

Mark schemes

- 1** (a) liver 1
- (b) insulin 1
do not accept glucagon
- (c) kidney 1
- (d) to replace water / ions / salt 1
(that is) lost in sweat 1
- [5]**
- 2** (a) detect changes in surroundings **or** detect stimuli 1
allow any named stimulus for skin
- convert information to impulse 1
allow send impulse to sensory neurones / brain
- (b) (i)
- | | |
|--------|---|
| muscle | contract(ion) |
| gland | release / secrete /
produce chemical /
hormone / enzyme |
- 1 mark for each effector*
1 mark for each response
response must match type of effector (if given)
ignore examples
ignore relax(ation) / movement for contraction
do not allow expansion for muscles 4
- (ii) any **one** from: 1
- (maintain temperature at which) enzymes work best
 - so chemical reactions are fast(est)
 - prevent damage to cells / enzymes
- allow prevent enzymes being denatured (by temperature being too high)* 1
- [7]**

3 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 apply a 'best-fit' approach to the marking.

0 marks

No relevant content.

Level 1 (1 – 2 marks)

There is a description of thermoregulation **or** at least one correct mechanism (skin, sweat glands or muscles) but roles may be confused.

Level 2 (3 – 4 marks)

There is a description of thermoregulation **or** some correct mechanisms (sweating, shivering, blood flow in the skin).

Level 3 (5 – 6 marks)

There is a clear description of thermoregulation by TC or skin **and** some correct control mechanisms.

examples of biology points made in the response:

full marks may be awarded for detailed description of what happens if the core temperature is either too high or too low

- temperature receptors in TC
- the TC detects (core) body / blood temperature
- temperature receptors in the skin send impulses to the TC, giving information about skin temperature
- if the core body temperature is too high: blood vessels / arterioles supplying the skin capillaries dilate / vasodilation

***do not** accept refs to veins instead of arterioles or answers that imply blood vessels have moved up / down through the skin.*

- so that more blood flows (through the skin) and more heat is lost
- sweat glands release more sweat to cool the body
- by evaporation
- if the core body temperature is too low: blood vessels supplying the skin capillaries constrict
- to reduce the flow of blood (through the skin) and less heat is lost

allow idea of blood diverted to vital organs in extreme cold

- muscles may shiver to release (heat) energy
- from respiration, some of which is lost as heat

[6]

4 (a) (i) 400

correct answer = 2 marks with or without working

$$2600 - (1500 + 600 + 100)$$

or

$$2600 - 2200$$

for 1 mark

- (ii) LHS: glucose
accept $C_6H_{12}O_6$ / $C6H12O6$ / *sugar* 1
- RHS: carbon dioxide
accept CO_2 / $CO2$
do not accept CO^2 / CO 1
- (iii) (sweat) increase 1
- (urine) decrease 1
- (b) (i) 66.7 / 66.67 / 66^{2/3} / 66. $\dot{6}$ / 67
accept answers in range
correct answer = 2 marks with or without working
or
 $\frac{20}{0.3}$ for 1 mark
or 66 / 66.6 / 66.66 / 66. $\dot{6}$ / 67.0 for 1 mark
(penalise excessive number of sig. figs. -1 mark) (eg no more than 2 decimal places) 2
- (ii) reabsorption of water by the kidney 1
- (iii) (protein) (too) big 1
- cannot pass through filter / stays in blood / cannot enter kidney tubule 1
- (glucose) small / can pass through filter 1
- all taken back into blood / all reabsorbed
allow the glucose is reabsobed 1

(c) any **four** from:

- transplant is permanent / dialysis is repetitive treatment / dialysis only short term
- kidney works all the time / dialysis intermittent
- concentrations in blood kept (\pm) constant / substances build up in blood between dialysis sessions
- poisoning / damage to body by build-up of substances (with dialysis)
- danger of infection / damage to blood vessels by needles (with dialysis)
- risk of blood clots with dialysis or anticlotting drugs (can lead to blood loss)
- long term expense of dialysis / excessive use of health service resources
- social point – inconvenience of dialysis described – can eat or drink without constraint with transplant

4

[17]

