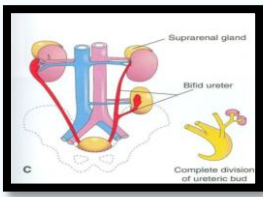


# DEVELOPMENT OF KIDNEYS & URETERS

## DEVELOPMENT OF KIDNEYS ( 3 stages )

<b>EMBRYOLOGICAL ORIGIN</b>		INTERMEDIATE MESODERM ( Differentiates into ) :	<b>Nephrogenic ridge (cord):</b> Lateral	forms kidneys & ureters
			<b>Gonadal ridge :</b> Medial	forms gonads (testes or ovaries)
<b>Metanephros</b>	<b>System</b>	<b>1- Pronephric system:</b>	<b>2-Mesonephric system:</b>	<b>3-Metanephric system:</b>
	<b>Appears at</b>	beginning of <b>4<sup>th</sup> week</b>	end of <b>4<sup>th</sup> week</b>	<b>5<sup>th</sup> week</b> but start function at at <b>9<sup>th</sup> week</b>
	<b>Location</b>	in <b>cervical</b> region	in <b>thoracic &amp; abdominal</b> regions	in <b>pelvis</b>
	<b>Formed of</b>	tubules & a duct	tubules & a duct	<b>Metanephros</b> ( 2 origin ) : 1- <b>Ureteric Bud</b> : derived from mesonephric duct → <b>gives Collecting part of kidney.</b> 2- <b>Metanephric Blastema (Mass)</b> : derived from nephrogenic cord → <b>gives Excretory part of kidney.</b>
	<b>Features</b>	<ul style="list-style-type: none"> <li><b>not</b> function in human</li> <li>analogous to kidney of fish</li> </ul>	<ul style="list-style-type: none"> <li>function <b>temporarily.</b></li> <li>analogous to kidney of amphibians.</li> </ul>	<b>Permanent kidney</b>
	<b>Fate</b>	Disappears (بنهاية هذه المرحلة وقبل انتهائها تظهر المرحلة التالية)	-The duct: <b>In male:</b> forms genital duct. <b>-in both sexes:</b> forms ureteric bud.	
	<b>COLLECTING PART</b>	Ureteric bud elongates & penetrates metanephric mass → Stalk of ureteric bud <b>forms ureter</b> & its cranial end <b>forms renal pelvis</b> → Branching of renal pelvis <b>gives 3 major calices.</b> Branching of major calices <b>gives minor calices</b> → Continuous branching <b>gives straight &amp; arched collecting tubules.</b>		
<b>EXCRETORY PART</b>	Each arched collecting tubule is surrounded by a cap of metanephric mass ( <b>metanephric vesicle</b> ) → elongates to form an <b>S-shaped metanephric tubule</b> → The <b>end of each tubule forms Glomerular (Bowman's) capsule</b> → Each glomerular capsule is <b>invaginated</b> by <b>capillaries (Glomerulus)</b> → <b>The tubule lengthens to form: Proximal &amp; Distal convoluted tubules + Loop of Henle.</b>			

