AQA GCSE BIOLOGY (HIGHER) · 8461

BIOLOGY



MARK SCHEME

4.5.3 HORMONAL COORDINATION IN HUMANS (PACK 2)

SCORE	PERCENTAGE
/227	%

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Q1.

(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]

Q2.

(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

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 RBC bursts

1

Haemoglobin is small enough to pass through filter

or haemoglobin diameter

1

[8]

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Q3.

(a) any **six** from:

- hormone(s) / named produced by pancreas
- if blood glucose levels are too high, insulin is produced / released
- allowing glucose to move from the blood into the cells / named eg liver
- glucose is converted to glycogen
- if blood glucose levels fall, glucagon is produced / released
- glycogen is converted to glucose
- causing glucose to be released into the blood

6

(b) diabetes that occurs when the body (cells) do not respond / are less responsive to insulin

1

(c) (i) higher BMIs due to <u>increase</u> in mass / weight (relative to height) / obesity

1

obesity / being overweight / being fat is a (significant) <u>risk factor</u> for Type 2 diabetes

allow causes Type 2 diabetes

1

(ii) any **three** from:

- related to <u>described</u> change in diet eg fast foods
- and less exercise
- which increases the chance of obesity / increases BMI
- increased awareness has helped to slow the increase

3

[12]

Q4.

(a) (i) <u>rate of</u> chemical reaction<u>s</u> (in the body)

1

(ii) any **two** from:

- heredity / inheritance / genetics
- proportion of muscle to fat **or** (body) mass
  allow (body) weight / BMI
- age / growth rate
- gender
  accept hormone balance or <u>environmental</u> temperature
  ignore exercise / activity

2

(b) (i) 77

*correct answer with or without working gains **2** marks*
*allow **1** mark for 70 / 56 **or** 1.25 **or** 5*

2

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(ii) increase exercise

accept a way of increasing exercise

1

reduce food intake

accept examples such as eat less fat / sugar

*allow go on a diet **or** take in fewer calories*

ignore lose weight

ignore medical treatments such as gastric band / liposuction

1

[7]

Q5.

(a) (i) kidney

1

(ii) bladder

1

(iii) liver

1

(iv) lung(s)

1

(v) skin

1

(b) (i) 3000

allow 2970 to 3030

*correct answer gains **2** marks with or without working*

*if answer incorrect allow **1** mark for evidence of 1550 + 450 + 1000 (allow tolerance of + or – ½ square on each)*

2

(ii) 1600

allow 1570 to 1630

1

(iii) 1400

allow (b)(i) – (b)(ii)

1

(iv) correct plot from (b)(iii)

tolerance ½ square ignore width

1

(v) cells swell / overhydrated / damaged

accept poisoned (by urea)

1

[11]

Q6.

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(a) pancreas

allow phonetic spelling

1

(b) (i) A

1

shortest / quicker time (to work)

1

(ii) D

1

acts for longest time

mark dependent on D

allow D will last until 09.00 / breakfast / 24 hours

1

(iii) diet / exercise

if 'diet' is qualified, then will need correct qualification, e.g. 'less carbohydrate / sugar'

accept pancreas transplant / stem cell treatment

1

[6]

Q7.

(a) (concentration high) in the hepatic portal vein is blood with glucose absorbed from the intestine

1

concentration is lower in the hepatic vein because insulin

1

(has caused) glucose to be converted into glycogen

1

or

allows glucose into liver cells

(b) (i) (after 6 hours) most of the glucose has been absorbed from the intestine **or** from food into the blood

1

(ii) because glucagon (made in the pancreas) causes

if biological terms incorrectly spelt they must be phonetically accurate

*do **not** accept glucagon made / produced by the liver*

1

glycogen to be converted into glucose

1

glucose released into blood

allow the liver maintains the correct / constant level of glucose in the blood

1

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[7]

Q8.

