INTRODUCTION TO HUMAN HEART DEVELOPMENT

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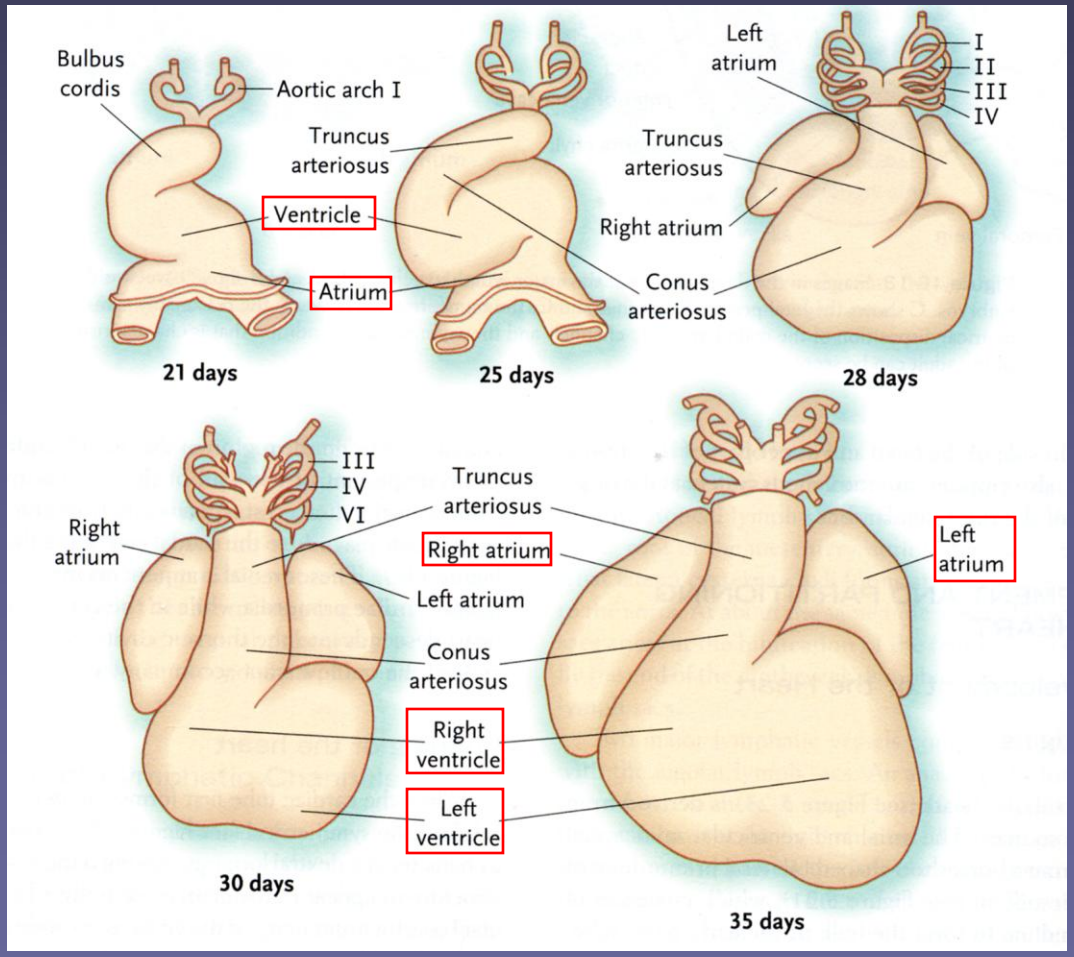
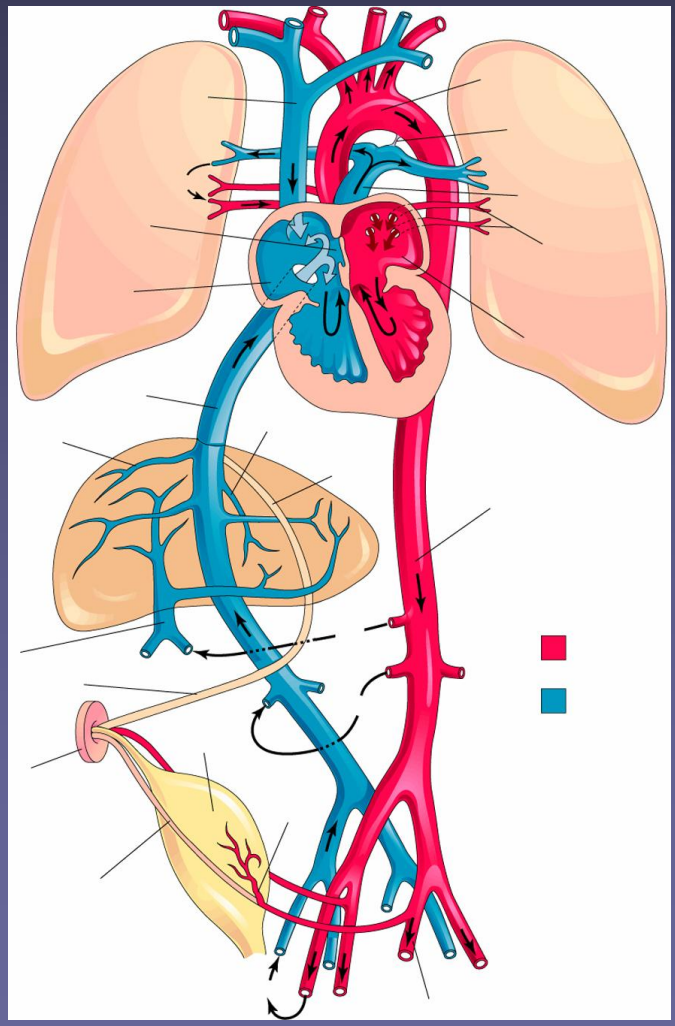
HUMAN HEART DEVELOPMENT



POSTNATAL CIRCULATION

PULMONARY CIRCULATION
RIGHT CHAMBERS

SYSTEMIC CIRCULATION
LEFT CHAMBERS



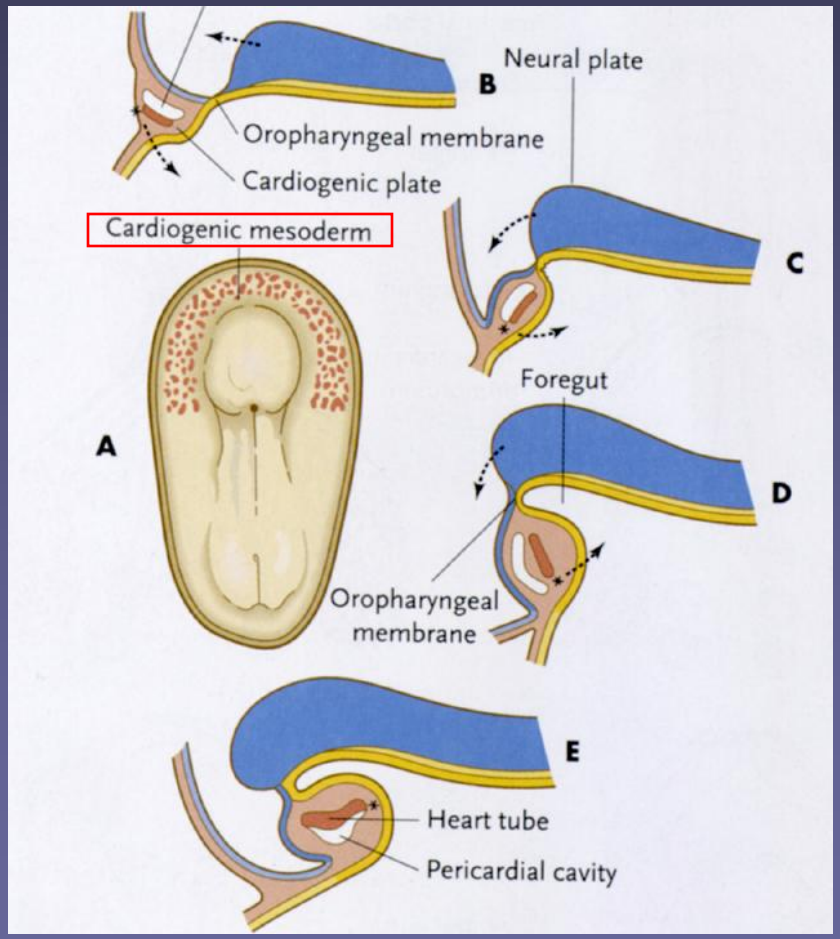
HUMAN HEART DEVELOPMENT

- HEART TUBE FORMATION
- CARDIAC LOOPING
- CHAMBER SEPTATION
- VALVE AND OUTFLOW FORMATION

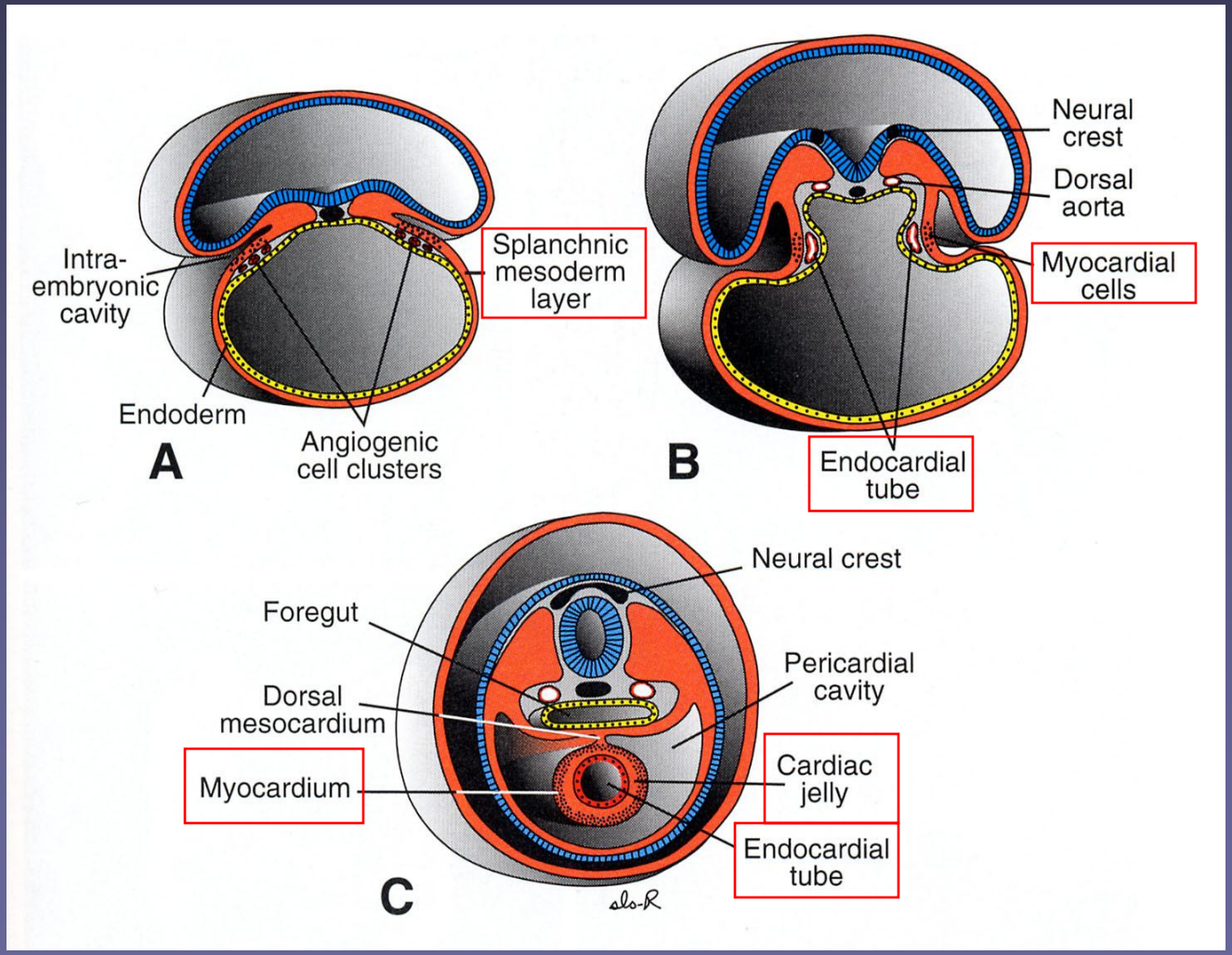
CONGENITAL HEART DISEASE

- RELATIVELY COMMON
- GENERALLY INITIATED BY EARLY DEVELOPMENTAL ERRORS
- CAN BE CAUSED BY EXPOSURE TO TERATOGENS
- CAN ORIGINATE WITH GENETIC DEFECTS

