[16]

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Q5.

(a) pancreas

1

(b) liver

1

glycogen

1

in this order

(c) would be digested / broken down (by enzymes / protease / pepsin / acid or to amino acids)

allow denatured (by acid)

1

(d) use of 14.2 **and** 6.8

1

7.4

*allow an answer of 7.2 or 7.3 (using 14.1 and / or 6.9) for **1** mark*

1

*an answer of 7.4 scores **2** marks*

(e) any **one** from:

- (person A's) results are higher

  ignore A peaks at a higher level than B

- (A) increases for a longer time **or** peaks later

- (A) takes longer to decrease **or** takes longer to return to normal

  allow other correct comparisons

  allow a description using pairs of figures from graph at a given time

1

allow converse comparisons with person B as the subject

(f) a negative correlation

1

(g) less carbohydrate / sugar / fat in diet

allow go on a diet
allow eat less
allow balanced / healthy diet

or

lose weight **or** maintain a healthy weight

ignore diet unqualified

1

(more) exercise

allow examples of exercise

1

[10]

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Q6.

(a) kills microorganisms / bacteria / fungi / viruses / microbes

allow to remove microorganisms / bacteria / fungi / viruses / microbes

ignore germs

allow so mycoprotein is not contaminated

1

(which) compete for food / oxygen
or
which make toxins

allow so mycoprotein is safe to eat

or
which are pathogens
or
which might kill the fungus / *Fusarium*

1

(b) 30 °C

1

(c) for (aerobic) respiration

*do **not** accept anaerobic*

1

(which) releases energy (for growth)

*do **not** accept produces energy*

allow glucose is used to make other organic substances e.g. protein

1

(d) any **two** from:

so *Fusarium* can

- grow faster / better
- get sufficient food / glucose / minerals

  allow more / enough

- get sufficient oxygen

  allow more / enough

- get rid of sufficient carbon dioxide

  allow more / enough
  allow waste

- be kept at a (suitable) temperature

  allow to avoid 'clumping'

2

(e) 200 grams

1

[8]

Q7.

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(a) *x*-axis: scale + labelled, including units

scale ≥ ½ width of graph paper label: biomass in g/m²

1

bar widths correct

± ½-square each side
allow 1 mark if 3 correct

2

all 4 bars correctly labelled

large fish + small fish + invertebrate (animals) + algae
or
(trophic level) 4 + 3 + 2 + 1
or
tertiary consumer + secondary consumer + primary consumer + producer
ignore bar heights

1

(b) $\frac{840-10}{840} \times 100$

allow equivalent calculation

1

98.809523... / 98.810 / 98.81 / 98.8

1

99

allow answer given to two significant figures from an incorrect calculation in step 2

1

*an answer of 99 scores **3** marks*

(c) inedible parts / example

*allow eaten by other animals **or** not all organisms eaten*

or

egested / faeces

allow not digested
allow excretion / urine
ignore waste

or

respiration / as CO_2

ignore energy losses
ignore movement

1

(d) bacteria decay organic matter / sewage / algae / dead plants

1

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(by) digestion

allow example such as starch broken down to sugar
or
protein broken down to amino acids

1

(and) bacteria respire aerobically
or
respire using oxygen

1

(which) lowers oxygen concentration (in water)
or
fish have less oxygen

allow reduced respiration of fish

1

(so) reduced energy supply causes death of fish

allow toxins in the sewage kill fish

ignore pathogens or (pathogenic) bacteria cause disease in fish and kills them

1

[13]

Q8.

(a) (**A**) bronchus

allow bronchi

allow bronchiole

1

(**B**) trachea

allow windpipe

1

(**C**) alveolus

allow alveoli

ignore air sac

1

(b) circulatory system

1

(c) **Q**

1

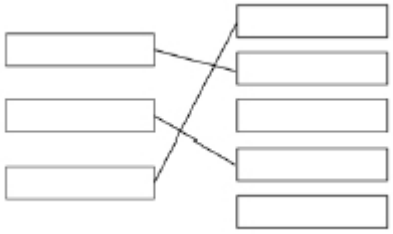
(d) guard cell

1

(e) a group of cells with a similar structure / function

1

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(f) 

1 mark for each correct line

extra line from a tissue negates the mark for that tissue

3

[10]

Q9.

