

國立中山大學 112 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，並不得攜帶具有通訊、記憶或收發等功能或其他有礙試場安寧、考試公平之各類器材、物品（如鬧鈴、行動電話、電子字典等）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. _____ refer to the aggregates of rough endoplasmic reticulum (rER) and polysomes that confer the cytological hallmark of neurons revealed by the conventional staining.

- (A) Wallerian stumps
- (B) Cajal masses
- (C) Nissl bodies
- (D) Leeuwenhoek processes
- (E) Schwann recesses

Ans: (C)

2. Collections of neuronal cell bodies in the central nervous system are called:

- (A) Ganglia
- (B) Neuroglia
- (C) Nodes
- (D) Nuclei
- (E) White matter

Ans: (D)

3. _____ connect the intermediate filament system of two adjacent epithelial cells.

- (A) Adherent junctions
- (B) Desmosomes
- (C) Occluding junctions
- (D) Gap junction
- (E) Focal contacts

Ans: (B)

4. What will happen when you trigger an action potential at each end of a very long axon?

- (A) Both action potentials will continue their transmissions to their respective distal ends.
- (B) The action potential starts close to the soma will transmit to the other end.
- (C) The action potential starts far away from the soma will transmit to the other end.
- (D) Two action potentials will merge into one action potential that subsequently transmits to the axon terminal in a larger amplitude.
- (E) Two action potentials will cancel each other around the middle of this axon.

Ans: (E)

5. Diapedesis occurs at:

- (A) vasa vasorum
- (B) arteries
- (C) capillaries
- (D) postcapillary venules
- (E) inferior vena cava

Ans: (D)

6. Oxygen crosses a plasma membrane by

- (A) osmosis.
- (B) active transport.
- (C) pinocytosis.

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- (D) passive transport.
(E) receptor mediated endocytosis.
Ans: (D)

7. _____ helps the maintenance of membrane fluidly of animal cells in cold environments.

- (A) PIP2
(B) Glycerol
(C) Cholesterol
(D) Phospholipid
(E) Fibronectin
Ans: (C)

8. Which of the following is not the derivatives of mesoderm in vertebrates?

- (A) Skeletal systems
(B) Circulation and lymphatic systems
(C) Dermis of skin
(D) Adrenal cortex
(E) Thymus
Ans: (E)

9. The destination of ubiquitinated proteins in cytosol is _____.

- (A) lysosome
(B) autophagosome
(C) proteasome
(D) spliceosome
(E) peroxisome
Ans: (C)

10. Which of the following genotypes due to nondisjunction of sex chromosomes is lethal?

- (A) XXX
(B) OY
(C) XXY
(D) XO
(E) None of the above
Ans: (B)

11. What do hagfishes and lampreys have in common with the extinct conodonts?

- (A) Lungs
(B) The jawless condition
(C) Bony vertebrae
(D) Their mode of feeding
(E) Swim bladders
Ans: (B)

12. A polymerase chain reaction must have:

- | | | |
|-----------------|-------------------|---------------------|
| I. DNA template | II. DNA primers | III. RNA polymerase |
| IV. dNTPs | V. DNA polymerase | VI. RNA primers |
- (A) I, II, III, IV
(B) I, II, IV, V
(C) I, III, IV, VI

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- (D) I, II, V
(E) I, IV, V, VI
Ans: (B)

13. The major inhibitory neurotransmitter of the human brain is _____.

- (A) acetylcholine
(B) epinephrine
(C) endorphin
(D) nitric oxide
(E) GABA

Ans: (E)

14. What do fungi and arthropods have in common?

- (A) Both groups are commonly coenocytic.
(B) The haploid state is dominant in both groups.
(C) Both groups are predominantly heterotrophs that ingest their food.
(D) The protective coats of both groups are made of chitin.
(E) Both groups have cell walls.

Ans: (D)

15. Short-term memory information processing usually causes changes in the

- (A) brainstem.
(B) medulla.
(C) hypothalamus.
(D) hippocampus.
(E) cranial nerves.

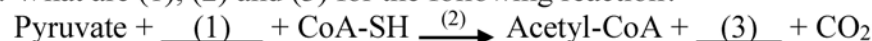
Ans: (D)

16. The cyclic adenosine monophosphate (cAMP) is synthesized by _____, and it is degraded by _____.

- (A) adenylate cyclase; phosphodiesterases
(B) phosphodiesterases; adenylate cyclase
(C) adenylate cyclase; phosphoesterases
(D) phosphoesterases; adenylate cyclase
(E) None of the above is correct

Ans: (A)

17. What are (1), (2) and (3) for the following reaction?



- (A) NADH, pyruvate decarboxylase, NAD^+
(B) NADH, pruvate dehydrogenase, NAD^+
(C) NAD^+ , pyruvate decarboxylase, NADH
(D) NAD^+ , pruvate dehydrogenase, NADH
(E) None of the above is correct

Ans: (D)

18. Each round of the Tricarboxylic Acid Cycle (TCA cycle) produces _____.

- (1) two molecules of carbon dioxide
(2) one molecule of ATP
(3) two molecules of NADH

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- (4) one molecule of FADH₂
(A) (1) and (2)
(B) (2) and (3)
(C) (1) and (4)
(D) (3) and (4)
(E) All of the above are correct
Ans: (C)

19. Which of the following molecule can cross cell membranes freely?

- (A) Carbon dioxide
(B) Na⁺
(C) K⁺
(D) All of the above
(E) None of the above
Ans: (A)

20. The allosteric enzyme PFK-1 (Phosphofructokinase-1) catalyzes the committed step of glycolysis. Which of the following statements about PFK-1 is correct?

- (A) It is inhibited by ADP and stimulated by AMP.
(B) It is inhibited by high pH.
(C) It is stimulated by citrate.
(D) It is stimulated by insulin but is inhibited by epinephrine in muscle cells.
(E) It is stimulated by insulin and inhibited by glucagon in liver cells.
Ans: (E)

21. Which of the following pairs of amino acids could form a charge-charge interaction through their R-groups (side chains)?

- (A) serine and glutamic acid
(B) glutamine and lysine
(C) methionine and histidine
(D) lysine and arginine
(E) aspartic acid and lysine
Ans: (E)

22. NADPH is synthesized mainly in which of the following pathways?

- (A) Glycolysis
(B) Pentose Phosphate Pathway
(C) TCA cycle
(D) Urea cycle
(E) Gluconeogenesis
Ans: (B)

23. The isoelectric point of tyrosine is _____. ($pK_1 = 2.2$; $pK_2 = 9.11$; $pK_a = 10.07$ of the side chain)

- (A) 5.66
(B) 6.135
(C) 7.126
(D) 9.11
(E) 9.59
Ans: (A)

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24. The disease gout is a disease of the joints, usually in males, caused by an elevated concentration of _____ in the blood and tissues.
(A) heme
(B) xanthine
(C) hypoxanthine
(D) uric acid
(E) inosine
Ans: (D)
25. Which of the following amino acids does not belong to glucogenic amino acid?
(A) Ala
(B) Arg
(C) Cys
(D) Glu
(E) Leu
Ans: (E)
26. Which is not an enzyme required for glycolysis?
(A) Hexokinase
(B) Phosphofructokinase
(C) Triosephosphate isomerase
(D) Cyclin-dependent kinase
(E) Pyruvate kinase
Ans: (D)
27. Which of the following is not a post-translational modification of a protein?
(A) Methylation
(B) Phosphorylation
(C) Alternative splicing
(D) Disulfide bond
(E) Acetylation
Ans: (C)
28. Lecithin is composed of _____.
(A) Glycerol + Fatty acid + Phosphoric acid + Serine
(B) Glycerol + Fatty acid + Phosphoric acid + Ethanolamine
(C) Glycerol + Fatty acid + Phosphoric acid + Betaine
(D) Glycerol + Fatty acid + Phosphoric acid + Choline
(E) None of the above
Ans: (D)
29. Amino acid residues which are predominantly involved in the protein-DNA interaction are _____.
(A) positively charged
(B) negatively charged
(C) proline
(D) alanine
(E) glycine
Ans: (A)
30. What are bile salts?

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- (A) Charged phospholipid
 - (B) Esterified cholesterol
 - (C) Hydrolyzed forms of triacylglycerol
 - (D) Amphipathic cholesterol analogs with detergent properties
 - (E) All of the above
- Ans: (D)

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. Where are the aged red blood cells captured and recycled in healthy adults?

- (A) Periarteriolar lymphoid sheath (PALS)
- (B) Splenic sinusoids
- (C) Bone marrow
- (D) Kidney
- (E) Splenic white pulp

Ans: (B)

32. The _____ provides the luminal lining of large-diameter conducting airway.

- (A) ciliated stratified cuboidal epithelium
- (B) simple columnar epithelium
- (C) stratified squamous epithelium
- (D) ciliated pseudostratified columnar epithelium
- (E) transitional epithelium

Ans: (D)

33. Which of the following is absent from the wall of small-diameter (~ 1 mm) bronchioles?

- (A) Epithelium
- (B) Cartilage
- (C) Smooth muscle
- (D) Blood vessels
- (E) Elastic fiber

Ans: (B)

34. What is the general sequential steps of human urine production?

- (A) Filtration → secretion → reabsorption → excretion
- (B) Secretion → filtration → reabsorption → excretion
- (C) Secretion → reabsorption → filtration → excretion
- (D) Filtration → reabsorption → secretion → excretion
- (E) Filtration → excretion → secretion → reabsorption

Ans: (D)

35. The sudden surge of _____ a few hours before ovulation changes the enzymatic activities of theca externa cells and alters the tunica albuginea on the Graafian follicle, leading to the eventual ovulation.

