Q1.

(a) releasing saliva when food enters the mouth

1

withdrawing the hand from a sharp object

1

(b) bright light

allow described method of increasing light
ignore light unqualified
allow correctly named drug e.g. morphine / heroin

1

(c) iris

1

(d) muscle contraction

allow muscles shorten
ignore radial / circular
ignore muscles relax / constrict
*do **not** accept muscles expand*
*do **not** accept ciliary muscle contracts*

1

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

4–6

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

1–3

No relevant content

0

Indicative content

- receptor detects stimulus
- e.g. receptor detects pressure
- receptor generates impulses / electrical signals

- neurones conduct impulses / electrical signals
- neurone A conducts impulses to spinal cord
- neurone A = sensory neurone
- synapse between neurones
- chemical (/ neurotransmitter) crosses synapse
- chemical stimulates impulse(s) in neurone B
- neurone B = relay neurone
- neurone C = motor neurone

- effector carries out response
- e.g. muscles of the arm / leg contract
- muscles contract **or** gland secretes chemicals

to access **level 2**, candidates need to consider, in terms of the indicative content, the receptor, the neurones and the effector in the correct sequence

[11]

Q2.

(a) 2400 **and** 2280
or
500 **and** 380

1

120

1

*an answer of 120 scores **2** marks*

(b) respiration of glucose

1

(c) (more) sweating

ignore reference to vasodilation / vasoconstriction

1

(because) exercise releases heat
or
need to cool the body
or
need to lose heat
or
need to maintain body temperature

*do **not** accept energy being produced*

1

(d) more energy needed

*do **not** accept energy production*
*do **not** accept energy needed for respiration*

1

(so) more (aerobic) respiration

1

(so) increased breathing (rate / depth) (to supply oxygen **or** remove carbon dioxide / water)

1

'more' does not need to be stated a second time to gain marking point 1 and marking point 2

[8]

Q3.

(a) times are very short / in milliseconds
or
milliseconds cannot be
measured with a stopwatch

1

(b) to increase validity / repeatability

or
to get representative results
allow to give a more reliable mean value
1

because of variation in results
allow to identify any anomalies
1

(c) (they have included) 468 / the 7th result
allow identification of anomaly in the table
1

(which) is anomalous / is a much higher value (than the others)
1

(d) $\frac{275}{259}$

1.06 (: 1)
*an answer of 1.06 (: 1) scores **2** marks*
1

*allow max **1** mark if wrong number of sig. figs.*
1

(e) 2.59×10^{-1} seconds
1

(f) any **two** from:
- cannot compare mean to **B** as it has been incorrectly calculated
- **C**'s mean reaction time is the longest, not the shortest
- only measured one type of reaction
  or
  cannot generalise to all reaction types
- other factors can influence reaction time
  allow examples

2

(g) involves (the conscious part of) the brain
allow voluntary (re)action
1

[11]

Q4.

(a) red blood cell
1

(b) 44
1

(c) retina
1

(d) **7** and **8** / the parents
do not have **A** (allele)
or only have **a** (allele) **or** are **aa**
*allow converse – if parents had an **A** (allele) they would have Stickler syndrome*

1

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

or

the parents show the recessive characteristic

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

1

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

1

derivation of offspring genotypes
allow ecf

1

identification of **Aa** offspring as Stickler

1

probability = 0.25 / $\frac{1}{4}$ / 1 in 4 / 25% / 1:3
*allow ecf – e.g. 0.5 if **12 = AA***
*do **not** accept 3:1*
*do **not** accept 1:4*

1

[9]

Q5.

(a) less sweating so less water loss

1

(as) no / little water available in desert

1

(b) (fat store) can be metabolised / respired to water

1

(little urine…) conserve water

1

(hard mouth) not damaged by spines on plants / on food
or
not damaged by hard / dry food

1

(c) dromedary / *C.dromedarius*
and bactrian / *C. bactrianus*

no mark for the names, but must be identified

because

same genus

ignore 'both are Camelus'

1

(d) any **two** from:

- the fossil record
- oldest fossils in N. America

or

- newer fossils in S. America / in Asia / in Africa

*allow numbers for ages (45 Mya **and** 3 Mya / 6 Mya)*

- chemical / DNA analysis of living species

allow radioactive dating of fossils

2

(e) isolation of separate camel populations by sea

or

by mountains

1

habitat variation / described between populations

allow examples – biotic (e.g. food / predators) or abiotic

1

genetic variation / mutation in each population

1

45 million years is sufficient time to accumulate enough mutations

1

natural selection

or

better adapted survive to reproduce

1

pass on favourable allele(s)

allow gene(s)

1

[14]

Q6.

(a) any **two** from:

- drop the ruler from the same height
- use the same / dominant hand each time
- thumb same distance from ruler at the start
- use same type / weight of ruler
- drop the ruler without any force each time
- keep arm resting on the edge of the table

2

(b) 8

allow 8.0

1

(c) 2 (in test number 2)

1

(d) 12

1

(e) (12 + 13 + 13 + 9 + 8 / 5 =) 11

1

(f) 0.15 − 0.12 (s)

1

0.03 (s)

*allow 0.03 (s) with no working shown for **2** marks*

1

(g) carry out more repeats

1

(h) caffeine speeds up reflex actions
or
reduces reaction time

1

[10]

Q7.

(a) pupils dilated (at **B**)

*allow converse for **A***

1

in dim light / low light levels

1

because circular muscles (in iris) relax

1

(and) radial muscles contract

1

(b) figure 2 shows myopia where light does not focus on the retina

allow refraction

1

in figure 3 the lens bends the light so that light focuses on the retina

1

[6]

Q8.

(a) any **two** from:

- drop the ruler from the same height each time
- let the ruler drop without using any force
- same type / weight of ruler
- thumb should be same distance from the ruler each time at the start
- use the same hand to catch the ruler each time
- carry out the experiment with the lower arm resting in the same way on the table

allow description of holding bottom edge of ruler opposite the catcher's thumb

2

(b) 117

1

(c) $\sqrt{\frac{11.6}{490}}$

1

0.1539

*allow 01539 with no working shown for **2** marks*

1

0.154

*allow 0.154 with no working shown for **3** marks*

1

allow ecf as appropriate

(d) no indication beforehand when the colour will change
or
you might be able to tell when the person is about to drop the ruler

1

measurement of time is more precise (than reading from a ruler)
or
resolution (of computer timer) is higher

1

(e) cerebral cortex

allow cerebrum

1

ignore identified lobes

(f) cerebellum

1

[10]

Q9.

