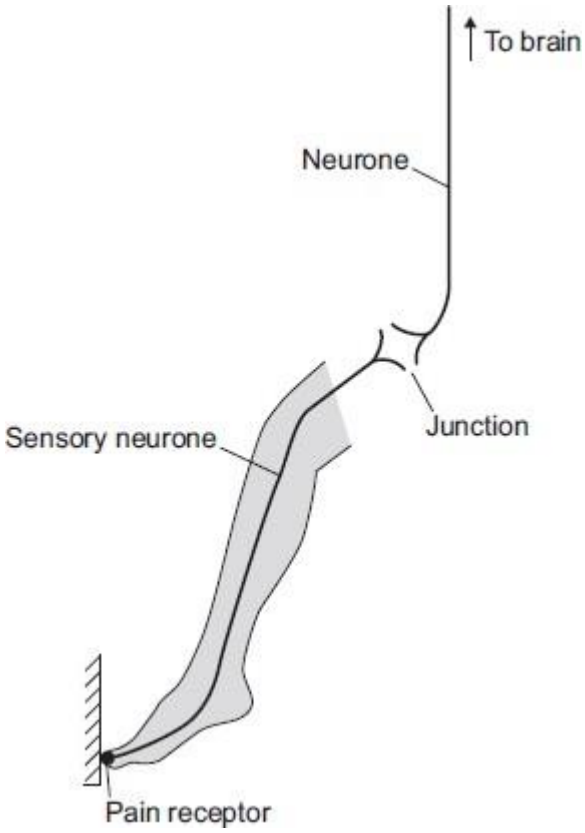
1 The diagram shows the pathway of an impulse from a pain receptor when someone bangs their toe on a hard surface.



(a) (i) What is the junction between neurones called?

_____

(1)

(ii) How does information cross the junction between neurones?

_____

_____

(1)

(b) If you bang your toe you feel the pressure of the impact before you feel the pain. This is because the impulse from a touch receptor travels faster than the impulse from a pain receptor.

The speed of transmission of the impulse from a touch receptor is 76.2 m / s.

The speed of transmission of the impulse from a pain receptor is 0.60 m / s.

The following equation can be used to calculate how long it takes for each impulse to reach the brain:

$$\text{Speed of transmission} = \frac{\text{distance}}{\text{time}}$$

If the distance each impulse has to travel from the toe to the brain is 1.920 metres, it will take 0.025 seconds for the impulse from the touch receptor to reach the brain.

Calculate how much **longer** it will take the impulse from the pain receptor to reach the brain.

You must show your working.

_____

_____

_____

_____

_____

_____

_____seconds

(3)

(Total 5 marks)

2 Read the following passage which is from an advice book for diabetics.

Insulin Reactions

Hypoglycaemia or 'hypo' for short, occurs when there is too little sugar in the blood.
It is important always to carry some form of sugar with you and take it immediately you feel a 'hypo' start. A hypo may start because:

- you have taken too much insulin, or
- you are late for a meal, have missed a meal altogether, have eaten too little at a meal, or
- you have taken a lot more exercise than usual.

The remedy is to take some sugar.

An insulin reaction usually happens quickly and the symptoms vary – sweating, trembling, tingling of the lips, palpitations, hunger, pallor, blurring of the vision, slurring of speech, irritability, difficulty in concentration.

Do not wait to see if it will pass off, as an untreated 'hypo' could lead to unconsciousness.

(a) Many diabetics need to take insulin.

(i) Explain why.

_____

_____

_____

_____

(2)

(ii) Explain why there is too little sugar in the blood if too much insulin is taken.

_____

_____

_____

_____

(3)

(iii) Explain why there is too little sugar in the blood if the person exercises more than usual.

_____

_____

_____

_____

(3)

(b) Suggest why sugar is recommended for a 'hypo', rather than a starchy food.

_____

_____

_____

_____

(3)

(c) Explain how the body of a healthy person restores blood sugar level if the level drops too low.

_____

_____

_____

_____

(3)

(d) Explain, using insulin as an example, what is meant by negative feedback.

_____

_____

_____

_____

(3)

(Total 17 marks)

3 A woman wants to have a baby. She has been told that her body is not making and releasing eggs. However she has thousands of cells which could develop into them. A possible treatment is to give her a hormone called FSH. This hormone will start the development of these cells.

Once the eggs have developed, explain what causes their release.

