PEARSON EDEXCEL GCSE COMBINED SCIENCE (HIGHER) · 1SC0

BIOLOGY



EXAM QUESTION PACK

TOPIC 7: ANIMAL COORDINATION, CONTROL AND HOMEOSTASIS (PAPER 2)

SCORE	PERCENTAGE
/119	%

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Q1.

* The human body prevents blood glucose levels from becoming too high or too low.

Explain how the human body maintains blood glucose levels within a narrow range.

(6)

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Q2.

A diabetic athlete is advised to estimate the number of grams of carbohydrate in his meals in order to calculate the number of units of insulin he will need to inject to lower his blood glucose concentration.

Each unit of insulin he injects reduces his blood glucose concentration by 1.5mmol dm^{-3}.

He needs to inject 1 unit for every 10 grams of carbohydrate he consumes.

Figure 12 shows the estimated carbohydrates in the breakfast eaten by the athlete.

food consumed	estimated carbohydrate /grams
orange juice	25
2 slices brown toast	68
350 grams baked beans	38
tea with sugar	25

Figure 12

(i) Calculate how many units of insulin the athlete would need to inject to control the rise in blood glucose levels.

Give your answer to two significant figures.

(2)

..... units of insulin

(ii) The athlete miscalculated his carbohydrate intake to be greater than his actual intake.

Explain how the increase in the number of units injected would affect his blood glucose concentrations.

(2)

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(Total for question = 4 marks)

Q3.

(i) A patient visits his doctor because he is putting on weight but does not think he is increasing his calorie intake.

The patient has a height of 1.9m and a body mass of 120kg.

What is his BMI?

(1)

☒ **A** 0.0083

☒ **B** 33.2

☒ **C** 0.016

☒ **D** 66.4

The doctor diagnosed this person with an underactive thyroid gland.

* (ii) Explain why an underactive thyroid could cause this patient to have an increased body mass.

(6)

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(Total for question = 7 marks)

Q4.

A hospital patient was tested for diabetes.

A nurse recorded his mass and height.

Figure 7 shows these measurements.

mass in kg	height in metres
124	1.8

Figure 7

Calculate the BMI of this patient using the information in Figure 7.

(2)

BMI = ...

(Total for question = 2 marks)

Q5.

The female population of Britain is 32.6 million.

The percentage of this population taking the combined contraceptive pill is 13.2%.

The combined pill is 98.8% effective.

Calculate the maximum number of females taking the combined contraceptive pill who could become pregnant.

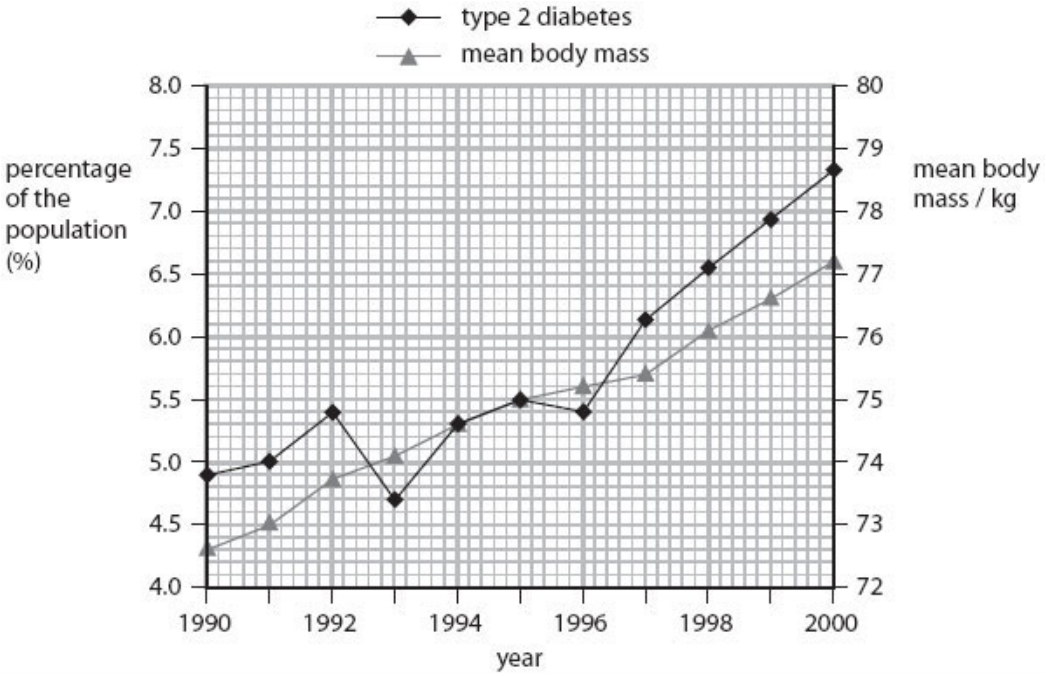
(3)

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(Total for question = 3 marks)

Q6.

The graph shows the percentage of the population with type 2 diabetes and the mean body mass of the population, from 1990 to 2000.