(a) (i) 2400 cm^3

1

(ii) 1400 (cm^3)

*allow **2** marks for ecf of correct answer to [answer given in (a)(i) – 1000]*

*allow **1** mark for 2400 – (600 + 400) or equivalent with no or incorrect answer*

*allow **1** mark for ecf of answer given in (a)(i) – 1000 or equivalent with no or incorrect answer*

2

(b) (i) sweat(ing)

allow evaporation

allow perspiration

1

(ii) any **one** from:
- for cooling
- to maintain body temperature

1

(c) (i) More water was lost through the skin.

1

(ii) decrease

1

[7]

Q10.

(a) (i) receptor cells

1

(ii) eye(s)

accept retina

1

(b) (i) any **one** from:
- gender / sex
- quality of eyesight

eg wearing glasses
- eg of factor that might affect reaction times

eg alcohol consumption / distractions / tiredness / health / time of day / amount of practice (at this test)

do not allow time / age

1

(ii) 182

allow 182.0

1

(iii) Any anomalies can be identified.

1

(iv) reaction time (too) long **or** reactions (too) slow

1

allow reaction time (too) slow

*allow examples of data quoted **or** derived from the table, eg (mean) reaction time for 90 year olds is 162 ms longer than for 75 year olds*

(so) more likely to have / cause an accident

1

[7]

Q11.

(a) receptors detect / sense stimuli / change in surroundings **or** convert stimulus into an impulse

ignore send impulses to brain / spinal cord

1

example of a receptor

allow any appropriate organ or part of an organ, eg eye / retina or named type of receptor eg light receptor

1

effectors allow / make response **or** convert an impulse to an action

ignore receive impulses from brain / spinal cord

1

(effector) muscle / gland

allow an example

ignore eg arm / leg

1

(b) (i) junction

allow idea of a (small) gap / space

*do **not** allow if implication is that the neurones move*

1

between neuron(e)s

allow named types of neurones

1

(ii) chemical

allow answers in terms of specific types of neurone

allow neurotransmitter / named neurotransmitter released

1

any **one** from:

- (chemical released) from one neurone
  ignore produced
- (chemical) passes (across synapse) to next neurone to stimulate / cause (electrical) impulse
  allow diffuses for passes (across)

1

(c) (i) skin

ignore hand / leg

1

(ii) 1.6 (cm per millisecond)

allow 2 if evidence of rounding up of 1.6

1

(iii) any **two** from:

ignore length of neurones

- synapses slow down transmission / impulse
  allow idea of movement of chemical being slower than electrical impulse
- fewer synapses (via brain)
  *allow one synapse compared to two **or** only one synapse*
- (therefore) fewer delays
  allow impulse travels more slowly in relay neurones

2

[12]

Q12.

(a) (i) The person started running a race.

1

(ii) 2300

1

(iii) drinking (water / sports drink)
or
through eating

1

(b) (i) brain

1

(ii) receptors

1

(c) cools us down
allow evaporates

1

[6]

Q13.

blood vessels supplying skin

1

constrict
allow vasoconstriction
*do **not** allow capillaries /veins constricting*
*do **not** allow moving blood vessel*

1

less blood flow (to / through capillaries / to skin)
allow blood flows further away from skin surface

1

so less energy is lost (to the surroundings)
allow less heat is lost

1

'shivering' by muscle (contraction)
allow muscles contract (and relax) rapidly

1

releasing energy **or** respiring (more)
allow 'heat produced'
*do **not** allow energy produced / made*
*do **not** allow energy **for** respiration*
allow sweating stops / reduces

ignore hair erection

1

[6]

Q14.

(a) tissue → organ → organ system

*one right for **1** mark*

*three right for **2** marks*

2

(b) **Epithelial tissue** → covers the outside and the inside of the stomach

more than one line from a tissue = no mark

1

Glandular tissue → produces digestive juices

1

Muscular tissue → allows food to be churned around the stomach

1

(c) (i) light

ignore dark

1

(ii) moving (to the dark)

1

(iii) any **two** from:

- use more woodlice
- repeat the experiment
- run for a longer time

2

[9]

Q15.

(a) (i) stimulus

1

(ii) cytoplasm

1

(b) (i) ear(s)

in this order only

1

eye(s)

accept retina

1

skin

ignore extra detail

1

(ii) A muscle

1

[6]

Q16.

(a) detect changes in surroundings **or** detect stimuli

allow any named stimulus for skin

1

convert information to impulse

allow send impulse to sensory neurones / brain

1

(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:

- (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]

Q17.

(a) (i) has the least amount of glucose

*allow least amount of fat **or** no fat*

1

(to) transfer energy (for the run)

allow (to) release energy (for the run)

*do **not** allow produces energy*

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

1

(ii) any **one** from:

- cells will work inefficiently
- absorb too much water / swell / overhydrate
- lose too much water / shrink / dehydrate

ignore turgid / flaccid

cells burst is insufficient

allow cramp <u>in muscle</u>.

1

(b) any **three** from:

- thermoregulatory centre
- (has temperature) receptors
- (which) monitor blood temperature (as it flows through the brain)
- (temperature) receptors in the skin
- (receptors) send impulses to the brain

ignore vasoconstriction / vasodilation / sweating

allow hypothalamus

impulses sent to the thermoregulatory centre = 2 marks.

3

(c) (i) (sports drinks) contain a lot of glucose

1

(a person with diabetes) does not produce insulin **or** does not produce enough insulin

allow (person with diabetes) has cells which do not respond to insulin

*do **not** allow insulin produced by liver*

1

so <u>blood</u> glucose / sugar levels will rise too high **or** to a dangerous level

1

(ii) inject insulin

or

have an insulin pump (fitted)

*do **not** allow swallow insulin*

accept exercise

accept inhale insulin

*accept take metformin **or** other correctly named drug*

allow pancreatic transplant

1

[10]

Q18.

(a) (i) sensory neurone

1

a synapse

1

(ii) contract

1

(iii) not connected to brain / coordinated <u>only</u> by spinal cord

1

(iv) automatic / rapid (response)

allow no thinking / faster / less time

1

protects body from danger / from damage / from burning

1

(b) (i) caffeine decreases reaction time

accept caffeine speeds up / quicker reactions

1

(ii) the two sets of results overlap (considerably)

allow use of appropriate numbers – eg 5 of the 'after' results overlap with the 'before' results

allow 'wide spread of results'

allow 'it was just one person' or 'it was a small sample'

accept use of one pair of results only – if meaning is clear

accept use of one pair of overlapping results

1

(iii) any **two** sensible suggestions: eg

- more repetitions
- perform investigation on several other people
- use other (measured) amounts of coffee
- use different / more time intervals
- other suggested measure of reaction time – eg computer-generated light flash + time measurement
- use pure caffeine or caffeine tablets

2

[10]

Q19.

