5. Neonatal Development (Birth to 15 days)

What are the things that you note when newborn babies are brought home?

Here is a hint for you :

A. Appearance

B. Bathing

C. Clothing

The human body goes through amazing changes during gestation which is the time spent in the mother's uterus. It starts out as a tiny, microscopic group of cells that grow and form all the organs and tissues found in a newborn baby. These changes don't stop at birth! Birth is just an interruption in the process of development which starts at conception. The fetus gets separated from the internal uterine environment of the mother to the external world environment. This period after birth, marked with crucial adjustments is called the Neonatal period. The neonatal period extends from birth through the first fifteen days of life. During this time, the new born undergoes physiological changes as it adapts to the new environment.

The first two weeks of neonatal period is the time of transition from the uterus where foetus is supported entirely by the mother to an independent existence.

Definition :

The period from the birth to the time when the newborn makes a stable adjustment to his new environment is generally referred to as the neonatal period and the baby is known as a neonate.

Facts about Newborn Babies :

- A newborn baby has no kneecaps at **birth!** ...
- A new born baby cries without tears as the tear ducts and glands only produce enough liquid to lubricate and protect their eyes.
- Newborn babies have more bones than adults.They have 270 -300 bones at birth
- Newborn babies can hear as well as you do. .
- The voice and smell of the mother, is recognized by the baby from **birth**.

5.1 Physical appearance of neonate :

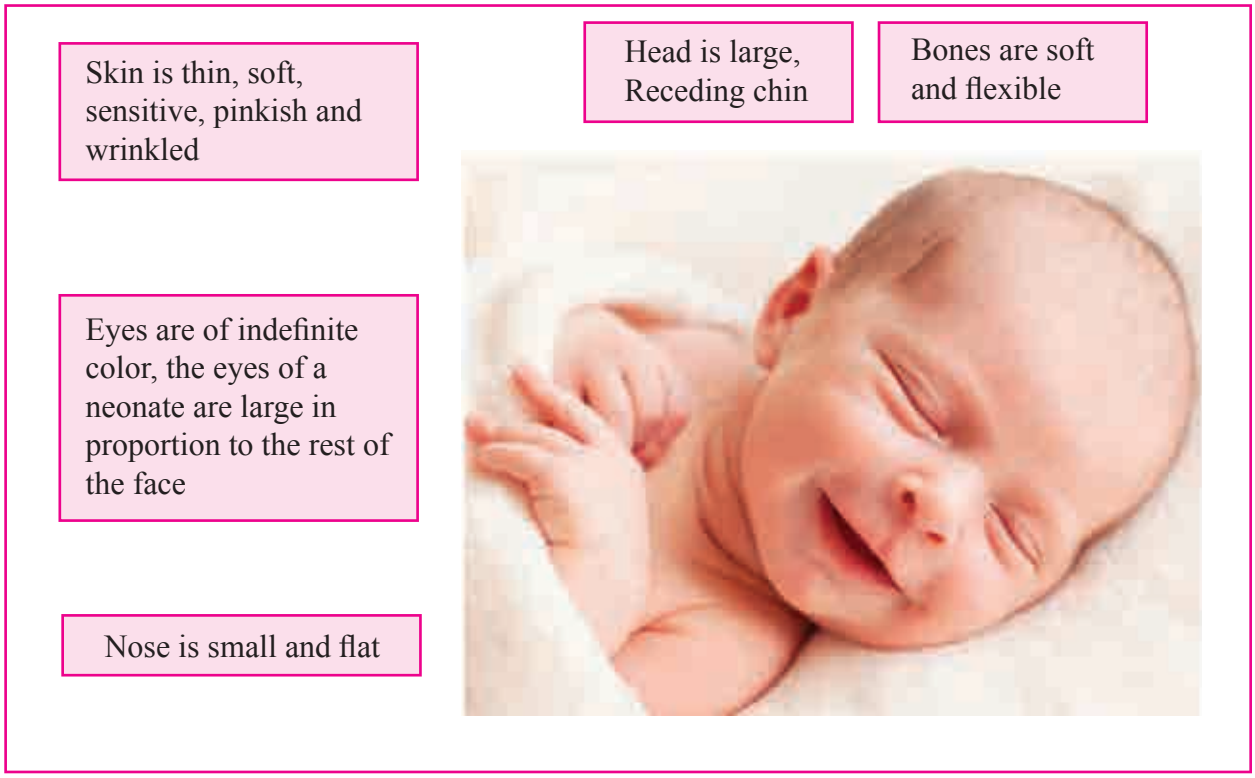


Fig 5.1 Physical appearance of a neonate

The skin of the neonate is wrinkled, thin, soft and sensitive with a pinkish cast. During the first few days neonates have prenatal hair which has not yet fallen off and hence they look very hairy. New babies are covered with a protective layer of vernix caseosa, an oily substance that protects them against infection. This dries off within the first few days after birth.

