CHAPTER 1

Data Interpretation

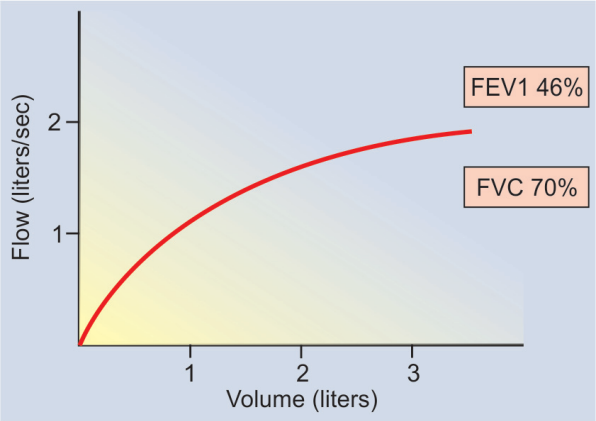
EXERCISES

Q.1. You are sitting in respiratory OPD of your hospital , 8 years old child Rajeev came with his lung function report.

	Predicted	*Measured*	
FVC	2.07	1.31	(63%) of best
FEV1	1.85	1.08	(51%) of best
PEF	275	210	

1. Which type of pulmonary function this result reflecting?
2. What may be the possible causes (write 2)?
3. What type of pulmonary function result you will get in a child with cystic fibrosis?

Q.2. A 7 years old girl Rajni reviewed in respiratory clinic. Here is her flow volume graph.



1. Which type of pattern this graph is reflecting and what is most common diagnosis?
2. What genetic mutation she may have?
3. Which drugs for nebulisation you will prescribe if she had recurrent culture positive pneumonia?

Q.3 . You are sitting in respiratory OPD of your hospital , 14 years old child Rahul came with his lung function report.

	Predicted	*Measured*	
FVC	4.07	3.6	(84%) of best
FEV1	3.90	2.24	(56%) of best
PEF	490	260	(54%) of best
FEF (25–75%)	4.07	1.68	(42%) of best

1. Which type of pulmonary function this result reflecting and what is most common diagnosis?
2. What may the other possible causes (write 2 other than most common)?
3. What is best lung function parameter measurement is best for this child in future?

Q.4. A 2 years old non-cyanotic child came to you with her cardiac catheter result.

	Saturation (%)	*Pressure (mm Hg)*
SA	79	
RA	88	
RV	86	
PA	86	
LA	96	–/6
LV	96	
A	96	

1. Is this catheter report is normal? if not, what is possible diagnosis?
2. What is normal saturation in RA and RV?
3. What pressure will you expect in RA in this child?

Q.5. A 5 years old child came to you with her cardiac catheter result. He was born as a preterm baby.

	Saturation (%)
RA	50
RV	50
PA	50
LA	80
LV	80
A	86

1. What is possible system affected—lung or heart?
2. What is possible diagnosis?

Q.6 A 4 years old child came to you with her cardiac catheter result.

	Saturation (%)	*Pressure (mm Hg)*
RA	74	–/4
RV	74	70/30
PA	74	22/12
LA	96	
LV	96	

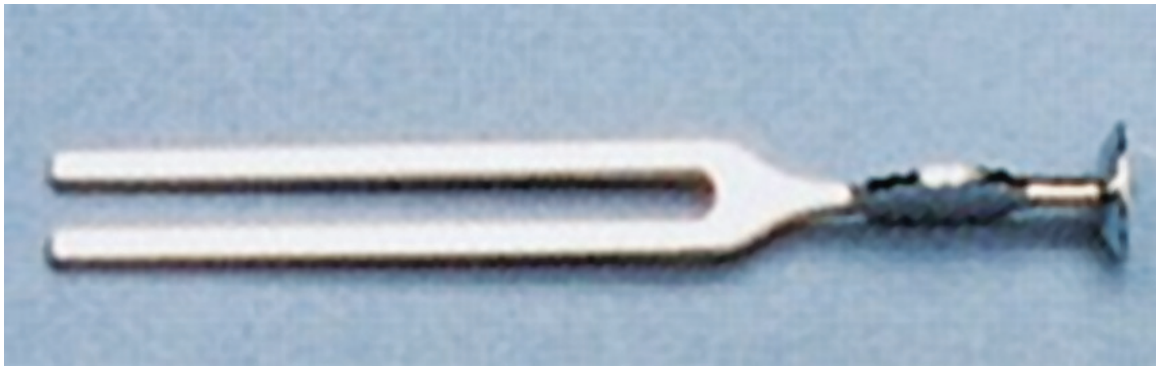
1. What is diagnosis of this catheter report?
2. Write 2 ECG changes.

