

**Part I. Question 1 to 10, please choose the answer closest to the underlined word or phrase. One Answer Only. 2 points each.**

1. Leaders of the world's largest economies are close to an agreement to tackle the global financial crisis.  
(A) fight (B) meditate (C) forbid (D) deal with
2. I think people realize the economy seemingly fell off the cliff.  
(A) inclined (B) caught up (C) help up (D) slumped
3. In the future, globalization is going to be increasingly driven quickly to its processes and technologies, and start to march forward.  
(A) directed (B) motivated (C) forced (D) manipulated
4. The home team kicked off the season with an easy win.  
(A) interrupted (B) commenced (C) avoided (D) complicated
5. The use of stem cells is controversial - opponents object on the grounds that it is unethical to destroy embryos in the name of science.  
(A) adversaries (B) allies (C) forerunners (D) associates
6. Slumdog Millionaire is about a Mumbai teen who grew up in the slums, becomes a contestant on the Indian version of "Who Wants To Be A Millionaire?"  
(A) asylum seeker (B) gangster (C) youngster (D) homeless
7. Critical listening is a difficult kind of listening because it requires you to both interpret and evaluate the message.  
(A) understand (B) integrate (C) intrigue (D) compose
8. He is worried about a potential quiz tomorrow.  
(A) possible (B) actual (C) providential (D) surprising
9. These two girls prefer to have intimate conversation one-on-one  
(A) personal (B) secret (C) intelligent (D) discreet
10. His position was contrary to that of the teacher's  
(A) puzzling (B) opposite (C) compatible (D) foreseeable

**Part II. Question 11-15, please choose the answer that best completes the sentence. Question 16-20, please choose the best answer to fill each of the numbered blanks in the passage.**

In many countries, it is considered 11 to appear naked or even half-naked on a public beach. However, some places often have a few 12 beaches that are designated as nudist or "clothing optional" beaches, where uninhibited people can fully 13 themselves to the sun. Other countries, especially those where 14 are hot and attitudes are 15, impose no restrictions at all, so people may sunbathe topless or nude even on the public beaches.

11. (A) inappropriate (B) interesting (C) conservative (D) considerate
12. (A) inclusive (B) executive (C) secluded (D) acceptable
13. (A) demonstrate (B) expose (C) lie down (D) externalize
14. (A) seawater (B) cuisine (C) fashion (D) climates
15. (A) strict (B) sincere (C) liberal (D) general

There are many different forms of potential economic stimulus and they work in different ways. Tax cuts for individuals generally encourage short-term spending. Tax cuts for companies encourage both spending and investment. Expenditures on public works create contracts for firms and provide short- to medium-term 16. Investments in research and development take a longer-term approach 17 the theory 18 in the future (and thus provide jobs) if they have the money to make intelligent investments in their operations

now. Finally, some forms of economic stimulus seek to make investments that will pay off in the long run 19 for everybody. An example is investing in the U.S. energy grid. 20, a one-time outlay could make energy costs for both individuals and businesses less expensive for decades to come.

16. (A) opportunities of employment (B) employment opportunities  
 (C) employing opportunities (D) employment in opportunities
17. (A) under (B) in (C) of (D) on
18. (A) business is going to be thrive (B) which business is going to be thrive  
 (C) that business will thrive (D) business thrives
19. (A) with cheaper consumption (B) in making cheaper consumption  
 (C) by consuming cheaply (D) by making consumption cheaper
20. (A) Theoretic concern (B) Theoretical (C) Being theoretic (D) Theoretically

**Part III. Reading Comprehension. In this part, you will read several passages. Each one is followed by one question or a number of questions. Question 21 – 40, you should choose the ONE best answer to each question. 2 points Each.**

**Question 21-25**

The importance of strength in many sports is undeniable. It is so important that many university and professional teams now hire a specialized coach who only attends to the development of strength in athletes. It is interesting to note that no such specialist is hired to attend to the other components of physical fitness. We have yet to see a cardiovascular coach, a coach who attends to developing fitness of the heart and blood vessels, hired by universities or professional teams. This situation raises the question of the relative importance of each of these two components, strength training and cardiovascular training, to the other. Does the strength coach develop the cardiovascular system by prescribing a program to increase muscle fiber?

