Coordination and response P2 questions

11. Coordination and response

Content

11.1 Nervous system
11.2 Receptors
11.3 Reflex action
11.4 Hormones

Learning outcomes

Candidates should be able to:

(a) state that the nervous system (brain, spinal cord and nerves) serves to coordinate and regulate bodily functions

(b) identify, on diagrams of the central nervous system, the cerebrum, cerebellum, pituitary gland and hypothalamus, medulla, spinal cord and nerves

(c) describe the principal functions of the above structures in terms of coordinating and regulating bodily functions

(d) describe the gross structure of the eye as seen in front view and in horizontal section

(e) state the principal functions of component parts of the eye in producing a focused image of near and distant objects on the retina

(f) describe the pupil reflex in response to bright and dim light

(g) outline the functions of sensory neurones, relay neurones and motor neurones

(h) discuss the function of the brain and spinal cord in producing a coordinated response as a result of a specific stimulus (reflex action)

(i) define a *hormone* as a chemical substance, produced by a gland, carried by the blood, which alters the activity of one or more specific target organs and is then destroyed by the liver

(j) state the role of the hormone adrenaline in boosting the blood glucose concentration and give examples of situations in which this may occur

(k) state the role of the hormone insulin in controlling blood glucose concentration

(l) describe the signs (increased blood glucose concentration and glucose in urine) and treatment (administration of insulin) of diabetes mellitus

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Coordination and response P2 questions

M/J18/21/Q8

(a) Describe **one** example of a simple reflex action and explain the importance to the body of this action.

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.....[4]

(b) Describe how **named** components of the nervous system are involved in producing a reflex action.

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.....[6]

[Total: 10]

Coordination and response P2 questions

M/J18/22/Q3

The table shows how the thickness of the lens of the eye changes when focussing on an object at different distances from the front of the eye.

distance from eye/cm	thickness of lens/mm
10	4.0
20	3.6
30	3.2
50	2.9
100	2.7
150	2.6
200	2.6

(a) **(i)** Describe the pattern shown by the data in the table.

.....

.....

.....[2]

(ii) Explain how **named** components of the eye change the thickness of the lens when focussing on an object as it moves further from the front of the eye.

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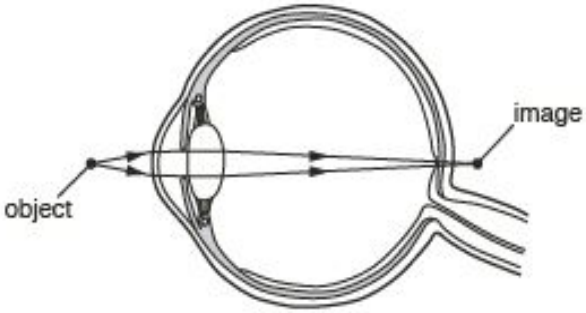
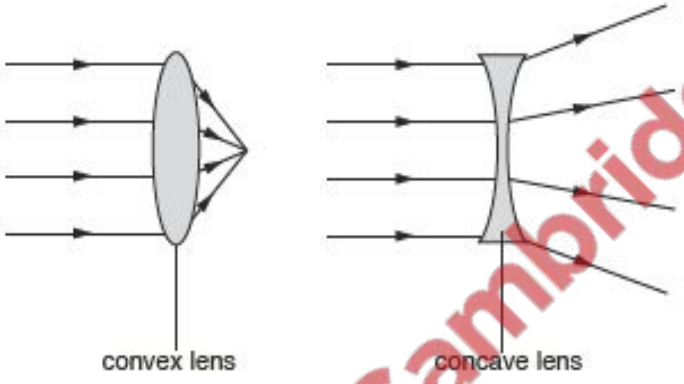
.....[4]

Coordination and response P2 questions

(b) As a person becomes older, the lens of the eye becomes harder and less elastic. This results in the person seeing an image of a close object that is out of focus.



The diagram below shows how light is refracted by two types of artificial lens that may be used to manufacture spectacles (glasses).



Suggest and explain which type of lens would be most suitable for this older person.

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.....[3]

[Total: 9]

Coordination and response P2 questions

O/N17/21/Q6

Fig. 6.1a shows the right eye of a person before moving into an area of bright light.

