Make a drawing distinguishing between the two systems of 9 pulleys whose equations of equilibrium are respectively P(2N) =W and P 2n = W

10. Define, moment, momentum, traverse table, deviation and mantissa.

ALGEBRA.

Any five questions will be considered a full paper.

1. Evaluate, when a = 4, b = -3, $x = \frac{2}{5}$, and $y = -\frac{1}{2}$, the following algebraic expression (taking positive signs only of square roots):

$$\left\{\frac{\left|\sqrt{\frac{bx}{2}}\left((a-b)^{2}+1\right)y+a\left(\frac{x-1}{2}-y\right)^{\circ}\right|^{-\frac{1}{2}}}{\sqrt{\frac{abxy}{-\left\{b\left(2a^{\circ}-y^{\circ}\right)x-3bx\right\}^{-\frac{3}{2}}}}\right\}^{-2}}\right\}$$

2 (a). Divide $a^4 b^{-2(m-1)} c^{\frac{1}{2}} x^{\frac{1}{2}} (m-1)$ by $2 a^2 b^{2-3m} c_{\frac{3}{2}} x^{\frac{3}{2}-1} y^{-1}$; and (b) express the answer in its simplest form without the use of negative or fractional indices.

3 (a). Given $\sqrt{6 + \sqrt{x - 1}} = 3$, find x. (b). Given $x + y = \pi xy$ (1) x + z = bxz (2) y + z = cyz (3) find x, y, and z.

4 (a). One of the roots of the cubic $x^3 - 8x^2 + x + 42 = 0$ -2: find the other roots. is -

(b). The square of the sum of two numbers, together with the sum of their squares, is 38; the square of their difference minus the difference of their squares is minus 4; what are the numbers?

5. Find three numbers in geometrical progression such that if 1, 3, and 9 be subtracted from them in order they will form an arithmetical progression whose sum is 15.

6 (a). How many parties of 10 men can be formed from a company of 24.

(b). Express 34042 in the scale whose radix is five.

GEOMETRY,

1. The difference between the squares on any two straight lines is equal to the rectangle contained by the sum and difference of those lines.

2. The difference between the squares on a side of an isosceles triangle, and on the line which joins the vertex with any point on the base, is equal to the rectangle on the segments into which the point divides the base.

3. If two chords in a circle cut one another, the rectangle contained by the segments of one of them is equal to the rectangle contained by the segments of the other.

4. From two given points on the same side of a given straight line to draw two lines to meet on that given line, which shall be together less than any other two lines from the given points to any point in the straight line. 5. About a given circle to describe a triangle, equiangular to a

given triangle.

6. If a circle be inscribed in a right-angled triangle, the diameter of the circle is equal to the difference between the sum of the sides and the hypotenuse.

If three circles be drawn each touching one side of a triangle and two other sides produced ; then the lines joining the centres of these circles shall each pass through an angular point of the triangle.

SCHOOL SYSTEM AND SCHOOL MANAGEMENT.

When is the annual school meeting held, and what are its 1 chief duties and powers ?

 Specify the principal duties of an Inspector of Schoels.
Under what circumstances, and for what offences, would you inflict corporal punishment?

4. What principles would you adopt to enforce punctuality, obedience, honesty and truthfulness amongst your pupils ?

5. Discuss the nature and extent of the teacher's authority over his pupils outside the school-room.

TEACHING.

Name and define the different methods employed in teaching 1. beginners to read, and give reasons for the one you prefer. 2. Give your ideas as to the best method of teaching

Give your ideas as to the best method of teaching "Composition."

3. Furnish the outlines of an oral lesson on any one of the

following: The human eye, coal, an apple, iron. 4. Detail your method of teaching the "Tables of Weights and Measures," particularly Long, Square, and Cubic Measures. 5. Discuss the proper place of text-books in School instruction.

No lot into

PHYSIOLOGY.