(a) (i) any **one** from:

- chemical messenger / message
  allow substance / material which is a messenger
- chemical / substance produced by a gland
  allow material produced by a gland
- chemical / substance transported to / acting on a target organ
- chemical / substance that controls body functions

1

(ii) gland / named endocrine gland
brain alone is insufficient
allow phonetic spelling

1

(iii) in blood / plasma **or** circulatory system **or** bloodstream
accept blood vessels / named
*do **not** accept blood cells / named*

1

(b) *each hormone must be linked to correct action*
apply list principle
ignore the gland producing hormone

FSH stimulates oestrogen (production) / egg maturation / egg ripening
ignore production / development of egg

1

oestrogen inhibits FSH
allow oestrogen stimulates LH / build up of uterine lining

1

LH stimulates egg / ovum release / ovulation
accept LH inhibits oestrogen
accept LH controls / stimulates growth of corpus luteum
ignore production of egg

1

[6]

Q9.

any **three** from:

*max **2** if only advantages **or** only disadvantages discussed*
ignore 'side effects' unqualified
ignore side effects produced by hormones

advantages of IUCD over pill eg

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- can't forget to take it / have to take pill every day
  *do **not** allow last 5 years unless qualified*
- effect much longer than pill
- more effective in preventing pregnancy
  *do **not** allow reference to figures unless qualified*
- stops sperm entering uterus

disadvantages of IUCD over pill eg

- pain / uncomfortable / risk of infection / may damage uterus
- prevents fertilised egg developing / 'embryo rights'
  allow kills embryo
- needs replacement by doctor / nurse / professional
  or access to IUCD is more difficult than pill
  or IUCD is harder to come off than pill

3

argued conclusion

*must include a preference and a reference to **both** advantages and disadvantages*
***or** one is better in a given situation but the other is better in a different situation*

1

[4]

Q10.

(a) B

1

less / no insulin (produced) **or** insulin produced in pancreas
allow pancreas can't monitor (blood) sugar (level)
ignore pancreas can't control (blood) sugar (level)
allow <u>increased</u> glucagon production
*allow A as liver stores less glucose / sugar for **2** marks only*

1

(b) (i) (it / protein / insulin) digested / broken down
if ref to specific enzyme must be correct (protease / pepsin)
ignore denatured
*do **not** accept digested in mouth / other incorrect organs*

1

(ii) any **two** from:
ignore injections

- (attention to) diet
  *accept examples, eg eat less sugar(y food) **or** eat small regular meals*
  allow eat less carbohydrate / control diet

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ignore cholesterol or balanced / healthy diet

- exercise
  ignore keep fit / healthy
- (pancreas) transplant / stem cells / genetic engineering

2

[5]

Q11.

(a) (i) (too) big

1

cannot fit / pass through filter / through (pores) in membrane / cannot be filtered
*too big to be filtered = **2** marks*

1

(ii) water

1

(iii) partially permeable

1

(b) any **two** from:

- hazards of operation / named eg
- may be rejected **or** need to use immunosuppressant drugs / long term drug use **or** transplant may need to be replaced
- susceptible to other infections
- shortage of donors
- high <u>initial</u> cost

2

[6]

Q12.

(a) <u>person with muscle disease:</u>
allow reverse argument for healthy person

any **three** from:
NB all points are comparative except peak (point 3)
*allow use of **two** approximate figures as a comparison*

- higher resting rate **or** higher at start
- when exercise starts / then increases more / more rapidly
  accept description eg rise …. fall
- peaks (then falls)
- levels off <u>later</u> than healthy person

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- higher rate during exercise
  *if no other marks awarded allow **1** mark for 'it's higher'*
- greater range

3

(b) (i) oxygen
accept adrenaline
accept O_2
*do **not** accept O, O2 or O^2*

1

(ii) cannot release sugar / glucose (from glycogen)

or

cannot store glucose / sugar (as glycogen)

1

need to receive glucose / sugar (from elsewhere)
ignore oxygen

1

for energy / respiration / cannot store energy
ignore aerobic / anaerobic

1

[7]

Q13.

