hours per term should be devoted to teaching reading and elocution, about the same to mental arithmetic, about seven hours to school law and regulations, and about six to school hygiene. The time-table shall be submitted to and approved by the Public School Inspector, and a copy of that drawn up for the first session shall be transmitted to the Department before the session is half over.

4. The Public School Board is required to employ, during the period of each of such Model School terms, a duly qualified assistant teacher to take the place of the Principal of the Model School in teaching the ordinary classes, in order to relieve the Principal of such duty during the period of at least one-half of the school hours in each day.

5. The Principal of each Model School shall employ at least one-half of the school hours of each day during each of the said terms in the instruction and supervision of the teachers-in-training.

6. The Principal of each Model School shall give instruction in penmanship, letter-writing, and English composition to such teachers-in-training as need them, and County Boards of Examiners shall withhold certificates from candidates who are deficient in any of these subjects.

7. Each Model School shall be provided with a separate room for Model School purposes, and this is to be an essential condition in future.

8. The inspection of County Model Schools shall be governed by the regulations now in force, and which were approved on the 30th September, 1879.

9. Public School Inspectors shall report, in accordance with No. 6 of such regulations, to the Education Department immediately upon the expiry of each term, instead of once in each year. If such report is found satisfactory by the Minister, the Public School Board will be entitled to receive for that term in respect of such Model School, one half of the amount apportionable by the Education Department in support of each County Model School, out of the grant of $150 annually voted by the Legislature for that purpose, and by Section 11 of the School Act of 1881 the County Council is also required to provide in aid of each Model School in such county an amount at least equal to such amount apportioned by the Education Department.

10. The County Board of Examiners may, by resolution of such Board, require from teachers in training in each County Model School, the payment of a fee for instruction therein, but not to exceed five dollars per term.

11. The Legislative and Municipal grants, as well as all sums from fees for instruction, shall be payable to the Public School Board with the view of enabling such Board to maintain the County Model School at the standard prescribed by the regulations, and the classes of the Public School at the same time in full efficiency.

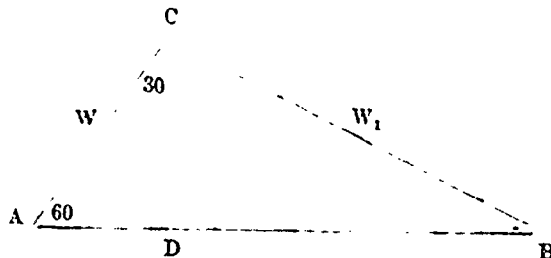12. The foregoing shall take effect from the first day of January, 1882.

Mathematical Department.

SOLUTIONS TO INTERMEDIATE EXAMINATION PAPERS, JULY, 1881.

(Continued from last month.)

NATURAL PHILOSOPHY.—*Continued.*

6.

Drop CD perpendicular on AB. Then the tension of the string to the power in the inclined plane CAD = power in plane CDB, acting (1) parallel to the plane; (2) parallel to the base. Let W be the weight on AC, and W_1 on CB; also T = tension of string. Then (1) taking A = 60°

$$T:W = CD:AC = \sqrt{3}:2$$
$$T:W_1 = CD:BC = 1:2$$
$$\therefore W:W_1 = 1: \sqrt{3}.$$

Also (2)

$$T:W = CD:DA = \sqrt{3}:1$$
$$T:W_1 = CD:DB = 1:\sqrt{3}$$
$$\therefore W:W_1 = 1:3.$$

7. See Smith's *Hydrostatics*, chaps. II. and IV.

The pressure on the table will be increased by the weight of the wood. The pressure on the bottom and sides will be increased, since the wood displaces some of the water and increases the depth of the column of water. In the second case no change would take place in the pressure on the table.

8. See Smith's *Hydrostatics*, pp. 66, 89.

As the bell sinks the mercury rises, and vice versa. In the pump, the mercury falls as the vacuum becomes more and more perfect, i.e., as the water rises. See Smith, p. 55.

