

# 國立中山大學 113 學年度 學士後醫學系招生考試試題

科目名稱：普通生物及生化概論

## —作答注意事項—

考試時間：100 分鐘

- 考試開始鈴響前不得翻閱試題，並不得書寫、劃記、作答。請先檢查答案卡之應考證號碼、桌角號碼、應試科目是否正確，如有不同立即請監試人員處理。
- 答案卡請以 2B 鉛筆劃記，不可使用修正液（帶）塗改，未使用 2B 鉛筆、劃記太輕或污損致光學閱讀機無法辨識答案者，後果由考生自負。
- 答案卡應保持清潔完整，不得折疊、破壞或塗改應考證號碼及條碼，亦不得書寫考生姓名、應考證號碼或與答案無關之任何文字或符號。
- 不可使用計算機，並不得攜帶書籍、紙張(應考證不得做計算紙書寫)、具有通訊、記憶、傳輸或收發等功能之相關電子產品或其他有礙試場安寧、考試公平之各類器材入場。
- 試題及答案卡請務必繳回，未繳回者該科成績以零分計算。
- 試題採雙面列印，考生應注意試題頁數確實作答。
- 違規者依本校招生考試試場規則及違規處理辦法處理。

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選擇題(單一選擇題，共 90 題，總分 150 分)

壹、第 1~30 題，每題 1 分，共計 30 分，答錯 1 題倒扣 0.25 分，倒扣至本大題零分為止，未作答，不給分亦不扣分。

1. The umami receptors in the taste cells primary detect  
(A) sodium.  
(B) fatty acid.  
(C) glucose.  
(D) glutamate.  
(E) glycine.  
Ans:(D)
2. Signal transduction is composed of three steps including:  
(A) reception, transcription, and translation.  
(B) reception, translation, and response.  
(C) reception, transduction, and response.  
(D) reception, neurotransmission, and reaction.  
(E) signal, translation, and response.  
Ans:(C).
3. When a virus enters the lysogenic stage:  
(A) the viral DNA is replicated outside the host cell.  
(B) it enters the host cell and kills the host immediately.  
(C) it enters the host cell, picks up host DNA, and leaves the cell unharmed.  
(D) it sits on the host cell plasma membrane with which it covers itself and the leaves the cell.  
(E) the viral DNA integrates into the host genome.  
Ans:(E)
4. The region(s) in the antibody that recognize the specific antigen is/are located at:  
(A) light chain constant region.  
(B) light chain variable region.  
(C) heavy chain constant region.  
(D) heavy and light chain variable region.  
(E) heavy and light chain constant region.  
Ans:(D)
5. Glial cells in the nervous system perform multitude of functions except  
(A) providing framework for neuron migration.  
(B) forming blood-brain barrier.  
(C) recycling neurotransmitter.  
(D) increasing the maximum depolarization potential of action potential.  
(E) removing waste produced by neurons.  
Ans:(D)
6. In the fish gills:  
(A) blood and water flow in opposite directions.  
(B) blood and water flow in the same direction.  
(C) blood flowing in the gills reverses direction with every heartbeat.  
(D) water flowing over the gills reverses direction with every inhalation.  
(E) blood and water are separated by a thick polysaccharide barrier.

試題請隨卷繳回，請留意背面是否有題。

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Ans:(A)

7. Which of the following descriptions best demonstrates the term "saltatory conduction"?
- (A) It inhibits direct neurotransmitter release.
  - (B) It transmits the action potential at the nodes of Ranvier and thus speeds up impulses on myelinated axons.
  - (C) It increases neurotransmitter release at the presynaptic membrane.
  - (D) It decreases neurotransmitter uptake at chemically gated postsynaptic channels.
  - (E) It removes neurotransmitters from the synaptic cleft.

Ans:(B)

8. You are able to resist infection by a specific pathogen after being vaccinated against it. This is an example of:
- (A) innate immunity.
  - (B) an allergy.
  - (C) a response with defensins.
  - (D) an autoimmune reaction.
  - (E) immunological memory.

Ans:(E).

9. All of the following are essential nutrients in humans **except**:

- (A) vitamin B.
- (B) calcium.
- (C) glycogen.
- (D) linoleic acid.
- (E) vitamin K.

Ans:(C)

10. Which of the following is true soon after a meal?

- (A) Both glucagon and insulin are released.
- (B) The total amount of insulin in the blood decreases.
- (C) Glucagon is released but not insulin.
- (D) Neither glucagon nor insulin is released.
- (E) Insulin is released but not glucagon.

Ans:(E)

11. Ovulation is the response of the matured follicle(s) to a burst secretion of

- (A) estrogen.
- (B) luteinizing hormone.
- (C) progesterone.
- (D) prolactin.
- (E) oxytocin.

Ans:(B)

12. The perception of the sound pitch is mediated by

- (A) the generation of the waves in the cochlear fluid by the specific corresponding region of the oval window.
- (B) the vibration of the specific corresponding part on the tympanic membrane.
- (C) the vibration of the specific corresponding region on the basilar membrane.
- (D) the sequence of sound wave traveling through the auditory ossicles.

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(E) the music training of listeners.

Ans:(C)

13. The midpiece of a sperm cell is to

(A) fuse with the jelly coat of the egg cell.

(B) carry the sperm's nucleus.

(C) carry the sperm's acrosomal material.

(D) generate fuel that propels the sperm.

(E) carry enzymes that are released to form a hole in the egg's jelly coat when the sperm encounters an egg.

Ans:(D)

14. A fish hobbyist needs to replace a certain amount of water in their fish tanks periodically, mainly because

(A) the accumulation of ammonia.

(B) the accumulation of dirt.

(C) the reduction of oxygen.

(D) the increase in temperature.

(E) the increase in pH.

Ans:(A)

15. Which activity can appear in the ovarian cycle?

(A) FSH stimulates the pituitary to release GnRH.

(B) When FSH and LH levels fall, the corpus luteum shrinks and the uterine lining breaks down.

(C) Luteinizing hormone stimulates the uterus to make progesterone.

(D) Estrogen levels initially have a positive feedback effect on the pituitary, which is followed by higher estrogen levels causing negative feedback.

(E) A fully developed corpus luteum inhibits uterine lining growth.

Ans:(B)

16. An enzyme that breaks DNA, dispels the tension, and reseals the strand ahead of a DNA replication growing fork is called a(n)

(A) topoisomerase.

(B) DNA polymerase.

(C) phosphodiesterase.

(D) aminoacyl-tRNA synthetase.

(E) All of the above.

Ans: (A)

17. One distinction between peptide and steroid hormones is that steroid hormones:

(A) bind to their receptors with low affinity, whereas peptide hormones bind with high affinity.

(B) bind to intracellular receptors, whereas peptide hormones bind to cell surface receptors.

(C) are less stable than peptide hormones.

(D) are generally water-soluble, whereas peptide hormones are water-insoluble.

(E) act through specific receptors, whereas peptide hormones act through nonspecific receptors.

Ans: (B)

18. Iron deficiency in a cell can adversely affect electron transport at which of the following sites:

(A) Cytochrome *b* and cytochrome *c*.

(B) Coenzyme Q and FADH<sub>2</sub>.

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- (C) NADH and FADH<sub>2</sub>.
- (D) Coenzyme Q and NADH.
- (E) All sites in electron transport are affected.

Ans: (A)

19. Which of the following hormones affects the arcuate nucleus of the hypothalamus and ultimately results in an inhibition of nutrient intake?

- (A) adiponectin
- (B) leptin
- (C) ghrelin
- (D) glucagon
- (E) None of the above

Ans: (B)

20. Which one of the following amino acids is critical for glutathione to function as a redox buffer in cells?

- (A) glycine
- (B) methionine
- (C) glutamine
- (D) glutamate
- (E) cysteine

Ans: (E)

21. Which one is the basic unit for the synthesis of cholesterol?

- (A) Malonyl-CoA
- (B) Serine
- (C) Palmitoyl-coA
- (D) Isoprene
- (E) L-glycerol 3-phosphate

Ans: (D)

22. There is no codon for the amino acid hydroxyproline, but this amino acid is a prominent feature of collagen structure. Which of the following is a likely explanation?

- (A) Hydroxyproline is substituted for proline after translation by a cut and patch mechanism.
- (B) Proline is covalently modified to give hydroxyproline after translation.
- (C) There is an alternative mechanism for synthesis of proteins that contain hydroxyproline.
- (D) All of the above are likely explanations.
- (E) It is not possible to form a hypothesis from the information given.

Ans: (B)

23. Which metabolite levels determine whether acetyl-CoA derived from fatty acids can enter the citric acid cycle?

- (A) Citrate
- (B) Succinyl CoA
- (C) Oxaloacetate
- (D)  $\alpha$ -Ketoglutarate
- (E) None of the above

Ans:(C)

24. In one turn of the citric acid cycle, how many steps in the metabolism of oxaloacetate and acetyl-CoA involve net carboxylic acid oxidation?

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- (A) 0
  - (B) 1
  - (C) 2
  - (D) 3
  - (E) 4
- Ans:(C)

25. Atherosclerosis is a condition characterized by poor metabolism of cholesterol, which is conveyed by lipoproteins. Please indicate the lipoproteins causing the development of this disease:

- (A) LDL
  - (B) HDL
  - (C) VLDL
  - (D) Chylomicrons
  - (E) Triglycerides
- Ans:(A)

26. Gluconeogenesis is induced in the liver after severe physical activity. Which chemical is largely used in gluconeogenesis in this case?

- (A) alanine
  - (B) glucose
  - (C) glutamate
  - (D) lactate
  - (E) pyruvate
- Ans:(D)

27. An enzyme that follows standard Michaelis-Menten kinetics was assayed for reaction velocity at various substrate concentrations. The data are shown below:

Substrate added (mmol/L)	$V_0$ ( $\mu\text{mol}/\text{min}$ )
0.5	150
1.0	245
2.0	300
6.0	375
500	500

Based on these kinetic data for the enzyme, what would be the closest estimate of the enzyme's  $K_m$  value?

- (A) 2.0 mM
  - (B) 1.0 mM
  - (C) 250 mM
  - (D) 0.5 mM
  - (E) 3.0 mM
- Ans:(B)

28. Orotate is converted to what two nucleotides which are used in nucleic acid synthesis?

- (A) AMP and GMP
- (B) TMP and CMP
- (C) UMP and AMP

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(D) GMP and CMP

(E) CMP and AMP

Ans: (B)

29. How many different reactions involve substrate-level phosphorylation during glycolysis?

(A) 2

(B) 3

(C) 4

(D) 5

(E) 0

Ans: (A)

30. Uncoupling in mitochondria refers to:

(A) Stopping electron flow but not stopping ATP synthesis.

(B) Stopping ATP synthesis but not stopping electron flow.

(C) Blocking the electrons from NADH from entering the electron transport system.

(D) Interruption of electron flow.

(E) None of the above.

Ans: (B)

貳、第 31~90 題，每題 2 分，共計 120 分，答錯 1 題倒扣 0.5 分，倒扣至本大題零分為止，未作答不給分亦不扣分。

31. Which of the following description of membrane potential is **false**?

(A) Resting potential in neurons means when membrane potential became 0 mV.

(B) Postsynaptic potentials are graded, and action potentials are all-or-none.

(C) Hyperpolarization means membrane potential became more negative.

(D) Under physiological condition,  $\text{Na}^+$  ions entering cells will cause depolarization.

(E) Membrane potential is the result of differential ion concentration across plasma membrane of the cell.

Ans:(A)

32. Which of following is **false** for alternative RNA splicing?

(A) removes different exon(s) to produce different mRNA

(B) can allow the production of mRNA of different sizes from a single gene

(C) is produced in nucleus

(D) can allow the production of proteins of different sizes from a single gene

(E) is processed by spliceosome with just snRNA

Ans:(E)

33. Enzymes are proteins that can

(A) change the specificity of reactants.

(B) lower the energy barriers of reactions.

(C) slow down the reactions.

(D) not affect the reactions.

(E) None of the above.

Ans:(B)

34. During cell communication, specificity is a key determinant for correct signaling. Which of the following determines the specificity?

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- (A) environment
- (B) ligand-receptor interaction
- (C) receptor activation
- (D) induction of effector proteins
- (E) None of the above

Ans:(B)

35. Which of the following demonstrates the characteristics of a respiratory surface?

- (A) a surface consisting of multiple layers of epithelial cells
- (B) the exoskeleton of an insect
- (C) the nasal passages of a mammal
- (D) a thin surface consisting of a single layer of epithelial cells
- (E) the outer membrane of a mitochondrion

Ans:(D)

36. Which event will occur when food enters the stomach?

- (A) stomach release ghrelin
- (B) adipose tissue release leptin
- (C) stomach release gastrin
- (D) bicarbonate is released to reduce pH in the stomach
- (E) None of the above

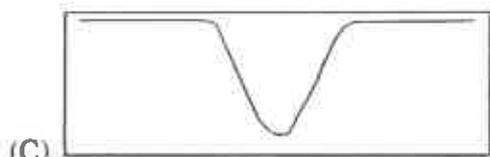
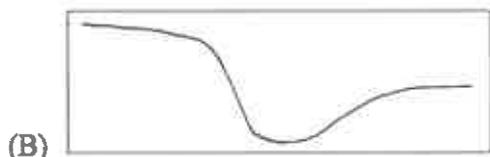
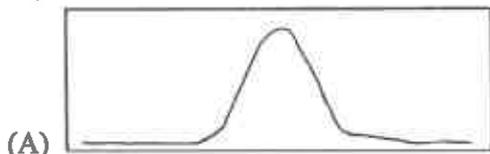
Ans:(C)

37. Which muscle types are striated under the microscopic observation?

- (A) skeletal muscles only
- (B) cardiac muscles only
- (C) skeletal muscles and cardiac muscles
- (D) smooth muscles only
- (E) skeletal muscles and smooth muscles

Ans:(C)

38. Which of the following correctly depicts the blood velocity in humans as it flows from the aorta → arteries → arterioles → capillaries → venules → veins → venae cavae (y-axis; velocity; x-axis: regions of blood vessels):

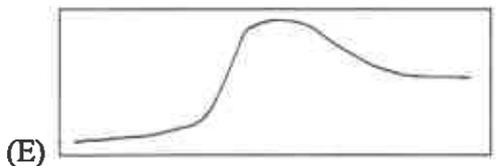
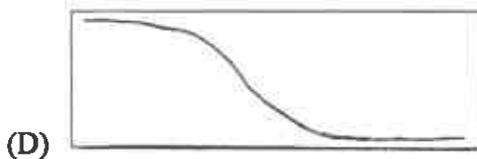


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Ans:(B)

39. The "hemoglobin O<sub>2</sub> dissociation curve":

- (A) reflects about 50% saturation of hemoglobin in the alveoli.
- (B) shifts to the left when the pH decreases.
- (C) demonstrates that hemoglobin holds less O<sub>2</sub> when the pH is higher.
- (D) proves lack of dependence on CO<sub>2</sub> levels.
- (E) explains how hemoglobin can bind O<sub>2</sub> at high pH in the lungs and release it at lower pH in tissue.

Ans:(E)

40. Which of the following statement is correct in a resting skeletal muscle fiber?

- (A) Sarcomeres are regions between two H zones.
- (B) Discs of M line proteins called the A band separate the thick filaments.
- (C) I bands are composed of the same thick filaments seen in the A bands.
- (D) Z lines are adjacent to H zones, which attach thick filaments.
- (E) Dark A bands contain overlapping thick and thin filaments with a central thin H zone composed only of thick filaments.