(a) movement of particles from (an area of) high concentration to (an area of) low concentration

allow movement of particles down a concentration gradient

*do **not** accept along / across a concentration gradient*

1

(b) oxygen

allow O_2

carbon dioxide

allow CO_2

in this order only

*both needed for **1** mark*

1

(c) less diffusion

allow less gas will enter / leave the blood

allow ecf from (b)

1

(because of the) reduced / smaller surface area

1

(d) (**B**) very low birth mass

1

(**C**) extremely low birth mass

1

(e) any **one** from:

- men would be included in the study (can't be pregnant)
- children / older (post-menopausal) women would be included in the study

ignore reference to cost

1

(f) any **three** from:

- higher percentage of pregnant women have never smoked (compared with non-pregnant women)
- higher percentage of pregnant women are ex-smokers (compared with non-pregnant women)

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- lower percentage of pregnant women currently smoke (compared with non-pregnant women)
- in both pregnant and non-pregnant women, the highest percentage of women have never smoked

allow converse throughout

allow appropriate use of correct figures throughout

3

(g) scatter graph

1

(h) **B**

1

(i) there is no correlation (between the variables)

allow (all) the points are widely scattered

allow idea that the person with the longest birth time does not have the highest risk

1

[13]

Q10.

(a) an undifferentiated / unspecialised cell

1

that can differentiate / become / change into (many) other cell types

1

(b) (malignant tumours) invade / spread to other tissues via the blood (benign don't)
or
(malignant tumours) form secondary tumours in other organs

ignore cancer unqualified

allow converse

allow metastasises

1

(c) mitosis

correct spelling only

1

(d) glucose

answers in any order

ignore sugar

1

protein / amino acids

1

(e) no need to wait for a donor
or
can be done immediately

1

(so) no risk of rejection
or
no need for immunosuppressant drugs

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*if no other marks awarded, allow for **1** mark idea of ethics surrounding the use of tissue from another / dead person*

1

(f) stent opens up the trachea

1

allowing air to flow through
or
allowing patient to breathe

1

(g) **Level 3 (5-6 marks):**
A judgement, strongly linked and logically supported by a sufficient range of correct reasons, is given.

Level 2 (3-4 marks):
Some logically linked reasons are given. There may also be a simple judgement.

Level 1 (1-2 marks):
Relevant points are made. They are not logically linked.

Level 0
No relevant content

Indicative content

embryos advantages
- can create many embryos in a lab
- painless technique
- can treat many diseases / stem cells are pluripotent / can become any type of cell (whereas bone marrow can treat a limited number)

embryos disadvantages
- *harm / death to embryo*
- *embryo rights / embryo cannot consent*
- *unreliable technique / may not work*

bone marrow advantages
- no ethical issues / patient can give permission
- can treat **some** diseases
- procedure is (relatively) safe / doesn't kill donor
- tried and tested / reliable technique
- patients recover quickly from procedure

bone marrow disadvantages
- *risk of infection from procedure*
- *can only treat a few diseases*
- *procedure can be painful*

both procedures advantage

can treat the disease / problem

both procedures disadvantages
- *risk of transfer of viral infection*
- *some stem cells can grow out of control / become cancerous*

[16]

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Q11.

(a) vena cava

1

(b) 0.5 mm = 0.05 cm

1

time = $\frac{10.00 - 0.05}{0.4}$

allow alternative correct substitution

1

24.875

1

25 (s)

*an answer of 25 (s) scores **4** marks*

*allow 24 for **3** marks (no conversion of mm to cm)*

*allow 23.8 / 23.75 for **2** marks (no conversion of mm to cm and incorrect sf)*

1

(c) (blood) travels through (the) pulmonary vein

1

(blood) enters left atrium

1

(blood) enters (the) left ventricle

1

(blood) leaves the heart via / through (the) aorta

allow blood travels through arterioles

allow blood (travels round the body and) reaches the cells / tissues via / in capillaries

1

ignore ref to valves / systole / diastole throughout

(d) **Level 3 (5-6 marks):**
Relevant points (reasons / causes) are identified, given in detail and logically linked to form a clear account.

