16. Reproduction

16.4 Sexual reproduction in humans

Paper 3 and 4

Question Paper

Paper 3

Questions are applicable for both core and extended candidates

1 Fig. 4.1 is a diagram of part of the human male reproductive system.

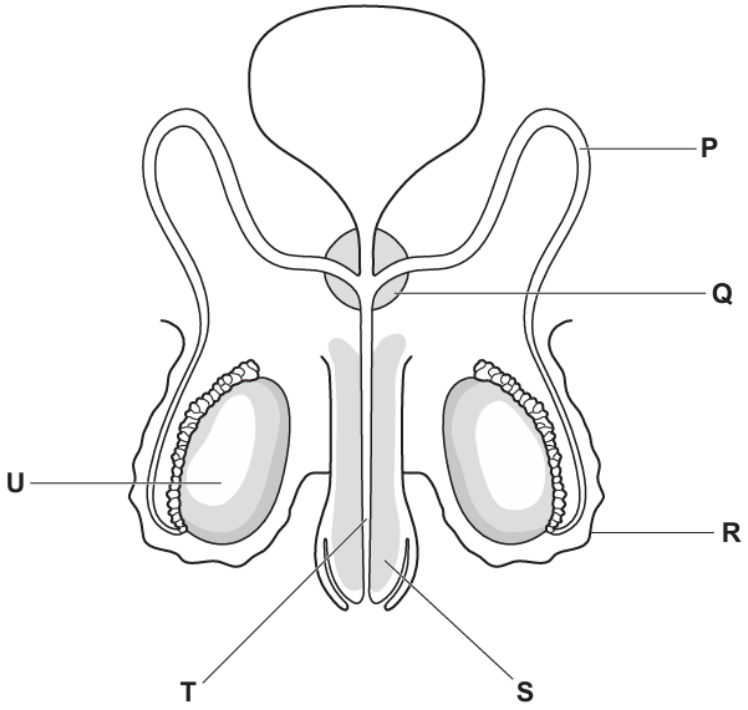

Fig. 4.1

(a) Identify the letter in Fig. 4.1 for the structure that:

produces sperm .....

places sperm into the vagina .....

carries urine out of the body .....

holds the testes outside the body. .....

[4]

2 **(a)** Fig. 7.1 is a diagram of the female reproductive system in humans.

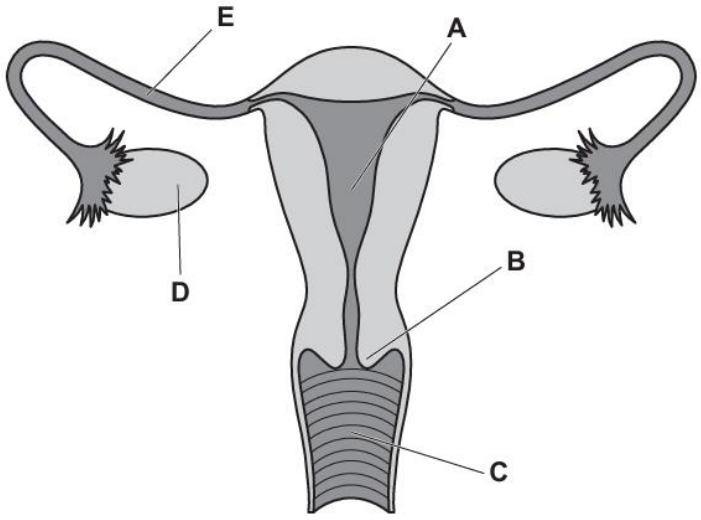

Fig. 7.1

Table 7.1 shows the name, letter and function of some of the parts in Fig. 7.1.

Complete Table 7.1.

Table 7.1

name of the part	letter in Fig. 7.1	function
uterus		where the fetus grows
		where fertilisation occurs
	D	

[5]

3 **(b)** State the names of **two** organs from the human female reproductive system.

1 .....

2 .....

[2]

4 **(a)** Explain the importance of the acrosome and the mitochondria for the function of sperm cells.

.....

.....

.....

.....

.....

.....

.....

.....

..... [4]

(b) Table 8.1 shows some features of egg cells and sperm cells in humans.

Complete Table 8.1 by stating the differences between egg cell and sperm cell size, motility and numbers produced.

Table 8.1

feature	egg cell	sperm cell
relative size		
motility		
numbers produced		

[3]

(c) At birth, a human female has approximately 1.5 million eggs in her ovaries.

By puberty only about 350 000 remain in the ovaries.

Calculate the percentage decrease in the number of eggs between birth and puberty.

Give your answer to **one** decimal place.

Space for working.

..... %

[3]

(d) Fig. 8.1 is a diagram of a fetus developing in a uterus.

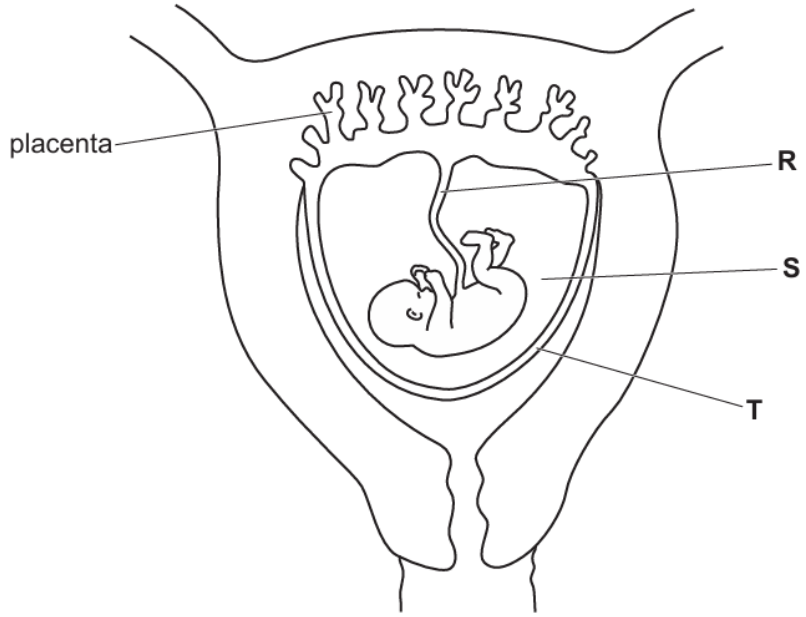

Fig. 8.1

(i) State the name of the part labelled **T** in Fig. 8.1.

..... [1]

(ii) State the functions of the parts labelled **R** and **S** in Fig. 8.1.

R .....

.....

S .....

.....

[2]

(iii) Describe the functions of the placenta.

.....

.....

.....

.....

..... [2]

[Total: 15]

5 **(a)** Fig. 3.1 shows the human male reproductive system and part of the excretory system.