The muscles of the neonate are soft, small and uncontrolled. At the time of birth the muscles of the neck and legs are less developed than the muscles of the hand and arms. The bones are soft and flexible due to the high percentage of cartilage present in them. The flesh is also elastic.

Neonates have a large head with a receding chin. At birth, many regions of the newborn's skull have not yet been transformed to bone, leaving "soft spots" known as fontanelles. These bones will fuse together in a natural process and form the skull. During labour and birth, skull of the foetus changes shape to fit through the birth canal, sometimes causing a misshapen or elongated head which will usually return to normal on its own within a few days or weeks. The eyes of newborns are of an indefinite colour which gradually changes to a permanent colour. The eyes of a neonate are large in proportion to the rest of the face and the nose is flat and small. The teeth and jaw are undeveloped.

Can you tell?

- What is vernix caseosa?
- What do you mean by soft spots?

Body Proportion of a neonate :

All Neonates are different in size and weight. At first glance, all babies seem to look alike but there are significant differences among them. Head of the neonate covers 1/4th proportion of the total body length. The head circumference of the neonate is almost eqa l to that of his/her chest.The shoulders are narrow whereas the abdomen is large and bulging. As compared to the head, arms and legs of a newborn are small. The average height of an Indian neonate is 45cms to 50cms and weight is 2700gms to 3250gms. In the first few days neonates lose almost 10 percent of their body weight due to loss of fluid and adjustments to the surroundings.

Activity :

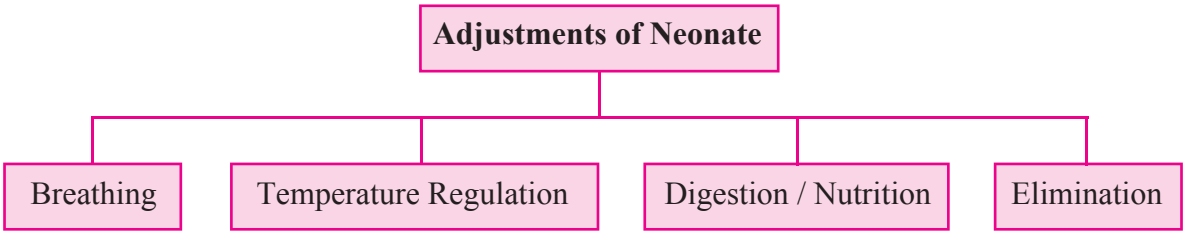
Observe and discuss the body proportion of a newborn in your family, one known to you in your surrounding

2 Adjustments of Neonate :

During the prenatal period, blood circulation, respiration, nourishment, elimination of waste and body temperature are regulated through the mother's body.Even though foetus and the mother have separate circulatory systems, the foetus's used blood is cleansed through the umbilical cord which carries the impure blood to the placenta and replaces it with the purified blood.The infant has to make four major adjustments after birth in order to live.

Do You Know?

A newborn can see mostly blurry shapes because they are near sighted. A baby can see things best from a distance of 8 to 12 inches. Their eyes are sensitive to bright light, so they are more likely to open their eyes in dim light



The new born has to make the adjustments given above. You will see more information related to this as shown below.

a) Breathing

The first adjustment that the neonate has to make is breathing. While in the womb, foetus gets oxygen through the umbilical cord which also carries away the carbon dioxide.

Even though the lungs develop during the prenatal period they are not used for breathing because the foetus is surrounded by the amniotic fluid.Therefore, the supply of oxygen to the foetus comes from the placenta through the umbilical cord. This cord is cut after birth and thereafter it becomes necessary for the neonates to start inhaling and exhaling air on its own. The first cry after birth usually helps in inflating the lungs thus enabling the infant to take the first breath. Initially newborn baby's breathing is very fast, i.e. nearly 30 to 40 times per minute as compared to adults breathing which is 18 times per minute. There is no regularity in inhaling and exhaling in a neonate during the first few days after birth. To regulate this, newborns respond through sneezing, yawning and hiccups.