Fig. 6.1a

Fig. 6.1b

(a) (i) Complete Fig. 6.1b to show the appearance of the right eye of the person shortly after moving into an area of bright light. [1]

(ii) With reference to named structures within the eye, describe the changes that take place when a person moves into an area of bright light.

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.....[5]

(b) Name the type of action that occurs to make the changes that you have described and suggest why it is important that these changes take place.

type of action .....

why the changes take place .....

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.....

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[4]

[Total: 10]

O/N17/21/Q9(b)

(b) Describe the role of the hormone adrenaline and give **one** example of a situation in which adrenaline may be released.

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.....[4]

Coordination and response P2 questions

O/N16/21/Q7

(a) Define the term *hormone*.

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..... [3]

(b) (I) State the role of the hormone insulin in controlling blood sugar concentration.

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..... [3]

(II) Name the condition caused if a person is unable to produce sufficient amounts of the hormone insulin.

Describe the signs of the condition that you have named, and its treatment.

name of condition

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description of signs and treatment

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..... [4]

[Total: 10]

Coordination and response P2 questions

O/N16/22/Q6

(a) As a person gets older, the lens of the eye loses its elasticity.
Describe and explain how light rays from a near object pass through the eye but may not form a sharply focused image for an older person.

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.....[7]

(b) Suggest how reading glasses may bring the image into focus.

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.....[3]

[Total: 10]

Coordination and response P2 questions

M/J16/21/Q8

The brain is one component of the nervous system.

(a) State **two** other components of the nervous system.

1 .....

2 .....[2]

(b) Fig. 8.1 shows the human brain.

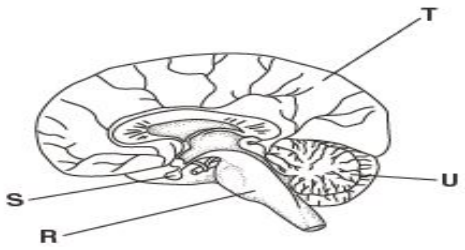

Fig. 8.1

Name and describe the functions of parts **R**, **S**, **T** and **U**, labelled in Fig. 8.1, in terms of coordinating and regulating bodily functions.

R .....

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S .....

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T .....

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U .....

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..... [8]

[Total: 10]

Coordination and response P2 questions

O/N15/21/Q7

(a) A person looks up from focusing on a near object to focus on an object further away.

Describe how changes that take place in **named** components of the person's eye produce a focused image of the distant object.

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..... [6]

(b) Suggest why these changes that take place in the eye are controlled by the nervous system, rather than by a hormone.

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..... [4]

[Total: 10]

Coordination and response P2 questions

M/J15/22/Q3

Fig. 3.1 shows the blood supply to cells in the liver.

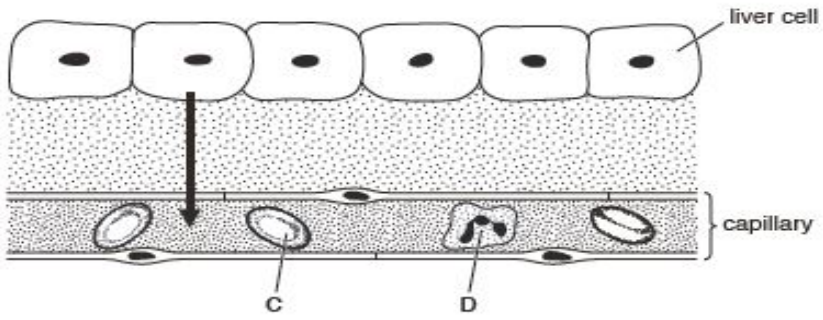

Fig. 3.1

(a) (i) Name the cells labelled **C** and **D** in Fig. 3.1.

C .....

D ..... [2]

(ii) The arrow in Fig. 3.1 shows the movement of substances from the liver cells into the capillary.

Name **three** substances that move in the direction shown.

1 .....

2 .....

3 ..... [3]

(b) (i) Describe the effect of adrenaline on liver cells.

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.....

..... [2]

(ii) State a situation in which this might occur.

