BRAINSE AN GHAIRMOIDEACHAIS.

CERTIFICATE EXAMINATIONS

for

DAY VOCATIONAL COURSES, 1965

MECHANICS AND HEAT.

WEDNESDAY, 16th JUNE - 2.30 to 4.30 p.m.

INSTRUCTIONS.

Four questions to be attempted.
All questions carry equal marks.
Sketches should be neat and clear.

1. (a) State the Law of Flotation and describe an experiment to verify it.

(b) Draw a labelled sketch of a common hydrometer.
State the purpose for which it is used. Why does the scale read downwards ?

2. Make a neat sketch of the common pump (lift pump) and label the parts. Describe how it works. Is this pump capable of raising water from any depth ? Give a reason for your answer.

3. Define

(a) Mechanical Advantage,

(b) Velocity Ratio,

(c) Efficiency of a machine.

What is the relationship between these quantities ?
In a simple screw-jack the pitch of the screw is $\frac{1}{2}$ inch and the length of the handle is 21 inches. An effort of 10 lbs applied at the end of the handle lifts a load of 1,120 lbs. What is the efficiency ? ($\pi = 3\frac{1}{7}$)

4. State Boyle's Law. Draw a diagram of the apparatus used to verify the law and indicate clearly the position of the mercury surfaces in both tubes when the pressure of the enclosed air is greater than atmospheric pressure.
How is the pressure of the enclosed air measured ?
A mass of gas occupies a volume of 180 C.C. at a pressure of 762 mm. of mercury. If the temperature does not change calculate the pressure when the gas has a volume of 270 C.C.

5. (a) Make a neat sketch of a clinical thermometer. What is it used for ? What advantage has a clinical thermometer over an ordinary thermometer ?

(b) What kind of thermometer or thermometers would be used to record the highest and lowest temperatures reached in a given period of time ? Make a sketch of the instrument or instruments used and label the parts.

(c) Convert 86°F to °C.

6. Define Latent Heat of Steam
When 3 gm. of steam at 100°C. are passed into 117 gm. of water contained in a calorimeter of water equivalent 3 gm., the temperature of the water is raised from 20°C. to 35°C. Calculate the latent heat of steam.
What precautions must be taken in such an experiment to obtain an accurate result ?
Why does steam burn more severely than water at the same temperature ?

7. Answer <u>any five</u> of the following:-

(a) Distinguish between conduction and convection of heat.

(b) For what purpose is an opisometer used ?

(c) What happens when a compound bar (bi-metallic strip) is heated ? Explain.

(d) For what purpose is a Leslie Cube used ?

(e) Why is it not possible to cook food in an open vessel at high altitudes ?

(f) Name and define the unit of power.

(g) A glass stopper weighs 50 gm. in air and 30 gm. in water. Calculate the volume of the stopper.

(h) Define

(a) centre of gravity,

(b) specific gravity.

5. What is meant by the "specific resistance" of a material ?

(a) How many yards of copper wire of cross-sectional area 0·01 sq. in. are contained in a coil of resistance 0·126 ohm ? (The specific resistance is 0·7 microhms per in. cube).

(b) By how much will the resistance of this coil increase if it is heated from 0°C. to 100°C. ? (The temperature coefficient of copper is 0·004 per 0°C.)

6. Define the watt.
Two bulbs A and B are connected in parallel to a 20V. supply. The total current flowing with both bulbs lighting is 5 amp. Bulb A is a 40W. bulb. Find:

(a) the wattage (power) of bulb B,

(b) the resistance of bulb A,

(c) the total resistance of the circuit.

7. (a) What is the main difference between a primary and a secondary cell ?

(b) Show how four cells, each of e.m.f. 1·5V. can be joined together to make a battery of e.m.f. 3V. If the internal resistance of each cell is 0·5 ohm, what will be the internal resistance of this battery ?

(c) Show on a diagram the items and materials used to construct a Daniell cell.