5

(a) microorganisms

allow microbes / bacteria / fungi / decomposers

1

(microorganisms) respire

*do **not** allow dead plants respire*

1

(respiration / decay / microorganisms) releases (thermal) energy / 'heat'

ignore produce 'heat'

*do **not** allow produce energy*

*do **not** allow dead plants release 'heat'*

1

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

- (opening) allows oxygen in
- microorganisms / eggs need oxygen
allow air for oxygen
- oxygen needed for respiration
- (opening) allows release of carbon dioxide (from microorganisms / respiration / eggs)
allow gaseous exchange (1 mark) of / for microorganisms / eggs (1 mark) if none of first four points given
- (opening) allows energy / 'heat' to escape
- (closing) retains energy / 'heat' if too cool / at night
*if no mark awarded for either of these points allow 1 mark for vents open in the day to prevent overheating **and** close at night to prevent it getting too cold*
- (closing) retains moisture
allow (opening) releases moisture

3

- (ii) any **one** from:
- maintains sex balance
e.g. equal / best / correct numbers of male and female
 - (survival of species depends on there being) males and females in population
allow so the offspring are not all the same sex

1

[7]

6 (a) brain

in correct order only

1

blood

1

sweat

1

(b) (i) A

1

(ii) to replace ions lost (in sweat)

accept salts

allow named examples, eg. prevent cramps

1

(iii) any **one** from:

- there is too much glucose / sugar in the sports drink
- they shouldn't have too much glucose / blood sugar
- it would cause their blood glucose / sugar to rise (too high)

1

[6]

7 (a) (i) (37C is the same as human) body temperature

1

(ii) any **one** from:

- urea
- glucose
- sodium

ignore water

1

(iii) (as they are) small enough to pass through (the membrane)

allow because there is a high concentration in the fake blood and a low concentration in the water (so will diffuse across)

1

(iv) glucose

1

(b) any **two** from:

- don't have to go to hospital **or** done at home rather than hospital
- less effect on lifestyle / can be mobile
- always filtering urea out
continuous is insufficient
- don't need a medical professional (to do it for you)
allow takes a shorter time
allow does not have to be connected to blood vessels
ignore 'less painful'

2

[6]**8**

(a) (i) defence against **or** destroy pathogens / bacteria / viruses / microorganisms

- do **not** allow 'destroy disease'*
- accept engulf pathogen / bacteria / viruses / microorganism*
- accept phagocytosis*
- accept produce antibodies / antitoxins*
- allow immune response*

1

(ii) they are small fragments of cells

1

(b) liver

in this order only

1

kidney(s)

1

(c) any **two** from:

- that it doesn't cause an immune response **or** isn't rejected / damaged by white blood cells
- whether it is a long lasting material / doesn't decompose / corrode / inert
- if it is strong (to withstand pressure)
- it will open at the right pressure
- that it doesn't cause clotting
- that it doesn't leak **or** it prevents backflow
- non toxic

ignore correct size

2

[6]**9**

(a) (i) 1 hour 15 mins / 1.25 hours / 75 mins

allow 1:15

ignore 1.15 hours

1

- (ii) increase in (core / body) temperature
ignore numbers 1
- (due to an) increase in respiration **or** more muscle contraction 1
- releasing energy (as a waste product)
allow produces 'heat'
*do **not** allow making energy* 1
- skin temperature decreases 1
- (because there is) sweating 1
- (which) evaporates and cools the skin
ignore references to vasodilation or vasoconstriction 1
- (iii) (there is) dilation of vessels (supplying skin capillaries)
allow vasodilation
allow blood vessels widen
ignore expand
*do **not** accept dilating capillaries or moving vessels* 1
- (so) more blood flows (near skin) (surface) **or** blood is closer (to the skin)
ignore ref to heat 1
- (c) pancreas detects (low) blood glucose 1
- produces glucagon
*do **not** allow glucagon made in the liver* 1
- (so) glycogen is converted to glucose
allow adrenaline released which increases conversion of glycogen to glucose
or
reduced insulin production so less glucose into cells / less glucose converted to glycogen
for 1 mark 1

[12]

10

- (a) (i) **A** – pituitary
allow hypothalamus 1

B – ovary / ovaries

1

(ii) in blood (stream)

accept in plasma

ignore dissolved

1

(b) (i) FSH and Luteinising Hormone (LH)