- (A) FSH
- (B) inhibin
- (C) estradiol
- (D) LH

試題請隨卷繳回，請留意背面是否有題

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(E) testosterone

Ans: (D)

36. Forward left heart failure will cause which of the following?

(A) Reduced cardiac output

(B) Pulmonary edema

(C) Reduced urine output

(D) Edema at lower limbs

(E) All of the above

Ans: (E)

37. When you accidentally drip-infused an additional 250 mL of normal saline to a healthy individual, his body removed the additional fluid via the activation of:

(A) Atrial natriuretic peptide system

(B) Renin-angiotensin-aldosterone system

(C) Antidiuretic hormone system

(D) Sympathetic system

(E) None of the above

Ans: (A)

38. After stabilizing this patient via the emergency trauma surgeries, which of the following in this patient could be expected in the next 24-48 hours?

(A) Increase in basophil percentage beyond 5%

(B) Increase in eosinophil percentage beyond 10%

(C) Increase in reticulocytes percentage beyond 3.5%

(D) Megakaryocytes would be detected in the peripheral blood

(E) Macrophages could be detected in the peripheral blood

Ans: (C)

39. After the emergency surgeries, the plasma potassium level of this patient appeared slightly higher than the normal level of 5.5 mEq/L. What might this patient experience most noticeably?

(A) Muscle weakness

(B) Tachycardia

(C) Bradycardia

(D) Diarrhea

(E) GERD

Ans: (B)

40. A man fell from a 1.5 m high platform and bumped the right side of his head directly against the concrete floor. Shortly after the incident, he appeared confused, unsure of his location, time of the day, and the events leading to his fall. He also complained about headaches on his right side. The horizontal CT scan of his head showed a lens-shaped radiopaque inside the right temporal cranium. This patient likely suffered from:

(A) skin abrasion

(B) subcutaneous bruises

(C) epidural hematoma

(D) subdural hematoma

(E) subarachnoid hemorrhage

Ans: (C)

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41. Which of the following statements about MHC I proteins is true?
(A) They are found primarily on immune system cells.
(B) They protect a developing fetus from the immune system of mother.
(C) They are found on the surface of most mammalian cells.
(D) They are antibodies.
(E) All of the above are true.
Ans: (C)
42. Which of the following is the visual evidence of genetic recombination during meiosis?
(A) Centromeres
(B) Synaptonemal complexes
(C) Chiasmata
(D) Secondary constrictions
(E) Mitotic spindle
Ans: (C)
43. Mammals are homeostatic for all of the following EXCEPT
(A) Body temperature
(B) Blood glucose concentration
(C) Blood pH
(D) Metabolic rate
(E) Blood calcium concentration
Ans: (D)
44. Which of the following is true for the phenomenon of "epistasis" in genetics?
(A) It is a type of gene interaction in which the phenotype expression of one gene alters that of another independently inherited gene.
(B) It is the inheritance of traits transmitted by mechanisms that do not involve the nucleotide sequence.
(C) It only occurs in mammals.
(D) It is the mechanism for the inheritance of organelles.
(E) It controls the early development of *Drosophila*.
Ans: (A)
45. The nontemplate strand of a portion of a gene reads: 5'-TTC ACTGGTTCA. What is the sequence of the resulting transcript (RNA) for this portion?
(A) 5'-AAGUGACCAAGU
(B) 5'-UGAACCAGUGAA
(C) 5'-UUCACUGGUUCA
(D) 5'-ACUUGGUCACUU
(E) 5'-TGAACCAGTGAA
Ans: (C)
46. During protein synthesis, which of the following proteins interacts via its *N*-terminal sequence with the signal recognition particle (SRP)?
(A) Nuclear matrix protein
(B) Lysosomal protein
(C) Ribosomal protein
(D) Mitochondrial protein
(E) Chloroplast protein

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Ans: (B)

47. The main function of the atrioventricular (A-V) node is to

- (A) initiate the heartbeat.
- (B) set the rhythm of the heartbeat.
- (C) relay the signal for the heart to contract from the left ventricle to the left atrium.
- (D) relay a signal for the ventricles to contract.
- (E) detect the vibration of heart.

Ans: (D)

48. Which of the following statements about fungi is true?

- I. They are eukaryotic.
- II. They all have rigid cell walls.
- III. Most are filamentous.
- IV. Some are photosynthetic.
- V. They are capable of only asexual reproduction.

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

Ans: (B)

49. Which of the following is present in double-stranded cDNA but absent in the corresponding genomic DNA of eukaryotic cells?

- (A) Promoter sequences
- (B) A homopolymeric sequence of A:T base pairs
- (C) Intron sequences
- (D) 5' and 3'UTRs
- (E) Exon sequences

Ans: (B)

50. Which of the followings are the RNA-protein complex:

- I. Ribosome II. Nucleosome III. Lysosome IV. Spliceosome V. Telomerase

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

Ans: (D)

51. Which of the following is incorrect for the function of glia in the CNS of adult vertebrates?

- (A) Ependymal cells help form the blood-brain barrier.
- (B) Astrocytes can act as stem cells.
- (C) Oligodendrocytes myelinate axons in the CNS.
- (D) Microglia are immune cells in the CNS.
- (E) Astrocytes promote blood flow to neurons.

Ans: (A)

52. Which plant hormone is incorrectly paired with its function?

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- (A) Auxin - promotes stem growth through cell elongation
 - (B) Cytokinins - initiate programmed cell death
 - (C) Gibberellins - stimulate seed germination
 - (D) Abscisic acid - promotes seed dormancy
 - (E) Ethylene - inhibits cell elongation
- Ans: (B)

53. Which of the following vitamins is correctly associated with its use?

- (A) Vitamin C - curing rickets
 - (B) Vitamin A - incorporated into the visual pigment of the eye
 - (C) Vitamin D - calcium removal from bone
 - (D) Vitamin E - protection of skin from cancer
 - (E) Vitamin K - production of white blood cells
- Ans: (B)

54. The MHC (Major Histocompatibility Complex) is important in a T cell's ability to _____.

- (A) distinguish self from nonself
 - (B) recognize specific parasitic pathogens
 - (C) identify specific bacterial pathogens
 - (D) identify specific viruses
 - (E) recognize differences among types of cancer
- Ans: (A)

55. Which combination of hormones helps a mother to produce milk and nurse her baby?

- (A) Prolactin and calcitonin
 - (B) Oxytocin and prolactin
 - (C) Follicle-stimulating hormone and luteinizing hormone
 - (D) Luteinizing hormone and oxytocin
 - (E) Oxytocin, prolactin, and luteinizing hormone
- Ans: (B)

56. Dog breeders maintain the purity of breeds by keeping dogs of different breeds apart when they are fertile. This kind of isolation is most similar to which of the following reproductive isolating mechanisms?

- (A) Reduced hybrid fertility
 - (B) Hybrid breakdown
 - (C) Mechanical isolation
 - (D) Habitat isolation
 - (E) Gametic isolation
- Ans: (D)

57. Photosynthesis ceases when leaves wilt, mainly because _____.

- (A) the chlorophyll of wilting leaves breaks down
 - (B) flaccid mesophyll cells are incapable of photosynthesis
 - (C) stomata close, preventing CO_2 from entering the leaf
 - (D) photolysis, the water-splitting step of photosynthesis, cannot occur when there is a water deficiency
 - (E) accumulation of CO_2 in the leaf inhibits enzymes
- Ans: (C)

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58. Which of the following pathways is most likely taken by newly synthesized histones?
(A) Rough endoplasmic reticulum → Golgi complex → secretory vesicle
(B) Rough endoplasmic reticulum → Golgi complex → nucleus
(C) Rough endoplasmic reticulum → smooth endoplasmic reticulum → nucleus
(D) Cytoplasm → nucleus
(E) Cytoplasm → rough endoplasmic reticulum → Golgi complex → nucleus
Ans: (D)
59. In the communication link between a motor neuron and a skeletal muscle, which of the following descriptions is right?
(A) The motor neuron is considered the presynaptic cell and the skeletal muscle is the postsynaptic cell.
(B) The motor neuron is considered the postsynaptic cell and the skeletal muscle is the presynaptic cell.
(C) Action potentials are possible on the motor neuron but not the skeletal muscle.
(D) Action potentials are possible on the skeletal muscle but not the motor neuron.
(E) The motor neuron fires action potentials but the skeletal muscle is not electrochemically excitable.
Ans: (A)
60. In nerves, vesicles can move the length of an axon at a rate that far exceeds that which would be predicted for simple diffusion. Which of the following models best explains vesicular movement in these cells?
(A) Depolymerization of actin microfilaments attached to vesicles pulls the vesicles toward the site of depolymerization.
(B) Vesicles are propelled by fluid movement generated by changes in osmotic potential within the cells.
(C) Vesicles are moved by alternate contraction and relaxation of actin-myosin "muscle" complexes.
(D) Vesicles, by virtue of their net negative charge, are attracted to positively charged regions of the cell.
(E) Vesicles are attached to the protein kinesin, which slides along microtubules by an ATP dependent process.
Ans: (E)
61. Which kinds of the following nucleic acid can form viral genome?
(1) double-stranded DNA
(2) single-stranded DNA
(3) single-stranded RNA
(A) (1) only
(B) (1) and (2)
(C) (1) and (3)
(D) None of the above is correct
(E) All of the above are correct
Ans: (E)
62. Retroviral vectors are more popular for somatic gene therapy than other viral vectors because:
(A) They replicate faster than most other viruses.
(B) They contain several copies of their DNA genome in the virus particle.
(C) They can integrate themselves into the host cell DNA.
(D) Their replication is more accurate than that of most other viruses.
(E) Their DNA has extensive sequence homology with normal cellular DNA.

