(*b*) Compare its action as a bleaching agent with that of sulphur dioxide.

4. Explain by equations what occurs in each of the following:

(*a*) Chlorine is passed over slaked lime and sulphuric acid added to the product.

(*b*) Chlorine is passed through a solution of potassic hydrate.

(*c*) Hydrogen sulphide is added to bromine water.

(*d*) Chlorine is added to starch paste and potassic iodide in solution.

(*e*) Strong sulphuric acid is added to potassic iodide.

(*f*) Phosphorus is treated with iodine and the product shaken up with water.

(*g*) A mixture of calcic fluoride and sand is treated with heated sulphuric acid and the gaseous product passed through water.

(*h*) Chlorine is passed over a strongly heated mixture of sand and carbon.

(5) A vessel is known to contain a solution of chlorine or hydrochloric acid. Give three methods by which you would determine which it contains.

6. Distinguish between chlorides, bromides and iodides.

7. Describe the preparation of phosphorus and give equations representing the reactions which take place.

8. Give the preparation of phosphine with equation; also give the equation representing its combustion.

9. Compare the compounds of phosphorus with those of nitrogen.

10. State the reasons for considering the air a mixture of gases and not a compound.

SENIOR LEAVING TRIGONOMETRY.

By Prof N. F. Dupuis, Queen's College, Kingston

(*Concluded from last issue.*)

4. (*a*) Let $P = a + b$ and $Q = a - b$. Then $a = \frac{1}{2}(P + Q)$ and $b = \frac{1}{2}(P - Q)$. But $\cos(a - b) - \cos(a + b) = 2 \sin a \sin b$.

$\therefore \cos Q - \cos P = 2 \sin \frac{1}{2}(P + Q) \sin \frac{1}{2}(1 - Q)$.

(*b*) Prove that $\cos 5^0 - \sin 25^0 = \sin 35^0$.

$\sin 35^0 + \sin 25^0 = 2 \sin 30^0 \cos 5^0$.

But $\sin 30^0 = \frac{1}{2}$, and the result follows.

5. In any triangle prove that

(*a*) $\frac{\sin A}{a} = \frac{\sin b}{b} = \frac{\sin c}{c} = \frac{1}{2R}$

Let ABC be a triangle inscribed in a circle and Let BD be the diameter of the circle. Then the $< BDC = < A$; and $\sin BDC = {}^{BC}/_{BD} = {}^{a}/_{2R}$.

$\therefore \frac{\sin A}{a} = \frac{1}{2R} = \frac{\sin B}{b} = \frac{\sin C}{c}$ from symmetry.

(*b*) $\frac{1 + \cos(A - B) \cos C}{1 + \cos(A - C) \cos B} = \frac{a^2 + b^2}{a^2 + c^2}$

Since in any $\triangle$ the sum of the angles is π, $\cos C = -\cos(A + B)$.

$\therefore$ The numerator of the left reduces to $1 + \cos(A - B) \cos(A + B)$;