GCSE BIOLOGY AQA - COMBINED SCIENCE MARK SCHEME

B5 HOMEOSTASIS & RESPONSE TEST 1
Mark schemes

(a) pancreas

(b) (in the) blood(stream)
   allow in the (blood) plasma
   ignore dissolved or in solution

(c) any two from:
   - concentration rises and falls in both people
   - concentration is higher at start / always in person with diabetes
   - concentration rises higher in person with diabetes
      allow correct use of figures

   plus any two from:
   - concentration rises more rapidly in person with diabetes
   - concentration stays high for longer in person with diabetes
   - concentration does not return to starting level during test in person with diabetes,
     yet concentration returns to starting concentration by 90 minutes in person without diabetes
   - concentration goes below starting concentration only in person without diabetes

(d) reduce carbohydrate / glucose / sugar in diet

   (so) blood glucose concentration does not increase as much

   (so) there is reduced named effect (of prolonged high blood glucose)
      allow reduced short or long term consequences such as tiredness
      or
      increase urination
      or
      thirst
      or eye / kidney / nerve / heart disease

[9]
(a) in the blood(stream)
   allow plasma
   ignore dissolved or in solution

(b) all three plots correct
   accept two correct plots for 1 mark
   suitable line drawn

(c) 1 hour

(d) 230–185
   identification of steepest part of graph and correct readings taken
   = 45

(e) line on graph showing extrapolation for person B
   correct value read from graph (at 130 mg per 100 cm$^3$)
   allow 1 mark for a value of 4.5–5 hours if no extrapolation shown

(a) Reflex action

(b) **Feature**
   **Label**
   A
   B
   C
   D
   E

   extra lines from the left negate the mark

(c) dependent

(d) 17.0
   allow answers in range 17.0–17.3 cm
(a) (i) receptor cells

(ii) eye(s)
   accept retina

(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

(ii) 182
     allow 182.0

(iii) Any anomalies can be identified.

(iv) reaction time (too) long or reactions (too) slow
     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

(a) fast reaction to reduce / protect from harm
     allow named examples
(b) higher caffeine concentration causes shorter reaction time.

allow converse

ignore ‘faster / slower reaction time’

(c) Level 3 (5–6 marks):
A coherent method is described with relevant detail, which demonstrates a broad understanding of the relevant scientific techniques and procedures. The steps in the method are logically ordered. The method would lead to the collection of valid results.

Level 2 (3–4 marks):
The bulk of a method is described with mostly relevant detail, which demonstrates a reasonable understanding of the relevant techniques and procedures. The method may not be in a completely logical sequence and may be missing some detail.

Level 1 (1–2 marks):
Discrete relevant points are made which demonstrate some understanding of the relevant scientific techniques and procedures. They may lack a logical structure and would not lead to the production of valid results.

0 marks:
No relevant content.

Indicative content
• use decaffeinated coffee as control
• control volume of coffee
• blind trial or do not tell students which coffee they are drinking
• left for standard time between drink and test
• at least 10 minutes
• control start position of ruler
• control other factors such as light in the room
• same person for different concentrations
• repeat for each caffeine concentration
• use a range of caffeine concentrations
• start with lowest concentration of caffeine
• use caffeine solution instead of coffee to control for other ingredients
• repeat investigation with more people and calculate means

(a) \( (715.1 - 238.8 = 476.3) \)

\[
\frac{476.3}{715.1} \times 100
\]

66.6 (%)

allow correct rounding of 66.60606908

an answer of 66.6 (%) scores 2 marks
(b) hold metre rule above hand of person to be tested so the bottom of the ruler is level with the top of the hand

*allow description of any reasonable method that would give results*

drop the rule and the other person catches it

record / measure the distance where the rule is caught

convert the distance into time using a standard (scale) chart or calculation

ignore electronic methods

(c) any one from:
- higher resolution
  *allow measured in milliseconds*

- times are too small (for humans) to measure
  *ignore human error unqualified*

- random
  *allow not biased*

- no calculation errors
  *allow it is quicker*
  *ignore more precise*

(d) any two from:
- used a different person in each test
  or
  different people need different amounts of sleep
  or
  no baseline established (for comparison)

- only one person was tested for each sleep time
  or
  sample size is too small

- only did the test on one night

- as reaction times in ms they need to do (more than three / five) repeats
  or
  there is wide variation in the results
  or
  result for Student C or
  4 hours' sleep shows a decrease in reaction time

- don’t know if other factors were controlled
  *allow correct named example, such as caffeine consumed, sleep before investigation, age*