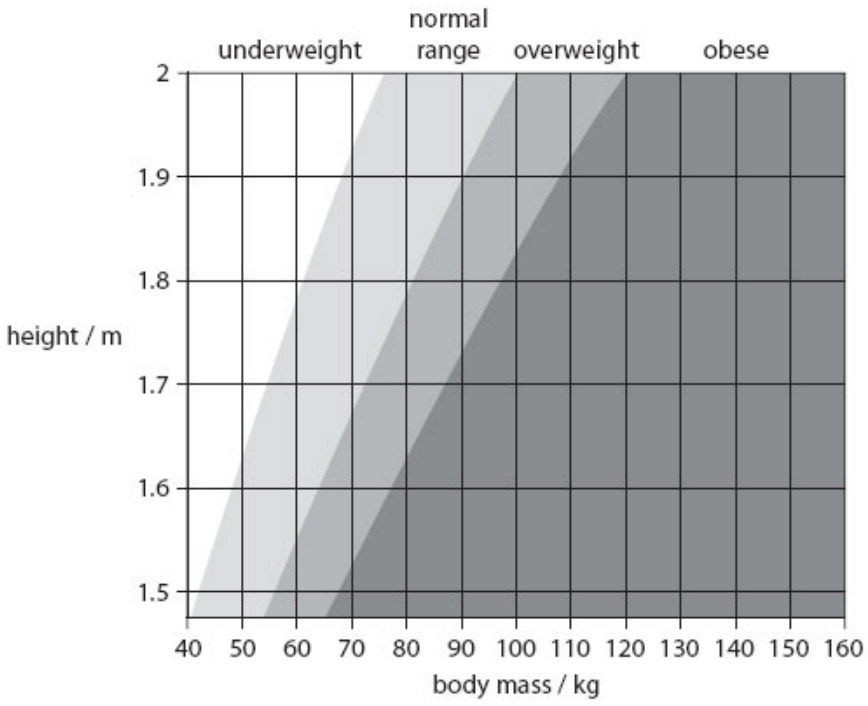
(i) Use the equation to calculate the body mass index (BMI) for a person with a body mass of 78 kg and a height of 1.7 m.

$$\text{BMI} = \frac{\text{mass / kg}}{(\text{height in metres})^2}$$

(2)

BMI .....

(ii) Use the chart to find the BMI category for this person.



Complete the sentence by putting a cross (☒) in the box next to your answer.

The BMI category for this person is

(1)

☒ **A** underweight

☒ **B** normal range

☒ **C** overweight

☒ **D** obese

Q7.

Explain what happens to the uterus lining if the egg cell is fertilised.

(2)

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Q8.

A woman had unexplained weight loss and fatigue.
She had blood tests to investigate the cause of these symptoms.

Figure 6 shows the results.

blood test	woman's result	normal range
TSH level	5.6 mU/l	0.4 to 4.9 mU/l
thyroxine level	27.5 pmol/l	9.0 to 21.0 pmol/l
red blood cell count	5.2×10^6 cells/μl	4.2 to 5.4×10^6 cells/μl
glucose level	82.0 mg/dl	72.0 to 99.0 mg/dl

Figure 6

Comment on the results of these blood tests and the possible causes of the woman's weight loss and fatigue.

(4)

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(Total for question = 4 marks)

Q9.

Blood tests can be used to check a person's blood glucose and hormone levels.

Figure 4 shows the results of two blood tests carried out on three people to check their blood glucose levels. Person 1 is healthy.

	blood glucose level (mmols/l)	
	after fasting for 12 hours	two hours after drinking 75 g glucose
person 1	5.4	6.4
person 2	5.6	9.0
person 3	7.8	12.1

Figure 4

(i) Compare the glucose levels of person 1 with the glucose levels of person 2 after fasting for 12 hours.

(1)

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(ii) Compare the glucose levels of person 3 with the glucose levels of person 1, two hours after drinking 75g glucose.

(1)

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Person 3 cannot produce the hormone that controls blood glucose levels.

(iii) State the hormone that person 3 cannot produce.

(1)

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(Total for question = 3 marks)

Q10.

Figure 8 shows the nutritional information for two different varieties of biscuit.

Variety A

Nutrition information	Per biscuit	Per 100 g
Energy	62 kcal	446 kcal
Fat	2.1 g	15.3
of which		
monounsaturated	0.9 g	6.2 g
polyunsaturated	0.3 g	2.2 g
saturated	0.9 g	6.9 g
Carbohydrates	9.562 g	68.3 g
of which		
sugars	0 g	0.4 g
Proteins	1.113 g	7.95 g
Dietary fibre	0.53 g	3.8 g
Natrium	0.07 g	0.52 g

Variety B

Nutrition information	Per Biscuit	Per 100 g
Energy	40.8 kcal	489 kcal
Protein	0.61 g	7.30 g
Carbohydrates	5.59 g	67.10 g
(of which sugars)	1.34 g	16.10 g
Fat	1.77 g	21.20 g
Saturated fatty acids	0.89 g	10.70 g
Monounsaturated fatty acids	0.70 g	8.40 g
Polyunsaturated fatty acids	0.18 g	2.20 g
Trans fatty acids	0.00 g	0.00 g
Cholesterol	0.00 mg	0.00 mg
Dietary fibre	0.51 g	6.10 g

Figure 8

(i) State why it is better to compare the nutritional information per 100 g of biscuit rather than per biscuit.