..... [1]

(c) Sometimes the liver is unable to remove glucose from the blood. This condition is called diabetes.

(i) State **two** symptoms of this condition.

1 .....

2 ..... [2]

(ii) State how this condition is treated.

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..... [1]

[Total: 11]

Coordination and response P2 questions

O/N14/22/Q7

(a) Explain what is meant by the term *reflex action*.

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..... [3]

(b) (I) Name a reflex action and explain how it is brought about.

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..... [5]

(II) Explain its value to the human body.

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..... [2]

[Total: 10]

Coordination and response P2 questions

O/N13/21/Q2

2 (a) Receptors receive stimuli and convert them into electrical impulses.

Fig. 2.1 shows the pathway taken by electrical impulses in a reflex action. Complete Fig. 2.1 by writing the name of the appropriate component on the dotted lines.

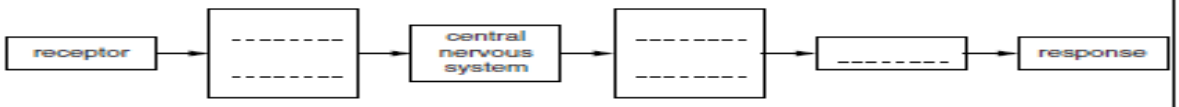

Fig. 2.1 [2]

(b) The brain is one part of the central nervous system. Fig. 2.2 is a diagram of the human brain.

Fig. 2.2

Damage to the brain can sometimes occur as the result of an accident.

Name the parts of the brain labelled **A** and **B** in Fig. 2.2 and suggest a problem that may be experienced by a person who has damage to that part of the brain.

part **A** .....

problem caused by damage

.....

.....

part **B** .....

problem caused by damage

.....

..... [4]

(c) Scientists are able to treat people with some types of brain damage. They may do this by injecting the patient with cells taken from another person (donor). These cells then travel to the brain where they divide and specialise to become groups of fully functioning brain cells.

(i) State the type of cell division that takes place when the cells that have been injected reach the patient's brain.

..... [1]

(ii) State the term used to describe a group of cells that are specialised to perform a specific function.

..... [1]

(d) Female patients were injected with cells from male donors. After a period of time, the scientists examined brain cells from these patients and looked for groups of brain cells containing the Y chromosome.

Explain why finding groups of brain cells containing the Y chromosome would suggest to the scientists that the treatment may have been successful.

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..... [3]

[Total: 11]

Coordination and response P2 questions

M/J12/21/Q4

Fig. 4.1 shows a horizontal section of the human eye and the pathway taken by light rays as they leave an object.

(a) Complete the diagram by continuing the lines from the object to show how the light rays produce a focussed image on the retina.

Fig. 4.1

[3]

(b) **(I)** State how the appearance of the pupil in the eye will change when a person moves from dim light into an area of bright light.

..... [1]

(II) Explain how this change is brought about by structures in the eye.

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..... [2]

(c) The change in appearance of the pupil when entering an area of bright light is a reflex action.

(I) Define the term *reflex action*.

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..... [2]

(II) Suggest why drugs that prevent this reflex action from occurring should be avoided.

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..... [2]

[Total: 10]

Coordination and response P2 questions

M/J12/22/Q1

Fig. 1.1 shows the human eye in horizontal section.

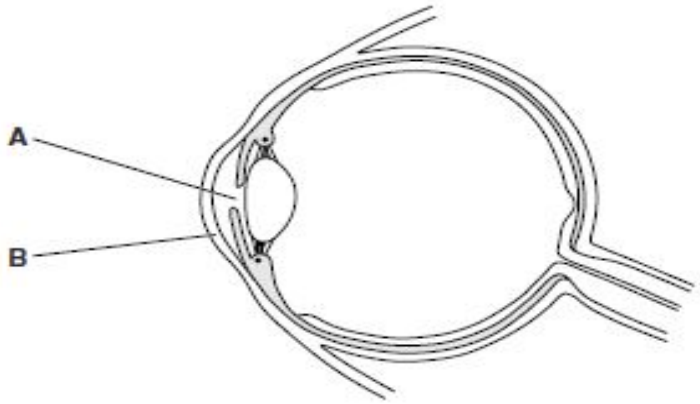

Fig. 1.1

(a) (i) Identify **A** and **B** that are labelled on Fig. 1.1.