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 <u>either</u> too high <u>or</u> 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]

Q20.

(a) (i) 400

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

2600 – (1500 + 600 + 100)

or

2600 – 2200

*for **1** mark*

2

(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 / $66\frac{2}{3}$ / $66.\dot{6}$ / 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 / 66.6 $\dot{7}$ / 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 (±) 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]

Q21.

(a) sensory neurone

1

(b) (i) synapse

1

(ii) a chemical

1

(c) (What happens to the muscle)

mark both parts of the question together

any **one** from:

- contraction / contracts

ignore relaxation / relaxes / tenses

1

- gets shorter

(How this helps the body)

idea of protection for body (from damage / pain)

eg moves finger / arm away (from pin / stimulus / source of pain)

1

[5]

Q22.

(a) motor

allow efferent / postsynaptic

*allow **another** relay (neurone)*

1

(b) release of chemical (from relay neurone)

allow ecf for 'motor' neurone from (a)

allow release of neurotransmitter / named example

1

chemical crosses gap / junction / synapse

allow diffuses across

allow chemical moves to X

1

chemical attaches to X / motor / next neurone (causing impulse)

1

(c) (curare) decrease / no contraction

accept (muscle) relaxes

1

(strychnine) increase / more contraction

*if no other mark awarded allow 1 mark for (curare) decrease / no response **and** (strychnine) increase / more response*

1

[6]

Q23.

(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]

Q24.

(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]

Q25.

(a) (i) skin

1

(ii) kidneys

accept kidney

1

(iii) lungs

accept lung

1

(b) (i) multiply temperature by number of students at that temperature and add them up

allow (36.8 5) + (36.9 3) + (37.0 6) + (37.1 7) + (37.2 3)

allow 888

1

divide by number of students

allow divide by 24

1

(ii) 10 / ten

1

(iii) so <u>enzymes</u> work (well)

ignore death / overheating / hypothermia

allow body <u>reactions</u> work (well)

1

[7]

Q26.

(a) **A** sperm

1

B egg

1

C fertilised egg

1

D embryo

1

(b) insert into mother

ignore fertilise / check fertilisation / check viability

1

womb / uterus

1

(c) (i) one quarter

1

(ii) no / little chance of success over 42

1

reference to table of only two women in the age bracket 40-42 years became pregnant

*the statement 'only 2 out of 53 40-42 year old women became pregnant / had babies' gains **2** marks*

1

(iii) so fewer twins / multiple births

or

multiple births more dangerous

1

[10]

Q27.

(a) **A** sensory (neurone)

ignore nerve

1

B motor (neurone)

ignore nerve

1

C spinal cord / central nervous system / white matter

accept grey matter

1

(b) by chemical / substance

allow transmitter

1

(c) muscle

allow extensor

ignore muscle names

1

[5]

Q28.

(a) (i) cerebral cortex

accept cerebrum / cerebral hemisphere

1

(ii) MRI (scan)

allow CAT / CT scan
*do **not** accept MIR*

or

electrode stimulation

allow electrical stimulation

1

(b) (i) sharp point stimulates (pain) receptor (in the skin)

must be in correct order

1

to send (nerve) impulse

ignore information and messages

1

via sensory neurone

1

to spinal cord

*do **not** accept spine, ignore CNS*

1

crosses synapse

allow synapse in any correct context

1

to other (relay) neurones / to brain

*do **not** accept motor neurone*
allow explanation in a flow diagram

1

(ii) damage must be between arms and legs / below arms

accept below the waist

1

since information from nerves in arms still reaches the brain / information from the legs doesn't reach the brain

1

[10]

Q29.

(a) any **three** from:

- streamlined shape enables it to swim quickly (to catch fish)
- wings (provide power) to move quickly (to catch fish)

  allow 'flippers'
- wings used for steering
- white underside / dark top acts as camouflage (so prey less likely to see it)

- long / sharp beak to catch fish

3

(b) any **three** from:

- reduces (total) surface area of penguins exposed to wind / cold atmosphere
- reduced number of penguins exposed (to wind / cold)

  accept reference to movement in or out of the huddle

  accept outer ones insulate / act as barrier
- reducing heat loss

  allow reduced cooling
- 'share' body warmth / heat

3

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

- size of tubes
- volume of (hot) water

  accept amount of (hot) water
- left for same length of time

  allow measured at same time intervals
- starting temperature

2

(ii) any **two** from:

- tube alone (**C**) lost heat most (rapidly)
- tube **B** intermediate
- tube **A** least (rapidly)

  allow correct use of figures for all 3 tubes

  ignore just quoting final temperature

2

(iii) confirms suggestion

no mark awarded
*accept correct answers referring to other suggestions in **(b)***

since (both outer and inner) tubes in bundle lost heat less rapidly (than 'stand − alone' tube)

comparison needed

1

penguins in a huddle lose less heat (than single ones)

accept 'it is the same for penguins'

1

(d) **if the core body temperature is too high**

blood vessels supplying the skin (capillaries) dilate / widen

*accept reference to arteries / arterioles but **not** veins / capillaries*

*do **not** accept references to movement of blood vessels*

ignore enlarge / expand

reference to skin / surface required only once

1

so that more blood flows through the (capillaries) in skin / near surface

*reference to 'more' needed at least once to gain **2** marks*

1

and more heat is lost

*reference to 'more' needed at least once to gain **2** marks*

1

if the core body temperature is too low

blood vessels <u>supplying the skin</u> (capillaries) constrict / narrow

allow full marks if 'too low' given first

*if no other marks awarded, allow vasodilation when too warm **and** vasoconstriction when too cold for **1** mark*

1

(e) (i) wings move to provide movement for diving

allow muscles contract / work

1

energy (for movement) comes from respiration

*do **not** allow produces / makes / creates energy*
allow energy comes from / is supplied by / is released by respiration

1

respiration / muscle contraction also releases heat

allow produces heat

1

(ii) any **three** from:

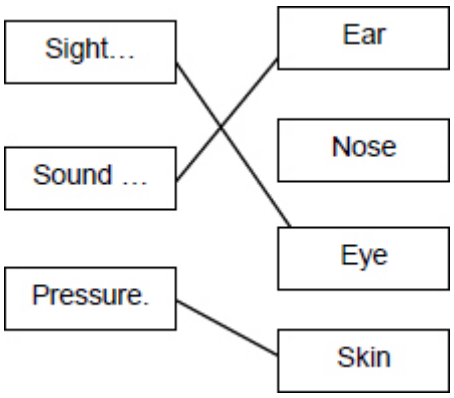
- feet not / less used **or** no muscle contraction in feet
  allow little energy / heat released through respiration in feet
  *do **not** allow veins / capillaries*
- vessels supplying feet constrict / less blood to feet
- so temperature in feet cools / decreases
- more heat loss from large surface area or rapid flow of cold water over foot

3

[22]

Q30.