It is theoretically possible to design a weight-lifting program in which the resistance is so low and the repetitions so numerous that it provides the cardiovascular benefits of a running program. Therefore, if you view weights as a way to overload muscles, you can imagine a continuum of programs that emphasize cardiovascular benefits on the one extreme and strength on the other. The practical truth of the matter is that most coaches are primarily concerned with pure strength. Therefore, the athlete has to work on the end of the weight-overload continuum that promotes little, if any, cardiovascular benefit. In fact, one study has found that a high-intensity strength program reduced mitochondrial density (density of the cellular structures that produce energy in the muscle fiber) per unit of muscle. The athletes increased muscle mass, so they did not eliminate mitochondria presumably, but the fact remains that the oxidative capacity, the ability to use oxygen in the synthesis of energy, was not promoted. Oxidative capacity would usually improve in programs that stress cardiovascular conditioning. Neither increased blood flow nor increased mitochondrial density (both indicators of oxygen extraction) occur with strength training.

Obviously, there is nothing wrong with training athletes to gain strength, but in most strength programs cardiovascular improvements are not made. Therefore, for athletes, who require both strength and cardiovascular conditioning, both components must be trained independently.

21. What is the main point of the passage?
- (A) College and professional teams do not need specialized coaches.  
 (B) Strength training should be replaced by cardiovascular training.  
 (C) Cardiovascular training is more difficult than strength training.  
 (D) Athletes need both strength and cardiovascular training.

22. Under which of the following conditions can a weight-lifting program provide cardiovascular benefits?
- (A) When the weights are very heavy
  - (B) When the weights are lifted very slowly
  - (C) When lifting a heavy weight overtires the muscles
  - (D) When light weights are lifted a large number of times
23. Why does the author mention running?
- (A) To give an example of the benefits of strength training
  - (B) To demonstrate what a typical weight program includes
  - (C) To give an example of an activity that provides cardiovascular conditioning
  - (D) To demonstrate the importance of oxygen extraction
24. Which of the following is an important direct result of cardiovascular training?
- (A) Improved oxidative capacity
  - (B) Increased muscle fiber
  - (C) Decreased mitochondrial density
  - (D) Increased body weight
25. Which of the following policies would the author be most likely to support?
- (A) Sports teams should increase their strength-training programs.
  - (B) All athletes should be able to choose the kinds of training they prefer.
  - (C) Sports teams should provide improved cardiovascular training.
  - (D) All athletes should avoid strength training in order to avoid injury.

**Question 26-31**

It is in search of adequate food supplies that cetaceans, marine mammals such as whales and dolphins, travel the oceans. They live in a world that is largely hidden from humans. Yet their range is three times as large as ours, since oceans occupy about three-quarters of the Earth's surface. They travel through well-marked ocean zones, **each** with its own characteristic marine life. They glide through the water, periodically rising to the surface to breathe. The sea may be raging but cetaceans are untroubled by the greatest storms; indeed they are more at home in rough than in calm seas.

Indirectly, however, their life is greatly influenced by wind. The eastward rotation of the Earth produces the **prevailing** trade winds, blowing east to west at the equator. These winds drag the surface waters and all they contain in a westerly direction. Warmed by its passage through the tropics, the wind-driven water is deflected against the westward continents, turning southwest in the Southern Hemisphere and northwest in the Northern Hemisphere.

In the Southern Hemisphere, the warm flow of tropical water under the west-going equatorial trade wind produces a genial climate along the eastern shores of Australia, South America, and South Africa. But there is open ocean to the south. Here the current is driven eastward unimpeded by land before the almost incessant westerly gales of this zone. The huge mass of water moves fast, chilled by water from the Antarctic Region, but **laden** with masses of plankton.

This cold, swift current is **split** when it strikes the southwestern extremities of the three southern continents. The northern portion of this water is diverted by the southwest coast of South America to sweep northward toward the equator. Known as the Humboldt Current, this current is rich in plankton on which cetaceans feed. Part of this same cool eastward-flowing current, enriched with water from higher latitudes, is similarly diverted north along the southwest coast of South Africa. This is the Benguela Current, where many cetaceans come to feed.

26. The passage answers which of the following questions?
- (A) What is the main difference between cetaceans and other marine life?