9. The pressure on the piston = weight of water in pipe

$$= 12 \times \left(\frac{9 \times 22}{7}\right) \times \frac{1}{144} \times \frac{125}{2} = \frac{33000}{32 \times 7} = 147.321.$$

See H. Smith's *Hydrostatics*, p. 75.

CHEMISTRY.

1 (1. Potassic nitrate and hydric sulphate produce hydric nitrate and hydric potassic sulphate.

Potassium = 39·04, Nitrogen 14·01, Oxygen = 15·96, Hydrogen 1, Sulphur = 31·98. *Roscoe and Schorlemmer* (1878).

(3) H_2SO_4 and HNO_3 would redden litmus or any vegetable blue, KNO_3, a neutral salt, would not affect the litmus.

2. See Roscoe's Primer, pp. 64, 65 and 95. Taking the combining weights in round numbers

$$H_2SO_4 = 98, \quad HNO_3 = 63.$$ Hence

98lbs. H_2SO_4 give 63lbs. HNO_3

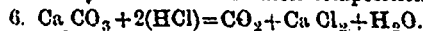$$\left(\frac{98}{63} \times 3\frac{1}{2}\right) \text{ lbs. } \text{ "} \quad 3\frac{1}{2} \text{ lbs. } HNO_3$$

5⅓lbs. H_2SO_4.—Ans.

3. See Roscoe's Primer, p. 57. The lamp is not safe when (a) exposed to a current of air moving at 8ft. per second, (b) when the gauze becomes heated up to the point of ignition of fire-damp. The metallic gauze acts as a first rate conductor of heat, and cools the flame below the temperature of ignition before it can reach the external gas.
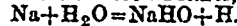
4. To prepare hydrogen. See Roscoe's Primer, pp. 25 and 96. This will do for class purposes. Pure hydrogen is best prepared by the electrolysis of distilled water.

To prepare nitrogen. See Roscoe's Primer, p. 12. A little alcohol will do instead of phosphorous. This is the simplest method, but the gas is not pure. Pure nitrogen may be obtained by heating a concentrated solution of ammonic nitrite $(NH_4) NO_2 = N_2 + 2H_2O$. The simplest way is to act on ammonia with chlorine $8NH_3 + 3Cl_2 = N_2 + 6 (NH_4) Cl$, but the experiment is dangerous, as NCl_3 may be formed, which is frightfully explosive. Experiments with hydrogen should show its extreme lightness, peculiar flame, explosiveness when mixed with air or oxygen, insolubility in water, effect on the voice, occlusion by metals, etc. Our space forbids extended descriptions. There are few experiments possible with nitrogen, and these are chiefly negative, showing what nitrogen will not do.
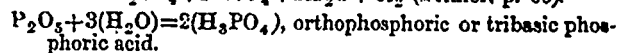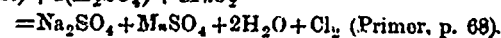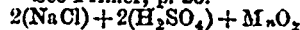
5. See Roscoe's Primer, p. 66. Equal weights ignited in pure oxygen produce the same weight of carbonic acid and nothing else. Hence they are identical in their composition.

6. $Ca CO_3 + 2(HCl) = CO_2 + Ca Cl_2 + H_2O$.
   See Roscoe's Primer, p. 45.
   $Na + H_2O = NaHO + H$.
   See Primer, p. 23.
   $2(NaCl) + 2(H_2SO_4) + Mn O_2$
   $= Na_2SO_4 + MnSO_4 + 2H_2O + Cl_2$ (Primer, p. 68).
   $P_2O_5 + 3(H_2O) = 2(H_3PO_4)$, orthophosphoric or tribasic phosphoric acid.

See Primer, p. 12. This is the liquid in the dish after the white fumes ($= P_2O_5$) have been absorbed.

7. Flame may be defined as gas or vapour heated to a temperature at which it becomes visible. Solid particles usually emit light when they are raised to a red heat from 426° C. to 538° C. (800° to 1,000°