

Mark schemes

Q1.

(a) A 1

(b) D 1

(c) liver 1

(d) glycogen 1

(e) 2.6
allow answers in the range 2.5 to 2.7 1

7.6 (mmol/dm³)
allow a correctly calculated value using student's value from graph + 5 1

(f) 30 (minutes)
allow ½-hour or 0.5 hour 1

(g) points too far apart
or
no reading between 30 and 50 mins
allow no reading at 40 mins
or
points joined by straight lines
or
allow not a curve of best fit
values could have fallen to zero change before 50 mins 1

(h) higher values of y than given line 1

returning to(wards) zero change later than given line 1

[10]

Q2.

(a) response / reaction
ignore examples
ignore action 1

- automatic or no thinking or not conscious or involuntary
ignore reference to brain
ignore quick 1
- (b) receptor (in skin of finger / hand) detects stimulus / temperature change
allow receptor detects heat ignore pain 1
- (electrical) impulses pass along neurones
allow electrical signals pass
along nerve cells
ignore messages 1
- (impulses pass from) sensory to relay to motor neurones 1
- synapse between neurones where chemical crosses gap
allow neurotransmitter / acetylcholine
for chemical
allow by diffusion 1
- (synapses) in spinal cord / CNS
ignore brain 1
- muscle contraction (to pull hand away)
or effector is a muscle 1
- (c) coordination by endocrine system is:
allow converse points if clearly
indicating nervous co-ordination
answers must be comparative
- slower 1
- longer-lasting 1
- (chemical / hormone) via blood instead of electrical / impulse / neurones 1
- (d) FSH (release from pituitary) stimulates maturation of egg / ovum / follicle
ignore reference to days of menstrual cycle
allow FSH stimulates development / growth of egg

	1
oestrogen (release from ovary) inhibits FSH production and stimulates LH production	1
LH (release from pituitary) stimulates ovulation <i>allow LH stimulates release of egg</i>	1
progesterone (release from ovary) inhibits FSH and LH production <i>allow (release from corpus luteum)</i>	1
oestrogen and progesterone maintain the uterus lining <i>allow oestrogen and progesterone build up the uterus lining</i>	1
	[16]

Q3.

(a)

$$\frac{1430}{2600} \times 100$$

1

55 (%)

1

(b) (volume) increases

allow (volume) goes up

1

(c) drink (a lot / more)

1

(d) filtration

1

reabsorption

1

excretion

this order only

1

(e) 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

Indicative content

Advantages of kidney transplant

- no need for regular / long hospital visits or is a long-term solution
- flexible lifestyle, such as can go on holidays
- may not live near a hospital or reference to transport costs
- no risk of infection from frequent needles / treatment
- less / no need to control diet
- maintains correct concentration of substances in blood / body cheaper long term for NHS / hospital

Disadvantages of kidney transplant

- may be rejected
- have to keep taking anti-rejection drugs or immunosuppressants
- (suitable) donor may not be available or need for tissue matching
- risk from surgery (e.g. anaesthesia or infection)
- recovery from surgery will take a long time
- does not last forever (therefore further surgery needed)

For Level 2, answers must refer to both advantages and disadvantages

[11]

Q4.

(a) protein 1

(b) urea is a waste (product)
allow toxic / poisonous or may damage cells or denatures proteins
ignore harmful / dangerous 1

(c) *in this order*
 respiration 1

breathing 1

(d) *in this order*

least

medium

most

3 correct = 2 marks
1 or 2 correct = 1 mark

- | | | |
|-----|--|---|
| | | 2 |
| (e) | diffusion | 1 |
| (f) | protein | 1 |
| | (molecules too) large
<i>this mark may only be awarded if mp1 is correct or not attempted</i>
<i>allow pores in membrane are too small</i> | 1 |
| (g) | 3
<i>allow three</i> | 1 |
| (h) | increases
<i>ignore numbers</i> | 1 |
| (i) | any two from:
<i>allow converse points for person A / dialysis</i> <ul style="list-style-type: none"> • has a low(er) concentration of urea • constant urea concentration / level
<i>allow substance (if named must be correct)</i> • less time attached to machine or fewer hospital visits • no / less restriction on travel • not piercing skin repeatedly • less chance of infection / blood clots • cheaper in the long term
<i>ignore cheaper unqualified</i> • no restrictions on diet | 2 |
- [13]

Q5.