(a) (i)



1 *mark for each line*
do ***not*** *award a mark for a 'change' that has two lines*

3

(ii) receptor cells

1

(b) used to provide (extra) energy
allow (more) used in respiration
allow suitable reference to muscles
do ***not*** *accept used for sweat*

1

(c) (i) growth of muscles

1

(ii) (these drugs have) possible side / harmful effects
or
answers that refer to 'fairness of competition' e.g. cheating

1

[7]

Q31.

(a) **A** cytoplasm
in this order only

1

B (cell) membrane
do ***not*** *accept (cell) wall*

1

(b) (i) synapse

1

(ii) (as) chemical
accept neurotransmitter or named
ignore references to how the chemical is passed
do ***not*** *accept electrical*

1

(c) (from light-sensitive cell to connecting neurone) to sensory neurone
ignore references to synapses accept 'nerve cell' for neuron(e) throughout penalise 'nerve' for neurone once only

1

(sensory neurone) to brain / CNS

allow (sensory neurone) to relay neurone / spinal cord

1

(brain / CNS) to motor neurone

allow (relay neurone / spinal cord) to motor neurone

1

(motor neurone) to (eyelid) muscle

ignore effector

1

[8]

Q32.

(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

so less heat lost / less cooling

or

it is evaporation of sweat that cools the body

1

[7]

Q33.

(a) (i) addictive

allow addicting / addict / addicted / addiction or similar
allow phonetic spelling
*do **not** accept / additive / addition*

1

(ii) junction / gap / space between neurones
allow nerve cells / nerves for neurones
allow idea where neurones / nerve cells / nerves meet / join

1

(b) (i) tablet with no drug
accept answers that convey this idea eg fake / dummy / sugar pill
allow injection with no drug
ignore drugs that don't work.

1

(ii) for comparison
accept to see if drug / it works
*allow to see psychological effect **or** make sure, it is not all in the mind*
allow as a control
ignore 'to make test fair / unbiased'

1

(iii) Neither doctors nor volunteers

1

(iv) any **two** from:

- age (range)
- sex / gender (mix)
- previous smoking habits **or** eg number smoked (before trial) **or** length of time smoked
- number in the group
- other drugs being taken **or** general health **or** height / weight / BMI / lifestyle / fitness

ignore factors already controlled
*ignore reference to all smokers **or** all want to give up*

2

(c) higher percentage / number of smokers who had stopped smoking (than Drug B)
answers must refer to data and be comparative
allow best results / most effective
ignore best drug unqualified
ignore references to 12 weeks / 1 year

1

[8]

Q34.

(a) *ignore nerve / neuron(e) throughout*

A sensory

accept afferent

1

B motor

accept efferent

1

C relay

accept intermediate

1

(b) stretch

allow pressure / pull / tension (in muscle)
*allow a hit at (point) **P***
ignore pain

1

(c) any **three** from:

- chemical (release)
  accept neurotransmitter / acetylcholine
- diffuses (across the gap / synapse)
- transmits impulse / information (across synapse)
  allow transmits signal / message
- between neurones / nerve cells / named
  *if named, must be either sensory / A to relay / C **or** relay / C to motor / B*
  allow 'to the next neurone'

3

[7]

Q35.

(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]

Q1.

(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]

Q2.

(a) a stimulus

1

(b) (i) **A**

1

(ii) **C**

either order

1

D

1

(iii) **E**

1

(c) brain

allow spinal cord / CNS / central nervous system

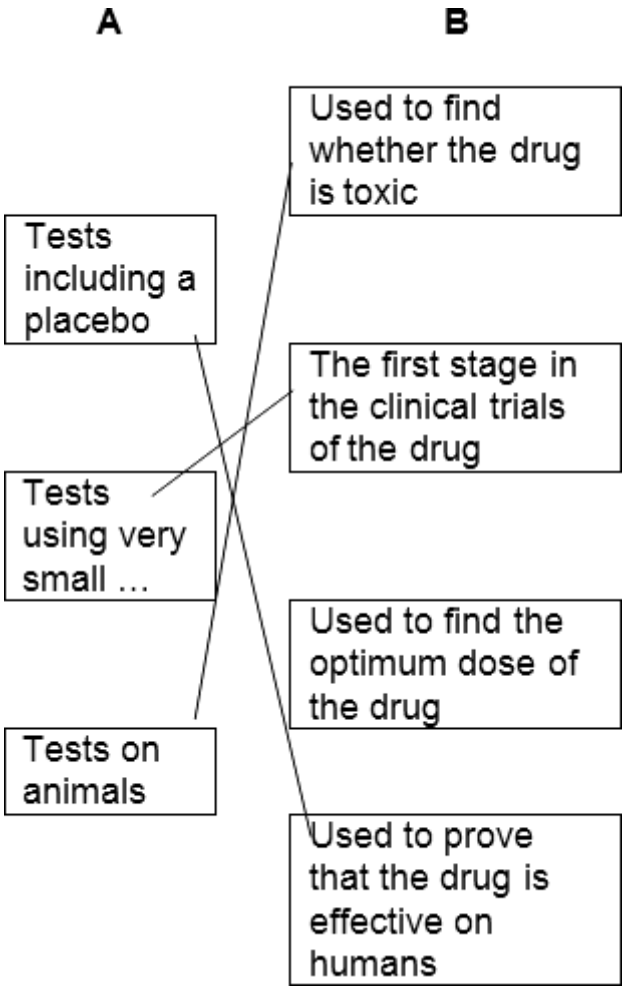
*do **not** allow spine*

1

[6]

Q3.

(a)



1 *mark for each correct line*

mark each line from left hand box

two lines from left hand box cancels mark for that box

3

(b) any **three** from:

Students have been informed that the headline is not justified

- reference to reliability, eg only a small number of mice tested
  or trial too short
  or investigation not repeated

- reference to control, eg mice given caffeine <u>not</u> coffee
  or 6 cups (equivalence) is more than 1 dose

- (and) the effect on mice might not be same as on humans

  allow only tested on mice

- (also) text suggests that the treatment improves memory loss (rather than delays it)

  accept text suggests disease cured

  or mice already have memory loss or experiment only showed improvement in memory

or does not show **delays** Alzheimer's
or experiment not done on old mice

allow reference to the fact that mice engineered to have it

3

[6]

Q4.