Ans:(E)

41. Which of the following reactions produces the highest amount of ATP?

- (A) glycolysis
- (B) oxidative phosphorylation
- (C) pyruvate oxidation
- (D) citric acid cycle
- (E) None of the above

Ans:(B)

42. Which of the following gradient drives the ATP synthase for the production of ATP?

- (A) hydrogen
- (B) sodium
- (C) potassium
- (D) chloride
- (E) None of the above

Ans:(A)

43. Which of the following organelle contents has the lowest pH?

- (A) Golgi apparatus
- (B) mitochondrion

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- (C) nucleus
  - (D) endoplasmic reticulum
  - (E) lysosome
- Ans:(E)

44. Calcium is one of the critical ions required for the cellular functions. Which of the following is true regarding calcium?

- (A) Calcium can trigger cell death.
- (B) Calcium is critical for the activation of different proteins.
- (C) The free calcium concentration in the cytosol is very low.
- (D) The endoplasmic reticulum contains a high amount of calcium.
- (E) All of the above.

Ans:(E)

45. DNA subjective to genetic mutation or environmental lesion can have point mutations, but those mutations may not affect physiological functions by the proteins because:

- (A) the mutations do not change the amino acid encoded.
- (B) the mutations change the encoded amino acids that are not critical for the functions of proteins.
- (C) the mutations do affect the functions of proteins, but other proteins compensate for their functions.
- (D) None of the above.
- (E) All of the above.

Ans:(E)

46. How does the sensory neurons transmit stimulation strength to the central nervous system?

- (A) duration of the depolarization phase in the action potential.
- (B) the frequency of its action potentials.
- (C) the peak of the depolarization phase of an action potential.
- (D) how fast is neurotransmitter released from one action potential.
- (E) the lowest point of the hyperpolarization of an action potential.

Ans:(B)

47. Which of the following is not the mechanism that stops the action of neurotransmitters?

- (A) recycle by the pre-synaptic neuron
- (B) recycle by glia
- (C) digestion enzyme in the synaptic cleft
- (D) recycle by macrophages
- (E) All of the above are used to quickly stop neurotransmitter's function

Ans:(D)

48. Which statement about the gut microbiota is false?

- (A) It can help digesting food.
- (B) It can increase risk of peptic ulcers.
- (C) It can generate specific metabolites such as short chain fatty acids.
- (D) It can influence neuronal development.
- (E) It remains the same for each person through aging.

Ans:(E)

49. Which description about complement system is incorrect?

- (A) requires antibody to target pathogen

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- (B) can attract phagocytic leukocyte
  - (C) normal body cells continuously produce proteins that inactivate complement
  - (D) activation of one complement protein can trigger the enzymatic cleavage of another complement protein
  - (E) is part of the innate immunity system
- Ans:(A)

50. Lateral inhibition via amacrine cells in the mammalian retina:

- (A) recycles neurotransmitter molecules
- (B) prevents bleaching in bright light
- (C) is required for color vision to occur
- (D) enhances visual contrast
- (E) underlies habituation of vision

Ans:(D)

51. The enhancer is located distant from the transcriptional start site. How can an enhancer change transcription?

- (A) An enhancer cannot change transcription.
- (B) Activators bind to the enhancer and bring the bound activators closer to the promoter to trigger transcription.
- (C) An enhancer can only change the transcription of another gene.
- (D) None of the above.
- (E) All of the above.

Ans:(B)

52. In vertebrate animals, spermatogenesis and oogenesis differ in that

- (A) oogenesis ends at menopause, whereas spermatogenesis is finished before birth.
- (B) oogenesis produces four haploid cells, whereas spermatogenesis produces only one sperm.
- (C) oogenesis begins at the onset of sexual maturity, whereas spermatogenesis begins during embryonic development.
- (D) cytokinesis is unequal in oogenesis, whereas it is equal in spermatogenesis.
- (E) spermatogenesis is not completed until after fertilization occurs, but oogenesis is completed after ovulation.

Ans:(D)

53. Calcium ion initiates skeletal muscle contraction by:

- (A) breaking the actin-myosin cross-bridges
- (B) transmitting action potentials across the neuromuscular junction
- (C) spreading action potentials through the T tubules
- (D) initiating ATP generation
- (E) binding to the troponin complex that subsequently displaces tropomyosin from the myosin binding sites

Ans:(E)

54. The equilibrium potential for the specific ion is correlated to the ion's polarity and

- (A) the voltage difference across the membrane.
- (B) the concentration ratio of this ion across the membrane.
- (C) how many ion channels are on the plasma membrane.
- (D) the direction of ion movement through the membrane.
- (E) All of the above.

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Ans:(B)

55. The action potential depolarizes the cell membrane and transiently bring the membrane potential above 0 mV, then rapidly repolarizes with an undershoot, yet the membrane potential eventually returns to the resting membrane potential at  $\sim -70$  mV. Which ion channel mediates the rapid repolarization?

- (A)  $\text{Ca}^{2+}$  channel
- (B)  $\text{Na}^{+}$  channel
- (C)  $\text{K}^{+}$  channel
- (D) ATP channel
- (E) All of the above

Ans:(C)

56. Humans can smell many different kinds of odorant molecules via receptors on the olfactory neurons. These receptors belong to a class of receptors that can induce cAMP production to mediate the downstream responses. These odorant receptors are:

- (A) EGF receptor
- (B) TGF beta receptor
- (C) G-protein-coupled receptor
- (D) Tyrosine kinase receptor
- (E) All of the above

Ans:(C)

57. Which of the following correctly describes a part of kidney function?

- (A) Collecting ducts dilute urine because they are permeable to salt but not water.
- (B) In the ascending loop of Henle,  $\text{Na}^{+}$  and  $\text{Cl}^{-}$  move into the tubules because the osmolarity of the filtrate is increased.
- (C) The descending loop of Henle receives filtrate from the ascending loop.
- (D) The distal convoluted tubule pumps water into the tubule by active transport.
- (E) The renal pelvis receives urine from the collecting ducts and carries it to the ureters.

Ans:(E)

58. Which of the following exposure scheme of a foreign antigen to an animal will result in the highest titer of the induced antibody?

- (A) right after antigen introduction
- (B) a few days after antigen introduction
- (C) a few days after the second exposure to the same antigen
- (D) a few days after the exposure to another antigen
- (E) None of the above

Ans:(C)

59. The generation of antibody diversity includes:

- (A) joining of V to C to J segments to make a functional light chain gene.
- (B) choice from several different types of C segments to make a functional light chain gene.
- (C) deletion of the J segment to make a functional light chain gene.
- (D) joining of V to J to C segments to make a functional light chain gene.
- (E) initial generation of IgG followed later by IgM on a given cell.

Ans:(D)

60. Which type of stem cell has the widest potential to give rise to other cell types?

試題請隨卷繳回，請留意背面是否有題。



國立中山大學 113 學年度學士後醫學系招生考試試題

科目名稱：普通生物及生化概論

※本科目依簡章規定「不可以」使用計算機(選擇題)

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- (A) cortisol
  - (B) testosterone
  - (C) arachidonic acid
  - (D) bile acid
  - (E) vitamin D<sub>3</sub>
- Ans: (C)

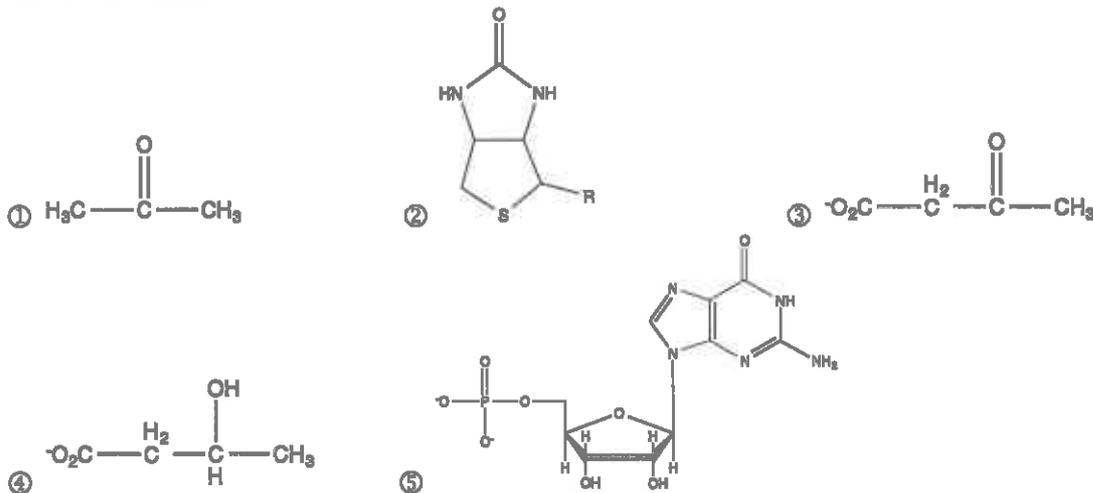
66. 5-Fluorouracil (5-FU) is used to treat cancers. It is a mechanism-based inhibitor of \_\_\_\_\_.

- (A) ribonucleotide reductase
  - (B) thymidylate synthase
  - (C) adenylosuccinate lyase
  - (D) GMP synthetase
  - (E) xanthine oxidase
- Ans: (B)

67. In amino acid metabolism, threonine is converted into acetyl-CoA and pyruvate while proline is converted into  $\alpha$ -ketoglutarate. Classify each of these amino acids.

- (A) Threonine and proline are ketogenic.
  - (B) Threonine is ketogenic and glucogenic; proline is ketogenic.
  - (C) Threonine is ketogenic; proline is glucogenic.
  - (D) Threonine is ketogenic and glucogenic; proline is glucogenic.
  - (E) None of the above.
- Ans: (D)

68. Ketone bodies are produced by the  $\beta$ -oxidation of an excess of acetyl-CoA. Which of the followings are ketone bodies?



- (A) ①②③
  - (B) ①③④
  - (C) ②④
  - (D) ③④
  - (E) ②④⑤
- Ans: (B)

# 國立中山大學 113 學年度學士後醫學系招生考試試題

科目名稱：普通生物及生化概論

※本科目依簡章規定「不可以」使用計算機(選擇題)

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69. Many biomolecules are derived from amino acid precursors. Serotonin and dopamine are synthesized from \_\_\_\_\_ and \_\_\_\_\_, respectively.  
(A) histidine; tyrosine  
(B) phenylalanine; tryptophan  
(C) tryptophan; tyrosine  
(D) histidine; tryptophan  
(E) tryptophan; histidine  
Ans: (C)
70. Several nucleotide bases undergo spontaneous loss of their exocyclic amino groups (deamination). Deamination of the nucleotide bases cytosine and 5-methylcytosine yields nucleotide bases:  
(A) hypoxanthine and xanthine, respectively.  
(B) uracil and thymine, respectively.  
(C) uracil only.  
(D) uracil and hypoxanthine, respectively.  
(E) thymine and uracil, respectively.  
Ans: (B)
71. If a cell were unable to synthesize or obtain tetrahydrofolic acid ( $H_4$  folate), it would probably be deficient in the biosynthesis of:  
(A) isoleucine  
(B) leucine  
(C) lysine  
(D) methionine  
(E) serine  
Ans: (D)
72. Which of the following statements explains why allopurinol is able to prevent gout?  
(A) It binds to uric acid thus preventing the formation of uric acid crystals.  
(B) It acts as a diuretic to increase the elimination of uric acid.  
(C) It inhibits the production of uric acid and allows for the more highly soluble xanthine and hypoxanthine to be excreted from the body.  
(D) It stimulates the purine salvage pathway, thus eliminating the need for production of uric acid.  
(E) None of the above.  
Ans: (C)
73. In anaerobic circumstances, the re-oxidation of NADH generated during glycolysis occurs through the following reaction:  
(A) fructose 1,6-bisphosphate  $\rightarrow$  glyceraldehyde-3P + dihydroxyacetone-P  
(B) glyceraldehyde-3P  $\rightarrow$  1,3-DPG  
(C) pyruvate  $\rightarrow$  lactate  
(D) dihydroxyacetone-P  $\rightarrow$  glyceraldehyde-3P  
(E) malate  $\rightarrow$  oxaloacetate  
Ans:(C)
74. Asians and Native Americans may experience flushing and discomfort after consuming a small amount of ethanol in alcoholic beverages. This reaction is attributed to genetic variation in an enzyme responsible for metabolizing the liver metabolite of alcohol. What is this metabolite?  
(A) methanol  
(B) acetone

# 國立中山大學 113 學年度學士後醫學系招生考試試題

科目名稱：普通生物及生化概論

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- (C) glycerol
  - (D) acetaldehyde
  - (E) pyruvate
- Ans:(D)

75. Match the correct form of tetrahydrofolate with the corresponding reaction for which it acts as a coenzyme.

- (A) 5,10-methenyl-THF: biosynthesis of purines
- (B) 5-methyl-THF: dUMP → dTMP
- (C) 5,10-methylene-THF: glycine → serine
- (D) 5,10-methenyl-THF: methionine → homocysteine
- (E) All of the above

Ans:(C)

76. The percentage saturation of hemoglobin by oxygen is increased when one of the following is increased:

- (A) concentration of 2,3 bisphosphoglycerate
- (B) concentration of hydrogen ions
- (C) concentration of Hb
- (D) partial pressure of CO<sub>2</sub>
- (E) partial pressure of O<sub>2</sub>

Ans:(E)

77. Which of the following describes the coenzyme involved with thymidylate synthase?

- (A) 5-methyl-THF serves as the methyl donor.
- (B) 10-methyl-THF serves as the methyl donor.
- (C) 5,10-methylene-THF serves as both methylene donor and reducing agent.
- (D) 5,10-methenyl-THF serves as both methylene donor and reducing agent.
- (E) S-adenosylmethionine serves as the methyl donor.

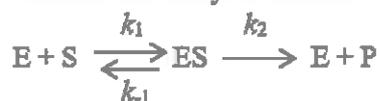
Ans:(C)

78. Which statement regarding allosteric regulation of enzyme activity is false?

- (A) Allosteric regulators can either activate or inhibit enzyme function.
- (B) Binding of allosteric effectors induces a conformational change in the enzyme.
- (C) Homotropic allosteric effectors compete with substrate for binding sites.
- (D) Allosteric enzymes usually consist of multiple subunits.
- (E) Sigmoidal kinetic plots are indicative of the presence of allosteric binding sites.

Ans:(C)

79. Consider the enzyme kinetic model:



Which expression best describes the INITIAL rate of ES formation under the standard Michaelis-Menten quasi steady-state assumption?

- (A)  $k_1[E][S]$
- (B)  $k_1[E][S] - k_{-1}[ES]$
- (C)  $k_1[E][S] - (k_{-1} + k_2)[ES]$
- (D)  $k_2[ES]$
- (E)  $k_{-1}[ES] + k_2[ES]$

試題請隨卷繳回，請留意背面是否有題。

# 國立中山大學 113 學年度學士後醫學系招生考試試題

科目名稱：普通生物及生化概論

※本科目依簡章規定「不可以」使用計算機(選擇題)

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Ans:(A)

80. In bacteria, the biosynthetic routes for proline and arginine diverge when glutamate is N-acetylated for arginine synthesis. Which of the following explains why acetylation is required for arginine synthesis but not proline synthesis?

- (A) Acetylation alters the  $pK_a$  of the amine group.
- (B) Acetylation prevents reduction of the amine group in N-acetylglutamate- $\delta$ -semialdehyde.
- (C) Acetylation activates the amine group for synthesis of the guanidine group of arginine.
- (D) Acetylation prevents the cyclization of N-acetylglutamate- $\delta$ -semialdehyde.
- (E) None of the above.

Ans: (D)

81. In skeletal muscle, PFK-2 is not subject to regulation by phosphorylation. However, in the liver, what is the effect of dephosphorylation of PFK-2?