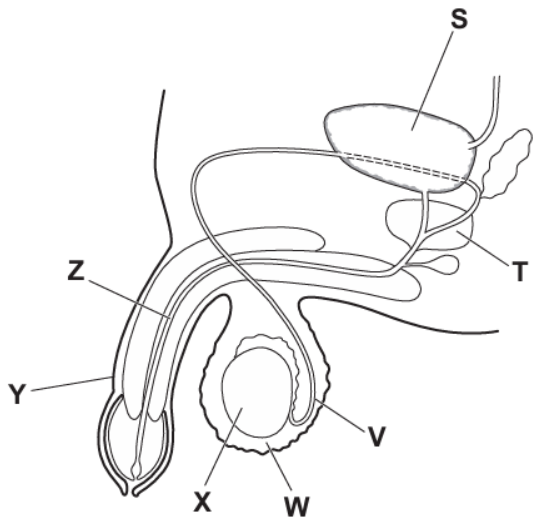

Fig. 3.1

Table 3.1 shows the letters, names and functions of parts from Fig. 3.1.

Complete Table 3.1 using Fig. 3.1.

Table 3.1

letter from Fig. 3.1	name	function
V	.....	carries sperm away from the testis
.....	urethra	carries urine and sperm out of the body
Y	.....	deposits sperm into the vagina
.....	prostate gland	makes the fluid for the sperm to swim in
W	scrotum	....
X	testis	....

[6]

(b) (i) Table 3.2 shows some of the events (**G** to **M**) that can occur after the sperm leaves the male reproductive system.

Table 3.2

G	an embryo is formed
H	nuclei of the sperm and egg cell fuse
J	sperm enters the oviduct
K	sperm passes through the uterus
L	sperm is deposited into the vagina
M	sperm travels through the cervix

Write the letters of the events in the correct sequence, in the spaces provided.

One has been done for you.

L					

[3]

(ii) State all the possible sex chromosomes that can be found in a sperm cell.

..... [1]

6 **(a)** Fig. 4.1 is a diagram of the female reproductive system in humans.

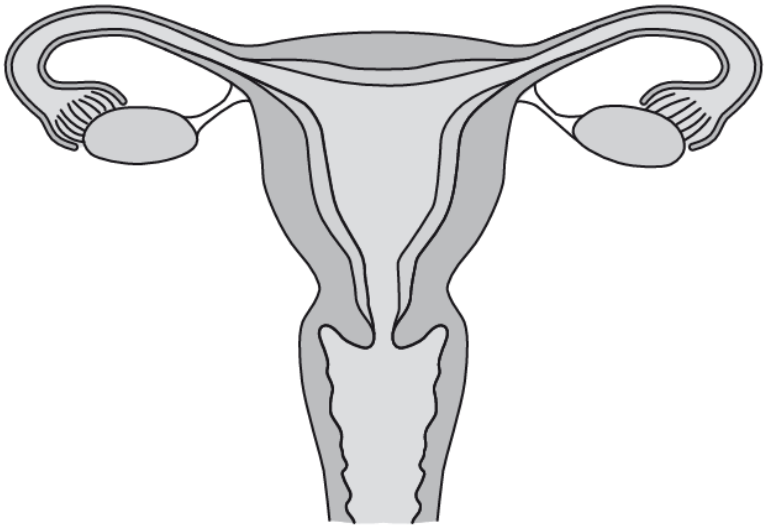

Fig. 4.1

(i) On Fig. 4.1:

- Circle a part that releases egg cells.
- Draw a label line and the letter **W** to show where fertilisation occurs.
- Draw a label line and the letter **X** to show where the fetus develops.

[3]

(ii) State the name of the process that produces egg cells.

..... [1]

(iii) State the names of **two** parts of the female reproductive system that sperm must pass through to reach the egg cell.

1 .....

2 .....

[2]

7 **(a)** Fig. 2.1 is a front view diagram of the male reproductive system in humans.

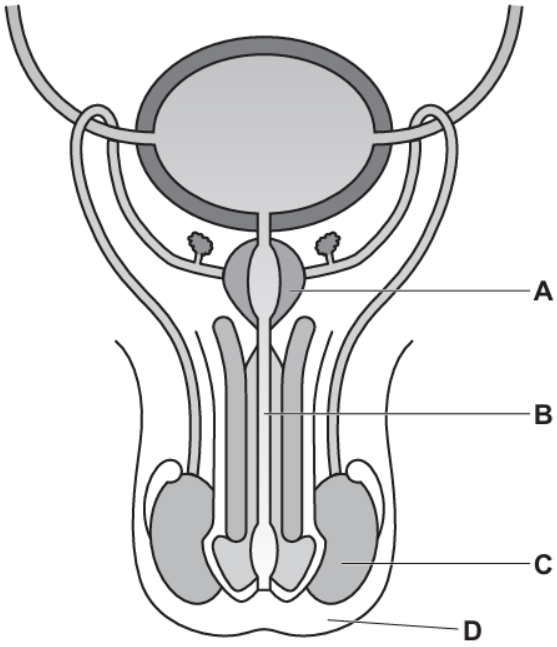

Fig. 2.1

The boxes on the left show the letters identifying the parts in Fig. 2.1.

The boxes on the right show the functions of some of the parts of the male reproductive system.

Draw lines to link each letter to its function. Draw **four** lines.

letter from Fig. 2.1	**function**
	gland that secretes fluid for sperm to swim in
A	
	produces sperm
B	
	sac that holds the testes
C	
	tube carrying semen and urine
D	
	tube carrying sperm to urethra

[4]

(b) Sperm are the male gametes in humans.

(i) State the name of the female gamete in humans.

..... [1]

(ii) State the name of the cell that is formed at fertilisation.

..... [1]

(iii) State the usual site of fertilisation in humans.

..... [1]

8 **(a)** Fig. 3.1 is a diagram showing stages during the development of a human embryo and fetus.

Fig. 3.1

(i) Put a tick (✓) in the box that describes a human embryo.

a ball of cells	
a cell with energy stores and a jelly coating	
a cell with a flagellum	
is made of cells that have a cell wall	

[1]

(ii) Table 3.1 shows some of the events (**D** to **J**) that occur between fertilisation and birth.

The events are not in the correct order.

Table 3.1

D	a baby is born
E	complexity of the fetus increases more than size
F	a zygote is formed
G	embryo implants into the wall of the uterus
H	size of the fetus increases more than complexity
J	the zygote divides by mitosis to produce two cells

Put the events into the correct sequence by ordering the letters.

One has been done for you.

	J				

[3]

(b) Complete the sentences using the words and phrases from the list.

Each word or phrase may be used once, more than once or not at all.

afterbirth **amniotic sac** **amniotic fluid** **cervix**

oviduct **penis** **umbilical cord** **uterus wall** **vagina**

Birth begins when the strong muscles of the ..... start to contract. This causes the ..... to dilate. The ..... can break at this stage. The muscles start to push the baby out. The baby moves through the ..... . The ..... is tied and cut. Finally the ..... is delivered.