(a) proteins are not filtered

1

glucose is filtered and (re)absorbed
allow glucose (completely) <u>re</u>absorbed

1

ions are filtered and some (re)absorbed
allow some ions are <u>re</u>absorbed

1

urea is filtered [and some / none (re)absorbed]
allow some / no urea is <u>re</u>absorbed

1

(b) <u>more / a lot of</u> sweating occurred
accept converse arguments for cold day

1

<u>more / a lot of</u> water loss (by sweating)

1

<u>more / a lot of</u> water reabsorption / <u>more</u> water absorption by the kidney

1

lower volume of urine
allow less urine / less water in urine

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1

[8]

Q14.

(a) (i) any **one** from:

ignore cancer / AIDS

- as a sleeping pill

  *do **not** accept morning sickness*

- treating leprosy

1

(ii) thalidomide causes birth defects / abnormalities / described

in this order
ignore kill / harm / damage baby

1

to be (more) sure of not getting pregnant

*allow to be certain there is no baby **or** in case one doesn't work*

1

(b) (i) oestrogen

1

progesterone

1

(ii) any **two** from:

- reduce chances of <u>ovarian</u> cancer
- <u>more</u> effective (in preventing pregnancy)
- no pills (to remember) for 7 days (out of every 28)

  allow only taken for 21 days (out of 28)

- doesn't have to be taken at the same time every day

2

(iii) less chance of headaches

ignore won't get headaches

or
less chance of forgetting

allow lower dose of hormone
allow fewer side effects
ignore only contains one hormone

1

[8]

Q15.

(a) (i) any **three** from:

*if diet given as answer = max **2***

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- age (of athlete)
- gender (of athlete)
- starting concentration of glycogen
- type / intensity of exercise
- length of exercise period
- number of training sessions
  *if none of these points gained amount of exercise = **1** mark*
- time interval between exercise sessions
- exercise at same time of day
  *if last four points not awarded allow time (for exercise) for **1** mark*
  ignore references to amount of energy
  ignore they are both athletes

3

(ii) any **two** from:

- intensity of exercise
- amount of exercise between sessions
- starting concentration of glycogen
- fitness / health
- metabolic rate / respiration rate
- amount / mass of muscle / physique
- aspects of diet qualified, eg amount of food eaten
  *do **not** accept amount of carbohydrate*
  *if no other marks awarded allow height / mass / weight for **1** mark*

2

(iii) (B has) less glycogen
he = B

or (B's glycogen) fell more
accept use of approximate figures

or (B's glycogen) built up less
allow other correct observations from graph eg A is lower at end of first session
ignore rate of fall

1

(b) athlete **A** (no mark)
to gain full marks 'more' must be given at least once

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athlete **A** had more glycogen / **B** has less (only if A chosen to complete marathon)
*accept converse argument for **B***
1

(glycogen / glucose) used in respiration
ignore anaerobic
1

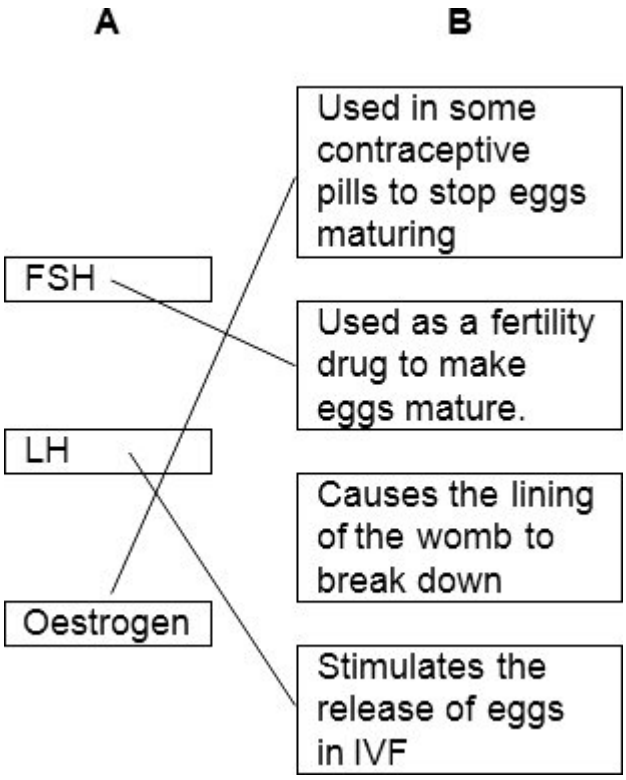
(more) energy released / available in athlete **A**
allow 'energy made'
1

and either energy used for movement / muscle action / to run
or
(extra) glycogen → (more) glucose
1

[10]

Q16.

