AQA GCSE BIOLOGY (HIGHER) · 8461

BIOLOGY



MARK SCHEME

4.5.1 HOMEOSTASIS (PACK 1)

SCORE	PERCENTAGE
/224	%

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Q1.

(a) (i) insulin

accept glucagon (correct spelling only)

1

(ii) pancreas

accept phonetic spelling

allow pancrease

1

(b) (i) 11(.0)

accept in range 10.5-11 (.0)

1

(ii) any **two** from:

ignore numbers unless comparative

- high(er) concentration (of blood glucose) (anywhere / any time)
  accept 115 <u>not</u> 88
  139 <u>not</u> 99
- large(r) increase (in concentration after the drink)
  accept increase by 24 <u>not</u> 11 / their b(i)
- fast(er) / steep(er) rise
  accept it takes 3 hours <u>not</u> 1 ¼ hours to get back to original level
  accept it takes a long time to get back to normal
- slow(er) fall

2

(iii) any **one** from:

- insulin present / produced
  accept glucagon not produced
- (used in) respiration
  allow exercise
- taken into cells
  allow converted to glycogen
  allow taken into liver (cells) / muscle (cells)
  allow produce / make energy

1

[6]

Q2.

(a) in rainforest:

accept converse

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(water from) sweat does not evaporate (as much)

*max **1** if not clear whether desert or rainforest*

1

any **one** from:

- (due to) less wind / higher moisture / humidity
- less cooling effect

ignore references to temperature

1

(b) blood vessels supplying capillaries dilate / widen **or** vasodilation

*do **not** award mark if candidate refers only to blood vessels dilating **or** to capillaries dilating.*

*accept 'arteries' or 'arterioles' for 'blood vessels supplying, capillaries' but do **not** accept 'veins'.*

ignore expand / get bigger / relax / open

*do **not** accept idea of blood vessels moving*

1

more blood (through skin / surface capillaries) leads to greater <u>heat loss</u>

1

[4]

Q3.

(a) (i) 94.9

correct answer with or without working

*if answer is incorrect 100 - (2.5 + 2.6) gains **1** mark*

2

(ii) protein molecules in the plasma cannot pass through the filter in the kidney

1

(b) (i) partially permeable

1

(ii) the same as

1

(c) any **one** from

- hazards of operation / named example
- may be rejected / need to use immunosuppressant drugs / need to find (tissue) match

allow long term drug use

- not enough donors

allow a long waiting list

- transplants have a limited life

1

[6]

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Q4.

(a) any **two** from:

*allow 2 correctly named substances for **2** marks*
ignore water

- urea
- ions / salt(s) / correct named example
  ignore minerals
- second correct named example
- hormones / named example
- allow ammonia
- allow creatinine
- allow uric acid
- allow bile pigment

2

(b) (i) glucose filtered (into kidney tubule)
accept Bowman's capsule

1

glucose reabsorbed **or** glucose taken back into blood

1

all glucose taken back into blood / all reabsorbed

1

(ii) not all glucose reabsorbed

1

because not enough time / length **or** too high
a concentration in tubule / not enough carriers

1

[7]

Q5.

(a) (i) lung

1

(ii) kidney

1

(iii) bladder

1

(b) (i) more

1

the same

1

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less

allow synonyms

1

(ii) cools / reduces temperature

or

prevent overheating

ignore reference to sweat

1

[7]

Q6.

(a) pancreas

allow phonetic spelling

1

(b) 4(.0) to 7.2 **or** 7.2 to 4(.0)

1

(c) 13 – 7 = 6

*working shows 6 = **1** mark*

1

6/2 = 3 <u>units</u>

*accept the correct answer to the calculation, 3 <u>units</u>, for **2** marks, irrespective of working*

1

increase (dose)

accept indication of increase, eg extra / more / + could be in working lines

1

[5]

Q7.

