1. **In the following phrases, supply either "*a*" or "*an*": (25 points)**

1. __ good person
2. __ geologist
3. __ apple
4. __ hair
5. __ opera
6. __ fine opera
7. __ honorable person
8. __ intelligent man
9. __ animal
10. __ union

2. **Choose the correct item from the choices in the parentheses: (25 points)**

1. He is a (*recent, recently*) retired high-school teacher.
2. How can you do that most (*effective, effectively*)?
3. Can the nuclear power plant be built (*safe, safely*)?
4. Can it be built in a way that is (*operational, operationally*) usable?
5. Make yourself (*essential, essentially*) to the university and to society.
6. What kind of explosive would produce that (*effect, affect*)?
7. This is a global issue that (*effect, affect*) everyone.
8. Science shapes our thinking by means of (*its, it's*) role in education.
9. Global change is a (*frequent, frequently*) discussed issue in the world.
10. Any career in science has to be (*firm, firmly*) rooted in its educational base.

3. Read the following paper recently published in *Science* and write down your opinion regarding this paper. (50 points)

When the Russian academician Baer reported to the Royal Geographical Society of London in 1838 that the ground in central Siberia was frozen to a depth of more than 100 m, the observation was met with disbelief. Permafrost remained a scientific curiosity until Soviet experiences with construction on frozen ground led to the development of geocryology (permafrost studies) as a discipline. Thaw-induced damage to military installations and roads in Alaska and northern Canada in the 1940s led to the rapid development of an English-language literature on permafrost.

(背面仍有題目,請繼續作答)

Because the distribution, thickness, temperature, and stability of permafrost are determined to a large extent by the temperature at Earth's surface, geocryology emerged in the 1990s as an important component of climate change studies. These developments were reflected at the American Geophysical Union (AGU) 2002 Fall Meeting in San Francisco, where more than 50 presentations by scientists from nine countries focused on permafrost and its roles in environmental change.

Permafrost is defined as any subsurface Earth materials that remain at or below 0°C continuously for two or more years. The permafrost regions occupy nearly a quarter of Earth's terrestrial surface, including extensive areas of the Arctic and Antarctic, high-elevation terrain in mid-latitude mountain ranges, and even mountain tops in the subtropics. Permafrost is up to 1500 m thick in parts of Siberia that remained unglaciated during the Pleistocene.

Permafrost represents a complex, integrated response to the energy balance at Earth's surface. Subsurface temperature is influenced by many factors, including air temperature; the thickness, density, and composition of the surface cover (vegetation, snow, or water); the thermal properties of the substrate; and the amount, phase, and mobility of water. Numerical and stochastic models of permafrost behavior have been developed to handle this complexity.

Permafrost is dynamic, and its distribution, thickness, and composition have varied substantially over geological time. Plant remains, animals, and human artifacts preserved in permafrost are invaluable for reconstructing paleoenvironments. Stratigraphic analysis of ground ice and periglacial landforms can also help to elucidate past climatic changes. Model studies indicate that extensive degradation of permafrost may occur in the Northern Hemisphere over the next century in response to anthropogenic climate change. Observations presented at the meeting and in the specialist literature support model results. Widespread changes, possibly related to greenhouse warming, are already occurring in the permafrost regions. Many have serious implications for natural ecosystems and human activities.

Permafrost preserves a record of temperature change at Earth's surface. Because heat transfer occurs primarily by conduction in frozen ground, permafrost functions as a natural filter of short-term, "noisy" temperature oscillations. Hence, under appropriate circumstances, it can be used as an archive of temperature changes at the surface over periods of centuries. Precise measurements in boreholes show that permafrost temperatures increased markedly during the latter half of the 20th century in the northernmost permafrost regions of North America and Eurasia.

This trend appears to be accelerating. In northern Alaska, measurements in the mid-1980s indicated a 2° to 4°C increase over the preceding 100 years. Preliminary analysis by Clow and Urban (U.S. Geological Survey, Lakewood, CO) of measurements made in 2002 in the same borehole network indicates further warming of about 3°C. A similar situation in northwestern Canada was reported by Burn (Carleton University, Ottawa, Canada), with permafrost temperatures having increased by about 2°C in recent decades.