Time – 100 minutes

Question 1~40: 1 point for each question

Question 41~70: 2 points for each question

No points will be deducted for incorrect answers.

SECTION 1

40 Questions

Directions: Each sentence below has one or two blanks, each blank indicating that something has been omitted. Beneath the sentence are five lettered words or sets of words. Choose the answer for each blank that best fits the meaning of the sentence as a whole.

1. Fourier transform was applied to ___ the behavior of the system at the frequency domain.

   (A) analyze
   (B) analyzed
   (C) analysis
   (D) analyzable
   (E) analyzability

2. The flow rate ___ the surface tension and viscosity of the liquid as well as the dimensions of the capillary.

   (A) is determined by
   (B) determines
   (C) was determined
   (D) is determining by
   (E) determined

3. This article ___ a new method ___ folding a long, single stranded DNA into desired shapes using numerous short single stranded DNAs.

   (A) introduced to us … of
   (B) introduce … with
   (C) is introduced … of
   (D) introducing … for
   (E) introduces … of

4. This method is more sensitive ___ the quartz crystal microbalance technology.

   (A) contrast to
   (B) comparing
   (C) compared to
   (D) compare
   (E) contrasting

5. Cantilever beams were fabricated ___ standard lithographic methods.

   (A) using
   (B) by
   (C) according
   (D) based
   (E) with

6. The authors ___ the reproducible electronic conduction through short DNA molecules across two metal pads placed 2 nm apart.

   (A) find a way
   (B) demonstrated
   (C) created
   (D) discovered
   (E) tested

7. This is believed ___ the reduced oxidation of metal in the nitrogen atmosphere.

   (A) because
   (B) due
   (C) owing
   (D) caused
   (E) to be due to

8. The current level in device 1 is as stable ___ device 2.

   (A) as the
   (B) as
   (C) as which in
   (D) as that in
   (E) as in the

9. Current molecular biology ___ identifying cellular components and their functions.

(A) is focus on
(B) is focused on
(C) is focusing on
(D) focuses
(E) is focusing

10. ___ surface plasmon resonance, more and more approaches towards the high-precision fabrication of nano antennas have been explored .

(A) Base on
(B) Base at
(C) Based on
(D) Basing on
(E) Basis of

11. His boss undoubtedly ___ that practice makes perfect.

(A) think
(B) thinks
(C) thinks of
(D) is thinking
(E) think of

12. The students who receive the most credits ___ to Hawaii for a week.

(A) goes
(B) go
(C) went
(D) is going
(E) are going

13. John and Mary ___ both selected star of the month.

(A) was
(B) were
(C) is
(D) have been
(E) is going to

14. Not only the resolution but also the sensitivity ___ greatly enhanced.

(A) is
(B) are
(C) were
(D) be
(E) being

15. Carolyn was an excellent student____ she got a fellowship.

(A) ,
(B) .
(C) ;
(D) !
(E) ?

16. He ___ every time he was reviewed by his advisor.

(A) had a heart attack almost
(B) had an almost heart attack
(C) had heart attacks almost
(D) almost had a heart attack
(E) had almost a heart attack

17. Each of the students attended the seminar ___ the treasurer, who was out of town for fundraising activities.

(A) accept
(B) except
(C) without
(D) except for
(E) only

18. The ___ he gave was invaluable to me at this early stage of my career.

(A) advice
(B) advise
(C) advisory
(D) advising
(E) adviser

19. Guidance must ___ a change in students' attitudes toward absenteeism.

(A) affect
(B) effect
(C) take affect
(D) take effect
(E) in effect

20. Let me ___ this most recent paper as an example.

(A) sight
(B) site
(C) cite
(D) recite
(E) sit

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21. ___ is an unethical action.