[6]

[Total: 10]

9 Fig. 7.1 shows part of the female human reproductive system.

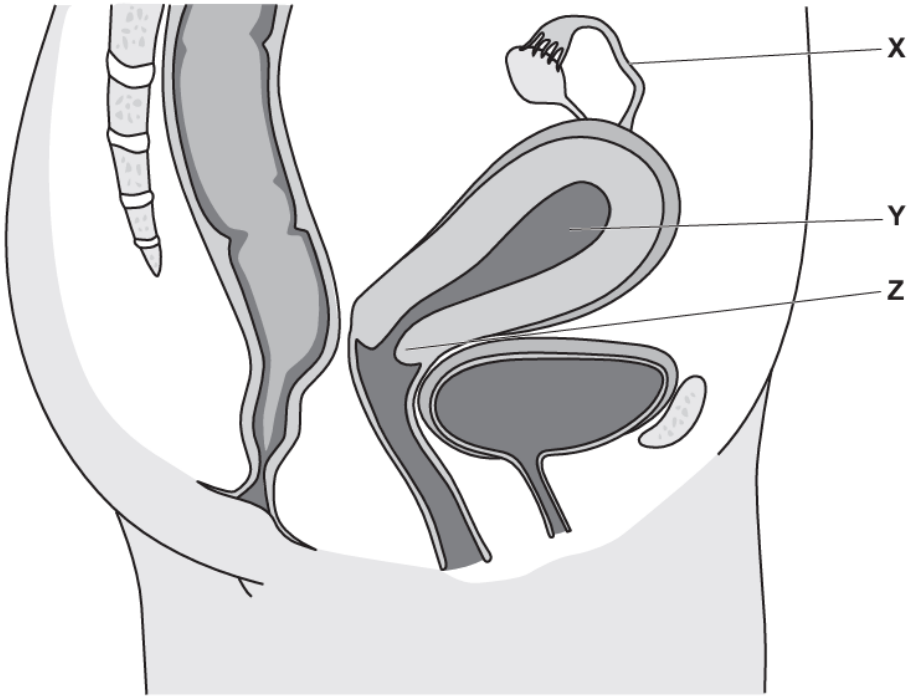

Fig. 7.1

(a) State the names of the structures labelled **X**, **Y** and **Z** on Fig. 7.1.

X .....

Y .....

Z .....

[3]

10 Fig. 2.1 shows an image of two sperm cells.

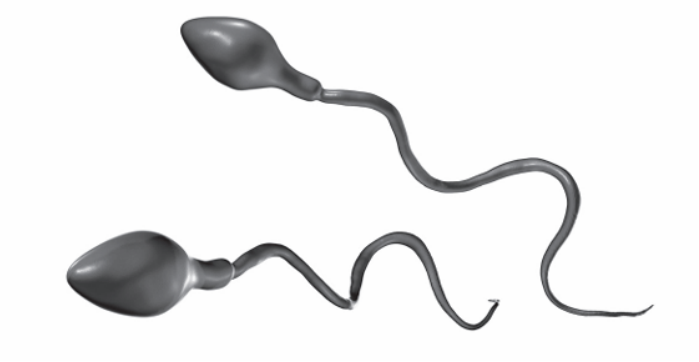

Fig. 2.1

(a) State **two** adaptive features of sperm.

1 .....

.....

2 .....

.....

[2]

(b) Describe the process of fertilisation.

.....

.....

.....

..... [2]

(c) Fig. 2.2 shows a fetus during development.

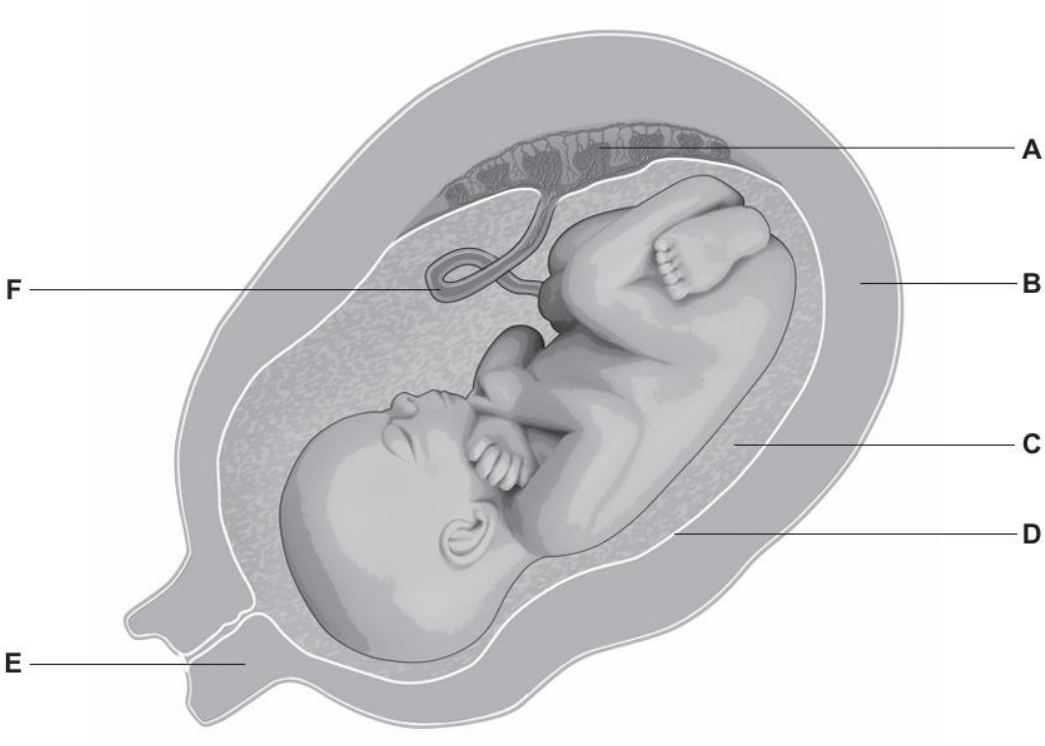

Fig. 2.2

Complete Table 2.1 by stating:

- the missing letters from Fig. 2.2
- the missing name of the structure
- **one** function for structures **C**, **A** and **F** during pregnancy or birth.

Table 2.1

letter on Fig. 2.2	name of the structure	**one** function
C	amniotic fluid	
		dilates during birth
A	placenta	
F	umbilical cord	
	uterus wall	contracts during birth

[6]

[Total: 10]

11 **(a)** Fig. 2.1 is a diagram of the human female reproductive system.

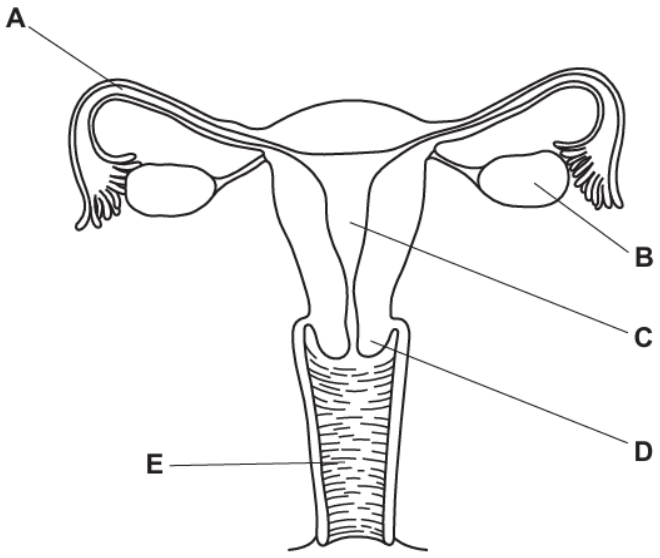

Fig. 2.1

Identify the letter from Fig. 2.1 which represents:

- the vagina .....
- the uterus .....
- where ovulation occurs .....
- where the fetus grows .....
- where fertilisation occurs. .....