<b>THE NEPHRON (FUNCTIONAL UNIT OF KIDNEY)</b>	The <u>Nephron</u> is formed by fusion of:	<b>1-Excretory tubule</b>	from metanephric mass (cap).	<b>At Full Term</b> (remember from physiology ) each kidney contains: 800000 – 1000000 nephrons.		
		<b>2-Arched collecting tubule</b>	(from ureteric bud).			
<b>Criteria of The Fetal Kidney</b>	The Kidney is subdivided into <u>Lobes</u> that are <u>visible externally</u> .		<u>Lobulation</u> diminishes at the <b>end of fetal period</b>	<u>Nephron formation</u> is <b>complete at birth</b> .		
<b>CHANGES of kidney</b>	<b>Before Birth</b>		<b>Change from</b>	<b>To</b>	<b>What Happens At The 9<sup>TH</sup> WEEK</b>	
		<b>Position</b>	The kidney <b>ascends</b> from pelvis	caudal to <b>suprarenal gland</b> : -adult position -abdominal region.	Beginning of glomerular filtration ( <b>start of function</b> ).	
		<b>Blood supply</b>	renal branches of <u>common iliac arteries</u>	renal branches of <u>abdominal aorta</u> .	The kidney attains its <b>adult position</b> . Receives its arterial supply from <b>abdominal aorta</b> .	
		<b>Rotation</b>	Initially, the Hilum is <b>ventral</b>	then rotates medially about <b>90°</b> & becomes <b>medial</b> .	The hilum is rotated <b>medially</b>	
	<b>After BIRTH</b>	<b>Increase in size</b> : due to <b>elongation of tubules</b> and <b>increase in connective tissue</b> between tubules (not due to increase in number of nephrons)			<b>Disappearance of kidney lobulation</b>	
<b>Congenital Anomalies</b>	<b>Pelvic kidney</b>	<b>Horseshoe kidney</b>	<b>Unilateral renal agenesis</b>	<b>Supernumerary kidney</b>	<b>Right side</b>	<b>Left side</b>
	<b>failure of ascent of one kidney (ureter is short)</b>	<b>the poles of both kidneys (usually the lower poles) fuse: the kidneys have a lower position than normal but have normal function</b>	<b>due to absence of one ureteric bud.</b> ( احدى الكليتان غير موجودة منذ الولادة نظرا لفقدان uretic bud )	<b>due to development of 2 ureteric buds</b> ( زيادة كلية ثالثة في جسم الإنسان وهذا الأمر مفيد وبعض المصابين به يتبرعون بهذه الكلية )	<b>malrotation of kidney ( ventral hilum )</b>	<b>bifid ureter &amp; supernumerary kidney</b>
						

# Summary

beginning of 4 <sup>th</sup> week	Appears of <u>Pronephric system</u>	
end of 4 <sup>th</sup> week	Appears of <u>Mesonephric system</u>	
5 <sup>th</sup> week	Appears of <u>Metanephric system</u>	
<b>9<sup>TH</sup> WEEK ( before birth )</b>	Function of <u>Metanephric system</u>	
	Beginning of glomerular filtration ( <b>start of function</b> ).	
	The kidney attains its <b>adult position</b> .	
	Receives its arterial supply from <b>abdominal aorta</b> .	
	The hilum is rotated <b>medially</b>	
At birth.	<b>At full time</b>	<b>Nephron formation is complete.</b>
end of fetal period		<b>Lobulation diminishes</b>

<b>Congenital Anomalies</b>	<u>Pelvic kidney</u>	<b>failure of ascent</b> of one kidney ( <b>ureter is short</b> )
	<u>Horseshoe kidney</u>	the poles of both kidneys ( <b>usually the lower poles</b> ) fuse : the kidneys have a lower position than normal, but have normal function
	<u>Unilateral renal agenesis</u>	due to <b>absence</b> of one ureteric bud. ( احدى الكليتان غير موجودة منذ الولادة نظرا لفقدان uretic bud )
	<u>Supernumerary kidney</u>	due to <b>development of 2 ureteric buds</b> ( زيادة كلية ثالثة في جسم الإنسان وهذا الأمر مفيد وبعض المصابين به يتبرعون بهذه الكلية )
	<u>Right side</u>	<b>malrotation</b> of kidney - ( ventral hilum )
	<u>Left side</u>	<b>bifid ureter &amp; supernumerary kidney</b>

# MCQ'S

## 1-Gonadal ridge form :

- A-kidneys
- B-gonads (testes or ovaries)
- C-ureter
- D- All

## 2-in the 9<sup>th</sup> weak :

- A-kidneys start function
- B- the hilum is rotate to ventral
- C-Disappearance of kidney lobulation
- D- All.

## 3- kidneys increase in size (After birth ) due to :

- A-elongation of tubules
- B- increase in connective tissue between tubules.
- C-increase in number of nephrons
- D-both A and B

## 4-Pronephric system appears at :

- A-9<sup>th</sup> weak
- B-5<sup>th</sup> weak
- C- beginning of 4<sup>th</sup> week
- D-end of 4<sup>th</sup> week

## 5- The Nephron is formed by fusion of:

- A-Excretory tubule
- B-Arched collecting tubule
- C-both A and B
- D- none of them

## 6- Supernumerary kidney is due to :

- A-development of 2 ureteric bud
- B-ureter is short
- C-malrotation of kidney
- D-absence of one ureteric bud