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Ans: (C)

63. cAMP regulates the transcription of many genes. What is the major mechanism for this action?
- (A) It induces the phosphorylation of transcription factors.
 - (B) It binds directly to cAMP response elements in promoters and enhancers.
 - (C) It mediates this effect by increasing the calcium concentration in the cytoplasm and the nucleus.
 - (D) It binds directly to nuclear transcription factors.
 - (E) It induces the phosphorylation of STAT proteins, thus enabling them to translocate into the nucleus.

Ans: (A)

64. Which of the following statements regarding circulating immunoglobulins is correct?
- (1) They are produced by B-cell-derived plasma cells.
 - (2) Their diversity is generated by gene rearrangements in the developing B cells.
 - (3) Each immunoglobulin producing cell generates only one kind of immunoglobulins.
- (A) (1) and (2)
 - (B) (1) and (3)
 - (C) (2) and (3)
 - (D) None of the above is correct
 - (E) All of the above are correct

Ans: (E)

65. During long-term fasting, the liver produces acetyl-CoA by the β -oxidation of fatty acids. What is the major metabolic fate of this acetyl-CoA?
- (A) Fatty acid biosynthesis
 - (B) Gluconeogenesis
 - (C) Amino acid biosynthesis
 - (D) Ketogenesis
 - (E) Oxidation in the TCA cycle

Ans: (D)

66. On a high-carbohydrate, low-fat diet, carbohydrates are converted into fat through a series of reactions listed below. What is the correct sequence of these reactions?
- (1) esterification
 - (2) glycolysis
 - (3) fatty acid biosynthesis
- (A) (1), (2), (3)
 - (B) (1), (3), (2)
 - (C) (2), (3), (1)
 - (D) (2), (1), (3)
 - (E) (3), (2), (1)

Ans: (C)

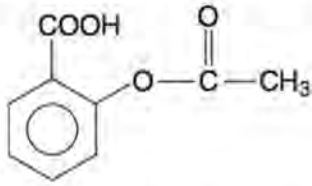
67. The molecule shown here is acetylsalicylic acid (aspirin). What kind of electrical charge does aspirin carry in the stomach at a pH value of 2 and in the small intestine at a pH value of 7?

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科目名稱：普通生物及生化概論

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- (A) Negatively charged in the stomach; positively charged in the intestine
 - (B) Negatively charged both in the stomach and the intestine
 - (C) Uncharged in the stomach; negatively charged in the intestine
 - (D) Uncharged both in the stomach and the intestine
 - (E) Uncharged in the stomach; positively charged in the intestine
- Ans: (C)

68. The brain produces most of its energy by the oxidation of glucose; during long-term fasting, however, it can cover more than half of its energy needs from _____.

- (A) anaerobic glycolysis
- (B) oxidation of its stored glycogen
- (C) oxidation of free fatty acids
- (D) oxidation of amino acids
- (E) oxidation of ketone bodies

Ans: (E)

69. Which of the following reactions is not the reversible reaction in glycolysis?

- (A) Glucose 6-phosphate to fructose 6-phosphate
- (B) Fructose 6-phosphate to fructose 1,6-bisphosphate
- (C) Glyceraldehyde 3-phosphate to 1,3-bisphosphoglycerate
- (D) 3-Phosphoglycerate to 2-phosphoglycerate
- (E) 2-Phosphoglycerate to phosphoenolpyruvate

Ans: (B)

70. Which amino acid is the common donor for methyl transfer?

- (A) Met
- (B) Ala
- (C) Gly
- (D) Ser
- (E) Lys

Ans: (A)

71. Which of the following best describes the metabolic outcome of glycolysis for the degradation of glucose?

- (A) 2 Pyruvate, 4 ATP, 4 NADH
- (B) 2 Pyruvate, 2 ATP, 2 NADH
- (C) 2 Pyruvate, 4 ATP, 2 NADH
- (D) 4 Pyruvate, 2 ATP, 4 NADH
- (E) 4 Pyruvate, 4 ATP, 2 NADH

Ans: (B)

72. Which step of the TCA cycle can generate GTP directly?

- (A) Citrate to isocitrate

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- (B) Isocitrate to α -ketoglutarate
- (C) α -Ketoglutarate to succinyl-CoA
- (D) Succinyl-CoA to succinate
- (E) Succinate to fumarate

Ans: (D)

73. Fatty acids with 14 or high carbons require _____ for transport into mitochondria.

- (A) glycerol-3-phosphate shuttle
- (B) carnitine shuttle
- (C) clathrin
- (D) citrate shuttle
- (E) malate-aspartate shuttle

Ans: (B)

74. The mutation that occurs in sickle cell anemia belongs to _____.

- (A) silent mutation
- (B) missense mutation
- (C) nonsense mutation
- (D) frameshift mutation
- (E) insertion mutation

Ans: (B)

75. Which of the following is with the same binding site as O_2 in hemoglobin?

- (A) CO
- (B) CO_2
- (C) NO_2
- (D) 2,3-BPG
- (E) 1,3-BPG

Ans: (A)

76. The synthesis of 1 molecule of cholesterol requires _____ molecules of isopentenyl pyrophosphate, with each molecule of isopentenyl pyrophosphate requiring _____ molecules of acetyl-CoA.

- (A) 4; 2
- (B) 5; 2
- (C) 6; 2
- (D) 5; 3
- (E) 6; 3

Ans: (E)

77. Which of the following nucleoside analogs is used against HIV?

- (A) 2',3'-Dideoxycytidine (ddC)
- (B) 3'-Azido-2',3'-dideoxythymidine (AZT)
- (C) 2',3'-Dideoxyinosine (ddI)
- (D) 3'-Thiacytidine (3TC)
- (E) 2',3'-Didehydro-3'-deoxythymidine (d4T)

Ans: (B)

78. The process of "sugar modification" to proteins starts in the _____?

- (A) endoplasmic reticulum
- (B) Golgi complex

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(C) mitochondria

(D) nucleolus

(E) vacuole

Ans: (A)

79. Very low-density lipoprotein (VLDL) is a lipoprotein produced by the liver and circulated in the blood. Which of the following is not the main component of its initial stage?

(A) Triglycerides

(B) Cholesterol

(C) Apolipoprotein C

(D) Apolipoprotein B

(E) Pyridoxal phosphate

Ans: (E)

80. In protein structure, disulfide bonds are formed by two _____.

(A) Ser

(B) Tyr

(C) Cys

(D) Asp

(E) His

Ans: (C)

81. Sphingomyelinase catalyzes the conversion of sphingomyelin into _____.

(A) ceramide and acetylcholine

(B) ceramide and phosphatidylinositol

(C) ceramide and phosphatidylserine

(D) ceramide and phosphocholine

(E) ceramide and pyrophosphate

Ans: (D)

82. Dietary polysaccharides are metabolized by _____ to monosaccharides; intracellular carbohydrate store, as glycogen, are metabolized by _____ to monosaccharides.

(A) hydrolysis; hydrolysis

(B) hydrolysis; phosphorolysis

(C) phosphorolysis; hydrolysis

(D) phosphorolysis; phosphorolysis

(E) hydrolysis; glycolysis

Ans: (B)

83. What is the major purpose of the pentose phosphate pathway?

(A) Generate NAD^+ for oxidative biosynthesis

(B) Generate NADH for reductive biosynthesis

(C) Generate FADH_2 for reductive biosynthesis

(D) Generate ribose-5-phosphate for nucleotide biosynthesis

(E) Generate ATP for energy biosynthesis

Ans: (D)

84. Within the electron transport chain, complex _____ represents the entry point for electrons from NADH while complex _____ represents the entry point for electrons from FADH_2 .

(A) I; II

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- (B) II; III
- (C) III; IV
- (D) I; III
- (E) II; IV
- Ans: (A)

85. People who can have relatively high level of pyruvate in their blood due to _____; what enzyme that contains this cofactor is inactivated? _____

- (A) Vitamin B deficiency; pyruvate carboxylase
- (B) Vitamin C deficiency; pyruvate kinase
- (C) Thiamine deficiency; pyruvate dehydrogenase
- (D) Alcohol intake; pyruvate dehydrogenase
- (E) PLP deficiency; pyruvate transaminase
- Ans: (C)

86. What cofactors are in acyl-CoA dehydrogenase?

- (A) FAD
- (B) ATP
- (C) Mg^{2+}
- (D) NADH
- (E) cAMP
- Ans: (A)

87. Protein three-dimensional structures can NOT be determined by _____.

- (A) X-ray crystallography
- (B) NMR
- (C) cryo-electron microscopy
- (D) high performance liquid chromatography
- (E) small angle X-ray scattering
- Ans: (D)

88. Intrinsic fluorescence of GFP is contributed by _____.

- (A) cyclization and oxidation of residues: Ser - Trp - Gly
- (B) cyclization and oxidation of residues: Ser - Tyr - Gly
- (C) cyclization and oxidation of residues: Ser - Tyr - Ala
- (D) cyclization and oxidation of residues: Thr - Tyr - Gly
- (E) cyclization and oxidation of residues: Gly - Trp - Ser
- Ans: (B)

89. Several classes of hydrolases are localized in _____.

- (A) Golgi vesicle
- (B) lysosomes
- (C) late endosome
- (D) mitochondria
- (E) nucleus
- Ans: (B)

90. Match the co-enzyme in List I severing as the transient carrier with the specific item or functional group in List II:

List I	List II
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A. Coenzyme A	I. Aldehyde groups
B. Thiamine pyrophosphate	II. Amino groups
C. Pyridoxal phosphate	III. Hydrogen atoms
D. Coenzyme Q10	IV. Acyl groups
E. Flavin adenine dinucleotide	V. Quinone group

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

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

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

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

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

Ans: (B)

國立中山大學 112 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，並不得攜帶具有通訊、記憶或收發等功能或其他有礙試場安寧、考試公平之各類器材、物品（如鬧鈴、行動電話、電子字典等）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 112 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。

1. Which equation may describe a damped harmonic oscillator? x is for the displacement of the body and m, b, k are all positive real.