- table only shows some of the data
(e) **reasons in support:**
- performance / accuracy decreases with increasing alcohol concentration and
  performance / accuracy decreases as lack of sleep increases
- reduction in performance at the legal alcohol limit / 0.08% (for driving) is the same as (more than) 24 hours without sleep

**reasons against:**
- idea that the statement is sensationalised and does not use (quantifiable) data
- the (performance) scales are different, so difficult to make comparison or the (performance) scales are different so the data is misleading
- being tired is subjective / different for everyone
  - allow idea that lack of sleep does not necessarily correlate with tiredness
- there is wide variation in the data
- (the graph shows that) some people have 16 / 18 hours without sleep and don’t have a drop in performance
- at alcohol levels of 0.09% some people have a 14% drop in performance (which is much higher than lack of sleep)
  - allow other correct points of comparison
- (data contradicts the statement because) for some a small amount of alcohol improves performance
  - **max 3 marks if only reasons in support or reasons against given**
  - ignore study design

(a) hormone
  - **ignore protein**

(b) (once a certain amount of thyroxine has been produced)
- (thyroxine) inhibits / prevents / stops (pituitary gland from) stimulation of the thyroid gland
- so less thyroxine is produced

(c) cold weather stimulates the pituitary gland, which stimulates the thyroid gland to produce more thyroxine
- increased / more thyroxine raises basal metabolic rate
- which increases rate of respiration, which increases body temperature
(d) less stimulation of thyroid gland, so less thyroxine produced / released

so basal metabolic rate decreases

therefore reduced respiration rate, so more food stored as fat

(a) A FSH

allow follicle stimulating hormone

B Progesterone

(b) LH peaks

allow luteinising hormone

which causes an egg to be released.
(c) **Level 3 (5–6 marks):**
A detailed and coherent explanation is given, which logically links the role of different hormones to their use in IVF and a clear explanation of how IVF increases the chance of a successful pregnancy.

**Level 2 (3–4 marks):**
An attempt is made to link the role of hormones to their use in IVF. The logic used in explaining how IVF increases the chance of a successful pregnancy may not be clear or linked to the hormones.

**Level 1 (1–2 marks):**
Discrete relevant points made. The logic may be unclear and links may not be made.

**0 marks:**
No relevant content

**Indicative content**

Identification of hormones used in IVF:
- FSH
- LH.

Role of hormones in IVF:
- FSH causes eggs to mature
- LH causes the eggs to be released.

Effect on chance of successful pregnancy:
- high levels of hormones cause many eggs to be matured and released
- sperm and eggs are collected and eggs are fertilised (so increased probability of fertilisation)
- fertilised eggs are given time to develop into a small ball of cells
- some are transferred into the mother (uterus), to increase the probability of one successfully implanting.

(a) \((76 - 28) \times 2\)

\[96 \text{ (units / h)}\]

*allow 96 (units / h) with no working shown for 2 marks*

*allow 1.6 units / min for 1 mark*

*allow answer in range of 94–104 (units / h) for 1 mark*

(b) increased blood glucose concentration causes insulin release from pancreas

which stimulates cells to absorb glucose / sugar from the blood, so blood glucose concentration decreases
any three from:

at least one advantage and one disadvantage of the system(s) must be given for full marks

allow responses phrased in terms of the meter and injection systems

advantages of the new system:

• better control so reduces risk of future health problems
  allow fewer low / high blood glucose periods so safer
• no need to estimate dose of insulin
• less chance of giving too much / little insulin
• system works automatically / continuously so no need to test / inject

disadvantages of the new system:

• system is always attached so may restrict activities
  allow pump is difficult to hide
• pump has to be carried somewhere
  allow risk of discomfort
• pump will need re-filling
• risk of infection
  or
  risk of tissue damage (at injection site)
• line might come out
  accept new system more expensive

qualified conclusion: a statement as to which system is better with reference to at least one advantage and one disadvantage

for example, the new system is better because although it is more expensive, it works automatically

(d) blood glucose concentration goes too low

blood glucose concentration detected by pancreas

pancreas releases glucagon

(glucagon causes) cells to convert to glycogen into glucose

glucose released into blood

(a) Pituitary
(b) \[
\frac{10 - 4}{4} \text{ or } \frac{6}{4} = 150 (\%)
\]

(c) the level in the blood is already higher than it was before point A

levels hadn’t returned to normal yet (before the next scare)

\textit{allow he had already been scared so he was expecting the second scare}

(d) increased oxygen to brain / muscles

increased glucose to brain / muscles

[7]