

國立清華大學 107 學年度碩士班考試入學試題

系所班組別：奈米工程與微系統研究所

考試科目：科技英文

科目代碼：2102

共 13 頁，第 1 頁 *請在【答案卷、卡】作答

Time: 10:20 ~ 12:00 (100 minutes)

Questions 1-10, 2.5 points for each question

Questions 11-35, 3.0 points for each question

No points will be deducted for incorrect answers.

Questions 1-10

Choose the best answer to replace the section in the question that has an underline.

1. At least one study has been conducted _____ investigate the benefits of following data.

- (A) for
- (B) to
- (C) but
- (D) like
- (E) because

2. Each nucleotide _____ made up of a phosphate, a sugar, and a base.

- (A) was then
- (B) was
- (C) are
- (D) were
- (E) is

3. The patient was ecstatic to learn that there was a cure to his disease _____ but was still unaware of the many side effects that would come with the cure.

- (A) ,
- (B) .
- (C) :
- (D) ;
- (E) {

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4. Numerous other applications have been identified _____ manual force is critical.
(A) like
(B) though it may be
(C) right where
(D) where
(E) though it might be
5. Many research groups have banded together internationally _____ the source of the disease outbreak.
(A) to locate for
(B) locate to
(C) locating towards
(D) locating for
(E) to locate
6. The new prototype _____ the engineers at Dartmouth University intrigued many possible sponsors.
(A) creating
(B) created by
(C) created
(D) created from
(E) creating by
7. "Unfortunately, I am not knowledgeable on this specific topic." Phil said. This quote clearly shows that Phil _____ the topic very well.
(A) does not like
(B) doesn't understand
(C) understands
(D) is understanding
(E) is going to understand

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8. With this method, the sensor can be thin enough _____ prevent interference _____ normal clinical practice _____ remaining inexpensive.

- (A) to.....with.....meanwhile
- (B) however.....with.....while
- (C) to.....because.....while
- (D) to.....with..... while
- (E) in order.....while.....to

9. This has been known to cause frustration for the patients who are _____ subjected to painful or routine procedures.

- (A) repeatedly are
- (B) often are repeatedly
- (C) repeatedly to
- (D) repeatedly
- (E) often repeatedly

10. The professor _____ who always had a large smile on her face _____ greeted the students.

- (A) (.....)
- (B) <.....>
- (C) \.....\
- (D) “.....”
- (E) ‘.....’

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Questions 11-24

Choose the best answer to the question that is being asked.

11. The rate of bacteria growth proliferated when the thermostat was turned up to a certain temperature. What is another word for proliferated?

- (A) expanded
- (B) examined
- (C) decreased
- (D) stopped
- (E) multiplied

12. The young boy relied on his instincts to quickly react in deadly situations. Which word best describes the boy based on the previous sentence?

- (A) inquisitive
- (B) knowledgeable
- (C) intuitive
- (D) important
- (E) unique

13. The professor praised the student, stating that he performed the task impeccably. What is another word for impeccably?

- (A) flawlessly
- (B) lovingly
- (C) hatefully
- (D) grudgingly
- (E) harshly

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14. The student despised the summer camp that his parents had signed him up for. Nevertheless, he continued to attend camp every day because he did not want to anger his parents. What is another word for nevertheless?

- (A) however
- (B) never
- (C) also
- (D) then
- (E) Therefore

15. Which of these sentences is grammatically incorrect?

- (A) She had travelled across the globe to gain more insight for her research paper.
- (B) Everybody was skeptical of their new invention when they presented their first prototype.
- (C) I went to the lab and finished the project.
- (D) Anna and Mike are working on the research project together.
- (E) HE said that I performed quite good today.

16. The man gave a very ambiguous description of the building the lady was looking for. What is another word for ambiguous?

- (A) complicated
- (B) popular
- (C) ambient
- (D) vague
- (E) superfluous

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17. If all humans had the ability to live forever, the world would be a very different place. What word best replaces the phrase 'the ability to live forever' in the previous sentence?

- (A) mortality
- (B) immortality
- (C) imortality
- (D) immortal
- (E) mortal

18. In diagnosis, treatment, and evaluation, the forces that a clinician applies to his/her patients are not currently quantifiable. Which of the following does not pertain to qualitative data?

- (A) size
- (B) texture
- (C) weight in grams
- (D) appearance
- (E) color

19. The methods employed by these investigations are expensive, cumbersome, and not widely applicable. Which of the following is the best synonym of cumbersome?

