Answer all four questions. Please observe the length limitations. Your grades will be affected if you do not obey the instruction given.

1. Read the following passage and answer the question below.

ANCIENT WRITING OR MODERN FAKERY?

They look like a child's exercise in geometry. But the images Yousef Madjidzadeh projected onto a screen last month in a sweltering lecture hall elicited gasps from archaeologists. The symbols on three baked mud tablets display a hitherto unknown writing system and likely are part of a larger archive, claimed Madjidzadeh, chief of excavations near Jiroft in southeastern Iran. He believes that these inscriptions were made between 2200 and 2100 B.C.E. and could hold the key to understanding a sophisticated urban culture in Middle Asia. The discovery of an ancient script is a momentous find. But the circumstances surrounding the excavation have raised doubts about the tablets' authenticity. "Everyone is convinced they are fake, but no one dares say it," whispered one archaeologist after the presentation. Such criticism galls Madjidzadeh and his supporters, who say that although one tablet was found by a villager, the other two are from a carefully excavated trench. "People are skeptical because these are so different. It is hard to accept something so completely new," says Massimo Vidale, a University of Bologna archaeologist who was present during the excavation. The first writing—cuneiform—evolved over millennia in Mesopotamia and coalesced into a coherent system by 3200 B.C.E. in the southern Iraqi city of Uruk. Not long after, another script appeared on the western edge of Mesopotamia. Dubbed proto-Elamite, after the kingdom of Elam that later flourished beside Mesopotamia, the system resembles cuneiform, although its origin and meaning are a puzzle. Centuries later, toward the end of the 3rd millennium B.C.E., another set of symbols arose on the Iranian plateau: linear Elamite. Only a handful of examples exist, mainly from the Elam capital of Susa and mainly in the form of stone carvings paired with cuneiform. Some scholars doubt it is a coherent script; they believe it is an attempt by Elamite kings to appear as modern as their Mesopotamian neighbors.

Given the dearth of linear Elamite inscriptions, the Jiroft finds are attracting scrutiny. In early 2005, Madjidzadeh's team found a brick in the gateway of the main Jiroft mound. Dated to between 2480 and 2280 B.C.E., the brick is inscribed with signs that may be related to linear Elamite, Madjidzadeh says. Later that field season, a worker showed the dig director a tablet with odd symbols that he said came from a hole he dug a half-kilometer from the mound. Returning last year, Madjidzadeh had a student dig a trench at the spot. The team promptly recovered a second tablet. The next day, Madjidzadeh came to oversee the work; he uncovered the third tablet. The three tablets appear to show a progression. One has eight simple geometric signs, another has 15 slightly more complex signs, and the third has 59 signs of an even more complex nature, all inscribed in wet clay. On the back of each, apparently scratched into the mud brick after it was dry, are inscriptions that may be related to linear Elamite. Madjidzadeh believes he has stumbled on an archive, and that a librarian-scribe made the marks on the back of each tablet. He believes the tablets reveal linear Elamite's evolution from simple geometrical system to final complex form. That analysis doesn't wash with some specialists. One archaeologist at the meeting suggested that the tablets could be exercises from a scribal school. Others doubt the authenticity of the geometrical markings. Earlier this year, Madjidzadeh shared photos of the tablets with Jacob Dahl, a specialist in ancient texts at Berlin's Free University. "I was shocked," Dahl recalls. "No specialist in the world would consider these to be anything but absolute fakes." The only script the geometric designs resemble, he argues, is a modern phonetic system for Eskimo. However, Dahl is intrigued by the inscriptions on the back of the tablets, which he says could indeed be linear Elamite. He maintains that it is possible that the tablets are fake on one side, genuine on the other. Mesopotamia, he notes, is rife with objects that combine real inscriptions with those of counterfeiters. Such assertions "are completely crazy," says University of Pennsylvania archaeologist Holly Pittman, who has worked with Madjidzadeh at Jiroft. She notes that when fine artifacts from the 3rd millennium B.C.E. began to trickle out of Afghanistan decades ago, scholars were similarly dismissive because the material did not conform to existing theories. Madjidzadeh plans to publish soon a scholarly article laying out the details. But the controversy is likely to roil the field until he returns to Jiroft in November and expands the trench. Then the critics will eat crow, predicts Pittman. "They will be shown to be fools when he pulls out 1000 tablets," she predicts. Such extraordinary evidence may be vital to back the extraordinary claims.