(a) any **two** from

- reference to role of thermoregulatory centre detecting rise in temperature (of blood or skin) **or** / causing increase in sweating
- more evaporation

  *need to refer to more at least once to gain **both** marks*
- more cooling / heat loss

  *without reference to more only award max **1** mark if both ideas given, eg cooling alone gets no marks*

2

(b) blood vessels supplying (skin) capillaries

*do **not** accept capillaries / veins*

1

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or

arteries

or

arterioles

1

dilate / widen

allow vasodilation
do not accept idea of blood vessels moving
note: marks are awarded independently
*accept shunt vessels close for **2** marks*

1

(c) (i) muscle contraction

ignore relaxing
*do **not** allow vasoconstriction*

1

(ii) respiration

(respiration) releases / produces heat

reference to respiration is required for this mark

1

[7]

Q8.

(a) in table, in sequence:

allow descriptions for increase / decrease

decrease

1

increase

1

(b) **No**

older have lower % / less chance of rejection (than younger) (1)

allow figures

older have higher % / more chance of still working (after 5 years than younger)

allow figures
allow in older patients kidney works for longer

1

or

Yes

*allow max **1** mark if Yes*

older have lower % / less chance of surviving (at least 10 years than younger)

allow older people are more likely to die

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1

[4]

Q9.

(a) (i) A

1

(ii) (protein molecule is) too large to pass through the filter / cannot pass through the filter

1

(b) RBC is too big to / cannot pass through filter

1

haemoglobin released when RBC bursts
or
haemoglobin inside RBC in a healthy person

1

haemoglobin is small enough to / can pass through filter
or
haemoglobin diameter < pore diameter
or
haemoglobin only 5.5 nanometres

1

[5]

Q10.

(a) insulin

extra ring drawn cancels the mark

1

(b) pancreas

extra ring drawn cancels the mark

1

(c) diabetes

extra ring drawn cancels the mark

1

[3]

Q11.

(a) 1800

allow - / minus 1800

1

(b) 3200

award both marks for correct answer irrespective of working
allow - / minus 3200
*award **2** marks for 200 or -200 irrespective of working*
allow ecf from part (a) for both routes to 2 marks
*if no answer **or** incorrect answer then indication of addition of 1800 **or** their (a), 1000 and 400 gains **1** mark*

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2

(c) drink more / take in more from food & drink

allow ecf from (b), ie if answer to (b) is less than 3000 then accept drink less

if answer to (b) is exactly 3000 accept do nothing

1

200 (cm^3)

accept ecf from (b) answer should be difference between (b) and 3000 if answer to (b) is 3000 accept they are the same

***NB** drink / take in 3200 (cm^3) of water = **1** mark*

*drink / take in 200 (cm^3) of water = **2** marks*

ignore references to exercise / sweat

1

[5]

Q12.

(a) (i) thermoregulatory centre

allow thermoregulation centre

allow hypothalamus

1

(ii) it has receptors

ignore receptors in skin

1

reference to temperature of blood

allow plasma for blood

1

(b) muscles contract

ignore relax / expand

1

increased respiration **or** more heat released

allow more heat produced

if more not given allow respiration releases / produces heat

1

(c) (i) (blood vessels / arteries / arterioles) dilate / widen

*do **not** accept capillaries dilate*
ignore blood vessels get bigger / expand

*do **not** accept idea of blood vessels moving*

1

(ii) more blood close to / near surface

allow blood is closer to the surface

*do **not** accept idea of blood vessels moving*

1

more heat lost **or** heat lost faster **or** cools faster

*do **not** allow for idea of evaporation*

1

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[8]

Q13.

(a) (protein molecules too) big **or** larger than pore size

allow cannot fit through the pores / hole / gaps

1

(b) (i) diffusion

1

(ii) high to low concentration

ignore along gradient / across gradient

or high concentration in blood, low concentration in dialysis fluid

allow there is none in dialysis fluid

or down concentration gradient

or correct use of numbers

1

(c) any value between 3.15 and 3.25 (inclusive)

1

(d) (i) any **two** from:

- kidney works all the time **or** dialysis works for short time

  ignore enables an active life

  or

  dialysis needs regular trips to hospital / regular treatment / long term treatment

  accept kidney transplant is one off treatment

- kidney maintains correct concentration all the time **or** no build-up as between dialysis sessions
- no need to regulate diet **or** correct example – eg low salt / low protein / low fluid intake as with dialysis
- cheaper in the long term

2

(ii) any **two** from:

