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THE SCHOOL MAGAZINE.

SEPTEMBER—OCTOBER, 1880.

INDUSTRIAL EDUCATION.

BY PROF. W. S. GOODNOUGH.

(In the Ohio Educational Monthly.)

TO all who have made any study of the subject, who know what Europe has done and is doing for Industrial Education, and who have investigated the state and character of our industries, it is evident that simply as a matter of protection we cannot delay action in this matter much longer. It is a noteworthy fact that those industries which place the greatest value, through skilled and artistic labor, on the smallest amount of raw material are the most valuable from an economic point of view; not only because the value of the raw material is increased perhaps many hundred fold, but because the cost of transportation, in proportion to value, is slight. The Frenchman who sends over lace that could be put in one's hat, which is so costly as to take a cargo of wheat or mowing-machines to pay for it has the advantage of us. Again the Frenchman or Englishman who takes a piece of clay worth five cents and turns it into a piece of pottery worth fifty dollars, is manifestly superior to our workman who can only make the same piece of clay worth one dollar. By an examination of the reports of the Bureau of Statistics it will be seen that we export principally,

natural products and the cruder and more bulky kind of manufactures, such as mechanical appliances, labor-saving machines and the like. Our imports include, mainly, those articles which are costly in proportion to their bulk, and require high technical and artistic skill in their production.

A large manufacturer recently said "I want fifty hands to whom I will pay one hundred dollars a month each, and twice as many to whom I will pay seventy-five dollars each, a month, and I cannot obtain them. Plenty can be found to do the common kinds of work, but I cannot obtain a sufficient number of skilled workmen." The complaint is common. We have no system of apprenticeships, it is almost impossible for a boy to learn a trade; trade unions are against him, and trades are now divided into a multitude of distinct parts or branches. Again, our boys do not want to learn a trade; they prefer some occupation at which they can wear good clothes. Industrial occupations have never appeared dignified in their eyes. How many boys if they could have their choice, would go into a machine shop or any industrial establishment of any

kind where they would have to wear overalls and jacket, in preference to entering a store to become even an errand boy or shipping clerk, possibly in the future a salesman, entry clerk or book-keeper. Yet in the business world there is no demand so pressing as for good men to take the lead in enterprises that require some technical knowledge, men trained in the natural sciences, in mechanical operations, men who can draft a piece of machinery or wood work, or make a skilful design. Even without the vast number of art, technical and trade schools which Europe has, see what our workmen, with no such aids have accomplished. Already our fame is world-wide for the production of labor-saving machines and exercise of inventive skill. Where should we not stand if we made broad provisions for Industrial training. It seems as if no man of broad views, who has looked into the matter fairly, can question the fact that some provision should be immediately made for Industrial Education. What, however, is the most practical thing we can do at once under existing circumstances? As our schools are now constituted, will it do to establish school shops or trade schools, even in the larger cities, at public expense? Are the people ready for it? Will they bear the increased cost of education? How shall we modify our present course of study to provide for this? Shall we rest awhile on the Normal School and County Supervision question to agitate this new one? These and many more questions naturally arise and must be met. I am happy to say that at the State University in Columbus, and under Prof. Robinson, a grand beginning has been made. A fine building has been erected which is well supplied with appliances for working in wood and metal. There are branches with carpenter and machinist's tools, forges, lathes, drills, etc. The students, in this department, are very enthusiastic

in their work. Similar schools or departments have been established in many states. The Rensselaer Polytechnic Institute at Troy, N. Y., the Institute of Technology in Boston, and the Worcester Free Industrial School at Worcester, Mass., are old and well established institutions. However, a much more general Industrial Education is needed. I believe, for the present, we have got to depend largely on these technical schools, supported either as our University is supported, or by private funds. Something more might be done which would do much towards making it more general, if in one or more of the larger cities of the state, we might do as they have done in Boston, that is by soliciting private funds establish a school shop as an experiment, and to educate public opinion. Another thing which is practicable and of the utmost importance, and which can be done at once in every city and town in the state if superintendents will undertake it, is the introduction of Industrial drawing. A broad system of Industrial Drawing, like the Massachusetts system, will train the eye and hand; no one will ever be a good mechanic without these two elements; it will enable the workman to read and make working-scale drawings of the article to be constructed; to make his mistakes on paper instead of in the more costly material; he will have a practical knowledge of design and its principles, and be able to design anything in metal, wood, stone, printed or textile fabrics, and in any style of decoration. He can put upon paper any form that he sees or imagines. He will be able to draw the development of a hollow cylinder cut at any angle, as for a sheet-iron elbow, or construct the curve of intersection of a cylinder with a sphere. The Industrial school was never heard of that did not make drawing a part of its course or demand it as a condition of admission. It is as essential there as reading or writing in

a general course. School shops for Industrial training should not teach trades, but general principles and processes underlying all mechanical operations. We should not aim to make carpenters and machinists in these school shops, but to teach our boys how to use the tools that carpenters and machinists use, and to use them skilfully. There are very many industries requiring skilled educated labor that the course in any school shop at present in America, would not reach at all. Among these are the pottery industries, for which we have great natural resources, woven and printed fabrics, as carpets, figured linen, woolen and cotton goods, lace, wall paper, etc., etc. All of these industries depend almost entirely for their value on a knowledge of art and design. It will be seen that Industrial Drawing is the principal factor in a large number of Industries, and hardly one can be named that does not depend more or less on it. In our Public Schools it is almost the only subject at present that leads pupils to think of industrial pursuits. Here is something, then, that every city and town can do and at once, as the expense is very small. In large cities a special teacher, or Superintendent of Drawing, of the broadest requirement, is needed. In smaller ones that cannot, for the present perhaps, afford this expense, a competent instructor could be engaged to plan the work, and come at the beginning and several times during the year to instruct the teachers and inspect what has been done. By this means the expense would be ridiculously small in comparison with the benefit derived. Care, however, should be taken in selecting a system of drawing and a person to direct it. All drawing is not Industrial drawing, neither

are all systems, though they may be so entitled. There is more than one city and town in Ohio that is folding its arms in the most contented manner, fondly believing that it is safe; Industrial drawing is studied in its schools; when the fact is, the drawing it is pursuing is almost worthless and a waste of time, so far as laying a foundation for Industrial education is concerned.

Having come from a state that is most liberal in its provisions for Normal Schools, and having spent nearly five years in them as pupil and teacher, I feel Ohio's great need in this direction. I believe it would be folly to interrupt the agitation for Normal Schools and County Superintendents till those points are gained. The next step would be to place in these schools thoroughly-trained teachers of Industrial drawing and give them well-equipped drawing or art rooms. For nearly ten years, Massachusetts has had the best of drawing teachers in her Normal schools, with art rooms in all of them, splendidly equipped with casts, copies and appliances, and which are not equalled, and only approached by the high school in one city of Ohio. In this way nearly ten thousand teachers have been instructed in addition to the vast influence the State Normal Art School has exerted. In Ohio as soon as possible, a law, similar to the Massachusetts law of 1870, should be passed making Industrial drawing one of the required subjects of study in all public schools, and requiring all teachers to be examined in drawing when appearing before an examining board for a certificate to teach. After these things are accomplished, something can be done towards a special provision for industrial education.

HEALTH DEPARTMENT.

Editor: A. Hamilton, M. A., M. D., Port Hope.

THE SCHOLAR'S EYE.

II.

Frequency of Defective Vision in Canadian Schools.

Evil Effects of the same.

Cases:—

- (i). *Shortsightedness.*
- (ii). *Oversightedness.*

Having, in the foregoing article, shown how to measure defective vision, let us, in this, consider its frequency, as exhibited in the school-room. Next, let us consider what disadvantages, evils, and positive suffering are entailed on the scholar from defective vision.

Statistics are available to show that high percentages of scholars are below the average in sight. This percentage is commonly greater in proportion to the size of the town or city in which the children reside. In the cities of New York and Boston it is found that a surprisingly large number see badly. *Prima facie* this seems strange. It is, at least in part, accounted for by the fact that the children of cities are in unnatural conditions. Natural conditions pertain in a simple rustic life. Besides, lack of development in general, some faculties and powers are overtaxed and overstimulated. The eye of the city or town child is early accustomed to great use, and much overuse, of his eyes. The illiterate are, as a rule, blessed with keen sight—where no inflammatory diseases have diminished it. My own observation leads me to believe that some of the percentages given are too high. I do not discredit the source from which they come; the inference is only in-

correct. A child, whose vision is $\frac{3}{4}$, $\frac{2}{3}$, or $\frac{1}{2}$, does not necessarily suffer from school work. With a vision of $\frac{2}{3}$, this rarely occurs unless there be prolonged application. Practically, when vision is about $\frac{1}{2}$, there comes serious complaint, and should it be diminished still further, complaint will be great. This applies more especially to vision for distance. I have examined the vision of two hundred pupils in Port Hope, about one-half in the High School; the other in the Central Public School (but not in the Primary departments). Of the two hundred, seventeen, or $8\frac{1}{2}$ per cent., had vision less than $\frac{1}{2}$ for distance. Port Hope has a population of 6,000. In cities I believe the percentage to be higher, in rural districts lower. Eight per cent. is, perhaps, about the average for Ontario. If grades of defective vision greater than $\frac{1}{2}$ are taken into account the percentage is proportionally higher. Mr. Thornhill, of the West Primary School, Port Hope, had sufficient interest in the matter (which, by the way, every teacher has not,) to make an examination of his own pupils, 55 in number, as to their vision for distance. The result in percentage is about that stated. It had also the result of making him acquainted more accurately with the visual condition of several of his pupils. To a considerable extent he can distinguish those who are defective in vision, and manage them accordingly, as by placing them nearer blackboard, maps, &c. On the other hand, he can distinguish some as easily who put in a false plea of defective vision.

This introduces the subject of the scholar suffering many disadvantages and often unjust punishment if he have vision defective to any considerable degree. He is commonly profoundly ignorant of such defect, but supposes he can see both near and far as well as his fellows. If the teacher be at the same time not aware of the serious abnormal conditions under which he labors there is likely to be much fault-finding. He is blamed as idle, inattentive, not studious, and so on. He is a discordant note in what might otherwise be all harmony. He perhaps becomes demoralized as to school life, which has grown irksome. The spur of emulation is lost, for, judging by results, he finds that he comes out far behind in his classes, as a rule, and is discouraged. It is the duty of the teacher to be aware of such defect if present. When the evil is known to the teacher it is half remedied. The other half will often, however, be left quite unattended to, through the apathy of parents. Imagine what disadvantages a child must labor under who has a vision for distance of $\frac{1}{40}$. Vision of $\frac{1}{10}$ and less is not very infrequent in school-rooms.

The two cases following are in several respects interesting and instructive: Ella Watson, aged 13, Oct., 1877, has vision of $\frac{1}{2}$ with left eye, and $\frac{2}{3}$ with the right; with both eyes vision is $\frac{1}{2}$. She is now complaining of vision for distance. A suitable glass brings distant vision up to the normal. She is a case of pure short-sightedness. In June, 1878, her vision is $\frac{2}{3}$ with both eyes. She, however, goes on in school work for nearly three years longer and is an excellent pupil from natural inclination and other advantages. During this time complaints become more urgent, and her natural antipathy to glasses has been overcome. In August, 1880, the vision of the left eye is only $\frac{1}{10}$ and somewhat less with the other. A glass which brings vision

for distance up to almost normal she now accepts as a necessity.

