

Part I. Question 1 to 10, please choose the answer closest to the underlined word or phrase. Question 11 to 15, please choose the answer that best completes the sentence. One Answer Only. 2 points.

1. Some of the **potential** dangers to cows treated with synthetic bovine growth hormone were brought into light through the effort of some scientist.
(A) related (B) possible (C) certain (D) obvious
2. As more U.S workers spend their days at keyboards, hand injuries and lawsuits are **multiplying**.
(A) increasing (B) minimizing (C) boundary-crossing (D) profit-making
3. There are several **bodies** that match volunteers with voluntary groups, including the National Volunteering Centre.
(A) organizations (B) remains (C) people (D) motivations
4. Piaget believed that we go through four stages in understanding the world. Each of the stages is age-related and consists of **distinct** ways of thinking.
(A) new (B) simple (C) different (D) exact
5. Some people think that spoken language is **transient** but writing tends to last because of its physical medium (characters on some surface).
(A) unimportant (B) temporary (C) interesting (D) clear
6. But what most prevents women from reaching the boardroom, say bosses and headhunters, is lack of **hands-on** experience of a firm's core business.
(A) significant (B) available (C) tested (D) practical
7. Manufactured in the **tranquil** New England town of Concord, New Hampshire, the famous Concord Coach came to symbolize the Wild West.
(A) peaceful (B) bustling (C) industrial (D) tiny
8. With oil prices shooting up, the demand for big cars is **dwindling**. Now compact cars are on great demand.
(A) depressing (B) surpassing (C) decreasing (D) swirling
9. All of this she conferred on me without ever **setting foot in** the kitchen of her house.
(A) leaving (B) dressing (C) entering (D) preparing
10. In choosing your career, you should follow your heart, but you also need to be **rational**.
(A) making decisions based on intelligent thinking (B) making decisions using strong emotion of feeling
(C) making decisions because of relationships (D) making decision because of profits
11. _____ abolishing death penalty is a global trend, the public is so polarized over the issue that it requires more discussion.
(A) Because (B) Whereas (C) Although (D) In addition to
12. Women now often work areas _____ medicine, business management and higher education, which would not have been possible 100 years ago.
(A) regardless of (B) in virtue of (C) due to (D) such as
13. Both the National Cancer Institute and the World Health Organization say there isn't evidence to support the assertion that cell phones are a _____ threat.
(A) health public (B) healthy public (C) public-health (D) publically health
14. _____ on barren slopes can help prevent erosion.
(A) Planting trees (B) For trees to be planted (C) In order to plant trees (D) Trees are planted
15. Almost four in five people around the world believe that _____, a poll for the BBC World Service suggests.
(A) access the Internet is a fundamental right (B) that access to the Internet is a fundamental right
(C) fundamental right accessing the Internet is (D) the fundamental right is access the Internet

II. Question 16 to 25, please choose the best answer to fill each of the numbered blanks in the passages. 2 points each.

People communicate in many different ways and yawning is one important means of 16 communication. It gives many different 17 to people and everyone yawns. Some birds, reptiles, fish and most mammals also yawn. However, the reason why we do it is still a mystery. There is also very little research available on yawning as for most people, it is not a problematic 18. Here are a few things that are known about yawns: 1.) The 19 duration of a yawn is about six seconds; 2.) in humans, the 20 yawn happens about eleven weeks after conception; 3.) Yawns become contagious to people between the first and second years of life.

16. (A) audio (B) friendly (C) non-verbal (D) scenario
 17. (A) messages (B) funs (C) challenges (D) experiments
 18. (A) resistance (B) repeat (C) reflex (D) rejection
 19. (A) critical (B) analytical (C) terminal (D) average
 20. (A) most difficult (B) earliest (C) most fundamental (D) experiential

Culture shock can be an excellent lesson 21 human differences. The reason culture shock occurs is that we are not prepared for these differences. 22 the way we are taught in our culture, we are all ethnocentric. This term comes from the Greek root ethnos, 23 a people or group. Thus, it refers to 24 our outlook or world view is centered on our own way of life. Ethnocentrism is the belief that one's own patterns of behavior are the best: the most natural, beautiful, right, or important. Therefore, other people, 25 that they live differently, live by standards that are inhuman, irrational, unnatural, or wrong.