(a)



mark each line from left hand box
two lines from left hand box cancels mark for that box
3

(b) (i) implant
1

(ii) any **one** from:
allow explanation for their method in (b)(i)

- lasts for 5 years / long(est)
- cannot forget to take / replace it / lose it

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- (hormone) there all the time
  ignore expense
  ignore STDs
  ignore side effects

1

(iii) any **one** from:

accept correct disadvantage for wrong method in (b)(i)

- needs surgery / operation
  allow it could go wrong
- painful
- infection
- have to wait five years for a child or more difficult to have a change of mind
  ignore expense
  ignore STDs
  ignore side effects

1

[6]

Q17.

(a) chance of getting pregnant decreases with age

ignore figures

1

chance of infertility increases with age

1

(b) (i) causes eggs to mature

allow growth
*do **not** accept produced*
*do **not** accept releases egg*
ignore references to oestrogen / LH / uterus / womb

1

(ii) causes egg release

*do **not** accept matures egg / growth of egg / produces egg*
ignore references to other hormones and uterus / womb

1

(c) embryo

allow (fertilised) egg divides

1

insert (embryo) into womb / uterus

ignore electric shock

1

[6]

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Q18.

(a) any **one** from:

- (in) food / named
  allow eating
- (from) respiration
  *do **not** allow breathing*

1

(b) (i) the greater / heavier the body mass the more water (should be drunk)
ignore references to hot / cold day
accept positive (relationship)
ignore figures unqualified

1

(ii) 2200

1

(iii) 400
*award **2** marks for correct answer, irrespective of working*
*allow ecf from b(ii) for **2** marks*
*if no answer or incorrect answer: 2200 - 1800 **or** b(ii) - 1800 gains **1** mark*

2

(c) need to replace water lost / prevent dehydration / keep hydrated
idea of balancing input and output

1

from / by (more) sweat
ignore other losses

1

(d) kidney

1

[8]

Q19.

(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

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- high(er) concentration (of blood glucose) (anywhere / any time)
  accept 115 not 88
  139 not 99

- large(r) increase (in concentration after the drink)
  accept increase by 24 not 11 / their b(i)

- fast(er) / steep(er) rise
  accept it takes 3 hours not 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]

Q20.

(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

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- not enough donors
  allow a long waiting list
- transplants have a limited life

1

[6]

Q21.

(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]

Q22.

(a) FSH / follicle stimulating hormone
allow FHS
either order

1

LH / luteinizing hormone

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1

(b) any **four** from:

- egg(s) collected from ovary
- (eggs) mixed with sperm **or** fertilisation occurs
  allow eggs and sperm put into tube
- fertilised egg divides
- embryo formed
- (embryos) inserted into womb / uterus
  ignore references to vagina
- FSH matures egg **and** LH releases eggs

4

[6]

Q23.

(a) (i) lung

1

(ii) kidney

1

(iii) bladder

1

(b) (i) more

1

the same

1

less
allow synonyms

1

(ii) cools / reduces temperature

or

prevent overheating
ignore reference to sweat

1

[7]

Q24.

(a) pancreas
allow phonetic spelling

1

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

1

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(c) 13 – 7 = 6

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

1

6/2 = 3 units

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

1

increase (dose)

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

1

[5]

Q25.

(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

1

[4]

Q26.

(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

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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]

Q27.

(a) any **two** from:

- FSH
  *do **not** accept FHS*
- LH
  *do **not** accept LSH*
- oestrogen
  allow progesterone as alternative to any hormone

2

(b) egg(s) / egg cell(s) / ova
*do **not** accept ovaries*
*do **not** accept fertilised eggs*

1

(c) (i) any **one** from:
ignore faster

- don't have to take (pill) every day
  ignore side effects
- can't forget to take
  ignore cost
- more reliable
- lasts 3 years / lasts longer
- hormone level in blood more constant

1

(ii) any **one** from:
ignore cost

- eg painful (to insert) / uncomfortable / causes rash
  ignore side effects unqualified
- woman can't take it out

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- more difficult to stop treatment
- needs to be removed if woman decides to become pregnant
  allow have to wait three years to become pregnant

1

[5]

Q28.