- rejection / described **or** need to use immunosuppressants **or** need to take drugs for life

  allow may need later replacement

- susceptible to other infections
- hazards of operation / anaesthetic
- shortage of donors / match
- high initial cost

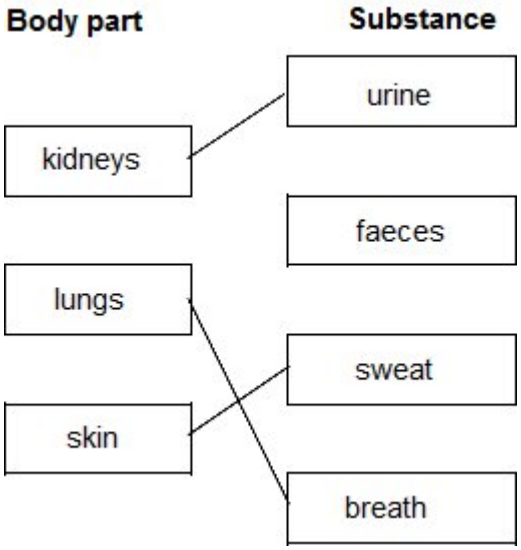
2

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[8]

Q14.

(a)



1 *mark per correct line*

extra line from a body part cancels the mark

3

(b) (i) 1800 cm^3

1

(ii) decreases

1

(iii) any **one** from:

- less / no sweat
- less / no cooling (needed)
- less / reduce / no heat loss / keep warm

1

(c) increases

1

[7]

Q15.

(a) pancreas

1

(b) the diabetic should get more energy from fat

1

the diabetic should get less energy from carbohydrate

1

(c) (use) insulin

allow pancreas / stem cell transplant

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*do **not** allow injection / transplant /stem cells / tablets alone*
ignore exercise

1

[4]

Q16.

(a) three layer triangular pyramid
either way up (as blocks or triangle)

1

(soya / beans / food – trout / fish – people / human (in sequence)
ignore reference to producers /herbivores / consumers
*award **1** mark only for a correct food chain with 2 correct arrows showing energy flow*

1

(b) the trout release energy when they respire

1

some energy will be lost in waste from the trout

1

(c) any **one** from eg

- easy / easier to catch / more caught
  allow easy / easier to monitor
- easy / easier to feed
  allow control food
- no / less predation
  allow less fishing / poaching
- less energy loss
  allow grow faster
- less movement
  ignore less space to move
  *do **not** allow easier to farm*

1

(d) any **two** from:

- microorganisms / bacteria /decomposers / microbes / fungi /detritus feeders
- decay / rot / decompose / digest /break down
  ignore biodegrade
- (microorganisms) respire
  *do **not** award this mark if response implies the trout respire*
- turned into fossil fuels / named fossil fuels
- carbon dioxide / $CO_{2\ released}$

2

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[7]

Q17.

(a) (i) pancreas

allow phonetic spelling

1

(ii) (increases movement of) glucose into cells / organs / named

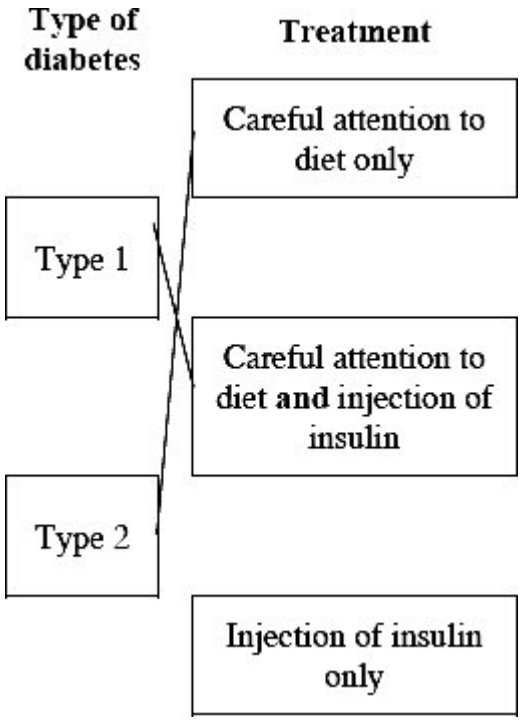
allow (glucose) converted to glycogen / fat

allow (glucose) used in (increased) respiration

*do **not** allow hybrid spellings of glycogen*

1

(b)



***1** mark per correct line*

extra line from a type of diabetes cancels the mark

2

(c) (i) protein

1

(ii) gene / allele

1

(iii) any **three** from:

*max **2** if any one process goes on in the wrong organ*

- (amino acids) broken down /converted
- (amino acids) form / into urea
- (break down / convert / urea formed) in liver
- (urea / broken down amino acids) removed / filtered by kidney
- (urea / broken down amino acids) in urine

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- (urine / urea / broken down amino acids) stored / held in bladder

3

[9]

Q18.