- (A) Degradation of fructose-1,6-bisphosphate
- (B) Increased transcription of PFK-2
- (C) Increased turnover of PFK-2
- (D) Reduced production of fructose-2,6-bisphosphate
- (E) Enhanced production of fructose-2,6-bisphosphate

Ans:(E)

82. A researcher wants to isotope label purines with  $^{15}N$  for future spectroscopic studies. Which substrates when labeled with the heavy nitrogen would result in the most  $^{15}N$ -enriched purines through de novo synthesis?

- (A) Glutamine, aspartate, glycine
- (B) Glycine, glutamine,  $N^{10}$ -formyl-THF
- (C) Aspartate, glutamine, asparagine
- (D) Glycine, carbamoyl aspartate, glutamine
- (E) Aspartate, glycine, 5-phosphoribosyl- $\alpha$ -pyrophosphate

Ans: (A)

83. Different carbon positions of  $^{14}C$ -labeled glucose are tested within the crude tissue extract containing enzymes from the pentose phosphate pathway. Which specific carbon position will lead to the fastest generation of  $^{14}CO_2$ :

- (A) C-6
- (B) C-5
- (C) C-4
- (D) C-3
- (E) C-1

Ans:(E)

84. Which of the following is true regarding the control of pyruvate dehydrogenase?

- (A) It is inhibited by succinyl-CoA.
- (B) It is activated by acetyl-CoA.
- (C) It is inhibited by ATP.
- (D) It is inhibited by  $NAD^+$ .
- (E) None of the above.

Ans:(C)

85. Which of the following is an end product of glucose metabolism via either aerobic or anaerobic

國立中山大學 113 學年度學士後醫學系招生考試試題

科目名稱：普通生物及生化概論

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means?

- (1) fructose
- (2) carbon dioxide
- (3) lactate

- (A) (1) and (2)
- (B) (2) and (3)
- (C) (1) only
- (D) (2) only
- (E) (3) only

Ans:(B)

86. Which is the order of compounds produced in the conversion of glucose to pyruvate?

(PEP = phosphoenolpyruvate)

- (1) fructose-6-phosphate
- (2) 1,3-phosphoglyceric acid
- (3) fructose-bisphosphate
- (4) PEP
- (5) 3-phosphoglyceric acid

- (A) (1), (2), (3), (4), (5)
- (B) (1), (3), (2), (5), (4)
- (C) (2), (3), (1), (4), (5)
- (D) (2), (3), (1), (5), (4)
- (E) (3), (1), (2), (5), (4)

Ans:(B)

87. What will occur when insulin is released?

- (A) Insulin binds to receptors on cell surfaces.
- (B) A protein kinase cascading leads to glycogen synthesis.
- (C) Insulin stimulates the GLUT4 transport protein system in muscle cells.
- (D) Glucose transporters move glucose out of the blood and into the cell.
- (E) All of the above.

Ans:(E)

88. Which of the following is a regulatory enzyme in gluconeogenesis?

- (1) pyruvate kinase.
- (2) pyruvate carboxylase.
- (3) phosphoenolpyruvate carboxykinase.
- (4) glucose-6-phosphatase.

- (A) (1), (2) and (3)
- (B) (1), (2) and (4)
- (C) (2), (3) and (4)
- (D) (2) and (3)
- (E) (1), (2), (3) and (4)

Ans:(C)

89. Which of the following statement is true about lipoic acid?

# 國立中山大學 113 學年度學士後醫學系招生考試試題

科目名稱：普通生物及生化概論

※本科目依簡章規定「不可以」使用計算機(選擇題)

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- (A) It contains one disulfide group in its reduced form and two sulfhydryl groups in its oxidized form.
- (B) It contains one disulfide group in its oxidized form and two sulfhydryl groups in its reduced form.
- (C) It contains two disulfide groups in its reduced form and one sulfhydryl group in its oxidized form.
- (D) It contains two disulfide groups in its oxidized form and one sulfhydryl group in its reduced form.
- (E) None of the above.

Ans:(B)

90. Which of the following statement regarding electron transport and ATP synthesis is **not** true?

- (1) The synthesis of ATP is directly linked to the oxidation of NADH.
- (2) The synthesis of ATP in mitochondria is driven by a proton or pH gradient.
- (3) The reoxidation of NADH and FADH<sub>2</sub> indirectly creates a proton gradient that is involved in ATP synthesis.

- (A) (1) only
- (B) (2) only
- (C) (3) only
- (D) All are correct
- (E) None is correct.

Ans:(A)

# 國立中山大學 113 學年度 學士後醫學系招生考試試題

科目名稱：物理與化學

## —作答注意事項—

考試時間：100 分鐘

- 考試開始鈴響前不得翻閱試題，並不得書寫、劃記、作答。請先檢查答案卡之應考證號碼、桌角號碼、應試科目是否正確，如有不同立即請監試人員處理。
- 答案卡請以 2B 鉛筆劃記，不可使用修正液（帶）塗改，未使用 2B 鉛筆、劃記太輕或污損致光學閱讀機無法辨識答案者，後果由考生自負。
- 答案卡應保持清潔完整，不得折疊、破壞或塗改應考證號碼及條碼，亦不得書寫考生姓名、應考證號碼或與答案無關之任何文字或符號。
- 不可使用計算機，並不得攜帶書籍、紙張(應考證不得做計算紙書寫)、具有通訊、記憶、傳輸或收發等功能之相關電子產品或其他有礙試場安寧、考試公平之各類器材入場。
- 試題及答案卡請務必繳回，未繳回者該科成績以零分計算。
- 試題採雙面列印，考生應注意試題頁數確實作答。
- 違規者依本校招生考試試場規則及違規處理辦法處理。

# 國立中山大學 113 學年度學士後醫學系招生考試試題

科目名稱：物理與化學

※本科目依簡章規定「不可以」使用計算機(選擇題)

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選擇題(單一選擇題，共 90 題，總分 150 分)

壹、第 1~30 題，每題 1 分，共計 30 分，答錯 1 題倒扣 0.25 分，倒扣至本大題零分為止，未作答，不給分亦不扣分。

Unit	Abbreviation
newton	<i>N</i>
meter	<i>m</i>
second	<i>s</i>
kilogram	<i>kg</i>
radian	<i>rad</i>
joule	<i>J</i>
coulomb	<i>Coul</i>
volt	<i>V</i>
mole	<i>mol</i>
tesla	<i>T</i>
kelvin	<i>K</i>

1. Newton's law of gravitational force is represented by  $F = GMm/r^2$ . What is the dimension of the gravitational constant  $G$ ?  
 (A)  $\text{kg}\cdot\text{m}^3\cdot\text{s}^{-2}$       (B)  $\text{kg}^{-1}\cdot\text{m}\cdot\text{s}^{-2}$       (C)  $\text{kg}\cdot\text{m}^2\cdot\text{s}^{-2}$       (D)  $\text{kg}\cdot\text{m}\cdot\text{s}^{-2}$       (E)  $\text{kg}^{-1}\cdot\text{m}^3\cdot\text{s}^{-2}$   
 Ans: (E)
  
2. The numerical value of the Boltzmann constant is  $k_B = 1.38 \times 10^{-23}$ . Which of the following units is a correct unit of the Boltzmann constant  $k_B$ ?  
 (A)  $\text{K}^{-2}$       (B)  $\text{JK}^{-1}$       (C)  $\text{JK}^{-1}\text{mol}^{-1}$       (D)  $\text{JK}^{-2}$       (E)  $\text{K}^{-1}$   
 Ans: (B)
  
3. Bernoulli's equation results from which conservation law?  
 (A) conservation of electric charge      (B) linear momentum conservation  
 (C) angular momentum conservation      (D) energy conservation  
 (E) no relation to the above conservation  
 Ans: (D)
  
4. Which of the following statements of gravitational force is wrong?  
 (A) It is a conservative force.  
 (B) Objects with masses always attract each other.  
 (C) It obeys Newton's third law.  
 (D) The value of gravitational constant  $G$  is different on the moon.  
 (E) All of the above are correct.  
 Ans: (D)
  
5. Which of the following statements of lenses is true?  
 (A) Nearsighted glasses use concave lenses.  
 (B) Farsighted glasses use concave lenses.  
 (C) Simple magnifying glass uses concave lenses.  
 (D) All of the above.  
 (E) None of the above.  
 Ans: (A)

試題請隨卷繳回，請留意背面是否有題。

國立中山大學 113 學年度學士後醫學系招生考試試題

科目名稱：物理與化學

※本科目依簡章規定「不可以」使用計算機(選擇題)

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6. An object is placed  $2f$  away from a thin and double convex lens of focal length  $f$ . Which of the following descriptions on its image is true?  
(A) erect, real, and magnified  
(B) inverted, virtual, and reduced  
(C) inverted, real, and the same size  
(D) erect, virtual, and magnified  
(E) inverted, real, and reduced  
Ans: (C)
7. Order the following electromagnetic waves by wavelengths from the shortest to the longest: (i) visible light, (ii) radio waves, (iii) infrared light, (iv) ultraviolet light, (v) x-ray.  
(A) (v) < (ii) < (i) < (iv) < (iii)  
(B) (v) < (iv) < (i) < (iii) < (ii)  
(C) (iii) < (i) < (iv) < (ii) < (v)  
(D) (v) < (iv) < (iii) < (i) < (ii)  
(E) (iii) < (i) < (iv) < (v) < (ii)  
Ans: (B)
8. According to the laws of thermodynamics, which of the following statements is correct?  
(A) Thermodynamic perpetual machine is possible.  
(B) Heat always flows from a colder to a hotter object.  
(C) The entropy of an isolated system never decreases.  
(D) All thermodynamic processes are reversible.  
(E) Work done on a system is always greater than the heat added.  
Ans: (C)
9. Which of the following statements about absolute pressure  $P$ , gauge pressure  $P_G$  and atmospheric pressure  $P_0$  is true?  
(A)  $P$  is the same as  $P_G$  at 273 K.  
(B)  $P_0 + P_G$  is the absolute pressure  $P$ .  
(C) Gauge pressure  $P_G$  is always positive.  
(D) Absolute pressure  $P$  is the atmospheric pressure  $P_0$  at 15°C.  
(E) None of the above.  
Ans: (B)
10. Which of the following gases would exhibit a more narrow Maxwell-Boltzmann speed distribution at a given temperature?  
(A) Hydrogen ( $H_2$ )      (B) Oxygen ( $O_2$ )      (C) Nitrogen ( $N_2$ )  
(D) Helium ( $He$ )      (E) Argon ( $Ar$ )  
Ans: (E)
11. Which of the following descriptions of electrons is correct?  
(A) Electrons are massless.  
(B) Electrons are positively charged.  
(C) Electrons can travel at the speed of light.  
(D) Electrons obey the Pauli exclusion principle.  
(E) None of the above.  
Ans: (D)

國立中山大學 113 學年度學士後醫學系招生考試試題

科目名稱：物理與化學

※本科目依簡章規定「不可以」使用計算機(選擇題)

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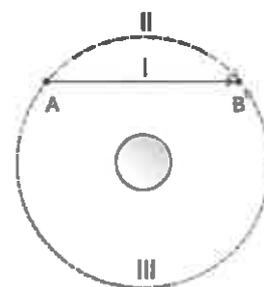
12. Under what condition does the magnetic force on a charged particle perform work?  
 (A) When the particle moves parallel to the magnetic field.  
 (B) When the particle moves perpendicular to the magnetic field.  
 (C) When the particle moves at an angle to the magnetic field.  
 (D) When the magnetic field is non-uniform.  
 (E) None of the above.

Ans: (E)

13. According to Lenz's law, when changing the magnetic flux through a coil, the direction of the induced current in a coil is such that it...  
 (A) opposes the change in magnetic flux. (B) supports the change in magnetic flux.  
 (C) depends on the resistance of the coil. (D) is unrelated to the magnetic flux.  
 (E) aligns with the magnetic flux.

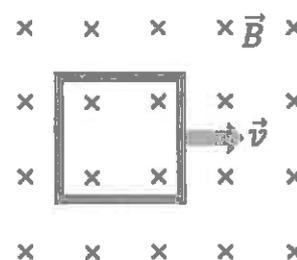
Ans: (A)

14. See the right figure, there is a metallic sphere, on which a constant electric potential is applied. A charged particle moves from point A to point B through three different kinds of paths denoted as I, II, and III. Through which path does the particle gain the most electric energy?  
 (A) I (B) II (C) III (D) All the same  
 (E) It depends on the sign of the charge.



Ans: (D)

15. Refer to the figure. A conducting loop (square coil of wire) is pulled at constant velocity through a uniform magnetic field entering the plane. Which of the following statements is correct?  
 (A) Current is induced in the loop in the clockwise direction.  
 (B) Current is induced in the loop in the counterclockwise direction.  
 (C) Alternating current is induced in the loop.  
 (D) Charge separation occurs; negative charges are accumulated at the bottom edge.  
 (E) Charge separation occurs; negative charges are accumulated at the top edge.



Ans: (D)

16. The coordination geometry of  $\text{Cr}(\text{NO})_4$  is \_\_\_\_\_.  
 (A) tetrahedral (B) trigonal pyramidal (C) see-saw  
 (D) square planar (E) none of the above

Ans: (A)

17. What type of high energy bonds are found in ATP and ADP?  
 (A) carboxylic anhydride (B) phosphodiester (C) thioester  
 (D) phosphoanhydride (E) amine

Ans: (D)

18. Consider the second-order reaction  $\text{A} \rightarrow \text{products}$ , which has a first half-life of 25 s. If the concentration of A after 15.6 s is 0.36 M, determine the initial concentration of A.  
 (A) 0.58 M (B) 0.26 M (C) 0.53 M (D) 0.14 M (E) 0.16 M

Ans: (A)

國立中山大學 113 學年度學士後醫學系招生考試試題

科目名稱：物理與化學

※本科目依簡章規定「不可以」使用計算機(選擇題)

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19. Which of the following is the reason for minimum chemical interferences in inductively-coupled plasma?  
(A) Zeeman effect correction (B) high ionization efficiency  
(C) high temperature (D) large number of emission lines  
(E) none of the above  
Ans: (C)
20. The point group of  $\text{H}_2\text{O}_2$  is \_\_\_\_\_.  
(A)  $C_2$  (B)  $C_{2v}$  (C)  $C_3$  (D)  $C_{3v}$  (E) none of the above  
Ans: (A)
21. The C-O bond order of  $\text{CO}^-$  is \_\_\_\_\_.  
(A) 1 (B) 1.5 (C) 2 (D) 2.5 (E) 3  
Ans: (D)
22. The reaction  $\text{A} \rightarrow \text{B} + \text{C}$  is known to be zero order in A with a rate constant of  $4.8 \times 10^{-2} \text{ mol/L} \cdot \text{s}$  at  $25^\circ\text{C}$ . An experiment was run at  $25^\circ\text{C}$  where  $[\text{A}]_0 = 4.0 \text{ M}$ . What is the concentration of B after 5.0s?  
(A) 1.7 M (B)  $4.5 \times 10^{-1} \text{ M}$  (C) 3.0 M (D)  $1.1 \times 10^{-1} \text{ M}$  (E)  $2.4 \times 10^{-1} \text{ M}$   
Ans: (E)
23. Which of the following statements is/are true?  
I. An excited atom can return to its ground state by absorbing electromagnetic radiation.  
II. The energy of an atom is increased when electromagnetic radiation is emitted from it.  
III. The energy of electromagnetic radiation increases as its frequency increases.  
IV. An electron in the  $n = 4$  state in the hydrogen atom can go to the  $n = 2$  state by emitting electromagnetic radiation at the appropriate frequency.  
V. The frequency and wavelength of electromagnetic radiation are inversely proportional to each other.  
(A) III, V (B) II, III, IV (C) I, II, IV (D) I, II, III (E) III, IV, V  
Ans: (E)
24. How many electrons can be described by the quantum numbers  $n = 4, l = 4, m_l = 1$ ?  
(A) 14 (B) 6 (C) 10 (D) 0 (E) 2  
Ans: (D)
25. The concentration of  $\text{OH}^-$  ions in a solution is 5.62 mM. Determine the pH of the solution.  
(A) 11.7 (B) 2.2 (C) 14.7 (D) 13.3 (E) 5.6  
Ans: (A)
26. In which of the following techniques are we measuring the amount of light absorbed as a function of wavelength?  
(A) atomic absorption spectroscopy  
(B) X-ray diffraction  
(C) inductively coupled plasma-optical emission spectrometry (ICP-OES)  
(D) gas chromatography  
(E) none of the above  
Ans: (A)

