AQA GCSE BIOLOGY (HIGHER) · 8461

BIOLOGY



MARK SCHEME

4.5.2 THE HUMAN NERVOUS SYSTEM (PACK 3)

SCORE	PERCENTAGE
/120	%

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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

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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 <u>where pain is felt</u>) 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

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(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

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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** seeing	eye **or** retina

do not credit light but eye correct as receptor
do not credit looking

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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*

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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

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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]

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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

**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) <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

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(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]

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