bine, much beat being given out. (4) Hence under the influence of ! Chemical Affinity heat is generally croired.

distance between the acid and the powder no chai go will take place, now bring the acid into actual contact with the mixture and it at once inflame, leaving a black mass of carbon on the plate.

Exp. 8. Into a tumbler put a tea spoonful of baking soda, and the same quantity of linely powdered tartaric acid. However closely the solid particles are brought together by sturring or rub bing no action takes place. Now add water and effervescence immediately ensues, showing that chemical action is taking place. water added to the soda or acid separately does not cause any effervescence. The violent action observed on the addition of water to the mixed proders must, therefore, have been due to the mutual attraction of the two solids leading to chemical action ; and this could only take place, when, by solution, the particles of each body were endued with greater mobility than in the solid state, and were thus enabled to get within the sphere of each other's attraction. (5). Hence we see that Chemical Affinity acts only at inappreciable distances.

(6). From the preceding experiments we see that One of the most remarkable features of Chemical Affinity is the entire change of properties which it occasions in the substances dealt with-a change which have been obtained. no a priori reasoning could possibly predict.

metal magnesium as well as from all other known substances.

parallel slits with a penknife, and insert in one slit a shp of sheet, while several of the others are of such rare occurrence as to be of zinc reaching nearly to the bottom of the tube, and in the other a little interest except to chemists. It is important to guard careplanter shine with a perkine, and insert in one sint a sing of sneet intriest except to chemists. It is important to guard care-slip of copper foil of the same length, taking care that they do not fully against the idea that the elements are calcardy simple bodies, touch each other. Insert in each of the slips an end of a piece of Chemists, at present, cannot prove them to be compounds, but it is fine copper wire about 2 feet in length, so that one wire shall be in not at all impossible that more powerful analysis may yet decom-contract with each piece of foil. Fill the tube with dilute sulphuric pose them. acid (1 part of acid to 12 of water), insert the cork so that the slips shall be in the acid. Such an arrangement is a simple form of a galcanic cell. After the zine has been a few seconds in the acid remove it, put a drop of mercury on a plate and touch it gentle with zine in three or four places, first on the one side then on the other, rub it with the finger till it is all covered with the mercury. The zinc is now said to be amalgumated. Place it again in the acid which now does not seem to affect it. Now join the free ends of the wires, taking care that they are quite bright, and observe that a gas rises from the copper. Bring both wires in contract with the tip of the tongue, and notice the sharp metallic taste. Rub a common darning needle with a magnet and suspend it horizontally by a fine silk thread, pass one wire above it and the other below, and join their ends. The needle is immediately deflected. This is and join their ends. This is the usual test for a galvanic current. (7). Hence see that Chemical Action may give rise to a galvanic current.

Evidences of Chemical Affinity. From the preceding experiments we see that the proof of chemical action taking place between bodies, when they are brought together, may consist in the occurrance of one or more of the following changes :-

1. A change in the state of aggregation, consisting of a liquid into a solid, or vice versa. This result is not, however, to be taken as evidence of chemical action, unless accompanied by other phenomena not produced by simply heating or cooling of the substances separately.

2. A change of temperature, usually elevation. 3. The formation of a new substance possessing physical or chemical properties, or both, differing from those of the original substances.

4. The production of a galvanic current.

4. The production of a quarante current. Chemical Combination. In the preceding experiments we have seen that two substances brought together under certain con advance of 333 per cent. on cost; in selling the first half of it he ditions, unite to form a new substance differing entirely from the gave only 35 inches for a yard, but in selling the transaction original ones. In the experiment of burning the magnesium rib-gave 37 inches for a yard. He gained on the whole transaction to a weight (38897, What did the cloth cost him per yard (3897). bon, (exp. 2.) we saw that the white substance produced weigned 50000. The substance of 5. I bought French goods for 7490 francs, and paid an import and near the magnesium originally taken. Under the influence of 5. I bought French goods for 7490 francs, and paid an import and heat the magnesium took to itself come other body which could inform duity of 15 per cent. I sold the goods for £420. Find my only be derived from the air. The chemical action induced by gain or loss in dollars and cents if the £=fr. 25 22=S4.87. Solo the union of unlike kinds of matter 6. I invested in 7 per cent. stock at 781, and having received a half-year's dividend I sold out at 792, paying 1 per cent. brokorage

Exp. 10. Accurately weigh enough mercuric oxide to cover the Exp. 7. Take a te spoonful of finely powdered loaf sugar, and then increase the temperature, taking care not to heat intensely two teast confuls of firely powdered petassium chlorate, and mix any small spot of the tube, and loosely stopping its end with the them well together. Form them into a little heap on r piece of thumb. Remove the thumb and quickly place inside the tube the card-hoard placed on a tumbler. Dip a glass rod in subhuric acid glowing end of a splint of wood. It will burst into flame. If the and bring it near the powder As long as there is a measurable heat be continued till all action is over, there remains in the tube nothing but pure mercury, which is found to weigh less than the mercuric oxide originally taken.

Chemical Decomposition. In the preceding experiment the chemical action brought about by heat resulted in DECOMPOSITION, which consists in the separation, either partially or completely, of the constituents of a compound from one another. In this case mercuric oxide has been decomposed into mercury and some other kind of matter seen to be driven off as a gas which is recognized by its property of kindling a glowing splint of wood. The gas is called OXYGEN.

Elements and Compounds. Since chemical action may result in either combination or decomposition, it follows that all substances in naturo may be conveniently divided into two great classes :

(1) ELEMENTARY BODIES. Elements or simple substances are those out of which no other two or more essentially difforing substances have been obtained

Compounds are those bodies (2) COMPOUND BODIES. out of which two or more essentially differing substances

Number of Elements. The researches of Chemists up to the present time have made known to us some sixty-four elements. Thus, in the second experiment this is shown by the gam in the present time have made known to us some sixty four elements, weight; also by the fact that a new body has been produced, post Of these, or compounds of these with each other the whole mass of the set is a submersed. And even compounds of the set is a submersed of the set is a submersed of the set is a submersed. Exp. 9. Fit a test-tube with a small flat cork, pierce in it two, the Earth is made up of less than half a score of these elements,

Teachers' Examintions.

EDUCATION DEPARTMENT ONTARIO, JULY EXAMINATIONS, 1885.

ARITHMETIC.

SECOND CLASS TEACHERS.

Examiner-J. J. TILLEY.

1. A man bought a house which cost him 4 per cent. on the outlay to put it in repair ; it remained empty for a year, during which time he reckoned he was losing 5 ter cant. on his total outlay. He then sold it for \$1102, which paid for repairs and loss and also gave a profit of 10 per cent. on the cost price of the house. Find the cost price. 🗸

2. A railway train moving with uniform speed is met and passed in 5 seconds by an engine and tender 30% feet 18 and running 30 miles an hour, the engine and tender return shortly afterwards and pass the train in 25 seconds after overtaking it. Find the length of the train.

3. A person invested \$8420 in 8 per cent. stock on the 7th day of January at 1091, and on the 12th day of February of the same year sold it out at 1174, paying 1 per cent, brokerage on each transaction. Find his gain per cent. on what the stock cost himmoney being worth 8 per cent. per annum (360 days).