A .....

B ..... [2]

(ii) Describe what happens to **A** when light entering the eye becomes less intense.

.....

..... [1]

(iii) Place a letter **Z** on Fig. 1.1 where a response occurs as a result of a reflex action. [1]

(b) In some people's eyes, the retina becomes completely detached from the tissues beneath. Explain how this will affect their ability to see.

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..... [3]

(c) As people get older, cloudy (opaque) patches sometimes form in the lens of the eye. These are called cataracts.
Suggest how cataracts might affect the ability of the lens to carry out its function.

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..... [3]

[Total: 10]

Coordination and response P2 questions

O/N11/22/Q3

The following is a list of terms associated with a person's responses. Each term is identified by a letter.

A – brain
B – contraction
C – gland
D – hormone
E – impulse
F – motor neurone
G – muscle
H – receptor
I – sensory neurone
J – spinal cord

(a) **Using their identifying letters only**, place the terms in the order in which they are involved in the following:

(i) Peeling an onion causes a student's eyes to water.

.....[2]

(ii) A student decides to open a book.

.....[1]

(iii) A student hears a sudden loud noise and, shortly afterwards, his heart beats faster.

.....

.....[2]

(b) Name the type of response involved in **(a)(i)** and **(a)(ii)**.

(a)(i) .....

(a)(ii) .....[2]

(c) Describe how responses involving the nervous system differ from those that involve the effects of hormones.

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.....[3]

[Total: 10]

Coordination and response P2 questions

M/J11/21/Q9

(a) For each of the following, state where, in the reflex arc, they are found and state their functions.

- sensory neurones

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- relay neurones

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- motor neurones

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.....[5]

(b) Explain why, just after hearing a sudden loud noise, a person's heart beats faster.

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.....[5]

[Total: 10]

Coordination and response P2 questions

O/N10/22/Q6

(a) Explain what is meant by a *hormone*.

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.....[4]

(b) Give an example of a hormone and describe how it is involved in maintaining constant conditions within the human body.

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.....[6]

[Total: 10]

Coordination and response P2 questions

M/J10/21/Q7

7 Describe the principal functions, in terms of co-ordinating and regulating the body, of

(a) the cerebrum,

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..... [5]

(b) the cerebellum,

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..... [2]

(c) the hypothalamus.

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..... [3]

[Total: 10]

Coordination and response P2 questions

O/N09/Q6

(a) Define a *hormone*.

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..... [4]

(b) Describe how the nervous system is involved in producing a **named** reflex action.

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..... [6]

[Total: 10]

Coordination and response P2 questions

Mark schemes will use these abbreviations:
; separates marking points
/ alternatives
() contents of brackets are not required but should be implied
R reject
A accept (for answers correctly cued by the question, or guidance for examiners)
Ig ignore (for incorrect but irrelevant responses)
AW alternative wording (where responses vary more than usual)
AVP alternative valid point (where a greater than usual variety of responses is expected)
ORA or reverse argument
underline actual word underlined must be used by candidate
+ statements on both sides of the + are needed for that mark

.M/J18/21/Q8

8(a) named stimulus / trigger for a specific reflex action **;**
correct named receptor for stimulus given **;**
action described correct for example given **;**
importance of specific action explained **;**
4
8(b) synapse (anywhere in sequence) **;**
impulse / electrical pulse (anywhere in sequence) **;**
receptor **;**
detection of stimulus **;**
then
sensory neurone **;**
relay / inter(mediate) / connector neurone **;**
reference to CNS / brain / spinal cord **;**
then
motor neurone **;**
effector / named effector **;**
action of effector or described **;**
6
Ig signal / message

M/J18/22/Q3

3(a)(i) **1** distance from eye increases **+** thickness / width of lens decreases
or
inverse **;**
2 up to 150 **+** cm **or** up to 2.6 **+** mm **or** then constant **AW ;**
2 A distance from eye decreases **+**
thickness / width of lens increases
3(a)(ii) **1** ciliary **;**
2 muscles **+** relax **;**
3 suspensory ligaments **;**
4 ligaments **+** tighten / taut **AW ;**
5 lens **+** pulled / stretched **;**
4
3(b) (*if convex stated*) **no mark for convex**
1 light **+** rays **;**

