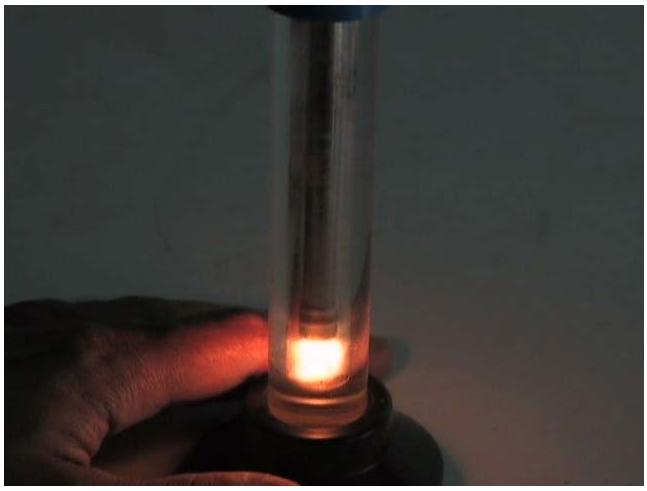
Answer #356

The answer is (e): the temperature will greatly increase inside the chamber and can be observed by dazzling fireworks created inside the cylinder. See so for yourself by viewing the video below, which has been slowed four times to 25% playback speed.



Alternate high-res version.

As you can see, the increase in temperature is so great that cotton puff ignites! Thus we conclude the plunger must compresses the air inside the chamber to at least the kindling temperature of cotton, which is nearly 460 ^{o}F (240 ^{o}C)!

This same "ignition by compression" phenomena is responsible for the creation of stars in our universe! Nebulas, giant clouds of stardust, are pulled together by the force of gravity. As the stardust "squishes together" and compresses, individual molecules are accelerated inward so rapidly that nuclei crash into each other and *fuse*, in a process known as fusion!

The fusion process releases tremendous amounts of energy, some of which in turn allow more nuclei to crash and fuse again, creating a self-sustaining chain reaction. In addition, some of the energy is carried away as light (of which our beloved visible is but a tiny part) and journeys across the depths of space, to warm the planets nearby.

It should be clarified however that though the fire syringe compressed molecules somewhat like the sun, the light emitted was *not* due to fusion; the only similarity between the two ends in the process of (adiabatic) compression. In other words, both compress molecules -- one through the syringe, the other through gravity -- but the way in which they emit light is entirely different.

If our apparatus *were* an example of fusion, then (a) we would likely have invented a marvelous machine and (b) not live to tell about it.

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