Case II:—Willie McMaster, aged 14, has a high degree of latent over-sightedness. His vision for distance is almost normal. He complains that he cannot read smaller types at all and even those moderately large for but a short time. His lessons to be committed at home are never got, and this he and his mother both declare to be solely because "his eyes are weak" and cannot bear application and study. He excels in arithmetic and is promoted for it, only to be degraded and punished for his imperfect recitations in other subjects. He succeeds in arithmetic because the figures on slate are large and he requires but an application of a few seconds to the printed page to get question, &c., which he can manage before his vision blurs. Geography (from atlas), History, Grammar, are all not half studied. He gets on well enough with black-board and wall maps, for he sees well in the distance, as has been said. Proper treatment at once relieved the difficulty so that he can compete with his classmates on a proper footing in so far as vision goes. He was for a long time not aware but that he saw as well as others.

THE AIR OF THE SCHOOL-ROOM.

In hospital construction it is usually considered that 1500 cubic feet of space is the minimum allowed for each single bed in the wards. The wards are large, well lighted as a rule, and often have a good system of ventilation. At the same rate, each pupil in a school-room should have a minimum of from 700 to 1200 cubic feet of well ventilated air, the figures varying according to the respiratory demands, which depends upon size of chest, and this corresponds in a measure with the age of the pupil. It makes much difference as to height of ceiling. A high ceiling, while giving more breath-

ing space to pupils in closely placed seats, also allows a sort of reservoir at the top of the room for air rendered impure by having been breathed. The lower third of the room contains a purer atmosphere than the upper two-thirds. Where the space, as measured by the number of cubic feet per pupil, is small, and more especially if the ceiling be low, it is highly imperative that a good system of ventilation be present and working. In any case, before the school session opens, the air should be about absolutely pure and fresh, and made approximately so by free ventilation at recesses and noon. This matter concerns the teacher as well as his pupils. Much of the ill-health of the teacher is due to the vitiated air of

the school-room.—*Verbum Sap.*

THE SCHOOL AGE.

A physician gives this opinion on studying at an early age: A healthy child may, perhaps, safely enter the primary school at seven years of age. If nervous, or inclined to talk or be restless in sleep, better wait another year. Then eight years in the current of graded schools will bring one, at fifteen or sixteen, prepared, in brain power and attainment, to enter the high school. If any are to attend college or higher seminaries, nineteen or twenty years is young enough to enter them, as the brain is then beginning to grow still slower, and has attained more firmness to bear labour.—*Exchange.*

MATHEMATICS.

University of Toronto.—Annual Examinations, 1880.

MATHEMATICS PASS.

Examiner: F. HAWTER, B.A.

1. Define *ratio* and *proportion*. Prove that in every proportion the product of the extremes is equal to the product of the means.

Compare the rate of speed of two locomotives, one of which travels $397\frac{5}{8}$ miles in $11\frac{2}{3}$ hours, and the other $262\frac{4}{3}$ miles in $8\frac{4}{9}$ hours.

Describe the units of length, surface and volume in the English and French systems. Given the numerical value of any length in one system, express it in the other.

3. A proprietor of Three per cent. Consols receives his half-yearly dividend and lays it out in the purchase of more Consols at 90. His next half-year's dividend is £457: 10s.; how much does this dividend exceed the former?

4. Simplify

$$(1) \frac{acx^2 + (ad-bc)x - bd}{a^2x^2 - b^2}$$

$$(2) \frac{x^2 + 3x + 2}{x^2 + 2x + 1} \times \frac{x^2 + 5x + 4}{x^2 + 7x + 12}$$

$$(3) \left(\frac{ay}{x}\right)^{\frac{1}{2}} \left(\frac{bx}{y^2}\right)^{\frac{1}{3}} \left(\frac{y^2}{a^3b^2}\right)^{\frac{1}{6}}$$

5. Divide by Horner's Method

$$(1) x^6 - x^2 + 10x - 10 \text{ by } x^3 - 3x^2 + 4x - 2$$

$$(2) 6x^4 - 23x^3 + 22x - 16 \text{ by } 2x^2 - 5x - 8$$

6. Solve

$$(i) (1+x)^{\frac{1}{3}} + (1-x)^{\frac{1}{3}} = 2^{\frac{1}{3}}$$

$$(ii) \begin{cases} \frac{x}{9} + \frac{y}{8} = 43 \\ \frac{x}{8} + \frac{y}{9} = 42 \end{cases}$$

$$(iii) \begin{cases} 7yz = 9(y + z) \\ zx = 8(z + x) \\ xy = 3(x + y) \end{cases}$$

$$(iii) \begin{cases} a^x b^y c^z = l \\ a^y b^z c^x = m \\ a^z b^x c^y = n \end{cases}$$

7. A messenger starts on an errand at the rate of 4 miles an hour; another is sent $1\frac{1}{2}$ hours after to overtake him; the latter walks at the rate of $4\frac{3}{4}$ miles an hour; when and where will he overtake him.

The road from a place A to a place B first ascends for 5 miles, is then level for 4 miles, and afterwards descends for 6 miles, the rest of the distance; a man walks from A to B in 3 hours 52 minutes; the next day he walks back to A in four hours, and he then walks half way to B and back again in 3 hours, 55 minutes; find his rates of walking up hill, on level ground, and down hill.

8. Solve

$$(i) x^2 - 2x + 6(x^2 - 2x + 5)^{\frac{1}{2}} = 11$$

$$(ii) \begin{cases} x^4 + y^4 = 257 \\ x + y = 5 \end{cases}$$

9. From a given point draw a straight line equal to a given straight line.

10. If one side of a triangle be produced, the exterior angle is greater than either of the interior opposite angles.

From a given point there can be drawn only two straight lines equal to one another.

11. If a straight line touches a circle, and from the point of contact a straight line be drawn cutting the circle, the angles made by this line with the line touching the circle shall be equal to the angles which are in the alternate segments of the circle.

P and Q are two points in the circumferences of two concentric circles. The angle included between the tangents at P and Q is equal to that subtended at the centre by PQ .

ALGEBRA.

HONORS.

Examiner: A. K. Blackadar, B. A.

1. Multiply $a^{-2} - 2 + a^2$, by $a^{-1} - 2 + a$, and divide the product by $a^{-2} - a^2 - 2a (a^{-2} - 1)$.

$$2. \text{ Divide } \frac{1+x^3}{(1-x)^3} \left(\frac{1}{1-x} - \frac{x}{1-x^2} + \frac{x^2}{1-x^3} \right)$$

$$\text{by } \frac{1-x+x^2}{(1-x)(1-x^2)(1-x^3)}$$

3. Resolve into factors:

$$(1) 2x^3 - 6x^2 - x + 3.$$

$$(2) 2ab + (a+b) \{ (a+b)^2 + 3(a-b)^2 \} + 8a^2b$$

If $a+b+c = 2s$, shew that

$$s(s-b)(s-c) + s(s-c)(s-a) + s(s-a)(s-b) - (s-a)(s-b)(s-c) \equiv abc.$$

4. Define the terms *Common Divisor* and *Common Multiple*, and prove that every common multiple of two algebraic expressions is a multiple of their least common multiple.

If $p^2 + pq + q^2 = 0$, shew that $x^2 + px + p^2$ and $x^2 + qx + q^2$ have a common divisor $x + p$ and a common multiple $x^3 - p^3$ or $x^3 - q^3$.

5. Find the values of x and y from the equations

$$\begin{cases} a_1x + b_1y + c_1 = 0 \\ a_2x + b_2y + c_2 = 0 \end{cases}$$

by the method of (1) substitution, (2) comparison, (3) elimination by means of arbitrary multipliers.

Find the relation between the constants when the values of x and y are indeterminate.

6. Solve the equations:

$$(1) \frac{a}{x-a} + \frac{b}{x-b} + \frac{c}{x-c} = \frac{abc}{(x-a)(x-b)(x-c)}$$

(2) $\sqrt{x^2 + 3x - 10} + x = \sqrt{x + 5} - 5.$

(3) $\left. \begin{aligned} xz + yz &= xy, \\ x^2(5z + y) &= 5yz, \\ 10z - 6x^2 &= 10xz. \end{aligned} \right\}$

7. Show how to find the product of two simple surds $m\sqrt{a}$ and $n\sqrt{b}$.

From the equation $x^4 - 10x^2 + 1 = 0$, find the values of x in the form of the sum or difference of two surds; and the values of $\frac{1}{x}$ correct to three decimal places.

8. Insert m arithmetic means between a and b .

If 1 be the $(m+1)$ th term in the A. S.

of which the first term is $\frac{m}{n}$ and the last term

is $\frac{n}{m}$, shew that the sum of the series is

$$\frac{(m+n+1)(m^2+n^2)}{2mn}$$

9. Sum the series

$$\frac{3}{1\sqrt{3}} + \frac{\sqrt{3}}{\sqrt{2}} + \frac{1}{2} \sqrt{3} + \dots$$

to $2n$ terms, and to infinity.

10. Find the number of permutations of n things taken r at a time.

Find the number of permutations of the letters in the word *Toronto*, taken all together.

How many different numbers, each containing 6 figures, can be formed out of the 10 digits, in each number, two figures at least being alike?

11. Find the greatest term in the expansion of $(x+a)^n$, n being a positive integer.

Write down the 7th term in the expansion of the square root of $(1-\sqrt{x})^3$.

Shew that

$$n^{-n} = \left\{ \frac{1}{1^2} - \frac{2n-1}{3} + \frac{(2n-1)(3n-2)}{4} - \dots \right\}^{n-1}$$

EUCLID.

HONORS.

Examiner: F. Hayter, B.A.

1. The angles which one straight line makes with another upon one side of it are either two right angles or are together equal to two right angles.

2. If the square described upon one of the sides of a triangle be equal to the squares described upon the other two sides of it, the angle contained by these two sides is a right angle.

3. If a straight line be divided into any two parts, the rectangles contained by the whole and each of the parts are together equal to the square on the whole line.

4. Describe a square which shall be equal to a given rectilineal figure.

5. Find the centre of a given circle.

6. If two circles touch each other externally in any point, the straight line which joins their centres shall pass through the point of contact.

7. From a given circle cut off a segment which shall contain an angle equal to a given rectilineal angle.

8. Inscribe a circle in a given triangle.

9. If a straight line be drawn parallel to one of the sides of a triangle, it shall cut the other sides, or these produced, proportionally.

10. Triangles which have one angle in the

one equal to one angle in the other, and their sides about the equal angles reciprocally proportional are equal to one another.

11. Rectilineal figures which are similar to the same rectilineal figure are also similar to one another.

12. If one angle of a triangle is equal to the sum of the other two, the greatest side is double of the distance of its middle point from the opposite angle.

13. One of the diagonals of a parallelogram being given, and the angle which it makes with one of the sides, complete the parallelo-

gram, so that the other diagonal may be parallel to a given line.

14. Describe a rectangle equal to a given square, and having one of its sides equal to a given straight line.

15. Two points are taken in the diameter of a circle at equal distances from the centre. Through one of these draw any chord, and join its extremities and the other point. The triangle so formed has the sum of the squares of its sides invariable.

16. If ABC is a triangle inscribed in a circle, and the tangent at A meets BC produced in D , prove that

$$CD : BD = CA^2 : BA^2$$

ARITHMETIC.—FIRST CLASS.

July, 1880.

1. Prove the rule for multiplying one fraction by another, and deduce that for dividing one fraction by another.

Prove

$$\frac{\frac{48}{13}}{\frac{35}{13}} + \frac{\frac{48}{36}}{\frac{36}{36}} + \frac{\frac{48}{11}}{\frac{37}{11}} + \frac{\frac{48}{10}}{\frac{38}{10}}$$

$$= \frac{51}{13 \cdot 38}$$

2. Shew, without Algebra, the reasons of the rules for pointing in Multiplication and Division of Decimals.

Reduce to a decimal of four places :

$$\frac{1}{2^2} + \frac{2}{2^3} + \frac{3}{2^4} + \frac{4}{2^5} + \frac{5}{2^6} + \frac{6}{2^7} + \frac{7}{2^8} + \frac{8}{2^9}$$

3. A rectangular piece of ground contains 9 ac., 1 rd., $16\frac{1}{3}$ poles; its length is to its breadth as 3 to 1. Find (1) the distance round it, (2) the distance from one corner to the opposite corner.