(A) $m \frac{d^2x}{dt^2} - kx = 0$

(B) $m \frac{d^2x}{dt^2} - kx - b \frac{dx}{dt} = 0$

(C) $m \frac{d^2x}{dt^2} + kx - b \frac{dx}{dt} = 0$

(D) $m \frac{d^2x}{dt^2} - kx + b \frac{dx}{dt} = 0$

(E) $m \frac{d^2x}{dt^2} + kx + b \frac{dx}{dt} = 0$

Ans: (E)

2. In the process of free expansion of an isolated ideal gas, which statement is incorrect?

(A) The gas gets cooler.

(B) The gas does not do work.

(C) The gas does not absorb heat.

(D) The process is irreversible.

(E) The entropy of the system changes.

Ans: (A)

3. An electron travels in a uniform magnetic field directed perpendicular to its path. Which of the following quantity of the electron will change?

(A) Its speed.

(B) Its potential energy.

(C) Its kinetic energy.

(D) Its acceleration.

(E) All of the above.

Ans: (D)

4. Which statement of the energy carried by a photon is WRONG?

(A) It is proportional to the photon frequency.

(B) It is inversely proportional to the photon wavelength.

(C) It is proportional to the photon mass.

(D) All of the above are correct.

(E) All of the above are wrong.

Ans: (C)

5. A 1000 kg car traveling north at 15 m/s collides with a 2000 kg truck traveling east at 10 m/s. The two vehicles move away from the impact point as one. What is the velocity of the wreckage just after impact?

(A) 0 m/s (B) 8.3 m/s (C) 5.0 m/s (D) 6.6 m/s (E) 1.7 m/s

Ans: (B)

6. When a mass attached to a spring is stretched by an amount x away from its equilibrium position, it oscillates with frequency f . What is the oscillation frequency if the mass is instead released $2x$ from its

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equilibrium position?

(A) $f/2$ (B) f (C) $\sqrt{2}f$ (D) $2f$ (E) $4f$

Ans: (B)

7. Two waves

$$y_1 = (3.0 \text{ cm}) \cos \frac{\pi}{2} [(2.0 \text{ m}^{-1})x + (5.0 \text{ s}^{-1})t],$$

$$y_2 = (3.0 \text{ cm}) \cos \frac{\pi}{2} [(2.0 \text{ m}^{-1})x - (5.0 \text{ s}^{-1})t],$$

are sent to a long string to create a standing wave. Let x be positive ($x \geq 0$). Where is the first node (the smallest value of x)?

(A) 5 cm (B) 10 cm (C) 50 cm (D) 100 cm (E) 200 cm

Ans: (C)

8. A spherical ball contains a charge $+q$ uniformly distributed over its surface. When its diameter is D , the electric field at its surface has magnitude E . What will the electric field be if its diameter changes to $2D$ without changing the charge?

(A) E (B) $2E$ (C) $4E$ (D) $E/2$ (E) $E/4$

Ans: (E)

9. What is the total energy supplied while the current increases from zero to a final value I ? Assume L is the inductance.

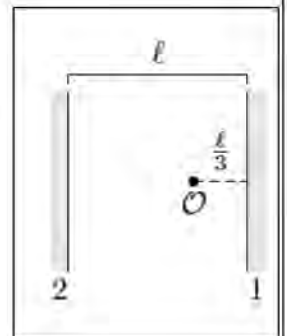
(A) $\frac{1}{2}LI^2$ (B) LI^2 (C) $2LI^2$ (D) $\frac{1}{4}LI^2$ (E) $4LI^2$

Ans: (A)

10. An object O is placed between two mirrors of distance ℓ apart. If object O is distance $\ell/3$ away from mirror 1 (see the right figure), what is the distance of the second closest image of object O that appears in mirror 1? (Hint: The closest one is $\ell/3$.)

(A) $\ell/3$ (B) $2\ell/3$ (C) ℓ (D) $4\ell/3$ (E) $5\ell/3$

Ans: (E)



11. Which of the following statements on radioactive decays is true?

(A) The rate of decay $\left(\frac{dN}{dt}\right)$ is proportional to the number of undecayed substance.

(B) The rate of decay $\left(\frac{dN}{dt}\right)$ is proportional to the half-life of the undecayed substance.

(C) The decay constant is proportional to the half-life of the undecayed substance.

(D) The half-life of a substance decreases with time.

(E) None of the above.

Ans: (A)

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12. A force produces potential $U(x) = ax^4$, where $a = 1.43 \text{ J/m}^4$. What is the force and direction when the particle is at $x = -0.78 \text{ m}$?
- (A) 0 N
(B) -0.67 N
(C) 0.67 N
(D) -2.7 N
(E) 2.7 N
Ans: (E)
13. In vacuum, an electromagnetic wave traveling along the x axis has an electric field \vec{E} and a magnetic field \vec{B} whose magnitudes depend on x and t as
- $$E(x, t) = E_0 \sin(kx - \omega t), B(x, t) = B_0 \sin(kx - \omega t + \phi),$$
- where E_0 and B_0 are the amplitudes of \vec{E} and \vec{B} . Which fact below is correct?
- (A) $B_0/E_0 = c = 1/\sqrt{\epsilon_0\mu_0}$
(B) The directions of \vec{E} and \vec{B} are arbitrary once they are perpendicular to x .
(C) $\phi = \pi/2$
(D) $\omega k = c$
(E) This is a linearly polarized wave.
Ans: (E)
14. Which statement regarding total internal reflection is not true?
- (A) It cannot occur when the incident light is in the medium of lower index of refraction.
(B) Total internal reflection occurs for rays with their incident angles greater a critical angle.
(C) It explains the phenomenon that the water-to-air interface looks like a mirror when an observer is in water.
(D) It is used in transmission through optical fibers.
(E) The effect is used to realize polarizers.
Ans: (E)
15. Which of the following statements on a wave function $\psi(x, t)$ in quantum mechanics is correct?
- (A) The probability of finding the particle in region $x \in (a, b)$ is $\int_a^b dx |\psi(x, t)|^2$.
(B) The wave function can be determined via a series of measurements.
(C) Since it is not a function of velocity, it does not carry the information of momentum.
(D) All of the above.
(E) None of the above.
Ans: (A)
16. Which type of titration is used to determine the concentration of calcium ions in a sample?
- (A) Acidity Titration
(B) Alkalinity Titration
(C) Redox Titration
(D) Complexometric Titration
(E) Ionic Strength Titration
Ans: (D)
17. Which of the following is a cyclic organic compound with four nitrogen atoms?
- (A) Tetrazine (B) Diazine (C) Triazine (D) Benenze (E) None of the above
Ans: (A)

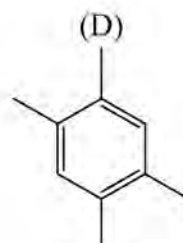
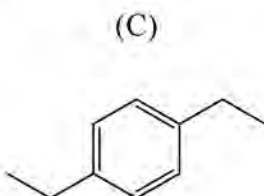
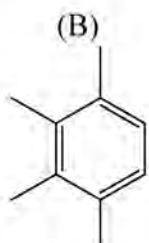
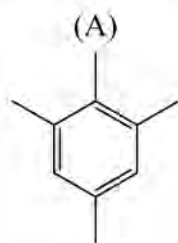
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18. Which of the following organic compounds with the sum formula $C_{10}H_{14}$ exhibits two singlets in the 1H NMR spectrum and three signals in the ^{13}C NMR spectrum?



(E) None of the above

Ans: (D)

19. What type of bonds hold the monomers in a typical polymer like PP together?

- (A) Ionic bonds
- (B) Hydrogen bonds
- (C) Covalent bonds
- (D) Hydrophobic interaction
- (E) Van der Waals interaction

Ans: (C)

20. Which of the following amino acids has a positively charged side chain under physiological conditions?

- (A) Alanine (B) Asparagine (C) Glutamine (D) Aspartate (E) Arginine

Ans: (E)

21. Determine the ligand field stabilization energy of $[Rh(H_2O)_6]^{3+}$.

- (A) $0 \Delta_o$ (B) $-0.4 \Delta_o$ (C) $-1.9 \Delta_o$ (D) $-2.0 \Delta_o$ (E) $-2.4 \Delta_o$

Ans: (E)

22. Determine the number of isomers for the $[Co(NH_3)_2(H_2O)_2BrCl]^+$ complex.

- (A) 3 (B) 4 (C) 5 (D) 6 (E) 7

Ans: (D)

23. The reaction $P_4(g) \rightleftharpoons P_2(g)$ has a reaction enthalpy of $\Delta H = 217 \text{ kJ mol}^{-1}$. If the bond energy of a single phosphorus-phosphorus bond is 200 kJ mol^{-1} , how much is the bond energy of the $P \equiv P$ bond?

- (A) 92 kJ mol^{-1} (B) 192 kJ mol^{-1} (C) 292 kJ mol^{-1} (D) 392 kJ mol^{-1} (E) 492 kJ mol^{-1}

Ans: (E)

24. Cisplatin is a well-known anticancer drug with the chemical formula $Pt(NH_3)_2Cl_2$. Which of the following statements is true?

