

DAY GROUP CERTIFICATE EXAMINATIONS 1968

MECHANICS AND HEAT

MONDAY, 17th JUNE - 10 - 12

INSTRUCTIONS

Not more than four questions to be attempted.  
All questions carry equal marks.  
Sketches should be neat and clear.

1. Define latent heat of fusion of a substance. 10 gms. of ice at  $0^{\circ}\text{C}$  are added to 62 gms. of water at  $35^{\circ}\text{C}$  contained in a calorimeter of water equivalent 8 gms. If the final temperature of the mixture is  $20.5^{\circ}\text{C}$ , find the latent heat of fusion of ice.  
If the calorimeter used in this experiment is made of copper and its weight is 80 gms. calculate the specific heat of copper.

2. Describe how a mercury thermometer may be constructed and graduated in degrees fahrenheit to read temperatures between the melting point of ice and the boiling point of pure water.

Give reasons why mercury is the liquid generally used for thermometers.  
Convert:-

- (a)  $86^{\circ}\text{F}$  to degrees centigrade.
- (b)  $45^{\circ}\text{C}$  to degrees fahrenheit.

3. (i) Define the coefficient of linear expansion of a solid. By how much does a 30 ft. steel rail change in length when cooled from  $40^{\circ}\text{C}$  to  $30^{\circ}\text{C}$  (coefficient of linear expansion of steel is  $0.000011$  per  $^{\circ}\text{C}$ ).
- (ii) State the effect of increased pressure on:
- (a) the melting point of ice,
  - (b) the boiling point of water.
- (iii) What causes a land breeze? When would you expect a land breeze to occur?
- (iv) What makes liquid rise in a pipette when suction is applied at the top?
- (v) State the function of each of the following:-
- (a) opisometer, (b) calipers, (c) graduated cylinder, (d) hydrometer.

4. State the law of the lever. What is meant by the turning moment of a force about a point? A uniform plank AB, 12 ft. long, is pivoted about a knife edge at its centre of gravity to form a see-saw. A boy, weighing 140 lbs. sits so that his weight acts at a point 6" from A and a boy, weighing 100 lbs., sits so that his weight acts at a point 1 ft. from B. Where must a weight of 90 lbs. be placed so that the plank balances horizontally?

5. Define specific gravity of a substance.  
Describe an experiment that may be carried out to determine the specific gravity of sand.  
The following readings were obtained from an experiment to determine the specific gravity of sand:-

weight of density bottle full of water	= 120 gms.
weight of sand	= 41 gms.
weight of bottle + sand + residual water	= 145 gms.

Using these results, calculate the specific gravity of sand.

6. (a) Describe an experiment to show that air has weight.  
(b) Describe, with the aid of a sketch, the working of an aneroid barometer.  
(c) Explain how an aneroid barometer may be used to obtain a permanent record of changes in atmospheric pressure over a fixed period.

7. Define (a) force, (b) work, (c) energy, (d) power, and state the units in which each is measured.  
A crane raises a load of 330 lbs. through a distance of 15 ft. in 3 seconds. At what horse-power is the crane working?