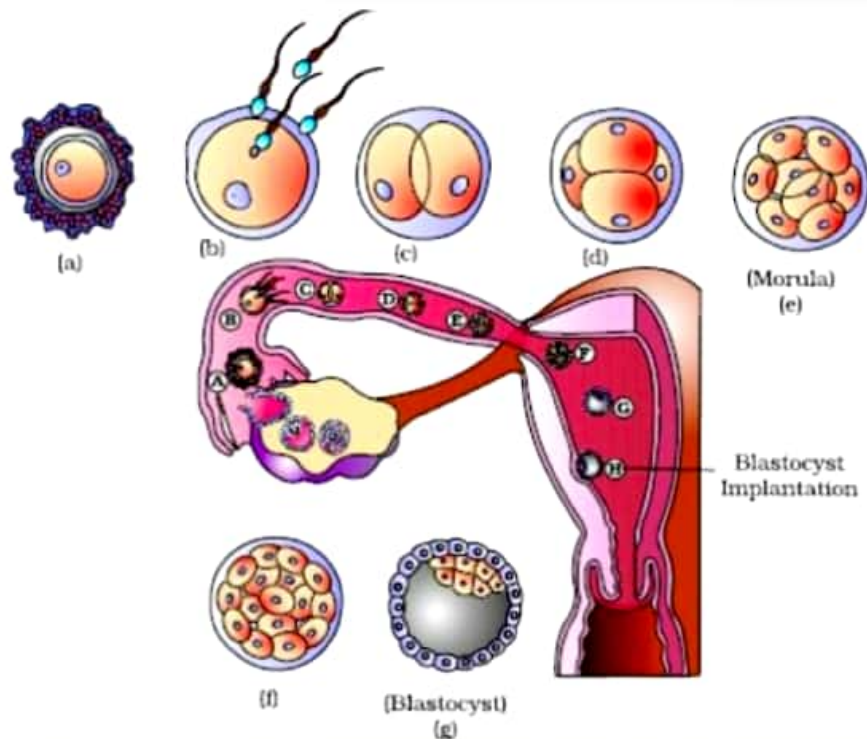


### **3.5: Fertilisation and Implantation:**

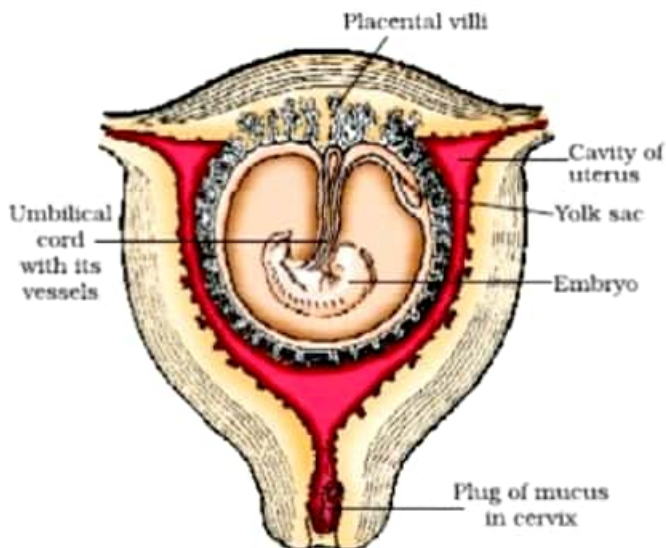
- **Insemination:** During coitus or copulation semen is released into the vagina by the penis.
- The motile sperms swim rapidly through the cervix, enter into the uterus and finally reach the ampullary region of the fallopian tube.
- The ovum released by the ovary is also transferred to the ampullary region of the fallopian tube.
- Fertilisation occurs in the fallopian tube only if the ovum and sperms are simultaneously transferred into the ampullary region of the fallopian tube.
- **Fertilisation:** It is the fusion of the sperm and the egg. During fertilisation the sperm induces changes in the zona pellucida layer of the ovum that block the entry of additional sperms ensuring that only one sperm can fertilise an ovum.
- The secretions of the acrosome help the sperm enter the ovum through the zona pellucida and the plasma membrane.
- This induces the secondary oocyte to complete meiosis. This is again an unequal division. It results in the formation of a second polar body and a haploid ovum.
- The haploid nuclei of the sperm and the ovum fuse to form a diploid zygote. The zygote contains 46 chromosomes.
- The sex of the foetus is determined by the sex chromosome present in the sperm. As the female is XX the ovum will always carry the X chromosome. Males are XY and therefore, the sperm can contain either X or Y. Therefore, half of all the sperms carry the X chromosome and the other half carry the Y chromosome. Depending on whether the X-containing sperm or the Y-chromosome fuses with the ovum, the zygote will be female or male.
- The zygote undergoes mitotic cleavage as it moves along the isthmus of the oviduct towards the uterus. It forms 2, 4, 8 and 16 daughter cells called as **blastomeres**.
- **Morula:** The embryo with 8-16 blastomeres.
- The morula continues division as it moves further along into the uterus. The blastomeres arrange in to an outer layer called as the **trophoblast**. The **inner cell mass** is attached to the trophoblast.
- The trophoblast attaches to the endometrium
- The inner cell mass differentiates to form the embryo
- The cells of the uterus divide rapidly and cover the blastocyst. The blastocyst thus embeds in the uterine wall. This is called as **implantation**. This leads to pregnancy.