- (A) Both Raman and IR spectra of cisplatin show two bands in the Pt-Cl stretching region.
- (B) Only the Raman spectrum of cisplatin shows two bands in the Pt-Cl stretching region; the IR spectrum does not show any bands in the Pt-Cl stretching region.
- (C) Only the infrared spectrum of cisplatin shows two bands in the Pt-Cl stretching region; the Raman spectrum does not show any bands in the Pt-Cl stretching region.
- (D) Both Raman and IR spectra of cisplatin do not show any bands in the Pt-Cl stretching region.
- (E) None of the above.

Ans: (A)

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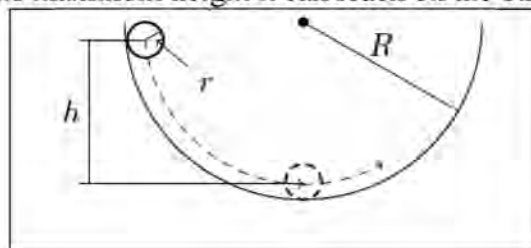
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25. Which of the following is a measure of the randomness of a system in thermodynamics?
(A) Energy (B) Pressure (C) Heat transfer (D) Work done (E) Entropy
Ans: (E)
26. What is the relationship between the activation energy and rate constant of a chemical reaction?
(A) The rate constant is proportional to the negative activation energy.
(B) The rate constant is inversely proportional to the negative activation energy.
(C) As the activation energy decreases, the rate constant remains constant.
(D) As the activation energy increases, the rate constant increases exponentially.
(E) As the activation energy increases, the rate constant decreases exponentially.
Ans: (E)
27. Organic compounds can be classified based on their functional groups. Which of the following is not a functional group?
(A) Isocyano (B) Carbonyl (C) Isocyanide (D) Carboxyl (E) None of the above
Ans: (C)
28. Which of the following binary compounds has two different solid-state structures?
(A) NaCl (B) CsCl (C) CaF₂ (D) NiAs (E) ZnS
Ans: (E)
29. Which of the following compounds is typically not needed for the conversion of trialkyl borane to an alcohol?
(A) Sodium hydroxide (B) Water (C) Diborane (D) Hydrogen peroxide (E) None of the above
Ans: (C)
30. Arrangement of nucleotides in DNA can be seen using which of the following methods?
(A) Electron microscopy
(B) Electrospray ionization mass spectrometry
(C) X-Ray crystallography
(D) Cyclic voltammetry
(E) Fourier-transform infrared spectroscopy
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. A ball at rest with mass m and radius r (i.e., rotational inertia $I = \frac{2}{5}mr^2$) rolls without sliding from a bowl of radius R from height h (see figure below). The coefficient of static friction between the ball and the bowl is μ . What is the maximum height it can reach on the other side of the bowl?



試題請隨卷繳回，請留意背面是否有題

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- (A) $\frac{R}{R+r}h$ (B) $\frac{(1-\mu)R}{R+r}h$ (C) h (D) $\frac{\mu r}{R}h$ (E) μh

Ans: (C)

32. A cannonball of mass 10.0 kg is fired upward. The cannonball explodes into 3 pieces when it reaches the maximum height. At the moment of explosion, a 5-kg piece carries velocity $\vec{v}_1 = 2\hat{i} - 3\hat{j}$ while another 4-kg piece carries velocity $\vec{v}_2 = 3\hat{j} - 2\hat{k}$. What is the velocity \vec{v}_3 of the third piece?

(A) Cannot be determined without knowing the energy provided by the explosion

(B) $\vec{v}_3 = 10\hat{i} - 27\hat{j} - 8\hat{k}$

(C) $\vec{v}_3 = 10\hat{i} - 8\hat{k}$

(D) $\vec{v}_3 = -2\hat{i} + 2\hat{k}$

(E) $\vec{v}_3 = -10\hat{i} + 3\hat{j} + 8\hat{k}$

Ans: (E)

33. Two bodies of mass m are connected individually to strings of length R , which are both pinned at P , as shown in the right figure. One body is raised with an angle θ and then released to swing. When the bodies collide, they stick to each other. Find the frequency of the motion after the collision.



- (A) $\frac{1}{2\pi}\sqrt{\frac{g \sin \theta}{R}}$ (B) $\frac{1}{2\pi}\sqrt{\frac{2g \sin \theta}{R}}$ (C) $\frac{1}{2\pi}\sqrt{\frac{g}{R}}$ (D) $\frac{1}{2\pi}\sqrt{\frac{2g}{R}}$ (E) $\frac{1}{\pi}\sqrt{\frac{g}{R}}$

Ans: (C)

34. A block of density 800 kg/m^3 floats face down in a fluid of density 1200 kg/m^3 . The block has height $H = 6 \text{ cm}$. If the block is held fully submerged and then released, what is the magnitude of its initial acceleration?

- (A) 2.45 m/s^2 (B) 19.6 m/s^2 (C) 0 m/s^2 (D) 9.8 m/s^2 (E) 4.9 m/s^2

Ans: (E)

35. What is the pressure difference between the heart and the brain of a man if the brain is 40 cm above the heart? (The density of blood is 1.05 g/cm^3 .)

- (A) 411.6 Pa (B) 4116 Pa (C) 41160 Pa (D) 411600 Pa (E) 41.16 Pa

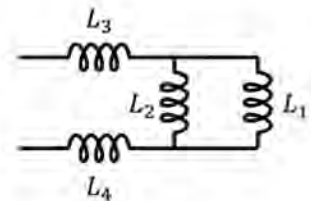
Ans: (B)

36. A flashlight uses two 1.5-V batteries. If the current passing through the lightbulb is 0.5 A, how much energy is consumed by the lightbulb in half an hour?

- (A) 45 J (B) 90 J (C) 900 J (D) 2700 J (E) 10800 J

Ans: (D)

37. A circuit, as shown in the right figure, contains four inductors of $L_1=20.0 \text{ mH}$, $L_2=30.0 \text{ mH}$, $L_3=40.0 \text{ mH}$, and $L_4=50.0 \text{ mH}$. What is the equivalent inductance of the circuit?



- (A) 102 mH (B) 15.38 mH (C) 140 mH (D) 7.81 mH (E) 60 mH

Ans: (A)

38. It takes time T for M gram(s) of a radioactive substance to decay to $M/4$ gram(s). How long does it take for $M/4$ gram(s) of the substance to decay to $M/8$ gram(s)?

- (A) $2T$ (B) T (C) $T/2$ (D) T^2 (E) \sqrt{T}

Ans: (C)

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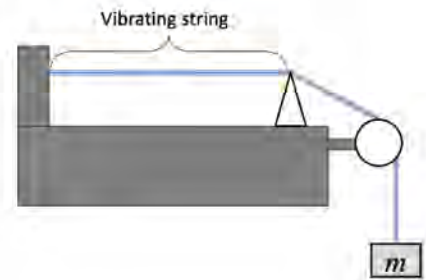
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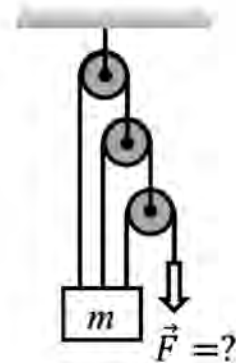
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39. A 5.0-kg ball is dropped from a cliff. Given the resistive force is $R = (0.49 \text{ kg/m})v^2$, where v is the speed of the ball, and the gravitational acceleration is $g = 9.8 \text{ m/s}^2$, what is the terminal speed the ball?
 (A) 4.9 m/s (B) 10 m/s (C) 40 m/s (D) 2.0 m/s (E) 20 m/s
 Ans: (B)

40. In the figure, the string is tensioned by a hanging block of mass m and can vibrate with a fundamental frequency f . If one wants to create a fundamental frequency of $2f$, what should the block's mass be?
 (A) m (B) $\sqrt{2}m$ (C) $2m$ (D) $m/2$ (E) $4m$
 Ans: (E)



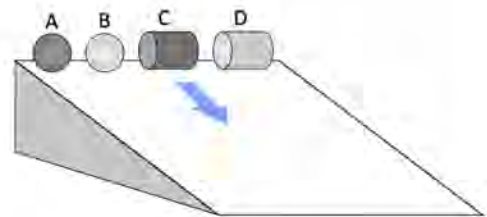
41. The force \vec{F} in the figure will keep the block and the pulleys in equilibrium. The block has mass m . Neglect the mass of pulleys and strings and friction in the system. What is the strength of \vec{F} ?
 (A) mg (B) $mg/3$ (C) $mg/5$ (D) $mg/7$ (E) $mg/9$
 Ans: (D)



42. At one instant, a force $\vec{F} = (4\text{N})\hat{j}$ acts on a 0.25 kg object that has position vector $\vec{r} = (2\text{m})\hat{i} - (2\text{m})\hat{k}$ and velocity $\vec{v} = (-5 \text{ m/s})\hat{i} + (8 \text{ m/s})\hat{k}$. What is the object's angular momentum about the origin?
 (A) $-1.5 \text{ kg m}^2/\text{s}$ (B) $1.5 \text{ kg m}^2/\text{s}$ (C) $-0.75 \text{ kg m}^2/\text{s}$ (D) $-0.375 \text{ kg m}^2/\text{s}$ (E) $0 \text{ kg m}^2/\text{s}$
 Ans: (A)

43. A jet aircraft of speed 200 m/s is making a vertical circular loop of radius 2 km. What is the force exerted by the seat on the 60-kg pilot at the top of the loop? (Gravitational acceleration $g = 9.8 \text{ m/s}^2$)
 (A) 12 N (B) 24 N (C) 306 N (D) 612 N (E) 48 N
 Ans: (D)

44. Four objects are released from rest at the top of an inclined plane and roll down the plane (see the figure). A is a solid sphere, B is a hollow sphere, C is a solid cylinder, and D is a hollow cylinder. All of the four objects have identical radii and masses. Assume that the objects roll without slipping. Which one would win the race?