Questions:
(1) What kind of evidence is provided to prove the authenticity of the writing? (10%)

(2) What is the stance of the author? Please use at most 250 words to support your claim. (15%)

2. Write a summary of 150 words for the following article. (25%)

CHIMPANZEE TECHNOLOGY

William C. McGrew

Almost 50 years ago, Jane Goodall watched an adult male chimpanzee in the Gombe Stream Reserve, Tanzania, make and use a blade of grass to "fish" termites from a mound for food. Her mentor, Louis Leakey, declared, "Now we must redefine 'tool,' redefine 'man,' or accept chimpanzees as humans!". Today, we know that various vertebrates in nature have elementary technology, but chimpanzees across Africa continue to astonish us with their technical abilities. Recent findings have further blurred the boundaries between what we consider to be human versus nonhuman by showing that chimpanzees can use and combine tools in complex sequences and combinations.

Since Goodall's discovery, scientific analyses of chimpanzee behavior have changed from natural history notes to descriptive, classifying ethnography, to theory-driven, hypothesis-testing ethnology. To systematic but serendipitous observation has been added experimentation, even with free-ranging apes. Eight populations of wild chimpanzees across Africa from Senegal to Tanzania are fully habituated (that is, they can be observed at close range from dawn to dusk). Scores more are not fully habituated, but leave behind artifacts that can be collected and analyzed.

Researchers use the term "tool kits" to describe the repertoire of tools used habitually by a group of chimpanzees. The tool kits of most chimpanzee populations consist of about 20 types of tools, which are used for various functions in daily life, including subsistence, sociality, sex, and self-maintenance. This tool-kit size is relatively constant, whether the apes live in rainforest or on savanna, with one regional exception: The tool kits of three Ugandan populations (Budongo, Kanyawara, and Ngogo), all well-habituated, are about half the usual size, for reasons as yet undetermined.

The uses to which tools are put vary across chimpanzee populations. At Goualougo, Republic of Congo, the most commonly used tools are for extractive foraging, whereas at Ngogo, they are for hygiene and courtship. However, some tools are used by all chimpanzee populations: They all make leaf sponges to obtain drinking water, show aimed throwing of missiles, and communicate by drumming on tree buttresses.

Chimpanzees also use tool sets, that is, they use two or more tools in an obligate sequence to achieve a single goal. In the most impressive example, a chimpanzee population in Gabon uses a tool set of five objects—pounder, perforator, enlarger, collector, and swab—to obtain honey. Other tool sets are used to fish for termites or dip for army ants. All these tool sets must be used in the correct functional order to be successful. Some primatologists have argued that this necessity for sequential order is a sign of complex cognitive processes.

Another way of using tools is as a tool composite, that is, two or more objects are used simultaneously and complementarily to achieve a goal. Tool composites long used by humans include bow-and-arrow and mortar-and-pestle, but such composites are virtually unknown in other species. In chimpanzees, the main example is the use of stones or clubs as hammers to crack nuts on anvils of stone or wood. This impressive technology provides access to embedded, high-calorie nut meat, with less expenditure of energy and less risk to the consumer's teeth. At Bossou, Guinea, chimpanzees have favorite combinations of hammer and anvil stones, which they use again and again.

Less common are compound tools, in which two or more components are combined as a single working unit. Human examples are commonplace, including hafted spears (with shaft, point, and adhesive) and bead necklaces (with beads, string, and knot). Compound tools used by chimpanzees include the leaf sponge: Several fresh leaves are compressed into a single absorbent mass that allows water to be extracted from inaccessible tree holes. Another example is the wedge stone, which chimpanzees insert under a stone anvil to level its working surface, thus making it more efficient. Finally, to make their sleeping platforms (beds or nests), great apes daily interweave various branches, twigs, and leaves to make a frame, mattress, lining, and even a pillow.

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How long have chimpanzees and their ancestors been making such complex tools? Chimpanzee tool use often modifies the raw materials (even stones), making them distinguishable from natural damage. Systematic excavation, radiometric dating, organic residues, wear patterns, actualistic experimentation (in which archaeologists seek to model past processes by recreating them in the present), and even museum studies have now been applied to the stone artifacts generated by ape tool users. The search is on for diagnostic wear patterns that allow the stone artifacts of the chimpanzee ancestors to be distinguished from those of early humans. Using apes as models may allow us to identify the precursors of the oldest known human tools by focusing on percussive technology, such as pounding tools, before the onset of Oldowan industries 2.6 million years ago.