Each letter may be used once, more than once or not at all. [5]

(b) Egg cells are the female gametes and have special adaptive features.

Complete the sentences using words from the list.

Each word may be used once, more than once or not at all.

birth **cellulose** **cytoplasm** **energy**

fertilisation **jelly** **labour**

Egg cells have ..... stores so that they can survive for several days in the female reproductive system after ovulation.

They also have a ..... coating which changes after ..... to prevent more sperm from entering the egg.

[3]

(c) Table 2.1 shows the average diameters of egg cells from different mammals.

Table 2.1

mammal	average diameter of egg cell / μm
goat	122
horse	168
human	165
mouse	90
rabbit	165
sheep	125

(i) State the name of the mammal with the egg cell that has the smallest average diameter in Table 2.1.

..... [1]

(ii) Calculate the difference in average diameter between the egg cells of humans and goats.

..... μm [1]

(d) Larger mammals usually have egg cells with a greater diameter.

Suggest which is the largest mammal using the information in Table 2.1.

..... [1]

[Total: 11]

12 **(c)** Some scientists have suggested that the longer the flagellum the more likely the sperm is to fertilise the egg cell.

Suggest a reason why.

.....

.....

..... [1]

(d) State the name of the organ that produces sperm.

..... [1]

13 **(a)** Complete the sentences by stating the part of the human body that produces male gametes and the part that produces female gametes.

Male gametes are produced by the .....

Female gametes are produced by the .....
[2]

(b) Fig. 6.1 represents the early stages in the development of a female embryo.

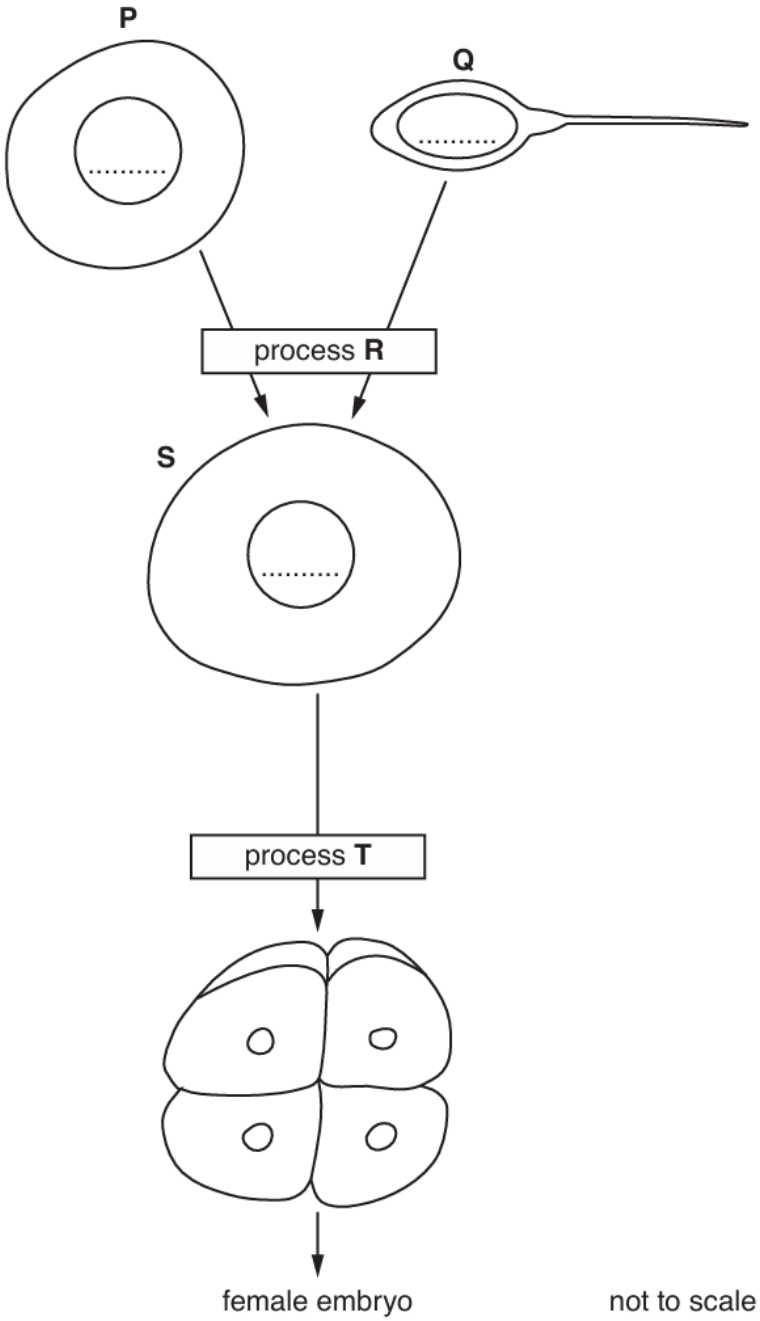

Fig. 6.1

(i) State the names of the cells labelled **P**, **Q** and **S** in Fig. 6.1.

P .....

Q .....

S .....
[3]

(ii) Complete Fig. 6.1 by writing the correct sex chromosomes in structures **P**, **Q** and **S**. [3]

(iii) State the names of processes **R** and **T** in Fig. 6.1.

R .....

T .....
[2]

(iv) State the name of the organ in the body in which the female embryo develops.

..... [1]

14 **(a)** Fig. 4.1 is a diagram of a fetus in the uterus.

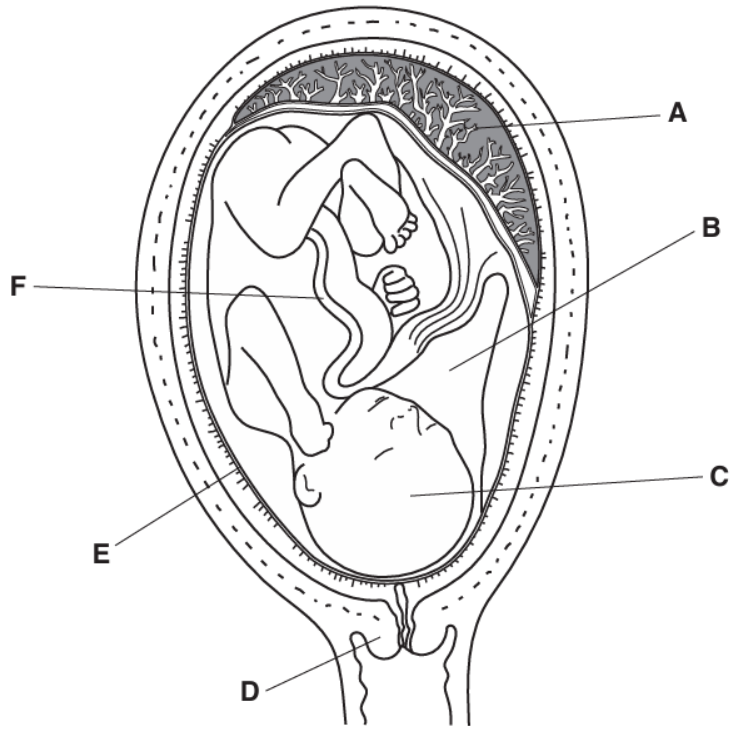

Fig. 4.1

Table 4.1 shows one of the names and the functions of some of the labelled parts shown in Fig. 4.1.