21. (A) on relative values and understanding (B) in relative values and in understanding
 (C) about relating values and on understanding (D) by means of relative values and understanding
 22. (A) Because of (B) Because (C) In the event of (D) In spite of
 23. (A) it means (B) it is meaning (C) meaning (D) by meaning
 24. (A) that the fact (B) the fact that (C) the fact (D) the fact that is
 25. (A) to the extend (B) by and large (C) more or less (D) drawing a line

III. Reading Comprehension. In this part, you will read several passages. Each one is followed by a number of questions. Question 26 to 40, you should choose the ONE best answer to each question. 2 points each.

Dariusz Leszczynski, a research professor at Finland's Radiation and Nuclear Safety Authority in Helsinki, has done studies indicating that radio frequency radiation may create a stress reaction in the cells that line blood vessels, leading to a dangerous breach in the blood-brain barrier. "Mobile-phone radiation may be able to indirectly hurt cells, perhaps by interfering with their ability to repair normal DNA damage," he says. "Given the scientific uncertainty, it's premature to say the use of cell phones is safe."

If radio frequency radiation increases the chances of developing brain cancer, it should show up in long-term studies of cell-phone users. But many epidemiological studies have found no clear connection, including a 2007 Danish Cancer Society study of 421,000 cell-phone users, which led many in the media to conclude that mobiles are harmless. To date, "peer-reviewed scientific evidence has overwhelmingly indicated that wireless

devices do not pose a risk," says John Walls, a spokesman for CTIA, a global wireless association.

26. According to Prof. Dariusz Leszczynski,

- (A) whether or not the use of cell phones is safe is still uncertain.
- (B) it is proved that cell phone would impair normal DNA.
- (C) Using cell phones will block blood vessels.
- (D) The research on cell phones is not reliable.

27. The passage following these two passages might be about

- (A) the autobiography of Dariusz Leszczynski.
- (B) problems with many of these studies.
- (C) the development of brain cancer.
- (D) peer review of cell phones.

While fats have lately acquired a bad image, one should not forget how essential they are. Fats provide the body's best means of storing energy, a far more efficient energy sources than either carbohydrates or proteins. They act as insulation against cold, as cushioning for the internal organs, and as lubricants. Without fats, energy would have no way to utilize fat-soluble vitamins. Furthermore, some fats contain fatty acids that contain necessary growth factors and help with the digestion of other food.

An important consideration of fat intake is the ratio of saturated fats to unsaturated fats. Saturated fats, which are derived from dairy products, animal fats, and tropical oils, increase amount of cholesterol in the blood. Cholesterol may lead to coronary heart disease by building up in the arteries of the heart. However, unsaturated fats, derived from vegetable oils, tend to lower serum cholesterol if taken in a proportion twice that of saturated fats.

The consumption of a variety of fats is necessary, but the intake of too much fat may lead to a variety of health problems. Excessive intake of fats, like all nutritional excesses, is to be avoided.

28. Comparing with carbohydrates or proteins, fats

- (A) store food more efficiently.
- (B) deserve their bad image.
- (C) consume more oils.
- (D) provide more fluids.

Which of the followings is the main idea of

29. The main idea of the third paragraph is that

- (A) people are eating less and less fat today.
- (B) fats should be eliminated.
- (C) excessive consumption of fats may be dangerous to one's health.
- (D) fats taken in the proper proportion may reduce serum cholesterol.

30. With which of the following is the whole passage primarily concerned?

- (A) The role of fats in human health
- (B) The dangers of cholesterol
- (C) The benefits of fats in the diet
- (D) The importance of good nutrition

Gender Equity

(1) In the past decade, increasing attention has been paid to the issue of gender equity in the science, technology, engineering, and mathematics (STEM) fields. Research publications, including the American Association of University Women Educational Foundation's Tech Savvy (2000) and Women at Work (2003), have documented the troubling shortage of girls and women preparing to work in these fields. In response to this "**shrinking pipeline**" of girls and women in STEM, a wide array of programs and strategies has been promoted and funded by governmental and nongovernmental organizations.

(2) The AAUW Educational Foundation and the National Science Foundation are among the top supporters of gender equity projects in the STEM fields. In the last decade alone, these two foundations have

invested nearly \$90 million to fund more than 400 projects specifically aimed at increasing the participation of girls and women in STEM fields. This body of projects presented a unique opportunity to explore the nature of gender equity intervention projects in STEM. Until now, no comparable survey of gender equity intervention projects in STEM has been done.