(a) (i) water

1

(ii) small

1

(iii) 3.15

1

(b) (i) 21 000

1

(ii) 2 years

1

(iii) prevent rejection

1

[6]

Q19.

(a) (i) protein

1

(ii) (protein molecules too) large

1

cannot pass through filter **or** can't leave blood **or** can'it pass into kidney tubule / named part

*NB holes in the filter are too small = **2** marks*

1

(b) any **four** from:

- use of partially permeable membrane **or** only small molecules can pass through membrane
- dialysis fluid has 'ideal' concentrations of solutes

  allow correct named example
- diffusion of waste substances out of blood

  accept named example – eg urea

  or
  waste passes from <u>high to low concentration</u>
- reference to equilibrium (between plasma & dialysis fluid)

  accept reference to counterflow to maintain concentration gradient

4

[7]

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Q20.

only 24 students tested **or** only one test **or** reference to lack of controls eg gender / age

1

students could drink as much water as they wanted

or

some students drank more water than others

or

some students drank water and beer

1

differences only slight

ignore effects of beer or promotion of beer drinking

1

[3]

Q21.

(a) pancreas

1

(b) any **one** from

- (controlling / changing) diet

  accept descriptions as to how diet could be changed eg eat less sugar(y foods) ignore reference to fat / protein

- exercise

  accept example eg go for a run

- pancreas transplant

  accept named drug eg metformin

1

(c) (i) increase

ignore reference to women

1

then fall

1

relevant data quote (for male)

max at ages 65 - 74

*eg starts at 10 (per thousand) **or** max at 130 (per thousand) **or** ends at 120 (per thousand)*

accept a difference between any pairs of numbers in data set

quoting of scale or per thousand but not 'thousands'

accuracy ± 2

1

(ii) *ignore numbers*

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(between 0 and 64) more females (than males) / less males

allow eg females more diabetic than males

1

(over 65) more males (than females) / less females

1

[7]

Q22.

(a) (i) liver

1

(ii) kidney

allow urethra / bladder

ignore ureter

1

(iii) (excess) protein / named / amino acids

accept amino / ammonia

1

(b) less / no sweating

allow ideas of how sweat glands change in order to reduce sweating

1

less heat lost / evaporation

1

(c) (i) become narrower / constrict

allow contract / get smaller etc

allow less blood flows through vessels

*do **not** allow capillaries become narrower **or** reference to movement of vessels*

1

(ii) reduced / no heat loss

allow heat gained from room

1

[7]

Q23.

(a) (i) too large to pass through the filter

1

(ii) passed through the filter, then reabsorbed into blood

1

(iii) water is reabsorbed from the filtrate into the blood

1

(iv) water, urea and sodium ions

1

(b) (i) less urine

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1

(ii) more concentrated

1

[6]

Q24.

(a) (i) movement of atoms / molecules / ions

accept particles

allow dissolved substances

ignore reference to membranes

1

(substance) moves from high to low concentration

allow down the gradient ignore

across / along / with a gradient

1

(ii) any **two** from:

- movement of molecules / ions

  accept particles

  allow dissolved substances this point <u>once</u> only in (a)(i) and (a)(ii)

- from low to high concentration

  allow up / against the gradient

  ignore across / along / with a gradient

- requires energy / respiration

  accept requires ATP

2

(b) • **<u>filtration</u>** of blood **or**
described re small (molecules)through / large not

ignore diffusion

1

max **four** from:

- **<u>reabsorption</u>** / substances taken back into blood
- (reabsorption) of <u>all</u> of the sugar / glucose
- (reabsorption) of <u>some</u> of ions / of ions <u>as needed</u> by body
- (reabsorption) of <u>some</u> of water / of water <u>as needed</u> by the body
- urea present in urine

  accept urea not reabsorbed

- reabsorption of water by <u>osmosis</u> / <u>diffusion</u> **or** reabsorption of sugar / ions by <u>active transport</u>

4

[9]

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Q25.