Complete Table 4.1 using the information in Fig. 4.1.

Table 4.1

name of part	letter in Fig. 4.1	function
amniotic sac		contains amniotic fluid
		dilates during birth
		carries materials between mother and fetus

[5]

(b) Describe the changes that occur in the fertilised egg cell up to the point of implantation.

.....

.....

.....

.....

.....

.....

..... [3]

(c) Compare the growth and development of the fetus in the early stages of pregnancy with its growth and development in the late stages of pregnancy.

.....

.....

.....

..... [2]

[Total: 10]

15 Fig. 1.1 shows a diagram of the human female reproductive system.

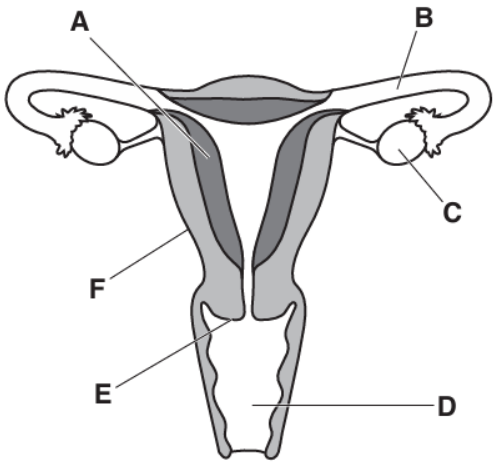

Fig. 1.1

(a) Using letters **A**–**F**, identify the parts of the human female reproductive system in Fig. 1.1.

where eggs are made .....

where fertilisation occurs .....

where implantation of the zygote occurs .....

[3]

(b) Oestrogen is a hormone responsible for the development of secondary sexual characteristics during puberty.

(i) State the name of the part of the female reproductive system that secretes oestrogen.

.....[1]

(ii) Describe how the hormone oestrogen is transferred to its target organs.

.....

.....[1]

(c) Table 1.1 shows some secondary sexual characteristics.

Place ticks (✓) in Table 1.1 to show which characteristics develop during puberty in boys and girls.

One row has been done for you.

Table 1.1

secondary sexual characteristic	boy	girl
breasts grow		✓
growth of sex organs		
growth of pubic hair		
start of menstruation		
voice deepens		

[4]

16 Fig. 6.1 shows the sequence of events that occur in sexual reproduction.

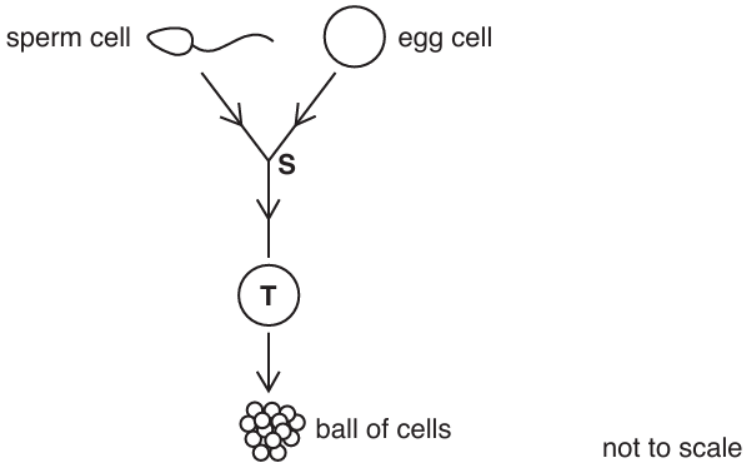

Fig. 6.1

(a) (i) State the name of cell **T** in Fig. 6.1.

.....[1]

(ii) State the name of the process that takes place at **S** to form cell **T** in Fig. 6.1.

.....[1]

(iii) State where in the human body process **S** takes place.

.....[1]

17 **(b)** Fig. 2.1 shows some organs in the body of a man.

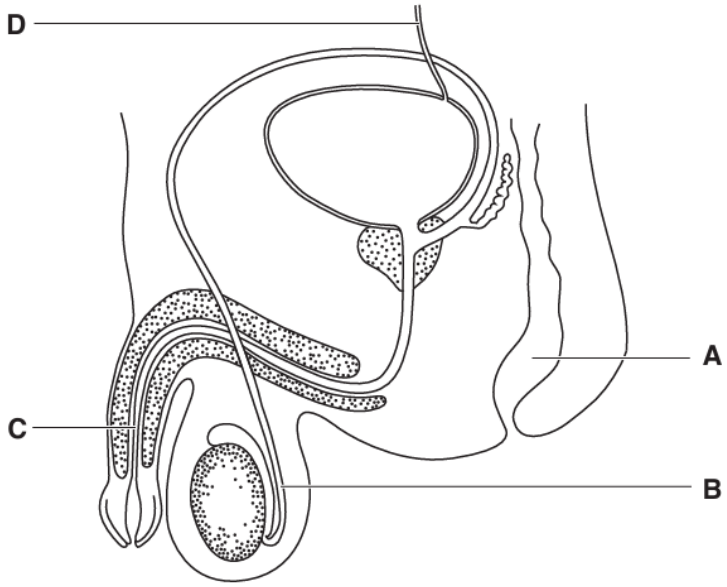

Fig. 2.1

(i) Complete Table 2.1 by writing in the names of the parts labelled **A** to **D** in Fig. 2.1.

Table 2.1

letter on Fig. 2.1	name of part	name of the substance or substances transported
A		faeces
B		sperm
C		sperm and urine
D		urine

[4]

(ii) On Fig. 2.1 draw a label line to the prostate gland and label it **P**. [1]

(c) State the function of the scrotum.

.....

.....

.....[1]

18 Fig. 1.1 shows a diagram of the male reproductive system.

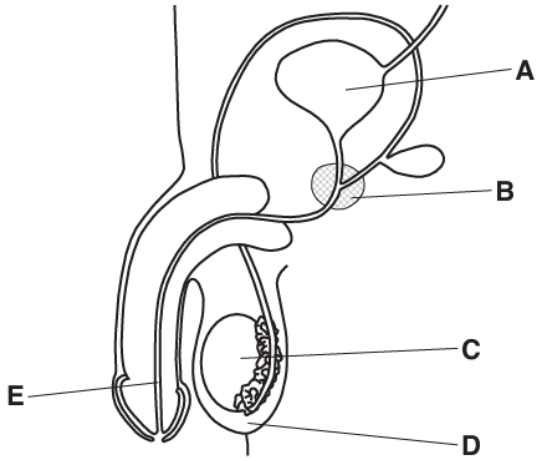

Fig. 1.1

(a) State the letter on Fig. 1.1 that identifies:

where sperm are made .....

the part that carries urine and sperm out of the body .....

where fluid that is added to the sperm is made. .....

[3]

(b) Sperm leaves the male reproductive system to fertilise the egg cell in the female reproductive system.

Describe the path taken by the sperm after it has left the male reproductive system until it fertilises the egg.

.....

.....

.....

.....

.....

.....

.....[3]

Paper 4

Questions are applicable for both core and extended candidates unless indicated in the question

19 **(c)** Fig. 5.2 is a diagram of part of the human female reproductive system, viewed from the side of the body.