- (B) How far do most cetaceans travel in a year?  
(C) How often do cetaceans need to breathe?  
(D) What winds and ocean currents affect cetaceans?
27. The word **each** in paragraph 1 refers to a  
(A) cetacean (B) surface (C) range (D) zone
28. The word **prevailing** in the passage is closest in meaning to  
(A) arctic (B) blowing (C) dominant (D) energetic
29. The word **laden** in paragraph 3 is closest in meaning to  
(A) balanced (B) filled (C) touched (D) wrapped
30. The word **split** in paragraph 4 is closest in meaning to  
(A) stopped (B) divided (C) opened (D) surrounded
31. What do paragraphs 3 and 4 primarily discuss?  
(A) The water currents in the Southern Hemisphere  
(B) The trade winds in the Southern Hemisphere  
(C) The three continents in the Southern Hemisphere  
(D) The large area of open ocean in the Southern Hemisphere.

**Question 32-36**

Doris Lessing received her Nobel Prize in 2007. Her novel *The Golden Notebook* is considered a feminist classic by some scholars, but notably not by the author herself, who later wrote that its theme of mental breakdowns as a means of healing and freeing one's self from illusions had been overlooked by critics. She also regretted that critics failed to appreciate the exceptional structure of the novel. As she explains in *Walking in the Shade*, Lessing modeled Molly, to an extent, on her good friend Joan Rodker, the daughter of the author and publisher John Rodker.

Lessing does not like the idea of being pigeon-holed as a feminist author. When asked why, she replies:

What the feminists want of me is something they haven't examined because it comes from religion. They want me to bear witness. What they would really like me to say is, 'Ha, sisters, I stand with you side by side in your struggle toward the golden dawn where all those beastly men are no more.' Do they really want people to make oversimplified statements about men and women? In fact, they do. I've come with great regret to this conclusion.

- Doris Lessing, *The New York Times*, 25 July, 1982[8]

32. Doris Lessing is a Nobel Prize winner in  
(A) Feminism. (B) Literature. (C) Sociology. (D) Peace.
33. According to Doris, what feminists want from her is  
(A) exceptional structure. (B) fighting against men.  
(C) creative ideas about men and women. (D) healing power from battles between men and women.
34. Doris Lessing does not particularly like the idea of being **pigeon-holed** as a feminist; pigeon-holed here means  
(A) categorized (B) wholesale (C) viewed (D) completed
35. Which of the following statements is **FALSE**?  
(A) Critics often neglect the theme of mental breakdowns as a self-freeing power.  
(B) She models a heroine on her friend in one of her books.  
(C) Her book *The Golden Book* is particularly considered a feminist one by Lessing.  
(D) Lessing thinks critics understand her work very well.
36. Generally speaking, Lessing's attitude towards being considered a feminist is  
(A) accepting (B) disappointed (C) welcomed (D) patient

**Question 37-40**

In recent years, many Taiwanese have won awards at international film festivals. However, many theater owners don't consider even prize-winning Taiwanese films to have much commercial potential in their home market. Their viewpoint is generally confirmed by the largely empty seats at showings of locally produced movies. The market share for local films is only about two percent, while more than 95 percent of the market is taken by Hollywood blockbusters. The dominance of American-made films in Taiwan has continued for the past ten years, but the government is proposing some solutions. It is hoped that some legal changes and few promotional projects will help Taiwan's struggling film industry.

One proposal is to give individuals or companies a tax deduction for money spent to produce a film. The idea is that the tax deduction would encourage investments in new films. There are also plans to provide financial support not only for film production, but also for marketing.

37. Which of the following could be a title for this passage?

- (A) The international Movie Industry and Taiwanese Films
- (B) Trends in Taiwanese Moviegoing Habits
- (C) Prize-Winning Taiwanese Films
- (D) A Helping Hand for the Taiwanese Film Industry

38. Which of the following statements is true about Taiwanese films in general?

- (A) They have been commercially successful both locally and abroad.
- (B) Most production of local films has been moved to Hollywood.
- (C) They have won many international awards, but little response from local audiences.
- (D) They have found little success anywhere in the world.