Level 2 (3-4 marks):
Relevant points (reasons/causes) are identified, and there are attempts at logical linking. The resulting account is not fully clear.

Level 1 (1-2 marks):
Points are identified and stated simply, but their relevance is not clear and there is no attempt at logical linking.

No relevant content (0 marks)

Indicative content

S = structural F = functional

- (S) both have a large surface area
- (S) villi have many microvilli
- (S) alveolar walls are not flat / are folded

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- (F) to maximise diffusion (of gases) / absorption of (food) molecules

- (S) both have many capillaries / good blood supply / capillaries near the surface
- (F) to maintain concentration / diffusion gradient

- (S) both have thin walls / walls that are one cell thick / one cell thick surface
- (F) to provide a short diffusion distance (for molecules to travel)

- (S) villi have many mitochondria
- (F) to provide energy for active transport (of food molecules)

- (S) cells of the villi have microvilli / more projections
- (F) to further increase the surface area / increase the number of proteins in the membrane / to allow more active transport to take place

[15]

Q12.

(a) salivary glands and pancreas

1

(b) starch / substrate fits into active site (of enzyme)

1

shape of active site is unique / complementary to substrate

allow converse

or

substrate is specific to active site / enzyme

allow enzyme has a high specificity for substrate

1

bonds (within starch / substrate

or

between sugar molecules) are broken

1

(c) converted to new carbohydrates / glycogen / named organic compound (e.g. protein / fat)

1

(d) to allow (the starch and amylase / solutions) to equilibrate (to the temperature of the water bath)

or

to get the starch and amylase / solutions to the same temperature / 20 °C

or

to get the starch and amylase / solutions to the (same) temperature of the water bath

1

(e) **40 °C**

all wells contain a symbol

and

must contain at least two crossed (×) wells at the end

allow final three wells crossed

(×)

1

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60 °C
all wells contain a symbol
and

must have fewer crossed (✖) wells at the end than at 40 °C

allow all wells ticked (✔)

*for either mp do **not** allow a crossed well followed by a ticked well*

1

(f) more accurate

allow (so) closer to (the) true value

1

(because) it is a quantitative measure

allow (it's) an actual value as opposed to an opinion

or
less / not subjective

allow colour is only qualitative

1

(g) 0.07 (%)

1

(h) starch is broken down less quickly (at 20 °C)

allow converse

1

because, at 20 °C, substrates / enzymes / molecules have less (kinetic) energy

1

(i) 1.08 (arbitrary units)

1

at 80 °C, enzyme / amylase has denatured

allow description of denaturation

*do **not** allow enzyme is killed*

1

so starch is not broken down (at all)

allow the concentration of starch is still 0.5%

1

[16]

Q13.

(a) to kill microorganisms on / in the flask
or
so only microorganisms in the milk caused the results

allow bacteria / fungi / microbes

*do **not** accept viruses*

ignore germs

1

(b) heating

1

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to over 100 °C

allow place in oven / pressure cooker

*do **not** accept disinfectant*

allow other suitable method – e.g. use of UV

1

(c) to prevent microorganisms entering from the air

allow bacteria / fungi / microbes for microorganisms

*do **not** accept viruses*

ignore germs

1

(d)

0	olive-green	**7**
1	olive-green	**7**
2	olive-green	**7**
3	orange-green	**6**

*all correct for **1** mark*

1

(e) (pH meter) – more accurate / more precise

allow more exact

allow can measure to 0.1 pH unit

***or** to smaller intervals of pH*

1

(leaving…6 days) – obtain greater pH change

or

because there was (very) little change in 3 days

allow more acid will be made

1

(f) scale > $\frac{1}{2}$ of x-axis

and

x-axis labelled (time in) days

1

points plotted correctly

*all 7 correct = **2** marks*

*5 or 6 correct = **1** mark*

2

line of best fit = smooth curve through points

*do **not** accept ruled point-to-point*

1

(g) (1st day) too few bacteria

1

(after day 1 more bacteria so more) acid made

1

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(days 5-6) sugar / food used up
or
low pH denatures enzymes
or
low pH kills bacteria

allow enzymes do not work

*do **not** accept enzymes killed*

1

(h) (similarity) – same start pH /
pH7 and end pH / pH4.5
or
same pH change / change = 2.5

1

(difference) – faster

1

[16]

Q14.