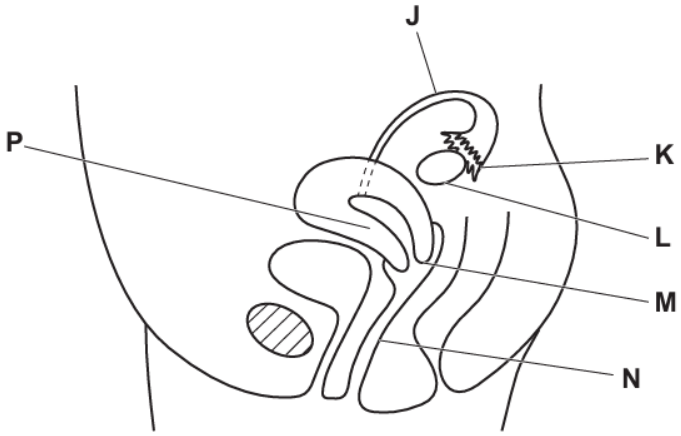

Fig. 5.2

Complete Table 5.1 by writing the letters that identify the structures in Fig. 5.2, the names of the structures and the functions.

Table 5.1

function	letter in Fig. 5.2	name
		cervix
		ovary
site of fertilisation		
site of implantation		

[4]

(d) Pregnant human females have a placenta.

(i) Describe the function of the placenta in humans. **(extended only)**

.....

.....

.....

.....

.....

.....

.....

.....

..... [4]

(ii) The placenta is connected to the amniotic sac.

State **two** functions of the amniotic fluid that is found in the amniotic sac.

1 .....

.....

2 .....

.....

[2]

20 **(c)** Once an egg cell has been released from a follicle it can be fertilised by a sperm cell.

State **three** adaptive features of a sperm cell.

1 .....

2 .....

3 .....

[3]

21 **(a)** Fig. 6.1 is a flow diagram showing the events that occur to form a human fetus.

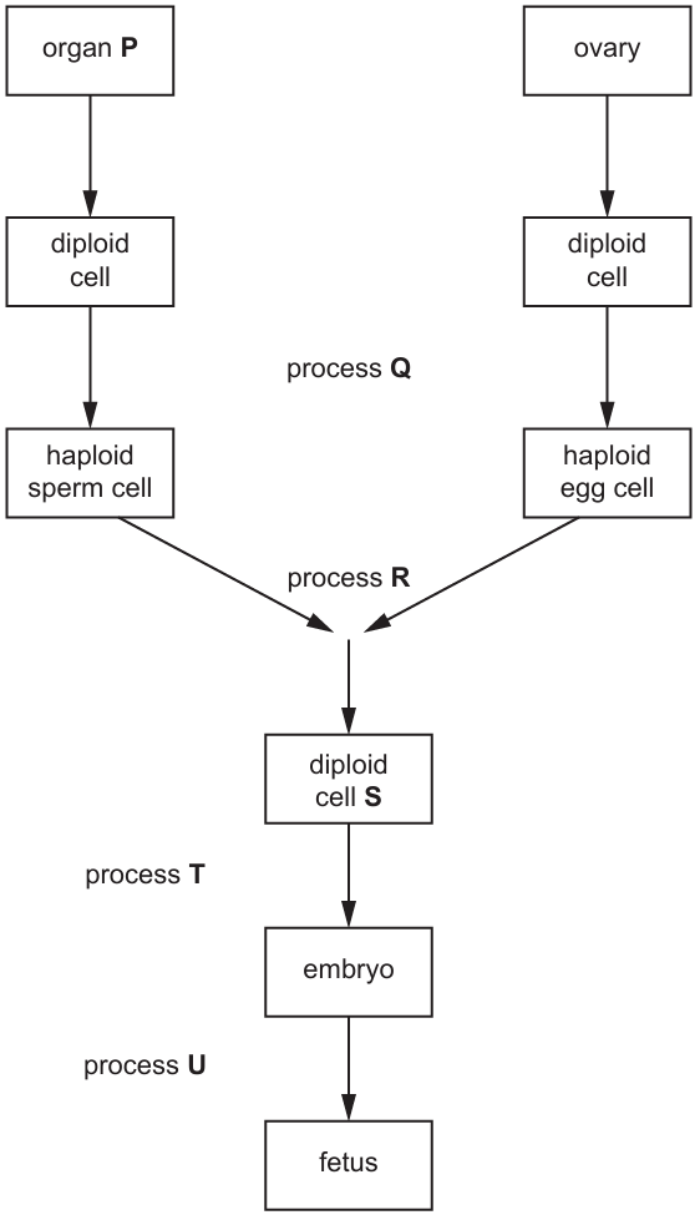

Fig. 6.1

Complete Table 6.1 by using the information in the flow diagram to identify the cell, the organ and the processes shown in Fig. 6.1. **(extended only)**

Table 6.1

cell, organ or process	name of the cell, organ or process
organ **P**	
cell **S**	
process **Q** produces haploid sperm and eggs	
process **R** produces diploid cell **S**	
process **T** occurs so that cell **S** can grow into an embryo	
process **U** occurs so that the embryo can gain oxygen and nutrients from the mother's blood	

[6]

(b) (i) State why it is important that sperm and egg cells are haploid and not diploid. **(extended only)**

.....

.....

..... [1]

(ii) State the function of the jelly coat that surrounds egg cells.

.....

.....

..... [1]

(c) Complete the sentences with the appropriate words. **(extended only)**

The placenta provides a large surface area for the ..... of oxygen and carbon dioxide between maternal and fetal blood. Dissolved nutrients also pass across the placenta. Examples of dissolved nutrients are: ..... acids, ... and ..... .

Antibodies pass from the maternal blood giving natural ..... immunity to the baby for some infections that the mother has had or has been vaccinated against. Each different type of vaccine contains one or more ..... taken from the ..... that causes the disease.

[7]

22 **(a)** Fig. 5.1 shows the female reproductive system.

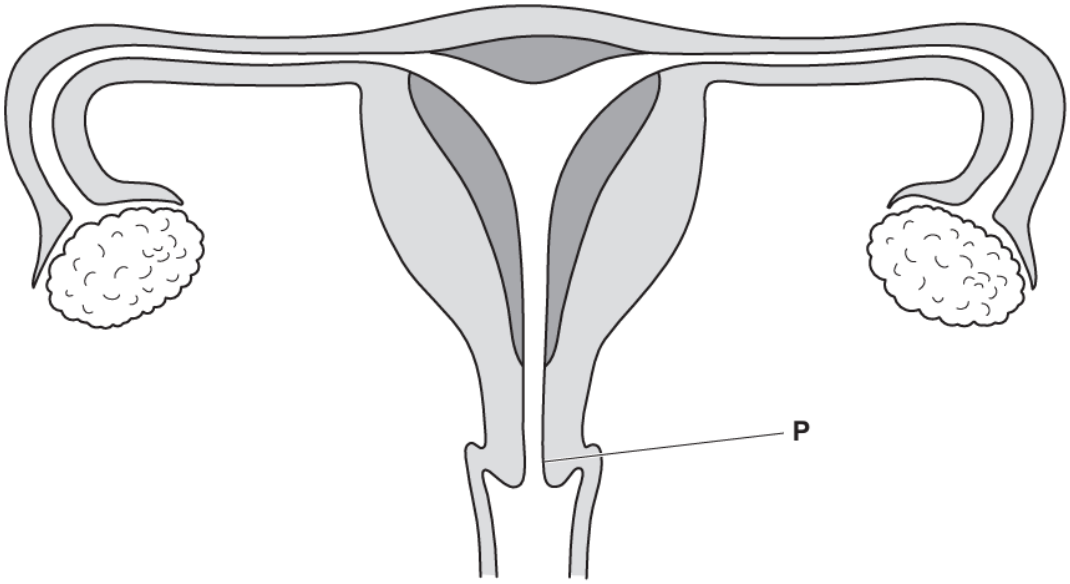

Fig. 5.1

Label Fig. 5.1 using the letters listed to show the position of the organs that are identified by their functions.