_____

_____

_____

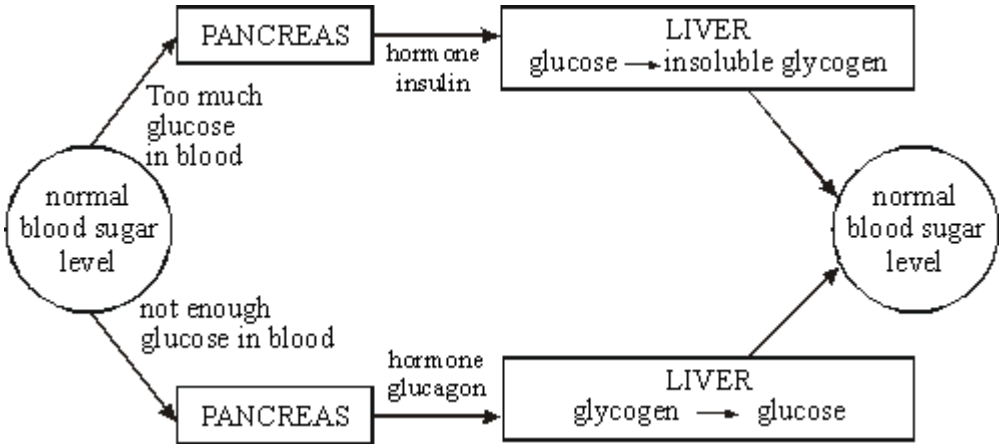
_____

_____

_____

(Total 4 marks)

4



The diagram shows how the blood sugar level is controlled in the body.

Explain fully what would happen if somebody ate some glucose tablets.

(Total 4 marks)

5 The figures below show the levels of carbon dioxide in air from 150 000 years ago.

TIME	CARBON DIOXIDE CONCENTRATION
1500 years ago	270 parts per million
1800 AD	290 parts per million
1957	315 parts per million
1983	340 parts per million

(a) Explain why carbon dioxide levels in the atmosphere are changing.

(3)

(b) It is suggested that the increased level of carbon dioxide in the air is causing the atmosphere to warm up (the "Greenhouse Effect").

Describe, as fully as you can, **two** major effects of global warming and how these may affect the human population.

(6)

(Total 9 marks)

6 A dog runs across the road in front of a car. The driver slams her foot on the brakes.

(i) Explain how the nervous system brings about this response.

(4)

(ii) Explain why alcohol consumption would affect the driver's response.

(1)

(Total 5 marks)

7 High levels of oestrogen inhibit the production of FSH by the pituitary gland.

(i) Explain how this is an example of negative feedback.

(2)

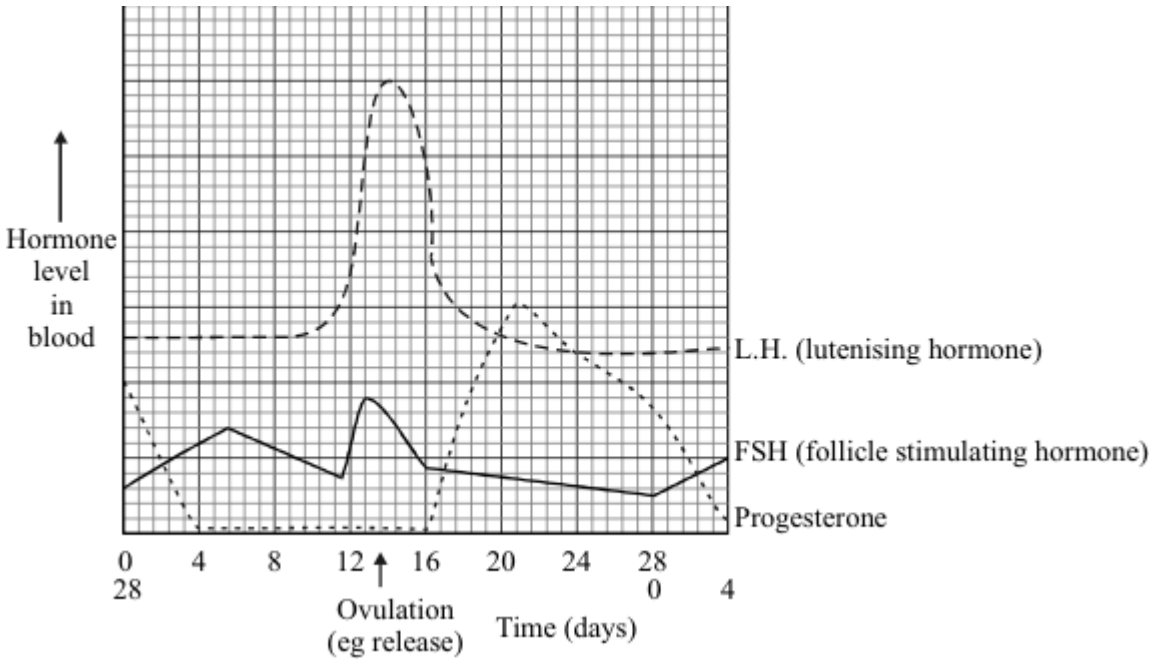
(ii) One drug that is used to treat female infertility is clomiphene. Clomiphene blocks the inhibitory effect of oestrogen on FSH production.