(a) any **two** from:
- sprinkled through air
- air spaces between stones
- thin layer over stones (for efficient diffusion)
- slow flow (for efficient diffusion)

2

(b) green algae

1

(c) (large / small) protist

1

(d) **Level 2 (3-4 marks):**
Scientifically relevant facts, events or processes are identified and given in detail to form an accurate account.

Level 1 (1-2 marks):
Facts, events or processes are identified and simply stated but their relevance is not clear.

No relevant content (0 marks)

Indicative content

digestion:
- (external) enzymes released
- role of enzymes – e.g. amylase / protease / lipase
- substrates & products – e.g. starch ⟶ sugar / protein ⟶ amino acids / fat ⟶ fatty acids

absorption:
- by diffusion / active transport

deamination:
- amino acids ⟶ ammonia / ammonium ions

release of other ions:

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- e.g. phosphate / nitrate / magnesium

respiration:
- produces carbon dioxide (+ water)
  or
  equation is given
- release of energy allows other processes to take place e.g. active transport

[8]

Q15.

(a) red blood cell

1

(b) 44

1

(c) retina

1

(d) **7** and **8** / the parents
do not have **A** (allele)
or only have **a** (allele) **or** are **aa**

*allow converse – if parents had an **A** (allele) they would have Stickler syndrome*

1

so children cannot inherit **A**
or can only inherit **a**

or

the parents show the recessive characteristic

so must be homozygous
(recessive)
or must be **aa**
or parents cannot have **A**

1

(e) parental genotypes:
12 = Aa and 18 = aa
or parental gametes:
12 = A + a and 18 = a + a

1

derivation of offspring genotypes

allow ecf

1

identification of **Aa** offspring as Stickler

1

probability = 0.25 / $\frac{1}{4}$ / 1 in 4 / 25% / 1:3

*allow ecf – e.g. 0.5 if **12 = AA***

*do **not** accept 3:1*

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*do **not** accept 1:4*

1

[9]

Q16.

(a) ventricle

1

(b) lungs

1

(c) valve circled on heart

1

(d) no fatty deposit

1

healthy artery is wider / bigger hole / has more blood flow

1

(e) statins

1

stent

1

(f) any **two** from:

- smoking
- high-fat diet
- lack of exercise

allow:

- *overweight / obese*
- *having high blood pressure*
- *having high cholesterol*

2

(g) 8 (%)

1

(h) more males have coronary heart disease than females

1

[11]

Q17.

(a) to show the experiment was more repeatable

1

(b) (circle) 0.0 at 20 °C

1

(c) ignored it / did not use it

ignore repeated it

1

(d) increases the rate of reaction up to 30 °C

1

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(e) 60 °C

1

(f) do the experiment at 30 °C, 35 °C and 40 °C

1

(g) **Level 2 (3–4 marks):**
A detailed and coherent plan covering all the major steps is provided. The method is set
out logically taking into account control variable and appropriate measurements. The plan could be repeated by another person to determine the effect of pH on breakdown of starch by amylase.

Level 1 (1–2 marks):
Simple statements relating to relevant apparatus or steps are made but they may not
be in a logical order. The plan would not allow another person to determine the effect of
pH on breakdown of starch by amylase.

0 marks:
No relevant content.

Indicative content
- range of at least 3 pH values / use of buffer solutions
- control variables / keep amount or concentration of starch and amylase the same
- keep temperature the same using water bath / electric heater
- use iodine test to make qualitative observations
- observe colour changes at different temperatures
- do repeats at each pH

4

[10]

Q18.

(a) 300

1

(b) suitable scale on *y*-axis

1

label *y*-axis

1

4 bars drawn correctly

*allow **1** mark for 3 correct bars*

2

(c) increases from 50 to 500

1

then decreases from 500 to 0

1

(d) carbohydrates broken down / digested into sugars

1

broken down by carbohydrase or amylase

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1

(e) absorption of glucose

1

into blood

1

by active transport

allow diffusion

1

[12]

Q19.