The first one (**P**) has been completed for you.

P site of secretion of mucus

Q site of fertilisation

R site of implantation

S site of oestrogen secretion

T site where sperm are deposited during sexual intercourse

[4]

(b) Fig. 5.2 shows a section through an egg cell at the time of ovulation.

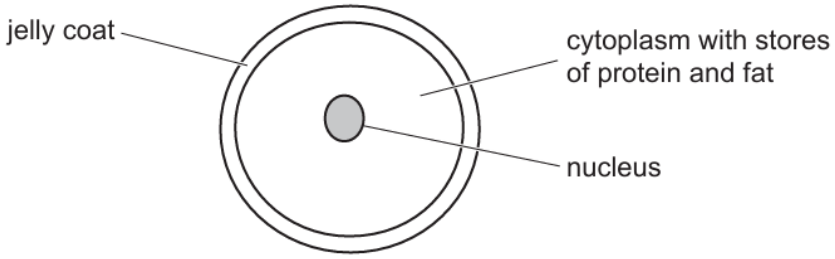

Fig. 5.2

(i) Explain why the egg cell contains stores of protein and fat.

.....

.....

.....

.....

.....

.....

..... [3]

(ii) Describe the function of the jelly coat.

.....

.....

.....

.....

..... [2]

(c) Fertilisation results in the formation of a zygote.

Describe how an embryo is formed from a zygote.

.....

.....

.....

.....

.....

.....

.....

.....

..... [4]

23 **(b)** During pregnancy menstruation does not occur.

Fig. 3.2 shows some of the organs of a pregnant woman, viewed from the side.

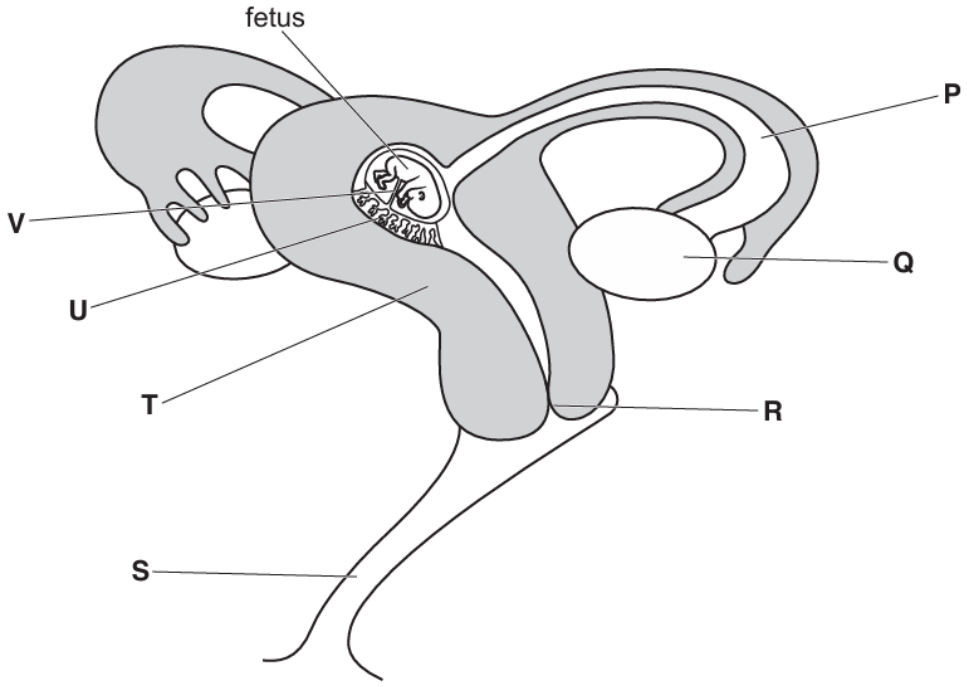

Fig. 3.2

Describe what happens between ovulation and the formation of a fetus.

Use the letters in Fig. 3.2 to support your answer.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

..... [6]

24 Pregnancy can occur after the fusion of a male gamete and a female gamete.

(a) State the name of the ball of cells that implants into the uterus after fertilisation.

..... [1]

(b) There are many changes that occur in a fetus during pregnancy.

Compare the development of a fetus in the early stages of pregnancy to its development in the late stages of pregnancy.

.....

.....

.....

.....

..... [2]

(c) Describe the functions of amniotic fluid and the amniotic sac.

.....

.....

.....

.....

.....

.....

.....

.....

..... [4]

25 **(c)** Some people are infertile.

Artificial insemination (AI) and *in vitro* fertilisation (IVF) are two methods of fertility treatment.

These two methods are outlined in Fig. 5.2.