(1)

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(ii) Explain why variety A would be a better choice of biscuit for a person with type 2 diabetes.

(2)

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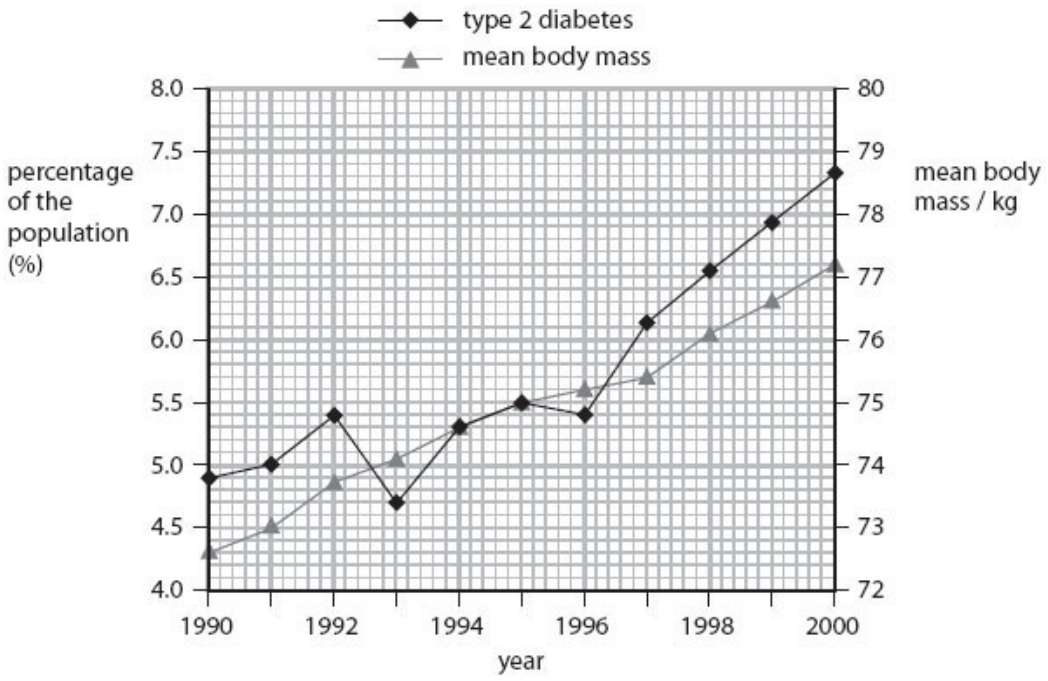
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(Total for question = 3 marks)

Q11.

The graph shows the percentage of the population with type 2 diabetes and the mean body mass of the population, from 1990 to 2000.



(i) Use information from the graph to describe the correlation between type 2 diabetes and body mass shown from 1993 to 2000.

(2)

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(ii) Suggest how a change in body mass may cause a person to develop type 2 diabetes.

(2)

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Q12.

Blood samples were taken from this patient every four hours.

The glucose concentrations were recorded in Figure 8.

time in hours	blood glucose concentration in milligrams per decilitre
0	100
4	131
8	139
12	90
16	92
20	134
24	137

Figure 8

(i) Describe the trends shown in this data.

(3)

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(ii) This patient was diagnosed as being type 2 diabetic.

Explain why the blood glucose concentration of this patient remained high from 4 hours to 8 hours.

(3)

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(iii) This patient did some exercise during these 24 hours.

Explain how the data in Figure 8 shows that this exercise occurred after 8 hours but before 12 hours.

(3)

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(Total for question = 9 marks)

Q13.

Figure 5 shows the level of progesterone for a female during five different stages of the menstrual cycle.

days in the menstrual cycle	progesterone level (nmol/l)
1–9	1.85
10–14	1.48
15–17	14.28
18–23	35.27
24–28	17.11

Figure 5

(i) Describe the changes in progesterone levels during the 28-day cycle.

(2)

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(ii) Explain why progesterone levels changed following day 14.

(2)

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(iii) Use Figure 5 to explain if the female is pregnant.

