The English Writing Exam

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**History of Polymer Thermosets**

1847 Jons Jacob Berzelius produces first condensation polymer, polyester, from glycerin (propanetriol) and tartaric acid Jons Jacob Berzelius is also credited with originating the chemical terms "catalysis," "polymer," "isomer," and "allotrope," although his original definitions differ dramatically from modern usage. For example, he coined the term "polymer" in 1833 to describe organic compounds which shared identical empirical formulas but which differed in overall molecular weight, the larger of the compounds being described as "polymers" of the smallest. According to this (now obsolete) definition, glucose (C6H12O6) would be a polymer of formaldehyde (CH2O).

The first man-made commercial plastic was invented in Britain in 1861 by Alexander Parkes. He publicly demonstrated it at the 1862 International Exhibition in London, calling the material he produced "Parkesine." Derived from cellulose, Parkesine could be heated, molded, and retain its shape when cooled. It was, however, expensive to produce, prone to cracking, and highly flammable.

In 1868, American inventor John Wesley Hyatt developed a plastic material he named Celluloid, improving on Parkes' invention so that it could be processed into finished form. Together with his brother Isaiah, Hyatt patented the first injection molding machine in 1872.[2] This machine was relatively simple compared to machines in use today. It worked like a large hypodermic needle, using a plunger to inject plastic through a heated cylinder into a mold. The industry progressed slowly over the years, producing products such as collar stays, buttons, and hair combs.

The industry expanded rapidly in the 1940s because World War II created a huge demand for inexpensive,mass-produced products. In 1946, American inventor James Watson Hendry built the first screw injection machine,which allowed much more precise control over the speed of injection and the quality of articles produced. This machine also allowed material to be mixed before injection, so that colored or recycled plastic could be added to virgin material and mixed thoroughly before being injected. Today screw injection machines account for the vast majority of all injection machines. In the 1970s, Hendry went on to develop the first gas-assisted injection molding process, which permitted the production of complex, hollow articles that cooled quickly. This greatly improved design flexibility as well as the strength and finish of manufactured parts while reducing production time, cost,weight and waste.

The plastic injection molding industry has evolved over the years from producing combs and buttons to producing a vast array of products for many industries including automotive, medical, aerospace, consumer products, toys,plumbing, packaging, and construction.

Question

1. Who was the founder of the first condensation polymer...?
2. What are Polymers made of..?
3. What was John Wesley Hyatt plastic material developed..?
4. When was Joh Wesley Hyatt patented the first injection machine..?
5. Who was the American Inventor built the first screw injection machine..?

**THE ATOMIC THEORY**

In 1804, John Dalton proposed the existence of atoms. He not only postulated that atoms exist, as had ancient Greek philosophers, but he also attributed to the atoms certain properties. His postulates were as follows:

1. Elements are composed of indivisible particles, called atoms.

2. Atoms of a given element all have the same mass, and the mass of an atom of a given element is

different from the mass of an atom of any other element.

3. When atoms combine to form compounds, the atoms of one element combine with those of the

other element(s) to form molecules.

4. Atoms of two or more elements may combine in different ratios to form different compounds.

5. The most common ratio of atoms is 1:1, and where more than one compound of two or more

elements exist, the most stable is the one with 1:l ratio of atoms. This postulate is incorrect.

Dalton’s postulates created great activity among chemists, who sought to prove or disprove them.The fifth postulate was very quickly shown to be incorrect, and the first three have had to be modified in the light of later knowledge. However, the first four postulates were close enough to the truth to lay the foundations for a basic understanding of mass relationships in chemical compounds and chemical reactions.

Dalton’s postulates were based on three laws which had been developed shortly before he

proposed his theory.

1. *The law* of *corzservation* of *mass* states that mass is neither created nor destroyed in a chemical reaction.
2. *The* ***law*** of *definite composition* states that every chemical compound is made up of elements in a definite ratio by mass.
3. *The law of multiple proportions* states that when two different compounds are formed from the same elements, the ratio of masses of one element in the two compounds for a given mass of any other element is a small whole number.

Dalton argued that these laws are entirely reasonable if the elements are composed of atoms. For example, the reason that mass is neither gained nor lost in a chemical reaction is that the atoms merely change partners with each other; they do not appear or disappear. The constant composition of compounds stems from the fact that the compounds consist of a definite ratio of atoms, each with a definite mass. The law of multiple proportions is due to the fact that different numbers of atoms of one element can react with a given number of atoms of a second element, and since the atoms must combine in whole number ratios, the ratio of masses must also be in whole numbers.

Question

1. When was John Dalton proposed the existence ot atoms...?
2. How many postulates was John Dalton create..?
3. Which John Dalton’s postulate is incorrect..?
4. Explain the three laws was Dalton’s postulates were based..?
5. What is the law of definite composition states..?

**PLC History**

PLCs were first introduced in the 1960’s. The primary reason for designing such a device was eliminating the large cost involved in replacing the complicated relay based machine control systems. Bedford Associates (Bedford, MA) proposed something called a Modular Digital Controller (MODICON) to a major US car manufacturer. The MODICON 084 brought the world's first PLC into commercial production. When production requirements changed so did the control system. This becomes very expensive when the change is frequent. Since relays are mechanical devices they

also have a limited lifetime because of the multitude of moving parts. This also required strict adhesion to maintenance schedules. Troubleshooting was also quite tedious when so many relays are involved. Now picture a machine control panel that included many, possibly hundreds or thousands, of individual relays. The size could be mind boggling not to mention the complicated initial wiring of so many individual devices. These relays would be individually wired together in a manner that would yield the desired outcome.

The problems for maintenance and installation were horrendous. These new controllers also had to be easily programmed by maintenance and plant engineers. The lifetime had to be long and programming changes easily performed. They also had to survive the harsh industrial environment. The answers were to use a programming technique most people were already familiar with and replace mechanical parts with solid-state ones which have no moving parts. Communications abilities began to appear in approximately 1973. The first such 9 system was Modicon's Modbus. The PLC could now talk to other PLCs and they could be far away from the actual machine they were controlling. They could also now be used to send and receive varying voltages to allow them to use analog signals, meaning that they were now applicable to many more control systems in the world. Unfortunately, the lack of standardization coupled with continually changing technology has made PLC communications a nightmare of incompatible protocols and physical networks.

The 1980’s saw an attempt to standardize communications with General Motor's manufacturing automation protocol (MAP). It was also a time for reducing the size of the PLC and making them software programmable through symbolic programming on personal computers instead of dedicated programming terminals or handheld programmers. The 1990’s saw a gradual reduction in the introduction of new protocols, and the modernization of the physical layers of some of the more popular protocols that survived the 1980's. PLCs can now be programmable in function block diagrams, instruction lists, C and structured text all at the same time. PC's are also being used to replace PLCs in some applications. The original company who commissioned the MODICON 084 has now switched to a PC based control system.

Question

1. When were PLCs first introduced..?
2. What is Modular Digital Controller abbreviation..?
3. When was the PLCs communications abilities began to appear..?
4. What then PLCs could do...?
5. What is the manufacturing automation protocol doing..?