Of the other living great apes, two taxa—bonobo and gorilla—show no habitual tool use in nature, which is puzzling given that laboratory studies show that their intelligence is comparable to that of chimpanzees. The fourth taxon—orangutan—shares many of the attributes of chimpanzees; for example, orangutan tool kits vary across populations. However, their largely arboreal lifestyle curtails their technical expression. (Most chimpanzees use tools while on the ground.) Among other animals, species such as the Galapagos woodpecker finch, California sea otter, and Egyptian vulture are specialists at a single kind of tool use. Of the birds, the impressive New Caledonian crow lags far behind the apes with regard to the types of elementary technology described above. New Caledonian crows make tools in the wild and in captivity, but only for extractive foraging. It is the only species of corvid habitually to make tools in nature. Of the other primates, the bearded capuchin monkeys top the tool use list: Their only well-established tool use is the use of hammer-and-anvil to crack nuts, but they also use stone tools to dig up roots at one site.

Among all animals, only chimpanzees appear to be able to use one type of raw material to make many kinds of tools (e.g., leaf as sponge, napkin, or fishing probe), or make one kind of tool from many raw materials (fishing probe from grass, bark, vine, and twig). Only chimpanzees have been shown to vary in their tool use at a multitude of levels, from individual, family, community, and population to subspecies. Chimpanzees also continue to yield new forms of tool use from continuing study: In the Nimba Mountains of Guinea, they "cleave" fibrous, basketball-sized fruits into manageable smaller pieces, using hammers and anvils; this is unlike nut-cracking, for example, which cracks open natural containers to get at the goal item inside.

With each passing day, the number of wild chimpanzees declines, with advancing deforestation and expansion of the bush-meat trade. Whole groups of chimpanzees already have been exterminated, and with them, their technological heritage, which probably will never be recovered. If we value the technology of our nearest living relations, in its own right or to help in understanding our ancestors, then we must not allow the apes to go extinct.

3. Read the following passage on neuroimaging and answer the question below. Your answer should not exceed 150 words. (25%)

LIMITS OF NEUROIMAGING

It is worth noting that all neuroimaging techniques require participants who can (and want to) comply with the procedures and instructions entailed. The most important technical limitation of human neuroimaging is that all currently available techniques are constrained to measurements of aggregate signals from hundreds of thousands of neurons at a time. Thus any signals critical for perception, thought or actions that are encoded at a finer spatial scale may be hard to detect using neuroimaging.

The techniques outlined above differ in their relative strengths and weaknesses. Functional MRI relies on measurement of signals associated with the oxygenation level of haemoglobin in the blood. This changes at a relatively fine spatial scale and so the spatial resolution of functional MRI is of the order of a few millimeters. But its temporal resolution is relatively poor, because blood flow changes that alter oxygenated haemoglobin concentration lag several seconds behind the electrical activity of neurons. In contrast, the electrical techniques of MEG and EEG have millisecond temporal resolution because they measure the electrical signals associated with neuronal activity directly at the scalp. However, because these signals summate over space and are altered by the scalp and tissues, the spatial resolution of these techniques is relatively poor compared to fMRI. Thus neuroimaging techniques are complementary in their limitations, which often leads to their use together to investigate a particular scientific problem.

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The principal disadvantage of PET is the need for extensive radiochemistry infrastructure (both people and equipment) to develop new radiotracers. Existing radiotracers can often be made on site with relatively small needs for additional equipment. Nevertheless the technique remains comparatively expensive and inflexible compared to all other neuroimaging techniques. The temporal resolution of PET is extremely low; typically one image is acquired every thirty seconds or so. Moreover, the need to use ionizing radiation places exposure limits on the numbers of scans that can be acquired (typically a maximum of 12, compared to no limits on fMRI where typically hundreds or thousands of scans are acquired for each participant).