(2)

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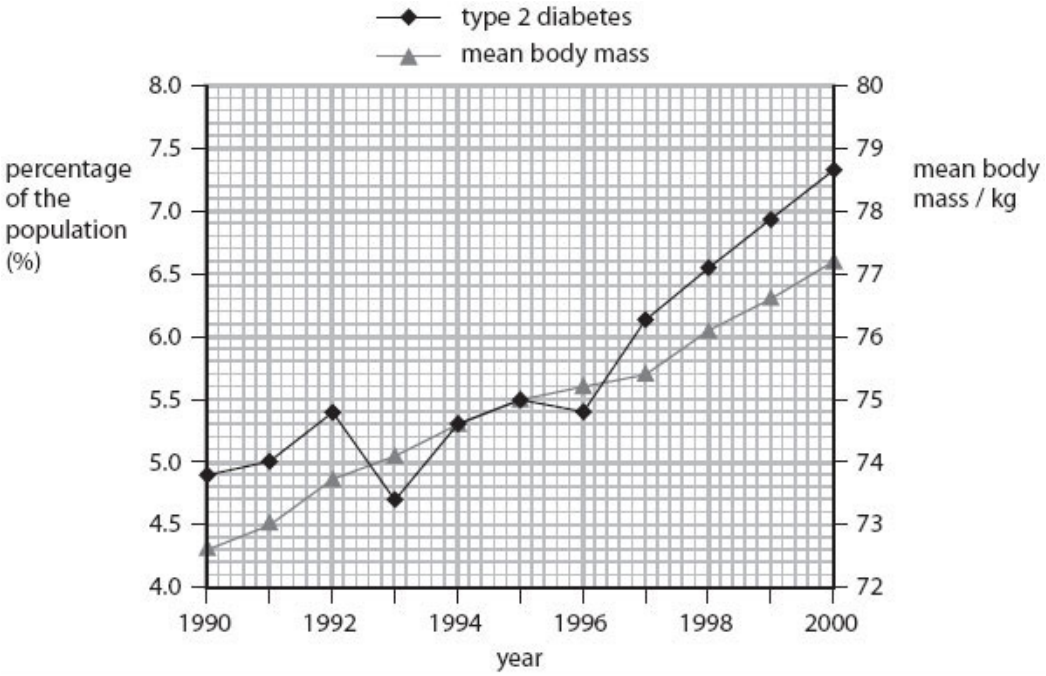
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(Total for question = 6 marks)

Q14.

The graph shows the percentage of the population with type 2 diabetes and the mean body mass of the population, from 1990 to 2000.



(a) (i) Use information from the graph to describe the correlation between type 2 diabetes and body mass shown from
1993 to 2000.

(2)

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(ii) Suggest how a change in body mass may cause a person to develop type 2 diabetes.

(2)

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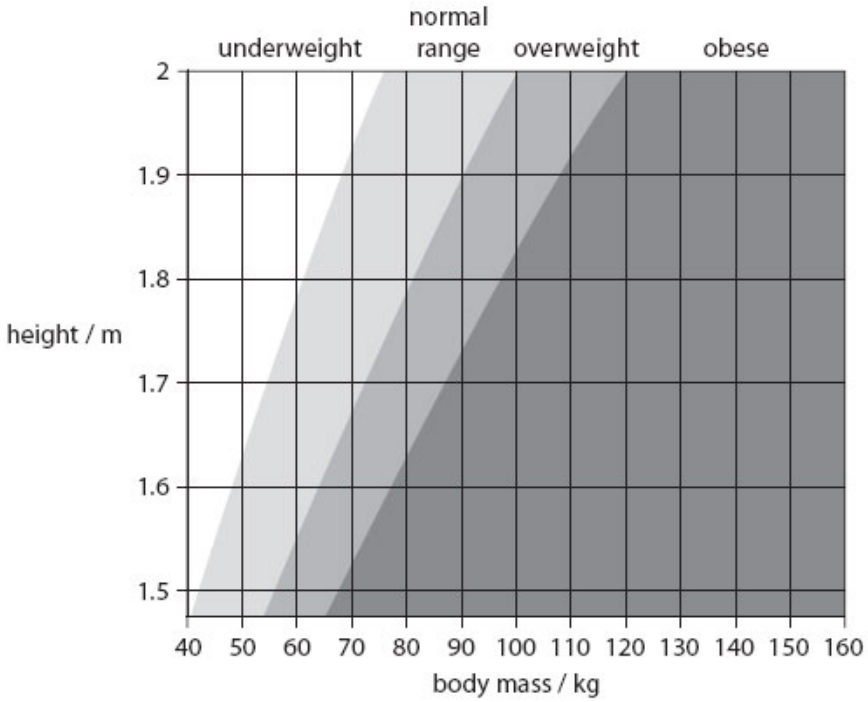
(b) (i) Use the equation to calculate the body mass index (BMI) for a person with a body mass of 78 kg and a height of 1.7 m.

$$\text{BMI} = \frac{\text{mass / kg}}{(\text{height in metres})^2}$$

(2)

BMI .....

(ii) Use the chart to find the BMI category for this person.



Complete the sentence by putting a cross (☒) in the box next to your answer.

The BMI category for this person is

(1)

☒ **A** underweight

☒ **B** normal range

☒ **C** overweight

☒ **D** obese

(c) Describe how the human body acts in response to low glucose levels in the blood.

(3)

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(Total for Question is 10 marks)

Q15.

Hormones can also be used to treat infertility.

Explain how clomifene therapy and IVF can improve female fertility.

(4)

clomifene therapy .....

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IVF .....

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(Total for question = 4 marks)

Q16.

*Explain how hormones control the menstrual cycle.

(6)

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(Total for question = 6 marks)

Q17.