4. Investigate a rule for finding the amount of an annuity at compound interest for a term of years.

I borrowed \$2,000 for four years at 10 per cent. compound interest, to be paid in four equal annual payments. Find the annual payment.

5. A piece of glass whose specific gravity is 2.4, and whose weight is $4\frac{1}{2}$ lbs., is found to weigh only $2\frac{1}{2}$ lbs. when weighed in a certain liquid. Find the specific gravity of the liquid.

6. Shew how to find the true discount for a given time and rate.

I bought a bill of goods amounting to \$1,040, for which I gave my note, payable in six months, without interest, and immediately sold the goods for \$1,200 on such a term of credit as made my gain 17 per cent., reckoning money worth 8 per cent. Find the term of credit.

7. Prove that the area of a circle = πr^2 , or = radius $\times \frac{1}{2}$ circumference.

What is the proportional error in the following rough rule for finding the area of a circle? Take $\frac{7}{8}$ of the square on the diameter and add one per cent.

8. A cistern is kept constantly supplied

with water; supposing it full, it is found that 24 equal taps opened together will empty it in $5\frac{1}{2}$ minutes, and 15 of them will empty it in 13 minutes. How many of them will empty it in 33 minutes?

9. State the rule for finding the characteristic of the logarithm for any number.

Find the number of digits in the integral part of

$$30^{20} \times 5^{15} \div 2^{11}$$

and the number of ciphers between the decimal point and the first significant figure of the decimal representing 3^{-15} .

10. (1) The base of a triangle is b , and its altitude a ; required, the distance from the vertex at which a parallel to the base must cut the altitude in order to bisect the triangle.

(2) The perimeter of a right-angled triangle is p , and the radius of the inscribed circle is r ; determine the sides of the triangle.

SECOND CLASS.

(Solutions will appear in next number.)

1. By discounting a note at 20 per cent. per annum, I get $22\frac{1}{2}$ per cent. per annum interest: how long does the note run?

2. A debt is to be paid in 4 equal instalments at 4, 9, 12, 20 months respectively; its cash value is \$750, allowing interest at 5 per cent. simple interest: what is the debt?

3. I had a 60 day note discounted at 1 per cent. a month and paid \$4.80 above true interest: what was the face of the note?

4. What principal must be loaned January

1st at 9 per cent. to be paid by 5 instalments of \$200 each, payable on the first day of the five succeeding months?

5. Bought a check on a suspended bank at 55 per cent.; exchanged it for bonds at 60 per cent., which bear 7 per cent. interest: what rate of interest do I receive on the amount of money invested?

6. My capital increases every year by the same per cent.; at the end of the third year it was \$13,310, at the end of the seventh year, \$19,487.171: what was my original capital, and rate of gain?

7. Bought goods on 4 months' credit; after 7 months I sell them for \$1,500, $2\frac{1}{2}$ per cent. off for cash; my gain is 15 per cent., money worth 6 per cent.; what did I pay for the goods.

8. Exchanged \$5,200 stock bearing 5 per cent. interest at 69, for stock bearing 7 per cent. interest at 92, the interest on each stock having been just paid: what is my cash gain, money worth 6 per cent.?

9. A dairyman took butter to market, for which he received \$49, receiving as many cents a pound as there were pounds: how many pounds were there?

10. What per cent. in advance of cost must a merchant mark his goods, so that, after allowing 5 per cent. of sales for bad debts, an average credit of 6 months, and 7 per cent. of cost of the goods for expenses, he may clear $12\frac{1}{2}$ per cent. on first cost of goods, money worth 6 per cent.

CHEMISTRY.

Answered by Miss Sammons and Miss Simpson.

I.—Describe the chief characters of Ammonia; (2). Ammonia Carbonate, and the process by which they are usually prepared. Give also the chemical reactions which occur in these processes.

Ammonia, a colorless gas of pungent odor, strong alkaline properties; it does not sup-

port combustion, does not burn in cold air; in pure Oxygen it burns, forming water and leaving Nitrogen free.

It is prepared by heating quick-lime and sal-amoniac. Quick lime is put into a glass flask and sal-amoniac is added. Heat is then gently applied, and ammonia gas is given off,

leaving water and Calcium Chloride in the flask. The gas may be collected by upward displacement.



Ammonium Carbonate is a white transparent salt, which decomposes in contact with air, evolving Ammonia.

The Ammonium Carbonate or Sal-volatile of commerce is prepared by heating a mixture of Sal-Ammoniac and Chalk. A mixture of half acid $(\text{NH}_4)_2\text{H}_2(\text{CO}_3)_3$ with Carbonate is formed. The half acid Carbonate in contact with air absorbs Carbonic Acid, and becomes Hydro-Ammonic Carbonate $\text{H} \left\{ \text{NH}_4 \right\} \text{CO}_3$. The Chlorine unites with the Calcium, forming Calcium Chloride (CaCl_2).

II.—Describe fully the modes of decomposing water which you have seen, and state how you would determine whether a given specimen of water is hard or soft. If hard, state (with reasons), the various means by which it may be softened.

(1.) Water may be decomposed (a) by Sodium or Potassium; (b) Electrolysis.

(a). The Sodium or Potassium are placed in the dish containing water (H_2O).

The Sodium or Potassium will replace one atom of Hydrogen in the water, forming Sodid-Hydrate (NaOH), and Potassic Hydrate (KOH).

(b). Electrolysis.—Into a vessel containing slightly acidulated water are led the two connecting wires of an electric battery, the ends of which terminate in platinum plates. Upon the insertion of the wires, the water is immediately decomposed, the Hydrogen appearing at the negative end of the battery, and Oxygen at the positive. If the gases are collected in graduated tubes it will be found that the volume of Hydrogen is twice that of the Oxygen.

(2). If the given specimen of water be hard soap when rubbed in it will form a curdy precipitate; if soft, form a lather.

(3). If water be hard from the union of Calcic Carbonate with it, it may be softened by boiling. Calcic Carbonate is insoluble in

pure water, soluble in water containing Carbon Dioxide. In the process of boiling Carbon Dioxide is driven off, and Calcic Carbonate falls as a white precipitate.

This hardness and that caused by the presence of the Sulphate of Magnesium and Sodium may be softened by adding Sodid Carbonate (Na_2CO_3) to the water. The Sodium will replace the Magnesium and Calcium forming soluble Sulphates, and the Calcium and Magnesium will unite with the Carbonic Acid, forming insoluble Carbonates.

$$\text{MgSO}_4 + \text{Na}_2\text{CO}_3 = \text{MgCO}_3 + \text{Na}_2\text{SO}_4$$

$$\text{Na}_2\text{CO}_3 + \text{CaSO}_4 = \text{CaCO}_3 + \text{Na}_2\text{SO}_4$$

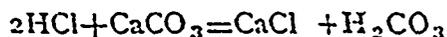
III.—What means are best employed for the collection of Nitric Oxide, Chlorine, Ammonia, Carbonic Acid, Sulphur Dioxide and Nitrous Acid gases.

Nitric Oxide	collected in bell jar over water.
Chlorine	do downward displacement
Ammonia	do upward do
Carbonic Acid	do downward do
Sulphur Dioxide	do downward do
Nitrous Oxide	do downward do

IV.—Describe fully the experiment in which the reactions are given by the equation



Into a glass flask containing lumps of Calcium Carbonate (marble, &c.) covered with water, Hydrochloric Acid is poured. A brisk effervescence immediately commences, Carbonic Dioxide is given off, and may be collected by downward displacement. The Calcium in Calcic Carbonate replaces the Hydrogen in Hydrochloric Acid. The Hydrogen unites with CO_2 of the Calcic Carbonate to form Carbonic Acid (H_2CO_3) which splits up into water and Carbon Dioxide.



V.—Describe some of the properties of Sulphur, and state some of its allotropic modifications and how they are obtained. Sulphur is said to be a dimorphous body—explain.

(1). Sulphur, a yellow solid, conducts electricity very badly, is insoluble in water, but soluble in Carbon Disulphide, and in Oil of Turpentine.

(2). Sulphur has two allotropic forms which differ from each other chemically and physically. (a). One of these occurs free in nature, in crystals of the orthorhombic system. Sulphur in this modification has the specific gravity of 2.07. If melted Sulphur be allowed to cool slowly, it crystallizes in long transparent needle shaped crystals of the oblique rhombic system. These crystals are not stable. Exposed to air they return to the orthorhombic form. (S. G., 1.98.)

Both of these modifications are soluble in Carbon Disulphide. They, therefore, form one of the allotropic forms of Sulphur, and are dimorphous.

(b.) The other form of Sulphur is a plastic substance, and is formed by pouring melted Sulphur heated to 230° into cold water. This form is not soluble in Carbon Disulphide, and returns to the first allotropic form after a few hours, or by plunging it into boiling water.

(3). Sulphur is called dimorphous, that is, two formed, because it crystallizes in two different systems of crystallization, the ortho and oblique rhombic systems.

Q.—6. Calculate the percentage composition by weight of Potassium Nitrate, and of the two Oxides of Carbon.

$$\text{Ans.—KNO}_3 = 39.1 + 14 + 48 = 101.1$$

$$101.1 = 39 \text{ K}$$

$$100 = 38.5 \% \text{ K}$$

$$101.1 = 14 \text{ N}$$

$$100 = 13.8 \% \text{ N}$$

$$101.1 = 48 \text{ O}$$

$$100 = 47.4 \% \text{ O}$$

$$\text{CO}_2 = 12 + 2 \times 16 = 44$$

$$44 = 12 \text{ C}$$

$$100 = 27.27 \% \text{ C}$$

$$44 = 32 \text{ O}$$

$$100 = 72.73 \% \text{ O}$$

$$\text{CO} = 12 + 16 = 28$$

$$28 = 12 \text{ C}$$

$$100 = 42.8 \% \text{ C}$$

$$28 = 16 \text{ O}$$

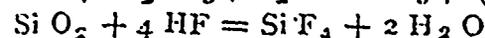
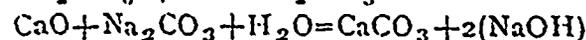
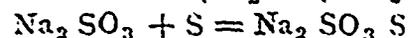
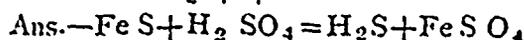
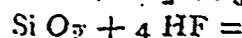
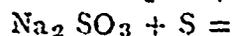
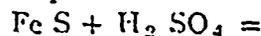
$$100 = 57.2 \% \text{ O}$$

Q.—7. Write down the atomic weight, the molecular weight, the relative weight, the specific gravity, the atomic and the molecular

Vol. of Chlorine, and fully explain the meaning of these terms.

Ans.—The law of Multiple Proportion, which has been established by direct experiment, affirms that definite weights or multiples of definite weights of the elements unite with each other to form chemical compounds. Upon this law Dalton based his atomic theory. He assumed that chemical combination consisted in the approximation of individual, indivisible atoms to one another. An atom, according to this theory, became the smallest particle by weight of an element capable of taking part in a chemical reaction; a *molecule*, a group of atoms, the smallest particle of a compound capable of existing in a free state. The atoms have all the same size but not the same weight. The relation between their weights is represented by the weights with which they combine with one another. The atomic weight, relative weight and combining weight mean the same thing. The molecular weight is double the atomic weight. Specific gravity of Chlorine, compared with the weight of same vol. of air taken as the unit, is found to be 2.47. The atomic volume is one vol. of any unit of vol. taken as standard. The molecular volume is double the atomic vol. The weight of an atom or atomic vol. of Chlorine, an atom or atomic vol. of Hydrogen, taken as standard, is 35.5 grammes or grains, &c. Its molecular weight, $35.5 \times 2 = 71$; its relative weight, 35.5; its atomic vol., one vol. of the unit of vol.; its molecular vol. double the atomic.