## 7-Pelvic kidney is due to :

- A-development of 2 ureteric bud
- B-ureter is short
- C-malrotation of kidney
- D-absence of one ureteric bud

## 8- Unilateral renal agenesis is due to:

- A-development of 2 ureteric bud
- B-ureter is short
- C-malrotation of kidney
- D-absence of one ureteric bud

## 9- Metanephric system appears at ..... and start function at .....

- A-9<sup>th</sup> weak - 5<sup>th</sup> weak
- B-5<sup>th</sup> weak - 9<sup>th</sup> weak
- C- beginning of 4<sup>th</sup> week – 5<sup>th</sup> weak
- D-end of 4<sup>th</sup> week – 9<sup>th</sup> weak

## 10- in the Horseshoe kidney :

- A-normal function
- B-lower position than normal
- C-bifid ureter
- D-both A and B

## 11- Which of the Congenital Anomalies do not causes any problem :

- A- Unilateral renal agenesis
- B-Supernumerary kidney
- C- right side malformation of kidney.
- D-all can cause problem

## 12-Lobulation diminishes at.....and Nephron formation is complete at.....

- A-birth - the end of fetal period
- B- both after birth
- C-the end of fetal period – birth.

1-B

2-A

3-D

4-C

5-C

6-A

7-B

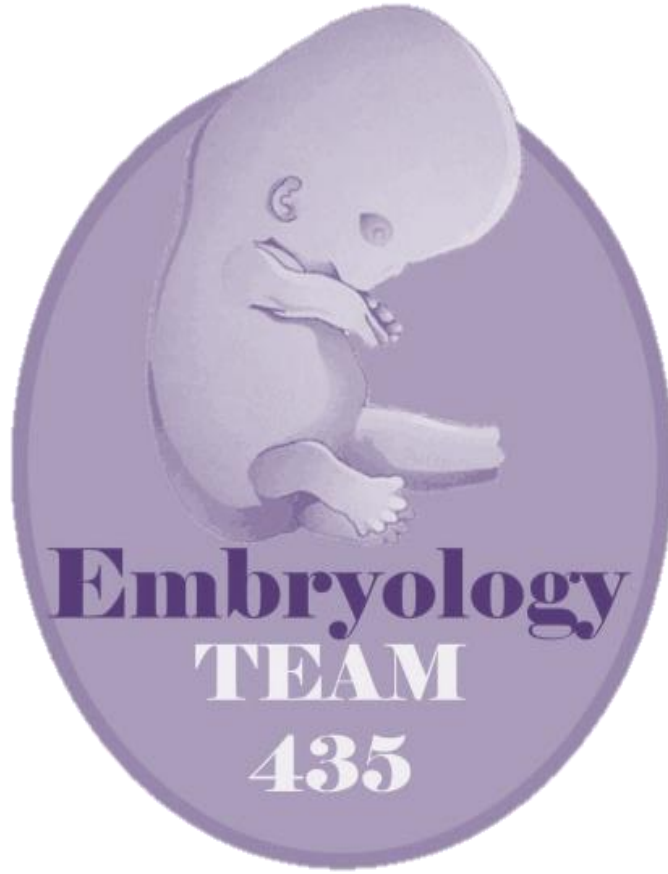
8-D

9-B

10-D

11-B

12-C



وَلَقَدْ خَلَقْنَا الْإِنْسَانَ مِنْ سَلَالَةٍ مِّن طِينٍ {١٢} ثُمَّ جَعَلْنَاهُ نَظْفَةً فِي فَراَرٍ مَّكِينٍ {١٣} ثُمَّ خَلَقْنَا النَّطْفَةَ عَلَقَةً فَخَلَقْنَا الْعَلَقَةَ مُضْغَةً فَخَلَقْنَا الْمُضْغَةَ عِظَامًا فَكَسَوْنَا الْعِظَامَ لَحْمًا ثُمَّ أَنشَأْنَاهُ خَلْقًا آخَرَ فَتَبَارَكَ اللَّهُ أَحْسَنُ الْخَالِقِينَ {١٤}

*Development of kidneys and ureters*

# *MCQ'S & Summary*

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