(A) Copy
(B) Pasting
(C) Plagiarism
(D) Refusing
(E) Copying

22. A doctor cannot treat an illness until he or she has made a ___.

(A) diagonal
(B) diagnose
(C) diagnosis
(D) diagnoses
(E) diagnostic

23. I doubted the ___ of what he had said; He must have fabricated it.

(A) real
(B) reality
(C) realty
(D) realist
(E) realistic

24. The ___ of the basketball team is high after its big win over the last year's champion.

(A) moral
(B) immoral
(C) morale
(D) mole
(E) more

25. The strange looking mechanical apparatus is the ___ of the modern combustion chamber.

(A) property
(B) protocol
(C) propriety
(D) prototype
(E) prototroph

26. I look forward ___ you.

(A) to hear
(B) to hearing
(C) to be hearing
(D) to hear from
(E) to hearing from

27. We need ___ results for a thorough comparison between the two devices.

(A) quantitative
(B) qualitative
(C) quantity
(D) quality
(E) equality

28. If the wealth is evenly distributed in a country, there is a ___ number of very rich and very poor people.

(A) large
(B) small
(C) significant
(D) remarkable
(E) equal

29. If a chemist dilutes his salty water sample, he ___ it.

(A) sips
(B) shakes
(C) drinks
(D) adds salt to
(E) add water to

30. By the late 1980's, multiple kinds of electrostatic microsensors ___.

(A) already developed
(B) already been developed
(C) have already developed
(D) had already been developed
(E) had already developed

31. Cantilever beams are suspended ___ the removal of the sacrificial layer.

(A) since
(B) before
(C) after
(D) because
(E) due

32. The gate voltage of the transistor ___ at 3 volts.

(A) is
(B) was
(C) set
(D) sets
(E) is set

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33. This is indeed a difficult question. I cannot ___ it ___.

(A) put … down
(B) sum … up
(C) figure … out
(D) get … up
(E) give … up

34. The Hall effect, ___ by Edwin Hall, describes the voltage difference across an electrical conductor, transverse to an electric current and a magnetic field.

(A) where discovered
(B) it was discovered
(C) because discovered
(D) discovered
(E) that discovered

35. Seattle has a pleasant climate, ___, and many nice neighborhoods.

(A) breathtaking scenery
(B) has breathtaking scenery
(C) it has breathtaking scenery
(D) the scenery is breathtaking
(E) which scenery is breathtaking

36. ___ the perimeter of a square, the larger its area.

(A) Greater than
(B) The greater
(C) Great as
(D) As great as
(E) Greater as

37. Not only ___ oxygen and nutrients, but it also removes wastes.

(A) does blood deliver
(B) blood delivers
(C) delivers blood
(D) does deliver blood
(E) blood does deliver

38. ___ of the Middle Ages only infected the impoverished was once a common belief.

(A) The plague
(B) That the plague
(C) Why the plague
(D) For the plague
(E) Because the plague

39. The weekly magazine, ___ only contains superficial information.

(A) it is Orange Herald
(B) being Orange Herald
(C) which Orange Herald
(D) that Orange Herald
(E) Orange Herald

40. A public-opinion vote can prove whether citizens support their government's policy or ___.

(A) none
(B) no
(C) not
(D) nor
(E) neither

SECTION 2

15 Questions

Directions: Each sentence below has one underlined word or phrase, followed by five lettered words. Choose the lettered word that is most equally in meaning to the underlined word or phrase.

41. Capillary channels are formed between a substrate and an elastomeric mold made of poly(dimethylsiloxane).

(A) support
(B) supper
(C) substance
(D) something
(E) compound

42. Atomic methods based on self-assembly are promising alternatives that offer inexpensive and parallel synthesis of nanostructures.

(A) high-throughput
(B) comparable
(C) divergent
(D) duplicate
(E) horizontal

43. Two immiscible dielectric liquids are used—mineral oil with 1 wt % Span 80 and an opaque propyl alcohol-based ink.

(A) non-mixing
(B) incapable
(C) dislikable
(D) invisible
(E) equivocal

44. He is contained to be a mediocre student.

(A) medical
(B) excellent
(C) diligent
(D) ordinary
(E) arrogant

45. As with any technology, the potential for misuse is enormous.

(A) stupendous
(B) heavy
(C) likely
(D) unlikely
(E) immense

46. She is a ROC citizen and thus eligible to apply for the fellowship.

(A) qualified
(B) engaged
(C) educated
(D) adorable
(E) unmarried

47. We are aiming to develop a rugged, portable, and battery-operated CD4+ T lymphocyte counter for resource limited settings.