39. What does the passage imply is the main reason that Taiwanese films do not have a large local audience?

- (A) Taiwanese audiences dislike prize-winning films, thinking them "arty."
- (B) American films are superior in quality.
- (C) The Taiwanese film industry is not supported well enough financially.
- (D) Ticket prices for local films are too high.

40. How is the government attempting to help the local film industry?

- (A) By limiting the number of foreign films that local theater owners can show.
- (B) By encourage lower ticket prices for local films.
- (C) By establishing schools for training local filmmaking talent.
- (D) By helping to make creating and promoting local films more affordable.

**Part IV. Essay. 20 points.**

**Do you think that technology alienate people from one another? Why or Why not? Please write a well-structured essay in 150 to 200 words discussing your opinions.**

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## (一)、選擇題 (30 分)

1. 貝克(Bq)是什麼單位? (A) expoure, (B) dose equivalent, (C) absorbed dose, (D) activity
2. 迴旋加速器不能使用下列那種粒子來打靶? (A) proton, (B) neutron, (C) deuteron, (D) alpha particle
3. 下列何種影像處理方式會產生星狀假影(star artifact)? (A) 疊代法(iterative reconstruction), (B) 逆投影法(backprojection), (C) 最大強度投影法(maximum intensity projection), (D) 傅立葉轉換法(Fourier Transform)
4. 制動輻射(bremsstrahlung radiation)比較容易發生的情況為: (A)低能量入射粒子與高原子序物質, (B)低能量入射粒子與低原子序物質, (C)高能量入射粒子與低原子序物質, (D)高能量入射粒子與高原子序物質
5. 利用 MTF(modulation transfer function)來評估造影(攝影)儀器的: (A) 均勻度(uniformity), (B) 靈敏度(sensitivity), (C) 穩定性(stability), (D) 空間解析度(spatial resolution)
6. 病人接受 LINAC 同心治療。已知當 SAD=80 cm, FOV=6x12 cm, 空氣中校正點之劑量率=100 cGy/min, TAR=0.681。請問施於病人腫瘤劑量 200 cGy, 約需時多久? (A) 1.01 min, (B) 1.96 min, (C) 2.94 min, (D) 4.12 min
7. 某台 CT 掃描儀可辨別 0.5 mm 的物質, 請問它的空間解析度為多少 lp/cm? (A) 5, (B) 10, (C) 20, (D) 40
8. 若入射超音波的強度為 10 W/cm, 而其回聲強度為 0.01 W/cm<sup>2</sup>, 則其回聲的相對強度為多少 dB? (A) -10, (B) -20, (C) -30, (D) -40
9. 有關磁共振造影, 請問 FOV 小於檢查部位時, 會產生何種假影? (A) 化學位移假影 (chemical-shift artifact), (B) 移動假影(motion artifact), (C) 反摺假影(aliasing artifact), (D) 射頻雜訊(RF noise)
10. 有關磁共振造影, 下列何種 spin echo (SE) 的參數可得到 T2 加權影像? (A) TE=70 ms, TR=500 ms, (B) TE=50 ms, TR=600 ms, (C) TE=30 ms, TR=3500 ms, (D) TE=110 ms, TR=3500 ms