(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 <u>heat loss</u>

1

[4]

Q5.

(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

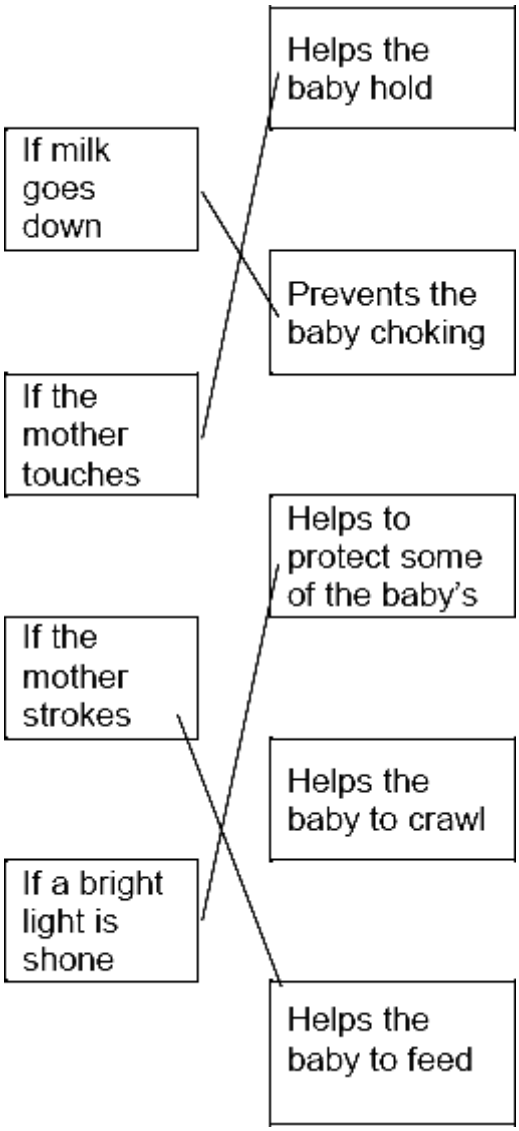
reference to respiration is required for this mark

1

[7]

Q6.

(a)



*all four correct = **4** marks*
*three correct = **3** marks*
*two correct = **2** marks*
*one correct = **1** mark*
extra line from a statement cancels the mark

4

(b) glands

1

muscles

***1** mark for each correct tick*
*each extra box ticked cancels **1** mark*

1

[6]

Q7.

(a) a drug taken for pleasure / fun

allow not taken as medicine
ignore recreational / legal / harmless / specific effects on

body

1

(b) (i) 45

1

(ii) a cup of takeaway coffee

1

(c) There is a link between drinking caffeine and hallucinations.

extra boxes ticked cancels the mark

1

[4]

Q8.

(a) (i) thermoregulatory centre

allow thermoregulation centre

allow hypothalamus

1

(ii) it has receptors

ignore receptors in skin

1

reference to temperature of <u>blood</u>

allow plasma for blood

1

(b) muscles <u>contract</u>

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]

Q9.

(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]

Q10.

(a) eye / sight / eyesight

either order

1

ear / hearing

ignore light

1

(b) ear

1

(c) (i) reflex

1

(ii) neurons

1

[5]

Q11.

(a) (i) receptor

allow named receptor eg light receptor

ignore sensory neurone

allow sense organ / named sensory organ eg skin / eye

1

(ii) sensory (neurone)

allow afferent

1

(iii) motor (neurone)

allow efferent

1

(iv) effector / muscle / gland / named

1

(b) any **two** from:

- impulse / information passes from one neurone to another **or** impulse / information passes across gap
- chemical / transmitter involved
- diffusion (across gap)

2

(c) brain / person not aware of pain / stimulus / can't feel

allow brain/ person doesn't know / realise / unable to coordinate

ignore reflex

ignore information

1

possibility of (permanent / serious) damage / eg burning

ignore danger

1

[8]

Q12.

(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]

Q13.

(a) (i) receptor

1

(ii) sensory neurone

1

(iii) motor neurone

1

(iv) muscle

1

(b) (i) eye(s)

allow retina

ignore sight

1

(ii) ear(s)

ignore hearing

*do **not** allow ear drum*

1

(iii) ear(s)

ignore balance

1

[7]

Q14.

(a) (i) lungs

1

(ii) skin

1

(iii) kidneys

1

(b) (i) (as sweat lost,) performance falls

1

(ii) drink water / sports drink

ignore antiperspirant

1

[5]

Q15.

(a) **A** sensory (neurone)

ignore nerve

1

B motor (neurone)

ignore nerve

1

C spinal cord / central nervous system / grey matter

1

(b) by chemical / substance

allow transmitter

1

(c) muscle

allow extensor

ignore muscle names

1

[5]

Q16.

(a) 4000

*award **both** marks for correct answer, irrespective of working*
*1500 + 2000 + 500 gains **1** mark*

2

(b) day 2 (no mark)

any **two** from:

*max **1** mark if correct day not identified or if no day given*

- more (water in) breath / breathing
- more (water in) sweat / sweating
  accept a lot of sweating
- less (water in) urine
  *if no other marks awarded allow **1** mark for more water lost on day 2*

2

(c) (i) respiration

1

(ii) cools / removes heat owtte

ignore 'maintains body temperature' unqualified

1

(iii) osmosis

1

[7]

Q17.

(a) (i) thermoregulatory centre (in brain)

accept hypothalamus

1

(receptors sensitive to/measures) temperature of <u>blood</u>

1

(ii) any **one** from:

- receptors (in skin)
- (skin) sends information / signals / impulses / messages to brain / thermoregulatory centre

1

(b) any **three** from:

(cold conditions)

- muscle (X) contracts when cold
- no / less blood through capillaries
- no / less heat lost / radiated
- no / less sweat produced

(hot conditions)

- muscle (X) relaxes/does not contract when hot
  NB X contracts when cold and relaxes when hot = ***2 marks***
- (more) blood through capillaries
- more heat lost / radiated
- more sweat produced

all other points must be clearly identified by correct conditions

max ***2*** *if idea of capillaries moving but ignore capillaries dilate*

3

[6]

-

Q18.

(a) (i) eye

1

(ii) nose

1

(iii) skin

1

(iv) tongue

1

(b) (i) eg to ensure more people addicted to cigarettes / make cigarettes more addictive

1

(ii) eg people might not buy the brand

1

[6]

Q19.