(3) The research for this report, led by Yasmin Kafai and a team of researchers at the University of California, Los Angeles, was guided by several overarching questions: What types of projects have been funded within and across the various STEM disciplines? Are there areas where we have concentrated our efforts, and areas we have overlooked? What patterns emerge among the project types and disciplines?

(4) The findings document impressive efforts in preparing girls and women for science, technology, engineering, and mathematics studies and careers and demonstrate a rich and diverse body of gender equity intervention projects within all STEM disciplines. About two-thirds of the projects involved extracurricular informal learning activities such as museum visits and field trips. Equally important were mentoring activities in many forms, ranging from traditional one-to-one to large-scale online versions, and professional development activities, such as course taking and network building, that were successfully integrated into projects.

(5) At the same time, the findings reveal some troubling trends. Many projects focused predominantly on career advice without providing access to necessary skill and content development. A majority of projects occurred outside the school curriculum. While such extracurricular projects can be effective and valuable, the overall lack of integration into the school curriculum suggests that gender equity remains on the margins of teaching and learning in the STEM fields. Finally, an absence of data on participant demographics and a lack of project evaluation make it difficult to determine who is being served and if and how project outcomes are being measured.

31. What does the phrase "shrinking pipeline" in paragraph refer to?

- (A) the shortage of oil supply (B) the shortage of labor supply
(C) the shortage of training programs (D) an issue that is getting smaller

32. Which of the sentences below best express the essential information in the highlighted sentence in the passage 2? (Incorrect choices change the meaning in important ways or leave out essential information.)

- (A) These projects allowed us to study the differences between men and women employed in STEM jobs.
(B) We were able to intervene when women STEM workers were being treated unfairly.
(C) Studying these projects helped to create more gender equity intervention projects.
(D) STEM jobs were able to be studied by exploring nature.

33. In paragraph 3, "Are there areas where we have concentrated our efforts, and areas we have overlooked?"

In this sentence, "we" refers to

- (A) the author and his/her coworkers. (B) people involved in creating gender equity projects.
(C) people in the STEM disciplines. (D) Yasmin Kafai and his team.

34. According to paragraph 4, what is one positive finding of this research?

- (A) the STEM field is rich and diverse (B) many projects involved mentoring opportunities
(C) girls and women are being prepared for STEM jobs (D) the quality of the questions asked

35. According to paragraph 5, what is one negative trend discovered through this research?

- (A) access to unnecessary content (B) extracurricular projects were common
(C) evaluation of the projects was too specific (D) focus on career advice

Chili peppers are decidedly an international phenomenon, spicing up regional dishes from Thailand to North Africa. In Thailand Confidential, this week's Globalist Bookshelf selection, Jerry Hopkins gives insight

to the culture and history surrounding this fiery fruit (yes, technically a fruit) and highlights how it may be one of the world's best medical miracles.

In Thailand — where restaurants rate their dishes by placing one, two, three, and sometimes four little red chilis on the menu next to the dishes' names to alert diners — I am tolerated. Barely.

A longtime friend, who is a Thai chef, used to bring home food purchased at street stalls and as she placed this on the table, she would point to one container and say, "Mine," then to another, saying, "Yours." As if to say, "Poor dear."

Thailand is not the birthplace of the Capsicum, or chili pepper; it only acts as if it is. In fact, the chili was imported, along with much else in the national diet. However, in Thailand the **per capital consumption** of the small, fiery fruit is surely as high if not higher than it is anywhere else. And it is in the use of unprocessed, fresh, ripe chilis where Thailand rings all the loudest bells.

The truth is that chili is an international phenomenon. There is a bimonthly magazine published in the United States, Chili Pepper (there is no agreement on the spelling), and a wide variety of products is available, including pepper-shaped wind chimes, bells, and strings of Christmas tree lights. There is even a Hot Sauce Club of America; members receive two new hot sauces and a newsletter every month. There is even a popular American rock and roll band that calls itself the Red Hot Chili Peppers. Yes, the band is hot.

36. From these passages, we learn that the author

- (A) enjoys chili peppers everywhere.
- (B) does not really like chili peppers.
- (C) likes to have chili peppers to go with some certain kind of food.
- (D) like to go to restaurant famous for chili peppers.