## (二)、計算與問答題 (70 分)

1. (4 分) 在標準狀況下, 體積為 1 cm<sup>3</sup> 的空氣腔曝露在輻射場中產生 3.336x10<sup>-10</sup> 庫倫的電量, 求空氣的吸收劑量為多少 Gy? (空氣密度=1.293 kg/m<sup>3</sup>, w/e = 33.85 焦耳/庫倫)
2. (9 分) 已知 1 MeV 的光子與氫及氧作用的質量衰減係數分別為 0.1263 cm<sup>2</sup>/g 及 0.0637 cm<sup>2</sup>/g, 試求 1 MeV 光子束在水中之 (a) 質量衰減係數 (b) 平均射程 (c) 半值層。
3. (4 分) 1.0 mCi 的 P-32(半衰期為 14.28 天), 其質量為多少克?  
 $3.7 \times 10^9 = 1.06 \times 10^{16} A$
4. (3 分) 輻射度量樣品總計數為 300±12, 背景計數為 30±5, 淨計數為 \_\_\_\_\_ ± \_\_\_\_\_。  
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 $1.06 \times 10^{-7} \times 10^{16}$
5. (6 分) 請寫出光子與物質作用最主要之三種效應的質量衰減係數 (mass attenuation coefficient) 與光子能量(hv)及物質原子序數(Z)的關係。
6. (3 分) Tc-99m 的半衰期為 6 小時, 星期一早上 6:00 測得某樣品有 Tc-99m 100 mCi, 則星期二早上 6:00 該樣品約剩多少放射活性?  
pixel =  $2.5 \times 10^{-5}$
7. (6 分) 請畫出在 80 kVp 下 X 光管產生的 X 光能譜圖  
FOV = 432  
matrix = 19 x 80000
8. (6 分) 為了能夠和影屏-軟片系統的空間解析度相比。數位攝影需要在 18 x 24 cm 的區域提供 3600 x 4800 以上的像素矩陣, 而每個像素需要 12 位元的對比解析度。請問在這樣的條件下影像的解析度為 \_\_\_\_\_ lp/mm。而一張這樣的數位影像將佔 \_\_\_\_\_ Mbyte 的空間。

<可使用計算器>

9. (4分) 簡單比較一個經高通濾波處理後的數位影像與低通濾波處理後的數位影像在影像特性上有何差異?
10. (4分) 計算一個 60 keV 的 X-ray 光子在被  $\text{CaWO}_4$  影屏(screen)吸收後將放出多少個(藍色)光子? [假設藍光波長為 4300 埃(A), 影屏(screen)的 conversion efficiency 為 5%]  

$$CZ = \frac{60 \text{ keV}}{4.3 \times 10^{-7} \text{ m}}$$
11. (3分) 已知  $\text{TR}=2000 \text{ msec}$ ,  $\text{TE}=100 \text{ msec}$ ,  $\text{NEX}=2$ ,  $\text{Nx}=256$ ,  $\text{Ny}=128$ , 請問若採用 FSE (fast spin echo), 其  $\text{ETL}=8$ , 則掃描時間為何?
12. (6分) 畫出基本的 spin echo MRI pulse sequence。(note: 須包括  $90^\circ$ 、 $180^\circ$  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。)
13. (4分) 若腹部軟組織聲速為 1540 m/s, 超音波轉換器 (transducer) 所產生的音波頻率為 4 MHz, 反射波的頻率位移 (frequency shift)  $\Delta f = -780 \text{ Hz}$ , 射束與血管所成的角度為  $60^\circ$ , 則血流速度為多少 m/sec?
14. (4分) 超音波掃描深度 15.4 cm, 每條掃描線有 3 個動態聚焦區, 每個畫面有 200 條掃描線, 則其最大畫面速率 (每秒畫面數目) 為多少?  

$$\frac{200 \text{ line/frame}}{1 \text{ frame/s}}$$
15. (4分) 在 125 kVp 的照射下, 脂肪的  $\mu_{\text{fat}}=0.185 \text{ cm}^{-1}$ , k 採用 1000, 脂肪的 CT number 等於 -100, 請水的  $\mu_{\text{water}}$  值?

$$d = \frac{1}{2} v t$$

$$15.4 = \frac{1}{2} v t$$

$$30.8 = v t$$

$$-0.1 = \frac{0.185 - x}{k}$$

$$-0.1 \times 1000 = 0.185 - x$$

$$-100 = 0.185 - x$$

$$x = 0.185 - 100$$

$$x = -99.815$$

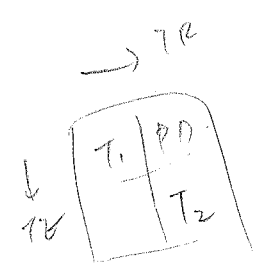
$$60 \text{ keV} \times \frac{1.6 \times 10^{-16} \text{ J/eV}}{1 \text{ keV}}$$

$$6 \times 69 \times$$

A.