- | | | |
|-----|---|---|
| (a) | pituitary | 1 |
| (b) | ADH | 1 |
| (c) | <i>allow ecf for name of hormone from part (b)</i>
<i>ignore name of gland</i> | |

high(er) concentration of blood causes (more) ADH / hormone

release

*allow low(er) water potential of blood
causes (more) ADH / hormone release
allow alternative descriptions in terms of
- eg low(er) water concentration / level
or high(er) osmotic pressure or high(er)
solute concentration / level*

1

(and hormone / ADH causes) increased permeability of kidney tubules (to water)

*allow increased permeability of
collecting duct / distal convoluted tubule*

1

(so) increased water reabsorption

*allow more water taken back into blood
ignore reference to urine*

1

(d)

*allow converse if clearly describing
dialysis
explanation must match reason*

changes in concentrations / levels of substances / urea are minimised

*allow no change in concentration / level
of substances / urea
allow correctly named substances*

1

(so) less / no chance of causing damage to body cells / tissues

*allow eg less / no osmotic stress or not
poisoned by urea*

1

not repeatedly puncturing skin or blood not in contact with machine

allow blood does not leave the body

1

(so) less / no chance of infection or less / no chance of blood clots or no need to take anti-clotting drugs

*allow less / no chance of
microorganisms entering body
allow only one operation so less chance
of infection for 2 marks
allow dialysis requires anti-clotting
drugs and so may lose more blood if cut
for 2 marks*

1

[9]

Q6.

(a)

ignore incorrect organ secreting insulin / glucagon

(blood glucose increases after meal causing) insulin secretion
allow (blood glucose increases after meal causing) insulin increase

1

insulin causes glucose to enter cells / liver / muscles

1

(insulin causes) glucose conversion to glycogen

1

allow glucose converted to glycogen in cells / liver / muscles for 2 marks

(so) blood glucose decreases causing glucagon secretion
allow increase in glucagon when blood glucose is low

1

glucagon causes glycogen to be converted to glucose

1

(b) cells / liver / muscles absorb less glucose

*allow cells / liver / muscles convert less glucose to glycogen
do not accept no absorption / conversion of glucose*

1

(so) glucose concentration in blood remains high
allow (so) glucose concentration in blood does not decrease

1

(high blood glucose stimulates / causes) pancreas to release more insulin

allow more insulin is released from pancreas to 'try' to reduce blood glucose

1

(c) any three from:

- age
- height and mass
- *allow BMI*
- proportion of males and females or group size
- *allow sex of the participants*
- (same) severity of diabetes
- (same) activity (during investigation)
- (same) type of meal
- dose of drug
- (similar) blood glucose concentrations at start

allow how much / type of food / drink

- no information about control variables or named e.g.
- concentration of drugs not given / may differ
- so results may not be valid

for level 3 an inclusion of a discussion of significance is required

[18]

Q7.

(a) to allow implantation of the embryo

1

(b) oestrogen

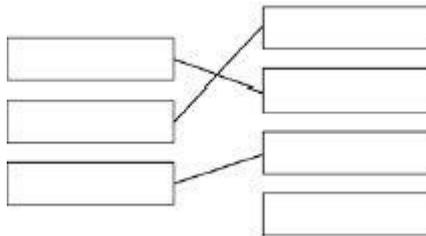
1

(c) 13 / 14 / 15 / 16

*allow any number in range 13 to 16
allow any range within these values e.g.
14-16*

1

(d)



extra line from a method cancels the mark

1

1

1

(e) more reliable than diaphragm / spermicidal cream

*allow fewer pregnancies than
diaphragm / spermicidal cream*

1

low chance of pregnancy

*allow only 1 more pregnancy than the
pill (per 100 women per year)
allow almost as good as the pill
allow reference to one named example*

1

no side effects

*allow easy to get / buy
allow easy to use
allow prevent / reduce spread of STDs /
gonorrhoea / HIV
ignore cost*

1

Q8.

