AQA GCSE BIOLOGY (HIGHER) · 8461

BIOLOGY



MARK SCHEME

4.5.2 THE HUMAN NERVOUS SYSTEM (PACK 2)

SCORE	PERCENTAGE
/217	%

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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 / <u>central</u> nervous system

*do **not** allow spine*

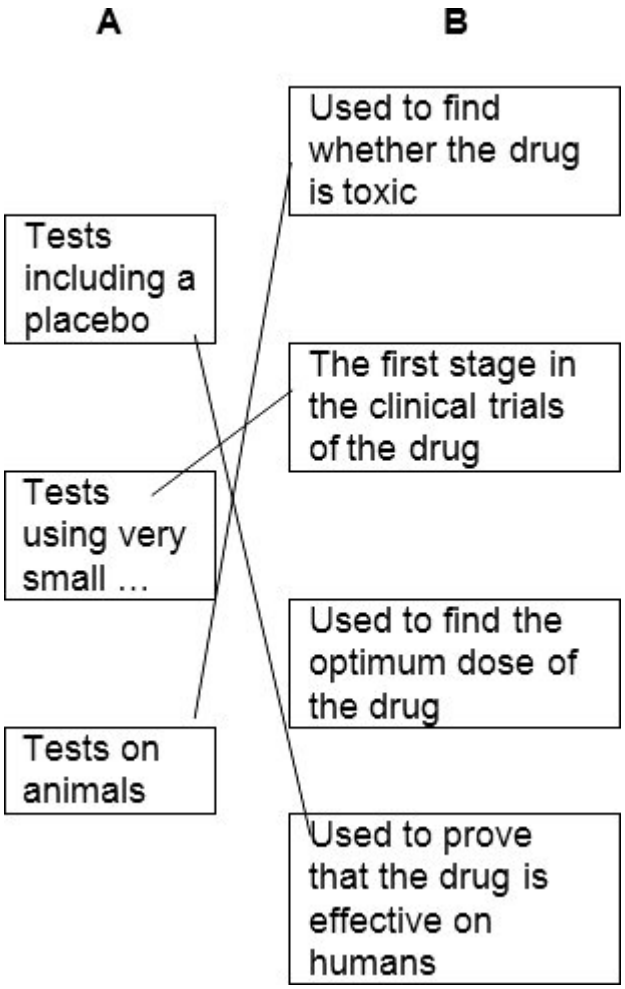
1

[6]

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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

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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

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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

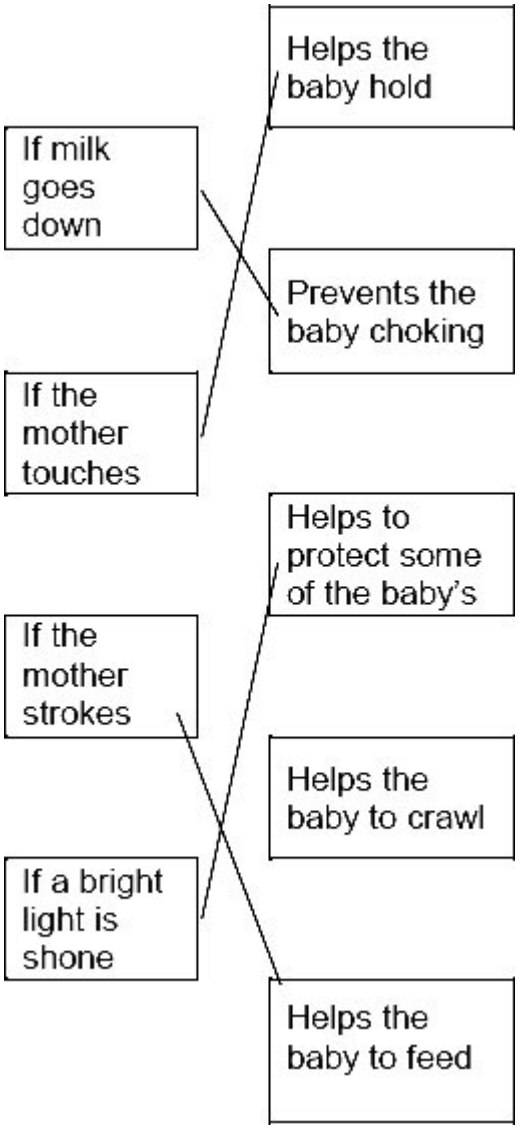
1

[7]

Q6.