選擇題: (單選, 每題 1.5 分)

- ( ) 1. MRI使用短回轉方法 (STIR, short-tau inversion recovery) 壓抑脂肪訊號時, 可見腦脊髓液訊號為:  
 (A) 混雜訊號 (B) 灰色中訊號 (C) 黑色低訊號 (D) 白色高訊號
- ( ) 2. 有關陽極腳跟效應 (anode heel effect) 的描述, 下列何者正確?  
 (A) 在陽極所發出的 X 光有較小的衰減  
 (B) 在光源與 X 光片距離越遠時此效應越明顯  
 (C) 通常焦距越小所發生的腳跟效應越大  
 (D) X 光從陰極端所發出之輻射強度比陽極端強
- ( ) 3. 在磁振造影, 下列那一種脈衝序列最不适合用以壓制脂肪訊號或對脂肪組織做評估?  
 (A) FLAIR (B) fat-sat 2D FLASH (C) In-Phase/Out-phase sequence (D) STIR
- ( ) 4. 影像擷取傳輸系統 (PACS) 中較常採用的影像模式為:  
 (A) BMP (B) MPEG4 (C) JPEG (D) DICOM
- ( ) 5. 在MRI 的原理中, 當radiofrequency 將z-軸的向量Mz 轉90 度後, magnetic moment 會停留在x-y 平面, 此時Mxy 從最大逐漸衰減到0, 這個現象稱為:  
 (A) Spin Echo (B) T2\* effect (C) T2 relaxation (D) T1 relaxation
- ( ) 6. 在spiral CT 的掃描技術中, 所謂的Pitch 是指下列那一項?  
 (A) X 光球管旋轉一次 (360 度) 時與病人體表的平均距離  
 (B) X 光球管旋轉一次 (360 度) 時病人移動的距離  
 (C) X 光球管每秒旋轉多少次 (360 度)  
 (D) X 光球管旋轉一次 (360 度) 的時間
- ( ) 7. Electron Beam CT 比一般的Spiral CT 較佳的地方是:  
 (A) wide coverage (B) contrast resolution  
 (C) temporal resolution (D) spatial resolution
- ( ) 8. 在MRI 中, 下列那一項最適於加強空間解像力?  
 (A) 降低NEX (number of excitation)  
 (B) 增加FOV (field of view)  
 (C) 增加顯影劑的劑量  
 (D) 降低 slice thickness
- ( ) 9. 磁振造影檢查時, 所發生的噪音主要來自:  
 (A) 表面線圈 (B) 無線電波 (C) 梯度磁場 (D) 主磁場
- ( ) 10. TR=500 ms, TE=12 ms 時, 1.5T 磁振造影影像:  
 (A) 脂肪為低訊號, CSF 為高訊號 (B) 脂肪為高訊號, CSF 為低訊號  
 (C) 脂肪為低訊號, CSF 為低訊號 (D) 脂肪為高訊號, CSF 為高訊號
- ( ) 11. 增加X 光片解析度的方法是:  
 (A) 增加SID 與OID, 用小focal spot 之X 光  
 (B) 減少SID 與OID, 用小focal spot 之X 光  
 (C) 增長exposure time  
 (D) 增加 SID, 減少 OID, 用小 focal spot 之 X 光
- ( ) 12. 下列何者可增加MRI 之SNR?  
 (A) 減少 NEX (B) 使用較低之 bandwidth  
 (C) 增長 TE (D) 縮短 TR