- (A) A (B) B (C) C (D) D (E) All arrive at the end of the inclined plane at the same time.
 Ans: (A)

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45. Knowing that a particle of mass m in a potential will do a simple harmonic motion as $x(t) = X \cos(\omega t + \phi)$, where $x(t)$ is the position of the particle with time. What will be the angular frequency for a particle of mass $2m$ when it moves in this potential?

- (A) ω (B) 2ω (C) $\omega/2$ (D) $\sqrt{2}\omega$ (E) $\omega/\sqrt{2}$

Ans: (E)

46. Assuming a satellite orbits a planet in a perfect circle with radius r . If the mass of the satellite is M_S and the mass of the planet is M_P , what is the speed of the satellite orbiting the planet? (G is the gravitational constant.)

- (A) $\sqrt{\frac{GM_P}{2r}}$ (B) $\sqrt{\frac{GM_P}{r}}$ (C) $\sqrt{\frac{GM_S}{2r}}$ (D) $\sqrt{\frac{GM_S M_P}{2r^2}}$ (E) $\sqrt{\frac{GM_S^2}{2M_P r}}$

Ans: (B)

47. If an amount of heat Q can increase the temperature of a solid metal sphere of diameter D from 10°C to 12°C . What is the amount of heat needed to increase the temperature of a solid sphere of diameter $2D$ of the same metal from 10°C to 16°C ?

- (A) Q (B) $3Q$ (C) $6Q$ (D) $24Q$ (E) $48Q$

Ans: (D)

48. Two opposite charges $+q$ and $-q$ are located as the right figure shows. What is the resulting electric field at points on the y axis?

(A) $kq(2d)(d^2 + y^2)^{-\frac{3}{2}} \hat{i}$

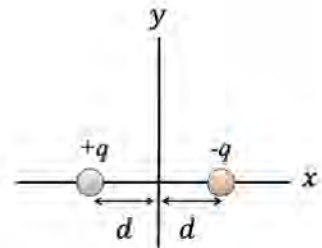
(B) $-kq(2d)(d^2 + y^2)^{-\frac{3}{2}} \hat{i}$

(C) $kq(2y)(d^2 + y^2)^{-\frac{3}{2}} \hat{j}$

(D) $-kq(2y)(d^2 + y^2)^{-\frac{3}{2}} \hat{j}$

(E) 0

Ans: (A)



49. What is the capacitance of a parallel plate capacitor? Assume A is the area of each plate, ϵ is electric constant and d is the distance between plates.

- (A) $\frac{4\epsilon A}{d}$ (B) $\frac{2\epsilon A}{d}$ (C) $\frac{\epsilon A}{d}$ (D) $\frac{\epsilon A}{2d}$ (E) $\frac{\epsilon A}{4d}$

Ans: (C)

50. A magnetic flux is through the conducting loop according to the relation $\Phi_B(t) = 6t^2 + 7t$, where Φ_B is in milliwebers and t is in seconds. What is the magnitude of the emf induced in the loop when $t = 2.0$ s?

- (A) 38 mV (B) 30 mV (C) 31 mV (D) 15 mV (E) 15.5 mV

Ans: (C)

51. The intensity of electromagnetic energy 3 m from the point source is 100 W/m^2 . What is the intensity 30 m away?

- (A) 1000 W/m^2 (B) 100 W/m^2 (C) 10 W/m^2 (D) 1 W/m^2 (E) 0.1 W/m^2

Ans: (D)

52. If the distance between the first and the tenth minima of the double-slit pattern is 18.0 mm and the slits are separated by 0.150 mm with the screen 50.0 cm from the slits, what is the wavelength of the

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light used?

- (A) 400 nm (B) 500 nm (C) 600 nm (D) 700 nm (E) 800 nm

Ans: (C)

53. A 29.5-kg boy standing still on a frictionless surface catches a 500-g dodgeball with velocity $\vec{v} = (20.0 \text{ m/s})\hat{i}$. What is the total energy loss of the system (the boy and the dodgeball)?

- (A) 16.7 J (B) 48.0 J (C) 98.3 J (D) 67.6 J (E) Not enough information

Ans: (C)

54. A block with mass 0.5 kg is forced against a horizontal spring of negligible mass, compressing the spring with a distance of 0.2 m. When the block is released, the block moves on a horizontal tabletop for 1.0 m before coming to rest. The force constant of the spring is 100 N/m. What is the coefficient of kinetic friction between the block and the tabletop?

- (A) 0.16 (B) 0.25 (C) 0.32 (D) 0.41 (E) 0.53

Ans: (D)

55. The gravitational acceleration at the surface of Earth is g . Another planet has the density of Earth but twice the radius. What is the gravitational acceleration at the surface of the planet?

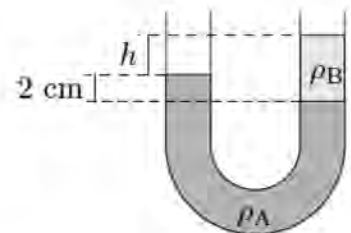
- (A) 8g (B) 4g (C) 2g (D) g (E) g/4

Ans: (C)

56. The left column of a U-tube is filled with liquid A of density ρ_A , and the right column is filled with another liquid B of density $\rho_B = \rho_A/3$. How much higher is the liquid in the right column than in the left one (see figure right)?

- (A) $h = 6 \text{ cm}$ (B) $h = 4 \text{ cm}$ (C) $h = 3 \text{ cm}$ (D) $h = 2 \text{ cm}$ (E) $h = 1 \text{ cm}$

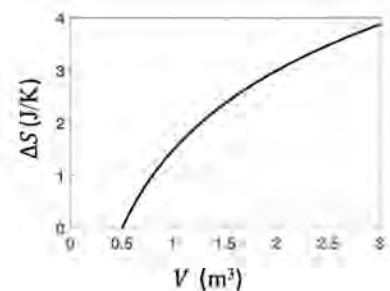
Ans: (B)



57. An ideal gas undergoes a reversible isothermal expansion. The change in entropy ΔS of the gas versus the volume of the gas is shown on the right. When V is expanded from 0.5 m^3 to 2 m^3 , $\Delta S = 3 \text{ J/K}$. How many moles are in the sample? (The gas constant is $R=8.3 \text{ J}\cdot\text{K}^{-1}\cdot\text{mol}^{-1}$.)

- (A) 10 mol
(B) 49.8 mol
(C) 0.26 mol
(D) 3.74 mol
(E) 104.3 mol

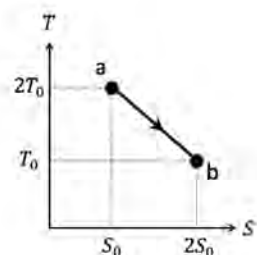
Ans: (C)



58. An ideal monatomic gas undergoes the following reversible process ($a \rightarrow b$). How much energy of heat is absorbed by the gas?

- (A) $T_0 S_0$ (B) $T_0 S_0/2$ (C) $4T_0 S_0$ (D) $3T_0 S_0/2$ (E) 0

Ans: (D)



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59. Two conducting spheres with radius r and $3r$ are separated far-apart. The larger sphere carries charge Q , while the smaller one is neutral. After the two spheres are connected by a conducting wire, what are the charges Q_S and Q_L carried by the smaller sphere and larger sphere, respectively?
(A) $Q_S = 15Q/16$ and $Q_L = Q/16$
(B) $Q_S = 9Q/10$ and $Q_L = Q/10$
(C) $Q_S = Q/10$ and $Q_L = 9Q/10$
(D) $Q_S = Q/16$ and $Q_L = 15Q/16$
(E) $Q_S = Q/4$ and $Q_L = 3Q/4$
Ans: (E)
60. What is the electrical oscillations angular frequency in an inductance-capacitor circuit? Assume L is the inductance and C is capacitance.
(A) $\sqrt{\frac{1}{4LC}}$ (B) $\sqrt{\frac{1}{2LC}}$ (C) $\sqrt{\frac{4}{LC}}$ (D) $\sqrt{\frac{2}{LC}}$ (E) $\sqrt{\frac{1}{LC}}$
Ans: (E)
61. Which symbol is used to denote the coupling between non-equivalent hydrogen atoms on adjacent carbon atoms in NMR spectroscopy?
(A) J (B) Hz (C) δ (D) eV (E) ppm
Ans: (A)
62. What is the role of $AlCl_3$ in the reaction of benzene and Cl_2 ?
(A) To act as a nucleophile
(B) To act as an electrophile
(C) To strengthen the Cl-Cl bond
(D) To increase the reactivity of the electrophile
(E) To act as a neutral species
Ans: (D)
63. Which of the following methods can be used to determine the molecular weight of a protein?
I: Sodium dodecyl sulfate-polyacrylamide gel electrophoresis; II: Size-exclusion chromatography;
III: Electrospray ionization mass spectrometry; IV: Infrared spectroscopy;
V: Ultraviolet-visible spectroscopy
(A) I, II, III, IV, V (B) I, II, III, IV (C) I, II, III (D) I, II (E) I
Ans: (C)
64. Boron consists of two isotopes, ^{10}B and ^{11}B . Chlorine also has two isotopes, ^{35}Cl and ^{37}Cl . Consider the mass spectrum of BCl_3 . How many peaks would be present?
(A) 7 (B) 8 (C) 9 (D) 10 (E) 11
Ans: (B)
65. Which of the following statements about 1D NMR and 2D NMR spectroscopy is **INCORRECT**?
(A) 1D NMR is faster than 2D NMR.
(B) 1D NMR gives less information than 2D NMR.
(C) 2D NMR spectrum provides information about the spatial relationships between different nuclei in the sample, such as the distances and angles between atoms.
(D) 2D NMR distinguishes between the overlapping signals that exist in larger molecules.
(E) The advantage of 2D NMR spectroscopy is that it requires only one frequency axis.
Ans: (E)

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66. The half-life of ^{14}C is 5730 years. A sample taken for radiocarbon dating has been found to contain 56 % of its original ^{14}C . Which of the following options is the best estimate for the age of the sample? (Radioactive decay of ^{14}C follows first-order kinetics.)