(a) stomach and pancreas correctly labelled

1

(b) bacteria not killed (by stomach acid / HCl) and so they damage mucus lining

1

so <u>acid / HCl</u> damages stomach tissue / causes an ulcer

allow bacteria infect stomach tissue

1

(c) if the cancer is malignant

1

(cancer) cells can spread to other organs

1

via the blood forming a secondary tumour

do not award marking points 2 or 3 without marking point 1

1

(d) add Biuret reagent to food sample

allow sodium / potassium hydroxide (solution) + copper sulfate(solution)

1

mauve / purple colour shows protein present

1

(e) damaged villi reduce surface area for absorption (of food molecules)

1

(therefore) fewer amino acids and glucose absorbed

1

with less glucose transfer of energy from respiration is reduced

1

and fewer amino acids available to build new proteins

1

[12]

Q20.

Level 3 (5–6 marks):

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A detailed and coherent explanation is provided with most of the relevant content, which demonstrates a comprehensive understanding of the human circulatory system . The response makes logical links between content points.

Level 2 (3–4 marks):
The response is mostly relevant and with some logical explanation. Gives a broad understanding of the human circulatory system. The response makes some logical links between the content points.

Level 1 (1–2 marks):
Simple descriptions are made of the roles of some of the following: heart function, gas exchange, named blood vessels, named blood cells. The response demonstrates limited logical linking of points.

0 marks:
No relevant content.

Indicative content

- dual / double circulatory system which means that it has higher blood pressure and a greater flow of blood to the tissues
- heart made of specialised (cardiac) muscle cells which have long protein filaments that can slide past each other to shorten the cell to bring about contraction for pumping blood
- heart pumps blood to lungs in pulmonary artery so that oxygen can diffuse into blood from air in alveoli
- blood returns to heart via pulmonary vein where muscles pump blood to the body via aorta
- oxygen carried by specialised cells / RBCs which contain haemoglobin to bind oxygen and have no nucleus so there is more space available to carry oxygen
- arteries carry oxygenated blood to tissues where capillaries deliver oxygen to cells for respiration and energy release
- thin walls allow for easy diffusion to cells
- large surface area of capillaries to maximise exchange
- waste products removed eg CO_2 diffuse from cells into the blood plasma
- blood goes back to the heart in veins which have valves to prevent backflow
- cardiac output can vary according to demand / is affected by adrenaline

accept annotated diagrams

[6]

Q21.

(a) (i) large intestine = **E**

1

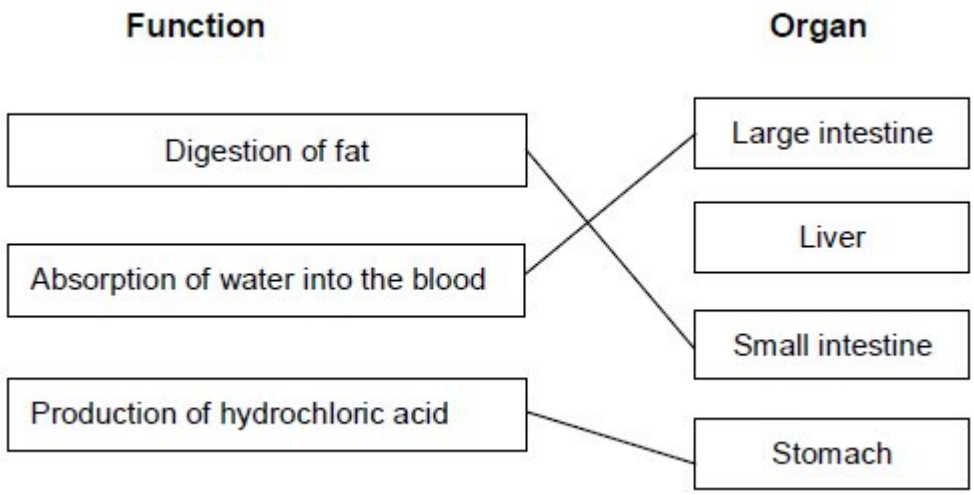
small intestine = **D**

1

stomach = **B**

1

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(ii)

extra lines cancel

3

(b) The concentration in the blood is lower.

1

[7]

Q22.