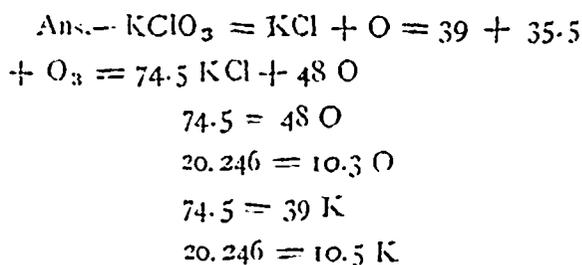
Q.—8. Complete the following equations:



Q.—9. Describe a mode of preparing Sulphur Dioxide, and give and explain the equations representing the reactions. Explain the difference between the bleaching action of Chlorine and Sulphurous Acid.

Ans.—Sulphur Dioxide may be prepared by heating the metals Copper or Mercury in Sulphuric Acid. The metals remove the elements of water and one additional atom of Oxygen from the Sulphuric Acid; $\text{Cu} + 2\text{H}_2\text{SO}_4 = \text{CuSO}_4 + \text{SO}_2 + 2\text{H}_2\text{O}$. In its bleaching action Sulphurous Acid acts as a dioxidizing agent, uniting with the Oxygen of the water to form Sulphuric Acid, and liberating the Hydrogen. Chlorine bleaches by oxidation, uniting with the Hydrogen of the water and liberating the Oxygen.

(c).—10. On completely decomposing by heat a certain weight of Potassium Chlorate, 20.246 grains of Potassium Chloride was obtained. What weight of Potassium was used and how much Oxygen was evolved?



The following Questions were sent to us to be answered.—Answered by T. J. Godfrey.

1. Why do we believe that matter is comprised of molecules? And the simplest molecule consists usually of two atoms?

(a) Molecules are necessary as a part of the "Atom Theory," and that is only a rational way of explaining chemical phenomena. By fresh advances in chemical science, this theory may be replaced by a better one.

That the molecule is composed usually of two atoms, is believed from the fact that elements when in the nascent state are much more active than when free. Another argument favoring this view is the laws of chemical combustion. 1 Mol of H + 1 Mol of Cl. from 2 Mols of H Cl., therefore 1 Mol of H Cl must contain $\frac{1}{2}$ Mol of H and $\frac{1}{2}$ Mol of Cl. There are other facts that point to the same conclusion, but the above will be sufficient answer.

2. A solid is put into water of its own temperature: under what condition will the temperature (a) rise—(b) fall—(c) remain unchanged.

(a) If the solid unites with the water to form a chemical compound the temperature will rise.

(b) If the solid merely dissolves in the water, and no chemical union takes place, the temperature will fall.

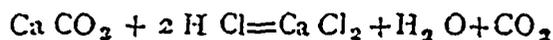
(c) If the solid does not form a chemical compound and does not dissolve, the temperature will remain unchanged.

3. How would you obtain *Calcic Chloride* and *Ferric Oxide* from the following materials: Wood, Iron, Marble, Salt and Sulphuric Acid.

The question is not definite, as far as we understand it, it may be answered as follows:—

(a) By the action of Sulphuric acid on Salt, Hydrochloric acid is formed.

$2 \text{NaCl} + \text{H}_2\text{SO}_4 = \text{HCl} + \text{HNaSO}_4$. If Marble and Hydrochloric acid are brought together in a flask, a brisk effervescence will take place, carbonic acid will be given off and Calcic Chloride will remain.



(b) By the action of Sulphuric acid on iron—Ferrous Sulphate FeSO_4 is formed. Ferric Oxide in the form of amorphous red-brown powder, may be obtained by strongly heating Calcined Ferrous Sulphate, FeSO_4 —Sulphur, Trioxide and Sulphur Dioxide, escaping as gases:



4. What is the cause of the blue flame of coal?

(a) Carbon being a tetrad unites with Oxygen and forms CO_2 when C Burns in an insufficient supply of Oxygen it forms CO , a gas which burns with a lamberit blue flame, so that the blue flame is caused by the carbon of the coal uniting with the O of the air and forming CO .

5. Two rooms have been occupied by pupils until the air in both became impure: How would you ascertain which room contained the greater amount of Carbonic acid?

(a) By passing equal quantity of the air from each room through pure lime water. The air which causes the greatest precipitate in the lime water, is that in which there is most CO_2 . The same would be true if a shallow vessel of the lime solution were allowed to stand in each room for a short time.

6. Is ice formed upon the surface of water containing liquid impurities always pure?

(a) Tyndal in his "Forms of Water," (Page 20) answers this question most beautifully. "Ice of sea water, when melted produces fresh water. The only saline particles

existing in such ice are *those entangled mechanically in its pores*. They have no part or lot in the structure of the Crystal. This *exclusiveness*, if I may use the term, of the water Molecules; *this entire rejection of all foreign elements* from the edifices which they build, is enforced to a surprising degree. Sulphuric acid has so strong an affinity for water that it is one of the most powerful agents known to the Chemist for the removal of humidity from air. Still, as shown by Faraday, when a mixture of Sulphuric acid and water is frozen, the crystal formed is perfectly sweet and free from acidity. *The water alone has lent itself to the crystallising force.*"

7. Under what conditions will water not freeze at 32° Fahr?

(a) If water be kept perfectly still in a clean vessel and gradually cooled, it will often remain liquid even at a lower temperature than 32° Fah. Further, as water expands when it freezes, the application of great pressure may be made to materially lower its freezing point.

NOTES ON DE FIVAS' READER.

P. 50. Ne soit pas une tentation. Soit, subjunctive after surprise. The subjunctive follows expressions of pleasure, sorrow, wonder, surprise, will, desire, consent, command, doubt, fear.

"Depuis plus de trois ans." Depuis refers to the beginning of a period, pendant and durant denote duration; durant embraces the whole extent of the period, pendant is used in the same sense, but also with reference to only a portion of the period e. g. durant la guerre, while it lasted; pendant la guerre, at some time of it; pendant is preferable when we speak of some particular circumstance,

pendant sa prosperite it etait insolent.

"Par un defi. Nouns in "i" are masc except foi, fourmi, apres-midi, loi, merci, (mercy.)

"Puis then; homonyms, (je) puis, can; puits, m. well.

51 Desormais, henceforth, from des, ore (L. hora) mais (L. magis), from this hour forward, *mais* had formerly the sense of plus, more. Compare dorenavant, d'ore en avant, from this hour forward.

"Chacun mange en paix," mange subjunctive after pour que, nouns in *ix* are masc, except croix, noix, paix, perdrix, poix (pitch), voix.

- 52 "Avant l'aout," pronounce *oo*, names of months are masc, except when preceded by *mi*, la *mi-mai*, la *mi-aout*, the middle of.
- 53 "Dussent-ils," if the word introducing the subjunctive is omitted, the subject is placed after the verb. De F. 464.
- "Aussi sage qu'on peut l'etre." *L'* refers to *sage*, not translated.
- "Il devait se marier a.," distinguish *marier*, *se marier*, *epouser*, (a) un pere marie son fils ou sa fille a ou avec q. u. le maire, le pasteur marie les gens.
(b) les gens se marient; un homme se marie a ou avec une femme, et une femme se marie etc.
(c) un homme epouse une femme, une femme epouse un homme.
- "Ils touchaient au moment"—they were approaching the moment, *toucher la ou dans la main*; to shake hands (on concluding a bargain, etc.)
- 54 "Le mit au bord du tombeau," brought him to the verge of the grave, distinguish *tombe*, *tombeau*, *sepulchre*; *tombe*, f, tablet or headstone; *tombeau*, a more elaborate monument, (in derivation it is the diminutive of *tombe*), *sepulchre*, place of burial; *tombe* and *tombeau* are both used also in the sense of grave.
- "Qu'avez-vous?" What is the matter with you; *je n'ai rien*.
- "Hors de vous-meme, beside yourself; hors d'affaire, out of danger (in sickness.)
- 55 "Le lendemain," deriv, l'en demain; compare le *lierre*, ivy, l'*hierre*, *hierre*, from *L. heder*a; comp, also, le *loriot*, oriole; *lors*, then, l'ores (*L. hora*.)
- "Quelqu'une qui fut bonne," fut subjunctive after relative expressing doubt. De F. 575.
- "Un seul remede qui puisse," subjunctive after superlative with a relative. De F. 574.
- 56 "Trop difficile a vivre," whimsical, *Il est difficile en son manger*, he is particular about his food.
- "Ne douterent pas qu'il n'eut." *nier*, *desesperer*, take *ne* before the dependent verb in the subjunctive when they are used negatively or interrogatively.
- 59 "L'occasion s'en presenta bien-tot," en, for it, compare De F. 490; la situation en est etc.
- "Alla vers le lion" *vers*, towards, physical tendency or time, *vers les trois heures*; *envers* denotes moral tendency, *crüel envers ses ennemis*.
- 60 "J'ai toujours ete brouille." I have always been at variance--*brouiller les gens*, to make mischief; *se brouiller*, to get embroiled, *le temps se brouille*, the sky is getting overcast.
- 61 "Est obligé de comparaitre," obliger active takes a, passive, de before an infinitive. *Cela m'a obligé a agir ainsi*; *je suis obligé d'agir ainsi*,
- "Il traite l'Indien de fourbe." He treats the Indian as a knave.
- 62 *Un marchand turc*. Adjectives in *c* take *qu* in the fem, to preserve the hard sound before *e* mute; *publique*, *caduque*; compare *long*, *longue*; in grecque, the *c* is a misspelling of the 16th century.
- "Il pretendait qu'il." He maintained, contended.
- "Il en porta sa plainte.—en refers to "sentence" concerning it.
- "Le matelot fit serment qu'il."—*faire serment*, to affirm on a formal oath, *jur*er said of profanity, and also of a formal oath.
- 63 "A faire crier"—*faire* with an in-

- finitive, to have a thing done.
- “ Il en jouira ”—en trans it; jouer requires de before the object; jouir de q. c. to enjoy s. t.
- “ Le fruit de son industrie: ” “ industrie ” is skill, dexterity, also trade, business; “ industrius ” is ingenious, skilful.
- “ Il y aurait de quoi mourir de honte. ” There would be reason for your dying of shame.—Il a de quoi vivre, he has the means of living. Il n’a pas de quoi payer ses dettes.
- 64 Venait de s’y laisser. ” Had just fallen in, venir de faire, to have just done; aller faire, to be on the point of doing.
- 66 “ A tel endroit, ” at such a place; Monsieur un tel, Madame une telle, Mr., Mrs. so and so; Tel, pareil, semblable, tel denotes perfect conformity in the objects compared; pareil denotes a close resemblance between objects that may differ in minor details; semblable denotes a likeness or analogy though the nature and characters be distinct.
- “ Cette affaire se viderait, ”—should be settled.
- 67 Se plaignit de ce qu’on etc., ” he complained that any one should take advantage of his misfortune to come and insult him.—Plaindre, to pity, se plaindre, to complain.—insulter q. u. insult some one.—Insulter a q. n. to be regardless of one’s misery, misfortune, etc.
- Venir faire to come and do or come to do; venir a faire, to happen to do; venir de faire, to have just done.
- “ Legs ” legacy, homonyms *les*, article; *lait*, m, milk; *lai*, lay, layman; *laid*, ugly; *laie*, f. path; *lais*, m. standard tree.
- 68 “ Si leroi, etc. ” si, if, is followed in the clause expressing condition, by the pres. or imp, Ind. (or sometimes the plup. subjunctive) but not by the fut. or condit.; but *si*, whether, may be fol. by the fut. or condit.; e. g. (a) s’il le fait je le louerai. S’il le faisait je le louerais, (b) je ne sais s’il le fera on non.
- “ Au beau premier lapidaire; ” to the very first.
- “ Mil. ” m. millet; the l has properly the liquid sound though rhyming here with “ il. ”
- “ Ducaton, m, ducatoon; diminutive for ducat: The diminutive terminations in French are (1) aille. (2) as, m. asse, f. (3) eau, m. elle, f. (4) et, m. ette, f. (5) on, illon, m. (6) ot, m. otte, f.
- 69 “ But, ” m. aim, t sounded at the end of a phrase or before a vowel sound.
- 70 “ Voici comment nous devons, etc. ” this is how we must set about it.
- “ Espèces, ” cash, ready money.
- “ Partie, f part, portion of a whole; *part*, share, the part that one is to receive, *parti*, m, a union of persons as a political party.

