

	imaging system and nuclear medicine system – radiation therapy. Ultrasonic imaging system - introduction and basic principle.		
VI	Instruments for clinical laboratory – test on blood cells – chemical tests - Electrical safety– physiological effects of electric current – shock hazards from electrical equipment – method of accident prevention, introduction to tele- medicine.	6	20%
END SEMESTER EXAM			

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QUESTION PAPER PATTERN:

Maximum Marks: 100

Exam Duration: 3Hours.

MODULE : 6

PATIENT'S SAFETY

Hospitals are facing problems of creating a safe electric environment for the care & comfort of the patients.

The main problem encountered are electric shocks, fire hazards, electric burning which results from the careless usage of electricity.

- (i) The measurement of respiration rate
- (ii) during surgical purpose
- (iii) recording signal such as ECG, EEG etc.

Electrical shock hazards

Hazards due to electric shock are also associated with equipments other than that ~~used~~ used in the hospitals.

There are two situations which account for hazards from electric shock are

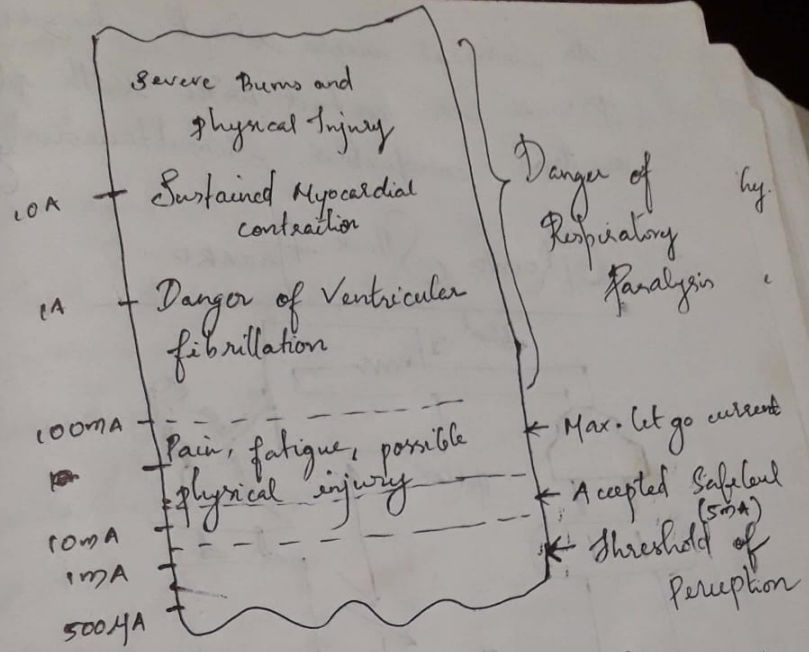
- (i) Macro Shock or Gross Shock
- (ii) Micro Shock.

Macro Shock: The current passes directly to the heart walls. It is experienced by a person by an accidental contact with electrical wiring at any point on the body surface. Voltage greater than 50V applied across dry unbroken human skin are capable of producing heart fibrillation.

Micro Shocks: These are more serious hazards than Macro shocks when current enters the body at any point and leaves some other point, some physiological effects ~~are~~ takes place.

- (i) Resistive heating of tissues.
- (ii) Electrical stimulations to the nerves and muscles.
- (iii) Electrochemical burning.
- (iv) tissue damages for direct current & very high voltages.

Types of Current	Current rate mA	Physiological effect
Threshold	1-5	tingling sensation
Pain	5-8	Painful "
	8-20	Threshold of invol. muscles.
Paralysis	> 20	Respirator paralysis & pain
Fibrillation	80-100	Ventricular & heart fibrillation.
Defibrillation	1000-10,000	