[Candidates who prefer may substitute for this paper that on Latin given below. If papers on both subjects are handed in by same ca didate, no credit will be given for either.]

1. Describe by a drawing the relative position of the bones of the hand and arm, and give their names. 2. Draw a diagram of the heart and vessels, illustrating the full

course of the circulation of the blood.

3. What are the differences between inspired and expired air ? 4. Compare the actions of saliva, gastric and pancreatic fluids

in the process of digestion. 5. Name and state the general function of each pair of cerebral nerves.

6. Write a note on disinfectants and their action. 7.

Write a note on errors in the character of dress or clothing

LATIN.

(Each Division of this paper has a maximum value of 50) I.

1. Translate into English :--

His rebus permotus Quintus Titurius, quum procul Ambiorigemsuos cohortantem conspexisset, interpretem suum, Cneium Pompeium, ad eum mittit, rogatum, ut sibi militibusque parcat. Ille appellatus respondit; "si velit secum colloqui, licere; sperare, a multitudinc impetrari posse, quod ad militum salutem pertineat; ipsi vero nihil nocitum iri, inque eam rem se suam fidem inter-ponere." Ille cum Cottà sancio communicat, "si videatur, pngag ut excedant et cum Ambiorige une colloquantur; sperare, ab eo de sua ac militum salute impetrare posse." Cotta se ad armatum hostem iturum negat atque in eo constitit.

2.

Write a note on the proper names in the passage. 3.

Parse rogatum, sibi militibusque, uihil nocitum vri, licere.

4. Syntax of Sperare and pertineat.

1. Decline together : dies festus, arcus triumphalis, jus-jurandum.

2. Compare the following adjectives: humilis, nequam, malus,

citer, juvenis, senex, pulcher, dives, multus, frugi.

3. Give the principal parts of the following verbs: sono, seco,

misceo, rideo, mordeo, pingo, vinco, tundo, sperno, aperio, san cio. 4. State the cases following: (1) verbs of teaching and concealing, (2) verbs of remembering and torgetting, (3) utor, fungor, vescor, licet, interest.

CHEMISTRY.

[Any seven questions will constitute a full paper.]

1. How many grains of K ClO₃ will be required to produce ten gallons of O gas? (277 cu. in. = 1 gal., and 1 cu. in. O gas weighing .34 grains).

How much Zn. must be dissolved in $H_2 SO_4$ to produce H gas 2.

enough for the perfect combustion of the ten gallons of O? 3. Given 10 lbs of K NO_3 , and an unlimited supply of $H_2 SO_4$, how much nitric acid (H NO₃) could be theoretically manufactured

from them? What would the residuum be? 4. If you were given the three white salts, KI, K Br, and K Cl, by what analytical process could you distinguish the iodide from

the bromide or the chloride? 5. Write the chemical formula for the following common sub-

stances: common salt, saltpetre, ammonia, sal-ammoniac, hydrochloric acid, silica, arsenic, baking soda, washing soda, and green vitriol.

6. Mention one chemical reaction or test for each of the following metals when existing in a simple solution, K, Na, Ba, Sr, Ca, Fe, Cu, Pb, Ag and Au. 7. Compare CO and CO₂ (a) with respect to their production, (b)

with respect to their properties, (c) their behavior when passed through a solution of Ca O, in water.

8. How can you prepare alumina from alum, white lead from sheet lead, gold from auriferous quartz, superphosphate of lime from bones, and nitrogen from the air.

Write a note on the character of the exhaustion of soil by 9. crops.

10. What is the reason of the advantage derived from a good rotation of crops.

PHYSICS.

[Any seven questions will constitute a full paper.]

Give Mohr's scale of bardness. What is the degree of bardness of window glass? A pen-knife? lead? copper?
State the four laws of capillarity. Give common examples

of capillary action. 3. Describe an experiment illustrating the unequal rate of diffusion of different gases through a porous partition.