(a) (i) without <u>oxygen</u>

allow not enough oxygen
ignore air
ignore production of CO_2
ignore energy

1

(ii) more / high / increased lactic acid (at end)

allow approximate figures (to show increase)
ignore reference to glucose

1

(b) (i) 1.5

allow only 1.5 / 1½ / one and a half

1

(ii) increases at first **and** levels off

ignore subsequent decrease

1

suitable use of numbers eg
rises to 10 / by 9 (dm^3 per min)
or
increases up to 1.5 (min) / levels off after 1.5 (min) (of x axis timescale)

allow answer in range 1.4 to 1.5

or
after the first minute (of the run)

1

(iii) supplies (more) oxygen

1

supplies (more) glucose

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1

need 'more/faster' once only for full marks

*allow removes (more) CO_2 / lactic acid / heat as an alternative for either marking point one **or** two, **once** only*

for (more) respiration

1

releases (more) energy (for muscle contraction)

*do **not** allow energy production or for respiration*

1

[9]

Q23.

(a) a catalyst / speeds up a reaction

ignore it is not used up

1

it is a protein **or** it is specific / described **or** it has an active site

allow it only acts on one molecule

1

(b) cytoplasm

1

(c) **Advantage:**

any **one** from:
- heat would denature proteins in milk
- heat alters texture or flavour of milk
- catalase / enzyme is specific **or** only affects hydrogen peroxide
- less energy / fuel / lower temperature used so less expensive **or** less pollution

1

Disadvantage:

any **one** from:
- (some pathogens may survive) causing illness
- catalase / enzyme left in milk **or** may cause allergies **or** may alter taste

1

[5]

Q24.

(a) The damaged alveolus has a smaller surface area.

1

(b) Less oxygen is taken in.

1

[2]

Q25.

(a) (i) any **one** from:
- glucose
- oxygen

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- carbon dioxide
- urea
- water

allow hormones

allow named example of a product of digestion

1

(ii) (cardiac) muscle

allow muscular

1

(b) (i) **B**

1

(ii) **D** atrium / atria

ignore references to left or right

1

E ventricle(s)

ignore references to left or right

1

(c) (i) a vein

1

(ii) an artery

1

(iii) keeps artery open / wider

allow ecf from part cii

1

(so) blood / oxygen can pass through (to the heart muscle)

1

[9]

Q26.

(a) (healthy alveolus has a) larger surface area

allow larger SA:Volume ratio

accept converse for alveoli from person with emphesema

*allow walls between alveoli disintegrate **or** fluid accumulation in alveoli*

1

(b) less oxygen into the blood / muscles

less only needed once

1

(so) less respiration

ignore ref. to anaerobic respiration

1

(and therefore) less energy is released (for exercise)

*do **not** allow energy is produced / made*

*do **not** allow energy **for** respiration*

1

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[4]

Q27.

(a) (i) doesn't have valves

allow veins have valves

1

has a thicker wall **or** thicker layer of muscle

allow has a smaller lumen

ignore references to elastic (in walls)

1

(ii) any **two** from:

- (artery has) more oxygen
- (artery has) more glucose

allow (artery has) more amino acids / fatty acids

- (artery has) less carbon dioxide
- (artery has) less lactic acid

ignore urea

ignore reference to pressure

accept converse for veins if veins is clearly stated

2

(b) any **two** from:

- no rejection

allow no tissue matching required

- abundant supply
- low risk of infection

allow named example ie HIV, CJD

- longer shelf life

allow less space needed for storage

ignore side effects

2

[6]

Q28.

(a) 55%

***2** marks for correct answer alone*

accept 54 − 56

*5.5 / 10 × 100 alone gains **1** mark*

2

(b) any **three** from:

- amino acids
- antibodies
- antitoxins
- carbon dioxide
- cholesterol
- enzymes
- fatty acid
- glucose
- glycerol

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- hormones / named hormones
- ions / named ions
- proteins
- urea
- vitamins
- water.

ignore blood cells and platelets

ignore oxygen

max 1 named example of each for ions and hormones

allow minerals

3

(c) Marks awarded for this answer will be determined by the Quality of Communication (QC) as well as the standard of the scientific response. Examiners should also refer to the information in the Marking Guidance and apply a 'best-fit' approach to the marking.