國立中山大學 113 學年度學士後醫學系招生考試試題

科目名稱：物理與化學

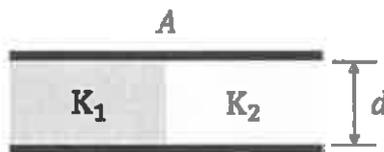
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共 14 頁第 5 頁

27. A gas releases 2.0 J of heat and then performs 11.8 J of work. What is the change in the internal energy of the gas?  
 (A) -13.8 J (B) 9.8 J (C) -9.8 J (D) 2.0 J (E) 13.8 J  
 Ans: (A)
28. The  $pK_b$  of the base cyclohexamine,  $C_6H_{11}NH_2$ , is 3.36. What is the  $pK_a$  of the conjugate acid,  $C_6H_{11}NH_3^+$ ? ( $K_w=1.0 \times 10^{-14}$  at  $25^\circ C$ )  
 (A) 3.36 (B) 14.00 (C) 10.64 (D) 7.64 (E) -10.64  
 Ans: (C)
29. Ellipsometry is commonly used to measure the thickness of films. Which of the following signal is detected in ellipsometry?  
 (A) resonance angle (B) reflected laser spot (C) second-harmonic generation  
 (D) polarized light (E) none of the above  
 Ans: (D)
30. Which of the following is not a feature of carrier gas used in gases chromatography?  
 (A) The carrier gas should be chemically inert.  
 (B) The carrier gas should be inexpensive.  
 (C) The purity of carrier gas should not be very high.  
 (D) The carrier gas should be suitable for the detector employed.  
 (E) None of the above.  
 Ans: (C)

貳、第 31~90 題，每題 2 分，共計 120 分，答錯 1 題倒扣 0.5 分，倒扣至本大題零分為止，未作答不給分亦不扣分。

31. Determine the correct unit and magnitude of the electric field at distance  $x$  from the midpoint of a very long line of uniformly distributed positive charge. Assume  $x$  is much smaller than the length of the wire, and let  $\lambda$  be the charge per unit length.  
 (A)  $\frac{1}{2\pi\epsilon_0} \frac{\lambda}{x}$ , unit (V/m) (B)  $\frac{1}{2\pi\epsilon_0} \frac{\lambda}{x^2}$ , unit (V/m) (C)  $\frac{1}{2\pi\epsilon_0} \frac{\lambda}{x^2}$ , unit (V/m<sup>2</sup>)  
 (D)  $\frac{1}{2\pi\epsilon_0} \frac{\lambda}{x}$ , unit (V/m<sup>2</sup>) (E)  $\frac{1}{2\pi\epsilon_0} \frac{\lambda}{x^{1/2}}$ , unit (V/m)  
 Ans: (A)
32. The plates of a parallel-plate capacitor have area  $A$  and separation  $d$ . Two different dielectrics each fill half the space between the plates of a parallel-plate capacitor (as shown in figure). Determine the correct unit and the capacitance in terms of  $K_1$ ,  $K_2$ , the area  $A$  of the plates, and the separation  $d$ , where  $K_1$  and  $K_2$  are the dielectric constants of two dielectrics.  $\epsilon_0$  is the vacuum permittivity.  
 (A)  $\frac{\epsilon_0 A}{2d} (K_1 + K_2)$ , unit (Coul/V)  
 (B)  $\frac{2\epsilon_0 A}{d} (K_1 + K_2)$ , unit (Coul/V)  
 (C)  $\frac{2\epsilon_0 A}{d} (K_1 + K_2)$ , unit (V/Coul)  
 (D)  $\frac{\epsilon_0 A}{2d} (K_1 + K_2)$ , unit (V/Coul)  
 (E)  $\frac{\epsilon_0 A}{d} (K_1 + K_2)$ , unit (Coul/V)  
 Ans: (A)



國立中山大學 113 學年度學士後醫學系招生考試試題

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33. A system comprises three particles with masses of 2.0 kg, 3.0 kg, and 5.0 kg, respectively. A force  $F = 3.0i + 4.0j$  (N) acts on the 2.0-kg particle, where  $i$  and  $j$  are unit vectors that point along  $x$  and  $y$  coordinate axes, respectively. What is the acceleration of the center of mass  $a_c$  caused by the force?

(A)  $a_c = 0.30i + 0.40j$  ( $m/s^2$ )

(B)  $a_c = 0.60i + 0.80j$  ( $m/s^2$ )

(C)  $a_c = 3.0i + 1.0j$  ( $m/s^2$ )

(D)  $a_c = 3.0i + 4.0j$  ( $m/s^2$ )

(E)  $a_c = 15i + 20j$  ( $m/s^2$ )

Ans: (A)

34. Assume that a satellite of mass  $M$  orbits Earth in a perfect circle of radius  $R$ . If the satellite is replaced with another one with mass  $2M$  but with the same circling radius, what is the ratio of the period of the first satellite to the period of the second one (i.e.,  $T_1/T_2$ )?

(A) 1/2

(B)  $1/\sqrt{2}$

(C) 1

(D)  $\sqrt{2}$

(E) 2

Ans: (C)

35. A 5.0-kg block moves with velocity  $v = 3.0i + 5.0j$  (m/s) on a horizontal surface of coefficient of kinetic friction  $\mu = 0.30$ , where  $i$  and  $j$  are unit vectors that point along the  $x$  and  $y$  coordinate axes, respectively. When the block comes to rest, what is the total thermal energy increased?

(A)  $1.2 \times 10^2$  J

(B) 63 J

(C) 38 J

(D) 26 J

(E) 85 J

Ans: (E)

36. A wheel rotates initially at a rate of 10 rad/s and begins to accelerate at a rate of 2 rad/s<sup>2</sup>. After 3 seconds the rate of the rotation will be

(A) 6 rad/s

(B) 9 rad/s

(C) 10 rad/s

(D) 16 rad/s

(E) 19 rad/s

Ans: (D)

37. A force-time curve for a ball struck by a bat is shown in the figure. What is the impulse on the ball?

(A) 12000 (N·s)

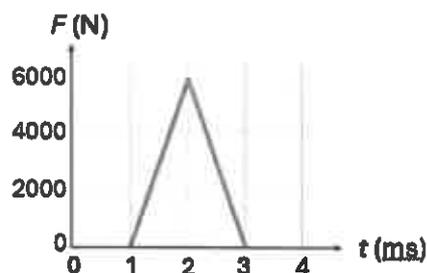
(B) 6000 (N·s)

(C) 3000 (N·s)

(D) 6 (N·s)

(E) 3 (N·s)

Ans: (D)



38. A force of 20 N acts on a wagon at an angle of 30° to the ground. Calculate the work done by the force when the wagon is dragged 100 m along the ground.

(A) 600 J

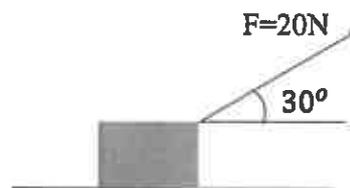
(B) 800 J

(C) 100 J

(D) 1300 J

(E) 1700 J

Ans: (E)



39. Calculate the recoil velocity of a 5-kg rifle that shoots a 0.02-kg bullet at a speed of 620 (m/s).

(A) -10 m/s

(B) -5 m/s

(C) -2.5 m/s

(D) -1.25 m/s

(E) -1 m/s

Ans: (C)

國立中山大學 113 學年度學士後醫學系招生考試試題

科目名稱：物理與化學

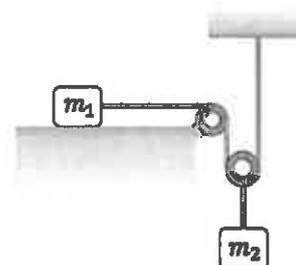
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40. Neglect the friction and weights of pulleys and cord in the figure. The body of mass  $m_2$  is falling down with acceleration  $a_2 = g/2$ . What is the mass ratio  $m_2/m_1$ ?

(A) 1 (B) 3/2 (C) 2 (D) 5/2 (E) 4

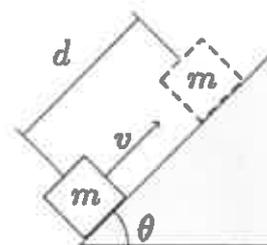
Ans: (E)



41. A block of mass  $m$  was placed on a surface (coefficient of kinetic friction  $\mu$ ) with an inclined angle  $\theta$ . The block is initially moving uphill with speed  $v$ . What is the total distance  $d$  the block moves before the block goes downhill or stops?

(A)  $\frac{v^2}{2g}$  (B)  $\frac{v^2}{2g(\sin^2\theta + \mu\cos^2\theta)}$  (C)  $\frac{v^2}{g}$   
 (D)  $\frac{v^2}{2g(\sin\theta + \mu\cos\theta)}$  (E)  $\frac{v^2\sin^2\theta}{g}$

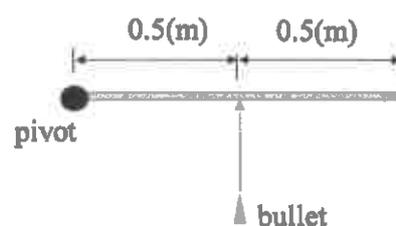
Ans: (D)



42. A uniform stick 1.0 m long with total mass 15 kg rests on a frictionless table and is pivoted at its end. The uniform stick rotates freely about this pivot. A bullet with a mass of 10 g and a speed of 400 m/s strikes the center of the stick, in a direction perpendicular to the stick and embeds itself there. Find the stick's angular speed.

(A) 0.1 rad/s (B) 0.4 rad/s (C) 0.6 rad/s  
 (D) 0.2 rad/s (E) 0.8 rad/s

Ans: (B)



43. One quarter of a circular loop of wire carries a current  $I$ . The current  $I$  enters and leaves on straight segments of wire. The straight wires are along the radial direction from the center of the circular portion. Find the magnetic field at the center of the circular.

(A)  $\frac{\mu_0 I}{2R}$  (B)  $\frac{\mu_0 I}{4R}$  (C)  $\frac{\mu_0 I}{8R}$  (D)  $\frac{\mu_0 I}{16R}$  (E)  $\frac{\mu_0 I}{32R}$

Ans: (C)

44. A capacitor  $C$  is fully charged by a dc power supply so that one plate has charge  $Q_0$ . It is disconnected from the power supply and is connected to an inductor  $L$ , which results in an electrical oscillation. What is the angular frequency  $\omega$  of the oscillation and its maximum current  $I_0$ ?

(A)  $\omega = \frac{L}{C}, I_0 = \frac{L}{C} Q_0^2$  (B)  $\omega = \frac{C}{L}, I_0 = \frac{Q_0}{LC}$  (C)  $\omega = \frac{1}{\sqrt{LC}}, I_0 = \frac{Q_0}{\sqrt{LC}}$

(D)  $\omega = \frac{\sqrt{LC}}{2\pi}, I_0 = Q_0\sqrt{LC}$  (E)  $\omega = \frac{1}{2\pi}\sqrt{\frac{C}{L}}, I_0 = \frac{1}{2\pi}\sqrt{\frac{C}{L}} Q_0^2$

Ans: (C)

45. What is the average translational kinetic energy of molecules in an ideal gas at 37°C?

(A)  $1.3 \times 10^{-21}$  J (B)  $2.6 \times 10^{-21}$  J (C)  $4.2 \times 10^{-21}$  J (D)  $5.2 \times 10^{-21}$  J (E)  $6.4 \times 10^{-21}$  J

Ans: (E)

國立中山大學 113 學年度學士後醫學系招生考試試題

科目名稱：物理與化學

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46. In human, blood flows from the heart into the aorta, from which it passes into the major arteries. These branch into the small arteries (arterioles), which in turn branch into myriads of tiny capillaries. The radius of the aorta is about 1.2 cm, and the blood passing through it has a speed of about 40 cm/s. A typical capillary has a radius of about  $4 \times 10^{-4}$  cm, and blood flows through it at a speed of about  $5 \times 10^{-4}$  m/s. Estimate the number of capillaries that are in the body.  
 (A)  $1 \times 10^9$       (B)  $3 \times 10^9$       (C)  $5 \times 10^9$       (D)  $7 \times 10^9$       (E)  $9 \times 10^9$   
 Ans: (D)
47. An electron travels at  $2 \times 10^7$  m/s in a plane perpendicular to a uniform 0.01 T magnetic field. What is the radius of the travel path? (electron mass =  $9.1 \times 10^{-31}$  kg, charge on electron =  $1.6 \times 10^{-19}$  Coul)  
 (A) 5.2 cm      (B) 3.8 cm      (C) 2.1 cm      (D) 1.1 cm      (E) 0.5 cm  
 Ans: (D)
48. A soap bubble appears green (wavelength: 540 nm) at the point on its front surface nearest the viewer. What is the smallest thickness the soap bubble film could have? Assume that the index of refraction of the soap film is  $n=1.35$ .  
 (A) 100 nm      (B) 150 nm      (C) 200 nm      (D) 250 nm      (E) 300 nm  
 Ans: (A)
49. An engine's heat input per second is 8.0 kJ at 500 K reservoir and output per second is 4.0 kJ at 300 K reservoir. What is the Carnot efficiency of this engine?  
 (A) 20%      (B) 40%      (C) 50%      (D) 80%      (E) none of the above  
 Ans: (B)
50. For a car traveling with speed  $v$  around a curve of radius  $r$ , determine a formula for the angle  $\theta$ , at which a road should be banked so that no friction is required.  
 (A)  $\sin\theta = \frac{v^2}{rg}$       (B)  $\cos\theta = \frac{v^2}{rg}$       (C)  $\tan\theta = \frac{v^2}{rg}$       (D)  $\cot\theta = \frac{v^2}{rg}$       (E) 0  
 Ans: (C)
51. Calculate the moment of inertia of a hollow cylinder when the rotational axis is through the center. The inner radius is  $R_1$  and outer radius is  $R_2$ ? The total mass of the hollow cylinder is  $M$ .  
 (A)  $\frac{1}{3}M(R_1^2 + R_2^2)$       (B)  $\frac{1}{4}M(R_2^2 - R_1^2)$       (C)  $\frac{1}{2}M(R_2 - R_1)^2$   
 (D)  $\frac{1}{2}M(R_1^2 + R_2^2)$       (E)  $M(R_1 + R_2)^2$   
 Ans: (D)
52. Consider a parallel-plate capacitor. Each plate has area  $A$ . One plate carries a uniform surface charge density  $\sigma$  and the other carries a uniform surface charge density  $-\sigma$ . Each plate of a parallel-plate capacitor exerts a force  $F$  on the other. Calculate the force.  
 (A)  $\frac{\sigma^2}{2\epsilon_0}$       (B)  $\frac{\sigma^2}{2\epsilon_0 A}$       (C)  $\frac{\sigma A}{\pi\epsilon_0}$       (D)  $\frac{\sigma^2 A}{2\epsilon_0}$       (E)  $\frac{2\sigma}{\epsilon_0 A}$   
 Ans: (D)
53. An observer is moving with speed  $u$  toward a stationary source which emits sound waves of frequency  $f$ . What is the frequency  $f'$  heard by the observer? Assume the speed of sound to be  $v$ .  
 (A)  $f' = f$       (B)  $f' = \left(\frac{v+u}{v}\right)f$       (C)  $f' = \left(\frac{v}{v+u}\right)f$   
 (D)  $f' = \left(\frac{v+u}{v-u}\right)f$       (E)  $f' = \left(\frac{v-u}{v+u}\right)f$   
 Ans: (B)

試題請隨卷繳回，請留意背面是否有題。

國立中山大學 113 學年度學士後醫學系招生考試試題

科目名稱：物理與化學

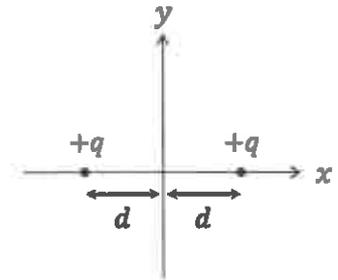
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54. Two charges ( $+q$ ) are located on the  $x$  axis as the figure shows. What is the resulting electric field at points on the  $y$  axis?

