Part I:

Below is a case history that illustrates the role of serology in the diagnosis of infectious diseases. A selected group of antigens associated with respiratory diseases was used to test the patient's sera for antibodies. The diseases considered and the antigens involved are as follows:

DISEASE	AGENT (Antigen)
Primary atypical pneumonia	Mycoplasma pneumoniae (wall-less bacterium)
Ornithosis (psittacosis)	Chlamydia psittaci (obligate intracellular parasite-transmitted from birds to man)
Q fever	Coxiella burnetti (Rickettsia-transmitted from cattle to man)
Influenza A	Influenza virus A
Influenza B	Influenza virus B

A 24 year old female pet shop employee was seen by her physician with a 2-day history of sudden onset of malaise, fever, loss of appetite, photophobia and severe headache. She developed a cough and mucoid sputum that was occasionally streaked with blood. Culture of the sputum showed normal flora. Her initial temperature was 100°F and it gradually rose to 103°F. Chest x-ray showed interstitial pneumonitis. The patient recovered after 3 weeks and initiated legal suit against her employer. Sera taken on the first visit to the physician and 3 weeks later had the following antibody titers (complement fixation test):

	Serum	
Disease	#1	#2
Primary atypical pneumonia	<10	<10
Ornithosis (psittacosis)	<10	160
Q fever	<10	<10
Influenza A	40	80
Influenza B	10	10

1. What disease did the patient have? (5%)
2. With what other agents had the patient come in contact? (5%)
3. With what agents did this patient probably never come in contact? (5%)
4. What if all the results had been <10 and the patient was not immunosuppressed? (10%)

(背面仍有題目,請繼續作答)

Part II:

A key function of neutrophils is to attack and kill bacteria at sites of infection. Bacteria are phagocytosed and fusion of phagocytic vacuoles with neutrophil granules exposes the bacteria to a collection of antimicrobial reagents, including lytic enzymes, cationic peptides that disrupt bacterial membranes and reactive oxygen species. Neutrophils can also kill bacteria extracellularly, and a new study from Volker Brinkmann and colleagues reveals that this is achieved by concentrating antimicrobial reagents in a fibrous network released by the neutrophil. Neutrophils were stimulated with interleukin-8, phorbol myristate acetate or lipopolysaccharide. When the activated neutrophils were gently washed and fixed, and examined by high-resolution scanning electron microscopy, Brinkmann and colleagues observed fibrous extracellular structures outside the cells. These were termed neutrophil extracellular traps or NETs. The NETs were composed of DNA, histones and granule enzymes, such as neutrophil elastase, and were released from the cells as early as 10 minutes after activation. NETs were able to trap both Gram-positive and Gram-negative bacteria. Blocking the function of neutrophil proteases showed that they were required for the deactivation of bacterial virulence factors. NETs were also observed in vivo in samples taken from shigellosis infection of rabbits and appendicitis in humans. Extracellular killing of bacteria carries the risk of damaging the host cells by exposing them to the neutrophil's antimicrobial toolkit. The authors suggest that NETs amplify the activity of antimicrobial components by concentrating them in the fibrous network,which should also reduce exposure of host tissue to these components. It remains to be determined whether NETs are formed by an active process or are an early stage in neutrophil cell death.

(Neutrophil extracellular traps kill bacteria. Science 303, 1532–1535 ; 2004)

1. This paragraph describes the new finding of neutrophils in the article of "Science" this year, can you summarize the contexts?(10%)
2. Do you know the functions of neutrophils?(5%)
3. In your opinion, can you suspect the real function of NETs? Please give the reasonable explanation.(10%)

Part III: 請以中文語法翻譯下列兩篇文章

Your genes on a CD (15 分)

Before the end of the year you'll be able to buy a personal genetic map of your entire body, supplied on a CD-ROM. The service will be offered by American geneticist Craig Venter, who was one of the pioneers in the mapping of the human genome.

It took scientists over 10 years to come up with the first draft of the human genome, but Venter is aiming to supply the CD within a week of taking a sample of your DNA. Advances in the computer sequencing of DNA have rapidly speeded up the process, but it won't come cheap. The service is initially likely to attract only millionaires, with a price tag of around 400,000 sterling pounds. The cost is expected to fall as increasing numbers of people take up the service and new technology makes sequencing cheaper.

Venter claims that access to your genetic code gives you a better chance of avoiding illness. For example, you would be able to discover if you are more at risk from diseases like colon cancer and Alzheimer's. Armed with that knowledge, you could go for medical checks more frequently than you would otherwise, and catch problems early.

Owning a personal copy of your genome doesn't mean that medics will be able to cure all your ailments. Today, scientists only know of a few links between particular genes and diseases, and many of those can't be cured at present.

First cure using gene therapy (10 分)

A decade ago, scientists were trumpeting the potential of gene therapy – curing inherited diseases like cystic fibrosis by giving patients healthy versions of defective genes. Since then, over 400 clinical trials of gene therapy have been carried out, without curing a single patient. The only success so far has come from a team of French scientists, who in 1999 treated five babies with a rare genetic disorder known as X-linked Severe Combined Immune Deficiency (SCID). Lacking a gene crucial for fighting infections, the babies faced death in 12 months unless treated. A team led by Dr Alain Fischer of the Necker Children's Hospital in Paris used a modified virus to insert copies of the missing gene into cells taken from the babies. These were then re-injected. By April 2000, four of the five babies had developed immune systems capable of protecting them against disease. But doctors are still searching for that elusive first success for gene therapy against a major inherited disease.

(背面仍有題目,請繼續作答)

Part IV:

EGFR is a specific receptor of EGF. PP1 is a specific inhibitor of c-Src protein activation. In figure A, the Y axis means EGFR activation. In figure B, the Y axis means ERK activation. Please explain the meanings of figure A and figure B. Furthermore, infer the possible signal transduction pathways of arsenic. (25%)