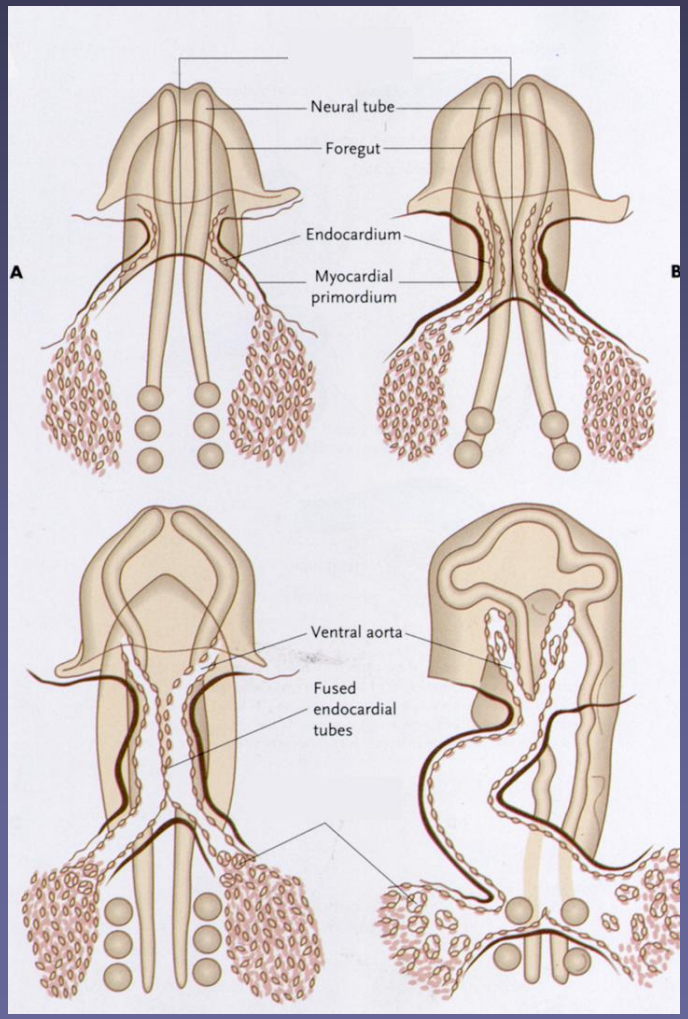
LONGITUDINAL FOLDING POSITIONS CARDIAC CELLS



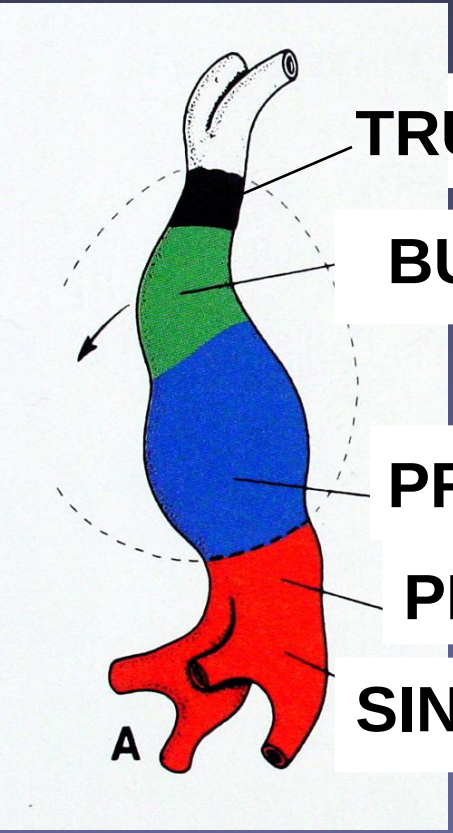
LATERAL FOLDING FACILITATES TUBE FORMATION



TUBE FORMATION BEGINS ROSTRALLY



PRIMITIVE HEART TUBE



TRUNCUS ARTERIOSUS

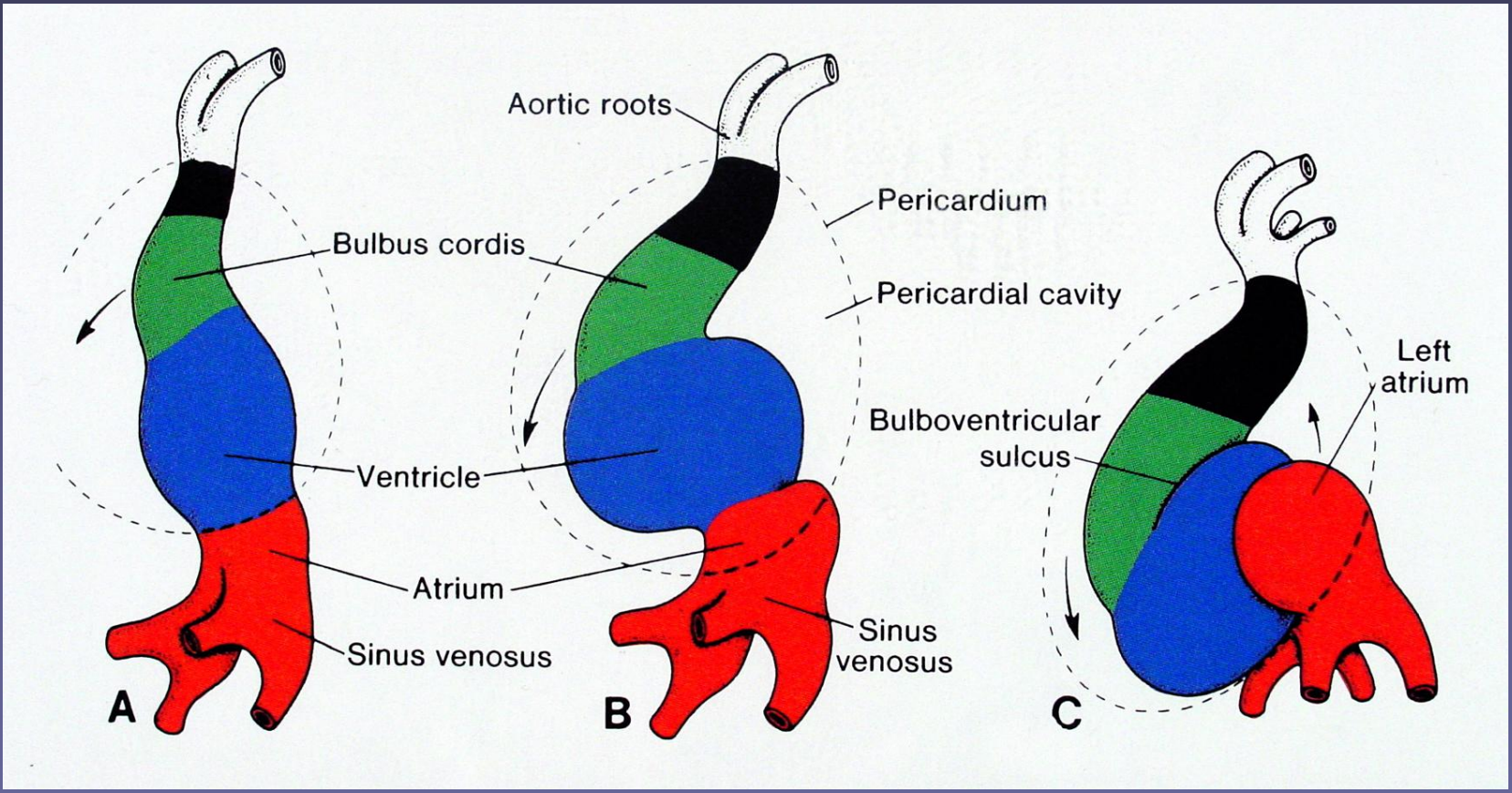
BULBUS CORDIS

PRIMITIVE VENTRICLE

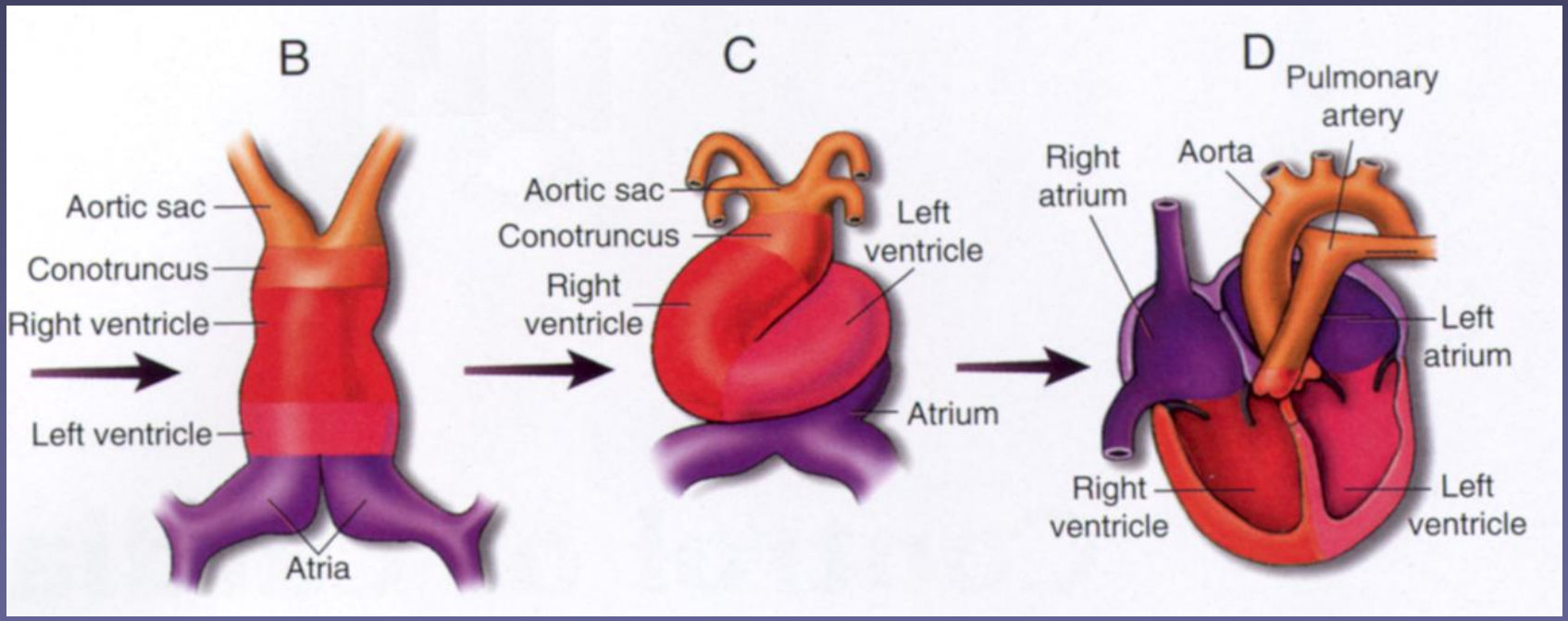
PRIMITIVE ATRIUM

SINUS VENOSUS