(a) inhibit FSH production

ignore LH production
ignore wrong hormone

1

so egg does not mature

ignore egg production / egg release / egg development

1

(b) any **three** comparisons: eg

- ease of insertion compared ie ring easily inserted by woman whereas implant needs professional **or** no damage to skin with ring

  *comparisons must be made ie two separate lists will gain no marks unless the lists are linked by eg whereas / however / on the other hand **and** the points are made in the same order in both lists*

- length of delivery compared eg 3 weeks for ring whereas 3 years for implant **or** delivery longer for implant
  or
  woman has to remember to insert ring whereas does not have to remember to insert implant

  ignore cost

- effectiveness compared eg 0.3 % failure with ring whereas nil for implant **or** implant more effective

- number giving up compared eg 4 % for ring whereas 2 % for implant **or** fewer women give up using implant

  or ring might cause vaginal discomfort whereas implant may cause irregular menstrual bleeding

3

reasoned conclusion (normally at the end)

ie must state 'better because....'

1

[6]

Q29.

(a) insulin

extra ring drawn cancels the mark

1

(b) pancreas

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extra ring drawn cancels the mark

1

(c) diabetes

extra ring drawn cancels the mark

1

[3]

Q30.

(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

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- hazards of operation / anaesthetic
- shortage of donors / match
- high initial cost

2

[8]

Q31.

(i) pituitary

1

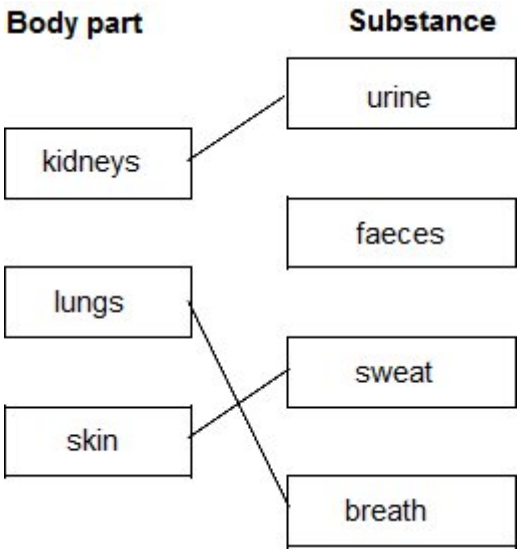
(ii) ovary

1

[2]

Q32.

(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

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[7]

Q33.

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

1

[4]

Q34.

(a) (i) pancreas

allow phonetic spelling

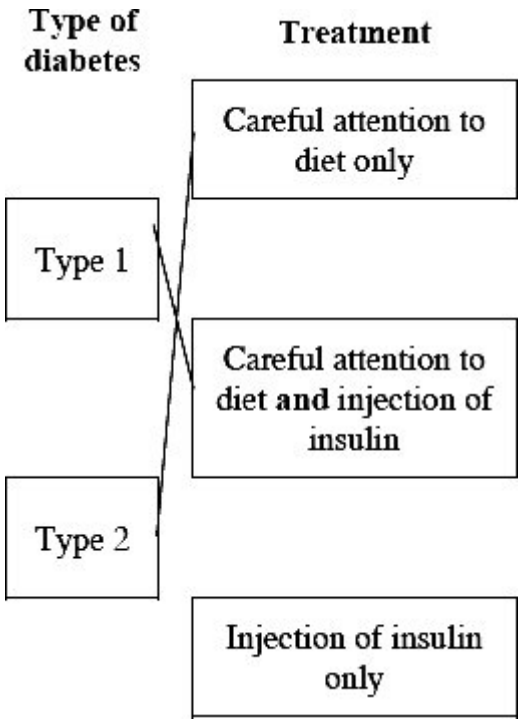
1

(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

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

3

[9]

Q35.

(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]

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