(a) respiration

clear indication eg tick, underlining, others crossed out

1

(b) lungs

1

(c) liver

1

(d) amino acids

1

[4]

Q26.

(a) the sun / light / sunshine / solar

allow radiation <u>from the sun</u>
ignore photosynthesis / respiration
apply list principle
*do **not** allow water / minerals / heat*

1

(b) 2.5 (:1)

correct answer with or without working

ignore rounding with correct working
*do **not** allow other equivalent ratios for both marks*
*evidence of selection of 10(insects) **and** 4(frogs) **or** 50 **and** 20 **or** 1 **and** 0.4 for **1** mark*

if no other working allow **1** mark for 0.4:(1) on answer line

2

(c) any **two** from:

*allow for insects **or** frogs*
allow energy for biomass

- some parts indigestible / faeces
- waste / examples of waste eg urea / nitrogenous compounds / urine / excretion
- movement / eg of movement

  allow keeping warm
- heat
- not all eaten / eg of not all eaten
- respiration

  do not accept energy for respiration

2

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(d) any **four** from:

- (bodies) consumed by animals / named / scavengers / detritus feeders
- microorganisms / bacteria / fungi / decomposers
- reference to enzymes
- decay / breakdown / decompose / rot
  ignore digest(ion)
- respiration
- carbon dioxide produced
- photosynthesis
- sugar / glucose produced
  accept other organic molecules
- fossilisation / fossil fuels / named
- combustion / burning
  must be linked with fossilisation / fossil fuels
- (burning) produces carbon dioxide
  allow carbon dioxide produced once only

4

[9]

Q27.

(a) (i) pancreas
allow phonetic spelling

1

(ii) glucose into cells / liver / muscles
allow any named organ / cell
allow turned into / stored as glycogen
but
*do **not** allow hybrid spellings for glycogen*
allow increases respiration
allow stored as / turned into fat

1

(b) (i) reference to “98.6% of all people who used Diacure reported an improvement in their condition”.
*allow claim **1** / **1** / the first one*

1

(ii) (only) 30 patients **or** not enough / not many patients
*allow only one trial **or** only done once **or** not repeated*
ignore bias

1

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(iii) little effect / difference

allow no effect

allow only drops by 4 (±1)

1

suggest drug is not effective (in long term)

allow wouldn't persuade people to take it

1

(iv) avoid bias / owtte

eg company could change / ignore results / might lie

ignore fair / accurate / reliable / valid

1

[7]

Q28.

(a) respiration

*allow muscle contraction **or** muscle movement **or** exercise of muscles*

allow metabolism / chemical reactions

1

(b) (i) any **two** from:

- less / no water (available) for sweat

  allow dehydrated so less sweat

  allow converse if evident that response refers to athletes who have drunk liquid

- less / no heat lost / less / no cooling

  only need to refer to less / no once

- less / no evaporation (of sweat)

2

(ii) **either**

blood vessels supplying the skin **or**
blood vessels in skin

*do **not** allow first mark if implied that skin capillaries dilate*

1

dilate / widen / muscles relax

ignore enlarge / open

*vasodilation in skin = **2** marks*

*allow hairs lie flat for **1** mark*

*allow less insulation for **1** mark if linked to hairs*

*allow more blood in skin for **1** mark if no other marks awarded*

1

(c) (i) cold / 15°C cools the body / blood (more)

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or *reverse argument*

ignore reference to values for body temperature derived from graph

1

(ii) any **two** from:

- cools slower at 15°C cold / 15°C
  allow converse arguments
- cold / 15°C causes reduced blood flow to surface / skin
  ignore reference to capillaries
- blood not cooled as much / as quickly
- cold / 15°C causes shivering
- muscles contract / more respiration / heat made

2

[8]

Q29.