- (A) 4.8×10^2 (B) 4.8×10^3 (C) 4.8×10^4 (D) 4.8×10^5 (E) 4.8×10^6

Ans: (B)

67. Sort the molecules in the order from the largest bond angle to the smallest bond angle: H_2O , NH_3 , BF_3 , CH_4 , CO_2

- (A) CH_4 , CO_2 , H_2O , BF_3 , NH_3
 (B) CO_2 , BF_3 , CH_4 , NH_3 , H_2O
 (C) NH_3 , H_2O , BF_3 , CO_2 , CH_4
 (D) H_2O , NH_3 , BF_3 , CH_4 , CO_2
 (E) BF_3 , NH_3 , H_2O , CH_4 , CO_2

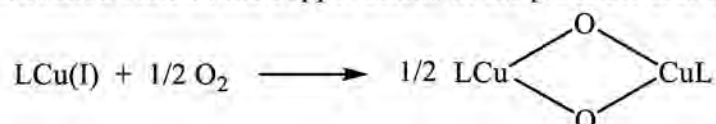
Ans: (B)

68. If the ionization energy of a hydrogen atom is 13.6 eV, the energy required to excite it from ground state to the next higher state is approximately:

- (A) 3.4 eV (B) 10.2 eV (C) 17.2 eV (D) 13.6 eV (E) 6.8 eV

Ans: (B)

69. Hemocyanins (Hc) are proteins that transport oxygen throughout the bodies of some invertebrate animals. These metalloproteins contain two copper atoms that reversibly bind a single oxygen molecule (O_2). The scheme below shows a proposed structure of how the copper atoms bind to oxygen. What is the oxidation state of the copper atoms in the product? L is a neutral ligand.



- (A) +1, +1 (B) +2, +2 (C) +3, +3 (D) +0.5, 0.5 (E) +1.5, +1.5

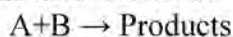
Ans: (C)

70. The value of the Bohr radius for hydrogen is:

- (A) 0.529×10^{-6} cm
 (B) 0.529×10^{-8} cm
 (C) 0.529×10^{-10} cm
 (D) 0.529×10^{-12} cm
 (E) 0.529×10^{-14} cm

Ans: (B)

71. Select the rate law that corresponds to the data shown for the following reaction:



$[\text{X}]_0$ represents the initial concentration for a species X.

Experiment entry	$[\text{A}]_0 / \text{M}$	$[\text{B}]_0 / \text{M}$	Initial rate / M/s
1	0.012	0.035	0.1
2	0.024	0.070	0.8
3	0.024	0.035	0.1
4	0.012	0.070	0.8

- (A) Rate = $k[\text{A}]^3$
 (B) Rate = $k[\text{A}]^2[\text{B}]^1$
 (C) Rate = $k[\text{A}]^1[\text{B}]^2$

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(D) $\text{Rate} = k[\text{B}]^3$

(E) None of the above

Ans: (D)

72. Which one of the following tetrahedral MX_4^{2-} complexes has the strongest crystal field stabilization?

(A) FeCl_4^{2-} (B) MnCl_4^{2-} (C) CoCl_4^{2-} (D) NiCl_4^{2-} (E) CuCl_4^{2-}

Ans: (C)

73. Although the peroxide ion, O_2^{2-} , and the acetylide ion, C_2^{2-} , have long been known, the diazenide ion N_2^{2-} has only been prepared in 2001. By comparison with the other diatomic species, N_2 and O_2 , what is the bond order and number of unpaired electrons for N_2^{2-} , respectively?

(A) 1, 1 (B) 3, 1 (C) 2, 1 (D) 2, 0 (E) 2, 2

Ans: (E)

74. Calculate the reduced mass of HF molecule given that the mass of H atom is 1 amu and the mass of F atom is 19 amu. Note: assume 1 amu = 20 mg.

(A) 18 mg (B) 19 mg (C) 20 mg (D) 21 mg (E) 22 mg

Ans: (B)

75. What factors affect the ionization energy of an atom?

(A) Electron shielding

(B) Electron configuration

(C) Nuclear charge

(D) All of the above

(E) None of the above

Ans: (D)

76. How can we explain the fact that CCl_4 is a liquid and Cl_4 is a solid at 25°C ? Which of the following options is the best explanation?

(A) CCl_4 has a larger dipole moment than Cl_4 due to the higher electronegativity of Cl compared to I.

(B) Cl_4 has a larger dipole moment than CCl_4 because there is stronger electron repulsion in the C-I bonds than in the C-Cl bonds.

(C) London dispersion forces are stronger in CCl_4 than in Cl_4 because Cl is more electronegative than I.

(D) London dispersion forces are stronger in Cl_4 than in CCl_4 because Cl_4 has a more easily polarizable electron cloud.

(E) None of the above.

Ans: (D)

77. How many microstates does a s^1d^1 electron configuration have?

(A) 5 (B) 10 (C) 15 (D) 20 (E) 25

Ans: (D)

78. The most probable distribution function for a system of molecules is given by

(A) Maxwell-Boltzmann distribution

(B) Fermi-Dirac distribution

(C) Bose-Einstein distribution

(D) All of the above

(E) None of the above

Ans: (A)

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79. What is the oxidation state of the terminal nitrogen atom in azide ions?
(A) -3 (B) -1 (C) +1 (D) +4 (E) +5
Ans: (B)
80. What is the highest occupied molecular orbital of a C_2^{4+} ion?
(A) σ_{2s}^* (B) π_{2p} (C) σ_{2p} (D) π_{2p}^* (E) σ_{2p}^*
Ans: (D)
81. On the basis of VSEPR, what is the predicted point group for XeO_2F_2 ?
(A) C_i (B) C_s (C) C_{2v} (D) C_{4v} (E) D_{3h}
Ans: (C)
82. Sort the ions in the order from the largest radius to the smallest radius:
(1) Se^{2-} (2) Br^- (3) Rb^+ (4) Sr^{2+}
(A) 1, 2, 3, 4 (B) 4, 3, 2, 1 (C) 3, 1, 2, 4 (D) 3, 2, 1, 4 (E) 3, 1, 4, 2
Ans: (A)
83. What is the highest molecular orbital degeneracy of cyclic H_3^+ ?
(A) 0 (B) 1 (C) 2 (D) 3 (E) 4
Ans: (C)
84. Which of the following $[M(H_2O)_6]^{n+}$ complexes reacts the slowest in a water exchange reaction?
(A) Cu^{2+} (B) High-spin Fe^{3+} (C) V^{3+} (D) Ti^{3+} (E) Cr^{3+}
Ans: (E)
85. How many carbonyl stretching bands could be observed in the IR spectrum of the $[Co(CO)_3(PPh_3)_2]^+$ complex exhibiting a trigonal bipyramidal molecular geometry, where all three CO ligands are in the equatorial plane?
(A) 1 (B) 2 (C) 3 (D) 4 (E) 5
Ans: (A)
86. The infrared spectrum of synthesized $[Co(CO)_2(CN)_2Br_2]^-$ exhibits two bands attributable to C–O stretching but only one band attributable to C–N stretching. What is the most likely arrangement of the coordinated CO and CN ligands around the Co center, respectively?
(A) *cis* C–O, *trans* C–N
(B) *cis* C–O, *cis* C–N
(C) *trans* C–O, *cis* C–N
(D) *trans* C–O, *trans* C–N
(E) None of the above
Ans: (A)
87. In Valence Bond theory, bonds between atoms are formed by _____.
(A) overlap of proton wave functions
(B) overlap of neutron wave functions
(C) overlap of electron wave functions
(D) overlap of proton and neutron wave functions
(E) overlap of positron wave functions
Ans: (C)

國立中山大學 112 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)

共 14 頁第 14 頁

88. What is the formal charge of the oxygen atom in a molecule of CO_2 ?

(A) 0 (B) +1 (C) -1 (D) +2 (E) -2

Ans: (A)

89. What does a low relative standard deviation indicate?

(A) High accuracy (B) High precision (C) Low accuracy (D) Low precision (E) None of the above

Ans: (B)

90. What is the number of σ -bonds in ethylene (C_2H_4)?

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

Ans: (E)

國立中山大學 112 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，並不得攜帶具有通訊、記憶或收發等功能或其他有礙試場安寧、考試公平之各類器材、物品（如鬧鈴、行動電話、電子字典等）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 112 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 10 頁第 1 頁

選擇題(單一選擇題，共 50 題，總分 150 分)

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。

1. What is printed by the following C/C++ program?

```
char a[] = "ABCDE", b[] = "74623";  
printf("%d \n", (a[4]-a[1])+(b[4]-b[1]));
```

- (A) 2
- (B) 3
- (C) 4
- (D) 5
- (E) 6

Ans: (A)

2. How many bits are used in the IPv6 address?

- (A) 16
- (B) 32
- (C) 64
- (D) 128
- (E) 256

Ans: (D)

3. Which one is NOT an operating system?

- (A) Solaris
- (B) Android
- (C) Linux
- (D) Windows
- (E) Oracle

Ans: (E)

4. Which one is NOT the extension name of a video file?

- (A) MOV
- (B) MP4
- (C) WAV
- (D) MPG
- (E) AVI

Ans: (C)

5. Which one is NOT a step of the genetic algorithm?

- (A) crossover
- (B) population initialization
- (C) mutation
- (D) feature extraction
- (E) fitness evaluation

Ans: (D)

6. What is printed by the following C/C++ program?

```
int a[10], y=2;  
a[1]=1; a[2]=3; a[3]=5;  
printf("%d \n", (a[--y]++));
```

- (A) 1

國立中山大學 112 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 10 頁第 2 頁

(B) 2

(C) 3

(D) 4

(E) 5

Ans: (A)

7. Which one is NOT a name of platform or software for artificial intelligence?

(A) Adobe Illustrator

(B) ChatGPT

(C) Midjourney

(D) Google Bard

(E) Imagen

Ans: (A)

8. Which one is a secure protocol?

(A) POP3

(B) IMAP

(C) FTP

(D) LDAP

(E) SSH

Ans: (E)

9. What is printed by the following C/C++ program?

```
int a[] = {1, -2, 2, -1, 3, -1, 2};
```

```
int sum = 0, m = 0;
```

```
for (int i = 0; i < 7; i++){
```

```
    sum += a[i];
```

```
    if (sum < 0) sum = 0;
```

```
    if (sum > m) m = sum;
```

```
}
```

```
cout << m;
```

(A) 3

(B) 4

(C) 5

(D) 6

(E) 7

Ans: (C)

10. Which one statement is NOT correct for an AVL tree?

(A) The level difference of every two leaf nodes is at most 1.