37. The best title for these passages is

- (A) Thailand and Chili peppers. (B) Chili Peppers and Spicy Dishes.
- (C) Different Tastes all over the World. (D) Chili Peppers and Globalization.

38. Based on the passages, which of the following is NOT TRUE?

- (A) That Thailand uses unprocessed, fresh, ripe chili peppers has started the popularity of chili peppers.
- (B) Thailand exports a lot of chili peppers.
- (C) Chili peppers are a kind of fruit.
- (D) Thai food is normally quite spicy.

39. What does **per capital consumption** mean?

- (A) amount consumed per person within a specific population.
- (B) capital population and its consumption.
- (C) capital with that the government provides each person for food consumption.
- (D) capital that each person can get for their daily food consumption.

40. What is the main idea of the last paragraph?

- (A) Chili peppers are very popular in the United States.
- (B) The use of chili peppers in the United States is being influenced by Thailand.
- (C) Chili peppers are made into different toys.
- (D) Chilli peppers have made a rock band very hot.

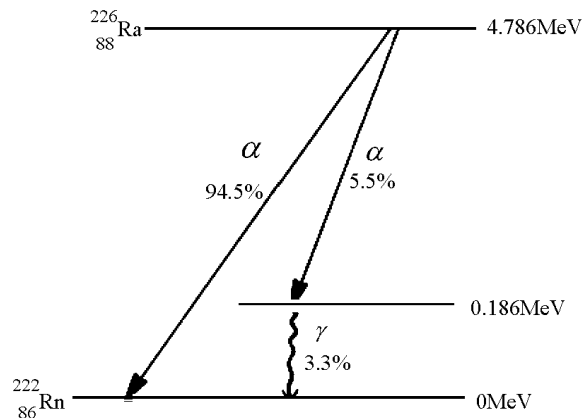
IV. Essay. 20 points.

Please write a **well-structured** essay on **how you can prepare yourself for living in a diverse and more global society** in 150 to 200 words discussing your opinions.

可使用計算器

計算題 10 題，每題 10 分，總分共計 100 分。

1. 已知 8 MeV 光子與電子相互作用的康普吞碰撞截面(Compton collision cross section) σ_c 是 $5.99 \times 10^{-30} \text{ m}^2$ ，回跳電子的平均能量 E_{avg} 為 5.34 MeV，回跳能量的分數 $E_{\text{avg}}/h\nu$ 為 0.667，試求 8 MeV 光子對水發生康普吞散射碰撞之能量轉移 (energy transfer) 的直線衰減係數 (linear attenuation coefficient) σ_{tr} 、能量吸收 (energy absorption) 的直線衰減係數 σ_{en} 分別為何？
- 2 已知母核進行電子捕獲(electron capture)的蛻變，且母核原子的質量為 A amu，子核原子的質量為 B amu，請問母核蛻變時，釋放出的總能量為何？[不考慮電子的束縛能(binding energy，結合能)]
3. $^{226}_{88}\text{Ra}$ 的衰變圖如下圖所示。請問 1Ci 的 $^{226}_{88}\text{Ra}$ ，在 1 秒內發生內轉換(internal conversion) 的次數為多少？假設內轉換發生在 K 層，而 K 層電子的螢光產率 (fluorescence yield) 為 0.7，請問離射源 0.5 公尺處的 K x-ray 通量率為多少 $\text{m}^{-2} \text{ s}^{-1}$ ？



- 4 若某 x 光診斷設備在 250 kV 的條件下操作(半值層為 2.8 cm 的混凝土)，經計算求得防護滲漏輻射所需要的混凝土厚度(t_l)為 9.83 個半值層(HVL)，而防護散射輻射所需的屏蔽厚度(t_s)為 34 cm 混凝土，試問次防護屏蔽(secondary protective barrier) 的厚度至少應大於多少公分？
5. 已知 6 MV 的 X 光，石墨對空氣的平均質量能量-吸收係數比 $(\bar{\mu}_{en}/\rho)_{\text{air}}^{\text{med}}$ 為 0.997，水對空氣的平均質量能量-吸收係數比 $(\bar{\mu}_{en}/\rho)_{\text{air}}^{\text{med}}$ 為 1.111，石墨對空氣的平均限制