1 Transport of ovum, fertilisation and passage of growing embryo through fallopian tube

### 3.6: Pregnancy and Embryonic Development:

- After implantation finger-like projections called as **chorionic villi** appear on the trophoblast.
- The chorionic villi are surrounded by uterine tissue and maternal blood. It causes the chorionic villi and the uterine tissue to become interdigitated with each other and jointly form a structural and functional unit between the developing foetus and the maternal body called as the **placenta**.
- Placenta supplies oxygen and nutrients to the developing embryo and removes the carbon dioxide and excretory waste from the foetus.
- The placenta is connected to the embryo through **umbilical cord**. The embryo transports nutrients and wastes to and from the placenta through the umbilical cord.
- Additionally the placenta functions as an endocrine gland. It produces several hormones such as **human chorionic gonadotropin (hCG), human placental lactogen (hPL), oestrogens, progesterone, etc.**
- Later in the pregnancy another hormone called as **relaxin** is produced by the ovary.
- During pregnancy production of various hormones is increased. These hormones include oestrogens, progesterone, cortisol, thyroxine, prolactin, etc. High levels of these hormones are essential for supporting foetal growth, metabolic changes in pregnancy as well as maintenance of pregnancy.
- Soon after implantation the embryo differentiates into the outer **ectoderm** and the inner **endoderm**. The **mesoderm** develops soon after. These three tissues soon give rise to the tissues in the body.
- The inner cell mass contains stem cells that have the ability to give rise to all the tissues and organs in the body.
- **Foetal development:**
  - 1 month- heart is formed
  - 2 month- limbs and digits are formed
  - 3 months- most of the major organ systems are formed
  - 5 months- appearance of hair on the head and the first movements of the foetus
  - 6 months- body is covered with fine hair, eyelids separate, eyelashes are formed
  - 9 months – foetus is fully developed and ready for delivery



**Figure 3.12** The human foetus within the uterus

### 3.7: Parturition and Lactation:

- **Gestation Period:** The average duration of pregnancy is called as gestation period. In humans the gestation period is 9 months
- **Parturition:** The process of childbirth by which the foetus is expelled or delivered due to vigorous contractions of the uterus.
- A fully developed foetus and placenta induces parturition. This causes mild uterine contractions called foetal ejection reflex.
- This triggers the release of oxytocin from the mother's pituitary.
- Oxytocin stimulates stronger uterine contractions which stimulates more production of oxytocin
- The stimulatory positive feedback reflex continues between the uterine contractions and oxytocin secretion. This leads to stronger and stronger contractions till the baby is expelled out of the uterus through the birth canal.
- Soon after the foetus is delivered the placenta is also delivered.
- **Lactation:** The production of milk by the mammary glands of the females towards the end of the pregnancy is called lactation.
- **Colostrum:** The milk produced during the initial few days of lactation is called as the colostrum. It is rich in antibodies that provide resistance and immunity to the new-born.