

3. A glass U-tube has two cylindrical arms of different diameters, namely 2 cms. and 4 cms. Some mercury is poured into it, and then 50 cc. of water is poured into the wider arm; what volume of liquid of relative density 0.8 must be poured into the other arm so that the mercury may be at the same level in both arms?

Section II.

4. (a) Describe simply any type of barometer, and explain *how* and *why* it can be used to read the atmospheric pressure.
 (b) State briefly why floating bodies are an illustration of Archimedes' principle.
5. (a) How is the boiling point of water affected by (i) a decrease in pressure, (ii) something dissolved in it?
 (b) A metal rod is one metre long, and is found to expand 1.5 mm. when heated through 100 centigrade degrees; what is the co-efficient of linear expansion of the metal?
6. (a) Define the following: Specific heat, calorie, British thermal unit.
 (b) Why does the temperature of a liquid standing in an open vessel usually fall below the temperature of the air?
 (c) What mass of dry steam at 100° C. must be condensed in a mixture of pure ice and water to melt 32 grms. of ice without raising the temperature of the mixture? (The latent heats of vaporisation and of fusion concerned are 540 cal./grm. and 80 cal./grm.)

Section III.

7. (a) (i) What difference is there in the statements that a body is moving with "uniform speed" or "uniform velocity"? (ii) Why is it correct to say that bodies fall to the ground, in a vacuum, with "a uniform acceleration of 980 cms./sec^2 " ? How is this altered when they fall in air?
 (b) Define a dyne, and calculate the weight of 1 pound in dynes (1 pd. = 454 grms.).
8. (a) State Newton's laws of motion.
 (b) Two men of the same height carry between them on their shoulders a uniform beam 20 ft. long and weighing 50 pounds. One man ("A") supports it 2 ft. from an end, and the other man ("B") 15 ft. from that end; what load does each take?
 What extra weight must be hung from the end nearer "B" so that "A" will have no load?

9. (a) Define (i) an erg, (ii) a watt.
 (b) A body of mass 2 Kg. is travelling with a velocity of 3 Km./sec.; what is its kinetic energy, and what force applied to it will just stop it in 5 sec.?
 (c) A load of 20 Kg. is raised vertically 3 metres in 5 sec.; what is the average power exerted?

Section IIA.

[For students in the technical schools; *one* question may be attempted from this section.]

10. State Ohm's law.

An electric lamp is employed across a 110 volt circuit and takes 0.80 ampere. What is its resistance?

What is meant by the statement that the difference in potential is 110 volts?

11. Write an essay on the subject of magnetism, employing and defining the terms equal poles, unit north pole, gauss, and magnetic declination.

English.

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Assessor: Dr. G. MACKANESS, M.A.

Time allowed—Three hours.

The answers must be done up in *four* separate bundles, marked respectively A, B, C, D.

A.

1. Choose *one* of the following subjects, and write on it an essay of about two pages in length:—
 (a) What will speed in travel achieve for mankind?
 (b) Whaling;
 (c) A winter sunset;
 (d) Adventure.

2. (a) Analyse the following passage, showing the principal and subordinate clauses, and their relations to each other ;

Also,

- (b) Parse the underlined words :—

If the innkeeper had not been smiling so insolently, I might have been deceived. As it was, I felt that a man whose manner was so self-confident knew more than he desired me to know. When I threatened him with the terrors of the law he was so impressed that his whole manner altered. Cringing in fear, he told me all he knew, and disclosed the direction in which the bandit rode.

B.

3. Answer, in about two pages of writing to each, *two only* of the following (*a, b, c, and d*) :—

- (a) Give a character-sketch of Long John Silver ;
 (b) Relate how and why Gaspar Ruiz met his death ;
 (c) Write an appreciation of *one* of the following :—

(i) The Cloud ;

Or,

(ii) The Teams.

- (d) Answer *one* of the following :—

- (i) Why was the Albatross hung about the neck of the Ancient Mariner ?

Or,

- (ii) With far-heard whisper, o'er the sea,
 Off shot the spectre-bark.

What was the "spectre-bark" ? Who were in it

C.

4. Write out, from any of the text-books set for this examination, not more than fifteen lines of poetry describing any *one* of the following :—

- (a) A fairy ;
 (b) Wind ;
 (c) Loneliness ;
 (d) The sea.

[N.B.—Do not give lines quoted in this paper.]

5. Discuss, in not more than one page of writing to each, *four only* of the following passages. From which of the books set does each come ? What is its significance in the story or poem concerned ?

(a) O, when she's angry, she is keen and shrewd !
 She was a vixen when she went to school ;
 And though she be but little she is fierce.

(b) Having once this juice,
 I'll watch Titania when she is asleep,
 And drop the liquor of it in her eyes.

(c) Quick as thought I sprang into the mizzen shrouds,
 rattled up hand over hand, and did not draw breath till I was seated on the cross-trees.

I had been saved by being prompt ; the
 dirk had struck not half a foot below me and
 there stood Israel Hands

(d) To me she was not an old rattle-trap carting about the world a lot of coal ; to me she was the endeavour, the test, the trial of life.

(e) To lend our hearts and spirits wholly
 To the influence of mild-minded melancholy ;
 To muse and brood and live again in memory.

(f) The self-same moment I could pray ;
 And from my neck so free
 The Albatross fell off, and sank
 Like lead into the sea.

D.

6. Answer *one* of the following :—

(a) What impression does Shakespeare give you, in A Midsummer Night's Dream, of woodland scenes ?

Or,

(b) What do you think of bully Bottom's powers as an actor ? What did he think of them ?

7. In the following passages give the meanings of *the underlined words only*. Say in what part of the story each passage occurs :—

(a) And there the snake throws her enamel skin,
Weed wide enough to wrap a fairy in.

(b) And since we have the vaward of the day,
 My love shall hear the music of my hounds.

(c) Brief as the lightning in the collied night,
 That, in a spleen, unfolds both heaven and earth.

(d) A crew of patches, rude mechanicals,
 That work for bread upon Athenian stalls.