(a)

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*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

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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

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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

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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)

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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)

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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]

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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)

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- 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*

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*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

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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.

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(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

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(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

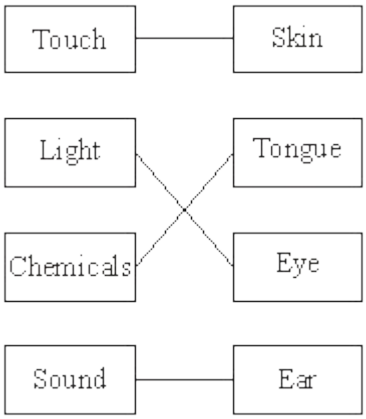
*do **not** accept on stretch receptor*

1

[4]

Q26.

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



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

max 3

(b) in correct sequence:

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

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*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)

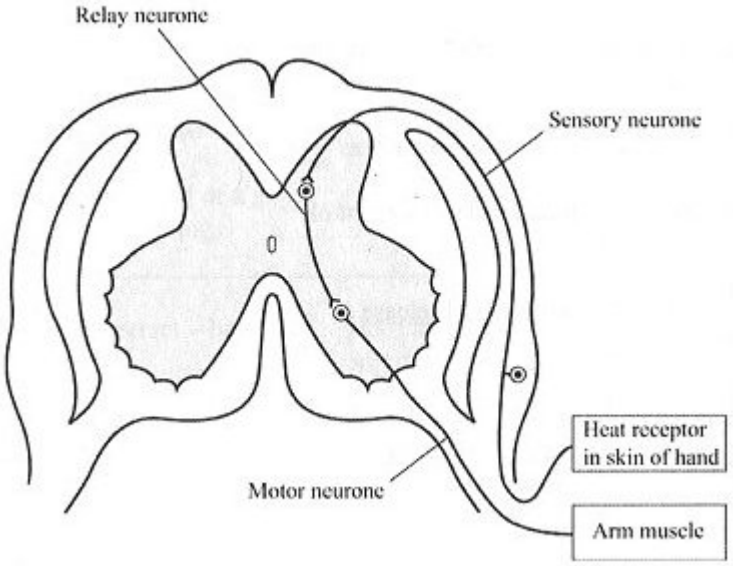
related to sweating
cooling the blood
ignore vasodilation

3

[7]

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

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(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

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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*

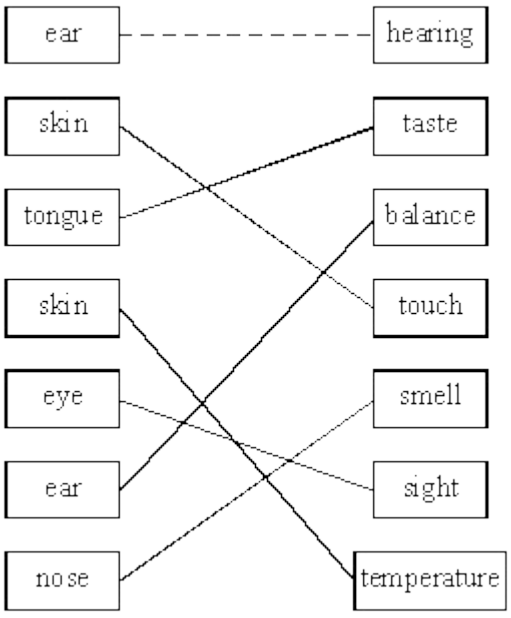
an arrow on the motor fibre from spine to muscle

- *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)

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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.

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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]

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