0 marks
No relevant content.

Level 1 (1 – 2 marks)
There is a description of pathogens with errors or roles confused.
or
the immune response with errors or roles confused.

Level 2 (3 – 4 marks)
There is a description of pathogens **and** the immune response with some errors or confusion
or
a clear description of either pathogens **or** the immune response with few errors or little confusion.

Level 3 (5 – 6 marks)
There is a good description of pathogens **and** the immune response with very few errors or omissions.

Examples of biology points made in the response:

- bacteria and viruses are pathogens

credit any ref to bacteria and viruses

- they reproduce rapidly inside the body
- bacteria may produce poisons / toxins (that make us feel ill)
- viruses live (and reproduce) inside cells (causing damage).

white blood cells help to defend against pathogens by:

- ingesting pathogens / bacteria / (cells containing) viruses

credit engulf / digest / phagocytosis

- to destroy (particular) pathogen / bacteria / viruses
- producing antibodies
- to destroy particular / specific pathogens
- producing antitoxins
- to counteract toxins (released by pathogens)

credit memory cells / correct description

- this leads to immunity from that pathogen.

6

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[11]

Q29.

(a) Marks awarded for this answer will be determined by the Quality of Communication (QC) as well as the standard of the scientific response. Examiners should also refer to the information in the Marking guidance and apply a 'best-fit' approach to the marking.

0 marks
No relevant content.

Level 1 (1−2 marks)
The method described is weak and could not be used to collect valid results, however does show some understanding of the sequence of an investigation.

Level 2 (3−4 marks)
The method described could be followed and would enable some valid results to be collected, but lacks detail.

Level 3 (5−6 marks)
The method described could be easily followed and would enable valid results to be collected.

Examples of the points made in the response:

- bean seedlings of same age
- cut material from same part of each organ (for repeats) e.g. top 1 cm of stem / a whole cotyledon / seed
- equal mass of each organ
  accept weight for mass
- grind / homogenise
- in equal amounts of water / buffer
- equal volumes of hydrogen peroxide solution
- equal concentrations of hydrogen peroxide solution
- same temperature
- temperature maintained in water bath
- quantitative measure of gas production eg height of foam in mm / collect gas in graduated syringe in cm^3
- for same time period
- repetitions (3+ times)
- calculate mean for each.

6

(b) (i) correct answer: 40

1 *mark for 45 as the anomalous result has been included in the calculation*

or

$$\frac{(38 + 41 + 42 + 39)}{4}$$

1 *mark for*

$$\frac{160}{4}$$

or 4

2

(ii) vertical axis correctly labelled:
'Enzyme activity in arbitrary units'

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allow ecf from (b)(i)

1

points plotted correctly ±1 mm

*deduct **1** mark for each incorrect plot*

2

suitable line of best fit

not feathery, not point to point

1

(iii) 6.0 / 6

allow ± 0.1

if 6.0 not given, allow correct for candidate's graph ± 0.1

1

(iv) in range 0 to 14 units

allow correct for candidate's graph

1

(v) enzyme denatured / enzyme (active site) shape changed

allow substrate no longer fits (active site)

ignore reference to temperature

do not allow enzyme dies

1

[15]

Q30.

(a) (i) 64

1

(ii) 36

allow e.c.f from (i) i.e. 100 − answer given in (a)(i)

1

(iii) any **one** from:

- only considers 16-year-olds

  ignore lack of evidence

  allow does not refer to all ages
- only about some / 5 countries

  allow does not refer to all countries.

1

(b) the more exercise done the healthier a person is

allow the more exercise done the higher the health rating

allow the less exercise done the lower the health rating

1

(c) having a high cholesterol level

1

(d) (i) antibodies

1

(ii) antibiotics

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1

[7]

Q31.