Q.7. You are asked to see a 7 years old boy who has been suffering from headache. His blood pressure is 160/96 mm Hg. You also noticed murmur on examination.

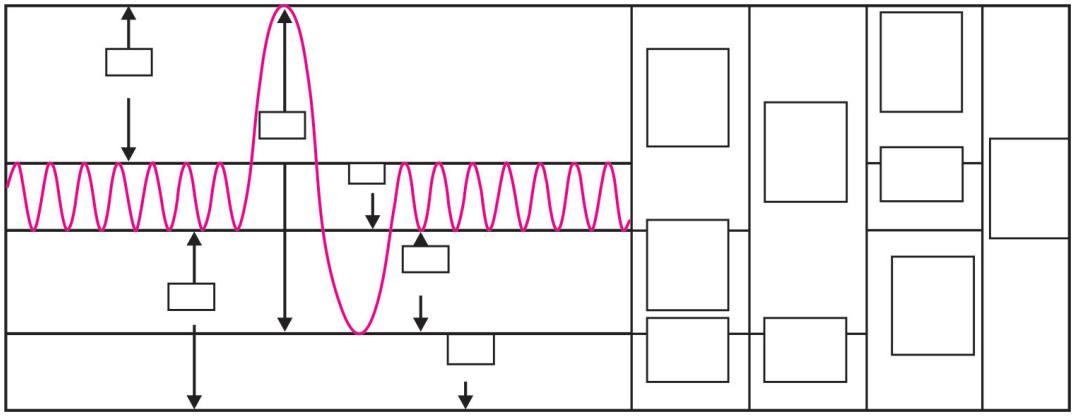
1. What is possible diagnosis in this child?
2. Draw most appropriate pressure and saturation in blocked heart chambers.

	Saturation (%)	*Pressure (mm Hg)*
LA	96	–/10
LV	—	—
Ascending aorta	—	—
Descending aorta	—	—

Q. 8. Test hearing in the 13 years old boy, describing at each step the procedure. (You are provided with tuning fork of frequencies 128 Hz, 256 Hz, 512 Hz.)



Q.9. Mark the lung volumes and capacities



Q.10. Theme: Interpretation of amino acids

A. Phenylketonuria
B. Tyrosinaemia
C. Non-ketotic hyperglycinaemia
D. Ornithine transcarbamylase deficiency (OTC deficiency)
E. Maple syrup urine disease (MSUD)

For each of the following amino acid results, select from the list above the most likely diagnosis.

1.

Amino acid	*Value (µmol/L)*	*Normal range (µmol/L)*
Serine	129	51–230
Glutamine	453	300–760
Glycine	222	80–300
Leucine	1137	55–60
Isoleucine	457	25–150
Valine	826	90–550
Arginine	104	20–180
Phenylalanine	76	30–100
Tyrosine	60	20–150

2.

Amino acid	*Value (µmol/L)*	*Normal range (µmol/L)*
Serine	124	51–230
Glutamine	4122	300–760
Glycine	301	80–300
Leucine	230	55–60
Isoleucine	75	25–150
Valine	300	90–550
Arginine	70	20–180
Phenylalanine	50	30–100
Tyrosine	280	20–150

3.