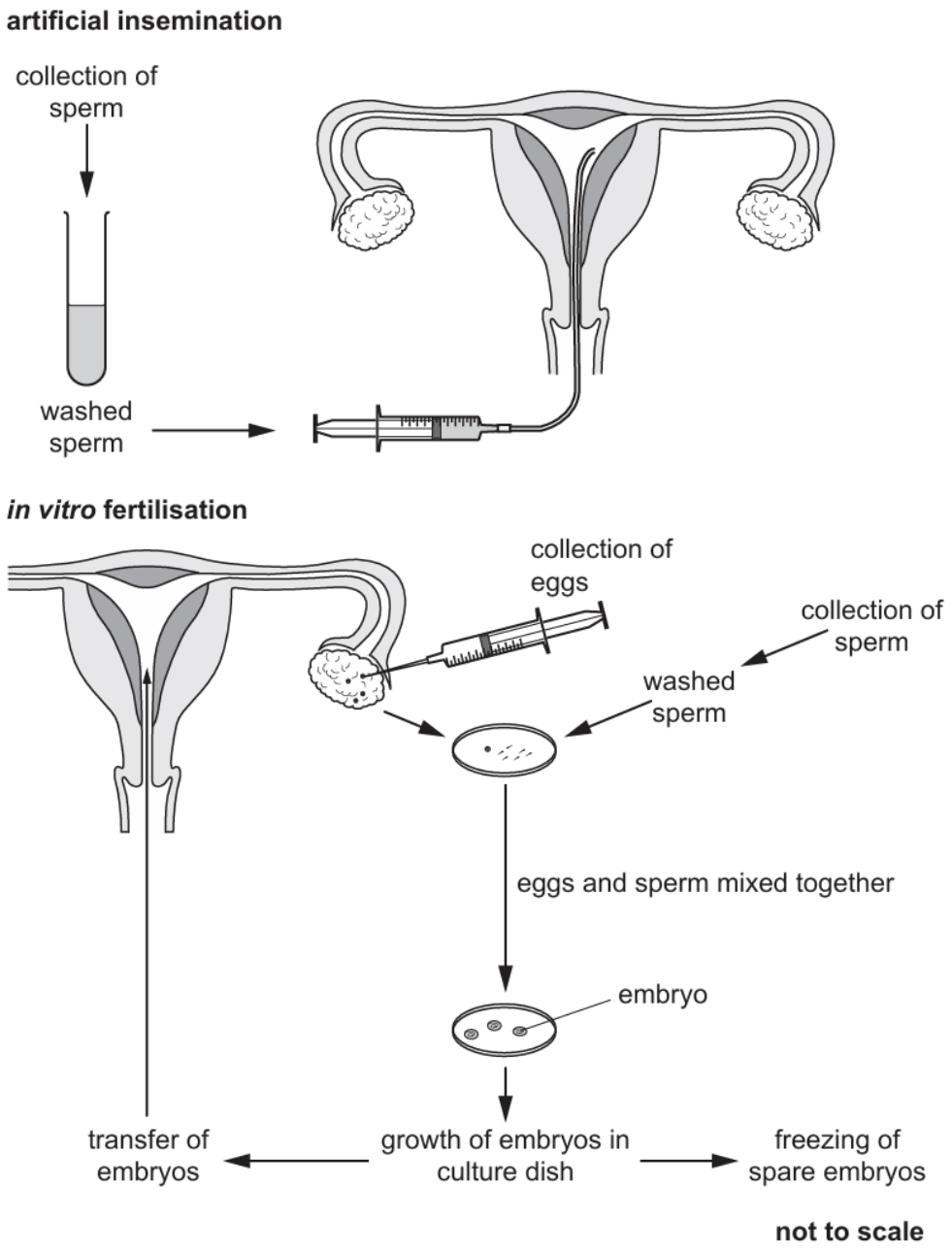

Fig. 5.2

Describe the similarities **and** differences between the two processes of fertility treatment shown in Fig. 5.2.

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.....

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.....

.....

.....

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.....

.....

.....

..... [6]

26 **(b)** Fig. 4.1 shows the male reproductive system.

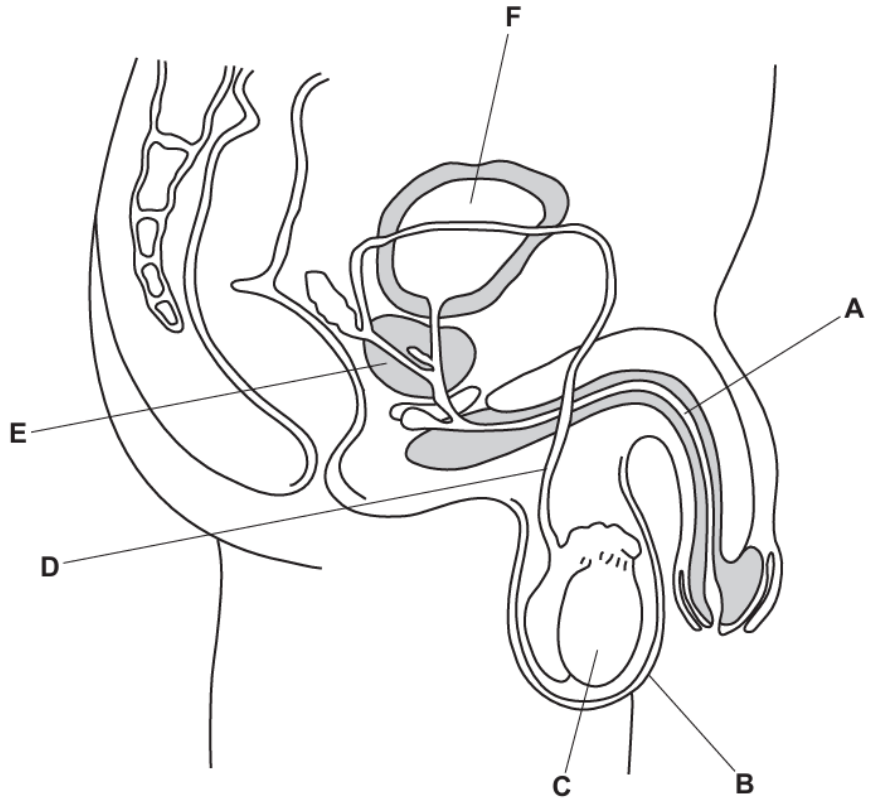

Fig. 4.1

Table 4.2 shows information about the male reproductive system shown in Fig. 4.1.

Complete Table 4.2.

Table 4.2

name of structure	function	letter in Fig. 4.1
testis		
	transports sperm but not urine	
	tube for urine and seminal fluid through the penis	
prostate gland		
	contains the testes	

[5]

27 **(c)** Fig. 5.3 is a photomicrograph of a section through a sperm.

Fig. 5.3

Table 5.1 shows information about the sperm shown in Fig. 5.3.

Complete Table 5.1.

Table 5.1

letter on Fig. 5.3	name of the structure	function
P		
	haploid nucleus	
		releases energy
	flagellum	

[4]

(d) Draw and label **one** human egg cell.

Include at least one labelled feature that is not found in a sperm cell.

[3]

(e) Describe what happens to a fertilised egg cell before implantation in the uterus.

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..... [3]

28 **(a)** Fig. 6.1 is a diagram of the human female reproductive system.

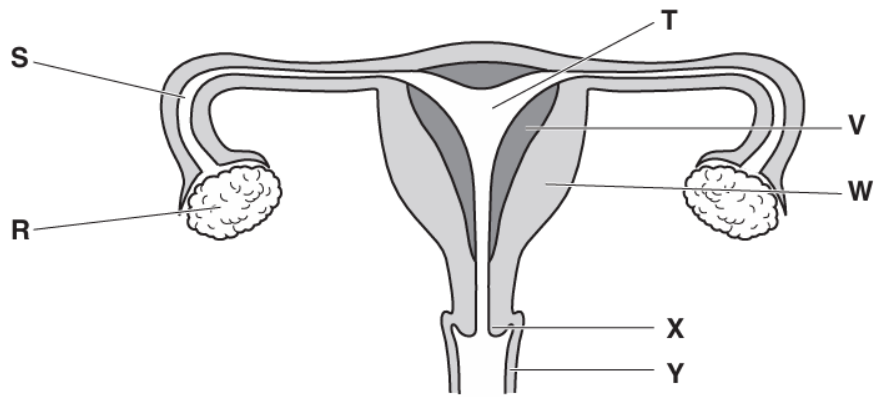

Fig. 6.1

(i) Complete Table 6.1 by stating the letter from Fig. 6.1 that identifies the structure where each process occurs.

Table 6.1

process	letter from Fig. 6.1
meiosis	
fertilisation	
implantation	

[3]

(ii) State the name of the part of the female reproductive system labelled **S** in Fig. 6.1.

..... [1]

(d) Explain the roles of the flagellum, the mitochondria and the acrosome in sperm cells.

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.....[6]

(e) Explain why the sex of a child is determined by its father.

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.....[2]