(a) (i) a catalyst

1

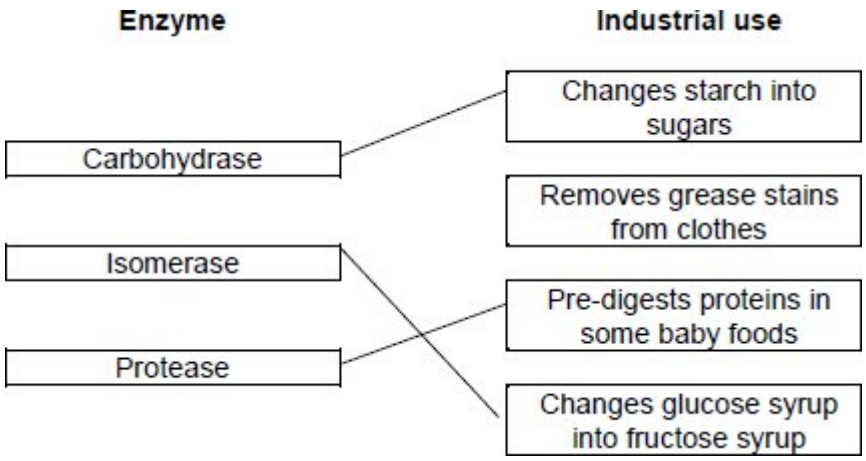
(ii) protein

1

(iii) salivary glands

1

(b)



extra lines from any enzyme cancels that mark

3

[6]

Q32.

(a) (i) glycerol

1

(ii) pancreas / <u>small</u> intestine

accept duodenum / ileum

ignore intestine unqualified

1

(b) any **two** from:

- type of milk
- volume / amount of milk
- vol. bile equals vol. water
- volume of lipase
- concentration of lipase
- temperature

ignore time interval

ignore solution unqualified

*do **not** allow pH*

ignore starting pH

ignore volume / amount of bile / water

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ignore concentration of bile

accept amount of lipase if neither volume nor concentration given

2

(c) (i) fatty acid (production)

1

(ii) faster reaction / digestion (with bile)
or
pH decreases faster (with bile)
or
takes less time (with bile)
or
steeper fall / line (with bile)

allow use of data

ignore easier

1

(iii) all fat / milk digested
or
same amount of fatty acids present
or
(lower pH) denatures the enzyme / lipase

allow all reactants used up

ignore reference to neutralisation

allow enzyme won't work at low pH

*do **not** allow enzyme killed*

1

[7]

Q33.

(a) 5624

***allow 2 marks** for:*

- *correct HR = 148 **and** correct SV = 38 plus wrong answer / no answer*

or

- *only one value correct **and** ecf for answer*

***allow 1 mark** for:*

- *incorrect values **and** ecf for answer*

or

- *only one value correct*

3

(b) (i) **Person 2** has low(er) stroke volume / SV / described

*eg **Person 2** pumps out smaller volume each beat*

*do **not** allow **Person 2** has lower heart rate*

1

(ii) **Person 1** sends more blood (to muscles / body / lungs)

1

(which) supplies (more) oxygen

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1

(and) supplies (more) glucose

1

(faster rate of) respiration **or** transfers (more) energy for use

ignore aerobic / anaerobic

allow (more) energy release

allow aerobic respiration transfers / releases more energy (than anaerobic)

*do **not** allow makes (more) energy*

1

removes (more) CO2 / lactic acid / heat

allow less oxygen debt

or less lactic acid made
or (more) muscle contraction / less muscle fatigue

if no other mark awarded,

allow person 1 is fitter (than person 2) for max 1 mark

1

[9]

Q34.

(a) (i) alveoli / alveolus

allow air sacs

allow phonetic spelling

1

(ii) any **one** from:
- protection (of lungs / heart)
- help you breathe / inflate lungs.

1

(b) (i) diffusion

1

(ii) capillaries

1

(iii) any **two** from:
- (have many) alveoli

  allow air sacs
- large surface / area
- thin (exchange) surface **or** short diffusion pathway

  accept only one / two cell(s) thick
- good blood supply / many capillaries

  allow (kept) ventilated or maintained concentration gradient.

2

[6]

Q35.

(a) Lung

1

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(b) Filtering the blood

1

(c) They will take in water and burst

1

(d) (i) 6

1

(ii) less than 28

1

(iii) urea not reabsorbed
or
dialysis (fluid) has removed urea

1

(e) (i) antibodies

1

(ii) Tissue typing the donor kidney

1

[8]

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