Amino acid	*Value (µmol/L)*	*Normal range (µmol/L)*
Serine	190	51–230
Glutamine	340	300–760
Glycine	310	80–300
Leucine	120	55–60
Isoleucine	65	25–150
Valine	200	90–550
Arginine	30	20–180
Phenylalanine	1500	30–100
Tyrosine	50	20–150

Q.11. A 6 years old girl Ritu was found to have a poor cortisol response when hypoglycaemic. On the basis of the results of further investigations shown below, what is the most likely diagnosis?

Synachthen test			
Time (min)	0	30	60
Cortisol (nmol/l)	101	94	89
Very-long-chain fatty acids			
C24/C22 ratio	1.54	(NR < 0.96)	
C26/C22 ratio	0.056	(NR < 0.022)	

1. What is possible diagnosis: Addision disease or adrenoleukodystrophy?
2. What is this test results showing?
3. What is genetic inheritance of this disease?

Q.12. Theme: Hepatitis B

	ALT	*HBV/DNA*	*cAb*	*HBsAg*	*Anti-HBsAg*	*eAg*	*eAb*
A	↑	Detectable	IgM	+	–	+	–
B	↑	Detectable	IgM	+	–	–	–
C	↑	Detectable	IgG	+	–	+	–
D	N	High	IgG	+	–	+	–
E	N	Undetectable	IgG	–	+	–	+
F	N	Undetectable	IgG	+	–	–	+

cAb, core antibody; eAb, envelope antibody, eAg, envelope antigen; HBV.

For each of the serologies above, select the correct diagnosis from the following:

1. Chronic hepatitis B infection, non-replicative phase
2. Acute hepatitis B infection with pre-core mutant
3. Chronic hepatitis B infection, immune clearance phase
4. Immune tolerant

Q.13. Theme: Blood and coagulation values

	Hb (g/dl)	*Platelets lacks*	*Total WCC/mm³*	*Neutrophils (%)*	*INR*	*APTT (s)*
A	10.5	0.44	10,000	30	1.1	30
B	12.2	3.2	6,000	50	1.1	32
C	6.2	0.4	15,000	60	1.15	31
D	7.1	0.2	2,200	5	1.15	33
E	18.5	1.5	18,000	60	1.3	55
F	10.1	1.9	5,500	5	0.9	32
G	10.6	0.3	14,000	60	2.5	80

For each patient below, select the appropriate haematological parameters listed above.

1. A 2 years old girl with haemolytic uraemic syndrome
2. A 3 years old boy with Wiskott-Aldrich syndrome
3. A normal 1 day old newborn baby.

Q.14. A 3 years old child present with UTI. On urine culture report you found multiple sensitive antibiotics against *E. coli*. Compare the MIC (minimum inhibitory concentration) report of finally chosen two antibiotics among all and select the best one as per report given below:

***In vitro* efficacy of amoxicillin** (predicts ampicillin)

(A)

Sensitive (MIC)			Intermediate	Resistant
(2)	4	8	16	32
Tested concentrations of amoxicillin (μg/ml)				Breakpoint

***In vitro* efficacy of cefovecin**

(B)

Sensitive (MIC)	Intermediate	Resistant
2	4	8
Tested concentrations of cefovecin (μg/ml)		Breakpoint

1. What is MIC?
2. What antibiotic you will choose among these two and why?
3. What is eagle effect while using antibiotics?

ANSWERS

Ans. 1. 1. Restrictive type
2. Kyphoscoliosis, muscular dystrophy
3. Mix type in cystic fibrosis

**Both FCV and FEV1 are markedly reduced in restrictive type of pattern.

** FCV near normal but FEV1 are markedly reduced in obstructive type of pattern. (Asthma)

** FCV is low but FEV1 much markedly reduced in mix type of pattern. (cystic fibrosis)

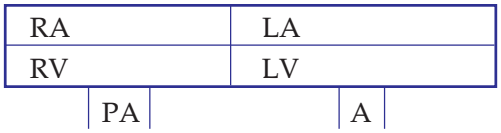
Ans. 2. 1. Mix type, cystic fibrosis
2. Delta 508 mutation for CFTR gene
3. Colistin

