Mark schemes

1

(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]

2

(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]

3

(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]

4

(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]

-

5 (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]

6 (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]

7

(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]

8 **A** – muscle **1**

B – receptor **1**

C – neurone **1**

D – spinal cord **1**

[4]

9 (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]

10 (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]

11 (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]

12 (a) (i) sensory / afferent

1

(ii) on diagram:

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) on diagram:

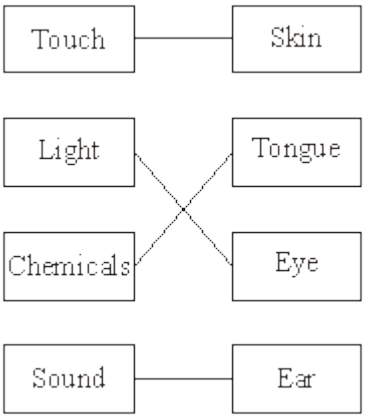
X labelling muscle **or** motor end plate

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

1

[4]

13 (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]

14 (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:

<u>more</u> sweating (at 37.6 °C)

'more' at least once in the first 2 points

<u>more</u> water loss **or** dehydration <u>occurs</u>

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 <u>water</u>

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

cools skin **or** uses heat from skin

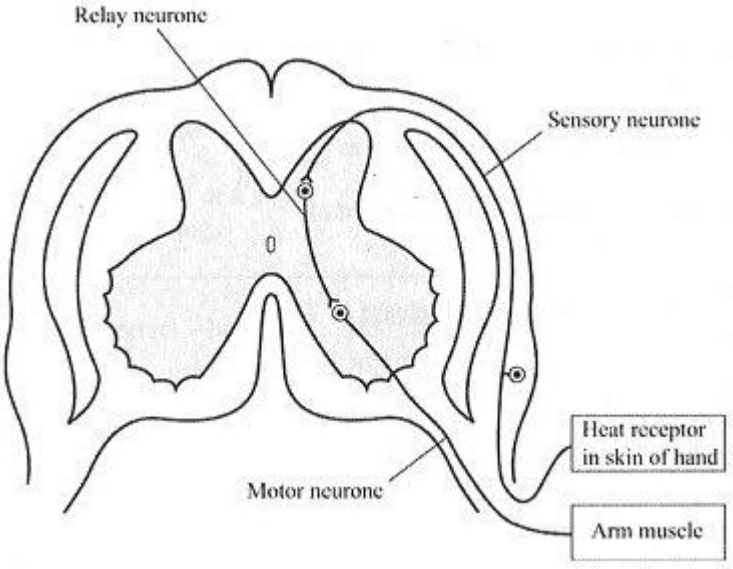
cools blood / heat from blood (passing through skin)

related to sweating
cooling the blood
ignore vasodilation

3

[7]

15 (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]

16 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]

17 (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*

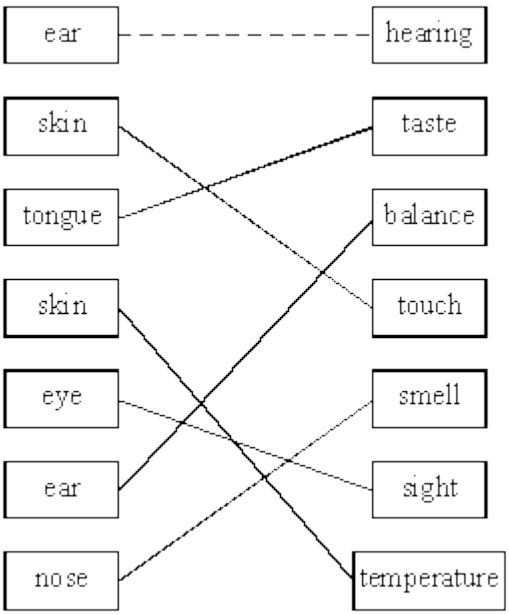
an arrow on the motor fibre from spine to muscle

- *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]

18



*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]

19

(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]

20 (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]

21 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]

22 (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]

23 (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]

24 (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]

25 (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]

26 (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 <u>where pain is felt</u>) brain involved at the end

3

each for 1 mark

[5]

27 (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]

28 (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]

29 (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]

30 (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 blood (passing through gut)
cooled (by ice)

1

(this) cooled blood cools brain

do not credit ice cools brain

1

(ii) **impulses** 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]

31 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]

32

(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** seeing	eye **or** retina

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]

33 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]

34 (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]

35 (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]

36 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]

37

(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]

38

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]

39

(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]

40

(a) breath same + sweat more* + urine less* (*All <u>three</u> needed)*
<u>or</u>
total same but split differently
for 1 mark

**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]

41 (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]