(a) 178

ignore working or lack of working

*correct working: 180 – 2 but no answer / wrong answer = **1** mark*

2

(b)

Man A	Man B
higher	lower
lower	higher
lower	higher

all 4 cells correct = **2** marks
2 or 3 cells correct = **1** mark
0 or 1 cells correct = **0** mark

2

[4]

Q30.

(a) (i) **A**

1

(ii) (protein) molecule is large

ignore letters

1

cannot pass through filter

*(protein is) too big to get through the filter = **2** marks*

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1

(b) **B** is taken back into the blood **or B** is reabsorbed

1

reabsorbed completely
or reabsorbed after filtration

1

(c) RBC is too big to pass through filter

1

Haemoglobin is inside red blood cells
or haemoglobin released when red blood cell bursts

1

Haemoglobin is small enough to pass through filter
or haemoglobin diameter < pore diameter

1

[8]

Q31.

(a) $\frac{1}{5}$ / 20% / 1 in 5 / 1 : 4 / 0.2 /

any correct proportion
ignore working
*do **not** allow 1 : 5*

$\frac{600}{3000}$ / 600 : 2400 / 600 in 3000

*award **1** mark for*
*selection of 3000 **and** 600*

2

(b) (i) sweat / sweating / perspiring

allow cooling / for cooling / to lose heat / to cool

1

(ii) the volume of water in the urine decreases.

1

the volume of water taken as food or drink increases.

1

(c) (i) liver

apply list principle

1

(ii) kidney

apply list principle

1

(iii) bladder

apply list principle

1

[8]

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Q32.

(a) (i) 50

*award **2** marks for correct answer irrespective of working*
*award **1** mark for selection of 60 **and** 10*

2

(ii) any **two** from:

- increases
- (then) decreases
- highest at 65 – 74 (years old) **or** maximum 112 (per thousand)

allow peaks at 65 - 74
ignore comparisons with men

2

(b) (i) stomach

1

(ii) any sensible reference to diet **or** carbohydrate intake **or** pancreas / stem cell transplant

*eg eat less / no sugary food **or** eat more fibre **or** go on a diet **or** watch what you eat*
ignore eat more protein
*do **not** accept reduce salt*

1

[6]

Q33.

(a) mineral ions

1

water

*each extra box ticked cancels **1** mark*

1

(b) (i) blood plasma

1

(ii) dialysis fluid

1

(iii) diffusion

1

(iv) partially permeable

1

(v) small

1

(c) drug treatment is needed to suppress the immune system

1

[8]

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Q34.

(a) (i) (wholemeal bread)
any **two** from:

lower maximum / peak / less change

1

slower rise / change
*ignore references to rate of fall **or** first to peak*

need to take less insulin / less likely to hyper
*no mark for identifying the type of bread but max **1** mark if not identified*

1

(ii) any **four** from:

- amylase / carbohydrase
- starch to sugar
  allow starch to glucose
- (sugar) absorbed / diffused / passes into blood
- correct reference to pancreas
  allow once only as rise or fall
- insulin produced
- glucose (from blood) into cells / tissue / organ **or** named tissue / organ
  allow glucose to glycogen
- glucose used in respiration / for energy
  max 3 for explaining rise
  max 3 for explaining fall

4

(b) any **three** from:

advantages (compared to insulin injections):

- (may be) permanent / cure
- no / less need for self monitoring
- no / less need for insulin / injections
  ignore reference to cost
- no / less need for dietary control

disadvantages (compared to insulin injections):

- low success rate
- (may) still need insulin / dietary control

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- operation hazards
- risk of infection from donor
- rejection / need for drugs to prevent rejection

*max **2** if only advantages **or** only disadvantages discussed*
can give converse if clear that it relates to insulin injections

3

[9]

Q35.

(a) (i) no effect / little effect

1

(ii) reduced

ignore reference to <u>later</u> increase

1

(b) (i) <u>more</u> (re)absorption

do not allow if extra incorrect reference to filtration made

1

or more (material) taken into blood

of water

*allow **only** if linked to reabsorption*
*do **not** accept water if in a list of substances*

1

(ii) ions in blood diluted

1

or concentration of ions decreases

increased water reabsorption

do not allow if extra incorrect reference to filtration made

or more water present in blood

accept sensible alternative suggestion
eg reabsorption of ions disrupted

1

[6]

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