- (A)  $\frac{-1}{4\pi\epsilon_0} \frac{2qd}{\sqrt{d^2+y^2}} \hat{i}$  (B)  $\frac{-1}{4\pi\epsilon_0} \frac{2qd}{(d^2+y^2)^{3/2}} \hat{i}$   
 (C)  $\frac{1}{4\pi\epsilon_0} \frac{2qy}{(d^2+y^2)^{3/2}} \hat{j}$  (D)  $\frac{1}{4\pi\epsilon_0} \frac{2qy}{\sqrt{d^2+y^2}} \hat{j}$  (E) 0

Ans: (C)



55. An ice skater with rotational inertia  $I$  and angular speed  $\omega$  pulls his arms in and increases his angular speed to  $3\omega$ . Calculate the change in kinetic energy.

- (A)  $\frac{9}{2}I\omega^2$  (B)  $\frac{3}{2}I\omega^2$  (C)  $\frac{1}{2}I\omega^2$  (D)  $I\omega^2$  (E)  $\frac{1}{4}I\omega^2$

Ans: (D)

56. A cylindrical container with a radius of  $2R$  and a height of  $2R$  contains liquid with a density of  $\rho$ , filling  $17/18$  of its volume. When a plastic ball of radius  $R$  is placed in the liquid, the liquid perfectly fills the container without any liquid spilled out. What is the density of the plastic ball in terms of  $\rho$ ?

- (A)  $\rho/4$  (B)  $\rho/3$  (C)  $\rho/2$  (D)  $3\rho/4$  (E)  $2\rho/3$

Ans: (B)

57. An object travelling at constant speed  $v$  in a circle of radius  $R$  has an acceleration  $a$ . If both  $R$  and  $v$  are doubled, the acceleration will change to

- (A)  $a$  (B)  $2a$  (C)  $4a$  (D)  $8a$  (E)  $a/2$

Ans: (B)

58. Two samples of the same ideal gas have the same volume and density. Sample B has twice the pressure of sample A. What is the root-mean-square speed of the molecules in sample B?

- (A) same as that in sample A (B) twice that in sample A (C) half that in sample A  
 (D)  $\sqrt{2}$  times that in sample A (E) insufficient information to determine

Ans: (D)

59. Given a traveling sinusoidal wave,  $y(x, t) = A \sin(kx - \omega t + \phi)$ . What are the wavelength and frequency of the wave?

- (A) wavelength:  $1/k$ , frequency:  $1/\omega$  (B) wavelength:  $k/(2\pi)$ , frequency:  $2\pi/\omega$   
 (C) wavelength:  $2\pi/k$ , frequency:  $2\pi/\omega$  (D) wavelength:  $2\pi k$ , frequency:  $2\pi\omega$   
 (E) wavelength:  $2\pi/k$ , frequency:  $\omega/(2\pi)$

Ans: (E)

60. If the wavelength of light is increased in a single-slit diffraction experiment, what happens to the angular width of the central maximum?

- (A) It increases. (B) It decreases. (C) It remains constant.  
 (D) It becomes zero. (E) It depends on the slit width.

Ans: (A)

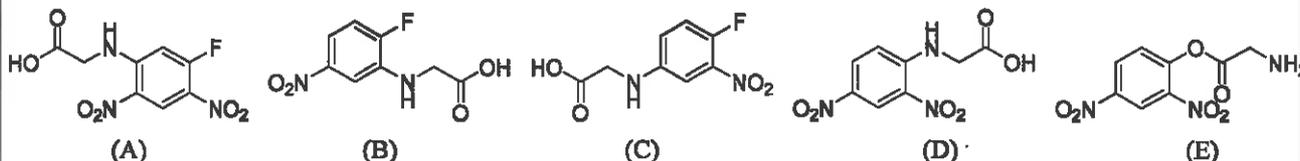
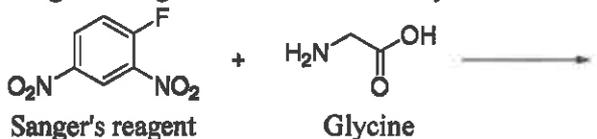
國立中山大學 113 學年度學士後醫學系招生考試試題

科目名稱：物理與化學

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61. Sanger's reagent (shown below) is a chemical used for protein sequencing. This reagent works by reacting with the N-terminal amino acid of polypeptides. Which is the product formed when Sanger's reagent is reacted with Glycine?



Ans: (D)

62. The highest occupied molecular orbital of ferrocene is \_\_\_\_\_  
 (A)  $d_{x^2-y^2}$       (B)  $d_{z^2}$       (C)  $d_{x^2-y^2}, d_{z^2}$       (D)  $d_{xy}, d_{xz}, d_{yz}$       (E) none of the above

Ans: (B)

63. The number of unpaired electrons in nickelocene is \_\_\_\_\_.  
 (A) 0      (B) 1      (C) 2      (D) 3      (E) none of the above

Ans: (C)

64. Which of the following are isolobal fragments?  
 (A)  $\text{CH}^-$  and  $\text{Ni}(\text{CO})_3$       (B)  $\text{CH}_2^+$  and  $\text{Fe}(\text{CO})_3$       (C)  $\text{CH}_3^-$  and  $[\text{Cu}(\text{CO})_2]^+$   
 (D)  $\text{CH}_4$  and  $[\text{Co}(\text{CO})_4]^+$       (E) none of the above

Ans: (A)

65. What is the valence electron configuration of S?  
 (A)  $3s^2 3p^4$       (B)  $4s^2 4p^4$       (C)  $1s^2 2s^2 2p^6 3s^2 3p^4$       (D)  $1s^2 2s^2 2p^4$       (E) none of the above

Ans: (A)

66. Which of the following statements about adiabatic processes is/are true?  
 I. In an adiabatic process, no energy such as heat flows into or out of the system.  
 II. An adiabatic process occurs when there is thermal conductivity between a system and its surrounding.  
 III. For an adiabatic process,  $q = 0$  and  $\Delta E = w$ .  
 (A) I only      (B) II only      (C) III only      (D) I and II      (E) I and III

Ans: (E)

67.  $\Delta H^\circ$  and  $\Delta S^\circ$  for the vaporization of  $\text{Br}_2(l)$  at  $25^\circ\text{C}$  and 1 atm are  $30.8 \text{ kJ/mol}$  and  $92.8 \text{ J/K}\cdot\text{mol}$ , respectively. Assuming  $\Delta H^\circ$  and  $\Delta S^\circ$  are temperature independent, calculate the normal boiling point of bromine.

(A)  $25^\circ\text{C}$       (B)  $332^\circ\text{C}$       (C)  $0^\circ\text{C}$       (D) 332 K      (E) none of the above

Ans: (D)

國立中山大學 113 學年度學士後醫學系招生考試試題

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68. Which technique used for the separation of compounds is based on the different electrostatic interactions between the stationary phase and solutes.

- (A) ion exchange chromatography (B) solvent extraction (C) paper chromatography  
(D) distillation (E) none of the above

Ans: (A)

69. Compound A on ozonolysis yields acetophenone and propanal. What is the structure of compound A?



- (A) 2-phenyl-2-pentene (B) 1-phenyl-1-hexene (C) 1-phenyl-2-pentene  
(D) 2-phenyl-2-hexene (E) none of the above

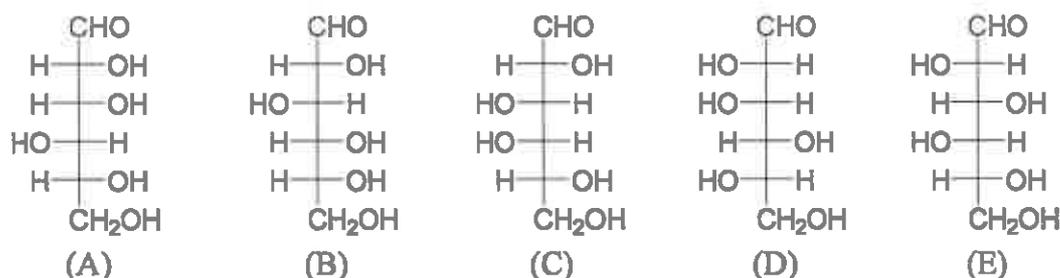
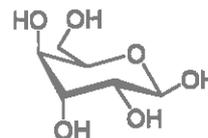
Ans: (A)

70. What compound is formed when 2,2-dimethyloxirane is treated with ethanol containing a trace of HCl?

- (A) 2-ethoxy-2-methyl-1-propanol (B) 1-ethoxy-2-methyl-2-propanol  
(C) 2-ethoxy-2-methyl-2-propanol (D) 2-ethoxy-1-butanol  
(E) 1-ethoxy-2-butanol

Ans: (A)

71. Identify the C3 epimer of the sugar on the right drawn in its open chain (acyclic) Fischer projection.



Ans: (C)

72. A first-row transition metal complex  $[\text{M}(\text{H}_2\text{O})_6]^{2+}$  has the ligand field stabilization energy of  $-0.6\Delta_o$ . M = \_\_\_\_\_.

- (A) Ti (B) V (C) Cr (D) Mn (E) none of the above

Ans: (C)

73. The ground term of a free carbon atom is \_\_\_\_\_.

- (A)  $^1S$  (B)  $^2S$  (C)  $^1P$  (D)  $^3P$  (E) none of the above

Ans: (D)

74. Among the following compounds, which has the highest C–O stretching frequency?

- (A)  $[\text{Ti}(\text{CO})_6]^{2-}$  (B)  $[\text{V}(\text{CO})_6]^-$  (C)  $[\text{Cr}(\text{CO})_6]$  (D)  $[\text{Mn}(\text{CO})_6]^+$  (E)  $[\text{Fe}(\text{CO})_6]^{2+}$

Ans: (E)

75. How many C–O stretching bands does *fac*- $\text{Mo}(\text{CO})_3(\text{PF}_3)_3$  give in its IR spectrum?

- (A) 0 (B) 1 (C) 2 (D) 3 (E) none of the above

Ans: (C)

國立中山大學 113 學年度學士後醫學系招生考試試題

科目名稱：物理與化學

※本科目依簡章規定「不可以」使用計算機(選擇題)

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76. Which of the following elements plays an important role in Suzuki coupling reactions?  
(A) Ag (B) B (C) Cu (D) Sn (E) Zn  
Ans: (B)
77. Which of the following is the most representative element in Wilkinson's hydrogenation catalyst?  
(A) Fe (B) Co (C) Ni (D) Pd (E) Rh  
Ans: (E)
78. The activation energy for the reaction  $\text{H}_2(\text{g}) + \text{I}_2(\text{g}) \rightarrow 2 \text{HI}(\text{g})$  is changed from 184 kJ/mol to 59 kJ/mol at 600 K by the introduction of a Pt catalyst. Calculate the value of the ratio  $\text{rate}(\text{catalyzed})/\text{rate}(\text{uncatalyzed})$ .  
(A) 1.00 (B) 0.32 (C) 2.58 (D)  $7.6 \times 10^{10}$  (E) none of the above  
Ans: (D)
79. At a particular temperature, the half-life of a zero-order reaction is 29.0 min. How long will it take for the reactant concentration to deplete to 1/8 of the initial concentration?  
(A) 87.0 min (B) 58.0 min (C) 50.8 min (D) 232 min (E) 203 min  
Ans: (C)
80. The reaction,  $2\text{H}_2\text{O}(\text{g}) \rightarrow 2\text{H}_2(\text{g}) + \text{O}_2(\text{g})$ , has a positive value for  $\Delta G^\circ$ . Which of the following statements must be true?  
(A) The reaction is slow.  
(B) The reaction will not occur. That is, when  $\text{H}_2\text{O}(\text{g})$  is introduced into a flask, no  $\text{O}_2$  or  $\text{H}_2$  will form even over a long period of time.  
(C) The equilibrium lies far to the right.  
(D) The reaction is exothermic.  
(E) None of these are true.  
Ans: (E)
81. Why does the pH value affect the separation of amino acids by electrophoresis? Please choose the wrong reason.  
(A) Amino acids exist as zwitterions.  
(B) At low pH values, the amino acid molecules will be strongly attracted to the negative electrode.  
(C) At high pH values, the amino acid molecules will be strongly attracted to the negative electrode.  
(D) In basic solution, the net charge is negative due to the dissociation of the carboxylic acid groups.  
(E) None of the above.  
Ans: (C)
82. What is a virtual state in Raman spectroscopy? Please choose the correct description.  
(A) It helps us to visualize both elastic and inelastic scattering processes.  
(B) It lies between the ground state and a vibrational state of the molecule.  
(C) It is also a first vibrational state.  
(D) It is a real electronic energy state.  
(E) None of the above.  
Ans: (A)

國立中山大學 113 學年度學士後醫學系招生考試試題

科目名稱：物理與化學

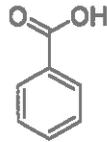
※本科目依簡章規定「不可以」使用計算機(選擇題)

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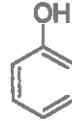
83. Sort the following compounds in decreasing order by their  $pK_a$  values (from highest to lowest).