- (A) unwieldy
- (B) unappealing
- (C) international
- (D) tiresome
- (E) complicated to use

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20. This attenuation of light is proportional to the amount of bending the fiber experiences. Which of the following is the best definition of attenuation in this sentence?
- (A) reduction of the force, effect, or value of something
 - (B) enlargement of the force, effect, or value of something
 - (C) reduction of the amplitude of a signal electrical current or other oscillation
 - (D) enlargement of the amplitude of a signal electrical current or other oscillation
 - (E) enlargement of object
21. A word describes a type of anxiety disorder in which you fear and avoid places or situations that might cause you to panic and make you feel trapped, helpless or embarrassed
- (A) Claustrophobia
 - (B) Agoraphobia
 - (C) Arachnophobia
 - (D) Nyctophobia
 - (E) Monophobia
22. The key idea needed in order to understand why the tightrope walker carries a long pole to aid balance is moment of inertia. Which of the following is the best define the units of mass moment of inertia?
- (A) kg/m^2
 - (B) lb/ft^2
 - (C) $\text{lb} \times \text{ft}^2$
 - (D) $\text{slug} \times \text{ft}^2$
 - (E) none of above

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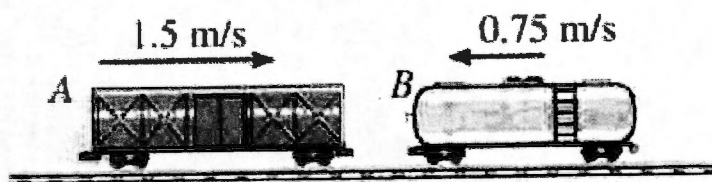
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23. Given Two rail cars with masses of $m_A = 15 \text{ Mg}$ and $m_B = 12 \text{ Mg}$ and velocities as shown. The speed of the cars after they meet and connect.



(A) $V_1 = 0.1 \text{ m/s}$ and $V_2 = 0.5 \text{ m/s}$

(B) $V_1 = 0.2 \text{ m/s}$ and $V_2 = 0.3 \text{ m/s}$

(C) $V_1 = 0.3 \text{ m/s}$ and $V_2 = 0.3 \text{ m/s}$

(D) $V_1 = 0.5 \text{ m/s}$ and $V_2 = 0.5 \text{ m/s}$

(E) None of above

24. Based on the above question, also find the average impulsive force between the cars if the coupling takes place in 0.8 s.

(A) $F_{\text{avg}} = 20,000 \text{ Ns}$

(B) $F_{\text{avg}} = 10,000 \text{ Ns}$

(C) $F_{\text{avg}} = 18,750 \text{ N}$

(D) $F_{\text{avg}} = 20,000 \text{ N}$

(E) None of above

25. What is MEMS?

(A) microelectromechanical systems

(B) microelectronic system

(C) micromachines

(D) micro system technology

(E) All of above

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26. MEMS are made up of components between _____ in size?

- (A) 1 and 100nm
- (B) 1 and 100mm
- (C) 1 and 100 μ m
- (D) 0.0001 and 0.1mm
- (E) None of above

27. With the spherical lens, rays coming from the lens periphery form the image before the ideal focal point. For this reason, the spherical aberration (blurred image) occurs at the center portion of the image formed. Which picture best describe this effect when a focus beam passes through this lens?

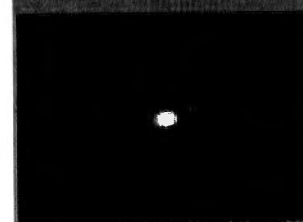
(A)



(B)



(C)



(D)