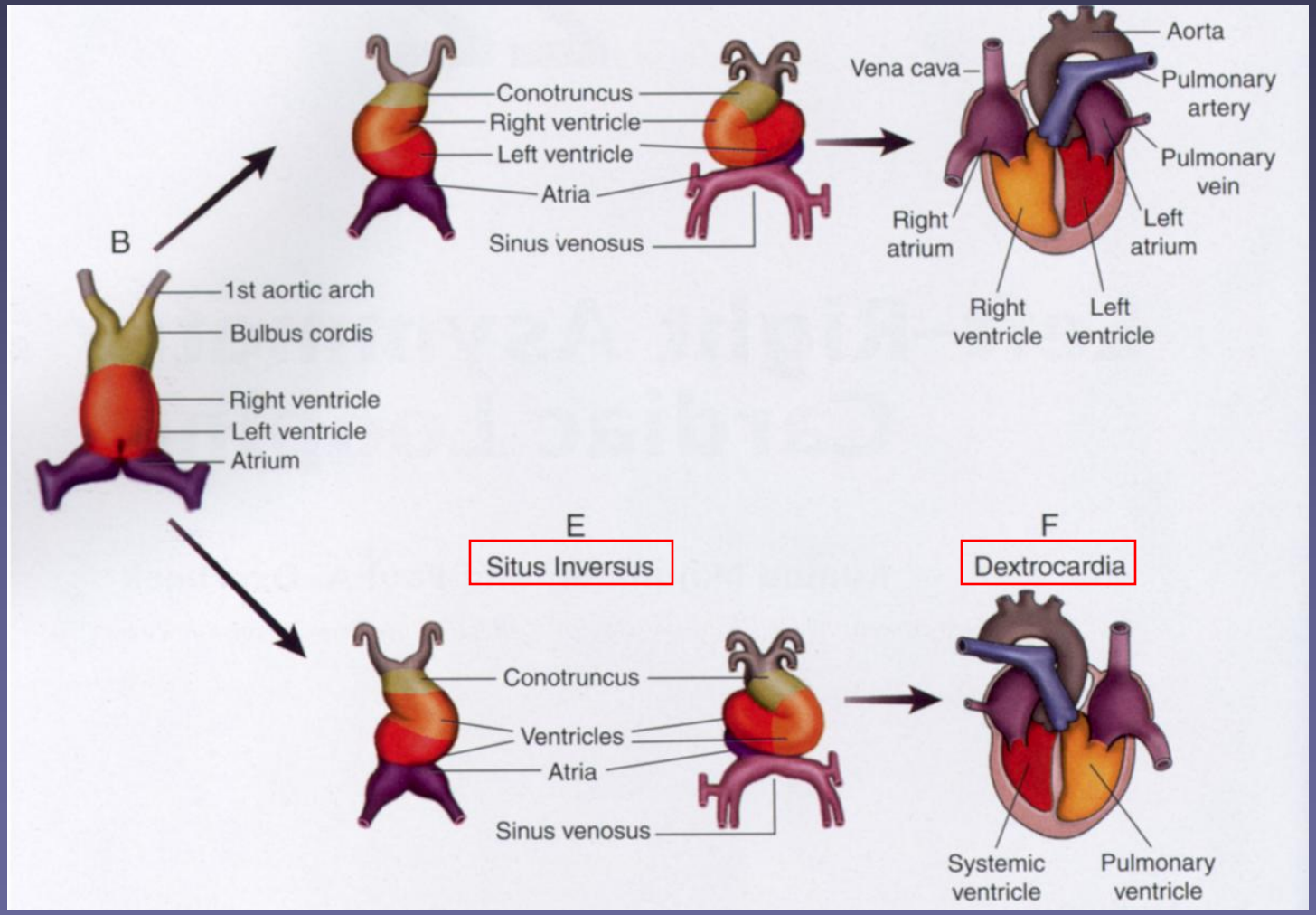
CARDIAC LOOPING



CARDIAC LOOPING



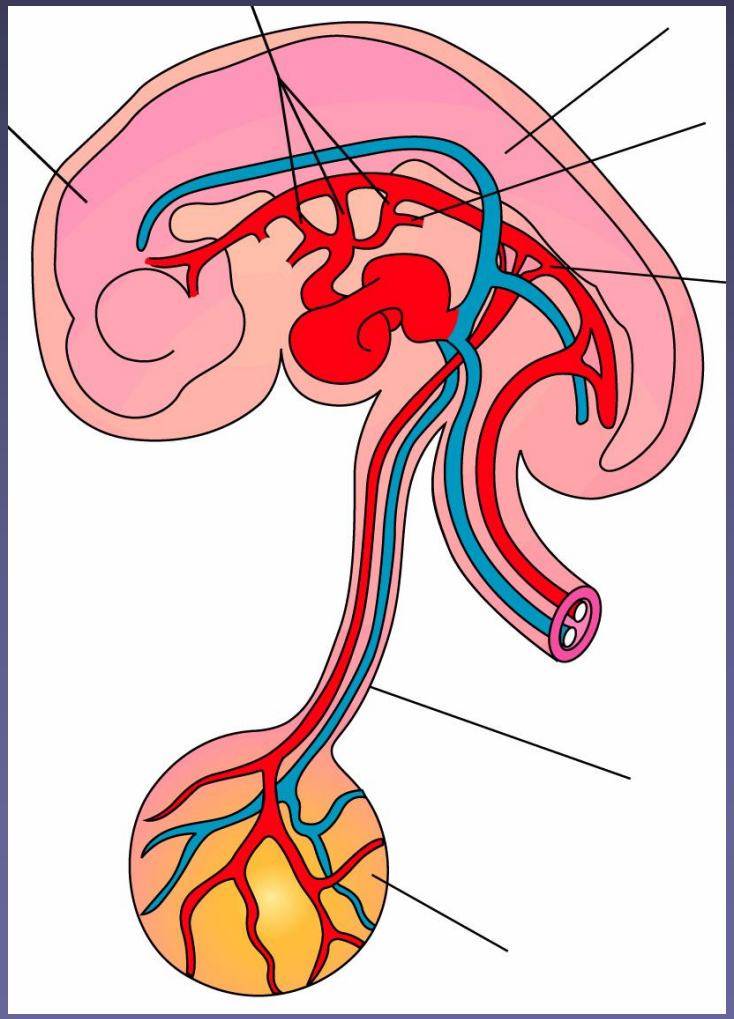
DEXTROCARDIA AND SITUS INVERSUS

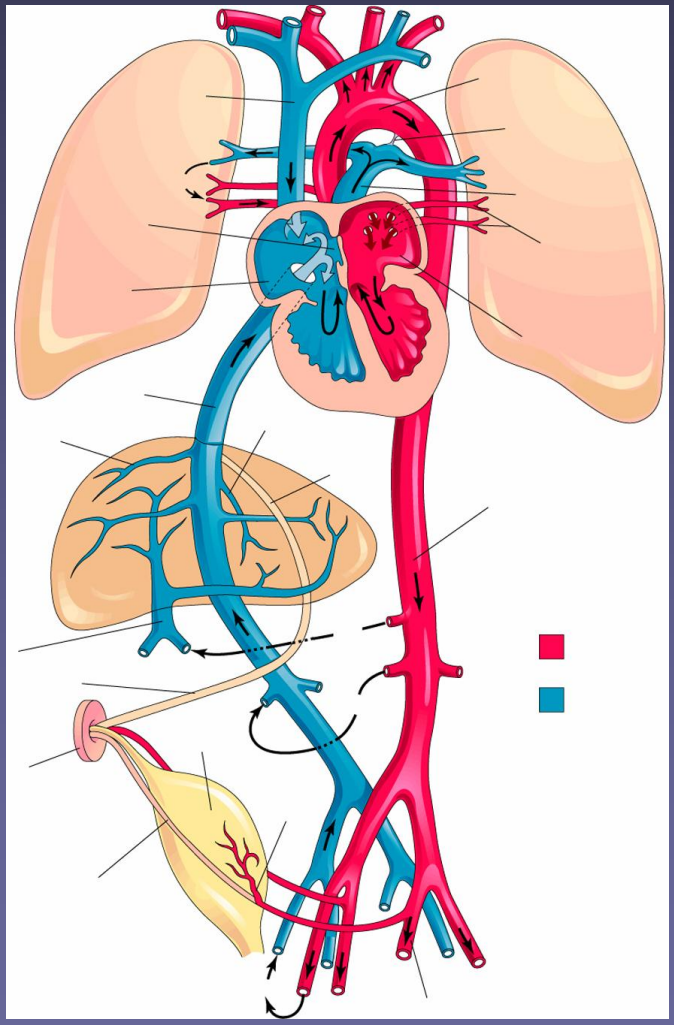


GENETIC BASIS FOR HETEROTAXY

- NODAL FAMILY OF GROWTH FACTORS REQUIRED FOR ESTABLISHMENT OF LEFT-RIGHT AXIS
- *CFC1* GENE ENCODES A COMPONENT OF THE RECEPTOR FOR NODAL FACTORS
- MUTATIONS IN *CFC1* CAUSE HETEROTAXY