- (A) I > II > III > IV  
 (B) IV > III > II > I  
 (C) IV > II > III > I  
 (D) III > I > II > IV  
 (E) I > III > II > I

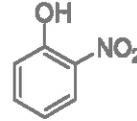
Ans: (C)



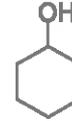
I



II

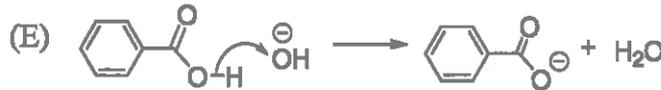
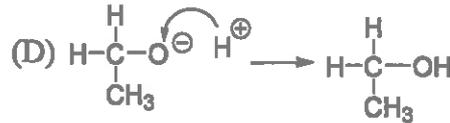
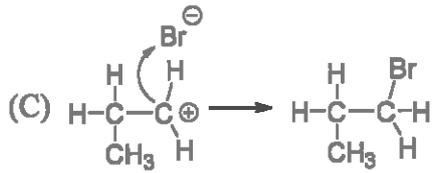
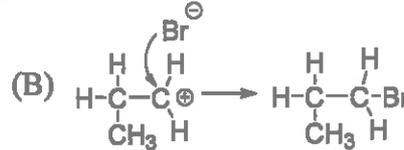
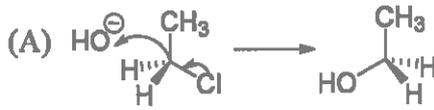


III



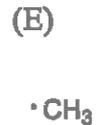
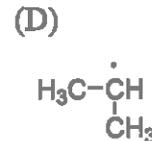
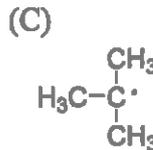
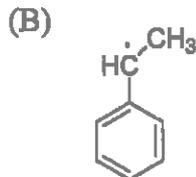
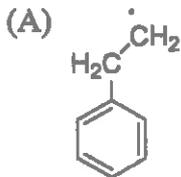
IV

84. Which of the reactions below shows the correct usage of curly arrows?



Ans: (B)

85. Which of the following radicals is the most stable?



Ans: (B)

86. Disulfide linkages can form between \_\_\_\_\_.

(A) two cysteine residues

(B) two methionine residues

(C) a cysteine residue and a methionine residue

(D) two threonine residues

(E) a methionine residue and a threonine residue

Ans: (A)

87. What is the electron configuration for the barium atom?

(A)  $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2$

(B)  $1s^2 2s^2 2p^6 3s^2 3p^6 4s^1$

(C)  $1s^2 2s^2 2p^6 3s^2 3p^6 3d^{10} 4s^2$

(D)  $[\text{Xe}] 6s^2$

(E)  $1s^2 2s^2 2p^6 3s^2$

Ans: (D)

國立中山大學 113 學年度學士後醫學系招生考試試題

科目名稱：物理與化學

※本科目依簡章規定「不可以」使用計算機(選擇題)

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88. Choose the correct statement.  
(A) A reaction that exhibits a negative value of  $\Delta S$  cannot be spontaneous.  
(B) Exothermic reactions are always spontaneous.  
(C) Free energy is independent of temperature.  
(D) At constant pressure and temperature, a decrease in free energy ensures an increase in the entropy of the system.  
(E) None of the above.  
Ans: (E)
89. Which of the following statements is true about the ionization energy of  $Mg^+$ ?  
(A) It will be equal to the negative value of the electron affinity of Mg.  
(B) It will be equal to the negative value of the electron affinity of  $Mg^+$ .  
(C) It will be equal to the ionization energy of Li.  
(D) It will be equal to the negative value of the electron affinity of  $Mg^{2+}$ .  
(E) None of the above.  
Ans: (D)
90. Please choose the correct description for confidence level.  
(A) Confidence level is the probability that the sample mean lies within a certain interval.  
(B) Confidence level is the probability that the true mean lies within a certain interval.  
(C) Confidence level is the range of values within which the population mean is expected to lie with a certain probability.  
(D) Confidence level is the range of values within which the true value is expected to lie with a certain probability.  
(E) None of the above.  
Ans: (B)

# 國立中山大學 113 學年度 學士後醫學系招生考試試題

科目名稱：計算機概論與程式設計

## —作答注意事項—

考試時間：100 分鐘

- 考試開始鈴響前不得翻閱試題，並不得書寫、劃記、作答。請先檢查答案卡之應考證號碼、桌角號碼、應試科目是否正確，如有不同立即請監試人員處理。
- 答案卡請以 2B 鉛筆劃記，不可使用修正液（帶）塗改，未使用 2B 鉛筆、劃記太輕或污損致光學閱讀機無法辨識答案者，後果由考生自負。
- 答案卡應保持清潔完整，不得折疊、破壞或塗改應考證號碼及條碼，亦不得書寫考生姓名、應考證號碼或與答案無關之任何文字或符號。
- 不可使用計算機，並不得攜帶書籍、紙張(應考證不得做計算紙書寫)、具有通訊、記憶、傳輸或收發等功能之相關電子產品或其他有礙試場安寧、考試公平之各類器材入場。
- 試題及答案卡請務必繳回，未繳回者該科成績以零分計算。
- 試題採雙面列印，考生應注意試題頁數確實作答。
- 違規者依本校招生考試試場規則及違規處理辦法處理。

# 國立中山大學 113 學年度學士後醫學系招生考試試題

科目名稱：計算機概論與程式設計

※本科目依簡章規定「不可以」使用計算機(選擇題)

共 12 頁第 1 頁

選擇題(單一選擇題，共 50 題，總分 150 分)

【單選題】每題 3 分，答錯 1 題倒扣 0.75 分，倒扣至本大題零分為止，未作答，不給分亦不扣分。

- Which one of the following is NOT a wireless technology?  
(A) Bluetooth  
(B) 5G  
(C) WiFi  
(D) NFC  
(E) Ethernet  
Ans: (E)
- Which one of the following models is NOT considered as a deep learning method?  
(A) CNN  
(B) SVM  
(C) LSTM  
(D) RNN  
(E) GNN  
Ans: (B)
- Which of the following structures is the most commonly-used directory structure?  
(A) Single level directory structure  
(B) Two level directory structure  
(C) Tree directory structure  
(D) Graph directory structure  
(E) None of the above  
Ans: (C)
- Which of the following statements is the most likely SQL statement used to perform the following task: a bank gives 2% interest of all customers whose balance is less than 100,000?  
(A) UPDATE balance a SET a.balance = a.balance \* 1.02 WHERE a.balance < 100000  
(B) UPDATE balance a SET a.balance += a.balance \* 1.02 IF a.balance < 100000  
(C) UPDATE account a SET a.balance = a.balance \* 1.02 WHERE a.balance < 100000  
(D) UPDATE account a SET a.balance += a.balance \* 1.02 IF a.balance < 100000  
(E) None of the above  
Ans: (C)
- Which one of the following binary representation is the two's compliment of -107?  
(A) 0110 1011  
(B) 1001 0100  
(C) 1001 0101  
(D) 1110 1011  
(E) 0110 1100  
Ans: (C)
- For a three-dimensional array A stored in the *row-major order* with dimensions 3x4x5, if the address of A[0][2][4] is 2048 and the address of A[1][2][2] is 2084, then what is the address of A[2][1][2]?  
(A) 2112  
(B) 2114  
(C) 2122

試題請隨卷繳回，請留意背面是否有題。

國立中山大學 113 學年度學士後醫學系招生考試試題

科目名稱：計算機概論與程式設計

※本科目依簡章規定「不可以」使用計算機(選擇題)

共 12 頁第 2 頁

- (D) 2124  
(E) None of the above  
Ans: (B)

7. You create a car with `mycar = Car(4, 2)`. Which is a line of code to change the color of `mycar` to "red"?

```
class Car(object):  
    def __init__(self, w, d):  
        self.wheels = w  
        self.doors = d  
        self.color = ""  
  
    def paint(self, c):  
        self.color = c
```

- (A) `Car.paint("red")`  
(B) `mycar.paint(red)`  
(C) `mycar.paint("red")`  
(D) `mycar.paint(Car, "red")`  
(E) None of the above  
Ans: (C)

8. What is the status of a process right after the process has been stopped because its time slot is over?

- (A) Ready  
(B) Waiting  
(C) Running  
(D) Terminated  
(E) Sleeping  
Ans: (A)

9. Assume there are seven characters, C1, C2, C3, C4, C5, C6, and C7, and the frequency (in parentheses) of each one is given as follows.

C1(24), C2(5), C3(7), C4(50), C5(11), C6(16), C7(101)

What is the correct encoded length of a given character as the following if the Huffman coding is adopted?

- (A) C1 for 2 bits  
(B) C2 for 6 bits  
(C) C3 for 7 bits  
(D) C6 for 3 bits  
(E) C7 for 2 bits  
Ans: (B)

10. What is the output of the following Python code?

```
arr = ['1', '2', '3', '4', '5', '6']  
print(arr[1:2])
```

- (A) ['2', '3', '4', '5', '6']  
(B) ['2']

國立中山大學 113 學年度學士後醫學系招生考試試題

科目名稱：計算機概論與程式設計

※本科目依簡章規定「不可以」使用計算機(選擇題)

共 12 頁第 3 頁

- (C) []  
(D) ['1']  
(A) ['1', '2']  
Ans: (B)

11. Symmetric encryption is commonly used to protect messages exchanged between two users without being exposed, where it is required to share a common secret key between the sender and receiver. If there are 20 users in a system, how many keys in total required to be shared among those users for the end-to-end security by symmetric encryption?  
(A) 10  
(B) 20  
(C) 380  
(D) 190  
(E) 19  
Ans: (D)

12. For the given array a=[6, 10, 5, 7, 8], using the following code for bubble sort:

```
for(int i = 0; i < 5; i++){  
    for(int j = i+1; j < 5; j++){  
        if(a[j] < a[i]){  
            int temp = a[j];  
            a[j] = a[i];  
            a[i] = temp;  
        }  
    }  
}
```

How many swaps are needed during the sorting process?

- (A) 2  
(B) 3  
(C) 4  
(D) 5  
(E) 6  
Ans: (C)
13. Consider the arithmetic right shift operation (SRA) in computer architecture. If we perform an SRA on the binary number 11011010 (assuming it represents a signed 8-bit two's complement integer), shifting it to the right by 2 positions, what is the decimal equivalent of the result?  
(A) -26  
(B) -49  
(C) -10  
(D) -13  
(E) 54  
Ans: (C)
14. Which of the following is the correct evaluation result of the postfix expression "826+\*263/++"?  
(A) 26  
(B) 34  
(C) 68

國立中山大學 113 學年度學士後醫學系招生考試試題

科目名稱：計算機概論與程式設計

※本科目依簡章規定「不可以」使用計算機(選擇題)

共 12 頁第 4 頁

- (D) 72
  - (E) None of the above
- Ans: (C)

15. An algorithm that runs in  $O(\sqrt{N})$ , where  $N$  is the size of the problem. For  $N = 100$ , the time the algorithm runs is 1 minute. How long does the algorithm take for  $N = 1000$ ?

- (A) Same time
- (B) About 3 minutes
- (C) About 10 minutes
- (D) About 30 minutes
- (E) None of the above

Ans: (B)

16. Mathematical arithmetic in program  $A^{(-B)+C}$  is presented in an infix notation, if it is changed to a postfix notation, the result should be which of the following?

- (A)  $AB^{-}C^{+}$
- (B)  $AB-C^{+}$
- (C)  $+^{A}BC$
- (D)  $^{A}+-BC$
- (E)  $^{AB}-C$

Ans: (A)

17. Which is NOT the primary features of the blockchain technology?

- (A) Distributed ledger
- (B) Immutability
- (C) Decentralization
- (D) High security
- (E) Low computational complexity

Ans: (E)

18. In the context of networking protocols, what differentiates TCP (Transmission Control Protocol) from UDP (User Datagram Protocol), and how does this difference impact data transmission?

- (A) TCP is connection-oriented and ensures reliable, ordered data delivery, while UDP is connectionless and provides faster but potentially unreliable data transmission.
- (B) TCP and UDP are both connectionless protocols, but TCP is designed for multimedia streaming, whereas UDP is optimized for file transfers.
- (C) TCP is a low-level protocol used for local network communication, while UDP is a high-level protocol employed for wide-area network connections.
- (D) TCP and UDP serve the same purpose in networking and are interchangeable depending on the application's requirements.
- (E) TCP and UDP are identical, and the choice between them are arbitrary based on personal or organizational preferences.

Ans: (A)

19. A confusion matrix is commonly used to estimate the performance of a trained machine learning model for classification. Through the prediction on a set of test data not being used for model training, one can calculate the evaluation metrics, such as accuracy, precision, recall and F1 score. There are four kinds of results for the prediction by a model on a test dataset of 1000 tuples. That is, TP (true positive) = 500, FN (false negative) = 100, FP (false positive) = 50, and TN = 350 (true negative). What is the value of recall for the model?

國立中山大學 113 學年度學士後醫學系招生考試試題

科目名稱：計算機概論與程式設計

※本科目依簡章規定「不可以」使用計算機(選擇題)

共 12 頁第 5 頁

- (A) 500/600
- (B) 500/550
- (C) 850/1000
- (D) 350/400
- (E) 100/400

Ans: (A)

20. The MMU's main service to the computer is

- (A) memory translation.
- (B) memory allocation.
- (C) memory transfer.
- (D) memory collection.
- (E) None of the above.

Ans: (A)

21. Consider the execution of the following set of processes on a single-core processor.

Process	Creation Time	Required Execution Time
P1	0	30
P2	5	12
P3	12	18
P4	70	20
P5	80	10

Assume we use first-in-first-out (FIFO) scheduling to execute the above 5 processes. What is the average waiting time?

- (A) 13
- (B) 33.4
- (C) 18
- (D) 0
- (A) 27.4

Ans: (A)

22. Assuming that  $t$  is an array and  $tPtr$  is a pointer pointing to the first element of that array and no errors are encountered during the compilation. What expression refers to the address of the  $k^{th}$  element?

- (A)  $*(t + k)$
- (B)  $\&tPtr[k]$
- (C)  $\&t[k-1]$
- (D)  $*(t+k-1)$
- (E) None of the above

Ans: (C)

23. What is the role of an operating system's "scheduler," and how does it contribute to the efficient execution of processes?

- (A) The scheduler is responsible for managing input/output operations within the operating system, ensuring seamless communication between peripherals and applications.
- (B) It controls the allocation of system resources, such as CPU time, memory, and peripherals, to different processes, enhancing overall system performance.
- (C) The scheduler is primarily focused on handling user authentication and authorization, ensuring

試題請隨卷繳回，請留意背面是否有題。

國立中山大學 113 學年度學士後醫學系招生考試試題

科目名稱：計算機概論與程式設計

※本科目依簡章規定「不可以」使用計算機(選擇題)

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secure access to the operating system.

- (D) It manages the installation and removal of software applications, ensuring compatibility and preventing conflicts within the operating system.
- (E) The scheduler is responsible for handling network protocols and communication, facilitating data exchange between connected devices.

Ans: (B)

24. Consider the following Python code. What is the content of the stack after the program execution?

```
stack = [5, 8, 1, 2, 9]
x = stack.pop()
stack.append('5')
stack.append(x)
```

- (A) [8, 1, 2, 9, '5', 5]
- (B) [8, 1, 2, 9, 5, '5']
- (C) [5, 8, 1, 2, 5, 9]
- (D) [5, 8, 1, 2, '5', 9]
- (E) Syntax Error.

Ans: (D)

25. Which one of the following statements about TCP/IP networks is NOT correct?

- (A) Each host is assigned a unique IP address.
- (B) IPv4 addresses consist of 32 bits.
- (C) A class C network has 256 useable addresses which can be assigned to host machines.
- (D) A broadcast IP is the last IP address of the subnet.
- (E) Each address consists of two parts: network address and host address.

Ans: (C)

26. Given the following program in C++. Which statement is correct?

```
#include <iostream>
using namespace std;
int count = 0;
int binarySearch(int a[], int l, int r, int x){
    while (l <= r){
        count++;
        int mid = l + (r - l) / 2;
        if (a[mid] == x) return mid;
        if (a[mid] < x) l = mid + 1;
        else r = mid - 1;
    }
    return -1;
}
int main(){
    int a[10] = {2, 5, 8, 12, 16, 23, 38, 56, 72, 91};
    int target = 23;
    int result = binarySearch(a, 0, 9, target);
    cout << count;
    return 0;
}
```

- (A) The value of variable *count* is 2 at the end of the program's execution.

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科目名稱：計算機概論與程式設計

※本科目依簡章規定「不可以」使用計算機(選擇題)

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- (B) During the first execution of *binarySearch()*, the variable *mid* is 5.
- (C) During the first execution of *binarySearch()*, the search should proceed to the left side.
- (D) The time complexity is  $O(n)$ .
- (E) None of the above.

Ans: (E)

27. Which one of the following statements is correct?

- (A) All peripheral devices need a device driver to communicate with the operating system.
- (B) The I/O functions, such as *scanf()* and *printf()* in C, eventually invoke system calls to perform I/O.
- (C) All I/O instructions are privileged instructions.
- (D) (A) and (C).
- (E) All of the above.