Ans. 3. 1. Obstructive, most common—Asthma
2. Pneumonia, bronchiolitis
3. FEF(25–75%)—best to measurement of small airway disease
Peak flow is best for large airway disease follow-up

Ans. 4. 1. ASD
2. 80, 81
3. –/6 (normal is –/4)

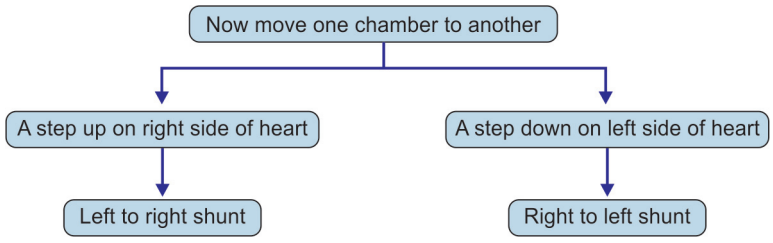
HOW TO SOLVE CARDIAC CATHETER QUESTIONS

1. Made a schematic heart



*RA: Right atrium, LA: Left atrium, RV: Right ventricle, LV: Left ventricle, PA: Pulmonary artery, A: Aorta.

2. Mark the saturation in heart areas
   - Are the saturations on left greater than 90% (Yes): Normal
   - Are the saturations on right less than 80%(Yes): Normal



3. Now mark the pressure in heart chambers
   - all right sides should be less than left-normal
   - if there is equality at any level-(mixing) cardiac shunt
   - if pressure fall across a valve-valve stenosis

Examples:

1. *Saturation*

80%	96%
81%	95%

80% 96%
Normal

80%	96%
79%	95%

96% 80%
TGA

81%	96%
88%	96%

VSD

87%	96%
87%	96%

ASD

2. *Pressures (mm Hg)*

–/4	–/7
20/4	100/10

20/10 (PA) 100/70(A)
Normal

–/7	–/7
20/4	100/10

20/10 (PA) 100/70(A)
ASD

–/4	–/7
60/30	100/10

20/10 (PA) 100/70(A)
Pulmonary stenosis

Ans. 5. 1. Lung 2. BPD

Ans. 6. 1. Pulmonary stenosis
2. Right ventricular hypertrophy—upright T wave in V1
Tall R wave in V1
Right axis deviation

Ans. 7. 1. Coarctation of aorta (COA)
2.

	Saturation%	*Pressure (mm Hg)*
LA	96	–/10
LV	96	150/70
Ascending aorta	96	150/70
Descending aorta	96	70/30

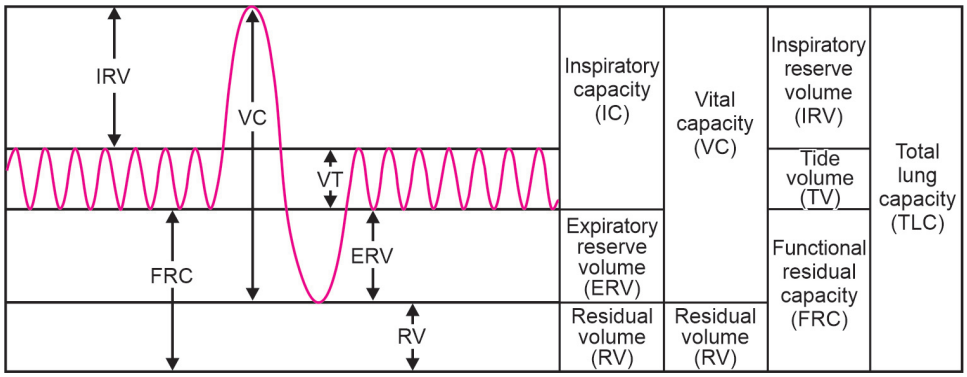
**Acyanotic lesion-COA. So there is no drop in saturation.

