Mark schemes

Q1.

(a) any **two** from:

- same starting position of rule(r)
  allow ensure the starting position of rule(r) is at 0cm
  allow other control variables
  *allow two control variables for **2** marks*
- more precise scale
  allow rule(r) with mm scale
  ignore more accurate scale
- repeat **and** calculate mean
  or
  repeat **and** eliminate anomalies
- convert distance to time
- student (**B**) rests hand / arm on table

2

(b) any **two** from:

endocrine system:

- (hormones) via blood
  allow converse if clearly referring to nervous system
  allow not via neurones / cells
- chemical transmission
  allow not (electrical) impulses
  allow not electrical signals
  ignore messages
  ignore hormones
- slower
- longer-lasting
  answers must be comparative
  ignore reference to target organs

2

(c) thyroxine

*do **not** accept thyroxide*
ignore reference to TSH / TRH

1

(d) any **one** from:

- insulin
- glucagon

1

(e) any **two** from:

- increases heart rate
  allow increases blood flow
- increases breathing rate
- increases oxygen delivery to cells / tissues / organs
- increases glucose delivery to cells / tissues / organs
  allow examples of cells / tissues / organs
- increases respiration / metabolism
  allow increases energy release
  *do **not** accept energy produced / made / created*
- increases sweat(ing)
  allow dilation of pupils
  *allow vasoconstriction in skin **or** vasoconstriction in digestive system*
  *allow raises blood sugar / glucose level **or** increase conversion of glycogen to glucose*
  allow vasodilation in (skeletal) muscles / brain
  allow increased blood pressure
  allow slows digestion
  allow other correct effects of adrenaline
  *if no other marks awarded allow **1** mark for prepares for 'fight or flight'*

2

(f) **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 contraception:

- use of hormones oestrogen and progesterone **or** progesterone (only)

o inhibition of FSH (production / release)
  - lack of FSH prevents follicle / egg development / maturation
  - therefore there is no egg to fertilise

○ inhibition of LH (production / release)
  - lack of LH prevents ovulation
  - therefore there is no egg to fertilise

- contraceptive methods include oral contraceptive pill, injection, implant, skin patch, IUD / IUS with hormones

treatment of infertility:

- use of FSH

○ (FSH) stimulates **maturation** of (several) egg(s) / follicle(s)
  - (FSH) increases number of eggs matured

- use of LH

○ (LH) stimulates ovulation
  - (LH) allows eggs / follicles to be collected (from ovary)
  - (so) increased chance of fertilising an egg
  - IVF and insertion of embryo(s) into uterus

- use of progesterone

○ (to) maintain uterus lining
  - increased chance of implantation

For **Level 3**, details of both contraception and infertility treatment are required.

[14]

Q2.

(a) regulation / control / maintenance of internal conditions

allow keeping internal conditions the same

1

for optimum conditions for cell(s) / enzyme(s) (activity)

allow a description of optimum functioning of cell / body

1

(b) glucose **and** urea are filtered (out of the blood)

*allow a description of filtration of glucose **and** urea (out of the blood)*

1

protein is not filtered (out of the blood)

1

all glucose reabsorbed

allow all glucose absorbed back into the blood

1

urea (mostly) not reabsorbed
or
urea passes out in urine

allow urea not absorbed back into the blood

1

(c) (increased / high) ADH increases water reabsorption
or
(increased / high) ADH
increases permeability to water

allow converse for decreased / low / no ADH

1

(water reabsorption) from kidney tubules

1

(so) ADH increases the concentration (of urine)

1

(so) ADH decreases the <u>volume</u> (of urine)

1

[10]

Q3.

