1 Fig. 3.1 shows the human female reproductive system.

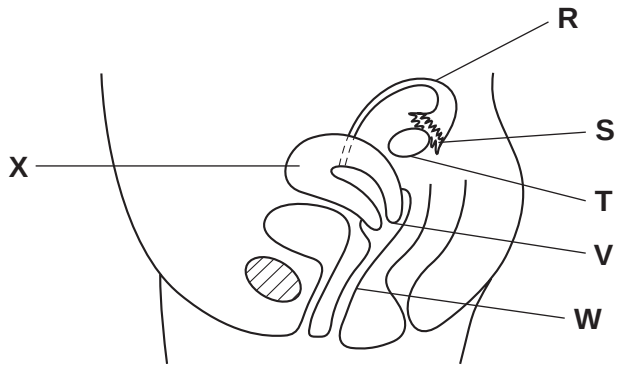

Fig. 3.1

(a) Table 3.1 shows four functions of the female reproductive system.

Complete the table by:

- naming the part of the system that carries out each of the functions;
- using the letters from Fig. 3.1 to identify the part of the system named.

One row has been completed for you.

Table 3.1

function	name of organ	letter from Fig. 3.1
production of gametes		
site of implantation		
site of fertilisation		
dilates during birth	cervix	**V**

[3]

The hormone FSH is important in regulating the menstrual cycle.

(b) (i) State the target organ of FSH.

.....

[1]

(ii) State **one** effect of FSH.

.....

.....

[1]

(c) The drug clomiphene is given to women who have difficulty in having children. The drug increases the secretion of FSH.

As part of treatment for infertility, a woman was given clomiphene for five days. The concentration of oestrogen in her blood was measured every day for 27 days.

The results are shown in Fig. 3.2.