Explain how negative feedback, involving the thyroid gland, controls metabolic rate.

(4)

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(Total for question = 4 marks)

Q18.

The combined contraceptive pill contains artificial versions of oestrogen and progesterone.

(i) Explain how the combined contraceptive pill prevents pregnancy.

(2)

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(ii) When taken correctly, the combined pill can be over 99% effective.

Taking the combined pill can lead to weight gain.

Give **one** other disadvantage of using the combined pill as the only method of contraception.

(1)

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(Total for question = 3 marks)

Q19.

Explain how the release of adrenalin can result in the improved performance of an athlete.

(4)

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(Total for question = 4 marks)

Q20.

Figure 17 shows the concentration of the hormones oestrogen and progesterone in the blood of women of different ages.

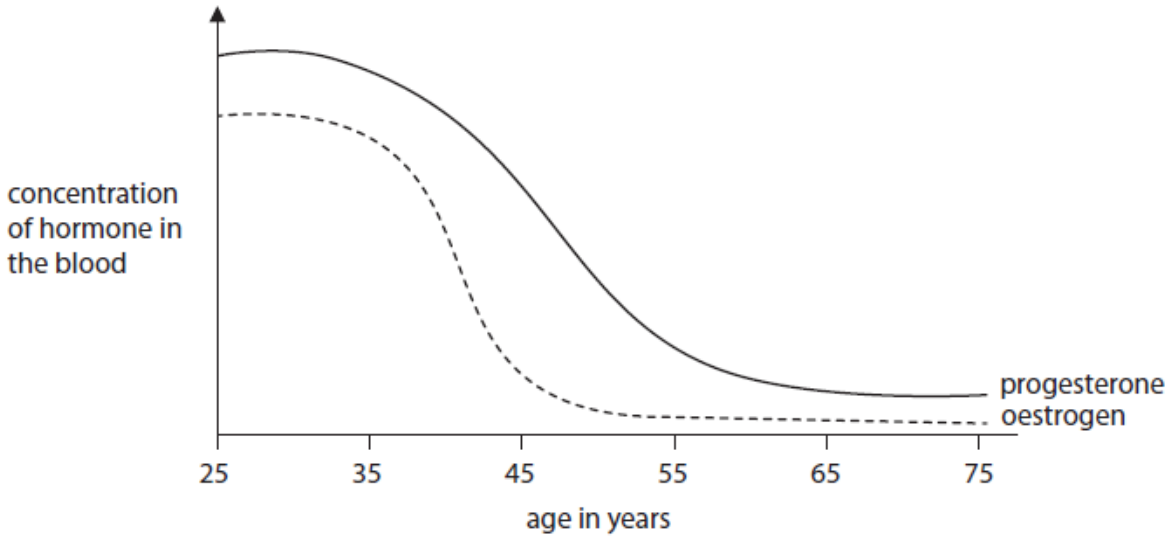


Figure 17

(i) Use information from Figure 17 to explain why women over the age of 50 are less likely to ovulate.

(2)

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(ii) Use information from Figure 17 to explain why women are less likely to menstruate after the age of 60.

(2)

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(iii) Explain how clomifene therapy may increase the chance of a woman over the age of 50 becoming pregnant.

(2)

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(iv) The hormone progesterone is produced by the

(1)

☒ **A** corpus luteum

☒ **B** pituitary

☒ **C** thyroid

☒ **D** uterus

(Total for question = 7 marks)

Q21.

Excessive weight gain and obesity increase the likelihood of developing type 2 diabetes.

Explain the effect of type 2 diabetes on the body.

(3)

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(Total for question = 3 marks)

Q22.

Hormones are also used as a method of contraception.

Explain why taking high levels of oestrogen and progesterone in the combined contraceptive pill reduces the chance of pregnancy.

(2)

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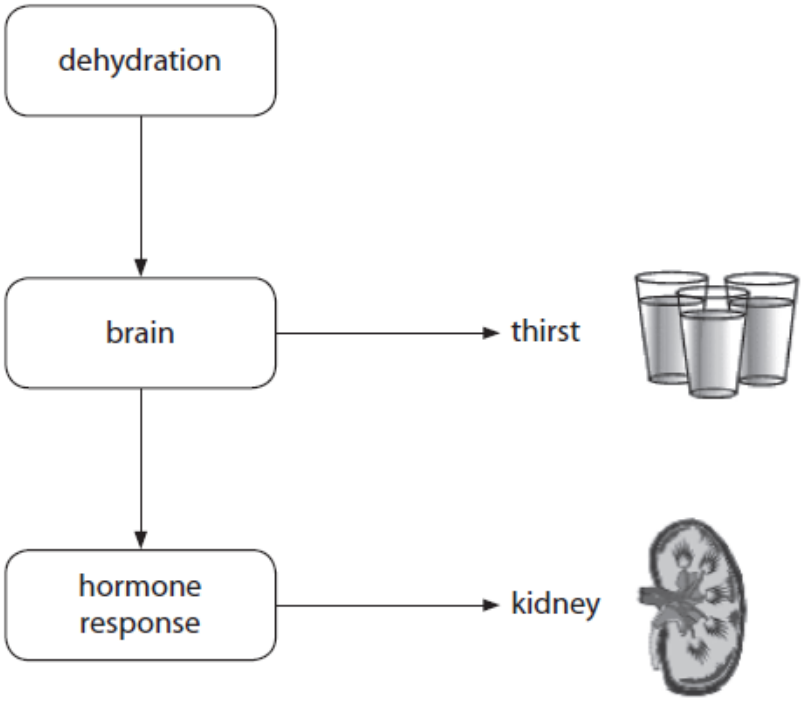
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(Total for question = 2 marks)

Q23.

