





You have been asked to write a short leaflet for young people about growing up and puberty.

Teacher information

Gallery visited	 Human Biology
Suitable for	 Key Stage 3 (ages 11 to 14)
Curriculum links	Organisms, behaviour and health.
Example page	www.nhm.ac.uk/human-growth-ks3
Pre-visit preparation	<p>Vocabulary: uterus, oviduct, embryo, foetus, placenta, umbilical cord, oestrogen, progesterone, testosterone, the contraceptive pill.</p> <p>Concepts: fertilisation, puberty, hormonal changes, the menstrual cycle.</p>
Post-visit work	Pupils can combine information gathered from the gallery with their own research work to complete the Final report task at the end of this guide.

1 Early development of the foetus

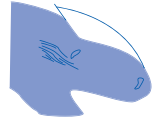



Three weeks after fertilisation the foetus is approximately the size of a tomato seed.

The bones in the foetus begin to form at roughly two months.

The placenta, membranes and amniotic fluid protect the baby in the uterus.

The drawing at 32 days after fertilisation should show the arm as a bud with few specialised cells.

The drawing at 80 days after fertilisation should show the arm with separate fingers and the individual bones present. These images are also shown in the worksheet in the section immediately below.

Stage	Number of days	Sketch	Description
1	32		Fin-like bud, all cells look the same (unspecialised).
2	37		Middle cells become crowded together, precartilage forms. Cells start to follow different special instructions.
3	42		Cartilage forms. The special instructions a cell follows are determined by its position on the arm and the kind of cells surrounding it.
4	80		Bones, fingers, nails present due to different specialised cells.

2 The role of the placenta and late development of the foetus

Discussion item on how the foetus at seven months is different from that at 80 days

Main points include: the foetus at seven months is bigger, ears and fingers are better formed, skin is thicker, no longer easy to see the blood vessels beneath. Pupils may also remember from the Life before birth film that bones, internal organs, etc will be better formed, too.

To stay alive, the foetus needs food and oxygen.

It gets these things from the placenta: the baby's blood receives food and oxygen from the mother's blood.

Before birth, the baby is joined to its mother via the umbilical cord.

- 1 The mother has substances in her blood that could be harmful to the foetus.
- 2 The baby's red blood cells could harm the mother if they entered her blood stream.
- 3 The powerful force of the mother's pulse would damage the baby's delicate blood system if they were directly connected.

Discussion item on the biggest changes a newborn baby has to deal with

Main points include: the baby has to actively feed, excrete and take in oxygen as previously these processes were done through the umbilical cord. A baby must acclimatise to the new feeling of space and to being in the light and the open air. It will also perceive sounds differently as it no longer has the sound of its mother's heartbeat, etc as a constant background noise. The baby needs to get used to being cleaned, dressed and encountering numerous other external stimulations.

3 Physical changes as children grow up

On average, people grow the fastest in the first few years after birth.

Females tend to be taller than males around ages 11 to 14.

Full adult height is attained by around 20, but many new cells of different kinds will be needed throughout life.

- 1 The proportion of bone to cartilage increases, an example of ossification in the hand is given in the display.
- 2 The shape and proportions of our limbs and heads in relation to body size.
- 3 Our height increases.

Discussion on other ways our bodies change

Possible answers include: changes due to puberty and reproduction, possible weight gain and hair loss, dental changes as adult teeth replace milk teeth, possible slackening of skin and muscles with age, degradation of the acuteness of senses, changes due to sufficient exercise such as increased muscle-mass and improved efficiency of breathing and heart beats.

4 Physical changes at puberty

Differences as you grow	From a girl to a woman	From a boy to a man
You become taller	✓	✓
You have more hair on your body	✓	✓
You have more hair on your face		✓
Your breasts develop	✓	
Your hips widen	✓	
Your shoulders enlarge		✓
Your body makes sperm cells		✓
Your body makes an ovum each month and periods happen	✓	

Discussion on other changes that happen inside the body
 Possible answers include: sperm ducts grow and develop, prostate enlarges (and starts to produce seminal fluid) in males. Vagina, uterus and oviducts grow and develop in females and the menstrual cycle begins. In both males and females there are many hormonal changes and the sex drive develops.

5 Hormonal changes at puberty

Hormone produced	Produced by males / females	Where in the body is it made?	What features does it control?
Oestrogen	Females	Ovaries	Controls development of female features such as breasts, rounded hips and thighs.
Progesterone	Females	Ovaries	Controls development of female features such as breasts, rounded hips and thighs.
Testosterone	Males	Testes	Controls development of male features such as larger muscles and body hair.

It may be noted that small amounts of male hormones are also produced in females and vice-versa.

6 The human menstrual cycle

When filling in the four boxes, it does not matter which box is used first so long as they follow each other in this order according to the arrows.

FSH is released (by the pituitary gland) and stimulates ovum growth.



Oestrogen is released by the growing ovum. This causes a drop in FSH production and causes the uterus lining to thicken.



LH (released by the pituitary gland) causes the ovum to be released.

(At this point X should be marked to show the point at which the ovum is most likely to be fertilised.)



Progesterone (released by the corpus luteum) prevents the pituitary gland from releasing LH and FSH.



The pill modifies this cycle by elevating the levels of oestrogen and progesterone, which suppress the production of FSH and LH, thus preventing the release of an ovum.