(a) (i) 1400

*award **2** marks for correct answer if no working shown*
*2400 – (300 + 600 + 100) or equivalent for **1** mark*

2

(ii) $\frac{1}{3}$

1

(b) **A**: chemical reactions

B: food

C: drinking

*all **three** required for **1** mark*

1

(c) cools / reduces temperature

allow 'maintaining body temperature' owtte
*do **not** allow regulate unqualified*
ignore reference to urea
numerical references to temperature should be correct

1

(d) more sweat produced

1

less urine produced

1

[7]

Q20.

(a)

glucose	☑
urea	☑
water	☑
sodium ions	☑
protein	☐

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

max 2

(b) (i) protein cannot pass through filter

or

protein (too) large

or

protein stays in the blood

1

(ii) reabsorbed

1

(c) (i) less

1

(ii) more

1

[6]

Q21.

A – muscle

1

B – receptor

1

C – neurone

1

D – spinal cord

1

[4]

Q22.

(a) 94.8

1

(b) (i) to cool (the body) / maintain (body) temperature
*do **not** accept let out heat*

1

(ii) water **and** ions

1

(iii) water ignore CO_2, and vapour

1

(c) any **two** from:

used in respiration

provides energy

(energy) needed for movement / running / muscle action

2

[6]

Q23.

(a) (in table) 4920

1

(b) exercise produces heat **or** causes rise in body temperature / makes athlete hot

named activity produces heat

1

needs to cool **or** needs to maintain temperature **or** sweat helps to cool the body

1

(c) more / a lot of <u>water</u> lost in sweating / breathing

1

replace water / prevent dehydration

1

[5]

Q24.

(a) (i) respiration

1

(ii) 9600

if correct answer, ignore working / lack of working

$\frac{80 \times 12000}{100}$ *for **1** mark*

2

(b) any **three** from:

- dilates / widens **or** muscle in wall relaxes **or** sphincter opens

  *do **not** accept expands or just gets bigger*
- more blood flows near skin surface **or** more blood through capillaries
- heat lost by radiation / convection / conduction

  ignore evaporation
- heat loss from blood / cools blood

3

(c) hypothalamus / brain

1

[7]

Q25.

(a) (i) sensory / afferent

1

(ii) <u>on diagram</u>:

arrow (next to neurone **A**) pointing towards spinal cord
and
arrow (next to neurone **B**) pointing towards muscle

1

(b) chemical (released) **or** neurotransmitter
or by diffusion

accept correct named example of a neurotransmitter

1

(c) <u>on diagram</u>:

X labelling muscle **or** motor end plate

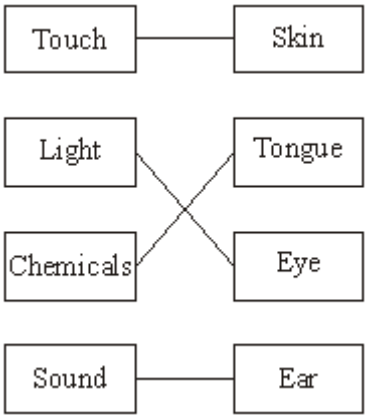
*do **not** accept on stretch receptor*

1

[4]

Q26.

(a) **Stimulus** **Part of the body**



***1** mark for each correct line*
*if **2** lines to **one** box, CANCEL mark*

max 3

(b) <u>in correct sequence</u>:

sensory

1

brain

1

[5]

Q27.

(a) 345 to 350

ignore working or lack of working
use of 355 to 360 ***and*** *10 for* ***1*** *mark*

2

(b) any **two** from:

more sweating (at 37.6 °C)
'more' at least once in the first 2 points

more water loss **or** dehydration occurs
do ***not*** *accept prevents dehydration only*

blood becomes (more) concentrated / (more) salty **or** need to replace water

stimulation of the hypothalamus

2

(c) any **three** from:

evaporation

of water
do ***not*** *accept just water loss unqualified*

cools skin **or** uses heat from skin

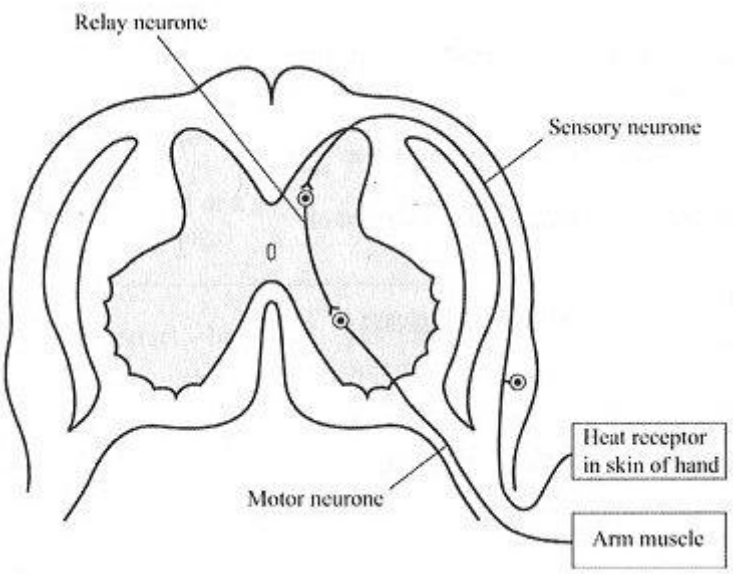
cools blood / heat from blood (passing through skin)
related to sweating
cooling the blood
ignore vasodilation

3

[7]

Q28.

(a)



sensory neurone correctly drawn **and** labelled

from receptor + via dorsal root + cell body in ganglion + synapse to relay neurone

1

motor neurone correctly drawn **and** labelled

to muscle + via ventral root + same shape as relay neurone + synapse with relay neurone

***OR** correct <u>pathways</u> for both neurones given (ie without synapse or cell bodies) **and** labelled, **or** correctly <u>drawn</u> but unlabelled = 1 mark for this part)*

1

(b) any **two** from:

reference to synapses / gaps between neurones

extra time for release / movement of chemical

extra time for development of muscle 'tone' / tension

2

[4]

Q29.

vasoconstriction/blood vessels near surface get narrower/decreased blood supply near surface of the skin **or** closing sweat pores

any three pairs. 2 marks for each pair of features and explanations up to a maximum of 6 marks

(which) prevents the heat being lost from the blood/prevents heat lost due to evaporation

explanation must match feature to score the second mark

---

hair/fur stands on end **or** goosepimples

(this) increases the insulation effect

---

shivering/increased muscular activity/movement/increased metabolism

(this) generates heat

*do **not** accept raise body temperature*

---

behavioural changes/find somewhere warm/put on clothes / huddling / hibernate / grow **extra** fat / fur

(this) prevents/reduces heat loss

*do **not** accept keep warm*

[6]

Q30.