Coordination and response P2 questions

2 increased / more **+** refraction / bending **;**
3 before entering eye **;**
4 converge / meet **+** on retina / fovea **;**
5 object / image **+** clear / in focus **;**
OR
(*if concave, i.e. incorrect, **or** no type of lens stated*)
6 reference to light rays **+** refraction **AW +** before entering eye **;**

O/N17/21/Q6

6(a)(i) shaded circle drawn in iris **+** smaller than in 6.1(a) **; 1**
6(a)(ii) iris **+** muscle **;**
circular **+** contract **;**
radial **+** relax **;**
pupil **;**
constricts **AW ;**
5
6(b) *(type of action)*
reflex / involuntary **;**
(why the changes take place)
protection / prevent damage **;**
reduces light (entering) **;**
retina / rods / cones / photoreceptors **;**

O/N17/21/Q9(b)

9(b) correct named situation **;**
target organ / named **;**
(any two effects from)
glycogen to glucose / sugar **;**
increased (heart) rate **;**
pupils dilate **;**
dry mouth **;**
breathing rate change **;**
diversion of blood to muscle / from gut **;**
4
increased heart rate = 2 marks (named target organ **+** effect)

O/N16/21/Q7

7(a) chemical (substance) **;**
produced by (endocrine / ductless) gland **;**
(secreted) into / carried by blood **;**
(effect on) target organ **;**
destroyed by liver **;**
3 lg named examples of hormones

Coordination and response P2 questions

7(b)(i) insulin is secreted when blood sugar / glucose is (too)
high / lowers blood sugar / glucose levels **;**
(increased) sugar / glucose into cells **;**
reference to liver / muscle (cells) **;**
(converted) to glycogen **;**
(glycogen) for storage / is insoluble **;**
3

7(b)(ii) diabetes **;**
increased blood sugar / glucose concentration **;**
sugar / glucose in urine **;**
frequent urination **;**
tired / thirsty / weight loss **;**
insulin (by injection or tablet) **;**
dietary control **;**
4
A sweet-smelling breath / urine
R injection alone as a treatment, insulin required for mark
Total: 10

O/N16/22/Q6

6(a) 1 light / rays **+** bent / refracted / converged **;**
following points must be related to, or imply, the idea
of light / rays (accept image) passing through:
2 cornea **;**
3 pupil **;**
4 aqueous / vitreous humour / bodies **;**
5 lens **;**
6 (lens has) less ability to change shape
AW / accommodate **;**
7 (therefore lens unable to bulge) fully / enough **;**
8 (lens) cannot refract sufficiently / decrease focal
length sufficiently **AW ;**
9 (cannot focus on the) retina / fovea / yellow spot **;**
7
6(b) 1 convex (reference to spectacle lens) **AW ;**
2 (light / rays) bend / refract / converge **;**
3 before entering eye / (eye) lens **;**
4 compensate for thinness / lack of convexity or fatness
in eye lens **;**
5 (to focus on the) retina / fovea / yellow spot **;**
3
M/J16/21/Q8

8 (a) spinal cord ;
nerves / neurones ;
named receptor / sense organ ;
[2]
(b) R + medulla ;
control of heart
rate / breathing / involuntary
actions ;
relay of impulses between brain
and spinal cord ;

Coordination and response P2 questions

S + pituitary gland ;
secretes / releases hormone(s) ;
example of named hormone
released + correct function ;
T + cerebrum / cerebral
hemispheres ;
voluntary movement or example
of ;
thought / memory / any other
acceptable function ;
U + cerebellum ;
coordination of movement ;
maintenance of
posture / balance ;
A functions only if linked to correct
named part of the brain
e.g. TSH released which stimulates the
thyroid gland to secrete thyroxine.
[max 8]
[Total: 10