- ( ) 13. MRI檢查時，增加interslice gap 可以：
- (A) 增加偵測到小病灶之機會  
(B) 減少SNR  
(C) 減少cross-talk artifact  
(D) 減少檢查範圍 (coverage)
- ( ) 14. 關於2D-TOF 與3D-TOF MRA 下列何者正確？
- (A) 2D-TOF MRA 之spatial resolution 比較好  
(B) 2D-TOF MRA 比較快  
(C) 3D-TOF MRA 對slow flow 之偵測比較敏感  
(D) 3D-TOF MRA 之 SNR 比較低
- ( ) 15. 關於beam hardening artifact 的描述，下列何者正確？
- (A) CT number 在周圍較低  
(B) 無法用軟體校正  
(C) 平均X 光能量穿過人體後，變低之現象  
(D) 常見於腦幹，又稱為 cupping artifact
- ( ) 16. 下消化道出血不止，施行血管攝影術時，至少須做下列那兩條血管之血管攝影？
- (A) 腹腔動脈 (celiac artery)，腎動脈 (renal artery)  
(B) 下腸繫膜動脈 (inferior mesenteric artery)，腎動脈 (renal artery)  
(C) 上腸繫膜動脈 (superior mesenteric artery)，下腸繫膜動脈 (inferior mesenteric artery)  
(D) 腹腔動脈 (celiac artery)，上腸繫膜動脈 (superior mesenteric artery)
- ( ) 17. 下列何種數位影像的解析度最高？
- (A) 磁振造影 (B) 數位 X 光攝影  
(C) 電腦斷層攝影 (D) 數位乳房攝影
- ( ) 18. 如果我們希望藉由CT angiography 來評估血管狹窄程度及血管壁鈣化情形，以做為醫師施行血管擴張術或置放支架 (stent) 的參考，則下列何者較不適宜？
- (A) volume rendering  
(B) surface shaded display  
(C) multiplaner reformation  
(D) maximum intensity projection
- ( ) 19. 下列敘述何者正確？
- (A) 發出的音波頻率越高，速度越快  
(B) 聲速在固體中傳播比在水中快  
(C) 聲速在空氣中傳播比在水中快  
(D) 音速在各種介質中的速度一樣快
- ( ) 20. 超音波的側解析度(lateral resolution)，取決於下列那一個因素？
- (A) beam frequency (B) transmitting power  
(C) beam width (D) spatial pulse length
- ( ) 21. 關於消化道攝影時所使用的鋇劑(barium sulfate)，下列敘述何者正確？
- (A) 與水混合形成膠狀懸浮劑 (B) 在懷疑胃穿孔時使用  
(C) 易溶於水 (D) 為一陰性對比劑
- ( ) 22. 下列何者非目前分子影像醫學之影像工具？
- (A) Micro-CT (B) Micro-PET  
(C) MRI (D) Micro-DR

B、

單選題 (1-16 題每題 2 分，第 17 題 1 分)

- ( ) 1. 以下有關全身照射 (Total Body Irradiation) 的敘述，何者不正確？
- (A) 全身照射可以用來治療再生不良性貧血、白血病及淋巴腫瘤
  - (B) 全身照射可造成全身免疫力下降及骨髓功能降低
  - (C) 全身照射常需要遮擋脊柱以免傷害
  - (D) 全身照射劑量的均勻度並不容易達成
- ( ) 2. 下列有關全身皮膚電子線照射的敘述何者錯誤？
- (A) 最常治療的疾病為皮膚 T 細胞淋巴腫瘤
  - (B) 常使用的照射技術可稱為 Stanford 6 dual fields 照射技術
  - (C) 常使用較高能量的電子線如 12MeV 電子線，以增加深部組織劑量
  - (D) 全身皮膚照射一般不會造成骨髓抑制
- ( ) 3. 下列有關度調控放射治療 (IMRT) 的敘述何者錯誤？
- (A) 是一種反向治療計畫 (Inverse planning)
  - (B) 會使治療照野內的劑量強度分佈均勻
  - (C) 會提高腫瘤劑量及降低正常組織器官劑量
  - (D) 治療時使用的監視單位 (monitor unit) 會增加
- ( ) 4. 下列何者並非電子射線治療使用組織補償物 (bolus) 的目的？
- (A) 使凹凸表面的組織獲得足夠劑量
  - (B) 吸收加速器機頭所產生的額外散射電子及光子
  - (C) 可以增加表面劑量
  - (D) 可降低照野中深部組織或器官之劑量
- ( ) 5. 在標靶劃定 (Target delineation) 過程中，醫師依據電腦斷層並考慮臨床 set-up 及病人 organ motion 因素所界定的腫瘤範圍被稱為？
- (A) Irradiation volume (IV)
  - (B) Clinical target volume (CTV)
  - (C) Planning target volume (PTV)
  - (D) Gross target volume (GTV)
- ( ) 6. 下列何者腫瘤的治療不屬於使用放射線治療配合外科手術治療以達到器官保存的目的？
- (A) 鼻咽癌
  - (B) 四肢的軟組織肉腫瘤
  - (C) 靠近肛門的直腸惡性腫瘤
  - (D) 早期乳癌
- ( ) 7. 下列何者不是緩解性放射線治療？
- (A) 攝護腺癌骨骼轉移
  - (B) 肺癌轉移腦部
  - (C) 肺腫瘤引起的上腔靜脈症候群
  - (D) 乳癌之腋下淋巴結轉移
- ( ) 8. 下列何種腫瘤界定範圍並不考慮腫瘤局部侵犯及擴散能力的因素？
- (A) Irradiation volume (IV)
  - (B) Clinical target volume (CTV)
  - (C) Planning target volume (PTV)
  - (D) Gross target volume (GTV)