(a) label drawn to the hand

may be labelled as 'a'

accept the receptor identified as the hand

1

(b) label drawn to the muscle

may be labelled as 'b'

accept the effector identified as the muscle

1

(c) (i) sharp point **or** heat

accept specific examples such as pain, bee sting, cut, burning

*do **not** accept touch by itself*

1

(ii) move the hand (or arm) away from stimulus
or
muscle in the arm contracts

*do **not** credit reference to impulse reaching brain unless it is clear that this is in addition to the reflex act*

*do **not** credit 'reflex action ' already given*

1

(d) an arrow on the sensory fibre from hand to spine

*award **one** mark for both arrows in the correct direction*

and

- *note the arrows may be drawn separately from the printed neurone*

an arrow on the motor fibre from

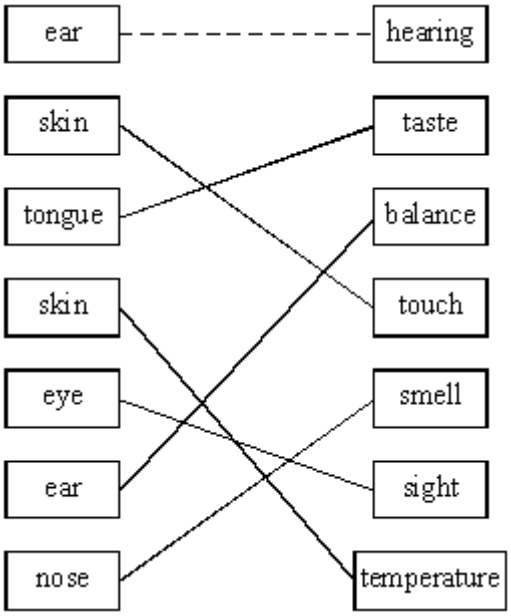
spine to muscle

- *do **not** credit if the impulse travels to the muscle via the brain **but** a 'one way' journey to the brain will be neutral*

1

[5]

Q31.



*one correct **1** mark*
*two correct **2** marks*
*three correct **3** marks*
*four correct **4** marks*
*five or six correct **5** marks*
(• for 6th correct mark)

both skin boxes can be connected to either touch or temperature

*do **not** credit where more than one link goes to or from any box (except for skin, touch and temperature)*

[5]

Q32.

(a) oxygen;)
carbon dioxide;) *allow symbols*
water)

each for 1 mark

3

(b) graph with reasonable vertical scales;
accurate plotting of all points (ignore lines) and labelling lines
histogram – must be coded

gains 3 marks

3

(c) 6 of:
during exercise the level of CO_2 (in the blood) rises;
increased breathing to remove excess CO_2;
increased oxygen supply to muscles;
or increased breathing takes in more O_2
or increased heart rate takes more O_2 to muscles;
increased supply of sugar to muscles;
increased respiration rate;
enable faster rate of energy release;
reference to lactic acid (allow even though not on syllabus)/O_2 debt;
to avoid cramp;
anaerobic reference;
reference to removal of 'heat';

6

(d) high carbon dioxide concentration;
brain/central nervous system;
heart muscles (both)

3

[15]

Q33.

(a) A – cell membrane
B – cytoplasm
C – nucleus
each for 1 mark

3

(b) (nerve) impulse sent along nerve fibre to brain
each for 1 mark

3

[6]

Q34.

8 of e.g.:
muscles release energy as heat
blood flowing through muscles heated increased blood temperature sensed by centre in brain
impulses to skin blood vessels
particularly overlying muscles used in exercise to dilate
increased surface flow in these regions
gives pattern shown on thermographs
each for 1 mark

[8]

Q35.

(a) brain correctly labelled spine correctly labelled
for 1 mark each

2

(b) (i) 10
4

1

for 1 mark each

3

mouse spends most time in corners

for 1 mark

1

(ii) 2 of:
idea that it is trying to make itself less conspicuous to predators
idea of looking for food

any 2 for 1 mark each

2

[8]

Q1.

(a) light/eye
smell/nose
taste/chemical/tongue
for 1 mark each

3

(b) 6 of e.g.
receptors in ear detect sound waves/vibrations
impulses/electrical signals to brain
brain co-ordinates response
impulses sent along nerves
to muscles/effectors which contract to bring about response
any 6 for 1 mark each

6

[9]

Q2.

(a) receptors
for 1 mark

1

(b) electrical/nerve
signals/impulses
for 1 mark each

2

(c) muscle
for 1 mark

1

(d) correct description of:
stimulus
receptor
co-ordinator
effector
response
for 1 mark each

5

[9]

Q3.

(i) eyes as sense organs/detector/receptors in eye,
electrical signals (impulses),
to co-ordinator,
then to leg muscles/effector
for 1 mark each

4

(ii) affects the nervous system and slows down the reactions

for 1 mark

1

[5]

Q4.

(a) (i) road traffic accidents

for one mark

1

(ii) 15% / 0.15 / $\frac{3}{20}$ / 3:17

for one mark

1

(b) *ideas that*
receptors (detect pain) involved initially
information *(or impulses / messages / signals)*
unable to pass along (nerves) cord idea
(to brain where pain is felt) brain involved at the end

3

each for 1 mark

[5]

Q5.

(i) *idea that* reduce water loss (in dry area) / conserve water

for 1 mark

1

(ii) ideas of evaporation (of moisture) uses energy / heat
or
large surface area of blood vessels / dilation of blood vessels
for evaporation / radiation

each for 1 mark

2

(iii) ideas of large surface area of (small) vessels / intertwining results in close contact of vessels idea that cool venous blood cools arterial blood

each for 1 mark

2

[5]

Q6.

(a) (i) more
less
the same
(*accept* appropriate numbers)

for 1 mark each

3

(ii) sweating / evaporation / perspiration

for 1 mark

1

(b) in food / named solid food / eating
from respiration

for 1 mark each

2

[6]

Q7.

(a) pressure / temperature / hot / cold / touch / pain
ear / cochlea
chemicals / taste / named taste e.g. salt
(*reject* skin receptors e.g. hot, cold)

for 1 mark each

3

(b) impulses / electrical pulse / electrical signal
(*reject* information, message, pulse, signal)
via sensory neurones (*ignore* relay neurone, synapse)
(in) optic nerve
(allow 1 mark for via nerves or neurone *if neither second nor third mark scored, reference to spinal cord disqualified route mark)*

for 1 mark each

3

[6]

Q8.

