5. Draw a sketch and show how polarity is developed in a solenoid when an electric current is passed through it.
6. Describe an azimuth mirror and how you would use it. How would you test it for instrumental error ?
7. When swinging your ship, if it be required to construct deviation tables for two or more compasses situated in different parts of the vessel, describe the process and how you would employ the Napier's diagram for this purpose.
8. Would you expect the compass to be more seriously affected by any given disturbing force when near the magnetic equator or near the poles ? State the reason.

4. CHART-CONSTRUCTION.

Time allowed 3 hours.

Construct a Mercator's chart extending from lat. 35° 10′ S. to 37° 20′ S., and from long. 24° 45′ E. to 27° 30′ E., to a scale of 4 in. to 1 degree of longitude, inserting a true compass, subdividing the marginal scales of latitude and longitude to 5′ and the compass to degrees. Then, supposing a ship in lat. 37° 10′ S., long. 25° 10′ E., sails the following courses and distances —030°, 30 m.; 110°, 35 m.; 015°, 60 m.; and 320°, 30 m.—plot the courses and distances on the chart, and find therefrom the position of the ship when the final course was completed.

5. GENERAL KNOWLEDGE.

Time allowed 2 hours.

1. Describe the essential features of Class I, II, and III lifeboats.
2. State the requirements in respect to davits and boats of a cargo-steamer carrying a crew of 60 hands all told.
3. A bar of metal alloy weighs 2,240 grammes, but when weighed in water weighed only 2,040 grammes.
   Find the volume of the bar and its specific gravity.
4. Explain the difference between temperature and heat.
5. Why is the sound of a submarine fog-bell more reliable than the sound of an ordinary surface fog-signal ?
6. How is a gnomonic chart constructed, and for what purpose is it used ?
7. State briefly how compensation for temperature is effected in a chronometer, and what the result would be if this compensation were not made.
8. What is meant by " priming " and " lagging " of the tides ?

6. NAVAL ARCHITECTURE AND STABILITY.

Time allowed 3 hours.

1. Give a sketch of the midship section of a steam-vessel, showing all the principal parts. Name the type of vessel selected.
2. What precautions are taken, from a structural point of view, to compensate for the concentration of weight in the machinery space of a vessel with a cellular double bottom ?
3. State how you would determine the position in which to place a weight so that the draught of the vessel aft would not be affected by the addition or gradual consumption of that weight.
4. Calculate the moment of inertia of the waterplane of a vessel whose length is 320 ft. and whose half-breadths taken at intervals of 40 ft. are 0, 12, 21, 23, 23, 23, 20, 12, and 0 ft. respectively.
5. Discuss the advantage and disadvantage from all points of view, including stability, of the turret vessel as compared with the shelter-deck vessel.
6. Supposing the half-breadths at five sections of five different waterplanes of a vessel to be as follows:—

Sections	Half-breadth at Water-lines				
	No. 1	No. 2	No. 3	No. 4	No. 5
1	·5	·4	·4	·3	·2
2	16	15	13	8	6
3	20	19	17	10	7
4	17	16	14	10	6
5	·5	·4	·4	·3	·2

Calculate the displacement and the height of the centre of buoyancy, supposing the length of each waterplane to be 200 ft. and the draught at W.L. 1 to be 16 ft.