Explain how this may help in the treatment of infertility.

(2)

(Total 4 marks)

8 The graph shows changes in the levels of three hormones in a menstrual cycle.



(a) What does the graph suggest the stimuli might be which cause the egg to be released?

_____

_____

_____

_____

(3)

(b) One type of contraceptive pill keeps the level of progesterone high for most of the cycle.

Suggest how this might work.

_____

_____

_____

(2)

(c) Outline **two** arguments for and **two** against using hormones as contraceptives.

For: 1 _____

_____

For: 2 _____

_____

Against: 1 _____

_____

Against: 2 _____

_____

(4)

(Total 9 marks)

1 (a) (i) synapse

1

(ii) chemical

accept neurotransmitter or named neurotransmitter

1

(b) 3.175 **or** 3.18 (seconds)

*allow **2** marks for a time of 3.2 calculated for the pain impulse*

or

*allow **1** mark for a correct substitution or reorganisation:*

0.6 = 1.92 / t

or

t = 1.92 / 0.6

*allow **1** mark for an incorrect time for pain impulse − 0.025 correctly subtracted*

3

[5]

2 (a) (i)
- blood sugar rises because
- insufficient insulin secreted by body

for 1 mark each

2

(ii)
- increase in rate of conversion
- of glucose to glycogen
- in liver

for 1 mark each

3

(iii)
- muscles use more glucose from blood
- in respiration
- to release energy needed for exercise

for 1 mark each

3

(b) 3 of

sugar soluble
therefore absorbed
quicker than starch
which has to be digested

any 3 for 1 mark each

3

(c)
- increased secretion of glucagons
- by pancreas
- results in increases rate of conversion of glycogen into glucose

for 1 mark each

3

(d) 3 of e.g.

higher blood sugar level results in increased secretion of insulin
effect of insulin is to lower blood sugar
which in turn reduces rate of insulin secretion
overall result is to keep fluctuations in sugar level to a minimum

any 3 for 1 mark each

3

[17]

3 oestrogen produced

gains 1 mark

but N.B. sequence important here
oestrogen produced by ovary

gains 2 marks

LH produced

gains 1 mark

but
LH produced by pituitary

gains 2 marks

LH causes egg release

for1 mark

[4]

4 *idea:*
glucose level rises
pancreas releases insulin
glucose → glycogen (in liver)/removes xs glucose
glucose level falls/returns to normal

for 1 mark each

[4]

5 (a) *idea:*
more (fossil) fuel burned (do not credit simply more people/cars/industry)
deforestation = less photosynthesis
deforestation = more respiration/burning

each for 1 mark

3

(b) *idea*:
climate change

for 1 mark

warmer/colder/drier/wetter
food production affected/starvation
mayor ecosystems destroyed/damaged

any two for 1 mark each

6

sea level rise

for 1 mark

low land flooded
less food grown/starvation
homes/factories flooded

any two for 1 mark each

Allow
polar ice caps melt
sea water expands

[9]

6 (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

for 1 mark

1

[5]

7 (i) reduction in FSH levels will lead to reduction of oestrogen production,
therefore oestrogen production is negatively affected
by high oestrogen levels

for 1 mark each

2

(ii) high levels of FSH,
more likely to lead to egg release/maturation

for 1 mark each

2

[4]

8 (a) LH or FSH (only one mentioned)

gains 1 mark

but
LH and/or FSH (both mentioned)

gains 2 marks

rises (sharply)

for 1 further mark

3

(b) FSH or LH level kept low
no ovulation/egg not released

for 1 mark each

2

(c) for:
very effective/prescribed/
personal preference/convenient/
promote family values

any two for 1mark each

against:
upset internal environment
named side effects (allow two)
religious belief
no protection against VD/AIDS
long-term effects
moral belief

any two for 1 mark each

4

[9]