Hormonal control

The diagram shows the body's response to dehydration.



(a) Use the diagram to help explain the body's hormonal response to dehydration.

(4)

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(b) The menstrual cycle is also controlled by hormones including progesterone.

(i) Complete the sentence by putting a cross (☒) in the box next to your answer.

Progesterone is produced by the

(1)

☒ **A** corpus luteum

☒ **B** glomerulus

☒ **C** hypothalamus

☒ **D** pituitary gland

(ii) Describe the effect of high levels of progesterone on the uterus lining during pregnancy.

(1)

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*(b) (iii) Explain how the menstrual cycle is controlled by hormones and negative feedback.

(6)

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(Total for question = 12 marks)

Q24.

Hormones control the menstrual cycle.

(i) Which row of the table shows where the hormones LH and oestrogen are produced?

(1)

	LH	oestrogen
☒ A	pituitary	ovaries
☒ B	ovaries	pituitary
☒ C	ovaries	ovaries
☒ D	pituitary	pituitary

(ii) Figure 9 shows the body temperature and oestrogen level for a fertile woman during a 30 day menstrual cycle.

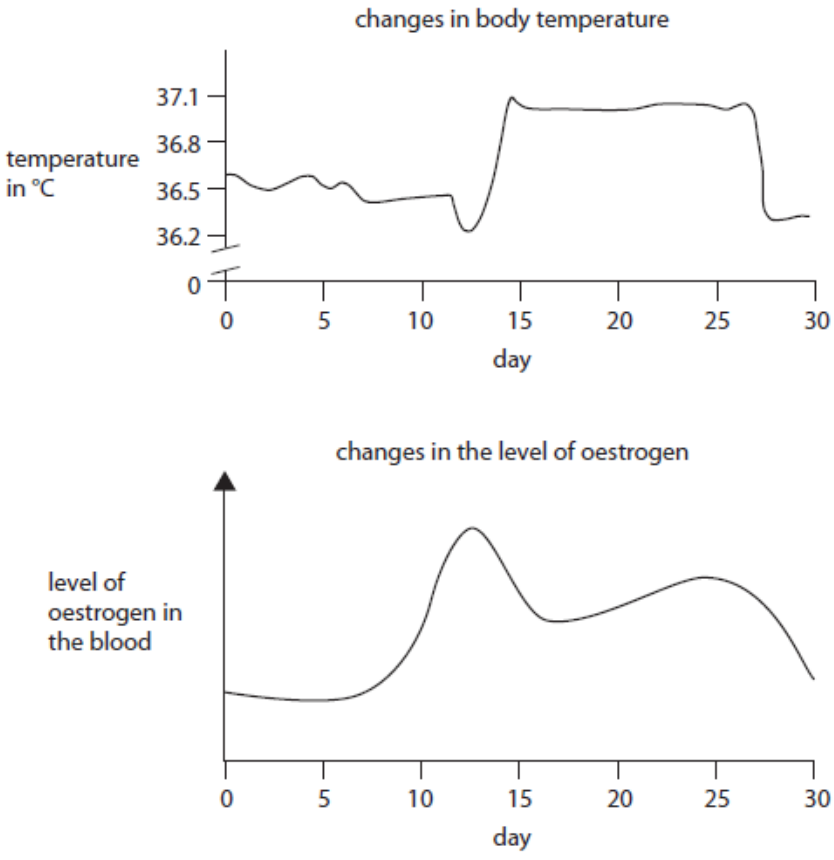


Figure 9

Describe the correlation between body temperature and oestrogen levels from day 5 to day 25.

(2)

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(iii) Explain how monitoring a woman's body temperature can be used to increase her chance of becoming pregnant.

(2)

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(Total for question = 5 marks)

Q25.

* Explain how hormones control the menstrual cycle.