- (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) 1
allow denatured (by acid)
- (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
an answer of 7.4 scores 2 marks 1
- (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
allow converse comparisons with person B as the subject 1
- (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 <i>allow examples of exercise</i>	1
		[10]
Q9.		
(a)	2400 and 2280 or 500 and 380	1
	120	1
	<i>an answer of 120 scores 2 marks</i>	
(b)	respiration of glucose	1
(c)	(more) sweating <i>ignore reference to vasodilation / vasoconstriction</i>	1
	(because) exercise releases heat or need to cool the body or need to lose heat or need to maintain body temperature <i>do not accept energy being produced</i>	1
(d)	more energy needed <i>do not accept energy production do not accept energy needed for respiration</i>	1
	(so) more (aerobic) respiration	1
	(so) increased breathing (rate / depth) (to supply oxygen or remove carbon dioxide / water) <i>'more' does not need to be stated a second time to gain marking point 1 and marking point 2</i>	1
		[8]

Q10.

(a)	A	1
(b)	E	1
(c)	28 <i>allow 27-29</i>	1
(d)	progesterone	1
(e)	any two from: <ul style="list-style-type: none"> • • inhibits FSH production / release prevents egg maturation <i>allow prevents egg growth</i> • prevents ovulation <i>allow prevents egg release</i> <i>ignore prevents egg production</i> 	2
(f)	oestrogen	1
	testosterone <i>allow in this order only</i>	1
		[8]

Q11.

(a)	(molecules are) (too) large cannot pass through (filtration) membrane / (holes in) filter allow 'is not filtered out of the blood'	1 1
(b)	glucose is reabsorbed <i>ignore 'is absorbed' unless qualified by 'into blood'</i> <u>all</u> of it	1 1
(c)	(molecules / ions) small so pass through filter or not all is reabsorbed <i>allow the body needs to maintain the right balance of ions and urea in the blood</i> <i>ignore 'are filtered' unqualified</i>	1

more water reabsorbed on a hot day

1

due to more water lost in sweat

'more' needed at least once to gain both marks

1

(d) 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):

A judgement, supported by some relevant reasons is given.

Level 1 (1-2 marks):

Relevant points are made. If there is a judgement, this is asserted, but not logically linked to the points made.

No relevant content (0 marks)

Indicative content

pro transplant:

- (dialysis requires repeated treatments to prevent) build-up of toxins
or
to prevent raised blood pressure between sessions
- inconvenience of dialysis, e.g. long sessions of immobility or repeated hospital visits
- (dialysis requires restricted diet) to prevent build-up of urea / ions
- there is a greater risk of infection with dialysis e.g. repeated puncturing of skin or use of non-sterile equipment allows entry of microorganisms
- there is a risk of blood clots with dialysis
- dialysis more expensive in the long term / 2+ years
or
examples given e.g. 2 yrs dialysis = £60 000 compared with 2 yrs after transplant
= (£51 000 + £5 000) = £56 000
- transplant is a long term treatment or may remain healthy for many years

con transplant:

- shortage of kidney donors leading to long waiting time
- requires death of another person or live donation leaving a person with just one kidney
- exploitation of poor people for donor kidneys (paying for organs)
- need to match tissue type
- rejection – role of wbc's / lymphocytes
- need immunosuppressant drugs – susceptibility to infection
- dangers of surgery – physical damage / infection / brain damage from anaesthetic
- high initial cost – limited funding (either personal or NHS / CCG)

[13]

Q12.