(A) compatible
(B) exportable
(C) automatic
(D) easy to set up
(E) capable of being carried

48. Using a drug without proper medical consultation may cause adverse effects.

(A) acceptable
(B) suitable
(C) unexpected
(D) unfavorable
(E) regretful

49. Several short duration investment solutions have been proposed.

(A) term
(B) long
(C) lounge
(D) end
(E) terminal

50. The proposal was put together with the help of several graduate students.

(A) summarized
(B) consulted
(C) compiled
(D) complied
(E) moved

51. The design of the new building utilized the most advanced eco-friendly concept.

(A) acquired
(B) proposed
(C) employed
(D) urged
(E) empowered

52. This document is confidential. Please do not distribute it.

(A) well-written
(B) lengthy
(C) short
(D) classified
(E) disclosed

53. We should anneal the composite in the furnace to remove the internal stress.

(A) temper
(B) burn
(C) synthesize
(D) separate
(E) fabricate

54. The impedance of the pristine chip is quite different from that of a contaminated chip.

(A) ruthless
(B) seductive
(C) coarse
(D) commonplace
(E) untouched

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55. The current level fluctuates when the input is floating.

(A) works
(B) flows over
(C) follows
(D) remains steady
(E) changes continually

SECTION 3

15 Questions

Directions: Each passage in this group is followed by questions based on its content. After reading a passage, choose the best answer to each question. Answer all questions following a passage on the basis of what is stated or implied in that passage.

PASSAGE 1

A simple liquid iris diaphragm has been designed and tested. With no complex moving mechanical parts, the liquid iris is continuously adjustable in diameter, and can be made small and inexpensive using microfabrication techniques. The liquid iris consists of a shallow cylindrical chamber on a flat transparent indium tin oxide (ITO)-patterned glass substrate, a poly(methylmethacrylate) plastic housing with a confinement ring, and a glass cover. Two immiscible liquids are introduced—a clear oil and an opaque ink. The densities of the two liquids are almost identical, eliminating any unintended changing the iris size and shape due to gravitational or inertial forces. The opaque ink naturally adheres to the edge of the confinement ring while the transparent oil fills the rest of the chamber. The diameter of the iris is controlled by the voltage applied to the concentric annular ITO electrodes that draw the dielectric liquid with the higher dielectric constant (the ink) toward the center. The force that changes the diameter of the iris arises from the fringing electric field at the corners of the ink that pulls the ink down onto the electrode, increasing the ink contact area. When the applied voltage is varied from 0 to 160 V, the iris changes diameter from 4 to 1.5 mm in an approximately quadratic relationship with the electric field. The total electric power consumed at the minimum 1.5 mm aperture is ~4.7 mW.

56. The author focuses primarily on

(A) presenting a newly developed iris diaphragm.
(B) discussing the difficulties involved in fabricating miniaturized iris diaphragms.
(C) outlining the specific reasons why an iris with no moving mechanical parts has not yet been developed.
(D) giving a brief overview of modulating the solid-liquid contact angle by the dielectric force.
(E) pointing out potential applications of liquid iris diaphragms.

57. Which of the following statements about the mechanism of changing the diameter of the liquid iris is accurate?

(A) The power consumption of the liquid iris is low, owning to the fact that two liquids are of the same densities.
(B) The ink creeps toward the center when the voltage is applied to the concentric annular electrodes.
(C) Light passes through the substrate since ITO is transparent.
(D) The diameter of the liquid iris is adjusted with no moving mechanical parts.
(E) The diameter of the liquid iris changes with the electric field quadratically.

58. Which of the following is a quadratic equation?

(A) $y = a$
(B) $y = ax + b$
(C) $y = ax^2 + bx + c$
(D) $y = ax^3 + bx^2 + cx + d$
(E) $y = ax^4 + bx^3 + cx^2 + dx + e$

59. ITO electrodes were used in the liquid iris primarily because it is

(A) easy to be patterned on glass.
(B) inexpensive.
(C) transparent.
(D) available.
(E) compatible with the dielectric liquids.