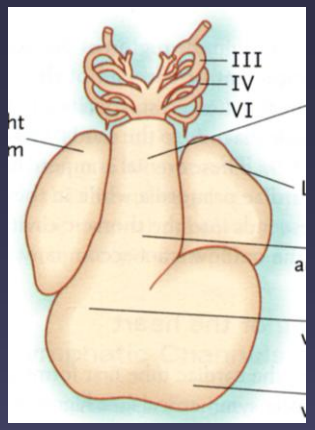
FROM FETAL TO POSTNATAL CIRCULATION





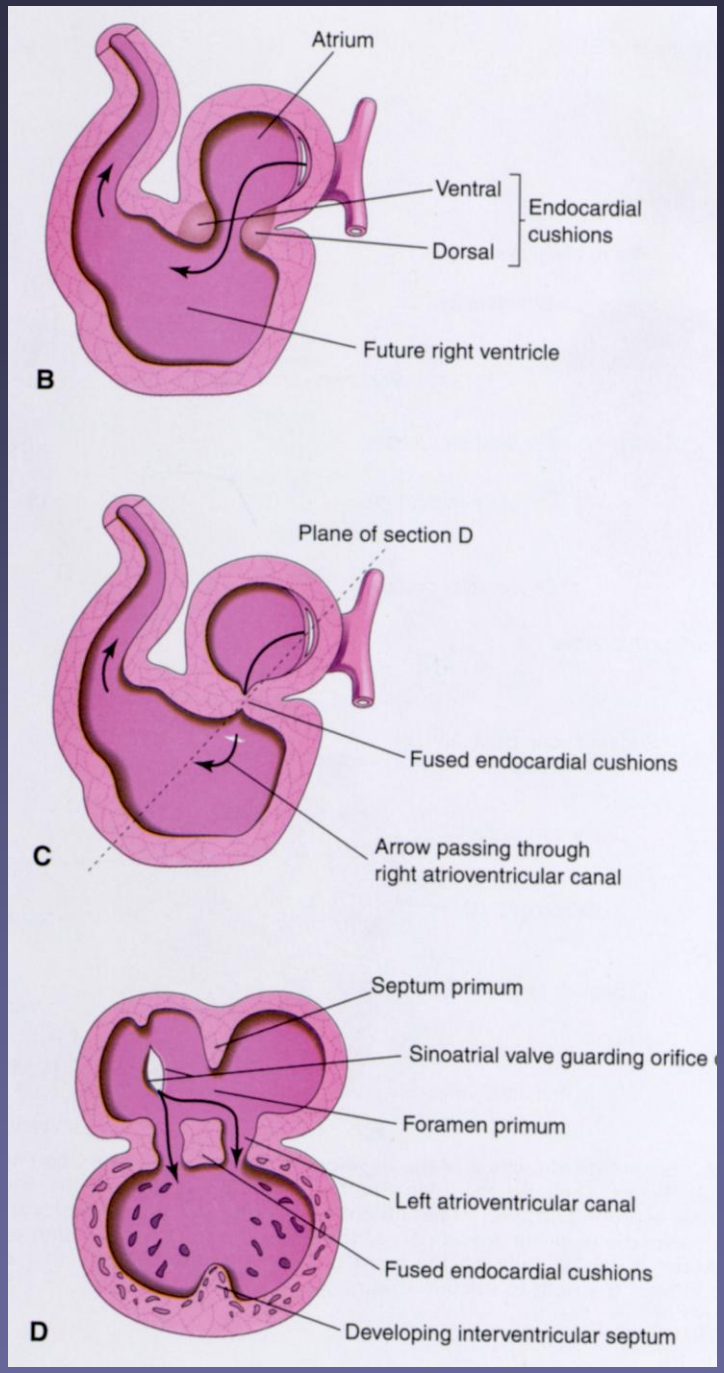
PARTITIONING THE HEART

- ATRIAL SEPTATION
- VENTRICULAR SEPTATION
- ATRIOVENTRICULAR VALVE FORMATION
- DIVISION OF THE OUTFLOW TRACT

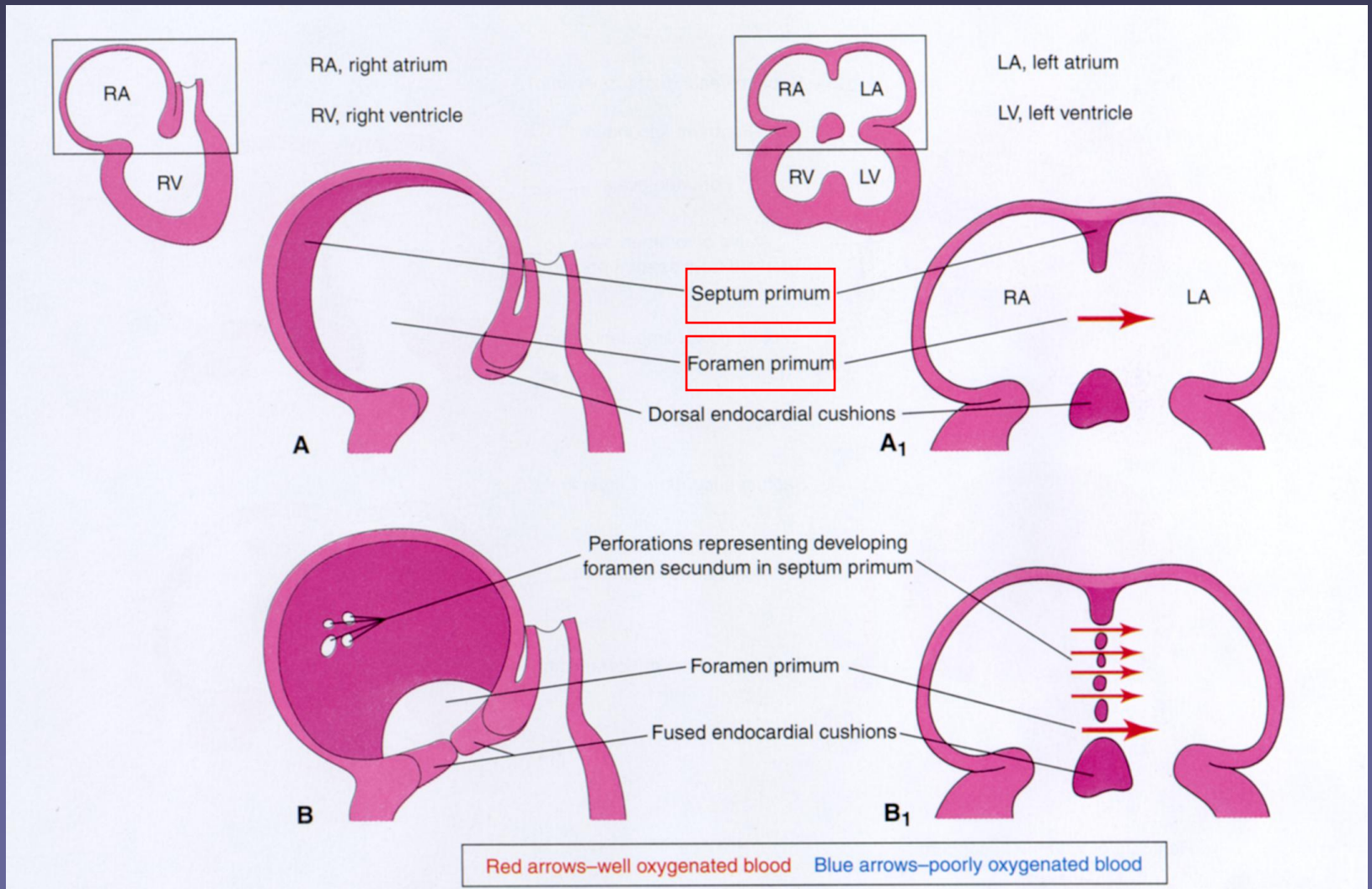


SAGITTAL SECTIONS

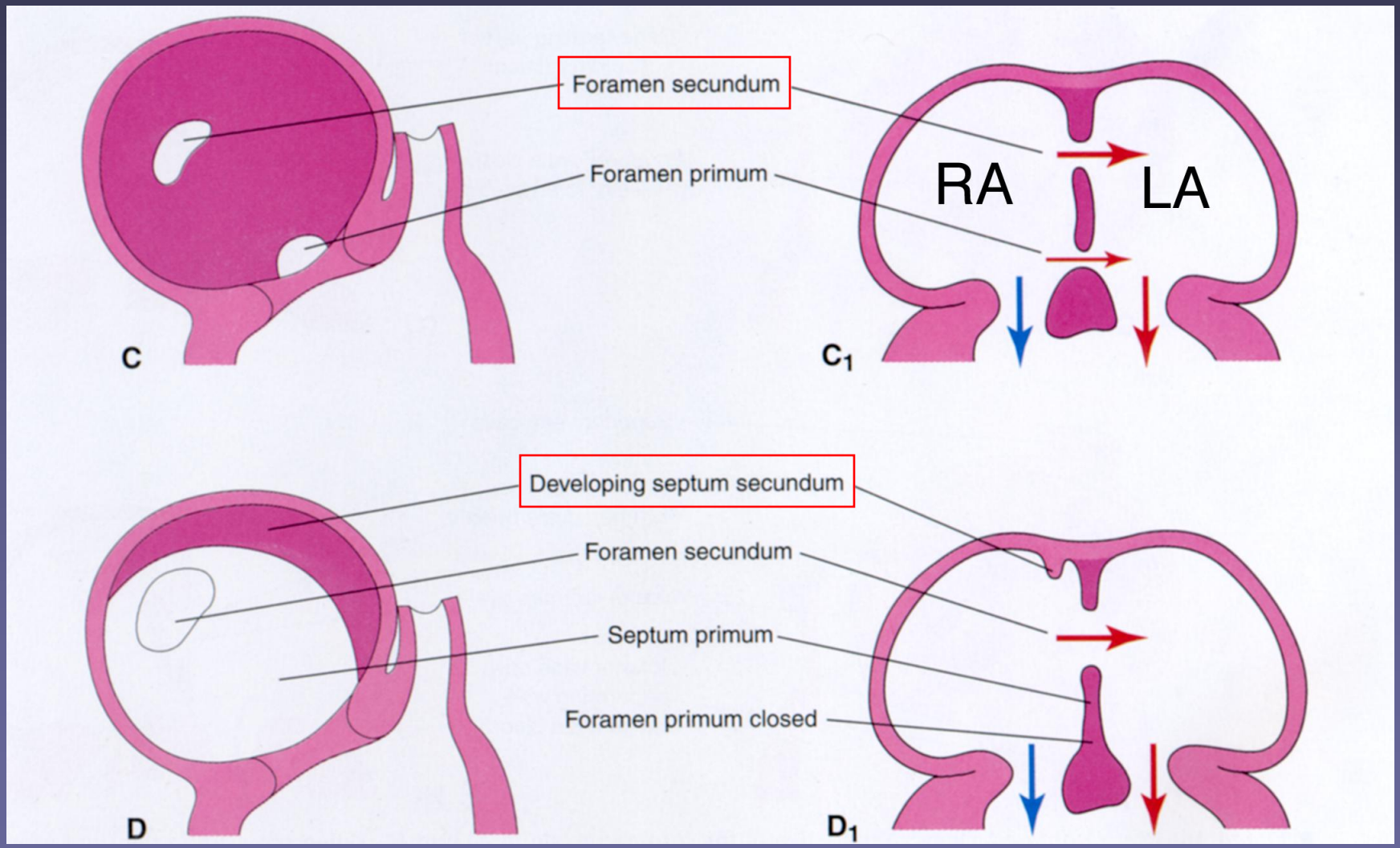
CORONAL SECTIONS



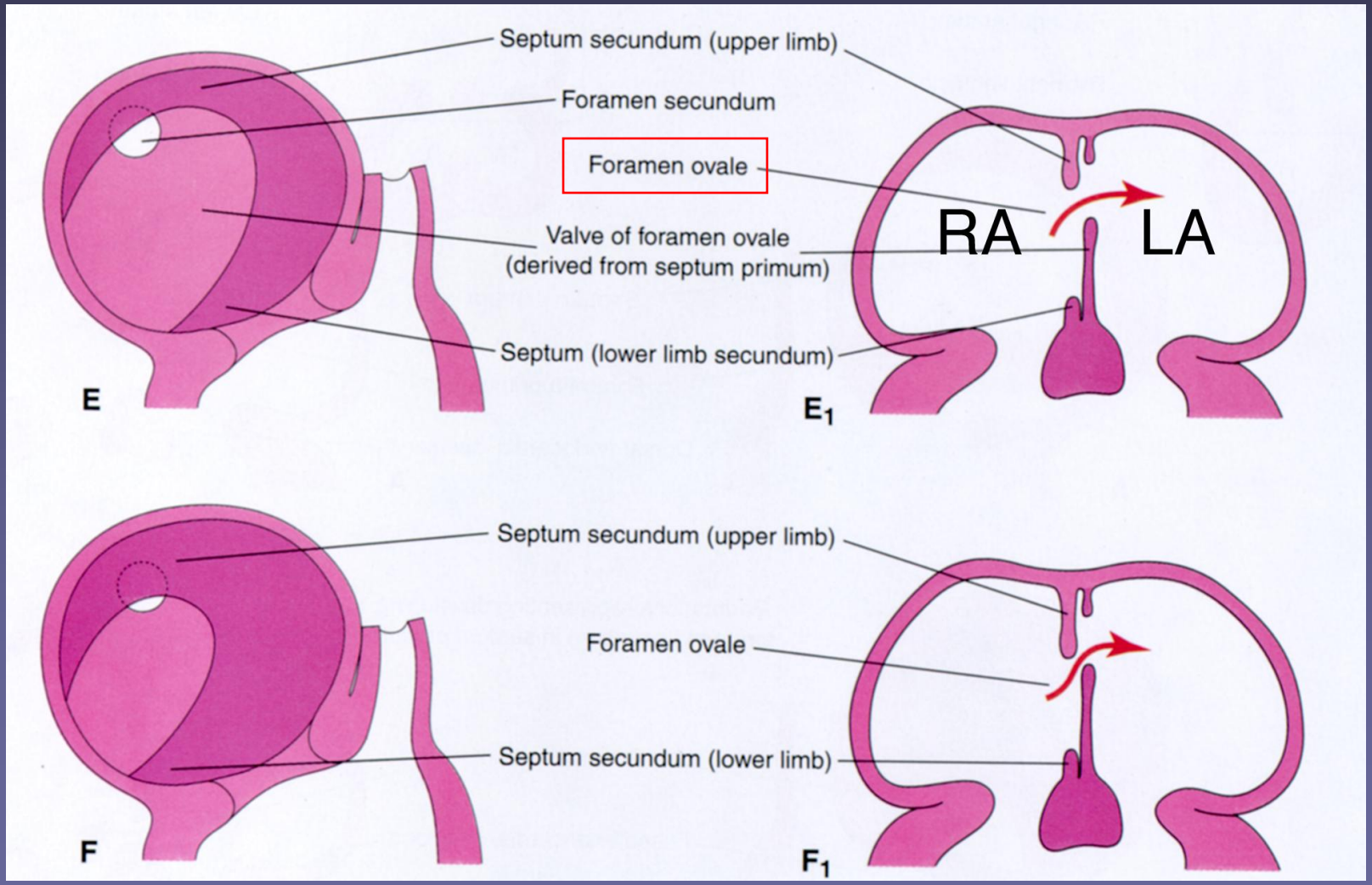
ATRIAL SEPTATION I: SEPTUM PRIMUM



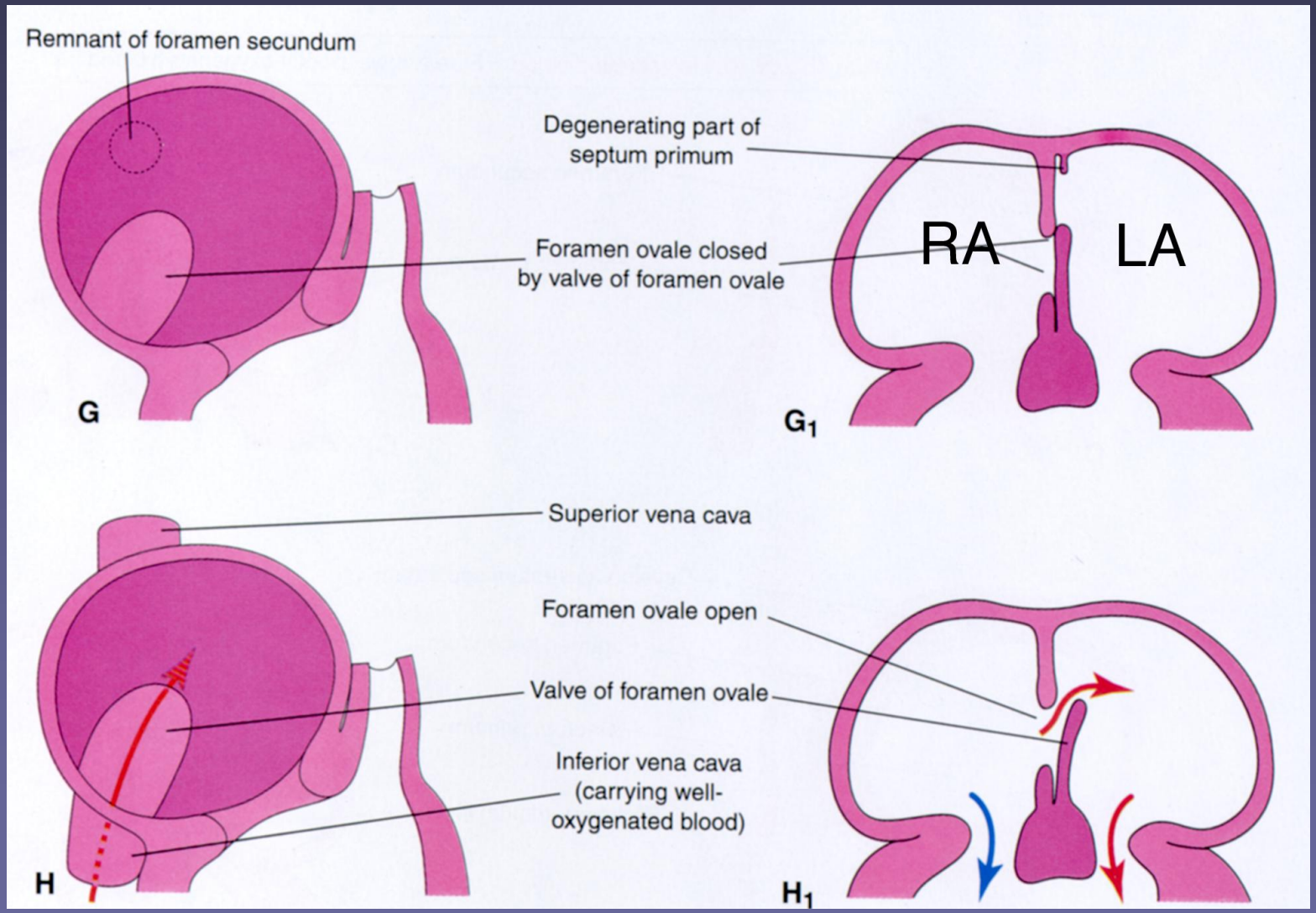
ATRIAL SEPTATION II: FORAMEN SECUNDUM