(a) any three from:

- a (chemical) messenger
or
an organic substance
allow correct named example – e.g. protein / modified amino acid / catecholamine / steroid
- made by the endocrine system / an endocrine gland / endocrine organ
allow made by / released from a (ductless) gland
- affects (a) specific / target organ(s) / tissue(s)
- released into the blood
allow carried by the blood

3

(b) insulin and glucagon

both required for 1 mark correct spelling only for glucagon

1

(c) Level 2 (3-4 marks):

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

Level 1 (1-2 marks):

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

No relevant content (0 marks)

Indicative content

- (0–0.5 h:) glucose from meal enters blood
or
increase in blood glucose (to 6.5 mmol / dm³)
- glucose detected by pancreas
- pancreas secretes insulin
- (insulin causes) glucose to move (out of blood) into cells / liver
- liver converts glucose to glycogen
- causing a fall in blood glucose (after 0.5h)
- low blood glucose (< 5.0 mmol / dm³) detected by pancreas
- pancreas releases glucagon
- liver converts glycogen to glucose (which enters blood)
- blood glucose rises (after 1 h or to 5.2 mmol / dm³ (at 1.5 h))

[8]

Q13.

(a) liver

1

- (b) insulin
do not accept glucagon 1
- (c) kidney 1
- (d) to replace water / ions / salt 1
(that is) lost in sweat 1
- [5]

Q14.

- (a) A – pituitary 1
B – adrenal 1
- (b) ovary 1
- (c) diaphragm
allow phonetic spelling 1
- (d) condom 1

- (e) Level 2 (3–4 marks):
A detailed and coherent evaluation is provided which considers a range of advantages and disadvantages and comes to a conclusion consistent with the reasoning.
Level 1 (1–2 marks):

An attempt to describe the advantages and disadvantages is made, which may not come to a conclusion. The logic may be inconsistent at times.

0 marks:

No relevant content.

Indicative content

advantages of the plastic IUD:

- is effective for longer than the copper IUD
- does not need to be replaced as often as the copper IUD
- although the pain of periods are more severe, the pain with the copper IUD is likely to be worse
- can reduce the bleeding during a period
- most of the possible side effects are not serious, eg feeling sick,

acne and headaches.

disadvantages of the plastic IUD:

- needs to be implanted for a period of time before it is effective ie not
- emergency contraception
- can make the pain of period more severe
- can cause more side effects than the copper IUD
can cause some more severe side effects such as cysts on the ovaries

an understanding that the side effects are only possible and may not necessarily occur
additional examiner guidance:

- pupils should add value to the points in the table and should not just be copies verbatim
- credit can also be given for other correct advantages and disadvantages from the candidates' own knowledge and understanding
- allow converse points if clearly made

4

[9]

Q15.

(a) if too high insulin released from pancreas

1

so glucose is moved into cells

allow glucose is stored

1

if too low, glucagon is released (from pancreas)

1

causes glycogen to be converted to glucose and released into the blood

1

(b) type 1 not enough / no insulin produced

1

whereas type 2 cells do not respond to insulin

1

type 1 is treated with injections of insulin

1

whereas type 2 is treated with diet and exercise

or

loss of weight

or

drugs

1

(c) $(3.45 \times 10^6) + (5.49 \times 10^5) = 3.999 \times 10^6$

or

$3\ 450\ 000 + 549\ 000 = 3\ 999\ 000$

allow 3.999×10^6 or 3 999 000 with no working shown for 1 mark

1

$$\frac{3.999 \times 10^6}{6.5 \times 10^7} \times 100$$

or

$$\frac{3\,999\,000}{65\,000\,000} \times 100$$

= 6.15

allow 6.15 with no working shown for 2 marks allow for 1 mark for a calculation using either:

$$\frac{3.999 \times 10^6}{6.5 \times 10^7}$$

or

$$\frac{3\,450\,000}{65\,000\,000}$$

or

$$\frac{5.49 \times 10^5}{6.5 \times 10^7}$$

or

$$\frac{549\,000}{65\,000\,000}$$

1

6.2

allow 6.2 with no working shown for 3 marks

1

allow ecf from second step correctly rounded for 1 mark

- (d) could be other reasons for glucose in urine
 or
 blood test gives current / immediate result, urine levels might be several hours old
 or
 not always glucose in urine