(6)

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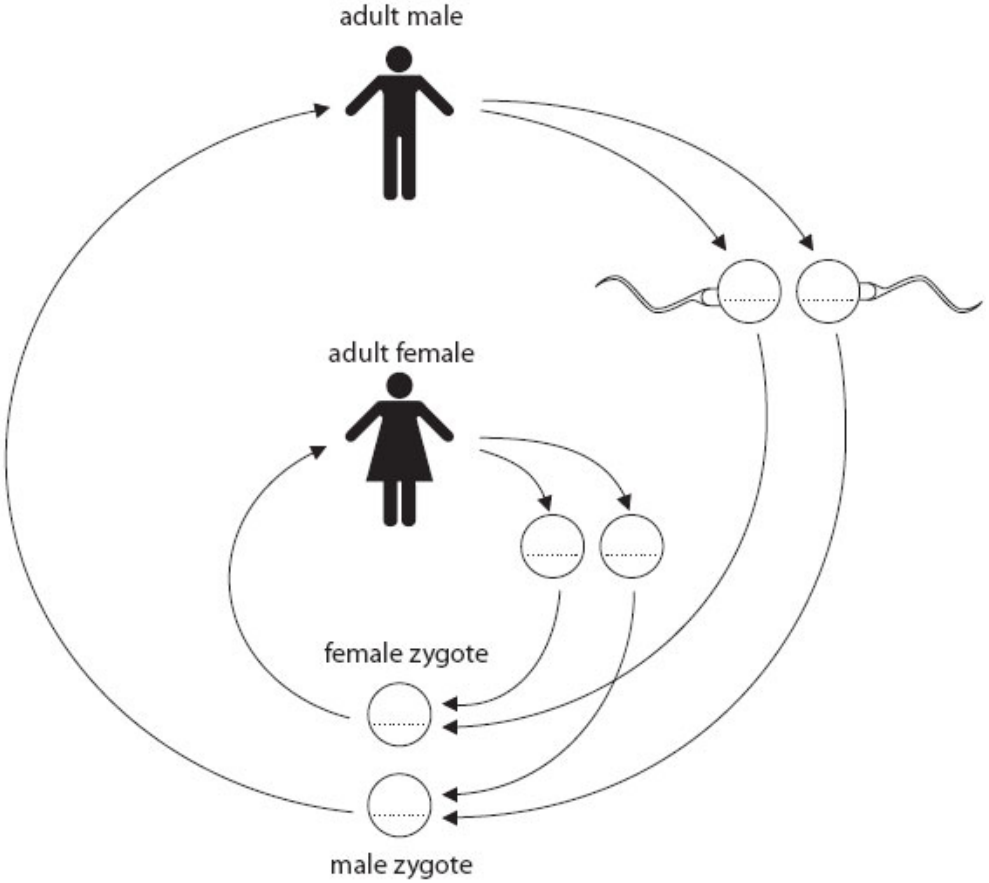
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(Total for question = 6 marks)

Q26.

The diagram shows the human life cycle.

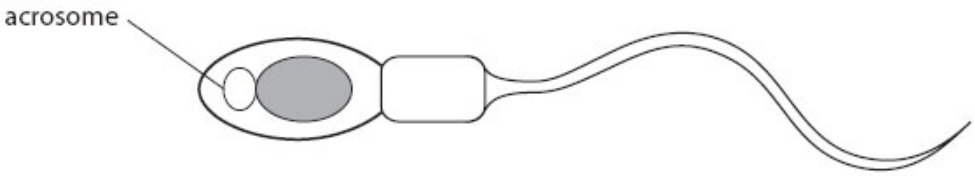
When a sperm cell fertilises an egg cell, a zygote is formed.



(a) Complete the diagram by writing the sex chromosomes in the egg cells, sperm cells, male zygote and female zygote.

(2)

(b) The diagram shows a sperm cell.



Complete the sentence by putting a cross (☒) in the box next to your answer.

The acrosome contains

(1)

☒ **A** enzymes to help get through the membrane of the egg cell

☒ **B** mitochondria to supply energy to swim

☒ **C** muscle fibres to swim

☒ **D** 23 chromosomes

(c) State why egg cells have a large amount of cytoplasm.

(1)

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(d) During ovulation an egg cell is released from the ovary.

Explain how changes in the levels of hormones result in ovulation.

(2)

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(e) Explain what happens to the uterus lining if the egg cell is fertilised.

(2)

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(Total for Question = 8 marks)

Q27.

Answer the question with a cross in the box you think is correct ☒. If you change your mind about an answer, put a line through the box ☒ and then mark your new answer with a cross ☒.

Methods of contraception include use of hormones and barrier methods.

(i) Which form of contraception is a barrier method?

(1)

☒ **A** oral contraception

☒ **B** female condom

☒ **C** rhythm (calendar) method

☒ **D** contraceptive implant

(ii) State why a barrier method of contraception may be used in addition to a hormonal method.

(1)

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(Total for question = 2 marks)

Q28.

Answer the question with a cross in the box you think is correct ☒. If you change your mind about an answer, put a line through the box ☒ and then mark your new answer with a cross .

(i) Women with the condition known as polycystic ovary syndrome (PCOS) do not ovulate regularly.

Women with PCOS can be treated using clomifene therapy.

Clomifene therapy stimulates the production of FSH.

Name the endocrine gland that produces FSH.

(1)

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(ii) During this therapy, a woman takes a clomifene tablet each day for the first five days of her menstrual cycle.

Describe the changes that would happen inside the ovaries during the first five days of this treatment.

(2)

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(iii) Which hormone causes ovulation?