NOTE.—Accents will appear in future articles. They are unavoidably omitted in this Number.

QUESTIONS ON THE LADY OF THE LAKE AND CONTEMPORARY LITERATURE.

1. Mention the great periods of English Literature, and name the representative poets of each.
2. Trace the origin and enumerate the chief characters of the poetry of the age of Scott, and compare this age with that of Pope, accounting for any peculiarities you mention.
3. Mention any circumstances that entered into the cause of the great poetic activity of the beginning of the century.
4. Write a note on the awakened interest in old English poems about the close of the last century, its cause and effects.
5. What relation did Scott bear to the contemporary poetry? what effect has his poetry had on our literature?
6. Write a note on the peculiarities and objects of the "Lay," or "Metrical romance."
7. Enumerate and account for some of the peculiarities of Scott's poetry, and estimate his position as a poet, comparing him with some of his contemporaries.
8. What is meant by the terms "Lake School," "Natural Poets," "Poets of Liberty," "Romantic School," "Metaphysical School."
9. How do the influences of German and of French literatures respectively show themselves on our literature? At what periods has each been felt? Name poets showing such influence.
10. Name and characterize the author of each of the following:—*Task*, *Thalaba*, *Excursion*, *Pleasures of Hope*, *Pleasures of Memory*, *Don Juan*, *Queen Mab*, *Hyperion*.
11. Explain the terms *realism* and *idealism* as used in literature, and show where Scott exhibits each of these qualities.
12. What are the principal advantages and disadvantages attending an *interest of plot*, as in the *Lady of the Lake*?
13. Discuss the influence of the French Revolution upon the literature of this period.
14. Investigate the alleged aristocratic inclinations of Scott, pointing out evidence of them, if any, in his life and writings.
15. Write a short note on the peculiarities of Scott's diction, showing how far it had been affected by the nature of his subject.
16. "Characters in fiction should be well defined, well sustained, and varied, as well as natural and consistent."—*Armstrong's Notes to L. of L.*—Apply this rule to any of the principal characters in the "*Lady of the Lake*."
17. Enumerate the chief means employed by Scott to maintain the interest of the reader.
18. Show how far the metre employed in the "*Lady of the Lake*," harmonizes with the general character of the poem.
19. Discuss the propriety of the title of the poem "*Lady of the Lake*."
20. What are the advantages of the system adopted by Scott in subdividing the poem?
21. Explain the effect of the archaisms to be met with in the poem.
22. Give the most probable reasons for the retirement of Scott from the field of poetry.

(To be Continued.)

ANSWERS TO THE ENGLISH PAPER IN THE UNIVERSITY OF LONDON.

(Continued from last Number.)

X. The chief difference between the strong, and the weak conjugations is in the manner of forming the past tense. In verbs of the strong conjugation, the past tense and past participle are denoted by a change in the radical vowel, whilst the termination "d" or "ed" is added to the root in the weak.

The only inflections for person in the weak conjugation, are "st" or "eth" in the second, and "s" "es" in the third person singular. These terminations were originally personal pronouns, added to the verb "t" in "est," being an outgrowth of the "s" while "s" in the third person is a softened form of "th" derived from the demonstrative pronoun "thæt," or some cognate form. The ending "d" or "ed" in the past tense, which is a contracted form of "did," the preterite of do, was joined to the verb by the connecting vowel "e." The perfect participle was formed by prefixing "ge" and adding "d" or "s" for the weak, and "en" for the strong. Probably adjective forms, the prefix *ge* has now disappeared, but "d" or "t" is still retained.

XI. Shall was an old preterite of sculan to kill, and as in Anglo-saxon the past tense had no terminations to denote person, in its use as a present tense, these are wanting. Should formed from shall by the weak conjugation, is now used to supply its place in the past. As killing involved the payment of a fine, "I shall," came to mean, I owe the fine, and then simply I owe, thence it was employed to denote compulsion arising from some external force, which meaning it still

retains in commands. Shall as now used is a verb of incomplete predication, followed by the infinitive without "to."

Will has been formed after the analogy of shall, though it is strictly a present tense. In addition to its use in the 2nd and 3rd persons as an auxiliary for forming future tenses, will is also employed to denote determination. Will also expresses the frequent repetition of an act.

Can, a preterite of the verb cunnan, to know, is now used with a present meaning, whilst could supplies its place as a past tense. The "l" in could does not belong to the root, but was inserted after the analogy of would and should. Can is now employed as a verb of incomplete predication and is followed by the infinitive without *to*.

May was originally mag, an old preterite of magan, and had a perfect meaning, which passed into a secondary present sense denoting the abiding result of an action, hence it is used to denote wish. May is also employed as an auxiliary instead of the subjunctive mood after "that" and "lest" and is followed by the infinitive without *to*.

XII. Tense is a variation of form in verbs or a compound verbal phrase, indicating partly the time to which an action or event is referred, and partly the completeness or incompleteness of the event at the time indicated. Moods are certain variations of form in verbs, by means of which we can show the mode or manner in which the attribute or fact indicated by the verb is connected in thought with the thing that is spoken of.

In Anglo-saxon the present tense

was often used for the future, but, shall and will were also made use of, shall being the usual, future auxiliary. The future tenses are now formed by means of these verbs, shall being used for the first person, will for the second and third. In affirmative principal sentences but in subordinate clauses after a relative or such words as *if, when, as though, unless, etc.*, the verb shall is used for all three persons.

The subjunctive mood is represented in modern English by a distinct form of the verb or by auxiliaries. When the forms of the first person singular and of the plural are the same as in the indicative, the second and third persons drop the personal inflections with the exception of *were*. When auxiliary verbs are used it is only by their endings or by the context that we can distinguish the subjunctive from the indicative. In Anglo-saxon the ending of the subjunctive singular was "e," and in the plural "an" "on" or "en," having no terminations in the second and third singular to denote person.

In modern English the subjunctive mood is used:—

1. In clauses denoting a supposition, concession or wish contrary to fact.

2. The subjunctive is used in hypothetical or concessive clauses relating to the future, which express a mere conception of the mind not contemplated as something that will be put to the test of actual fact.

3. Suppositions regarding what actually will be the case in the future may be expressed by the subjunctive.

4. The simple subjunctive present is employed when a concession is expressed without the use of the verb "let."

5. The present subjunctive is used to express a wish.

6. In poetry, the simple present subjunctive is used after "that" or "lest" to express purpose.

XIII. A word which is in its sim-

plest form, and can not be traced further, is called a "root."

If the crude form be regarded as a root, as it sometimes is, then the word as it appears in actual use in its simplest form, is the stem. When a root undergoes an alteration of form, either by the modification of the letters or by an addition, the new form is called a primary derivative, or with reference to other words to be formed from it, a stem.

If from the stem-word other words are formed by prefixes or affixes, they are called secondary derivatives.

A compound word is one that is made up, of two or more parts, each of which is a significant word by itself.

Song, bait, batch, thicket, hemlock, eyrie, along, are primary derivatives.

Suds, farthing, landscape, knowledge, are secondary derivatives.

Wedlock, gossip, waylay, are compound words.

(a.) *They were both fond of one another* should be *they were fond of each other*; each other refers to two, one another to more than two.

(b.) *Thersites' body is as good as Ajax, when neither is alive* should be *Thersites' body is as good as Ajax', when neither is alive*. The apostrophe should be used after Ajax because the possessive case in the singular number of nouns ending in s, x, or ce, is marked by placing an apostrophe only after the word, however, it is quite correct to use the s as well as the apostrophe, but it causes a hissing sound sometimes. The verb must be in the singular because its subject body is singular.

(c.) *How much more elder art thou than thy looks*. It is incorrect to have a double comparative, and elder is only used in speaking of members of the same family to denote priority of birth, hence we must use older which refers to age, &c., therefore this should be *how much older art thou than thy looks*.

(d.) *The elder house* is correct if house means family, but incorrect if house has its usual meaning. If taken in the last way it should be the older house, as elder denotes priority of birth.

(e.) *There are no less than five sons concerned* should be *there are no fewer than five sons concerned* as fewer refers to number and less to quantity, although the use of less in this sentence can be justified.

(f.) *They are the six first lines in Paradise Lost* should be the first six lines if we refer to the first six lines of the poem.

(g.) *Neither he nor we are disengaged* is correct because where two substantives taken separately are of different numbers the verb agrees with the one next it and the plural one is generally placed last.

(h.) *One of the best books that has been written on the subject* should be one of the best books that *have* been written on the subject; a verb must agree in number and person with its subject and the subject *that* is plural, having books for its antecedent.

(i.) *I like it better than any* is incorrect because it may have two meanings, either I like it better than I like any other, or I like it better than any one else likes it.

11. (k) *And since I never dare to write as funny as I can* should be. *And since I never dare to write in as funny a strain as I can*, adjectives should not be used for adverbs.

(l) *Laying the suspicion on somebody I know not who in the country* should be *laying the suspicion on somebody I know not whom in the country*—transitive verbs and prepositions govern the objective—and *who* is in the nominative.

(m) *Well is him that hath found prudence.* The modern form would be, *well is he that has found prudence* as the subject of a finite verb is put in nominative, and we have *has* instead of *hath* as a verb must agree with its subject in number and person, and that is in the third person, having *he* for its antecedent.

As however this from its form is an old phrase, *hath* is correct as also is *him* being in the dative after the exclamatory adverb.

PUBLIC SCHOOL DEPARTMENT.

PROMOTION EXAMINATIONS.

We give the following question-papers used at the mid-summer promotion examinations in the Goderich Model School, feeling sure that our County-school teacher patrons will be glad to see what is expected from pupils in towns and villages—glad also to have sets of papers with which to test the proficiency of their own pupils:

ARITHMETIC.

From 2nd to 3rd Class.

1. How often is 9 contained in the difference between 30765423 and 473-24362?

2. By what must 234 be multiplied to give for a product 132678?

3. A person bought 140 horses at \$125 each, and 575 sheep at \$5 per head; find total amount paid for them.

4. How many times is 9 contained in 12 times 1024067?

5. How many lots at \$145 each can be bought for \$14355?

6. From the sum 7806423 and 70865 take the product of 435 and 78.

7. $49306402 \div 654$.

8. How many pounds of butter at 15 cents per pound will be required to pay for 3 yards of cloth at \$2 per yard?

9. A farmer paid \$350 for horses, \$240 for cows, \$22 for a plough, \$18 for harrows, \$75 for a waggon and \$475 for other implements. After paying for them he had \$425 left; how much money had he at first?

10. A merchant bought wheat as follows: on Monday 78056 pounds, on Tuesday 10945 pounds, on Wednesday 70045 pounds, on Thursday 240642 pounds, on Friday 23456 pounds. On Saturday he sold twelve car loads 34567 pounds each; how many pounds had he left?

NOTE—Full work required—10 marks for each question.