1

- (e) results not affected by glucose from food
 or
 8 hours is sufficient time for insulin to have acted on any glucose from food eaten
 or
 so that there is a low starting point to show the effect

1

- (f) (patient A)
no mark for identifying A

glucose level much higher (than B) 1
and remains high / does not fall 1
[15]

Q16.

- (a) Too much thyroxine is released into the blood 1
which raises BMR 1
causing increase in formation of glycogen / lipids / proteins
or
increase in rate of respiration
or
increase in breakdown of excess proteins 1
- (b) FSH causes eggs to mature and stimulate ovaries to produce oestrogen 1
LH stimulates the egg to be released 1
- (c) (missing a dose causes a) dip / drop in progesterone levels 1
(therefore) FSH is not inhibited anymore 1
(therefore) LH is not inhibited anymore 1
(and consequently) an egg is matured and released
allow (and consequently) an egg is available to be fertilised 1
[9]

Q17.

- (a) (i) follicle stimulating hormone / FSH 1
(ii) oestrogen 1
- (b) (i) any one from:
• to help them have a baby / get pregnant
• *ignore to make them fertile*
• to stimulate egg production / release / maturation
own levels of FSH / LH / hormone (too) low
allow to increase hormone / FSH / LH levels

do not allow to increase oestrogen levels

- | | | | |
|------|-------------------------|---|-----|
| | | 1 | |
| (ii) | through the bloodstream | 1 | |
| (c) | oestrogen | 1 | |
| | progesterone | 1 | |
| | | | [6] |

Q18.

- | | | | |
|-----|---|---|-----|
| (a) | ovary | 1 | |
| (b) | 46 | 1 | |
| (c) | (i) does not fit the pattern
or
it is higher than the 3rd value / it should be lower than the 3rd value / it should be between the 3rd and 5th values
<i>do not allow use of incorrect figures</i> | 1 | |
| | (ii) As age increases % of women (having a baby) decreases | 1 | |
| (d) | (i) 33

$\frac{66}{2}$
<i>allow 1 mark for</i>
<i>if no answer / wrong answer</i> | 2 | |
| | (ii) low success rate

more likely to have a baby with health problems / abnormalities / a faulty chromosome | 1 | |
| | | | [8] |

Q19.

- | | | | |
|-----|---|---|--|
| (a) | (i) pancreas | 1 | |
| | (ii) Insulin causes glucose to move into cells. | 1 | |
| (b) | (i) A | 1 | |

- rapid rise or fastest 1
- (ii) 2 1
- (c) The pancreas could be rejected. 1
- [6]

Q20.

- (a) immune system
- allow white blood cells / lymphocytes*
ignore phagocytes 1
- produces antibodies 1
- (which) attack the antigens on the transplanted organ / pancreas
allow transplanted organs have foreign antigens at start of explanation and linked to attacking the organ 1
- (b) (i) change / rise detected by the sensor 1
- information used to calculate how much insulin she is going to need (bring her blood glucose back to normal) 1
- (pump delivers) insulin into the blood 1
- (causing) glucose to move into cells
allow (liver) converts glucose to glycogen 1
max 2 if no ref. to artificial pancreas
- (ii) any one from:
 - it is more accurate or less chance of human error
 - (glucose) level will remain more stable or no big rises and falls in blood sugar levels
 - you don't forget to test and / or inject insulin
 - if ill or in coma insulin is still injected*ignore continuous and automatic unqualified* 1
- [8]