A'....2 - 7 + 7 - 5 2B''....2 + 2 - 2 + 4A'' 9 - 9 + 9 reject factor 3 reject factor 9, A'''....I - I + I  $\begin{array}{c} A' \dots 2 - 7 + 7 - 5 \\ B' \dots 3 + 3 - 3 + 6 \\ B'' \dots 1 + 1 - 1 + 2 \\ A''' \dots 2 - 2 + 2 \\ reject factor 2 \quad 1 - 1 + 1 \end{array}$ 

The result being identical shows that the G. C. M. is  $x^2 - x + 1$ .

7. Four places are situated on a straight road in the order of the letters A, B, C, D. The distance from A to D is 34 miles. Three times the distance from A to B is equal to twice the distance from C to D; and one-fourth of the distance from A to B added to half the distance from C to D is three times the distance from B to C. What are the respective distances?

Let x = the distance from A to B Then  $\frac{3}{2}x =$ , " C to D And  $\frac{1}{3}x =$  " B to C  $\therefore x + \frac{1}{3}x + \frac{3}{2}x = 34$  miles. x = 12 miles;  $\frac{1}{3}x = 4$  miles;  $\frac{3}{2}x = 18$  miles.

8 If x = 2a - 3b, and y = 3b - 2a, prove  $(mx + ny)^3 + (nx + my)^3 = 0$ 

 $(mx + ny)^3 + (nx + my)^3$  is the sum of two cubes, and therefore can be factored. One of these factors is [(mx + ny) + (nx + my)]. and, mx + ny + nx + my = (m + n)(x + y) = 0.

Therefore, since one of the factors is zero,  $(mx + ny)^3 + (nx + my)^3 = 0$ . 9. Given (3a - x)(a - b) + 2ax = 4b(a + x) to find x.

 $3a^{2}-ax-3ab+bx+2ax = 4ab+4bx.$   $ax - 3bx = 7ab - 3a^{2}$  $x = \frac{a(7b - 3a)}{a - 3b}$ 

## SCIENCE.

Editor.-J. B. TURNER, BA.

THE HIGH SCHOOL JUNIOR LEAVING AND UNIVERSITY PASS MATRICULA-

## TION.

## PHYSICS.

Examiners . R. R. BENSLEY, B.A.; C. A. CHANT, B.A.; A. P. KNIGHT, M.A.

NOTE.—(a) Give diagrams whenever possible.

(b) Experiments are to be clearly and definitely described, and must be such as can be easily performed in an ordinary school.

1. A bullet of mass 50 grams is shot vertically upward with a velocity of 200 metres per second. Taking the acceleration of gravity in the centimetre-gram-second system to be 980 and neglecting the resistance of the air, find

(a) how long it takes to reach the highest point;

(b) its (potential) energy at the highest point, and also its (kinetic) energy on reaching the ground again;

(c) its momentum 2 seconds after leaving the gun.

Give the units in each case.

2. (a) Show how a wind-mill, used for pumping purposes, transforms energy of one kind into another.

(b) A uniform beam is 4 feet long and weighs 8 pounds. It lies on a horizontal table, I foot projecting over the edge. How great a weight can be placed on the outer end before the other end, upon which a 5-pound weight is placed, will leave the table? 3. A rectangular vessel has the fol-