From 3rd to 4th Class.

1. Express 987654321 square inches, in acres, roods, etc.

2. Multiply the difference between £257, 17s, 9¼d, and £400, 6s, 3½d by CMIX.

3. What number divided by 496 will give 49 for quotient and 207 for remainder?

4. The quotient is 17 acres, 27 perches, 19 yds., the dividend 970 acres, 39 per.; find the divisor.

5. An estate worth £3456, 7s, 8d is divided among 3 children; the first gets £1234, 5s, 6½d, the second gets half as much, and the third gets the remainder; find share of each.

6. If 7 yds of cloth cost \$35 how many bushels of potatoes at 35c. per bushel must I give for 5 yds. of the same cloth.

7. By what must 957 acres, 3 rds., 27 yds., be divided to give 30 for quotient?

Additional for Senior Section.

8. Find value of $2\frac{1}{3}$ of $\frac{4}{5} + \frac{3}{4} + 4\frac{1}{2}$
of $1\frac{1}{3} - 4\frac{1}{5}$

9. After selling $\frac{2}{3}$ of $\frac{3}{4}$ of my farm and renting $\frac{2}{3}$ of $\frac{3}{4}$ of the remainder I have 35 acres left: how many acres had I at first?

10. How often can the G. C. M. of 972 and 1440 be subtracted from the L. C. M. of 7, 8, 9, 10, 11, 12, 13, 14, 15?

NOTE—Full work required—10 marks for each question.

GRAMMAR.

1. Define. Orthography, syllable, letter, vowel, sentence.

2. Give three examples of words containing proper diphthongs, and three each of "w" and "y" used as vowels.

3. Of what use are capital letters, and when are they used?

4. Classify the words in the following sentence:—

The huge forests of North America are being gradually destroyed by the woodman's axe, and still more rapidly by the fires that break out in them and destroy the woods for many miles.

Additional for Senior Section.

5. Parse the nouns and pronouns, and compare the adjectives in previous sentence.

6. Divide into noun part and verb part:—

There was no one in the room.
That father, faint in death below,
His voice no longer heard.
I long to see the Northern Lights.

7. Correct, where necessary, the following sentences:—

You said you would give us ice cream and you never done it.
Me and Tom often went boating.
She dont want to be promoted.

GEOGRAPHY.

1. Define Plateau, Watershed, Horizon, Isthmus, Latitude, Longitude, Equator, Estuary.

2. Name and give the capitals of the countries of South America that border on the Pacific coast.

3. Name three rivers of North America flowing into the Pacific and three flowing into the Atlantic. Through what country does each flow?

4. Name the counties of Ontario that do not border on any of the lakes or rivers that form the boundaries of the Province.

5. Where and what are Collingwood, Scugog, Chaleur, Falkland, Guelph, Montreal, Nelson, Trinidad, Severn, Para?

Additional for Senior Section.

6. Through what counties would you pass in going by rail from Goderich to Toronto? What counties would you pass in going by water?

7. Show by a figure the shape of the earth and on it mark the position of each of the Tropics, Polar Circles, Ecliptic and a Meridian.

8. Name the countries of Europe bordering on the west coast, and those of Asia bordering on the Indian Ocean. Give capitals.

CANADIAN HISTORY.

1. Tell how Cartier and Champlain treated the Indian tribes.

2. For what were the following men noted:—Frontenac, Wolfe, Brock, Tecumseh, Ld. Durham, Champlain?

3. Name the principal events of the war which ended with the capture of Quebec in 1759. How often, and when was Quebec taken?

4. What is meant by the U. E. Loyalists, Clergy Reserves, Fenian Raids?

5. Give a brief account of the Rebellion of 1837.

6. Tell clearly what is meant by

Confederation. When was it brought about?

7. Name the last four Governors of Canada, and tell what you know of the last two.

From 4th to 5th Class.

ARITHMETIC.

1. Find the sum, difference and product of 2.926 and .515.

2. Divide the sum of six millions seventy thousand and nine, and five millions eight hundred and twenty thousand and nine by their difference. Quotient to be correct to three decimal places.

3. Find the value of $\frac{\frac{1}{2} + \frac{1}{3} + \frac{1}{4}}{\frac{1}{2\frac{1}{2}} + \frac{1}{3\frac{1}{2}} + \frac{1}{4\frac{1}{2}}}$ of \$100.

4. Simplify $\frac{8\frac{1}{2} \times 2\frac{2}{3} \div 8\frac{1}{2} - 2\frac{2}{3}}{8\frac{1}{2} + 2\frac{2}{3} \div 8\frac{1}{2} \div 2\frac{2}{3}}$

5. A vessel is required to be exactly filled by any one of the following measures, 2 pints, 3 quarts, 7 quarts, 2 gallons or 5 gallons. Find the smallest vessel for the purpose.

6 Find the value of $\frac{7\frac{3}{5}}{6\frac{3}{5}}$ of a 5 cwts., and express the result as a fraction of half a ton. Answer to four decimals.

7. A gentleman left his eldest son $\frac{5}{8}$ of his money, to the younger $\frac{5}{8}$ of the remainder and the rest to his wife; upon dividing the money it was found that the eldest son had \$750 more than the younger. How much was left to each?

8. A can do a piece of work in 3 days, B can do twice as much in 8 days, and C five times as much in 12 days; in what time can they do a piece of work three times as great if all work together?

9. A person buys 20,000 bushels of wheat at \$1.05 a bushel; he keeps it 7 mos., during which it loses in quantity $1\frac{1}{2}$ per cent., if money be worth

7 per cent., and his incidental expenses \$500, what does he gain or lose by selling the wheat at \$1.95 per bushel?

10. Define interest, both simple and compound. Find the difference between the simple and the compound interest of \$800 for two years. at 8 per cent. per annum payable half yearly.

NOTE—Full work required—10 marks for each question.

ENGLISH HISTORY.

1. Describe the first conquest of Britain by any foreign people.

2. What races of people settled Europe before 1100, and from what parts of Europe did they come?

3. Give any reason you can for Alfred being called the "Great."

4. Describe the Feudal System.

5. How did Ethelred II. treat the Danes?

6. Tell what you know about Agricola, Dunstan, Godwin, Laufrane, Canute.

Additional for Senior Section.

7. Where are the following places, and for what are they noted:—Crecy, Flodden, Pecquigny, Blenheim, Utrecht?

8. Give full account of the Reformation or the Revolution.

9. Name the principal Acts of Parliament passed during the reign of Charles II., and describe as fully as possible any one of them.

10. Trace the descent of Queen Victoria, from James I.

11. When were Wales, Ireland and Scotland respectively united to England? Give provisions of Acts of Union in two latter cases.

GEOGRAPHY.

1. Give the boundaries of British Columbia and South America.

2. Name five large cities in the United States; also five in Canada. State where each is situated.

3. Give a reason why there is no larger river in South America flowing into the Pacific Ocean.

4. Trace a trip from Fredericton, N. B., to Duluth, by water; from thence to Winnipeg.

5. Draw a map of Ontario. Fill in as fully as time will permit.

6. Where and what are Jamaica, California, Sitka, Quito, Fundy, Verte, Battleford, Albany, St. Louis, Biscay, Madagascar, Ganges, Baltic, Strathroy, Magdalen, Haarlem, Emerson, Fraser, Magellan, Venice, Hillsborough, Odessa, Tay and Liverpool.

7. Name all the British Colonies and dependencies in the Eastern Hemisphere, giving the position and chief towns of each.

8. In sailing along the coast from the mouth of the Seine to the Dardanelles what are the most noted cities and the most striking objects you might see? Give the position and a short description of each.

9. Explain fully and illustrate by a drawing the following:—Equator, Poles, Meridians, Parallels, Tropics and Circles.

10. Distinguish between the diurnal and annual motions of the earth, and state the results of each.

GRAMMAR.

1. Explain the meaning of *Etymology, Common Gender, Infinitive Mood, Passive Voice, Subordinate Conjunction, Pluperfect Tense.*

2. What kind of adjectives cannot be compared and what nouns have the same form in both numbers?

3. Write the plural of *attorney, tobacco, medium, mussulman, wharf*, the positive and superlative, of *better, worse, more, former*, the past tense, the present participle and the past participle of *arrive, swing, sit, die, choose, lay, burst.*

4. Parse the following sentence.—

"On leaving I embraced the children, who looked wonderingly at my crutches, and two hours later I was at Granville."

5. Analyze fully the above sentence.

Additional for Senior Section.

6. Analyze fully the following sentence and parse the words in italics.

"When we met with accident, or heard the conversation, or saw the spectacle or *felt* the emotion, which were the first cause or *occasion* of *some* of the chief permanent tendencies of future life, *how little* could we think that *long* afterwards we might be curiously and in vain desirous to investigate those tendencies *back* to their origin."

7. Correct the following sentences and give the rule in each case:

(a) Our happiness or misery is in a great measure placed in our own hands.

(b) He was drove that hard that he soon throwed up his situation.

(c) Not one in fifty of these writers can express themselves with correctness.

(d) Thomas seen his father coming and run to meet him.

ADMISSION TO HIGH SCHOOLS.

For the benefit of Teachers preparing pupils for future examinations, and parents who may wish to know something of the ordeal their children are required to undergo, we present below the papers set for June, 1880.

ARITHMETIC.

Time—Two Hours.

Values

10 1. Multiply one hundred and seventy-four million, five hundred and fifty thousand, six hundred and thirteen, by six hundred thousand, four hundred and seventeen. Explain why each partial product is removed one place to the left.

Values
10

2. Define *measure*, *common measure* and *greatest common measure*.

Find the G. C. M. of 153517 and 7389501522.

10

3. Shew that $\frac{2}{3} = \frac{8}{12}$.

Simplify $\frac{4\frac{1}{3} \text{ of } \frac{2}{3} \text{ of } 7\frac{3}{7} + 12\frac{1}{5} - 2\frac{3}{7}}$

$$\frac{2\frac{1}{3} + 1\frac{4}{5}}{9\frac{2}{7} - 3\frac{2}{15}} = \frac{12354}{12355}$$

10

4. A brick wall is to be built 90 feet long, 17 feet high, and 4 feet thick; each brick is 9 inches long, $4\frac{1}{2}$ inches wide and $2\frac{1}{2}$ inches thick. How many bricks will be required?

10

5. A merchant received a case of goods invoiced as follows:—

12 pieces of silk, each 48 yds., at 5s. 3d. per yd.

15 pieces of cotton, each 60 yds., at $6\frac{1}{4}$ d. per yd.

20 pieces of cotton, each 56 yds., at $4\frac{3}{4}$ d. per yd.

14 pieces of Irish linen, each 40 yds., at 1s. $3\frac{1}{2}$ d. per yd.

Supposing the shilling to be worth $24\frac{1}{3}$ cents, find the amount of the above bill of goods.

10

6. Divide 76.391955 by nine hundred and twenty thousand three hundred and eighty-five *ten-billionths*.

10

7. D. D. Wilson, of Seaforth, exported last year 8360 barrels of eggs, each containing the same number. He received an average price of 14.85 cents per dozen. Allowing the cost (including packing, &c) to have been 13.5 cents per dozen, and the entire profit to have been \$7900.20, find the number of eggs packed in each barrel.

10

8. The dimensions of the *Globe* newspaper are 50 inches by 32

Values | inches, and the Daily issue is about 24,000 copies; how many miles of Yonge street, which is about 70 feet wide, might be covered with ten weeks' issue?

10 | 9. A flag-staff 120 feet high was broken off by the wind, and it was found that .76 of the longer part was $\frac{2}{5}$ of $9\frac{1}{2}$ times the shorter part. Find the length of each part.