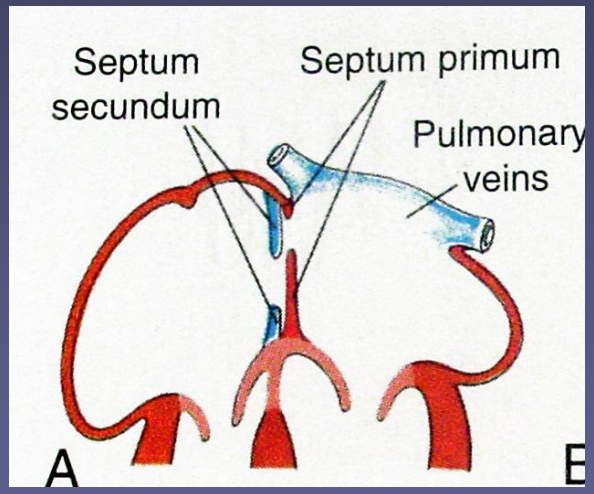
ATRIAL SEPTATION III: SEPTUM SECUNDUM



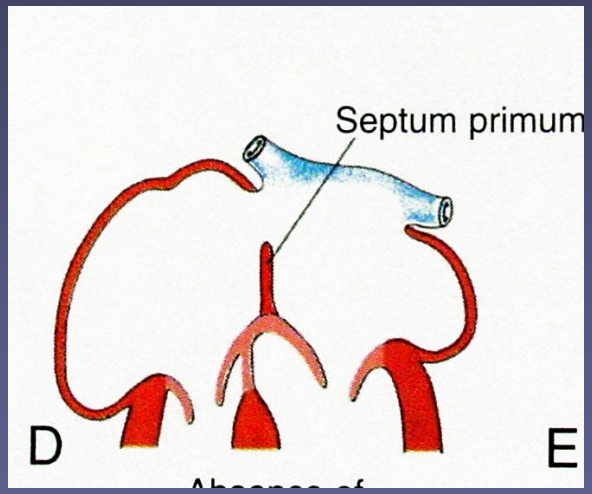
ATRIAL SEPTATION IV: COMPLETION



ATRIAL SEPTAL DEFECTS



NORMAL

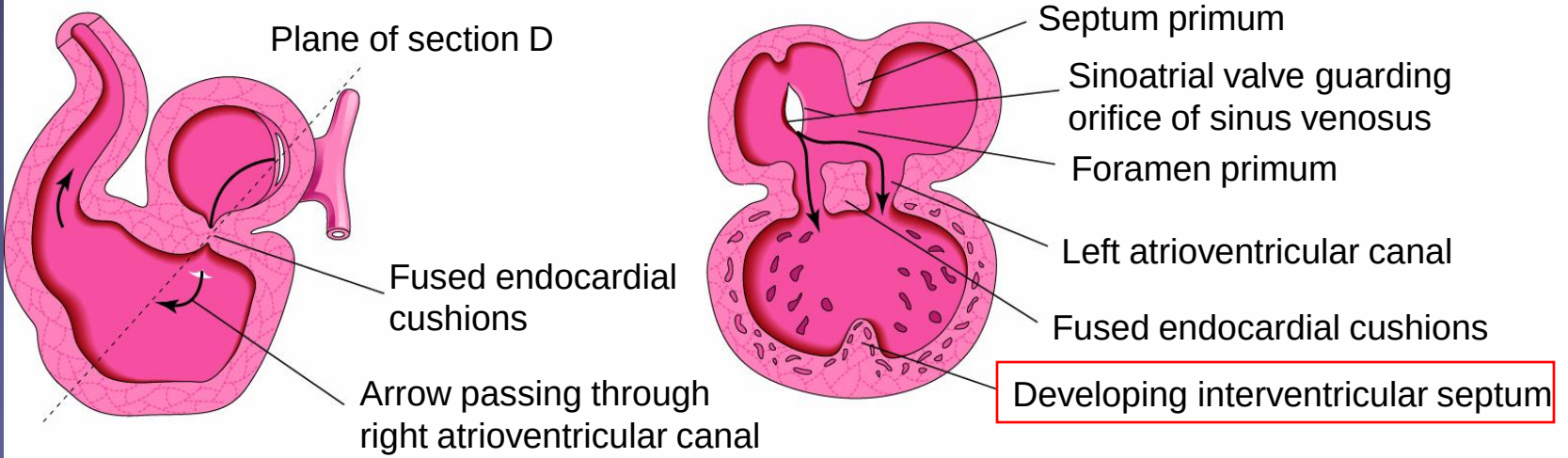


OSTIUM SECUNDUM (HIGH) ASD

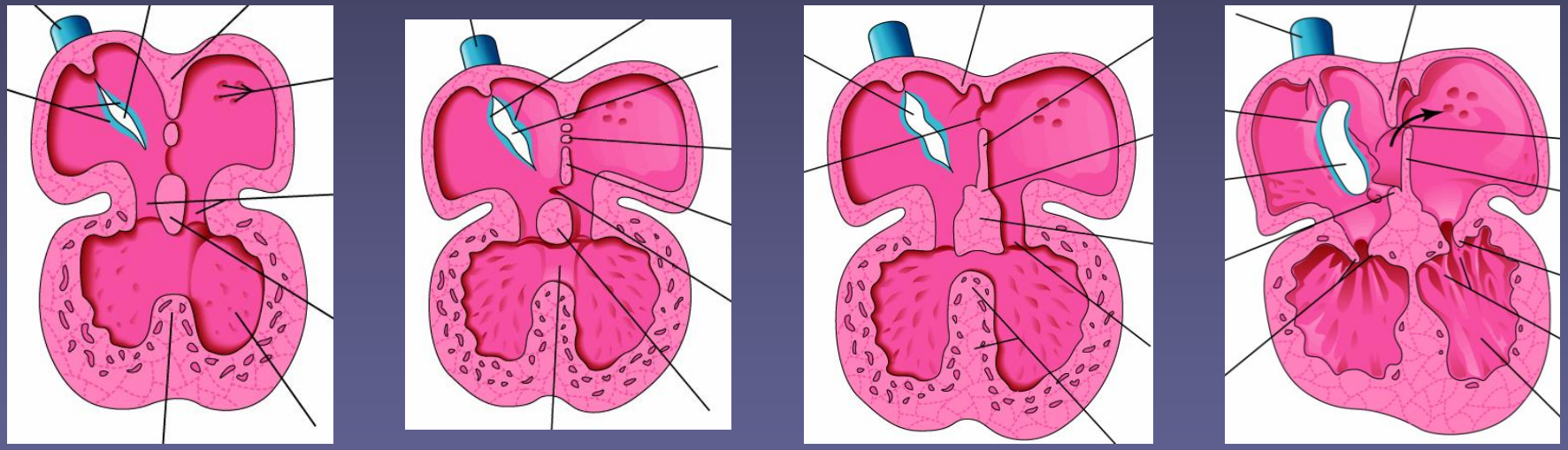
GENETIC CAUSES OF ASD

- HETEROZYGOSITY OF MUTATIONS IN GENES LIKE:
  - *Nkx2-5*, ENCODING A HOMEODOMAIN TRANSCRIPTION FACTOR
  - *TBX5*, ENCODING A T-BOX TRANSCRIPTION FACTOR (HOLT-ORAM SYNDROME)