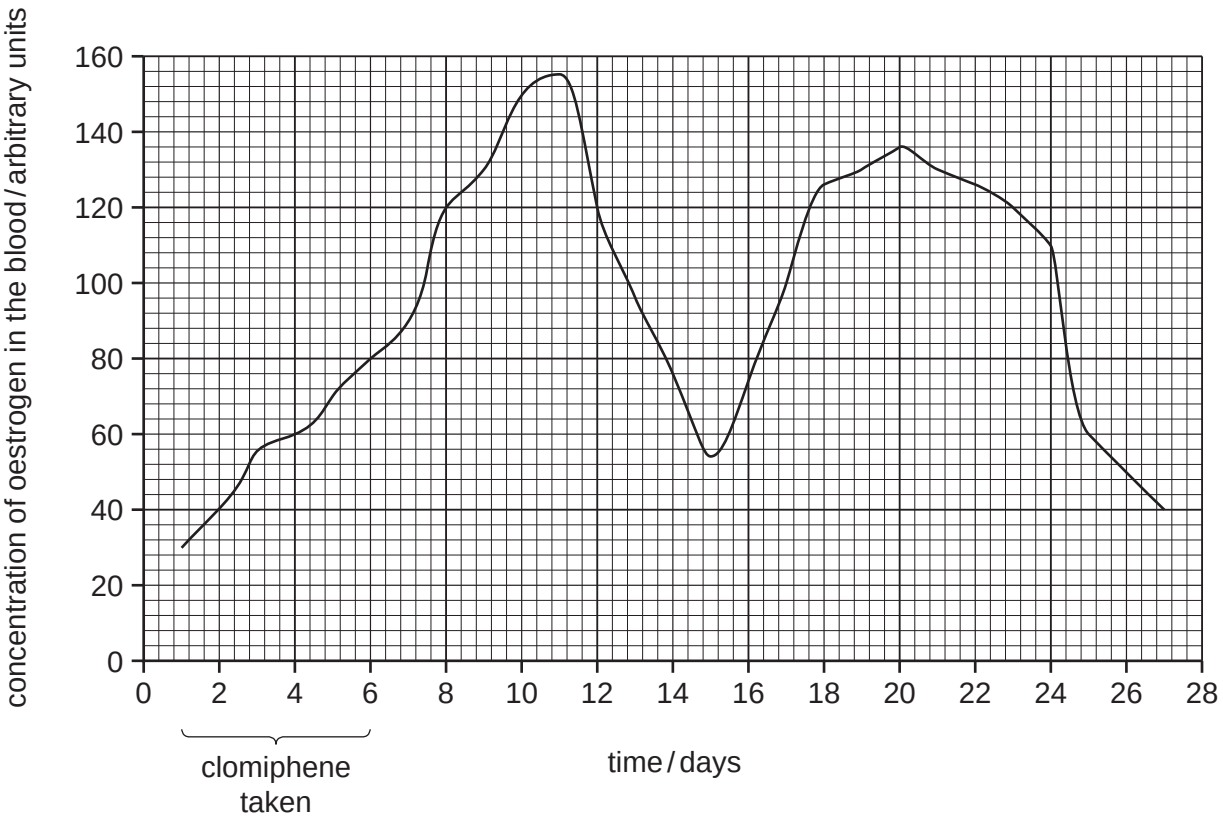

Fig. 3.2

(i) Describe the changes in oestrogen in the blood over the 27 days.

You will gain credit if you use results from Fig. 3.2 in your answer.

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.....

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..... [4]

(ii) Doctors thought that ovulation occurred around day 15.

Explain what is meant by the term *ovulation*.

.....

.....

.....

..... [2]

(d) The treatment was not successful on the first occasion.

As an alternative to this treatment, women may be offered *in vitro* fertilisation (IVF) treatment.

In IVF treatment, an egg is fertilised outside the body and the resulting embryo is placed into the uterus.

Describe what happens when an egg is fertilised by a sperm.

.....

.....

.....

.....

.....

..... [3]

(e) Some embryos produced by IVF do not develop because there are problems with their chromosomes, such as having the wrong number.

(i) Define the term *chromosome*.

.....

.....

.....

..... [2]

(ii) State the correct number of chromosomes that should be in a cell of a human embryo.

..... [1]

[Total: 17]

2 Fig. 4.1 is an electron micrograph of some red blood cells and lymphocytes.

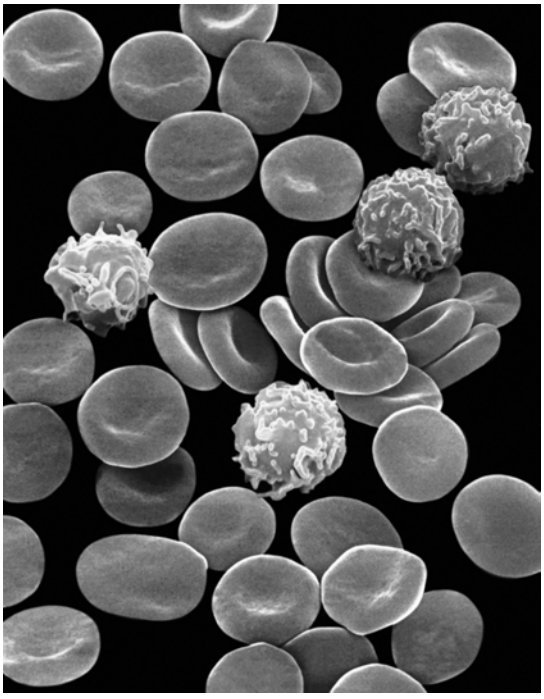

Fig. 4.1

(a) Lymphocytes respond to infection by making and releasing special protein molecules called antibodies.

Describe how antibodies provide protection from diseases caused by viruses and bacteria.

.....

.....

.....

.....

.....

..... [3]

Red blood cells have special molecules on their cell membranes. These are known as antigens and they stimulate the production of antibodies. These antigens also determine a person's blood group.

Before carrying out kidney transplants, it is important to check that the blood group of the donor matches the blood group of the recipient. This is called blood typing. It is necessary because blood group antigens are present on the inner lining of blood vessels in the kidney.