(a) if (concentration of substance) **Q** becomes high (hormone) **A** is released / used

1

if (concentration of substance) **Q** becomes low (hormone) **B** is released / used

1

hormone(s) / **A** / **B** brings (concentration of) substance **Q** back to ideal / normal

1

*allow answers in terms of insulin for hormone **A** and / or glucagon for hormone **B***

*allow answers in terms of blood glucose (concentration) for substance **Q***

(b) (thyroxine) increases (basal) metabolic rate

allow (thyroxine) increases metabolism

allow (thyroxine) increases respiration

allow (thyroxine) increases reactions in cells

1

<u>respiration</u> releases energy

*allow <u>respiration</u> releases heat do **not** accept energy being produced / made / created*

allow respiration is exothermic

1

(c) (kidney) tubules less permeable to water

1

(so) less water is reabsorbed

allow (so) less water taken back into the blood

1

(so) more water in urine causing increased rate of production (of urine)

allow (so) more water in urine causing increased volume (of urine)

1

(so) more water in urine causing lower concentration of dissolved substances (in urine)

(so) more water in urine causing more dilute urine

1

[9]

Q4.

(a) as volume of follicles rises oestrogen concentration (in blood) rises (for 7 / 8 days)

allow (positive) correlation between oestrogen concentration and volume of follicles (for 7 / 8 days)

or *oestrogen concentration is in proportion to follicle volume (for 7 / 8 days)*

*do **not** accept an increase of oestrogen concentration causes an increase of follicle volume*

1

(b) (volume of one follicle)

$= \frac{4}{3} \times 3.14 \times 11^3$

allow $\frac{4}{3} \times \pi \times 11^3$

1

= 5572.(4533)

allow 5575(.279…)

1

(total volume of follicles) = 39 000 (mm^3)

1

$\frac{39\,000}{5572}$ 6.99…

allow use of an incorrect volume (from Figure 12) and / or an incorrectly calculated volume of one follicle

1

7

*do **no**t accept 7.0*

1

(c) (lack of FSH causes) lack of oestrogen (production)

allow lack of FSH causes lack of follicle development / growth / maturation

1

breast development is dependent on oestrogen (from follicles)

allow (female) secondary sexual characteristics are dependent on oestrogen (from follicles)

1

(d) gametes correct:
H + **h** **and** **H** + **h**

1

correct derivation of offspring genotypes:
HH **Hh** **Hh** **hh**

allow correct for gametes stated in mp1

1

correct phenotype for each genotype

allow correct for genotypes stated in mp2

*do **not** accept if no **hh** offspring*

1

(e) mother (has **hh** so) passes on **h**

1

father (has **Hh** so) passes on **H**
or **h** with equal probability

1

(so) child will be **Hh** / heterozygous with 0.5 probability and produces FSH

1

allow annotated genetic diagram for all marks

[14]

Q5.

(a) parents without MSUD have a child with MSUD

allow 1 and 2 (without MSUD) have child 5 (with MSUD)

or

7 and 8 (without MSUD) have child 12 (with MSUD)

ignore MSUD skips a generation

1

(b) gametes correct:
N + **n** and **N** + **n**

1

correct derivation of offspring genotypes:
NN **Nn** **Nn** **nn**

allow correct for gametes stated

1

correct phenotype for each genotype

allow correct for offspring genotypes

ignore carrier

1

correct probability:
0.25 / ¼ / 25% / 1 in 4

allow correct answer only

allow 1:3

*do **not** accept 1 in 3 / 1:4*

1

(c) liver

1

(d) (no enzyme 2 made **so**) cannot break down the toxic substance

*allow (no enzyme 2 made **so**) cannot change toxic substance into harmless products*

1

the toxic substance is still made (from the amino acids)

allow toxic substance builds up over time

ignore concentration of toxic substance is high(er)

1

toxic substance diffuses / moves (from cells) into the blood

ignore incorrect name of organ

*allow **P** for toxic substance throughout*

1

(e) the toxic substance passes through filter in kidney
or
P passes through filter in kidney

1

(some / all) not reabsorbed

*allow (some / all) not absorbed **back** into the blood*
***or** (some / all) not taken **back** into the blood*
ignore (some / all) not absorbed into the blood
***or** (some / all) not taken into the blood*

1

(f) proteins contain amino acids
or
proteins are made of amino acids

allow proteins are broken down into amino acids

1

must keep (certain) amino acids in low amount

allow (so) (certain) amino acids do not build up
allow (so) less of (certain) amino acids are produced

1

(so) toxic substance **or P** does not build up in the body **and** cause damage to cells / tissues / organs

1

[14]