Interesting fact

Newborns sneeze a lot, but not because they're cold or sick. It helps clear their nasal and respiratory passages of congestion and airborne particles. Sneezing also helps to reopen a temporarily closed nostril. When a mother nurses and her baby is pressed up against her, the baby's nose might get flattened or one nostril may be pushed shut. After feeding, the baby will take a breath or sneeze to open up his nose again.

b) Temperature Regulation :

The temperature in the mother's womb is around 100° F (38 Celsius). After birth, the neonate has to adjust to the temperatures of the environment. In India, temperature changes from state to state depending upon the weather conditions. This is the reason for wrapping the new born babies for protection and enable them to adjust to the changes in temperature.

c) Digestion / Nutrition :

The neonate is well equipped to make the change from passively receiving nourishment from the mother's blood through the umbilical cord to actively seeking food from the mouth. Hunger sensations are felt by the newborn which reflects through rooting (head turning), sucking and swallowing reflex to get the nourishment required for growth. Newborn babies instinctively suck the milk and their own gastrointestinal secretions help in digestion.

d) Elimination :

In the uterus, foetus relies on the umbilical cord to carry the foetal body waste away. After birth, in the first few days infant eliminates 'meconium', a sticky, greenish black waste matter formed in the foetal intestinal tract.

Do You Know?

- **Meconium** is harmless. Most babies can pass it while still in utero or during labour and have no problems.
- If the **meconium** is inhaled into the lungs (meconium aspiration syndrome or MAS), it has the potential to be **dangerous** or fatal to newborns.

Activity :

Can you name or tell?

- The different types of adjustments of the neonate?
- The sticky waste matter excreted by the neonate?
- The breathing rate of a newborn?
- The temperature within the uterus?

5.3 Reflexes :

Neonate reflexes are involuntary motor responses to specific stimuli. The neonate reflexes are not learned. They are closely connected to the physiological functioning of the brain. These primitive neonatal reflexes are present at birth. A few reflexes form the basis of complex motor skills which the neonate will develop in later life. The new born should show most of the essential reflexes at birth. Their absence is an indication of developmental hazards. This is because many early reflexes specify the ability of the infant to survive. Reflexes reveal the capability of the nervous system, thus if there is an indication of weak or absence of reflexes at birth, it may be a hint suggesting brain damage.

Remember !

An absent or weak reflex may be a side effect of birth trauma, medical condition and illness

Types of Reflexes :

a) Rooting Reflex :

In this reflex a newborn turns his/her mouth towards the nipple or finger that touches its cheek. The newborn baby responds by turning the head toward the source of the stimulus and opening the mouth.

Figure : 5.2 Rooting reflex

Do You Know?

Babies respond positively to the smell of the mother. Even more striking is the discovery that a blindfolded woman has the ability to identify her own child from a host of other babies by scent alone.

b) Sucking Reflex :

The sucking reflex combines with the rooting reflex. A slight stimulation to the infant's lips, cheeks or chin may result in the vigorous sucking movements. This permits feeding as the infant sucks milk from the nipple.

Figure: 5.3 Sucking Reflex

c) Babinski Reflex :

It involves the peculiar extension and fanning of the toes, when the sole of the foot of a new born is stimulated. This reflex disappears by eight to twelve months of age. This reflex is an indication of the neonate's responsiveness to the outer stimulus.

Figure: 5.4 Babinski Reflex

d) Moro Reflex :

This is a "startle" response to sudden changes in position or sudden loud noises. When the neonates are stimulated in this manner, they quickly fling their arms and legs to the side with their hands open, and their fingers spread. This reflex begins to decline in the third month and disappears by six months.

Figure : 5.5 Moro Reflex

e) Darwinian Reflex (Grasping reflex) :

This reflex is also known as "Palmar Grasp". It occurs when an object touches an infant's palm. This causes the infant to automatically grasp the object. This ability becomes more pronounced in the first few weeks of life, then gradually declines and vanishes after 3 to 4 months.

Figure : 5.6 Grasping Reflex/ Darwinian Reflex

Amazing act

The grasp of a newborn baby is so strong that its whole body can hang in midair, with its bent fingers supporting its weight

f) Tonic Neck Reflex :

This is also known as the 'Fencing' position. It involves coordination of the position of the head, arms and legs. While lying awake on the back, the neonate assumes the position with his head turned to one side. One arm is extended in front of the eyes on the side to which the head is turned and the other arm is flexed.This reflex appears at four months of age and may prepare the infant for voluntary reaching. This reflex of the neonate continues up to infancy.