(b) Explain what would happen if a kidney from a person with blood group A was transferred into the body of a person with blood group O.

.....

.....

.....

.....

..... [2]

Tissue typing is carried out before transplanting a kidney. This makes sure that there is a close match between the donated kidney and the recipient. However, it is possible to carry out transplants of the cornea without blood typing or tissue typing.

(c) Suggest why it is possible to transplant corneas successfully without carrying out any tissue typing or blood typing.

.....

.....

..... [1]

The gene for the ABO blood group has three alleles, I^A, I^B and I^o.

(d) A person with blood group O has parents who have blood groups A and B. Complete the genetic diagram to show how this is possible.

Use the symbols, I^A, I^B and I^o, for the blood group alleles.

parental phenotypes	blood group A	×	blood group B
parental genotypes	.....	×	.....
gametes	....	+	....

offspring genotype	.....
offspring phenotype	blood group O

[3]

(e) Use your answer to **(d)** to give examples of the following. The first one has been completed for you.

term	exa
a dominant allele	I^A
heterozygous genotype	……..
codominant alleles	……..
phenotype	……..

[3]

[Total: 12]

3 The egg cell is the female gamete. Fig. 5.1 shows an ovum at the time of ovulation. The ovum is surrounded by a 'jelly coat' and many follicle cells.

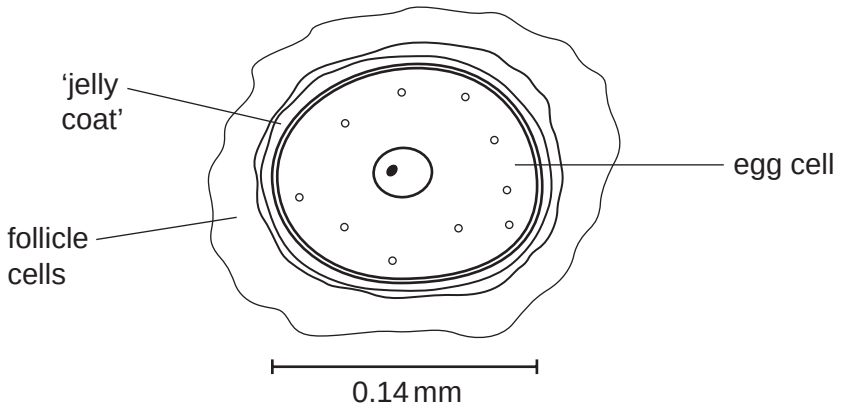

Fig. 5.1

(a) Calculate the magnification of the egg cell as shown in Fig. 5.1.

Show your working and express your answer to the nearest whole number.

answer = ... [2]

(b) State three ways in which the **structure** of an egg cell, as shown in Fig. 5.1, differs from the **structure** of a sperm cell.

1 .....

2 .....

3 ..... [3]

(c) Meiosis is involved in the production of male and female gametes.

Explain why it is important that meiosis occurs during the production of gametes.

.....

.....

.....

.....

..... [2]

Some women are unable to become pregnant because they or their partner are infertile.

(d) Suggest one reason why a man may be infertile and one reason why a woman may be infertile.

man .....

.....

.....

woman .....

.....

..... [2]

One way to treat infertility in a woman is to use artificial insemination (AI) using her partner's sperm.

The stages involved in AI are as follows.

1. If the doctor decides that AI is suitable, the woman will be given a course of a fertility drug at an appropriate stage of her menstrual cycle.
2. After two weeks, ultrasound is used to find out when the woman is likely to ovulate.
3. Sperm are collected from the man.
4. The sperm are placed into the uterus of the woman near the time of ovulation.
5. The woman is given an injection of a hormone to encourage the corpus luteum in the ovary to secrete progesterone.

(e) Explain why the sperm must be placed in the uterus near the time of ovulation.

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..... [3]

(f) Explain why it is important that progesterone is secreted after ovulation.

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..... [3]

(g) The success rate of AI is about 16 %.

Suggest how the success rate of AI is calculated.

.....

..... [2]

[Total: 17]