1

(ii) fertilised

OR

reference to sperm

1

form embryos / ball of cells or cell division

1

(embryo) inserted into mother's womb / uterus

allow (fertilised egg) is inserted into mother's womb / uterus

1

(iii) any **one** from:

- multiple births lead to low birth weight

- multiple births cause possible harm to mother / fetus / embryo / baby / miscarriages

allow premature

ignore reference to cost / ethics / population

1

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

- almost identical

allow S (slightly) more successful

- both approximately 20%

1

(ii) larger numbers (in clinic R) (in 2007)

allow only 98 (in S) (compared to 1004 (in R))

1

results likely to be more repeatable (in 2008)

allow more reliable

*do **not** accept more reproducible / accurate / precise*

1

[11]

11

(a) pancreas

apply list principle

1

(b) (i) protein
apply list principle 1

(ii) any **one** from:

- (controlling / changing) diet
*accept sugar(y foods) / named eg
ignore references to starch / fat / protein / fibre*
- 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)

*eg max at ages 65–74 **or** 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
accept quotes from scale eg '130' or '130 per thousand' but **not**
'130 thousand'; to within accuracy of +/- 2 (per thousand)*

1

(ii) (between 0 and 64) more females (than males) **or** less males (than females)
*ignore numbers
allow eg females more diabetic than males*

1

(over 65) more males (than females) or less females (than males)
allow eg males more diabetic than females

1

[8]

12

(a) Pancreas
allow phonetic spelling

1

(b) any **three** from:

max 2 if any one process goes on in wrong organ

- (amino acids) broken down
- (amino acids) form urea
- (amino acids broken down / converted **or** urea formed) in liver
- (urea / broken down amino acids) removed / filtered by kidney
do not allow amino acids filtered / removed by kidney
- (urine / urea / broken down amino acids) stored / held in bladder
do not allow amino acids stored / held in bladder

3

[4]**13**

(a) a higher concentration would be difficult to stir

1

(b) (i) methane

1

(ii) 60

100 - (5 + 35) but incorrect answer allow 1 mark

2

(c) (i) aerobic respiration

1

(ii) oxygen

1

[6]**14**

(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]**15**

(a) (i) without oxygen

ignore reference to 'air'

1

- (ii) otherwise difficult to stir / to pump / to transfer
allow prevent 'clogging' owtte 1
- (iii) need to stir / pump / heat 1
- (b) (i) rises then falls 1
- then levels / slight rise 1
- quantitative descriptor
- e.g. to 80% / max. on day
4 / min. on day 16
accept other valid quantitative descriptor
allow accuracy $\pm \frac{1}{2}$ small square 1
- (ii) 16 (15.5 to 16.4) 1
- (c) any **two** from:
- oxygen present
 - (CO₂ produced) by aerobic respiration
or not much anaerobic respiration
 - **not** much methane / CH₄ produced
- 2 [9]
- 16** (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 < pore diameter

1

[8]**17**

(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 $- \frac{1}{2}$ 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 $\frac{1}{2}$ square ignore width

1

(v) cells swell / overhydrated /
 damaged

accept poisoned (by urea)

1

[11]

- 18** (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 1
- if 'diet' is qualified, then will need correct qualification, e.g. 'less carbohydrate / sugar'*
accept pancreas transplant / stem cell treatment 1
- 19** (a) if body temperature too high blood vessels supplying skin (capillaries) dilate / widen
do not accept capillaries / veins dilate/constrict 1
- if body temperature is too low blood vessels supplying skin (capillaries) constrict / narrow
do not accept idea of blood vessels moving (through skin) 1
- ignore expand*
accept arteries / arterioles for 'blood vessels'
if no reference to skin allow blood vessels dilate and blood vessels constrict for one mark
- so more / less blood flows through skin (capillaries) or nearer the surface of the skin
must correctly relate to dilation or constriction 1
- so more / less heat is lost (from the skin by radiation)
must correctly relate to dilation or constriction 1
- (b) sweat released 1
- cannot evaporate because of high humidity / all the water vapour in the air 1

[6]

so less heat lost / less cooling

or

it is evaporation of sweat that cools the body

1

[7]