Figure : 5.7 Tonic Neck reflex

Do You Know?

Tonic neck reflex is an Asymmetric reflex

It signals the proper development of the baby's hand-eye coordination.

Reflection / Darpan

(1) Ask your mother to show you a photograph of yourself as a neonate.

(2) Observe the photograph and see if you can find the description given as per the text.

(3) Find out from your mother if you had any adjustment problems during the first few week after birth. If yes, what were they?

5.4 Prematurity :

Have you heard of babies being born before time i.e. before nine months? What do you think were the causes? Have you seen or heard of problems the baby faced? Discuss these with your class mates.

For those of you who aren't aware, they are called premature infants.

Let us now understand what a premature birth is.

Prematurity is a birth that takes place more than three weeks or more before the estimated due date. In other words, a premature birth is one that occurs before the start of the 37th week of pregnancy.

Complications of prematurity vary greatly and are often accompanied by related medical problems. The earlier a baby is born, the higher the risk of complications.

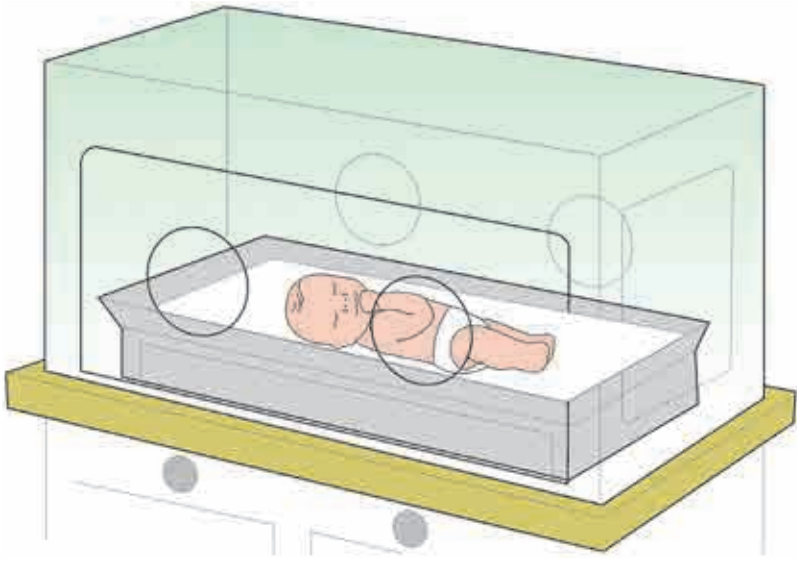
Depending on how early a baby is born, he or she may be:

Late preterm, born between 34 and 36 completed weeks of pregnancy.

Moderately preterm, born between 32 and 34 weeks of pregnancy.

Very preterm, born at less than 32 weeks of pregnancy.

Extremely preterm, born at or before 25 weeks of pregnancy.



A premature baby in an incubator

Prematurity is also determined by birth weight of the baby. If the birth weight of the baby is below 2.5 kg, such babies are generally kept in an incubator in order to maintain womb temperature i.e. 100^0F.

Do you know?

According to World Health Organization (WHO), every year about 15 million babies are born prematurely which is more than one in ten of all babies born globally