- ( ) 9. 下列何種設備在臨床上使用於強度調控放射治療最有效率？
- (A) Bolus
  - (B) Compensator
  - (C) Multi-leaf collimator
  - (D) Cerrobend block
- ( ) 10. 有關氧氣的放射生物效應，以下何者為非？
- (A) 阿發粒子( $\alpha$ -particle)比  $\gamma$ -ray 易受氧氣存在與否而影響其生物效應
  - (B) 放射線打到物質時氧氣必須同時存在才會起作用
  - (C) 氧氣會加強放射線產生的游離基如(氫氧游離基)存在時間較久
  - (D) 缺氧的癌細胞及正常細胞對放射線皆較不敏感
- ( ) 11. 下列何種器官對放射線最敏感？
- (A) 腎臟
  - (B) 肝臟
  - (C) 睪丸
  - (D) 脊椎
- ( ) 12. 下列何者正確？
- (A) 呼吸調控放射治療的敘述需搭配 gating
  - (B) 強度調控放射治療 (IMRT) 可調控病人呼吸
  - (C) 全身照射治療 (TBI) 通常只執行單次治療
  - (D) 以上皆對
- ( ) 13. 下列何者正確？
- (A) Gamma Knife 可治療全身各部位腫瘤
  - (B) Tomotherapy 是使用 MVCT 結合強度調控放射治療技術
  - (C) Rapid arc 可使用於全身照射 (TBI)
  - (D) 以上皆對
- ( ) 14. 欲以電子射束治療延伸至1.5公分深處的表淺腫瘤，且欲其劑量不低於最大劑量點的90%，則下列何能量最為恰當？
- (A) 6 MeV (B) 9 MeV (C) 12 MeV (D) 16 MeV
- ( ) 15. 有關放射治療之目的與好處，以下何者為非？
- (A) 可以治癒病患癌症，或減輕病人的痛苦、改善病人的生活品質
  - (B) 放射治療可單獨使用，或配合手術、化學治療使用
  - (C) 晚期癌症病人不適合接受放射線治療
  - (D) 合併化學治療可使癌症之控制率提高，惟合併化學治療時，所引起之副作用可能會較大
- ( ) 16. 有關近接治療，下列何者正確？
- (A) 攝護腺插種的近接治療是屬於一種腔內近接治療 (Intracavitary brachytherapy)
  - (B) Ir-192 射源可使用在永久插種
  - (C) 治療時間較短，因此屏蔽厚度可以縮小是遙控後荷式近接治療 (remote afterloading brachytherapy) 的優點
  - (D) 子宮頸癌近接治療技術治療，大多採用腔內近接治療 (intracavitary brachytherapy)
- ( ) 17. 有關放射治療之急性皮膚反應，以下何者為非？ (1%)
- (A) 常見於較深部惡性腫瘤之放射治療
  - (B) 照射範圍內的皮膚，依所給之劑量、時間而有不同反應
  - (C) 常於第三、四週後，開始有紅腫、熱及微癢等反應，好像在太陽下曝曬後的皮膚
  - (D) 繼續照射至五、六週時，膚色可能變黑，乾性脫屑，進而溼性脫屑現象

C.

- (1) 請任意列舉三項使用不同放射性製劑 (radiopharmaceuticals) 的正子斷層攝影 (positron emission tomography, PET) 檢查，並分別簡述其原理、適應症 (indications) 與檢查程序 (procedures)。 (12%)
- (2) 請任意列舉三項使用不同放射性製劑的核子醫學治療項目，並分別簡述其原理、適應症與治療程序。 (12%)
- (3) 請簡述核子醫學造影最常使用的安格加瑪攝影機 (Anger gamma camera) 的基本原理，請列舉任一種半導體加瑪攝影設備，並比較兩者的優缺點。 (10%)