10 | 10. A and B together can do a piece of work in $\frac{3}{4}$ of a day. B and C in $\frac{9}{10}$ of a day, and C and A in $1\frac{3}{5}$ of a day. In what time could all working together do the work?

ENGLISH HISTORY.

Time—One hour and a half.

Values

15*i.e.* | 1. Explain what is meant by the following terms:—

2½
+2½
+2½
+2½
+2½
+2½

Feudalism, Crusade, the Invincible Armada, Cabinet Minister, the Pretender, the Premier.

12 | 2. Name, in order, the sovereigns of Great Britain from James I. to Victoria, showing how each was related to his or her predecessor.

9*i.e.* | 3. What were the wars of the
3 + 3
+ 3
Roses? When were they waged? Why are they important events in English history?

9*i.e.* | 4. In whose reign did these
3 + 3
+ 3
eminent persons live, and for what is each of them distinguished: Thomas a Becket, Sir Walter Raleigh, William Pitt?

15*i.e.* | 5. What was the cause of the
5 + 5
+ 5
Great Civil War in England? Who were the principal persons engaged in it? What were its results?

12 | 6. What are the principal differences between the British Parliament and that of the Dominion?

COMPOSITION.

Time—One Hour and a Quarter.

Values

12 | 1. Insert the necessary punctuation marks and correct the spelling in—

A little way below the great fall the river is comparatively speaking so tranquil that a ferry-boat plies between the Canada and American shores for the convenience of travellers when I first crossed the heaving flood tossed about the skiff with a violence that seemed very alarming but as soon as we gained the middle of the river my attention was altogether engaged by the surpassing grandeur of the scene before me I was now within the area of a semi-circle of cataracts more than three thousand feet in extent and floated on the surface of a gulf fathomless and interminable majestic cliffs splendid rainbows lofty trees and columns of spray were the gorgeous decorations of this theatre of wonders.

18 | 2. Render into good English—

The owl conceals itself by day in the recesses of ivy-clad ruins. He conceals himself in the hollows of old trees. It conceals itself in barns. It conceals itself in haylofts. Towards twilight it quits its perch. Towards twilight it takes a regular circuit round the fields. It skims along the ground in quest of mice. It skims along the ground in quest of rats. It skims along in quest of moles, shrews, and large insects. It seizes its prey. It returns with it in his claws. The owl is of great utility. It destroys an enormous quantity of mice. It destroys an enormous quantity of other vermin. These

Values
—
would otherwise do incredible damage.

6x4 3. Improve the following sentences:—

Napoleon gained a great lot of battles before his career was finished.

I shall be much obliged if you would do so.

We arrived about the middle of the day in Toronto.

You are not the boy whom I promised to give it to.

A virtuous and pious life will prove the best preparation for immortality and death.

All the money was spent by my brother which you gave me.

18 4. Write at least twelve lines on *The Magna Charta*.

Outline.—The tyranny and rapacity of John; the Barons determine to vindicate their rights; Magna Charta drawn up; its chief provisions; John refuses to grant it; London is seized by the nobles; the king reluctantly signs the document; persuades the Pope to annul the charter; traverses through the kingdom with hired mercenaries laying it waste with fire and sword; his sudden death relieves the nation.

ENGLISH GRAMMAR.

Time—Two Hours.

Values

42 1. Parse—"The stranger trod upon alabaster slabs, each bearing an inscription recording the titles, genealogy, and achievements of the great king."

12 2. "Analyze—"He who entered them might thus read the history, and learn the glory and triumphs of the nation.

12 3. (a) Define four classes of 8+4 Pronouns, and give an example of each class.

Values. (b) Decline *Hein* in both numbers.

15 4. Correct the following, if 3x5 necessary, giving your reasons for making the changes:—

(a) It could not have been her.

(b) You are stronger than me.

(c) I cannot work like you.

(d) My friends approve my decision, especially them who are best acquainted with the circumstances.

(e) I do not know neither how it was done nor who done it.

10 5. (a) What nouns form their 4+6 plural by adding *es* to the singular?

(b) Write the *possessive plural* of *lady*, *orphan*, *mechanic*.

9 6. Write the *third singular* form of *to see* in each tense in the indicative mood.

FOURTH BOOK AND SPELLING.

Time—One Hour and a Half.

Values

13 1. Tell what you know about the battle Thermopylae.

2. "Impoverished by these disasters, it was not till the patent had nearly expired that Sir Humphrey procured the means to equip another expedition. With the assistance of Raleigh, now in high favor with the Queen, he collected a fleet of five ships. "We were in all," says the chronicler of the voyage, "two hundred and sixty men; among whom we had of every faculty good choice; as shipwrights, masons, carpenters, smiths, and such like, requisite to such an action; also mineral men, and refiners. Besides, for solace of our own people, and allurements of the savages, we were provided with music in good variety; not omitting the best toys for morris-dancers, hobby-horses and many like conceits."

Fourth Reader pp. 34 and 35.

2 + 2 | 3. (i.) Give Sir Humphrey's sur-
+ 6 | name ; quote the celebrated say-
| ing he uttered before he was lost,
| and tell what you know about
| the expedition.

2 | (ii.) Name the queen referred
| to.

2 | (iii.) Tell what you know about
| Raleigh.

11 | (iv.) Explain the meaning of
| 'impoverished,' 'disaster,' 'patent,'
| 'chronicler,' 'voyage,' 'mason,'
| 'mineral,' 'refiner,' 'solace,'
| 'allurement,' 'savage.'

3. "Speed on the ship! but let her bear
No merchandise of sin,
No groaning cargo of despair
Her roomy hold within,
No Lethæan drug for Eastern lands,
Nor poison-draught for ours ;
But honest fruits of toiling hands,
And nature's sun and showers !
—*Fourth Reader p. 69.*

7 | (i.) Explain the meaning of
| 'merchandise,' 'cargo,' 'despair,'
| 'hold,' 'Lethæan,' 'drug,' 'draught.'

6 | (ii.) To what kind of business
| does the poet refer in lines 3 and
| 4? In line 5? and in line 6?

2 | (iii.) Parse 'sun,' line 8.

2 + 2 | (iv.) What is meant by 'fruits'
| in line 7? Why are they called
| 'honest'?

10 | 4. Distinguish
| 'pane' from 'pain,'
| 'rain' " 'rein' and 'reign',
| 'main' " 'mane,'
| 'fane' " 'feign,'
| 'lain, " 'lane.'

1 + 1 | 5. Name the vowels. What is
+ 3 | a diphthong? Point out the diph-
| thongs in lines 3, 5 and 6 of the
| stanza quoted in question 3.

COUNTY OF PRINCE EDWARD.

PUBLIC SCHOOL EXAMINATIONS 1880.

Sr. or Jr. 4th Class—Time 3 Hours.

1. Divide four millions, seven hun-
dred and six thousand and forty, by
the sum of two thousand and sixteen,
and eight hundred and seven.

2. A farmer sells four loads of oats,

weighing respectively, 1,758, 2,346,
1,927 and 2,593 pounds at $42\frac{1}{2}$ cts.
per bushel. How many bbls flour at
\$6.50s. can he buy with the proceeds.

3. A lady bought 36 yards of Cotton
at $9\frac{1}{2}$ cts., 14 yards Print at $12\frac{1}{2}$ cts., 9
yards of Lustre at 26 cts., 6 lbs. Tea
at 45 cts. and 20 lbs Sugar at $9\frac{1}{2}$ cts.
She paid in butter at $17\frac{1}{2}$ cts. per lb.
How much is required?

4. How often must 706 be added to
116 to make ten thousand?

5. Divide \$25 between Jane, Ellen,
and Thomas, so that Ellen may have
\$2 more than Jane, and Thomas as
much as Jane and Ellen together.

6. Name the Continents, Oceans,
and largest Islands and Rivers of the
world.

7. Name the Provinces of Canada
with their capitals and chief rivers.

8. Through what waters and near
what cities would you pass in a trip
from Frederickton to Goderich?

9. Sketch a map of river St. Law-
rence, showing tributaries and towns
on its banks.

10. Draw a square parallelogram,
circle and triangle.

11. Sketch the clock and water-pail.

12. Classify the parts of speech in
the first four lines of Poetry in your
Reader.

13. Write a sentence on each of
these words, drawing a line under
each predicating—desk, ball, air, tree.

14. Write from memory any verse of
Poetry and the Lord's Prayer.

Sr. or Jr. 5th Class—Time 3 Hours.

1. Simplify

$$\frac{1}{3} + \frac{4}{4\frac{2}{3}} + \frac{1}{5} \text{ of } \frac{5\frac{1}{4} - 3\frac{1}{2}}{\frac{1}{2} + \frac{1}{1\frac{1}{3}}}$$

2. From one hundred and one
thousandths, subtract one hundred
thousand nine hundred and ninety-nine
millionths, and multiply the result by
two hundred and sixty-three ten
thousandths.

3. A man had $\frac{2}{3}$ of a mine: he sold $\frac{1}{4}$ of his share, and divided the remainder between his two sons, giving $\frac{1}{3}$ to the elder and \$1,000 to the latter. Find the value of the mine.

4. The height of a room is $4\frac{2}{3}$ yds.: the cost of painting the shorter wall at 30 cts. a square foot is \$63, and painting all the walls cost \$336. Find the length and breadth of the room.

5. F. Smith gives his note to J. Brown, February 7th, 1879, at six months' for \$250, interest at 8 per cent. What sum and interest does he pay December 22nd, 1879?

6. Write out the above note, also form of order, draft and receipt.

7. Fourth Reader, page 128—Analyze first three lines in "Life of Audubon."

8. Parse *saw, sinking, before, any, nothing, that and day.*

9. Give derivation of *duration, appearance, copse, attracted, confidence, presenting, affirmative, quantity and civilized.*

10. Write an original sentence containing each of the words in question 9 properly used.

11. What, and where are Canso, Selkirk, Fraser, Burlington, Alaska, Tay, Anglesea, Strasburg, Valparaiso, Denver, Pembina and Potomac.

12. Draw a map of the County of Prince Edward.

13. Name the waters, Capes and Islands, &c., met with in a voyage from St. Petersburg to Cyprus.

14. Name three important events in the history of Canada.

15. Explain Magna Charta, Spanish Armada, Commonwealth, Reformation and Peninsular War.

16. What do you know of the Abyssinian, Zulu, and Afghan wars?

4th Class—Time 3 Hours.

1. At what time between ten and eleven o'clock will the hands be directly opposite?

2. Bought a piece of cloth at \$2.75 a yard. At what price shall it be marked that I may sell it at 5 per cent. less than the marked price, and still make 20 per cent. profit?

4. The difference between the interest and discount of a sum of money for 1 year, 9 months, at 8 per cent. is \$9.80. Find the sum.

4. A reservoir is 57 ft. 9 in. long, by 46 ft. 3 in. wide, sufficient is drawn off to lower the water 2 inches: how many tons weight in it? (Cub. ft. = 1000 oz.)

5. Find the value of $5x^3 - 2x^2 + 10x - 28$, when $x=4$.

6. Divide $x^5 - 5x^4 + 10x^3 - 10x^2 + 5x - 1$ by $x^2 - 2x + 1$ Horner's method.

7. Simplify $\frac{a+b}{a-b} + \frac{a^2-b^2}{a^2+b^2} - \frac{a^2+b^2}{a^2-b^2}$

8. A person distributes a shilling among n persons, men and women: to the men he gave p pence each, and to the women q pence. How many men and women are there.

