注意：考試開始鈴響前，不得翻閱試題，並不得書寫、畫記、作答。

國立清華大學 109 學年度碩士班考試入學試題

系所班組別：動力機械工程學系
　　　　　　甲組(熱流組)

科 目 代 碼：1102

考 試 科 目：科技英文

一作答注意事項一

Part I, Question 1-20, 2.5 points each question.

Part II, Question 21-28, 2.5 points each question.

Part III, Question 29-38, 3.0 points each question.

No points will be deducted for incorrect answers.

Part I, Question 1-20 (2.5 points each question)

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

1. The girl was startled when the balloon _____.
(A) dropped, (B) exploded, (C) flowed, (D) disappeared, (E) connected

2. He _____ the wooden peg into the hole.
(A) insisted, (B) inserted, (C) inspired, (D) inquired, (E) injured

3. Who first discovered America?
(A) Einstein, (B) Newton, (C) Columbus, (D) Shakespeare, (E) Trump

4. Each of the drugs _____ been screened.
(A) is, (B) has, (C) are, (D) have, (E) was

5. Anyone can publish _____ ideas on the website.
(A) their, (B) his, (C) her, (D) its, (E) which

6. There would be difference _____ those three models.
(A) between, (B) for, (C) among, (D) to, (E) with

7. "Do you want to go to supermarket tonight?" No, I'd rather _____ computer game at home
(A) play, (B) to play, (C) with playing, (D) playing, (E) on playing

8. All of students _____ to submit their homework on time without any delay.
(A) need, (B) must, (C) has, (D) have, (E) are

9. Not only _____ Mary apologize, but she also sent me a gift.
(A) do, (B) does, (C) did, (D) was, (E) were

10. The solar cell is used to convert _____ into electric power.
(A) water, (B) wind, (C) gas, (D) soil, (E) light

11. The average of 3, 8, 7, and 10 is _____.
(A) 1, (B) 3, (C) 5, (D) 7, (E) 9

12. The _____ of 1, 3, 5, 7, and 9, is 9.
(A) average, (B) sum up, (C) minimum, (D) maximum, (E) middle number

13. The temperature is now _____ 5 degrees C. (-5°C)
(A) positive, (B) negative, (C) minus, (D) dash, (E) dot

14. One nanometer is _____ m.
(A) 10^{-3}, (B) 10^{-6}, (C) 10^{-9}, (D) 10^{-12}, (E) 10^{-15}

15. Which one is the smallest size?
(A) Cell, (B) Tissue, (C) Bacteria, (D) Virus, (E) Organ

16. What is the size of cubic if the volume of cubic is 1pL?
(A) 10 μm, (B) 100 μm, (C) 1 mm, (D) 1 cm, (E) 1 m

17. Which metal usually has the highest conductivity?
(A) Gold, (B) Silver, (C) Copper, (D) Iron, (E) Aluminum

18. What is the meaning if we multiply current with resistance?
(A) Voltage, (B) Power, (C) Force, (D) Intensity, (E) Capacitance

19. What is the unit of pressure?
(A) N, (B) N/m, (C) N/m^2, (D) N/m^3, (E) N/m^4

20. Let's assume the packaging cost is 60% of product cost. If we spent $5 on packaging cost, how much would be the product cost?
(A) $3, (B) $5, (C) $8.3, (D) $10, (E) S12.5

Part II, Question 21-28 (2.5 points each question)
Try to help complete this cover letter by filling the answers in.
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Dear Ms. Lee:

Over the years, I have built a successful career __21__ international operations and project management on my ability to quickly and accurately assess situations, identify problems and focus __22__ strategies which obtain results. I am currently seeking a challenging opportunity with an internationally focused, growth-oriented organization. I am willing __23__ explore interim assignments and consulting projects __24__ senior management opportunities. My enclosed resume __25__ some of my accomplishments and credentials.

I look forward to __26__ from you to discuss any mutually beneficial opportunities that you may be aware of. Please feel free to pass along my resume to others __27__ may have a need for a professional of __28__ caliber.

21. (A) in, (B) on, (C) at, (D) with, (E) to
22. (A) in, (B) on, (C) at, (D) with, (E) to
23. (A) in, (B) on, (C) at, (D) with, (E) to
24. (A) in, (B) as well as, (C) in addition to, (D) with, (E) to
25. (A) to detail, (B) detail, (C) details, (D) detailing, (E) in detailing
26. (A) hear, (B) hearing, (C) by hearing, (D) heard, (E) heared
27. (A) who, (B) which, (C) in which, (D) to, (E) by
28. (A) my, (B) his, (C) her, (D) our, (E) their

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Part III, Question 29-38 (3 points each question)

Below is the information from one of published Journal paper, please try to answer the following questions.