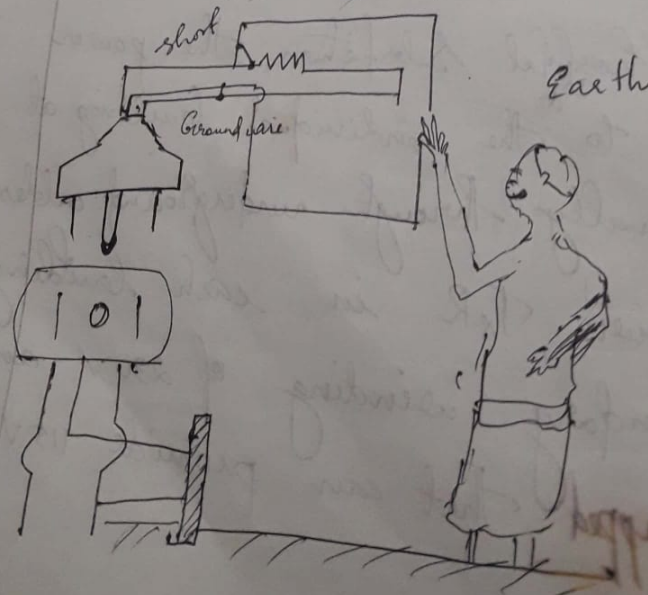
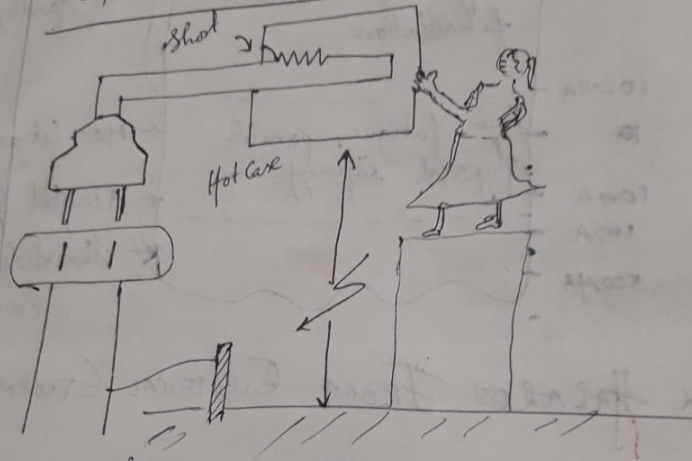


STROCK HAZARDS FROM ELECTRICAL EQUIPMENTS.

In main hospital Substation, the power distribution to the individual building at 4800V usually through underground cables & a step down TrR in each building has a secondary winding of 230V and is centre tapped that can provide 115V to

An electrical macro shock hazard to a person in contact with both phase & neutral conductors simultaneously.

Ground Shock Hazard



Blood Test

Blood : Nature has provided a special transport system to exchange chemical products b/w special cell of various organs through blood circulation. The circulatory system of an adult contains about 5 litres of blood. The blood contains fluid called plasma in which three different types of blood cells, they are RBC, WBC, & platelets or thrombocytes.

RBC : 4.5 to 5.5 million

WBC → 6000 to 10,000

Thrombocytes : 2,00,000 - 8,00,000.

The blood cells are round discs indented to the centre with a diameter 8µm. It has no cell nucleus

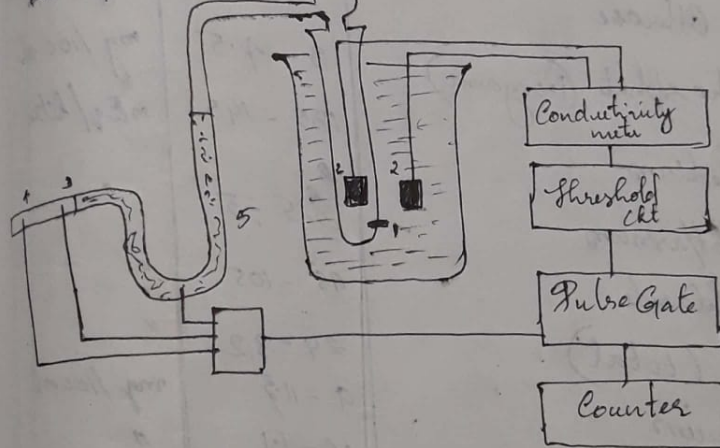
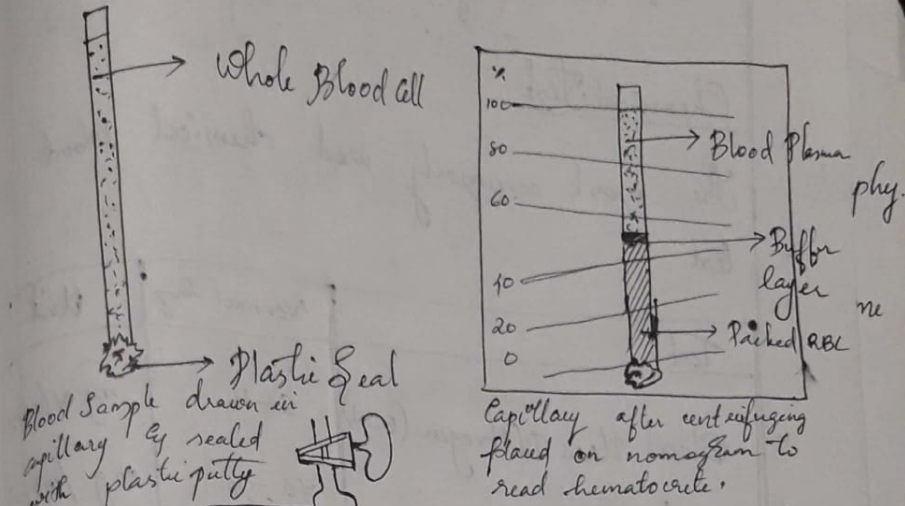
but it contains membrane & is filled with a soln. containing iron and protein called haemoglobin. Blood cells transport oxygen by chemically binding the O_2 molecule to the haemoglobin.