9. Demonstrate one of the following propositions: 6, 16, 26—Bk. I.

10. Fifth Reader—page 184—"The Queen." Analyze first 13 lines.

11. Parse *flushed, realms, that, own and looms*: to what principal sentence do the lines beginning with "where" refer?

12. Derive or explain—*Rome's Eagle, Aden, Sikle, wild cape, haze, blue strait, martial, remotest, increase, trophies, victory.*

13. Explain the change of Seasons, Moon's Phases, and Eclipses.

14. Describe the Governments of Great Britain and United States.

15. Whence come the following imports: Tea, Coffee, Sugar, Raisins, Spices.

16. Explain Witenagemote, Wyckliffe, Martyrs, Petition of Right, Stamp Act, Reform Bill, and Habeas Corpus Act.

17. Name principal writings of Goldsmith, Milton, Pope, Macaulay and Tennyson.

PERSONALIA.

Mr. A. B. Davidson, B. A., a former student of the Hamilton Collegiate Institute, was selected out of 54 applicants to fill the position of fourth master of the Ottawa Collegiate Institute, at a salary of \$700.

At the recent examination for first-class Teachers, only four were ranked grade "A;" one of them, Mr. Milton Haight, a student of the Hamilton Collegiate Institute, passed in the subjects required for C as well as A; another of the successful candidates was Miss Kate Ballantyne, a student of the same school during 1879, to whom was awarded a scholarship of \$100 given by the Rev. Father Stafford of Lindsay. Six were in grade B, and 14 in grade C; altogether 53 were successful in passing out of about 150 applicants.

Mr. Adam Carruthers, B. A., who prepared for the University in the Collegiate Institute, and who won the Gold Medal in classics this year at Toronto University, has just received the appointment of classical Master of the Lindsay High School.

Mr. Wm. Alford, late of Hamilton, was appointed to the position of first assistant in the Boy's Model School, Ottawa.

W. K. T. Smellie, B. A., of Hamilton was recently appointed science master of the Gananoque High School.

Miss M. Cusack of Hamilton, was selected for the position of first assistant in the Girl's Model School, Ottawa.

John McLaughlin, late of the Hamilton Collegiate Institute, formerly

of Collingwood Collegiate Institute, has been appointed head master of the Lucan Public Schools.

The winners of the scholarships given by the Hamilton Collegiate Institute, for passing the University Examinations of this year will be announced in the next number; the information requisite for making the award is not yet received from Toronto. The following are the winners of the scholarships offered for competition among candidates from the school at the recent 1st class examination:—

1st, Milton Haight; 2nd, George Stone.

The 1st and 2nd places in each of the departments of examination at the June Matriculation Examinations of Toronto University were won by the following candidates:—

CLASSICS.—1st W. B. Nichol, Toronto Coll. Inst.; 2nd W. G. Hamby, Hamilton Coll. Inst.

MATHEMATICS.—1st J. C. Fields, Hamilton Coll. Inst.; 2nd G. W. Holmes, Brantford Coll. Inst.

ENGLISH.—1st A. McMecham, Hamilton Coll. Inst.; 2nd T. C. Eoville, Ottawa Coll. Inst.

HISTORY AND GEOGRAPHY.—1st W. Nichol, Toronto Coll. Inst.; 2nd W. G. Milligan, Toronto Coll. Inst.

FRENCH.—1st W. H. Smith, Toronto Coll. Inst.; 2nd A. McMecham, Hamilton Coll. Inst.

GERMAN.—1st W. H. Smith, Toronto Coll. Inst.; 2nd Miss Ella Gardiner, Ingersoll High School, and Hamilton Coll. Inst.

The standing of candidates for the Dominion Gilchrist Scholarship is just announced, and is as follows:—

HONORS.

- 18ae * Mr. Pickard, B. A., New Brunswick University.
 19 * Mr. A. Lawson, Hamilton Collegiate Institute.
 20 * Mr. Darcy, B. A., McGill College, Montreal.
 59 Mr. Morphy, 2nd year man, Toronto University.
 83 Mr. Kerr, 3rd year man, Toronto University.

PASS.

Geo. Graham, Hamilton Collegiate Institute.
 * Obtained marks qualifying for a prize.

THE FOLLOWING ARE THE SUBJECTS REQUIRED FOR FIRST-CLASS EXAMINATIONS—(Non-Professional) Grade C., 1881.

GRAMMAR.—All the subject.

COMPOSITION.—Good style necessary.

ETYMOLOGY.—Etymological analysis of English words.

LITERATURE.—Julius Cæsar.—Shakespeare.—Lady of Lake.

Spectator papers, 106, 108, 112, 115, 117, 121, 122, 123, 125, 126, 131, 269, 329, 335, 517.

Johnson's life of Addison.

Macaulay's life of Johnson.

HISTORY.—British 1688 to 1820.—Green, and Hallam, Chapters 15 and 16.

GEOGRAPHY.—N. America, Europe and the British Empire.

ALGEBRA.—As in Colenso's.

ARITHMETIC AND MENSURATION.—Theory and practice.

GEOMETRY.—Euclid books 1 to 4 (inclusive) Book 6 and definition of book 5. Exercise.

STATICS, DYNAMICS, AND HYDROSTATICS.

CHEMISTRY.—Non-metallic elements.

PHYSICS.—Heat.

Grades A. and B.

Department of English Language and Literature.

COMPOSITION AND RHETORIC.—Bain's.

HISTORY AND ETYMOLOGY OF THE ENGLISH LANGUAGE.—Earl's Philology. Abbot and Seeley's English for English people. Marsh's English and Literature. Lectures 6 to 9 (inclusive.)

LITERATURE.—History of English Literature from Chaucer to the end of the reign of James I.

The following answers are prescribed:—

CHAUCER.—The prologue to the Canterbury Tales. The Bonne Prestes Tales.

SHAKESPEARE.—Coriolanus.

MILTON.—Areopagitica.

POPE.—The essay on man.

JOHNSON.—The Lives of Milton and Pope.

MATTHEW ARNOLD.—The preface to Johnson's Chief Lives of the Poets.

HISTORY.—The Persian to the Peloponnesian wars, inclusive. Cox's History of Greece. The second Punic war to the death of Augustus. Mommsen's History of Rome. The Tudor and Stuart period of British History. Green, Macaulay and Hallam. Parkman's old Regime in Canada.

GEOGRAPHY.—So much ancient Geography as is necessary for the proper understanding of the Histories of Greece and Rome prescribed.

Department of Mathematics.

ALGEBRA.—GROSS.

ANALYTICAL PLANE GEOMETRY.—Puckle and Salmon.

TRIGONOMETRY. — Hamblin Smith's, Colenso's, or Todhunter's.

DYNAMICS. — Kinematics and Kinetics, Gross.

ELEMENTARY GEOMETRICAL OPTICS.

Departments of Science, Classics and Modern Languages are not yet announced.

The Department will also accept the following examinations according to the curriculum of the honor courses prescribed by the University of Toronto, or the curriculum of equal standard in any college possessing University powers in the Province of Ontario; or in the University of McGill College of Montreal, as equivalents as hereinafter mentioned, namely:—

1. Any candidate who shall have passed the examination for the first year as prescribed in the said curriculum, and shall also have obtained first-class honors in any of the departments of mathematics, classics, or modern languages, shall be considered as having passed the non-professional examination of the Education Department for first-class certificate, grade B.

2. Any candidate who shall have passed the examination for the second year prescribed in the said curriculum, and shall also have obtained first-class honors in one of the departments of classics, mathematics, or modern languages, shall be considered to have passed the non-professional examination of the Education Department for first-class certificate, grade A.

3. Any candidate who shall have passed the examination prescribed for the second year in the said curriculum, and who shall also have obtained first-class honors in either of the departments of natural sciences, or of mental and moral science and civil polity, shall be considered as having passed the non-professional examination of the Education Department for a first-class certificate, grade B.

4. Any candidate who shall have passed the third year's examination prescribed by the said curriculum, and shall also have obtained first-class honors in either of the said departments of natural sciences, or of mental and moral science and civil polity, shall be considered as having passed the non-professional examination of the Department for a first-class certificate, grade A.

THE MEDICAL COUNCIL MATRICULATION EXAMINATIONS.

On and after July 1st, 1881, intending students must present to the Registrar the Official Certificate of having passed the intermediate or 2nd class examination, with Latin included, whereupon he shall be entitled to matriculate and register on the payment of \$20, and giving proof of identity.

The examination embraces the following subject:—

1. COMPULSORY SUBJECT.—The intermediate work with Latin.
2. OPTIONAL SUBJECT.—Any one of the following:—

Greek, French, German.

Graduates in Arts, or students having matriculated in Arts, in any University in Her Majesty's Dominions, are not required to pass the matriculation examination, but may register their names with the Registrar of the College, upon giving satisfactory evidence of this qualification and upon paying the matriculation fee of \$10.

The following circular notice has been issued by W. G. Falconbridge, M. A., Registrar of Toronto University.

“Candidates talking German at the “Junior matriculation examination “in 1881, will be examined on “Musæus, Stumme, Liebe, and not “on Schiller, Belagerung Von Ant- “werpen, as indicated in the circular “of matriculation published this “year.”

BOOK NOTICE.

WITMER'S PHONETIC ORTHOGRAPHY.
 --We are in receipt of a copy of this novel instruction book, designed for the rising future generation. It is a condensation of all the efforts of Tobias Witmer, of Eggersville, to revolutionize the present methods of spelling and reading the English language. That is to say, he is endeavoring to introduce a system of orthography which will do away with silent and final letters. Mr. Witmer goes even further than this, and gives a number of tables and examples of his idea of the spelling of the future, based on the principle of the adaptation of forms of syllables and words to natural sounds. As for instance, he would spell "Come, gentle Spring" in this manner: "Kom, jentl Spring;" "yacht" would be "yot;" and so on. Some of his notions, as exhibited in the poems at the end of his little work, we fail to appreciate, although there are doubtless many points of excellence in them that we are unable to explain or fully comprehend. Altogether, "Witmer's Phonetic Orthography" is worthy of perusal, and all who are interested in phonetics in the slightest degree could not spend 25 cents to any better advantage than enclosing that amount to him for a sample copy. The work is very neatly gotten up.

CHANGE IN PRONUNCIATION.

A language and its pronunciation must change from generation to generation in spite of all the efforts of printers and pendants to put them into a strait-waistcoat. We have only to use our ears to perceive that the pronunciation of cultivated English is even at the present moment slowly but surely undergoing alteration. I wonder how many still cling, like myself, to the old pronunciation of *either* and *neither*, and have not yet passed over to the ever

multiplying camp of those who change the pure vowel of the first syllable into a diphthong, or agree with the Poet Laureate in accenting *contemplate* and *retinue* after the fashion of our grandfathers? So long as a language lives it must grow and change like a living organism, and until this fact is recognized by our schoolmasters, our boys will never realize the true nature of the language they speak and the grammar they learn in childhood. The change that has passed over the pronunciation of English since the days of Shakespeare is greater than can easily be conceived. Were he to come to life again among us, the English that we speak would be almost as unintelligible to him as an Australian jargon, in spite of the fact that our vocabulary and grammar differ but slightly from his. But a familiar word sounds strangely when its pronunciation is altered ever so little, and when the outward form of a whole group of words is thus changed, the most skilled philologist would find himself at fault. Can anything, therefore, be more absurd than an endeavour to mummify an extinct phase of pronunciation, especially when the mummy-shroud was at its best but a rude and inadequate covering which portrayed but faintly and indistinctly the features of the corpse beneath? English spelling has become a mere series of arbitrary enigmas, an enshrinement of the wild guesses and etymologies of a pre-scientific age and the hap-hazard caprice of ignorant printers. It is good for little else but to disguise our language, to hinder education, and to suggest false etymologies. We spell we know not why, except that it is so ordained in dictionaries. When Voltaire was told that *a-g-u-e* was pronounced *ague*, and *p-l-a-g-u-e* *plague*, he said he wished the *ague* would take one-half the English language and the *plague* the other half; but the fault lay, not with the English language, but with the English spelling.
 —Prof. Sayre, in *Nature*.