20

- (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

[7]

21

- (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]

22

(a) Y - spinal cord / central nervous system / CNS

*do **not** accept spine*

ignore nerve / nervous system / coordinator

ignore grey / white matter

1

W - receptor / nerve ending

ignore sensory / neurone / stimulus

1

X - effector / muscle

allow gland

1

(b) any **two** from: eg
accept reverse argument for each marking point

- reflex action quicker
- effect of reflex action over shorter period
- hormone involves blood system and reflex involves neurones / nerve cells
ignore nervous system / nerves
- reflex involves impulses and hormone involves chemicals
- reflex action affects only one part of the body
ignore involves brain
ignore outside / inside stimuli

2

[5]**23**

(a) (i) the lower the temperature the shorter the time
a trend is required
accept reverse

or

the lower the temperature the more chance of frostbite
accept the lower the temperature the faster you get frostbite
*accept positive correlation but **not** directly proportional*
ignore wind speed

1

(ii) any value from 5 to below 10
*do **not** accept 10*
*allow less than 10 **or** < 10*

1

(b) Muscles 'shiver'
if more than two boxes ticked deduct 1 mark for each additional tick

1

Blood vessels supplying the skin capillaries constrict

1

[4]**24**

(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 increased 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

ignore cholesterol or balanced / healthy diet

• exercise

ignore keep fit / healthy

• (pancreas) transplant / stem cells / genetic engineering

2

[5]**25**

(a) 0.18

award both marks for correct answer irrespective of working

if no answer or incorrect answer

*allow **1** mark for $45 \times 100 / 25000$*

2

(b) heat / thermal

allow heat from respiration

1

(c) energy / mass / biomass lost / not passed on **or** energy / mass / biomass is used **or** not enough energy / mass / biomass left

ignore reference to losses via eg respiration / excretion / movement / heat

1

a sensible / appropriate use of figures including heron

eg only 2 from frog / to heron

ignore units

1

(d) any **three** from:

accept marking points if candidate uses other terms for microorganisms

- (microorganisms) decay / decompose / digest / breakdown / rot
ignore eat
- (breakdown) releases minerals / nutrients / ions / salts / named
ignore food
- (microorganisms) respiration
ignore other organisms respiring
- (microorganisms / respiration) release of carbon dioxide

3

[8]

26

(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 initial cost

2

[6]

- 27** (a) proteins are not filtered 1
- glucose is filtered and (re)absorbed
allow glucose (completely) reabsorbed 1
- ions are filtered and some (re)absorbed
allow some ions are reabsorbed 1
- urea is filtered [and some / none (re)absorbed]
allow some / no urea is reabsorbed 1
- (b) more / a lot of sweating occurred
accept converse arguments for cold day 1
- more / a lot of water loss (by sweating) 1
- more / a lot of water reabsorption / more water absorption by the kidney 1
- lower volume of urine
allow less urine / less water in urine 1
- [8]**
- 28** (a) too cold / very cold **or** oxygen / microbes cannot reach it
allow not enough energy / heat / warmth
ignore frozen 1
- for microorganisms / microbes / bacteria / fungi / enzyme / reaction (to work)
ignore other consumers 1
- (b) no longer exist
or no more left
or died out / all died
ignore died unqualified 1
- (c) (i) egg cell 1
- (ii) nucleus 1

- (iii) given an electric shock 1
- (iv) womb 1
- (d) has mammoth genes / chromosomes
accept genetic information / DNA / alleles / nucleus
accept converse 1

[8]

29

- (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]

30

- (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 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]

- 31** (a) in rainforest:
accept converse
 (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 heat loss
 1
- [4]**
- 32** (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]

33

(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]

34

(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]

35

(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

 $6/2 = 3$ 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]

36

(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

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]

37

(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]

38

(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]

39

(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]

40

(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*

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 (cm³)

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 (cm³) of water = 1 mark

drink / take in 200 (cm³) of water = 2 marks

ignore references to exercise / sweat

1

[5]**41**

- (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

[8]

42

(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:

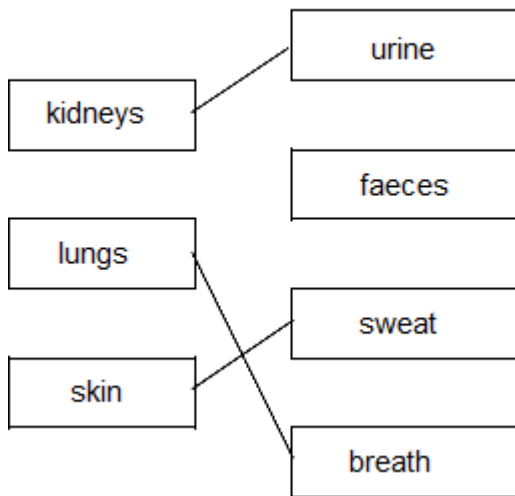
- rejection / described **or** need to use immunosuppressants **or** need to take drugs for life
allow may need later replacement
- susceptible to other infections
- hazards of operation / anaesthetic
- shortage of donors / match
- high initial cost

2

[8]

43

(a) **Body part** **Substance**



*1 mark per correct line
extra line from a body part cancels the mark*

3

(b) (i) 1800 cm³

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]

44

(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]

45

(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 / CO₂ released

2

[7]

46

(a) (i) pancreas

allow phonetic spelling

1

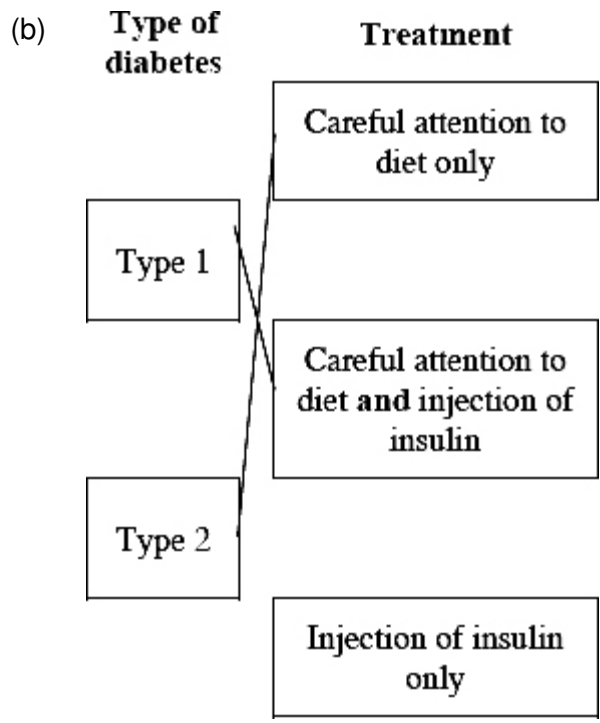
(ii) (increases movement of) glucose into cells / organs / named

allow (glucose) converted to glycogen / fat

allow (glucose) used in (increased) respiration

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

1



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

3

[9]

47

(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]**48**

(a) (i) protein

1

(ii) (protein molecules too) large

1

cannot pass through filter **or** can't leave blood **or** can't 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

orwaste passes from high to low concentration

- reference to equilibrium (between plasma & dialysis fluid)
accept reference to counterflow to maintain concentration gradient

4

[7]**49**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]

50

(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*

(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]

51

(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]

52

(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 1
- (ii) more concentrated 1
- [6]**

53

- (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 once 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) • **filtration** of blood **or**
described re small (molecules)through / large not
ignore diffusion 1

max **four** from:

- **reabsorption** / substances taken back into blood
- (reabsorption) of all of the sugar / glucose
- (reabsorption) of some of ions / of ions as needed by body
- (reabsorption) of some of water / of water as needed by the body
- urea present in urine
accept urea not reabsorbed
- reabsorption of water by osmosis / diffusion **or** reabsorption of sugar / ions by active transport

4

[9]

54

- (a) respiration

clear indication eg tick, underlining, others crossed out

1

- (b) lungs

1

- (c) liver

1

- (d) amino acids

1

[4]

55

- (a) the sun / light / sunshine / solar

allow radiation from the sun

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

(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]

56

(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
- (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]

57

- (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)

***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]**58**

(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]

59

(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 red blood cell bursts

1

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

1

[8]

60

- (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]