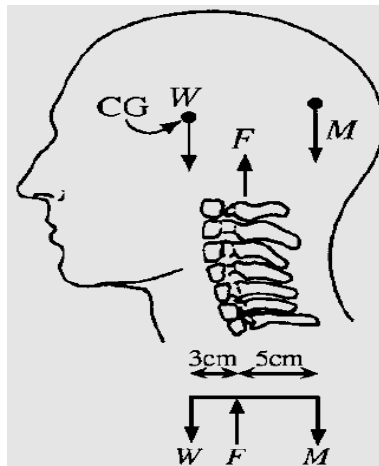




NOTE : Attempt all questions

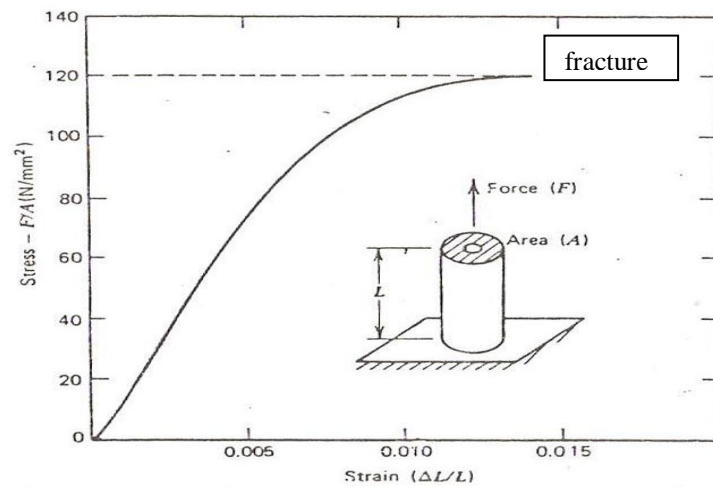
**Q1** / One first-class lever system involves the extensor muscle, which exerts a force  $M$  to hold the head erect; the force  $W$  of the weight of the head, acting at its center of gravity (cg), lies forward of the force  $F$  exerted by the first cervical vertebra (see sketch below). The head has a mass of about 3 kg, or weight  $W = 30$  N.



(a) Find  $F$  and  $M$ .

(b) If the area of the first cervical vertebra, on which the head rests, is  $5 \times 10^{-4} \text{ m}^2$ , find the stress on it.

**Q2/** Using the information in Fig. below:



a) Calculate the maximum force a bone could withstand just prior to fracture. Assume the cross-sectional area of the bone is  $4\text{cm}^2$

b) Determine how much a bone 35 cm long would elongate under this maximum tension.

c) Calculate the stress on this bone if a tension force of  $10^4 \text{ N}$  were applied to it. How much which this bone lengthen?

**Q3/** A- - List four techniques for heating parts of the body.

(a)

(b)

(C)

(d)

B- What is the power radiated per square centimeters from human skin at a temperature of 33 °C? if you know the Stefan-Boltzmann constant  $=5.7 \times 10^{-12} \text{ W/cm}^2 \text{ } ^\circ \text{K}^4$ .

**Q4/** A- Suppose that elevator is broken in the building in which you work and you have to climb 9 stories – a height of 45 m above ground level. How many extra calories will this work cost you if your mass is 70 kg and your body works at 15 % efficiency ?

B- By what percent dose your metabolic rate increase if you have a fever 1 °C above normal?

Q 5) Assume you are a shallow-water diver preparing for a 10 m dive into salt water.  
(a)- What absolute pressure and gauge pressure will you experience?

(b)- Normally your lungs have an available volume of 6 liters. What will happen to that volume?

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**GOOD LUCK**

**Head of Department  
ALI SAHIB HAMMOOD**

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Dr. Ali Jalaukhan**