阻擋本領比 $(\bar{L}/\rho)_{air}^{med}$ 為 1.002 ($\Delta=10$ keV)，若以石墨為壁的 Farmer 游離腔所測的空
氣吸收劑量 D_{gas} 為 100 cGy，則 Farmer 游離腔在水假體中所測得的吸收劑量 D_{water}
為何？

6. 克馬 K 減掉碰撞克馬 K^{col} 等於什麼？請列式說明。
7. 請敘述游離比(ionization ratio)IR 的測量方法。
8. 已知一 x 光射束在體積 0.6 cm^3 的空氣腔(air cavity)每分鐘產生 2×10^9 i.p.(ion pair，
離子對)，則其曝露率 \dot{X} (以 R/h 為單位)為何？空氣克馬率(air kerma rate) \dot{K}_{air} (以
Gy/h 為單位)為何？
9. 已知空氣的音波阻抗(acoustic impedance)為 $0.0004 \times 10^6 / \text{kg/m}^2 \text{ s}$ ，皮膚(肌肉)的音波
阻抗為 $1.70 \times 10^6 / \text{kg/m}^2 \text{ s}$ ，脂肪的音波阻抗為 $1.38 \times 10^6 / \text{kg/m}^2 \text{ s}$ ，請計算(a)皮膚與空
氣之間的穿透係數(transmission coefficient)T 為何？(b)皮膚與脂肪之間的反射係數
(reflection coefficient)R 為何？
10. 已知磁振造影機所產生的主磁場 \vec{B}_0 為 1.5T，當厚度為 1cm 的切面(斷層面)，梯度
磁場強度為 1.0gauss/cm，若經過切面(斷層面)的磁場變化為 1.5010T 到
1.5011T，則經過 6mm 的切面(斷層面)的拉莫頻率(Larmor frequency)相差多少？

高雄醫學大學 99 學年度 研究所 招生考試 考試科目: 放射技術學

Part A:

- 一、 試論述 2-D 傳統放射線治療、3-D 順形放射線治療、強度調控放射線治療(IMRT)、影像導引放射線治療(IGRT)及立體定位放射手術治療(SRS)等不同之放射治療技術之演進，其各有那些優點、缺點及適應症。(10%)
- 二、 在標靶劃定(Target delineation)常使用 GTV，CTV 及 PTV，請問三者的定義與關係為何？(5%)
- 三、 在放射線治療的成功或失敗之不確定因素(Uncertainties)有那些？請以發生的可能機率由大而小論述之，例如生物因素、物理因素及其他因素等等。(8%)
- 四、 何謂放射線治療的近接治療？原理為何？常使用之射源及適應症為何？(6%)
- 五、 試列舉 2 種以單獨放射線治療達到「根治」的癌症及 2 種放射線治療以達到「緩解性治療」的癌症或癌症相關症候群。(4%)

Part B:

1. 請描述電腦斷層之結構及其取像和影像重建之過程。(6%)
2. 請描述醫學影像儲存與傳輸系統(PACS)之架構及其運作模式。(6%)
3. 請說明常規胸部 x 光攝影條件中使用高 KVp 的理由。(3%)
4. 請描述電腦斷層掃描參數中"動度(pitch)"之定義和取像之間的關聯 30% (6%)
5. 請畫出基本的自旋回訊磁振造影脈衝序列圖(spin echo MRI pulse sequence)。(note: 須包括 90° 、 180° RF pulse，標示出 3 種 gradients 及其出現位置，標示出 TR、TE 及標示出 echo 訊號出現位置。)(6%)
6. ()在磁振造影中，以 T_2 為主的影像(T_2 -W image)所用的造影參數為下列那個選項：
(A) 長 TR(repetition time)，長 TE(echo time)、(B) 短 TR，短 TE、
(C) 長 TR，短 TE、(D) 短 TR，長 TE (2%)
7. 延續上題，請說明您的答案為什麼能形成以 T_2 為主的影像(T_2 -W image)？(2%)
8. 磁振掃描儀內主要有三種線圈，請問這三種線圈的名稱以及其對應的功能。(3%)

Part C:

1. 請說明閃爍攝影中，影響影像品質的因素有那些？應如何評估？(13%)
2. 請各舉一例說明含有 ^{99m}Tc 以及 ^{131}I 放射性藥品的標誌方法，並說明該放射藥品的用途。(10%)
3. 請舉出三項與癌症檢查相關的核子醫學影像學檢查，並說明其檢查原理及方法。(10%)