O/N15/21/Q7

7 (a) ciliary muscles ;
relax ;
suspensory ligaments ;
tighten / become taut / pulled AW ;
increased tension / pull on lens ;
lens long + thin / flatter / less fat / convex ;
light refracted / bent (by lens) ;
(light) converges / (produces image) on retina / fovea ;
[max. 6]
R bent more
(b) nervous system quicker AW / hormones slower ;
example of relevant situation ;
electrical / impulses ;
via neurones / nerve cells ;
hormones are chemical ;
carried / transported via blood ;

M/J15/22/Q3

3 (a) (i) C – RBC / erythrocyte ;
D – WBC / phagocyte / polymorph /
neutrophil ;
A polymorph / neutrophil
[2

(b)(ii) Urea,CO2,Iron,glucose,vitamins.water

(i)gylvogen broken down to glucose. Glucose released increases blood glucose conc.

(ii)fight or fright(Described)

(c)increased blood glucose conc./sugar level

Coordination and response P2 questions

Presence of glucose

(ii)insulin

O/N14/22/Q7

(a) fast / instant ;
automatic / involuntary / spontaneous / unconscious / AW ;
response / reaction ;
to a stimulus ;
[max. 3]
A ref. to no decision involved
(b) (i) named stimulus* ;
correct receptor / named* ;
impulse / electrical + pulse ;
sensory / afferent / receptor + motor / efferent / effector neurones, in correct order ;
CNS / spinal cord* ;
correct or named effector* ;
correct action (of effector)* ;
[max. 5]
* description must match
example
R brain if it directs response
(ii) automatic / innate / does not need to be learnt ;
ref. protection / aids survival / damage limitation ;
[2]
A example, e.g. prevents too much
light entering eye
[Total: 10]

O/N13/21/Q2

2 (a) Box 1: sensory / afferent neurone
Box 2: motor / efferent neurone /fibre
Box 3: effector / muscle / gland / A named effector
3 correct = 2 marks , 1 or 2 correct = 1 mark
[2]
R nerve
R unspecified organs
(b) (part A)
cerebrum / cerebral hemispheres / frontal lobes / fore brain;
(Problem)
loss of voluntary movement / speech difficulties /
change in sensory perception / / learning difficulty / memory loss /
change in emotional behaviour;
(part B)
Cerebellum / hind brain;
(Problem)
loss of control over movement / loss of learnt activity /
loss of balance / coordination;

Coordination and response P2 questions

[max 4]
Require the effect of the damage.
Need the idea of "loss"
(c) (i) Mitosis; [1]
(ii) Tissue; [1]
(d) Y chromosome is only in males / female is XX;
injected cells have travelled to brain;
Replication / cell division has occurred / tissue has formed;
Cells present after time period;
[max 3]
[Total: 11]

M/J12/21/Q4

4 (a) rays continue parallel until hit cornea;
rays converge at cornea;
rays converge at lens;
meet before retina + continue to hit retina; [3]
(b) (i) narrows / decreases in size or diameter / constricts (R contracts); [1]
(ii) iris + muscles;
circular + contract; [2]
(c) (i) fast / rapid / quick;
reaction / response + (to) stimulus;
automatic / involuntary / no involvement of conscious thought AW; / cannot be controlled
R no involvement of brain [2]
(ii) too much light allowed to enter AW;
damage to retina / rods / cones / light-sensitive cells; [2]
[Total: 10]

M/J12/22/Q1

1 (a) (i) A pupil / aqueous humour / anterior chamber;
B cornea; [2]
(ii) dilates / gets big / enlarges / opens / gets wide / expands; [1]
(iii) Z on ciliary muscle / iris / external muscle; [1]
(b) reasonable ref. light receptors / sensitive cells / rods / cones;
not in contact with optic nerve;
no impulses;
to brain;
no picture formed / unable to see / blindness;
(R blurred vision or reduced visionary powers)
less / no nutrition for retina; [max. 3]
(c) failure to focus (all) light (rays);
blurred image AW;
any reference to the passage of light rays being impaired
(e.g. reflection / refraction / deflection / absorption / convergence);
ref. possible change in elasticity / ability to accommodate;
faded colour vision; [max. 3]

