**Meiosis and gamete production**

The nucleus of each of your body’s cells contains 46 chromosomes. We have already found out that the zygote from which you began life resulted from the fusion of a sperm cell from your

father and an egg cell from your mother.

***What problem would result if two cells having 46 chromosomes each were to fuse?***

There has to be a special way for egg and sperm cells to form so that the chromosome

number of the zygote remains 46.

***Can you suggest a way the cell could do this?***

The cells of the reproductive organs form special cells called **gametes,** which have half the number of chromosomes of normal cells.

The division process forming these gametes is called **meiosis**.

It takes place only in the formation of gametes. It occurs in **testes and ovaries** in animals

or **anthers and ovaries** in flowering plants.

Chromosomes in our body’s cells are normally in pairs. Cells having paired chromosomes

present in them are said to be **diploid**.

In meiosis the paired chromosomes separate into different cells, which can then act as sex cells or **gametes**.

This diagram shows how this process takes place in forming sperm cells of an animal having only two chromosomes:

Paired chromosomes in a cell about to undergo meiosis

Each chromosome is separated from its pair

Chromosomes split into parts called **chromatids**

There are four new cells formed in this process. Each cell matures to become a **gamete**.

Notice that in this process

* There are two stages to the division.
* That **four** gametes are formed.
* Each gamete contains only **one member of each chromosome pair**.
* The chromosome number has been halved. Cells, like gametes, having only one of each chromosome are said to be **haploid**.

### QUESTIONS:

1. Why do gametes have to be haploid?

### If a human liver cell had 46 chromosomes, how many would you expect in an

### egg or a sperm cell formed by meiosis?

3. What is the diploid number for cells in humans?

4. What is the haploid number for cells in humans?

5. Copy and complete this table:

|  |  |  |
| --- | --- | --- |
| **Organism** | **Number of chromosomes in a normal body cell** | **Number of chromosomes in a gamete.** |
| Bee | 16 |  |
| Pig |  | 30 |
| Crayfish | 196 |  |
| Monkey | 48 |  |
| Watermelon | 22 |  |
| Adders Tongue Fern |  | 631 |

**Inheritance of sex in humans**

Each human cell has two kinds of chromosome within the nucleus of a cell.

There are 22 pairs of chromosomes carrying genes to control normal body features and another pair of **sex chromosomes**. This makes 23 pairs altogether.

Genes on this pair of sex chromosomes control the differences between the male and female sexes.

**Males** have 22 pairs of chromosomes for normal body features and both an

**X and Y** sex chromosome.

**Females** have 22 pairs of chromosomes for normal body features and two

**X** sex chromosomes.

***Let us see how sex is determined by following through this example***

***MALE FEMALE***

**Sex chromosomes**

**Present in normal cells XY XX**

**Sex chromosomes present X or Y X or X**

**in gametes formed**

#### Father's gametes

**Offspring X Y**

|  |  |
| --- | --- |
| **Mother's gametes**  **XX**  **X**  **X** | **XY** |
| **XX** | **XY** |

**Notice that there are two possibilities, XY (male) or XX (female).**

**Sperm**

**22 + X**

**22 + X**

**22 + Y**

**22 + X**

It’s a boy!

**44 + XY**

**44 + XX**

It’s a girl!

Eggs

# QUESTIONS:

1. How many chromosomes are in a human egg or a human sperm?

2. How many sex chromosomes will be in each gamete?

3. The diagram above shows the production of sperm and eggs. Copy it into your notebook together with this summary:

Sperm may carry either an **X** or a **Y** sex chromosome.

Eggs carry an **X** sex chromosome.

4. What “type” of sperm and eggs are required to produce:

(a) A male baby

(b) A female baby?

5. If half of the male gametes carry a Y sex chromosome, what is the chance of a couple producing a male child?