All neuroimaging techniques measure brain activity that can only be correlated with subjective reports or observable behavior of the individual being scanned. Such correlations do not imply a causal relationship between the brain activity and behavior. For example, if two or more brain regions show activity patterns that are correlated with a particular behavior, it may be that one or more of those areas are not necessary to generate the behavior and could be damaged by illness without affecting performance. To identify a causal relationship therefore requires that neuroimaging data is combined with other evidence, such as that obtained through studying individuals with brain damage or transiently disrupting brain function through transcranial magnetic stimulation (TMS).

There are also barriers to the use of currently available neuroimaging in real-world environments. All the technologies discussed here are widely available in hospital and research environments in the developed world, but there are significant obstacles to more widespread deployment in the community. MRI technologies require a large, heavy fixed installation that can only be transported in a large articulated truck. Scanning participants with MRI requires that they lie supine in an enclosed space, limiting access and interaction with the external environment, although a number of ingenious experimental approaches have been devised to circumvent this. Similarly MEG requires a cumbersome installation that requires careful electrical shielding. EEG is the most portable technology and can in principle be used in the home setting. However, local interference from other electrical devices is not trivial and can significantly limit performance. Moreover, the electrodes that are applied to the scalp for EEG cannot be worn for extended periods or in most real-life situations. Emerging technological developments may circumvent this possibility with the creation of easily wearable and unobtrusive electrodes, but this at present remains a future development.

In addition to these generic limitations of the technologies, particular methods have specific limitations that have already been discussed above. Specific issues relating to the application of neuroimaging technologies are described below.

While neuroimaging techniques have proven impressive in their ability to provide new insights into how mental processes are realized in the human brain, these insights are typically provided by studying relatively large groups of individuals. While they can provide insights into the group average (or typically, representative) patterns of brain activity, they can provide less insight into the variability of these patterns of brain activity associated with an individual. The ability of these findings to guide therapeutic decisions or inform policy about individuals is thus typically limited. This is not an intrinsic limitation, but reflects a relative dearth of studies concerning inter-individual variability.

The use of functional neuroimaging technologies to decode specific instances of what a subject is thinking at a precise moment has been impressive. But these studies, attempting to understand specific conscious content in an individual and operate as a 'brain reading' device, suffer from a potential limitation of generalization. Because the number of potential thoughts or perceptions an individual can have at any one time is virtually limitless, a general-purpose brain reading device would need to be able to generalize not just over all the thoughts an individual had previously experienced, but also any possible or indeed conceivable future experiences. Moreover, experimentally the process of 'brain reading' is typically studied in isolation, whereas in everyday life people typically have two or more streams of thought concurrently. It is not clear whether 'brain reading' techniques would be able to cope with such concurrency of thought.

Thus, irrespective of the possible policy issues that arise through recent developments in our ability to 'brain read', potentially serious and possibly insurmountable empirical limitations are already apparent.

The potential ability of neuroimaging to uncover covert mental states has received much recent attention. In fact, this has always been an area of intense interest to policymakers. The polygraph is a well-known approach to detecting deception (a covert mental state). Although not a neuroimaging technique, it has been repeatedly evaluated and its validity and reliability have been challenged for decades in systematic reviews and evaluations. In addition to

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questions about its reliability and validity, the polygraph is particularly vulnerable to countermeasures. Such vulnerability to countermeasures is shared by all neuroimaging efforts to date that attempt to detect deception through measuring brain activity directly.

Moreover, it remains unclear whether any neuroimaging technique is in fact superior to the poor performance of the polygraph, as there have been no direct comparisons. One of the important limitations of any such evaluation is that techniques for detecting deception are typically developed and validated in populations of young individuals simulating deception. It is not clear whether such simulated deception corresponds in any way to deception carried out in the real world. Moreover it is not clear whether any indices of deception (whether brain based or otherwise) detected in young healthy adults generalize in any way to older individuals or groups with mental illness – to name but two groups overrepresented in prison populations. These issues limit both the validity and the potential use of neuroimaging technologies in detecting deception.

Source: The Royal Society of London: Brain Waves Module 1, January 2011

Question:
According to the passage, what are the limitations in using neuroimaging?

4. Phonetic symbols were invented to transcribe speech sounds at the era when recording equipment is not accessible to most people. With the latest technology in recording and transmitting digital sound files, most people have easy access to digital recorders. It seems that phonetic symbols have lost most of its original functions. Do you think it is necessary for students of linguistics to learn to use phonetic symbols for transcribing and analyzing speech data? Why or why not? Your answer should be between 200 and 250 words. (25%)