O/N11/22/Q3

3 (a) (i) H, E, I (or I, E), A, F, C all correct = 2, 3 in correct consecutive sequence =1 (Ignore any

other ‘E’s);; [2]
(ii) A, E, J, F, G, B (Ignore any other E’s); [1]
(iii) H, E, I (or I, E), A, F, C, D, G (B) (4 in correct consecutive sequence = 1) (Ignore any other ‘E’s) (which can include the final B);; [2]

(b) reflex / involuntary / unintentional (R spinal reflex);
voluntary / deliberate / intentional; [2]
(c) faster / fast v. slow;
electrical / impulses v. chemical / blood;
neurones v. blood / chemical;
(R nerves)
muscles v. glands / organs;
temporary AW v. more lasting AW;
sometimes deliberate AW v. less controlled AW;
specific organs v more general effect; [max 3]
[Total: 10]

M/J11/21/Q9

9 (a) impulses anywhere;
Accept specific examples for next 6 mps
(sensory) from sense organ/receptor;
to CNS/spinal cord/brain;
(relay) within CNS;
connecting sensory to motor neurones;
(motor) from CNS/spinal cord/brain;
to effector/muscle/gland; [max 5]
(b) sound + stimulus;
ears AW;
one correct reference to a neurone;
brain;
gland/adrenal/suprarenal;
adrenaline/epinephrine;
blood;
heart muscles;
ref. fight/flight/fright etc. response – or described; [max 5]
[Total: 10]

O/N10/21/Q7

7 (a) receptor or correct e.g.;
(converts) stimulus;
to impulse / electric pulse;
sensory + neurone / nerve fibre or cell;
synapse;
CNS / spinal cord (R brain);
(N.b. If brain directs the response i.e. any idea of a decision being made – stop marking)
relay neurone;
motor neurone;
flexor or named muscle;
effector; [max. 7]
(b) adrenaline;
in blood to heart;
defence mechanism / fright / prepare for action – or described;

Coordination and response P2 questions

(e.g. muscular action)
faster circulation of blood / faster delivery of O_2 or glucose; [max. 3]
[Total: 10]

O/N10/22/Q6

6 (a) chemical (R named hormone);
released / produced by a gland;
into blood;
target organ;
effect / alter the activity of;
destroyed by the liver; [max 4]
(b) *deviation from set point (or described);
(For insulin / ADH, set point must be ref. glucose / water in the blood)
named hormone
(for more than one hormone, mark the best account. R adrenaline / thyroxine);
named gland that produces it;
(R for any hormone that is not involved in homeostasis)
name of target organ;
effect (which must be homeostatic) correct for example;
*homeostasis;
*return to set point AW (A 'keeps constant', but R regulates / controls); [max 6]
(Need not refer to blood)
(*Only these marks available if hormone is incorrect.)

M/J10/21/Q7

7 (a) (cerebrum) conscious thought ;
memory ;
intelligence ;
learning ;
sight ;
speech ;
hearing ;
sensation (e.g. touch / taste / smell) ;
voluntary action (or named e.g. arm movement) ; [5 max]
(b) (cerebellum) the main centre of co-ordination / fine movement ;
posture / muscle tone ;
balance ;
instinct ; [2 max]
(c) ref. maintenance of constant internal environment / homeostasis ;
detects changes in* ;
any two from :
blood concentration, in (blood) temperature,
CO_2 concentration in blood, ;;
control of blood pressure ;
triggers appropriate response / AW* ; [3 max]
(* A controls / regulates for ONE mark)

O/N09/Q6

6 (a) chemical (R named hormone) ;
produced by a gland (R specific named endocrine gland) ;
carried + by the blood ;
affects a target organ (R specific target organ) ;
destroyed by liver ; [max 4]

Coordination and response P2 questions

(b) stimulus or example ;
receptor / or described (R named sense organs) ;
impulse / electrical pulse AW ;
sensory neurone or sensory nerve cell (R nerve) ;
correct ref. to CNS for action described ;
relay / intermediate neurone or nerve cell (A 'interneurone') ;
motor or effector neurone or nerve cell ;
effector or described (muscle or gland) ;
correct response for stimulus given / named reflex ; [max 6]
[Total: 10]