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Application of a Terahertz System Combined with an X-Shaped Metamaterial Microfluidic Cartridge

Shih-Ting Huang [1], Shen-Fu Hsu [2], Kai-Yuan Tang [2], Ta-Jen Yen [3] and Da-Jeng Yao [1,4,*]

[1] Department of Power Mechanical Engineering, National Tsing Hua University, Hsinchu 30013, Taiwan; doublu1208@gmail.com
[2] ACE BIOTEK Co. Ltd., Hsinchu 30261, Taiwan; steve_hsu@acesolution.com.tw (S.-F.H.); david_tang@acebiotek.com
[3] Department of Material Science Engineering, National Tsing Hua University, Hsinchu 30013, Taiwan; tjyen@mx.nthu.edu.tw
[4] Institute of NanoEngineering and MicroSystems, National Tsing Hua University, Hsinchu 30013, Taiwan
* Correspondence: djyao@mx.nthu.edu.tw; Tel.: +886-3-5715131 (ext. 42850)

Abstract: Terahertz (THz) radiation has attracted wide attention for its ability to sense molecular structure and chemical matter because of a label-free molecular fingerprint and nondestructive properties. When it comes to molecular recognition with terahertz radiation, our attention goes first towards the absorption spectrum, which is beyond the far infrared region. To enhance the sensitivity for similar species, however, it is necessary to apply an artificially designed metamaterial sensor for detection, which confines an electromagnetic field in an extremely sub-wavelength space and hence receives an electromagnetic response through resonance. Once the resonance is caused through the interaction between the THz radiation and the metamaterial, a minute variation might be observed in the frequency domain. For a geometric structure of a metamaterial, a novel design called an X-shaped plasmonic sensor (XPS) can create a quadrupole resonance and lead to sensitivity greater than in the dipole mode. A microfluidic system is able to consume reagents in small volumes for detection, to diminish noise from the environment, and to concentrate the sample into detection spots. A microfluidic device integrated with an X-shaped plasmonic sensor might thus achieve an effective and highly sensitive detection cartridge. Our tests involved not only measurements of liquid samples, but also the performance of a dry bio-sample coated on an XPS.

Keywords: terahertz radiation; metamaterials; microfluidics

29. How many authors are listed for this paper?

(A) 3

(B) 4

(C) 5

(D) 6

(E) 7

30. When was this paper accepted by Journal?
(A) 2017
(B) 2018
(C) 2019
(D) 2020
(E) 2021

31. What does XPS mean?
(A) Extra pressure
(B) X-file of PS
(C) Extra PS beads
(D) X-shaped particle structure
(E) X-shaped plasmonic

32. What is the frequency range this research work for?
(A) about 10^3 Hertz
(B) about 10^6 Hertz
(C) about 10^9 Hertz
(D) about 10^{12} Hertz
(E) about 10^{15} Hertz

33. What does XPS metamaterial use for?
(A) Increase sensitivity of sensor
(B) Decrease sensitivity of sensor
(C) Increase bandwidth of sensor
(D) Decrease bandwidth of sensor
(E) None of above
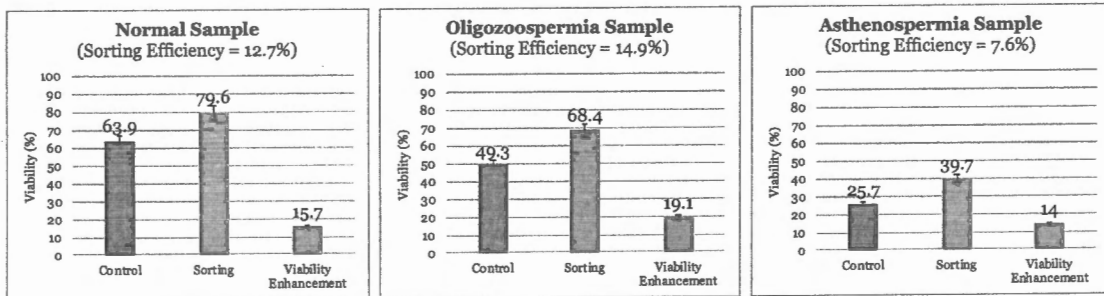
34. What type of resonances can be generated by XPS metamaterial on microfluidic chip?
(A) Single pole
(B) Di-pole
(C) Triple pole
(D) Quadrupole
(E) None of above

****

Below are the analysis data from research, please try to answer the following questions.

35. What kind of samples can generate the highest sorting viability?
(A) Normal sample
(B) Oligozoospermia sample
(C) Asthenospermia sample
(D) They are all similar.
(E) Cannot compare from the data.

36. Try to find out how to evaluate the viability enhancement?
(A) Sum up of control viability and sorting viability.
(B) The difference between control viability and sorting viability.
(C) Divided control viability by sorting viability.
(D) Half of control viability.
(E) Half of sorting viability.

37. What would be the standard derivation of sorting viability from Oligozoospermia sample?
(A) 2.5%
(B) 5%
(C) 7.5%
(D) 10%
(E) 20%

38. Which two parameters go for the similar correlation?
(A) control viability vs sorting viability
(B) control viability vs viability enhancement
(C) sorting viability vs viability enhancement
(D) sorting viability vs sorting efficiency
(E) sorting efficiency vs viability enhancement