BEGINNING OF VENTRICULAR SEPTATION



PROGRESSION OF VENTRICULAR SEPTATION

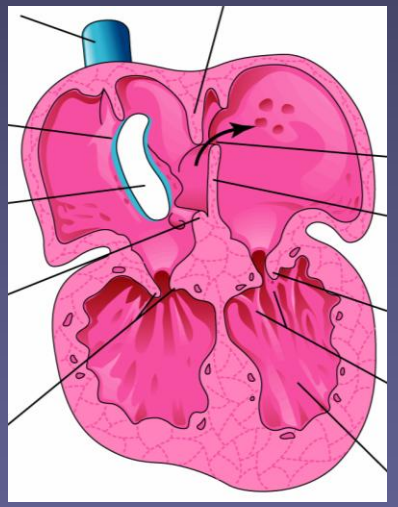


COMPLETION OF VENTRICULAR SEPTATION

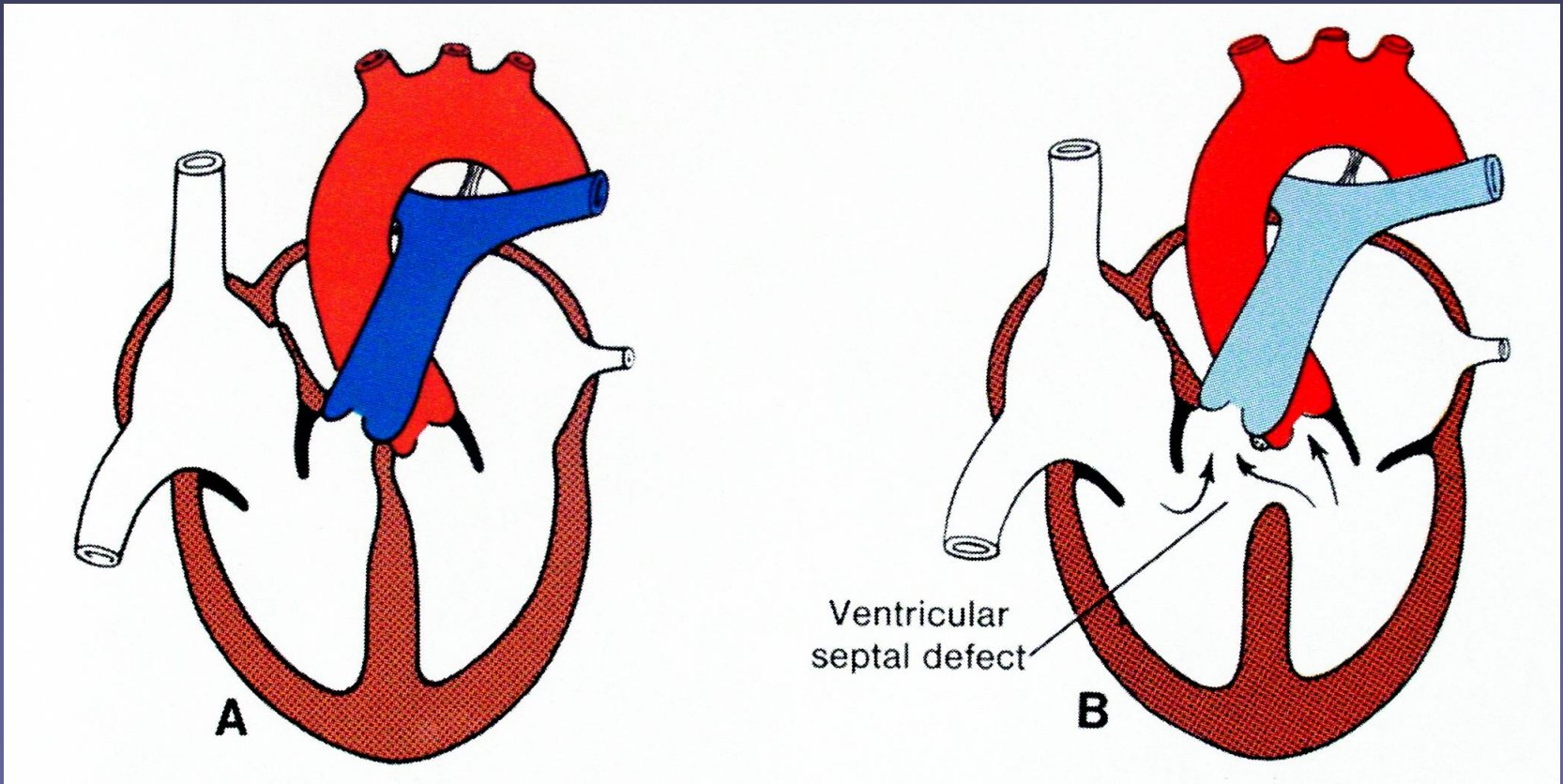
MUSCULAR SEPTUM

MEMBRANOUS SEPTUM

CONOTRUNCAL SEPTUM

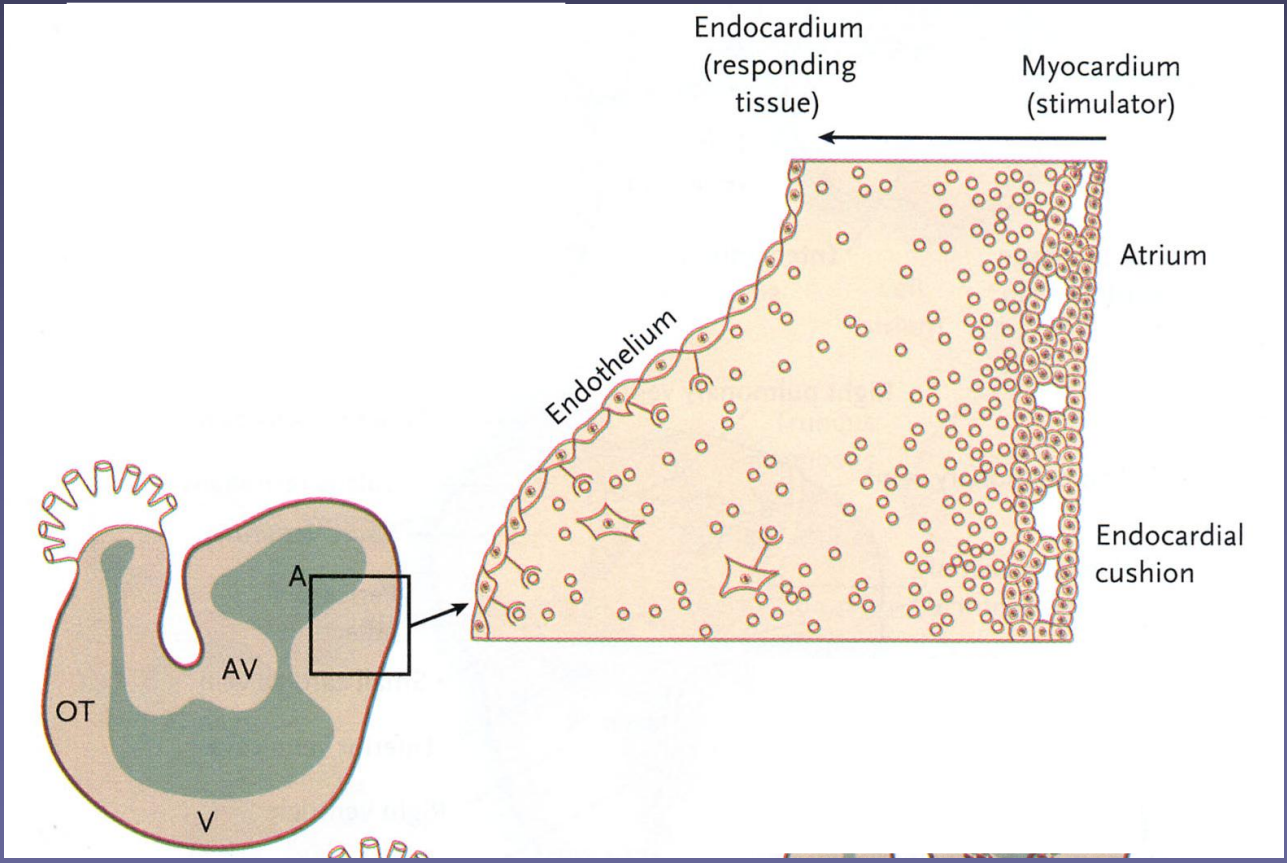


MEMBRANOUS VSD

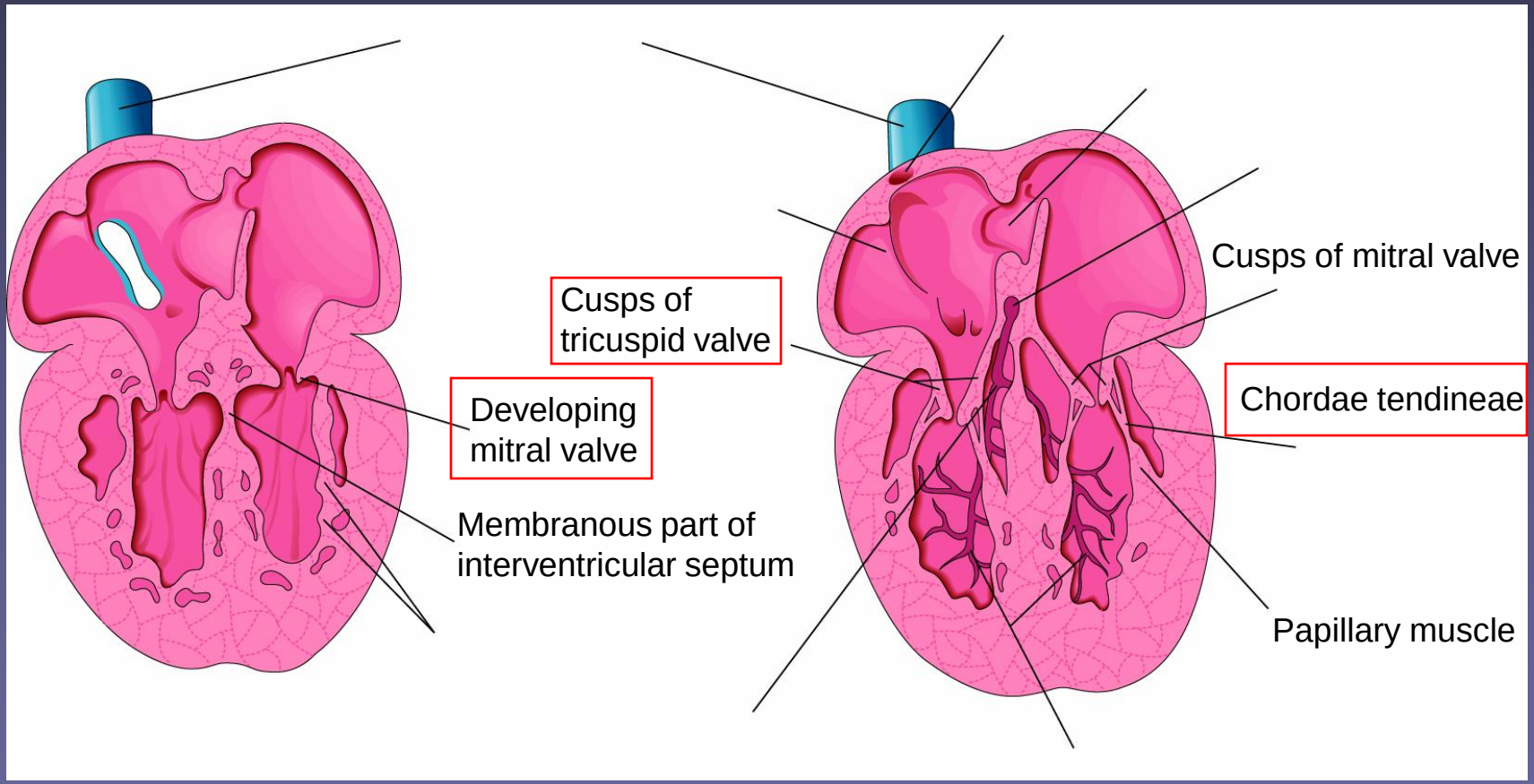


NORMAL VSD

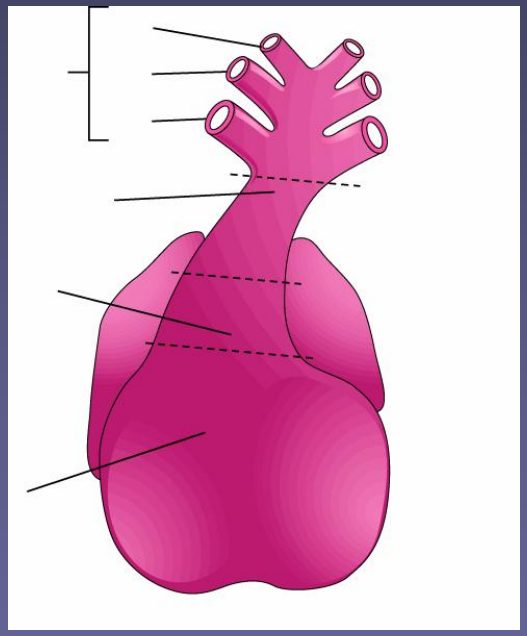
ENDOCARDIAL CUSHION FORMATION

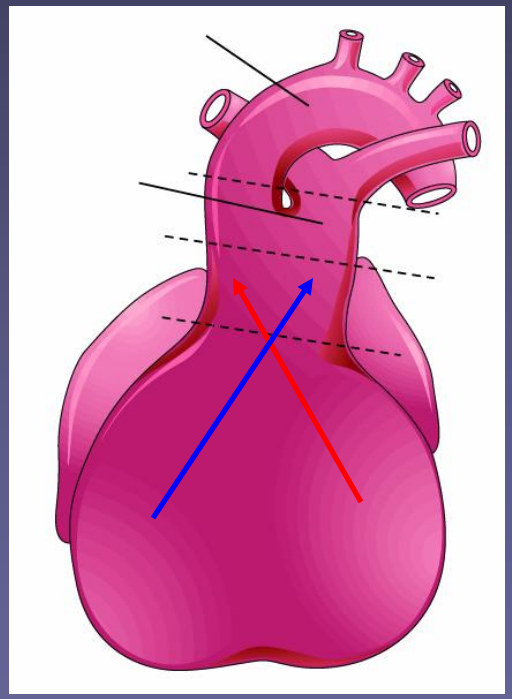


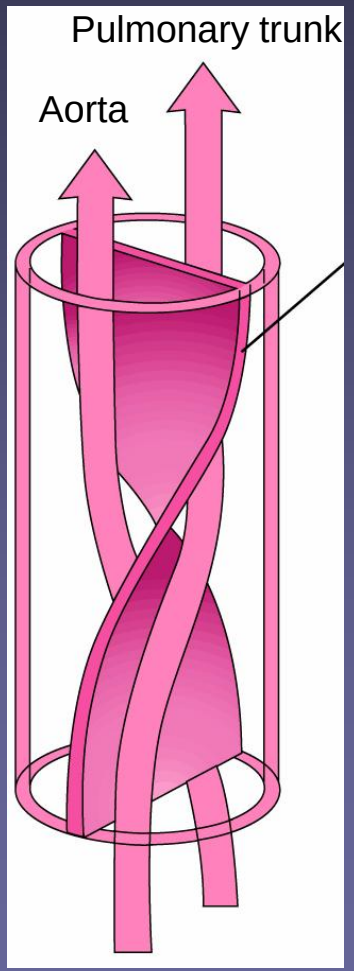
VALVE FORMATION



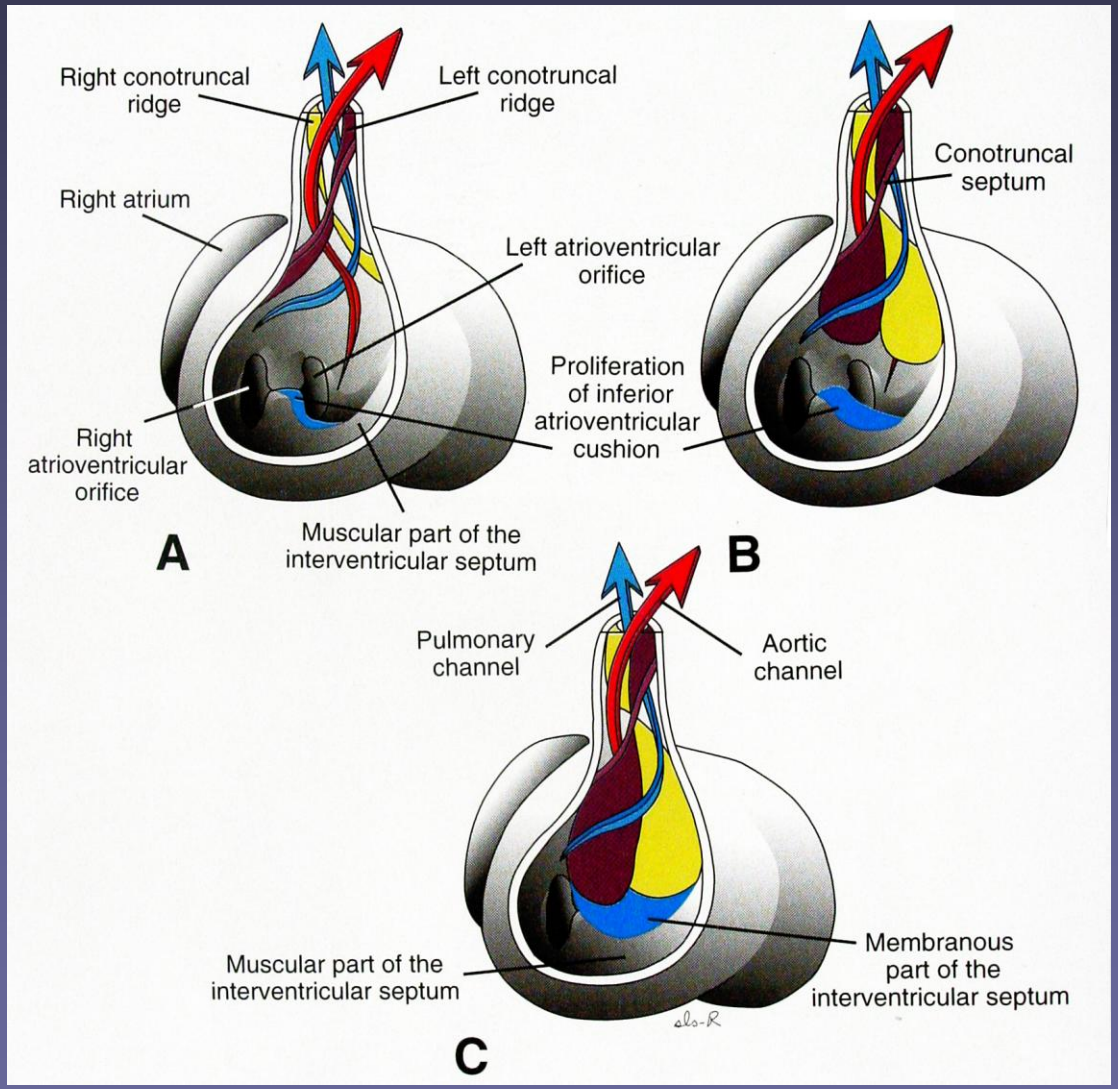
OUTFLOW SEPTATION