(a) <u>evaporation</u> of sweat

do not credit sweating cools body if no reference to evaporation

1

cools body

allow cools body if attempt at description of evaporation (e.g .sweat dries) for 1 mark

1

(b) (i) idea <u>blood</u> (passing through gut)
cooled (by ice)

1

(this) cooled <u>blood</u> cools brain

do not credit ice cools brain

1

(ii) **<u>impulses</u>** from brain /
thermoregulatory centre to skin

do not accept messages / signals
accept hypothalmus
accept electrical signals

1

vessels supplying skin surface
capillaries constrict / sweat glands less active or hairs become erect

do not credit capillaries constrict / move down
accept reduced supply of blood to skin surface
shivering (unqualified) is neutral

therefore less heat lost by skin

2

[7]

Q9.

any **three** from:

heat produced by muscles

during exercise

accept when working

by respiration

(skin) temperature over muscles rises / more blood to skin over muscles

*allow vasodilation **or** arterioles dilate over muscles*
reject capillaries dilate
sweating neutral

[3]

Q10.

(a)

the senses may be in any box.
do not credit list of receptors
the appropriate organ must be adjacent

2

Mark first	Look for suitable
Sense	**Receptor**
taste	tongue **or** taste buds

do not credit mouth

2

smell	nose
hearing	ear cochlea

2

vision **or** sight **or**	eye **or** retina

seeing

do not credit light but eye correct as receptor

do not credit looking

heat **or** temperature	skin
movement	ear **or** semi-circular canals

do not credit feel or alternatives to touch or pressure

balance	eye **or** ear **or** both **or** semi-circular canals

2

(b) any **two** from three

a sensor **or** receptor **or** detector feels the touch **or** starts the process

accept nerve endings in skin

a signal **or** impulse is sent along a nerve **or** neurone **or** spinal cord **or** (central) nervous system

do not credit message
do not credit spine
beware of repeat of stem

2

[10]

Q11.

an impulse **or** electrical signal

accept electrical pulse do not credit message

1

in receptor **or** neurone of retina

*accept nerve **or** rod **or** cone*

1

sent along optic nerve

do not credit inverts the image

1

[3]

Q12.

(a) brain

1

(b) receptor **or** sensory **or** afferent

*connector **or** relay*

3

effector **or** motor **or** efferent

(c) any **one** from
blink (of eye)

*accept a violent movement of a limb from pain **or** sharp object*

knee jerk

*do not credit snatch from cold object **or** any temperature reference e.g. boiling water*

*accept sneezing, coughing, choking, vomitting, pupil closing **or** reflex*

1

(d) danger **or** a signal detected (by nerve)
or impulse sent

1

goes to **or** through spine

accept impulse by-passes the brain
do not award mark if brain mentioned
do not credit message to spine

1

a very rapid response occurs **or** then to effector **or** muscle **or** motor

accept no thinking time is needed

1

[8]

Q13.

(a) (i) any **two** from

see the (green) light **or** sign **or** man
for seeing where to go to avoid objects
see cars (that are stopped)

answer must show that the person sees something

2

(ii) any **two** from

hear the bleeps **or** noise
to listen for traffic or danger
for balance

answer must show that the person hears something

2

(b) (i) nose

credit smell

1

tongue

credit taste but not mouth

credit temperature sensor

1

(ii) any **one** from

*do not accept sensory receptors **or** neurone*

touch
pain

credit nerves

pressure
temperature

credit heat

do not accept cold

1

[7]

Q14.

top left label sensory

credit afferent
do not accept receptor

1

bottom right label connector **or** relay

credit intermediate

1

bottom left label motor **or** effector

credit efferent

1

[3]

Q15.

(a) A > B > C;
A + B + C = 2 800;
one number correct
two numbers correct

each for 1 mark

4

(b) urine;
less produced;
kidneys absorb more water
or
to maintain (water) balance

each for 1 mark

3

[7]

Q16.

ideas that
internal cooling/cooling of brain causes reduction in sweating and of blood flow to skin
less sweating = less loss of heat from skin (= X)
less blood flow = less heat supplied to skin (= Y)
X > Y (so temperature rises)

each for 1 mark

[4]

Q17.

(a) sweat – 6 squares high
urine – 15 squares high

each to < half a square for 1 mark each

2

(b) for *hot day (assumed unless otherwise stated)*

- same in breath
- same total
- more in sweat* / sweats more
- less in urine* / urinates less
- correct quantification of either * eg **x**cm^3 more / less or **n** times more / less
  250 cm^3 more sweat 6 × more sweat
  250 cm^3 less urine ¼ / 25% less urine

any four • for 1 mark each
[Do not allow just figures quoted from the table]

4

(c) *ideas that*

- you sweat more **<u>to keep cool</u>** on a hot day
- urine adjusted (by kidneys) to keep balance / to keep same total loss

each for 1 mark
[Accept "more sweat therefore less urine"]
[Credit ideas from (c) if given in (b)]

2

[8]

Q18.

(a) breath same + sweat more* + urine less* (*All <u>three</u> needed)*
<u>or</u>
total same but split differently

for 1 mark

<u>*</u>*either change correctly quantified eg*
x cm^3 more/less or **n** times more/less

for 1 further mark

sweat 250 more 6 x more
urine 250 less ¼/25%less

2

(b) *ideas that*

- you sweat (more) to keep cool on a hot day
- urine adjusted (by kidneys) to keep balance / to keep same total loss

each for 1 mark

(NB credit these answers if in (a) candidates have answered more fully than expected)

2

(c) *ideas that*

- when blood water normal/100% / steady kidney re-absorbs water at low/steady rate
- when blood water percentage falls, the rate at which kidney re-absorbs water rises
- when blood water percentage rises again, is high/normal the rate at which
  kidney re-absorbs water falls
- 97 / 97.5% / 98% (of normal) blood water is the point at which the kidney's reabsorption rate starts to increase / decrease

each for 1 mark

[allow idea that there is delay between blood water percentage changing and rate of re-absorption changing]

4

(d) *any reference to* hormone(s) / pituitary (gland)

gains 1 mark

but
ADH or hormone(s) from pituitary (gland)

gains 2 marks
(do not allow 'brain)

2

[10]

Q19.

(a) 1

for 1 mark

1

(b) skin
kidneys

for 1 mark each

2

(c) (i) *idea that*
there will be less / no sodium (per day) (in her urine)
for 1 mark

1

(ii) *idea that*
she should take in more sodium (chloride) / salt
(*allow* stay indoors / in shade **or** be less active)
for 1 mark

1

[5]