Ans: (E)

28. Cloud computing has been adopted in businesses, and service providers provide different types of cloud services. Which one of the following statements is NOT correct?

- (A) Virtual machine is an enabling technology of cloud computing.
- (B) Hypervisors offer resource management for users to monitor the usage of computing resources.
- (C) SaaS is one type of cloud computing.
- (D) A container is a software package that includes an executable with its dependencies.
- (E) A virtual machine is an abstraction of a pure software system.

Ans: (E)

29. Consider the following code in C. If the input sequence is 0, 3, 1, -1. What is the output of the final position and its value?

```
int main()
{
    int board[3][3] = {{1,2,3}, {4,5,6}, {7,8,9}};
    int control, x = 1, y = 1;
    while(1){
        scanf("%d", &control);
        if(control < 0 || control > 3) break;
        switch(control){
            case 0: y--; break;
            case 1: y++; break;
            case 2: x--; break;
            case 3: x++; break;
        }
    }
    printf("position=[%d][%d], ", y, x);
    printf("value=%d", board[y][x]);
    return 0;
}
```

- (A) position=[2][2], value=9
- (B) position=[1][1], value=5
- (C) position=[2][1], value=8
- (D) position=[1][2], value=6
- (E) position=[1][0], value=4

Ans: (D)

試題請隨卷繳回，請留意背面是否有題。

國立中山大學 113 學年度學士後醫學系招生考試試題

科目名稱：計算機概論與程式設計

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30. Suppose that *floating-point* instructions are improved with a speedup of tenfold, i.e., speedup = 10. Only 20% of actual instructions are *floating-point* instructions. What is the overall speedup?
- (A) 1.22  
(B) 5  
(C) 1.67  
(D) 3  
(E) 2
- Ans: (A)

31. Which one of the following is correct memory hierarchy?
- (A) Register → cache → DRAM → hard drive  
(B) Cache → register → DRAM → hard drive  
(C) DRAM → cache → register → hard drive  
(D) Register → DRAM → cache → hard drive  
(E) Cache → DRAM → register → hard drive
- Ans: (A)

32. Which one of the following statements about DDoS (distributed denial of service) attacks is NOT correct?
- (A) DDoS is a type of attacks that compromise availability.  
(B) Syn flooding is a DDoS attack.  
(C) DDoS attacks attempt to exhaust the victim's computing resources.  
(D) Attackers can use DDoS attacks to steal user data.  
(E) DNS amplification is a DDoS attack
- Ans: (D)

33. Which one of the following statements about cryptographic hash functions is correct?
- (A) Hash provides message confidentiality.  
(B) Hash is many-to-one function, so collision may happen.  
(C) Hash can be used as a message authentication code.  
(D) Hash can protect software integrity.  
(E) (B), (C), and (D).
- Ans: (E)

34. What is the output of the following C code?

```
#include <stdio.h>

int main()
{
    int a[8] = {6, 7, 7, 9, 8, 1, 3, 2};
    int b[8] = {1, 1, 1, 1, 1, 1, 1, 1};
    for (int i = 0; i < 8; i++) {
        b[a[i]-1] = b[a[i]-1] + 1;
    }
    printf("%d", b[6]);

    return 0;
}
```

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- (A) 2
- (B) 3
- (C) 8
- (D) 4
- (E) 5

Ans: (B)

35. Which of the following arithmetic is NOT allowed on pointers?

- (A) Increment/Decrement of a pointer
- (B) Addition of integer to a pointer
- (C) Subtraction of integer to a pointer
- (D) Subtracting two pointers of the same types
- (E) None of the above

Ans: (E)

36. Let the height of a tree be the number of nodes, including root node, along the longest path from the root node to the leaf nodes. Consider the integers 42, 37, 12, 58, 31, 74, 86, 98, 66, 11 in a specified order to construct a binary search tree. Which of the following statement is TRUE?

- (A) The height of the tree is 4.
- (B) The root node is 58.
- (C) The node for 31 is a leaf node.
- (D) The node for 66 is an internal node.
- (E) The node for 86 is a child node of the node for 98.

Ans: (C)

37. What kind of method is NOT for the authentication of a user ID?

- (A) CAPTCHA
- (B) SMS OTP
- (C) Password
- (D) Biometrics
- (E) All of the above

Ans: (A)

38. A hospital wants to establish a data center for storing all electronic medical records (EMRs). It is required to guarantee the confidentiality of the EMRs to prevent from unauthorized access. Which one of the following algorithms is more suitable to be used to guarantee the confidentiality of EMRs?

- (A) AES
- (B) RSA
- (C) DSA
- (D) HTTPS
- (E) None of the above

Ans: (A)

39. The following code in C program

```
char str[] = "NSYSU";
```

is equivalent to which of the following option?

- (A) `char str[] = {'N', 'S', 'Y', 'S', 'U'};`
- (B) `char str[5] = {'N', 'S', 'Y', 'S', 'U', '\0'};`
- (C) `char str = {'N', 'S', 'Y', 'S', 'U'};`

試題請隨卷繳回，請留意背面是否有題。

國立中山大學 113 學年度學士後醫學系招生考試試題

科目名稱：計算機概論與程式設計

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(D) `character str[] = {'N', 'S', 'Y', 'S', 'U', '\0'};`

(E) `char str[] = {'N', 'S', 'Y', 'S', 'U', '\0'};`

Ans: (E)

40. In Python statement, which of the following is error ?

(A) `print(23 + "67")`

(B) `print(23 + int("67"))`

(C) `print(str(23) + "67")`

(D) `print(str(23) + str("67"))`

(E) None of the above

Ans: (A)

41. Which of the following represents a disadvantage of using a Star topology in networking?

(A) Limited scalability

(B) Single point of failure

(C) Complex wiring requirements

(D) High setup cost

(E) Difficult to troubleshoot

Ans: (B)

42. Which of the following technique can NOT avoid overfitting problem?

(A) Increasing layers / number of units per layer of the neural networks

(B) Using Lasso / Ridge regularization

(C) Early stopping while training model

(D) Adding dropout between layers

(E) Cross-validation

Ans: (A)

43. Which of the following items is NOT features of Dynamic Loading?

(A) The program is loaded in the memory when it's needed during the execution.

(B) It reduces memory usage and improves performance.

(C) Program is not linked and compiled before being loaded in memory.

(D) The complete program is loaded into the main memory before it is executed.

(E) None of the above.

Ans: (D)

44. Which of the following information are normally NOT included in a process control block (PCB)?

(A) CPU-scheduling information

(B) I/O device queues

(C) Memory-management information

(D) Process identifier

(E) All of the above are normally included in a PCB

Ans: (E)

45. Given the following piece of code, which one of the following statements is correct?

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科目名稱：計算機概論與程式設計

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```
#include <stdio.h>
#include <string.h>

int Func(char* s1, char* s2)
{
    int M = strlen(s1);
    int N = strlen(s2);
    int I, j;

    for (i = 0; i <= N - M; i++) {
        for (j = 0; j < M; j++)
            if (s2[i + j] != s1[j])
                break;
        if (j == M)
            return i;
    }
    return -1;
}
```

- (A) This code is to check if string s1 is a substring of s2.
- (B) It returns -1 when string s1 does not exist in string s2.
- (C) It returns the position of string s2 that contains s1 if s1 is in s2.
- (D) The time complexity is  $O(MN)$ .
- (E) All of the above.

Ans: (E)

46. In the following statements which is NOT true regarding Bob wants to send Alice an encrypted email?

- (A) Bob and Alice each can have his/her own pair of public and private keys.
- (B) Bob can take Alice's public key and encrypt his message to her.
- (C) Bob can take his public key and encrypt his message to her.
- (D) Bob can take his private key to encrypt his message to her.
- (E) Bob has more than one way to encrypt his message.

Ans: (C)

47. Which of the following statements about arrays and linked lists is correct?

- (A) Linked lists have dynamic memory allocation.
- (B) Arrays have a fixed size determined at compile time.
- (C) Linked lists have efficient insertion and deletion operations.
- (D) Both arrays and linked lists can be used to implement data structures.
- (E) All of the above.

Ans: (E)

48. Which one of the following security features is required to prevent medical internet-of-things (MIoT) devices from being out-of-service?

- (A) Confidentiality
- (B) Integrity
- (C) Authentication
- (D) Availability
- (E) Multi-factor authentication

Ans: (D)

國立中山大學 113 學年度學士後醫學系招生考試試題

科目名稱：計算機概論與程式設計

※本科目依簡章規定「不可以」使用計算機(選擇題)

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49. Given the following piece of code, which one of the following statements is NOT correct?

```
#include <stdio.h>

int main() {
    int n1, n2, max;

    scanf("%d %d", &n1, &n2);
    max = (n1 > n2) ? n1 : n2;
    while (1) {
        if ((max % n1 == 0) && (max % n2 == 0)) {
            printf("The result is %d\n", max);
            break;
        }
        ++max;
    }
    return 0;
}
```

- (A) This program takes two integers as input and calculates the least common multiplier (LCM) of the two integers.
- (B) The variable max is used to store the LCM of the two input integers.
- (C) Given  $n1=4$  and  $n2=3$ , the while loop iterates 9 times to find the answer.
- (D) The initial value of the variable max is the maximum of the two input integers.
- (E) The time complexity is  $O(\max(n1, n2))$ .

Ans: (E)

50. What is the output of the following C program code?

```
#include <iostream>
int &max(int &i, int &j) {
    if (i < j) return j;
    return i;
}

int main()
{
    int a = 78, b = 43;
    max(a,b) = 10;
    max(a,b)++;
    std::cout<<a<<" , "<<b;