Test On Blood Cells.

When whole blood is centrifuged the blood cells sediment and form a pack at the bottom of the test tube. Most of this pack contains RBC with a thin Buffer layer on top of the red cells. The vol. of packed red cells is called hematocrit. It is expressed as the percentage of total blood volume; if the no. RBC per cubic mm of blood is known, this no. & hematocrit can be calculated by mean cell volume (MCV).

Haemoglobin can be calculated by mean haemoglobin conc. (MCHC).

Hematocrit Determination.



Blood Counter, Conductivity (Coulter method).

- 1: Diluted Blood
- 2: Two electrodes
- 3: 1st column of mercury
- 4: Second Column of mercury

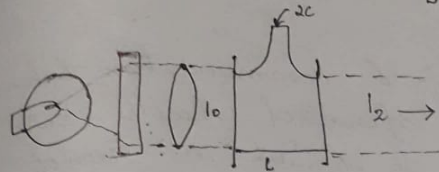
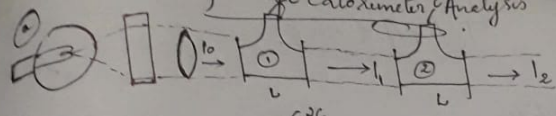
5: U-tube filled with mercury

Chemical Test

The most commonly used chemical blood test

Test	Normal Range	Unit
1. Blood Urea Nitrogen (BUN)	8-16	mg N/100 ml
2. Glucose	70-90	mg/100 ml
3. Phosphate (Inorganic)	3-4.5	mg/100 ml
4. Sodium	135-145	mEq/litre
5. Potassium	3.5-5	"
6. Chloride	95-105	"
7. CO ₂ (total)	24-32	"
8. Calcium	9-11.5	mg/100 ml
9. Creatinine	0.6-1.1	"
10. Uric Acid	3-6	"
11. Protein (total)	6-8	g/100 ml
12. Albumin	4-6	g/100 ml
13. Cholesterol	160-200	mg/100 ml
14. Bilirubin	0.2-1	mg/100 ml

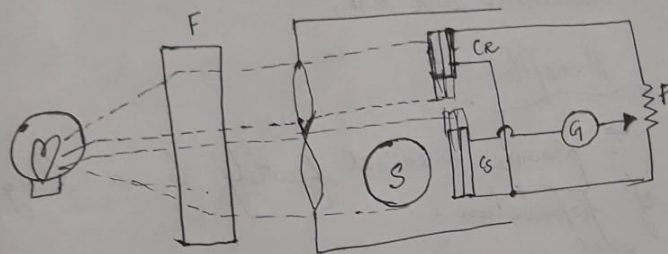
Principle of Colorimeter & Analysis



aphy.

me

Colorimeter (filter - photometer)



Transmittance, $T = \frac{I_1}{I_0} \times 100$

Absorbance, $A = -\log \frac{I_1}{I_0}$

$A = \log \frac{1}{T}$

Concentration, $C_u = C_s \frac{A_u}{A_s}$

where I_0 - low intensity, I_1 - normal intensity
 L - length of path. C is the concentration.
 A_s - known concentration (std. value). A_u : unknown absorption.

Tele Medicine

Objective

Use of info & communication technologies to provide specialised health care consultation to patients in remote locations. by using video conference among the health care experts for better treatment and care.

Benefits

1. To provide medical faculty to a large area of population.
2. To reduce visits to Super speciality hospital for long time follow up for aged patients.