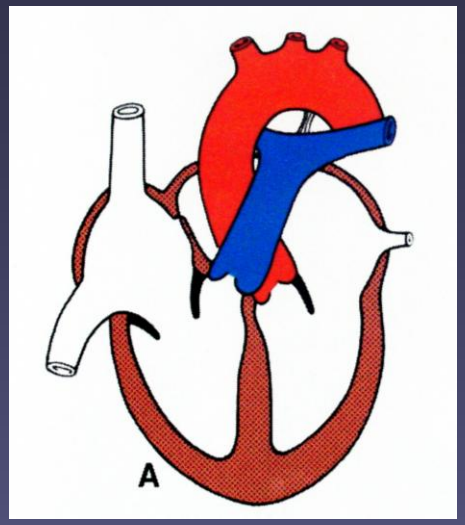




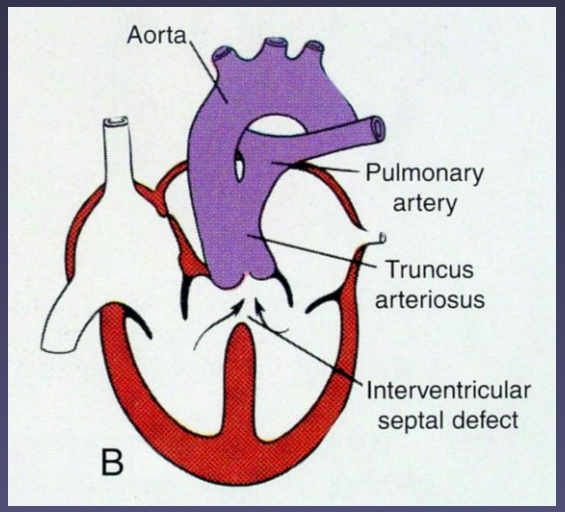
OUTFLOW SEPTATION



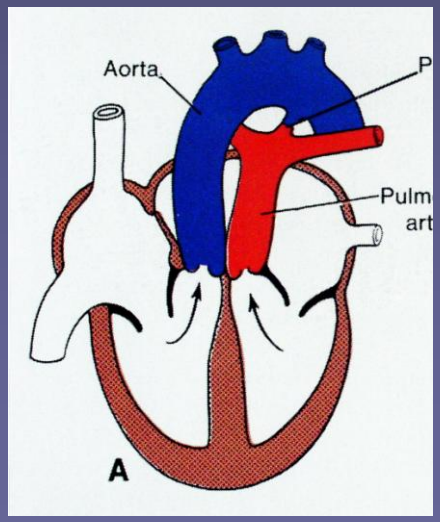
DEFECTS IN OUTFLOW SEPTATION



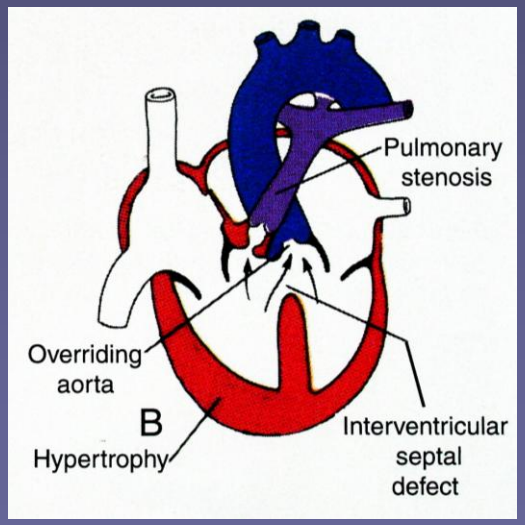
NORMAL



NO SEPTUM: PERSISTENT TRUNCUS ARTERIOSUS

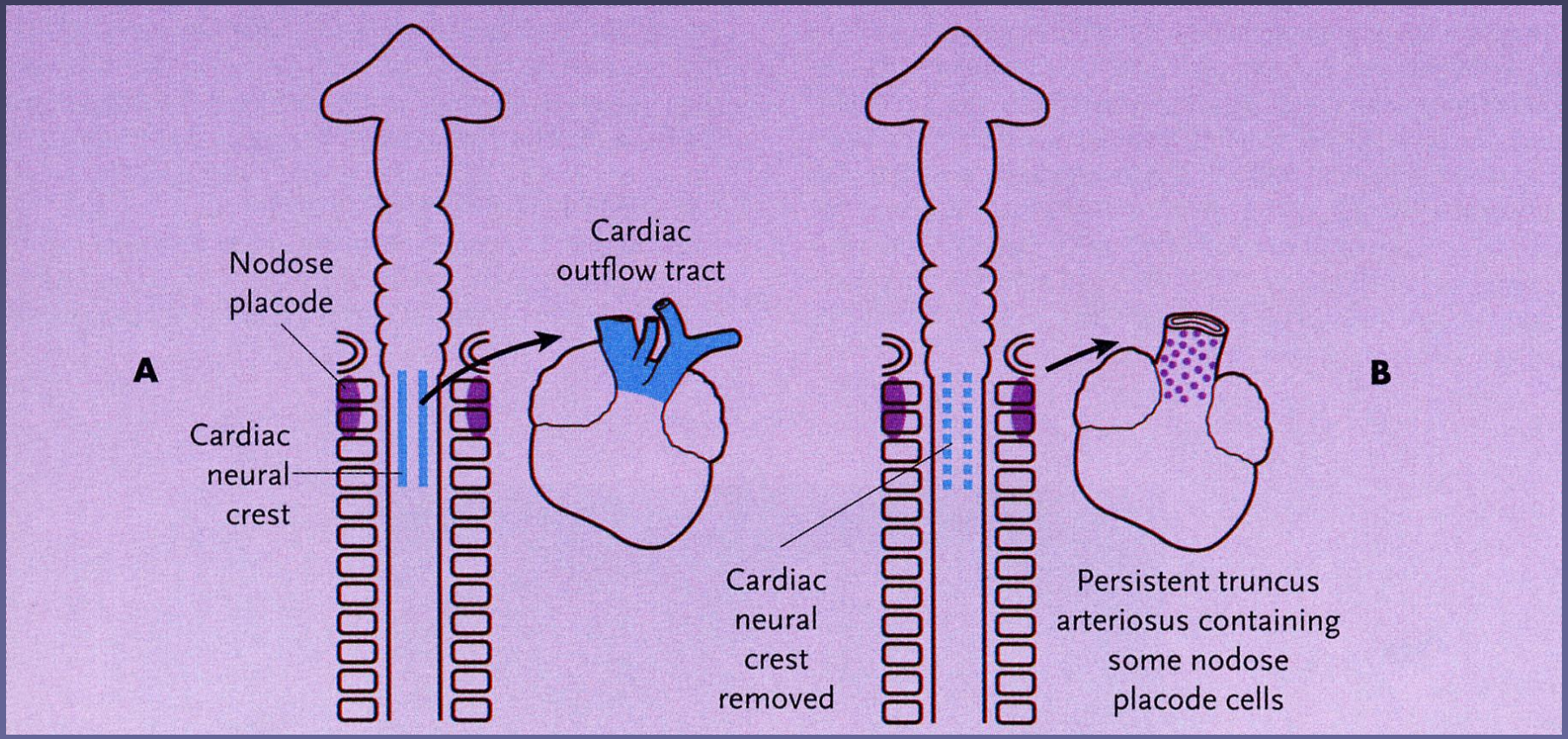


STRAIGHT SEPTUM: TRANSPOSITION OF GREAT VESSELS



ASYMMETRIC SEPTUM: PULMONARY STENOSIS; TETRALOGY OF FALLOT

NEURAL CREST AND OUTFLOW TRACT SEPTATION



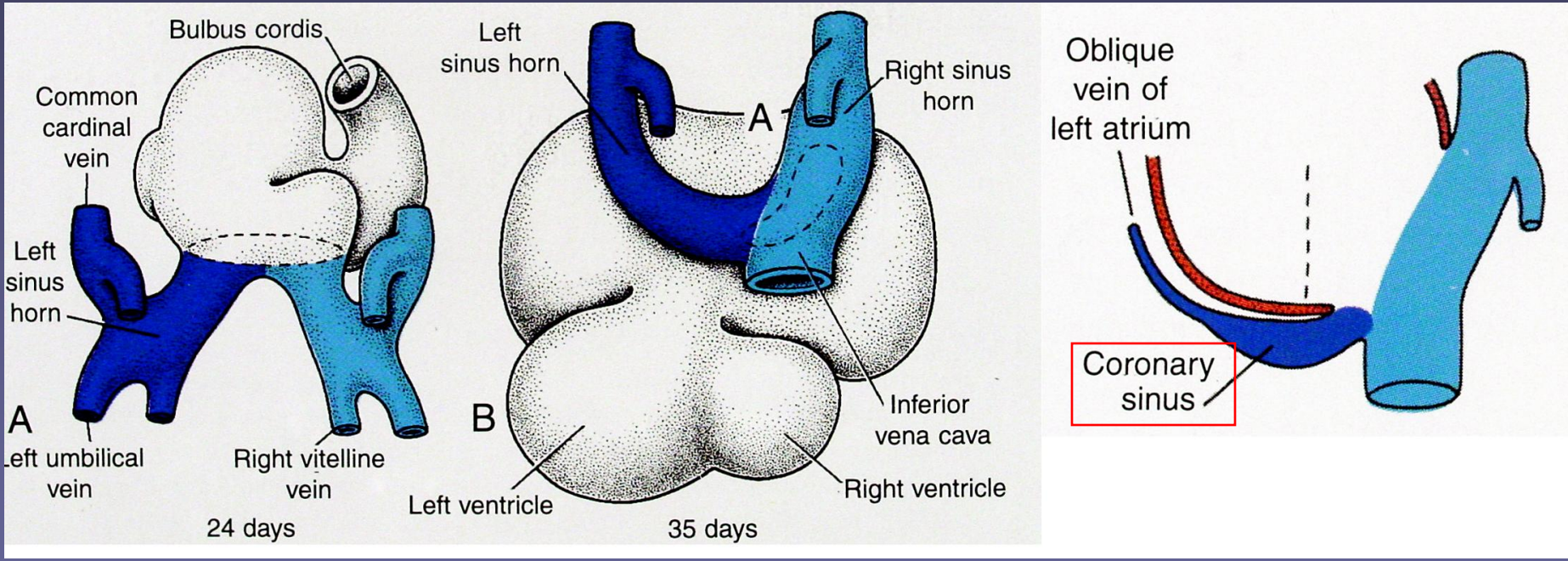
GENETIC BASIS FOR OUTFLOW DEFECTS

- *TBX1* ENCODES A TRANSCRIPTION FACTOR EXPRESSED NEAR MIGRATING NEURAL CREST CELLS