- **Some sig s and symptoms of prematurity include the following**

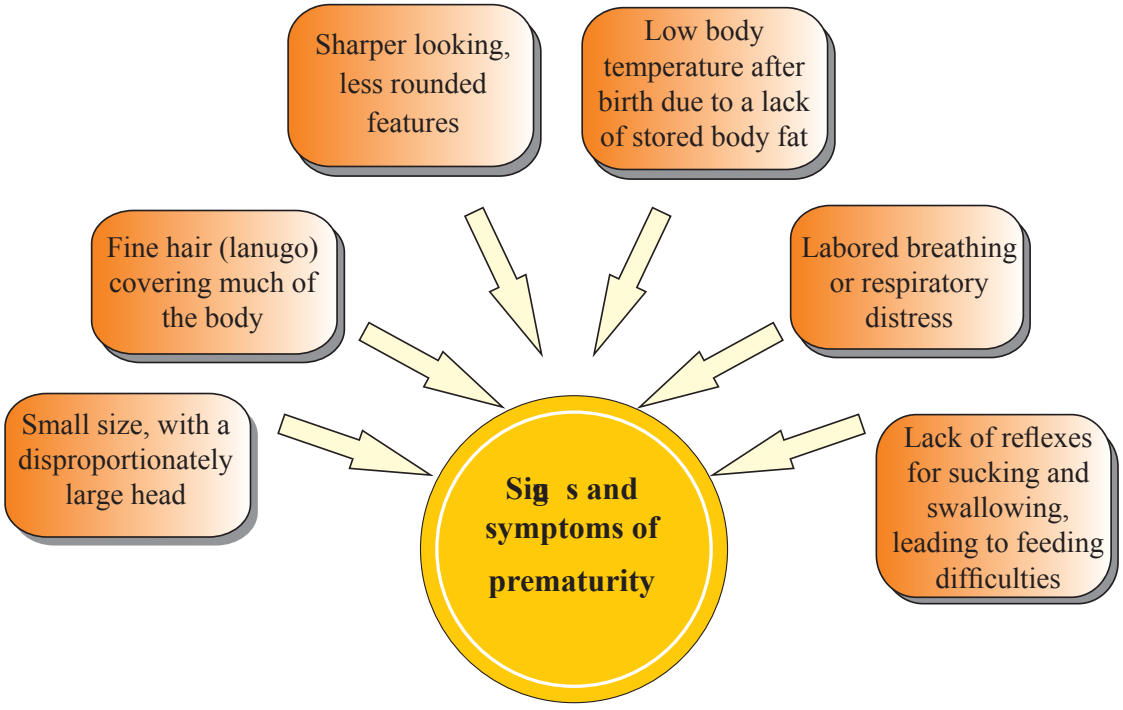


Fig 3 S ig s and symptoms of prematurity

Very often, the specific cause of premature birth may not be evident. However,t here are a few known causes :

- History of a previous premature birth
- Pregnancy with twins, triplets or other multiple pregnancy
- A gap of less than six months between pregnancies
- Problems with the uterus, cervix or placenta
- Smoking cigarettes or using narcotic drugs
- Some infections, particularly of the amniotic fluid and lower genital tract
- High blood pressure and diabetes
- Being underweight or overweight before pregnancy
- Stressful life events such as the death of a loved one or domestic violence
- Multiple miscarriages or abortions
- Physical injury or trauma

Interesting Fact :

Famous People Born Premature

Charles Darwin, Albert Einstein, Pablo Picasso, Stevie Wonder and Sir Winston Churchill were all premature births.

Being born too early can cause some health problems and increase the risk of complications. Let us see some problems that may be apparent at birth:

1 Breathing problems :

A premature baby may have trouble breathing due to an immature respiratory system.

2 Heart problems :

In infants there is an opening in the heart, which often closes on its own. If this does not happen and is left untreated it can lead to heart failure as well as other complications.

3 Brain problems :

The earlier a baby is born, the greater the risk of problems related to the brain.

4 Temperature control problems :

Premature babies can lose body heat rapidly. They do not have the fat insulation that a full-term infant has and are therefore unable to generate enough body heat. If body temperature dips too low in a premature baby, it can lead to breathing problems and low blood sugar levels.

Premature babies require additional heat from an incubator. This is so because the premature infant may use up all the energy gained from feeding to stay warm.

5 Other complications :

- **Gastro intenstinal problems :** Premature babies who receive only breast milk have a much lower risk of developing gastro intestinal problems.
- Premature babies are at risk of anemia and neonatal jaundice.
- Some premature babies may develop an abnormally low level of blood sugar (hypoglycemia). This can happen because premature infants typically have smaller stores of glucose than do full-term babies. Premature babies also have more difficulty converting their stored glucose into more-usable, active forms of glucose.
- Premature babies have an underdeveloped immune system. This can lead to a higher risk of infection.

Some complications resulting from premature birth can be solved. Yet there could be other health issues which may reqi re treatment.Some premature birth complications cannot be prevented. However, keeping them in a neonatal intensive care unit can save a lot of lives.

Activity :

Can you now ġ ve a reason?

Premature babies may have:

a) difficulty in regulating body temperature

b) low blood sugar

c) heart problems

d) infections

Remember :

A preterm baby might not meet growth or development milestones like a full term baby. This is normal. Preterm babies usually catch up to full-term babies developmentally by the age of two years.