(1)

☒ **A** LH

☒ **B** FSH

☒ **C** testosterone

☒ **D** progesterone

(iv) During clomifene therapy, the woman has a blood test on day 20 of the menstrual cycle.

The blood test shows a high level of progesterone.

Explain the cause of this high level of progesterone on day 20 of the menstrual cycle.

(2)

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(Total for question = 6 marks)

Q29.

Infertility can be treated by increasing the chance of ovulation occurring.

Ovulation is controlled by hormones.

(i) Complete the sentence by putting a cross (☒) in the box next to your answer.

The hormone that stimulates the maturation of follicles in the ovary is

(1)

☒ **A** FSH

☒ **B** LH

☒ **C** oestrogen

☒ **D** progesterone

(ii) Infertility treatments, including the use of hormones, can stimulate ovulation.

Explain **one** disadvantage of treating infertility by using hormones to stimulate ovulation.

(2)

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(iii) Complete the sentence by putting a cross (☒) in the box next to your answer.

Ovulation during pregnancy is prevented by high levels of

(1)

☒ **A** FSH

☒ **B** LH

☒ **C** insulin

☒ **D** progesterone

Q30.

During ovulation an egg cell is released from the ovary.

Explain how changes in the levels of hormones result in ovulation.

(2)

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Q31.

Answer the question with a cross in the box you think is correct ☒. If you change your mind about an answer, put a line through the box ☒ and then mark your new answer with a cross ☒.

Hyperthyroidism is caused by an overactive thyroid gland.

Figure 9 shows a person with a normal thyroid gland and a person with hyperthyroidism.



normal



hyperthyroidism

© medistock/Shutterstock

Figure 9

(i) State **one** effect of hyperthyroidism on the thyroid gland.

(1)

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(ii) The thyroid gland is part of the

(1)

☒ **A** circulatory system

☒ **B** digestive system

☒ **C** endocrine system

☒ **D** urinary system

(Total for question = 2 marks)

Q32.

Exercise increases adrenalin levels.

(i) State which endocrine gland secretes adrenalin.

(1)

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(ii) Explain the effect of adrenalin on liver cells during exercise.

(3)

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(Total for question = 4 marks)

Q33.

The combined contraceptive pill contains the hormones oestrogen and progesterone.

(i) State the endocrine gland that releases oestrogen.

(1)

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(ii) Explain how high levels of oestrogen and progesterone in the combined contraceptive pill work together to prevent pregnancy.

(4)

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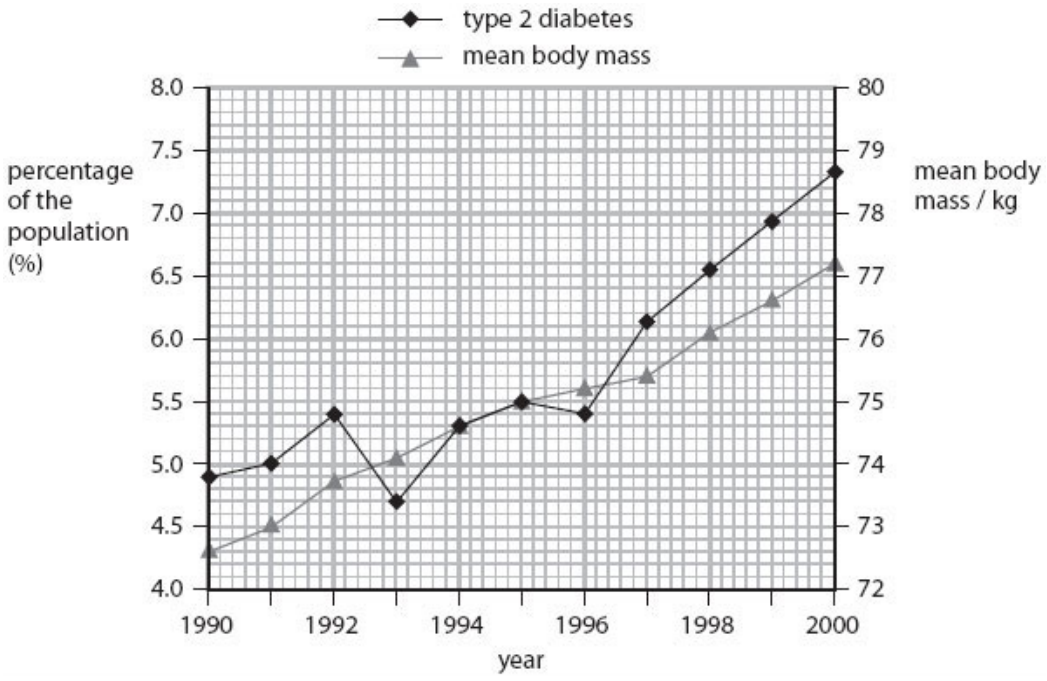
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(Total for question = 5 marks)

Q34.

The graph shows the percentage of the population with type 2 diabetes and the mean body mass of the population, from 1990 to 2000.



Describe how the human body acts in response to low glucose levels in the blood.

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Q35.

Explain the role of glucagon in the body.

(3)

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(Total for question = 3 marks)