- *TBX1* MUTATION IN MICE CAUSES DEFECTS RESEMBLING DIGEORGE SYNDROME
- DELETION OF *TBX1* FOUND IN MANY DIGEORGE SYNDROME PATIENTS

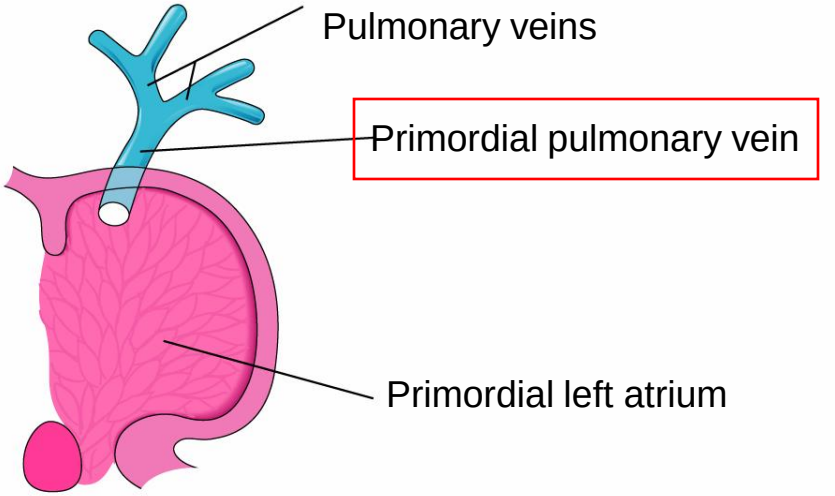
HUMAN HEART DEVELOPMENT

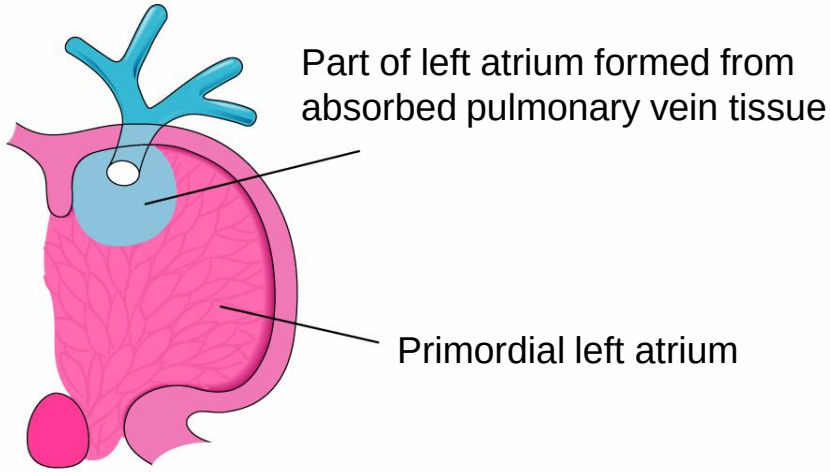
- HEART TUBE FORMATION
- CARDIAC LOOPING
- CHAMBER SEPTATION
- VALVE AND OUTFLOW FORMATION

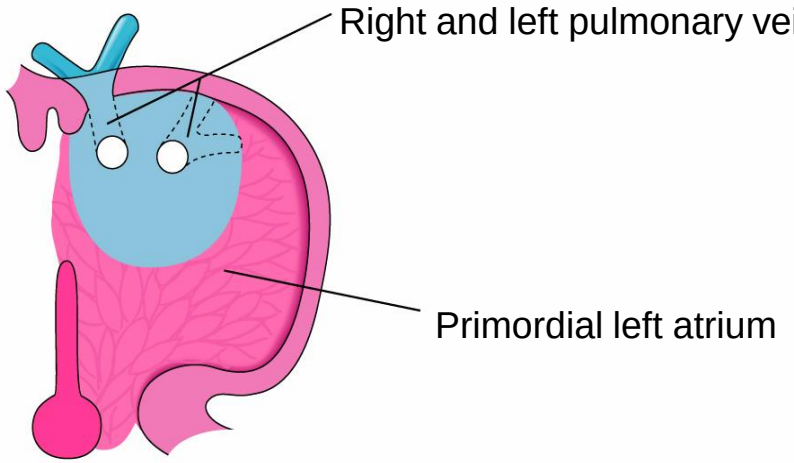
SINUS VENOSUS AND RIGHT ATRIUM

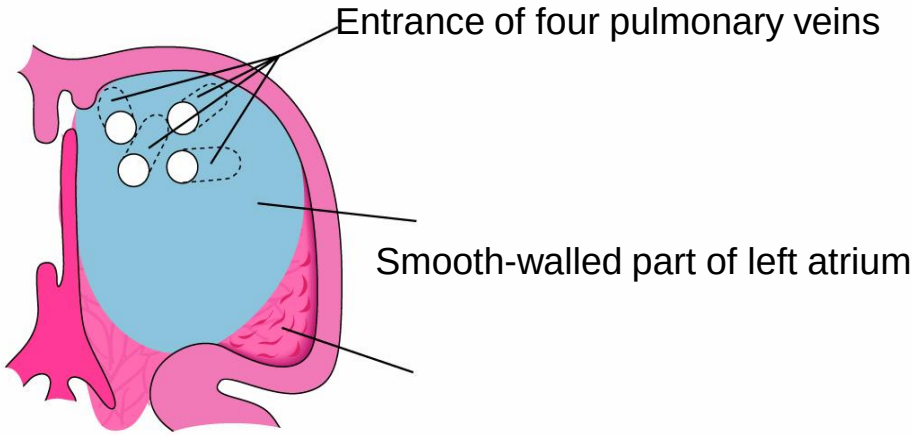


PULMONARY VEINS AND LA









ATRIAL SEPTAL DEFECTS

- OSTIUM PRIMUM (LOW) ASD
- OSTIUM SECUNDUM (HIGH) ASD
- SINUS VENOSUS ASD

End