Revise the points

Neonate

Physical appearance and body proportions

- Vernix caseosa
- Large head
- Fontanelles
- Soft bone
- Thin pinkish skin

Adjustment

- Breathing
- Temperature regulation
- Digestion / Nutrition
- Elimination

Reflexes

- Rooting
- Sucking
- Babinsky
- Moro
- Darwanian
- Tonic-neck

Prematurity

Sig s and symptoms	Causes	Complications
1) Small size	1) Maternal BP, Diabetes	1) Heart problem
2) Lanugo covering body	2) Multiple birth	2) Breathing problem
3) Less fat on the body	3) Physical or mental trauma	3) Low blood sugar
4) Low body temparature	4) Substance abuse	4) Low body temperature
5) Irregular breathing	5) Underweight / overweight	5) Poor immune system
6) Lack of reflexes	) Maternal infections	) Increased risk to brain

Exercises

Q. 1 Select and write the most appropriate word from the given alternatives.

1. Neonatal period is from birth to ..... days

   a) 0 day s *b) 2 day s*

   c) 1 day s

2. Neonate ..... weight soon after birth.

   a) gains *b) loses*

   c) balance

3. Bones of the neonate are soft and flexible due to the high percentage of ..... present in them.

   a) protein *b) vitamin*

   c) cartilage

4. Tonic Neck reflex is also known as the ..... position.

   a) Darwinian *b) Fencing*

   c) palmar

5. The temperature in the mother's womb is around ..... .

   a) 38 ^0F *b) 0 ^0F*

   c) 98 ^0F

6 Infants born between 34 and 36 completed weeks of pregnancy are called .....

   a) moderately preterm

   b) very preterm

   c) late pretermm

Q. 2 Match the column :

A		B	
1.	Neonate sucks fingers rhythmically	a)	Tonic neck reflex
2.	Head turns towards source of stimulation	b)	Moro reflex
3.	Newborn makes embracing motion	c)	Grasping reflex
4.	Toes fan out	d)	Sucking reflex
5.	Spontaneous grasp of adult's finger	e)	Rooting reflex
6.	Infant lies in a fencing position	f)	Babinski reflex
		g)	Stepping reflex

Q. 3 Write whether the following statement are right or wrong and rewrite the statement.

1. Newborn babies look good and cute.
2. Neonate has to make many adjustments immediately after birth.
3. Babies skin is usually wrinkled and soft.
4. Foetus breathes through its nose during prenatal period.
5. Premature infants are born at 40 weeks.

Q. 4. Give reasons

1. Reflexes reveal the capability of the nervous system.
2. New born baby's bones are soft
3. In the first few days neonates lose almost 10 percent of their body weight
4. New born babies are wrapped in cloth
5. Premature infants have difficulty in regulating body temperature.

Q. 5 Answer the following in one sentence.

1. What is the meaning of neonate?
2. What is reflex action?
3. What is the importance of birth cry?
4. What is meconium?

Q. 6. Explain the terms :

1. Temperature regulation
2. Vernix caseosa
3. Babinski reflex
4. Prematurity

Q. 7 Answer the following in brief

1. Physical appearance of a neonate.
2. Body proportions of a newborn.
3. List the signs and symptoms of prematurity.
4. Give the causes of prematurity.

Q. 8. Identify the following reflexes and describe in short.

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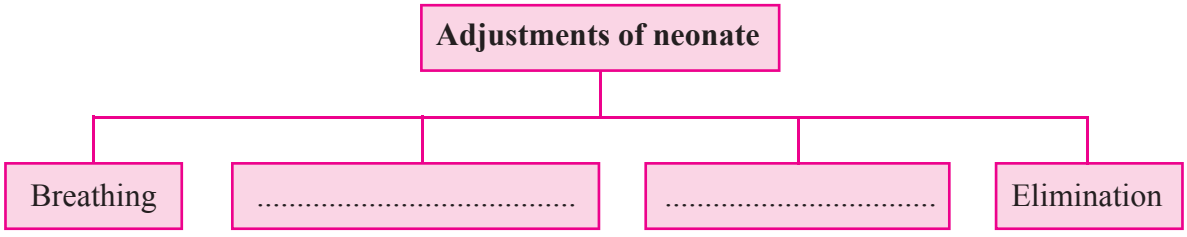
Q. 9. a) Complete the following chart



b) Explain the importance of the first cry after birth.

c) What complications does a premature infant undergo?

Project / Self study

- **Make a chart on reflexes of a new born baby / care of neonate/ feeding practices.**