    return 0;
}
```

- (A) 10, 44
- (B) 78, 43
- (C) 44, 10
- (D) 79, 10
- (E) 10, 44

Ans: (A)

# 國立中山大學 113 學年度 學士後醫學系招生考試試題

科目名稱：英文

## — 作答注意事項 —

考試時間：80 分鐘

- 考試開始鈴響前不得翻閱試題，並不得書寫、劃記、作答。請先檢查答案卡之應考證號碼、桌角號碼、應試科目是否正確，如有不同立即請監試人員處理。
- 答案卡請以 2B 鉛筆劃記，不可使用修正液（帶）塗改，未使用 2B 鉛筆、劃記太輕或污損致光學閱讀機無法辨識答案者，後果由考生自負。
- 答案卡應保持清潔完整，不得折疊、破壞或塗改應考證號碼及條碼，亦不得書寫考生姓名、應考證號碼或與答案無關之任何文字或符號。
- 不可使用計算機，並不得攜帶書籍、紙張(應考證不得做計算紙書寫)、具有通訊、記憶、傳輸或收發等功能之相關電子產品或其他有礙試場安寧、考試公平之各類器材入場。
- 試題及答案卡請務必繳回，未繳回者該科成績以零分計算。
- 試題採雙面列印，考生應注意試題頁數確實作答。
- 違規者依本校招生考試試場規則及違規處理辦法處理。

# 國立中山大學 113 學年度學士後醫學系招生考試試題

科目名稱：英文

※本科目依簡章規定「不可以」使用計算機(選擇題)

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選擇題(單一選擇題，共 50 題，總分 100 分)

【單選題】每題 2 分，答錯 1 題倒扣 0.5 分，倒扣至本大題零分為止，未作答，不給分亦不扣分。

I. Expression and Structure. This part contains questions 1-28. For each question, choose the answer that best completes the sentence.

1. People who have height dysphoria may have surgery to lengthen their legs, which is a terribly painful process that requires up to one year's confinement \_\_\_\_\_ a wheelchair.

- (A) on
- (B) into
- (C) with
- (D) to
- (E) by

Ans: (D)

2. The medicine may make you feel \_\_\_\_\_, so don't drive or operate heavy machinery after taking it.

- (A) dazed
- (B) dozy
- (C) drowsy
- (D) dodged
- (E) dubious

Ans: (C)

3. \_\_\_\_\_ care addresses symptoms such as pain, fatigue, nausea, and shortness of breath. The aim is to enhance comfort and overall well-being, particular for end-of-life care.

- (A) Plighted
- (B) Palliative
- (C) Prognostic
- (D) Hypnotic
- (E) Aphrodisiac

Ans: (B)

4. The \_\_\_\_\_ responsible for COVID-19, SARS-CoV-2, is a novel coronavirus that was first identified in December 2019 in the city of Wuhan, Hubei province, China.

- (A) pollutant
- (B) allergen
- (C) vector
- (D) pathogen
- (E) pollen

Ans: (D)

5. A polymath is an individual who has \_\_\_\_\_ a few disciplines. For example, Leonardo da Vinci who studied the fields of geometry, mechanics, chemistry, botany, zoology, and so on.

- (A) managed
- (B) modified
- (C) mastered
- (D) maintained

試題請隨卷繳回，請留意背面是否有題。

國立中山大學 113 學年度學士後醫學系招生考試試題

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(E) malfunctioned

Ans: (C)

6. Parkinson's disease is commonly characterized by rhythmic and involuntary \_\_\_\_\_, causing slight shaking movements when the patients are sitting or standing.

(A) relapses

(B) tremors

(C) cramps

(D) stitches

(E) blisters

Ans: (B)

7. The baby was so large that we had to perform a \_\_\_\_\_.

(A) Caesarean section (C-section)

(B) Cardiopulmonary resuscitation (CPR)

(C) Gastroscopy

(D) Colonoscopy

(E) Gastrointestinal examination

Ans: (A)

8. It is crucial for hikers to wear appropriate protective gear, such as insulated clothing and waterproof boots, to prevent frostbite on their \_\_\_\_\_.

(A) amputations

(B) extremities

(C) extensions

(D) accessories

(E) supplements

Ans: (B)

9. Surgical \_\_\_\_\_ may be necessary for certain types of brain tumors, especially if they are causing increased pressure within the skull or if they are accessible for removal.

(A) intervention

(B) aspiration

(C) aberration

(D) simulation

(E) alteration

Ans: (A)

10. Born in an impoverished family, Josh has always had a(n) \_\_\_\_\_ when he is among the upper-class crowd. He doesn't feel confident to speak to others.

(A) aggression

(B) benevolence

(C) ecstasy of consumption

(D) inferiority complex

(E) benefits

Ans: (D)

11. To cultivate bacteria, you should place the inoculated culture medium at an appropriate temperature. The bacteria will multiply and form visible \_\_\_\_\_.

(A) residences

國立中山大學 113 學年度學士後醫學系招生考試試題

科目名稱：英文

※本科目依簡章規定「不可以」使用計算機(選擇題)

共 11 頁第 3 頁

- (B) communities
  - (C) assemblies
  - (D) colonies
  - (E) canopies
- Ans: (D)

12. To successfully deploy any vaccine, it is crucial to ensure that the vaccine \_\_\_\_\_ are maintained at the required temperatures during transportation between healthcare facilities.

- (A) visors
  - (B) vials
  - (C) swabs
  - (D) scalpels
  - (E) conduits
- Ans: (B)

13. The surgeon donned a \_\_\_\_\_ before entering the operating room, ensuring a sterile and hygienic environment for the upcoming procedure.

- (A) lab coat
  - (B) patient gown
  - (C) scrub suit
  - (D) stethoscope
  - (E) trench coat
- Ans: (C)

14. Flus are rarely deadly, but they can be associated with a high risk of serious \_\_\_\_\_, and in some cases, they can be fatal if not properly managed or treated.

- (A) detonations
  - (B) implications
  - (C) complications
  - (D) intrusions
  - (E) emancipations
- Ans: (C)

15. Hospitals must implement \_\_\_\_\_ measures for patient confidentiality to safeguard sensitive medical information.

- (A) restricted
  - (B) stringent
  - (C) negligent
  - (D) diligent
  - (E) exclusive
- Ans: (B)

16. In rural areas, \_\_\_\_\_ often serve as the first responders, offering vital medical assistance and providing helpful advice until the patient can be transported to a healthcare facility.

- (A) mechanics
  - (B) defibrillators
  - (C) rehabs
  - (D) paramedics
  - (E) maneuvers
- Ans: (D)

# 國立中山大學 113 學年度學士後醫學系招生考試試題

科目名稱：英文

※本科目依簡章規定「不可以」使用計算機(選擇題)

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17. According to the cover story published in *Cell Reports* in the issue dated 14<sup>th</sup> September 2021, a Taiwan research team has found a link between single neuron activity and anxiety-related behavior. Their study uncovers an anxiety-related cell in the hippocampus, which \_\_\_\_\_ anxiolytic effects, so it sheds light on the prospect of brain circuit intervention in mental disorders.
- (A) mediates
  - (B) meditates
  - (C) mitigate
  - (D) motivates
  - (E) ruminates
- Ans: (A)
18. The \_\_\_\_\_, which are located between the ribs and the pelvis, support upper body, facilitate movement and hold organs in place.
- (A) diaphragm
  - (B) abdominals
  - (C) deltoids
  - (D) temporal lobes
  - (E) biceps
- Ans: (B)
19. The doctor \_\_\_\_\_ a new idea to reverse aging.
- (A) made out
  - (B) hit upon
  - (C) gave away
  - (D) put off
  - (E) rammed into
- Ans: (B)
20. Adequate hydration is essential for efficient sweating and heat \_\_\_\_\_. It is the reason why we need to drink enough water to avoid heat strokes.
- (A) dissipation
  - (B) precipitation
  - (C) irrigation
  - (D) saturation
  - (E) satiation
- Ans: (A)
21. The survival rate for many cancers has improved considerably over recent decades, due to the development of \_\_\_\_\_ to treat the condition.
- (A) chemistry
  - (B) thermoplastic
  - (C) chemotherapy
  - (D) chemist
  - (E) eradication
- Ans: (C)
22. In anatomy classes, medical students may have to dissect \_\_\_\_\_ to study the structure, organization, and relationships of organs.
- (A) accomplices

# 國立中山大學 113 學年度學士後醫學系招生考試試題

科目名稱：英文

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- (B) massacres
  - (C) forensics
  - (D) cadavers
  - (E) prosthetics
- Ans: (D)

23. The circulatory system is crucial for \_\_\_\_\_, which delivers oxygenated blood to tissues and organs in the body, ensuring that they receive an adequate supply of oxygen and nutrients.

- (A) oxidation
- (B) detoxification
- (C) metastasis
- (D) transfusion
- (E) perfusion

Ans: (E)

24. Recent discoveries about \_\_\_\_\_ have done serious damage to the company's reputation.

- (A) proposition
- (B) rehabilitation
- (C) correlation
- (D) reciprocity
- (E) corruption

Ans: (E)

25. According to their study, methylxanthines, the chemical found in coffee, tea and dark chocolate can make brains healthier and more \_\_\_\_\_.

- (A) resilient
- (B) respiratory
- (C) vivid
- (D) available
- (E) vulnerable

Ans: (A)

26. To protect patients' rights, researchers should obtain an informed \_\_\_\_\_ from patients to ensure a clear understanding of the proposed treatment, potential risks, and alternatives.

- (A) sanction
- (B) ratification
- (C) waiver
- (D) consent
- (E) treaty

Ans: (D)

27. In the informational guidelines accompanying most drugs, manufacturers typically provide a comprehensive list of \_\_\_\_\_, outlining specific situations, medical conditions, or concurrent medications where the usage of the drug is advised against or requires careful consideration.

- (A) formulations
- (B) contraindications
- (C) expiration dates
- (D) dosages
- (E) origins of production

Ans: (B)

試題請隨卷繳回，請留意背面是否有題。

# 國立中山大學 113 學年度學士後醫學系招生考試試題

科目名稱：英文

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28.No matter how angry she was at the time, she didn't argue with that unreasonable man because she did not want to \_\_\_\_\_ in public.

- (A) hit rock bottom
- (B) make a scene
- (C) mess around
- (D) mess up
- (E) be over the moon

Ans: (B)

**II. Discourse Structure. In the following passage, there are five sentences missing. Please choose the most suitable sentence from the sentences provided below to complete the passage. Use each sentence provided once only.**

Read the following questions and answer questions 29-33.

\_\_\_\_\_29\_\_\_\_\_, and there are hundreds of literary words that deal, in one way or another, with medical themes broadly construed, such as illness, suffering, and death. Among these are many masterpieces of western literature that have long been read and taught for their literary quality, psychological insight, and theological or philosophical vision. The biblical Book of Job, Sophocles' *Philoctetes*, Eliot's *Middlemarch*, Tolstoy's *The Death of Ivan Ilyich*, Mann's *Death in Venice* and *The Magic Mountain*, Kafka's *Metamorphosis*, Camus' *The Plague*, and Garcia-Márquez' *Love in the Time of Cholera*, to name only a few examples, are among the highly regarded works of art that raise ultimate questions about what it means to be ill, to suffer, and to die. \_\_\_\_30\_\_\_\_. They may be even more important for physicians than they are for "lay" readers—certainly they are no less so—because in the daily practice of their profession physicians must deal with the ultimate human questions examined in these works.

\_\_\_\_\_31\_\_\_\_\_; they are often lengthy as well. Although their complexity makes them ideal texts for teaching students "to read, in the fullest sense," and thereby helping train them medically—one of the first clearly articulated and defended purposes of incorporating the study of literature into medical education—their length works against their easy inclusion in the curricula of many medical schools and residency programmes. For this reason, and because the relevance of literature to the world of clinical practice was not as well understood in the 1970s as it has become two decades later, literature was first taught in many US medical schools in conjunction with medical ethics. \_\_\_\_32\_\_\_\_, illustrating traditional dilemmas of medical ethics, that they belong to an evolving canon of works frequently taught in medical humanities classes. Most of these works do not hold canonical status as literature in the way that such masterpieces as, for example, *The Magic Mountain* and *The Plague* do. Rather, it is a combination of their medical subject matter, their brevity, and their literary style that gives them special pedagogical value for medical education. \_\_\_\_33\_\_\_\_; in this, they are like the traditional ethics case. But the encounter or dilemma is presented and developed in a literary way—that is, embedded in a complex human situation replete with highly charged emotions....

(from Anne Hudson Jones, "Literature and Medicine: An Evolving Canon," *The Lancet* 348 (1996): 1360.)

- (A) Certain stories work so well as literary "cases"
- (B) The powerful affinity between literature and medicine goes back to ancient times
- (C) Often written by physicians, these works may focus sharply on a doctor-patient encounter or an ethical dilemma in medical practice

試題請隨卷繳回，請留意背面是否有題。

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- (D) These great works certainly belong in any canon of literature and medicine  
(E) Great literary works are, almost by definition, complex

29: Ans: (B)

30: Ans: (D)

31: Ans: (E)

32: Ans: (A)

33: Ans: (C)

**III. Reading Comprehension. In this part, there are four reading passages. Read each of the following passages and answer the corresponding questions.**

Read the following passage and answer questions 34-38.

Medical professionals often encounter ethical dilemmas in their practice. One common ethical concern revolves around patient confidentiality. Patient confidentiality is a fundamental aspect of healthcare that ensures patients feel secure in sharing sensitive information with their healthcare providers. However, there are situations where the healthcare provider may face conflicting priorities, such as the duty to protect patient confidentiality versus the obligation to prevent harm to the patient or others.

In the context of patient confidentiality, healthcare providers must weigh the potential risks and benefits. Striking the right balance requires careful consideration of the patient's autonomy, the need for information sharing among healthcare team members, and the legal obligations that govern confidentiality. Medical professionals must navigate these complex situations ethically to maintain the trust and well-being of their patients.

34. What is the primary focus of the passage?

- (A) Medical procedures
- (B) Patient confidentiality
- (C) Legal obligations
- (D) Healthcare team communication
- (E) Surgical details

Ans: (B)

35. What ethical concern is mentioned in the passage?

- (A) Informed consent
- (B) Patient confidentiality
- (C) Billing procedures
- (D) Staff training
- (E) Hospital management

Ans: (B)

36. What is the fundamental purpose of patient confidentiality?

- (A) Enhancing billing processes
- (B) Promoting legal actions
- (C) Ensuring patient trust
- (D) Facilitating communication among healthcare providers
- (E) Enforcing necessary punishment

Ans: (C)

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37. In situations of conflicting priorities, what must healthcare providers consider?

- (A) Strictly following legal obligations
- (B) Ignoring patient autonomy
- (C) Weighing potential risks and benefits
- (D) Prioritizing information sharing at all costs
- (E) Informing the Ministry of Health and Welfare

Ans: (C)

38. What is the challenge in balancing patient confidentiality?

- (A) Ensuring rapid decision-making
- (B) Enforcement of hospital policies
- (C) Ignoring legal obligations
- (D) Minimizing information sharing
- (E) Navigating conflicting priorities

Ans: (E)

Read the following passage and answer questions 39-41.

In a recent study, researchers discovered that bottled water sold in stores can contain 10 to 100 times more bits of plastic than previously estimated — nanoparticles so infinitesimally tiny they cannot be seen under a microscope. At 1,000th the average width of a human hair, nanoplastics can migrate through the tissues of the digestive tract or lungs into the bloodstream, distributing potentially harmful synthetic chemicals throughout the body and into cells, experts say. The new finding reinforces long-held expert advice to drink tap water from glass or stainless steel containers to reduce exposure. That advice extends to other foods and drinks packaged in plastic as well. “Because the temperature of the body is higher than the outside, those chemicals are going to migrate out of that plastic and end up in our body,” said Dr. Mason, director of sustainability at Penn State Behrend in Erie, Pennsylvania.

39. What is the main concern addressed in the recent study mentioned in the news?

- (A) The environmental pollution caused by nanoplastics
- (B) The number of nanoplastics in bottled water
- (C) The number of plastic bottles in the environment
- (D) The synthetic chemicals in the digestive tract
- (E) The excessive packaging of plastic bottles

Ans: (B)

40. Why is “human hair” mentioned in this article?

- (A) to illustrate the size of nanoplastics
- (B) to demonstrate the number of nanoplastics
- (C) to emphasize the harms to the body
- (D) to show the diverse shapes of nanoplastics
- (E) to show where nanoplastics may go to

Ans: (A)

41. What does the temperature of the body do to those nanoplastics?

- (A) It facilitates the release of these chemicals from the plastics.
- (B) It enhances the visibility of nanoplastics under a microscope.
- (C) It inhibits the migration of chemicals from plastics.

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- (D) It accelerates the degradation of nanoplastics.
- (E) It increases the circulation of plastic particles in the bloodstream.

Ans: (A)

Read the following passage and answer questions 42-46.

More than 35,000 people die each year in the US alone from antimicrobial resistant infections. With novel treatments in short supply, scientists plan to boost available therapies to target antimicrobial resistance. In a paper published in PNAS, researchers used the power of light to give antibiotics a fighting chance. Light interacts with chemicals called photosensitizers to produce toxic reactive oxygen species. Unlike many antibiotics, photosensitizers can sneak past bacterial defenses. For example, it was found that light, plus the photosensitizer curcumin, a chemical found in turmeric, potentiated antibiotic efficacy. In their new study, Dr. Bagnato and his team found that they needed to expose drug-resistant strains of *Staphylococcus aureus* to high doses of different antibiotics to curb its growth. However, when Bagnato added the curcumin and shone light on the bacteria, a lower dose sufficed. Still, the effects were limited. For most strains, the effects were temporary; the team observed a recurrence in resistance after only a few cycles of bacterial growth. Bagnato emphasized the need for alternative therapies. "Infection does not need one type of weapon; it needs a whole arsenal," said Bagnato.

42. What is the primary focus of the study mentioned in the news?

- (A) Developing new antibiotics
- (B) Using the light in antibiotic treatment
- (C) Investigating bacterial defenses
- (D) Identifying drug-resistant strains of bacteria
- (E) Testing the effects of turmeric on bacteria

Ans: (B)

43. What is the role of photosensitizers in the study?

- (A) Manufacturing antibiotic medicines
- (B) Producing toxic reactive oxygen species
- (C) Heating and breaking the outer layer of bacteria
- (D) Strengthening individuals' defense systems
- (E) Absorbing and distributing light

Ans: (B)

44. What is the benefit of using photosensitizers in anti-bacterial treatments?

- (A) cheaper prices of antibiotics
- (B) lower pains of patients
- (C) decreased side effects
- (D) lower doses of antibiotics
- (E) easier accessibility of medications

Ans: (D)

45. What is the limitation of this current attempt?

- (A) Increased strains of super virus with resistance to antibiotics
- (B) Efficacy on limited strains such as *Staphylococcus aureus*
- (C) Recurring resistance after a few bacterial growth cycles
- (D) A short supply in novel treatments
- (E) Viral and fungal resistance to antibiotics

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Ans: (C)

46. Based on the context, what is the closest meaning of “arsenal” in the last sentence?

- (A) Increased doses of antibiotics
- (B) Bacteria, virus, and fungi
- (C) More radical treatments
- (D) An innovative research team
- (E) A diverse range of treatments

Ans: (E)

Read the following passage and answer questions 47-50.

Picture a person having a heart attack—what do you see? Most likely a man looking sweaty and short of breath, clutching his arm or chest in pain. But when women have heart attacks, their symptoms can be quite different, presenting as deep fatigue, nausea and vomiting, and more widespread bodily discomfort instead of localized pain. Discrepancies like this can have devastating consequences. Most often, men’s symptom profiles are considered the “textbook cases,” and so when women present with different symptoms, they may be misdiagnosed, resulting in delays or possible deprivation of life-saving measures. The failure to consider the influence of gender on health physiology goes beyond the clinic. In laboratories around the world, most scientists have historically chosen to study only male rats and mice, under the assumption that female animals’ fluctuating hormones would make their data messy and hard to interpret. In 2016, the journal Research Integrity and Peer Review published guidelines for Sex and Gender Equity in Research (SAGER), which provide clear steps for scientists and editors to increase equity, accuracy, and transparency in both the conduct and reporting of research in subjects of both sexes. These guidelines clearly state that experiments should be designed to reveal sex or gender differences, and that single-sex studies require justification for the exclusion of either sex. Sadly, few journals have incorporated these guidelines into their publishing policies.

47. Which is a “textbook” symptom of a person having a heart attack, as mentioned in the news?

- (A) heat exhaustion
- (B) feeling tired
- (C) vomiting
- (D) discomfort throughout the body
- (E) clutching arms

Ans: (E)

48. What is primary concern when women present different heart attack symptoms?

- (A) Prolonged recovery
- (B) Misdiagnosis and delays
- (C) Slower response to medication
- (D) Low textbook sales
- (E) Gender exploitations

Ans: (B)

49. Why did many researchers choose to study only male rodents in laboratories?

- (A) They think female rodents are not representative of the group.
- (B) They found female rodents are more likely to be resistant to treatments.
- (C) Male rodents display more observable symptoms.
- (D) They think female rodents’ hormones make data inconsistent.

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(E) This has been historically true and people stop questioning it.

Ans: (D)

50. Which is the implication of this news?

(A) Gender differences in physiology has been exaggerated.

(B) Unless a guideline was set, gender inequality in science could never be resolved.

(C) Instead of striving to fight against it, gender inequality should be embraced as a norm.

(D) Despite initiatives such as SAGER, progress is slow in addressing gender inequality.

(E) The guidelines might be problematic; even academic journals choose not to follow them.

Ans: (D)