Ans. 8. 1. Wish and introduce yourself.
2. Get permission of parent and explain what you're going to do.
3. Select the appropriate tuning fork. (512 or 256 Hz)
4. Rinne test: Strike the tuning fork and hold it near the external ear canal (air conduction) and then against the mastoid process (bone conduction). Ask the patient which sound was louder. In subjects with normal hearing and those with sensorineural loss air conduction is better than bone conduction (Rinne positive.) In conductive deafness bone conduction is louder (Rinne negative).
5. Weber test: Base of the vibrating tuning fork is placed on the vertex or forehead in the midline. Ask the patient whether the sound is heard in the midline or whether

it is lateralized. The normal response is to hear the sound in the midline; this is also true if hearing is symmetrically reduced. However, if there is normal hearing on one side and a pure sensorineural loss on the other the tuning fork will be louder in the normal ear. Conversely, if there is a purely conductive hearing loss the sound will be louder on the side with the conductive deficit.

6. Thank the child.

Ans. 9.



**One block is always volume >1 is always a capacity.

Ans. 10. 1. *Maple syrup urine disease:* The branch-chain amino acids, leucine, isoleucine and valine, share a common enzyme at the start of their catabolic pathway. Deficiency of branched-chain oxo acid dehydrogenase results in increases in all three amino acids.

2. *Ornithine transcarbamylase deficiency:* This amino acid profile suggests a defect of the urea cycle. Ammonia is 'mopped up' by glutamate with a resultant increase in glutamine, which is then transported to the liver for conversion to urea.
3. *Phenylketonuria:* This is the basis of the newborn screening test for PKU phenylalanine hydroxylase converts phenylalanine to tyrosine, and therefore the ratio of phenylalanine to tyrosine is increased. Classic PKU is defined as a phenylalanine level greater than 1000 µmol/L.

Ans. 11. 1. Adrenoleukodystrophy

2. The Synacthen test shows a flat response, with no increase in cortisol. the VLCFAs (very long chain fatty acids) are increased, consistent with adrenoleukodystrophy.
3. X-linked

Ans. 12. 1. F, 2. B, 3. C, 4. D

The following phases of hepatitis B virus infection are recognised:

Host HBV status	*ALT*	*HBV DNA*	*cAb*	*sAg*	*sAb*	*eAg**	*eAb*
A. Acute	↑	Detectable	IgM then IgG	+	–	+	–
B. *Chronic*							
1. Immune tolerance	N	High	IgG	+	–	+	–
2. Immune clearance	↑	Detectable	IgG	+	–	+	–
3. Non-replicative	N	Undetectable	IgG	+	–	–	+
C. Resolved	N	Undetectable	IgG	–	+	–	+

***eAg absent in pre-core mutant.** ↑, increased; ALT, alanine aminotransferase; cAb, core antibody; eAb, envelope antibody; eAg, envelope antigen; HBV, hepatitis B virus; N, normal; sAb, surface antibody; sAg, surface antigen.

Clues to remembering:

Hep Bc IgM +ve	Acute infection
Hep Bc IgG +ve with HBsAg +ve	Chronic infection
Presence of HBeAg	Infective and therefore absent in non-replicative and resolved states (except when there is a pre-core mutant)
Abnormal liver function tests	Only occurs during acute infection and clearance of virus

HBeAg, hepatitis B envelope antigen; HBsAg, hepatitis B surface antigen; Hep Bc, hepatitis B virus core antigen.

Ans. 13. 1. C, 2. A, 3. E

Ans. 14. 1. *In vitro* lowest concetration of an antibiotic agent which completely prevents visible growth of an organism (mg/l or µg/ml).

2. Resistant value of amoxicilline is four times dilution (32) away from MIC value (2) and two times dilution (4) away from MIC value (2) of cefovecin. So in this case amoxicilline is the best choice.
3. Paradoxical reduced killing activity at antibiotics concentrations above its MIC or OBC (supra MIC). (If you use very high dose of antibiotics, it may be less effective than usual dose).