Mark schemes

Q1.

(a) A = cornea

1

B = lens

1

C = optic nerve

1

(b) by becoming thicker

1

(c) ciliary muscles

1

suspensory ligaments

1

(d) retina

allow rods / cones / fovea

1

(e) retina

brain

muscles

in this order only
3 correct = 2 marks
1 or 2 correct = 1 mark

2

[9]

Q2.

(a) response / reaction

ignore examples
ignore action

1

automatic or no thinking or not conscious or involuntary

ignore reference to brain
ignore quick

1

(b) receptor (in skin of finger / hand) detects stimulus / temperature change

allow receptor detects heat ignore pain

1

(electrical) impulses pass along neurones

allow electrical signals pass along nerve cells

ignore messages

1

(impulses pass from) sensory to relay to motor neurones

1

synapse between neurones where chemical crosses gap

allow neurotransmitter / acetylcholine for chemical

allow by diffusion

1

(synapses) in spinal cord / CNS

ignore brain

1

muscle contraction (to pull hand away) or effector is a muscle

1

(c) coordination by endocrine system is:

allow converse points if clearly indicating nervous co-ordination

answers must be comparative

slower

1

longer-lasting

1

(chemical / hormone) via blood instead of electrical / impulse / neurones

1

(d) FSH (release from pituitary) stimulates maturation of egg / ovum / follicle

ignore reference to days of menstrual cycle

allow FSH stimulates development / growth of egg

1

oestrogen (release from ovary) inhibits FSH production and stimulates LH production

1

LH (release from pituitary) stimulates ovulation

allow LH stimulates release of egg

1

progesterone (release from ovary) inhibits FSH and LH production

allow (release from corpus luteum)

1

oestrogen and progesterone maintain the uterus lining

allow oestrogen and progesterone build up the uterus lining

1

[16]

Q3.

(a) (A) cerebellum

1

(B) pituitary gland

1

(C) cerebral cortex

1

(b) cerebellum

1

(c) coordinator

1

(d) neurone

allow nerve (cell)
ignore names of neurone

1

(e) retina

1

(f) can see fruit / food

allow can find fruit / food

1

(so) get more food

1

(g) accommodation

1

(h) light rays are refracted less

1

(i) any one from:

- myopia
- short-sightedness

allow near-sightedness

1

[12]

Q4.

(a) A

1

(b) cerebral cortex

allow cerebrum

allow cerebral hemisphere(s)
ignore D

1

(c) any three from:

- can ask people to do different tasks (while taking scan)

  allow can ask person to do a (specific) task
- to see which part of brain is active / inactive

  allow to see which part of the brain is working
- to compare with a person without brain damage
- to see (exactly) where the damage is
- (traditional) MRI scanner cannot be used if people can't stay still

  allow examples such as children or patients with Parkinson's disease
  allow may be better for people who are claustrophobic

3

(d) (cells in) retina sensitive to light

allow retina detects light
allow rods / cones detect light

1

impulse passes along (sensory) neurone

allow electrical signal or electrical message passes along (sensory) neurone

1

(along) optic nerve

allow chemical transmission across synapse

1

(e) Level 3: Relevant points (reasons/causes) are identified, given in detail and logically linked to form a clear account.

5–6

Level 2: Relevant points (reasons/causes) are identified, and there are attempts at logical linking. The resulting account is not fully clear.

3–4

Level 1: Points are identified and stated simply, but their relevance is not clear and there is no attempt at logical linking.

1–2

No relevant content

0

Indicative content

- mutation (in gene / DNA)
- randomly or due to chance
- causes new / different protein / (visual) pigment to be made
- in the retina of bird
- (so more) variation in the wavelengths of light birds retinas could detect

- birds with the mutation or birds able to detect UV are more likely to see fruits (that reflect UV)
- birds with the mutation or birds able to detect UV are more likely to see where small mammals are or have been
- therefore get more food (small mammals or fruit)
- avoid being eaten (by small mammals)
- out competing those birds without the mutation or birds not able to detect UV

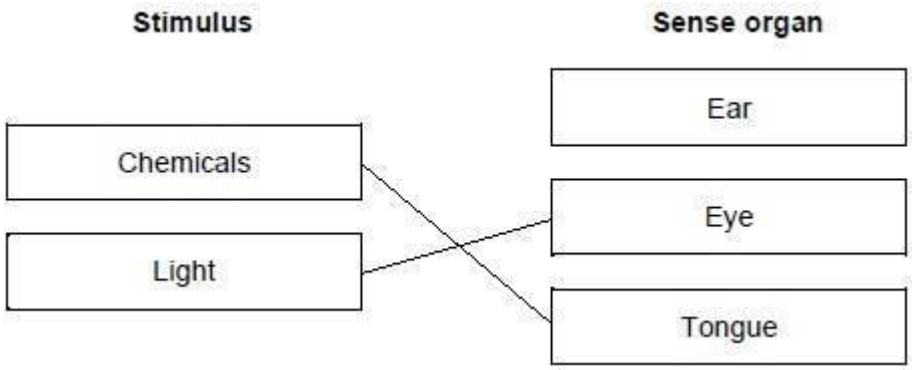
- so more likely to survive and reproduce or have offspring
- by natural selection
- passing on allele / gene / mutation to offspring
- repeated over many generations

For Level 3 a link to UV vision is required

[14]

Q5.

(a)



additional lines from a stimulus negates the mark for that stimulus

2

(b) any two from:

1

- fast / rapid
- protect (from danger / harm)

1

- a response / a reaction
  ignore 'action'
- automatic / involuntary or not under conscious control
  allow not coordinated by conscious part

of the brain
or
allow does not involve thought / thinking
ignore not coordinated by the brain

(c) the muscle contracts

1

(d) (10)
(14)
8
11
13

in this order
all 3 correct = 2 marks
2 correct = 1 mark
0 or 1 correct = 0 mark

2

(e) (after drinking coffee) ruler falls less far (before being caught)
allow mean before = 17 and mean after = 11(.2)
or mean after is only 11(.2)
allow (ruler is) caught more quickly

1

(f) any two from:
- more repeats
- test more students
- use ruler with more precise scale – e.g. mm scale
  ignore accurate
- drop from same height (above the hand)
- make sure student B's hand is stationary
- same distance between finger(s) and thumb
  allow alternative method – e.g. use of computer to measure reaction time

2

[10]

Q6.

(a) ciliary muscles contract

1

(so ciliary muscles have a) smaller diameter

1

(so) suspensory ligaments loosen / slacken
do not accept 'relax'

1

(so) lens thickens or lens becomes more curved / rounded *allow lens becomes fatter*
ignore lens becomes bigger

1

(thicker) lens is more convergent
allow light rays bent (inwards) more or light refracted more
1

light rays / image focused on retina
allow light rays meet on retina
1

(b) eye(-ball) is (too) short or lens cannot be thickened enough *allow*
ciliary muscles (too) weak or lens not (sufficiently) elastic
1

(so) light 'focuses' behind retina
allow (so) image forms behind retina
1

(c) convex / converging lens
allow shape described eg thicker in middle
1

light rays bent / refracted (inwards) more
allow changes direction of light rays further inwards
1

light rays focused on retina
allow light rays brought to a point on retina or light rays converge on retina or focused / clear image forms on retina
1

[11]

Q7.

(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]

Q8.

(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]

Q9.

(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]

Q10.

(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]

Q11.

(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]

Q12.

(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]

Q13.

(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]