60. Which of the following properties of liquid iris diaphragms make them superior to mechanical ones?

(A) They are small.
(B) They are cheap.
(C) There are no mechanical moving parts.
(D) The iris is continuous adjustable in diameter.
(E) All of above.

PASSAGE 2

09920NEMS500000 Measurements of nano- and microdevices: spring, 4 hours, lecture + lab.

Prerequisites: 09920NEMS400000 or 09920NEMS300000.

Major emphasis will be given to familiarizing students with basic measurement skills and methodologies commonly used for the characterization of nano- and microdevices. Topics include the characterization of surface temperature profiles, mechanical resonators, microstructure geometry, magnetic properties, and optical thin films.

Lab reports are due two weeks after each session and can be submitted via the iLMS system.

61. What is the main purpose of this passage?

(A) To describe a course
(B) To give an example of a measurement method
(C) To announce a lecture
(D) To advertise a job opportunity in NEMS institute
(E) To familiarize students with measurement skills

62. Which of the following topic will NOT be covered?

(A) surface temperature profiles
(B) mechanical resonators
(C) thin films
(D) robots
(E) microstructures

63. Which of the following statements is NOT accurate?

(A) There will be both lecture and lab sessions.
(B) Lab reports need to be submitted in time.
(C) Everyone is welcome to participate.
(D) This course is offered in spring.
(E) Lab reports can be uploaded.

PASSAGE 3

This position offers great research opportunity to work in a high-quality collaborative research environment at National Tsing Hua University. The College of Engineering is liaised with Hsinchu General Hospital to improve the health and wellbeing of all by fostering the next generation of leaders in biomedical engineering worldwide. Successful applicant would be involved in research projects focused on quantitative image processing and image-guided therapies. The successful candidate should have PhD. or Master degree in Electrical Engineering, Computer Science, Biomedical Engineering, or other related fields. Graduate students are encouraged to apply for this research opportunity. To apply for the position, send CV and Research Statement to fun@nthu.edu. Deadline for applications: May 1st.

64. What is the main purpose of this passage?

(A) To describe a course
(B) To give an example of a research collaboration
(C) To announce a lecture
(D) To advertise a job opportunity at NTHU
(E) To promote a candidate

65. What are the qualifications for a successful candidate?

(A) A degree in electrical engineering
(B) A degree in computer science
(C) A degree in biomedical engineering
(D) A motivated graduate student
(E) All of above

66. It can be inferred from the passage that

(A) the successful candidate will be employed by Hsinchu General Hospital.
(B) the successful candidate will treat patients
(C) the successful candidate will work on a collaborative research project.
(D) NTHU is highly valued.
(E) Hsinchu General Hospital is in short of manpower.

67. The word CV is this advertisement most nearly means

(A) cardiovascular.
(B) curriculum.
(C) Cape Verde.
(D) virtue capital.
(E) résumé.

68. The word deadline is this advertisement most nearly means

(A) the first day for application to be submitted.
(B) the last day for application to be submitted.
(C) the first day for this advertisement to be announced.
(D) the day for the applicant to be informed of the decision.
(E) the first day for the applicant to start the position.

PASSAGE 4

Many confident and successful people are frightened by the idea of giving an oral presentation. Too often college students fail to realize the importance of speech classes, or they may be in a curriculum which does not require oral communication classes. However, after they graduate and begin their careers, they quickly realize that oral communication skills are important. As with any well-written communication, a speech consists of an introduction, a discussion, and a conclusion. The introduction should arouse and capture your audience's interest. In the discussion section of your speech, provide details to support your statement. Finally, conclude your speech by (a) reiterating the main points discussed and (b) recommending a future course of action.

69. The primary purpose of the passage is to tell us that

(A) successful people are afraid of giving talking in public.
(B) there are three parts in a successful speech.
(C) college students should begin their careers.
(D) the importance of oral communication skills.
(E) details should be provided in an oral presentation.

70. According to the passage, which of the following is NOT an essential part of a well-written communication?

(A) an introduction
(B) gestures
(C) a discussion
(D) a conclusion

THE END