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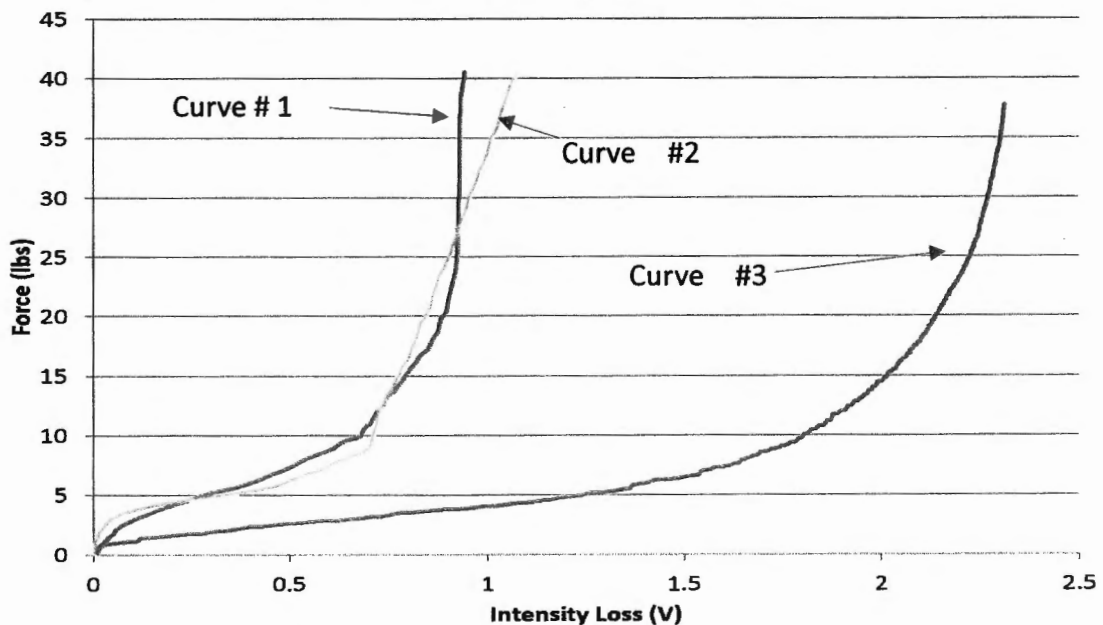
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For clinical application, the sensor's response to materials of different stiffness was evaluated. In this work, two materials were chosen to mimic tissues that may be encountered in a clinical setting. The sensor was calibrated with no pad (between two rigid surfaces), between two soft, 1 cm thick pads (modulus of elasticity (E) = 290 kPa), and between two stiffer 1 cm thick pads (E = 400 kPa) (see Figure below). The general shape for all three calibrations was similar but presented notable differences. The toe regions for the padded calibrations were significantly larger than the unpadded calibration. Also, sensitivity at low forces was approximately twice as high for the unpadded calibration than for both padded. Because of this, the overall loss at 40 lbs (181.4 N) was more than twice as high for the unpadded calibration. The calibration for the stiffer pad was repeatedly bimodal with an uncharacteristic linear region at approximately 9 lbs (40.8 N). The sensitivity for the softer padded test fell to zero at 30 lbs (136.1N), representing its total operating range. The difference between padded and unpadded calibrations is mostly attributed to the contact between top and bottom pads beyond the footprint of the sensor such that some load was transferred through the pads instead of exclusively through the center of the sensor.



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28. Which curve best describes the unpadded sensor?

- (A) Curve #1
- (B) Curve #2
- (C) Curve #3
- (D) None of the above

29. Which curve best describes the softer padded sensor?

- (A) Curve #1
- (B) Curve #2
- (C) Curve #3
- (D) None of the above

30. What happen to the slopes near the toe regions of the curves on the two padded sensors?

- (A) The soft padded sensor has a steeper slope.
- (B) The unpadded sensor has the similar slope as the firmer padded sensor
- (C) The unpadded sensor has the similar slope as the softer padded sensor
- (D) None of the above

31. All three sensors have three different distinct slope regions. What is the approximate value of the slope for the unpadded sensor in the second region?

- (A) $1/2$
- (B) $1/3$
- (C) $3/7$
- (D) $5/7$

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Policymakers must confront the dilemma that fossil fuels continue to be an indispensable source of energy even though burning them produces atmospheric accumulations of carbon dioxide that increase the likelihood of potentially disastrous global climate change. Currently, technology that would capture carbon dioxide emitted by power plants and sequester it harmlessly underground or undersea instead of releasing it into the atmosphere might double the cost of generating electricity. But because sequestration does not affect the cost of electricity transmission and distribution, delivered prices will rise less, by no more than 50 percent. Research into better technologies for capturing carbon dioxide will undoubtedly lead to lowered costs.

32. The passage implies which of the following about the current cost of generating electricity?

- (A) It is higher than it would be if better technologies for capturing carbon dioxide were available.
- (B) It is somewhat less than the cost of electricity transmission and distribution.
- (C) It constitutes at most half of the delivered price of electricity.
- (D) It is dwelt on by policymakers to the exclusion of other costs associated with electricity delivery.
- (E) It is not fully recovered by the prices charged directly to electricity consumers.

33. Passage suggests that extensive use of sequestration would, over time, have which of the following consequences?

- (A) The burning of fossil fuels would eventually cease to produce atmospheric accumulations of carbon dioxide.
- (B) The proportion of the delivered price of electricity due to generation would rise and then decline.
- (C) Power plants would consume progressively lower quantities of fossil fuels.

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34. Riddle: You go at red and stop at green. What am I?

- (A) M&M
- (B) Fig
- (C) Water melon
- (D) Guava
- (E) All the above

35. Riddle: I fly without wings, I cry without eyes. What am I?

- (A) Cloud
- (B) Rain
- (C) Superman
- (D) Electron
- (E) All of the above