(B) When a new element is inserted, the inserted position is always at a leaf node.

(C) An AVL tree is a binary search tree.

(D) The tree height is $O(\log n)$, where n denotes the number of nodes in the tree.

(E) When a new element is inserted, if rotations are needed, then the tree height remains unchanged.

Ans: (A)

11. Which one statement is NOT correct for the Internet protocol suite?

(A) TCP is in the Transport Layer.

(B) UDP is in the Transport Layer.

(C) IPv4 is in the Internet Layer.

國立中山大學 112 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 10 頁第 3 頁

- (D) SSH is in the Transport Layer.
 - (E) HTTP is in the Application Layer.
- Ans: (D)

12. Which one statement is NOT correct for TCP and UDP?

- (A) TCP is comparatively slower than UDP
- (B) UDP is a connectionless protocol.
- (C) UDP does not support broadcasting.
- (D) Retransmission of lost packets is supported in TCP.
- (E) TCP provides an ordered delivery of data from user to server.

Ans: (C)

13. The time complexity of a certain algorithm is calculated by $T(n)=cn+T((1-y)n)$, where n represents the number of input elements, c and y are positive constants, $0 < y < 1$. What is the time complexity?

- (A) $\Theta(n)$
- (B) $\Theta(n \log n)$
- (C) $\Theta(n \log^y n)$
- (D) $\Theta(n \log^{1-y} n)$
- (E) $\Theta(n^2)$

Ans: (A)

14. Which of the following is the decimal representation of $(F3A5)_{16}$?

- (A) 153105
- (B) 62373
- (C) 1815
- (D) 18105
- (E) 65535

Ans: (B)

15. Which of the following statements for a 64-bit processor is incorrect?

- (A) It can support 18 exabytes of potential addressable memory space.
- (B) The memory size of it is larger than that of a 32-bit processor.
- (C) The maximum memory size of it is 2^{32} times of that of a 32-bit processor.
- (D) The computing performance is always faster than that of a 32-bit processor.
- (E) The instruction sets of it are incompatible to a 32-bit processor.

Ans: (D)

16. Which of the following items is a part of central processing unit (CPU) ?

- (A) Hard disk
- (B) Input unit
- (C) Control unit
- (D) Output unit
- (E) Graphics processing unit

Ans: (C)

17. Which radix r is correct for $(B7)_{16} = (267)_r$?

- (A) $r = 10$
- (B) $r = 12$
- (C) $r = 7$
- (D) $r = 13$

國立中山大學 112 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 10 頁第 4 頁

(E) $r = 8$

Ans: (E)

18. What can be used to keep the state information on an end user's computer?

(A) Password

(B) CSS

(C) Database

(D) Cookies

(E) None of the above

Ans: (D)

19. What is to ensure unauthorized access to data content?

(A) Confidentiality

(B) Authentication

(C) Integrity

(D) Availability

(E) None of the above

Ans: (A)

20. How many operations can be defined when a machine equips a control bus of sixteen wires?

(A) 16

(B) 32

(C) 256

(D) 65536

(E) None of the above

Ans: (D)

21. What is the protocol for email services?

(A) HTTP

(B) SMTP

(C) HTTPS

(D) FTP

(E) TELNET

Ans: (B)

22. Which method can be used for the starvation when the operation system has limited resource for processes?

(A) Sorting

(B) Searching

(C) Priority scheduling

(D) Greedy method

(E) None of the above

Ans: (C)

23. What is the subject of health informatics?

(A) Tools to support practitioners

(B) Telehealth and telemedicine

(C) Decision support, artificial intelligence and machine learning in healthcare

(D) Informatics in clinic research

(E) All of the above

國立中山大學 112 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 10 頁第 5 頁

Ans: (E)

24. Which operation can be taken to flip all of the bits in a binary string with a mask of all 1's binary string of equal length?
- (A) AND
 - (B) OR
 - (C) XOR
 - (D) NOT
 - (E) None of the above
- Ans: (C)

25. HTTPS is in which network layer?
- (A) Physical layer
 - (B) Data link layer
 - (C) Network layer
 - (D) Application layer
 - (E) None of the above
- Ans: (D)

26. When executing a function call in a program, which data structure will be taken to store the status of the global variables and recover them back once the execution of the function is complete?
- (A) Heap
 - (B) Linking list
 - (C) Array
 - (D) Stack
 - (E) None of the above
- Ans: (D)

27. In order to ensure the access control of medical equipment to avoid unauthorized operations, which information security principle should be considered?
- (A) Confidentiality
 - (B) Integrity
 - (C) Availability
 - (D) Authentication
 - (E) None of the above
- Ans: (D)

28. What is the output of the following C program?
- ```
int i = 8, j = 7, *s = &i, *t = &j;
printf("%d\n", 6*(*/t)+5);
```
- (A) 17
  - (B) 11
  - (C) 12
  - (D) 13
  - (E) None of the above
- Ans: (B)

29. What is the output of the following C program?
- ```
int M = 10;
int N = 0;
```

國立中山大學 112 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 10 頁第 6 頁

```
for (int i = 1; i < M; i++) {  
    for (int j = 0; j < i; j++) {  
        N++;  
    }  
}
```

printf(“%d\n”, N);

(A) 45

(B) 46

(C) 44

(D) 47

(E) None of the above

Ans: (A)

30. What is the output of the following C program?

If $a = 3.0$, $b = 5.0$, and $c = 2.0$, then what is printed by `printf(“%.3f”, sqrt(a+b*c));`

(A) 3.606

(B) 2.606

(C) 1.6

(D) 3.6

(E) None of the above

Ans: (A)

31. For a Generative Adversarial Network (GAN) to produce images of chest x-ray, which of the following statement is TRUE?

(A) The generator can produce unseen images of chest x-ray

(B) The discriminator can be used to enhance the detection rate of certain anomaly chest x-ray

(C) The discriminator can be used to classify images as normal and abnormal chest x-ray

(D) All of the above

(E) None of the above

Ans: (A)

32. How does a ransomware cause damages to the infected computing devices?

(A) Delete data

(B) Exploit computing power

(C) Expose data

(D) Encrypt data

(E) None of the above

Ans: (D)

33. Given a table as follows:

T:	X	Y	Z
	2	3	3
	7	9	6
	9	3	3

What is the output of the following SQL statement?

Select X from T where $T.Y = T.Z$

(A) 2, 9

(B) 2

(C) 9

(D) 2,7,9

國立中山大學 112 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 10 頁第 7 頁

(E) None of the above

Ans: (A)

34. Which one of the following statements about malware is wrong?

(A) A computer might be infected without connecting to a network.

(B) Malware can spread through wireless networks.

(C) Malware can spread through social engineering techniques.

(D) .doc files may contain malware.

(E) Browsing websites is safe from malware infection.

Ans: (E)

35. What is the potential technique for the privacy protection on medical data?

(A) Differential privacy

(B) K-anonymity

(C) Secure computation

(D) Private information retrieval

(E) All of the above

Ans: (E)

36. Given a prefix expression as $+ab*c/de$, where $a = 6$, $b = 7$, $c = 9$, $d = 9$, and $e = 3$. Which of the following answer is correct?

(A) 27

(B) 40

(C) 26

(D) 0

(E) None of the above

Ans: (C)

37. Consider the following code in C program:

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

```
void swap (int a, int b, int c);
```

```
int main() {
```

```
    int i = 3, j = 5, k = 7;
```

```
    swap (i,j,k);
```

```
    printf("i=%d, j=%d, k=%d\n", i, j, k);
```

```
    return 0;
```

```
}
```

```
void swap (int a, int b, int c) {
```

```
    int temp = a;
```

```
    a = c;
```

```
    c = b;
```

```
    b = temp;
```

```
}
```

Which of the following output is correct?

(A) $i = 3, j = 5, k = 7$

(B) $i = 5, j = 5, k = 3$

(C) $i = 3, j = 7, k = 7$

(D) $i = 7, j = 3, k = 5$

(E) None of the above

Ans: (A)

國立中山大學 112 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 10 頁第 8 頁

38. Consider the following code in C program.

```
#include <stdio.h>
int max(int a, int b){
    if (a>b) return ++a;
    return b--;
}
int main() {
    int i = 3, j = 7;
    int h = max(i,j)+j++;
    printf("h=%d\n", h);
    return 0;
}
```

Which of the following output is correct?

- (A) 7
- (B) 14
- (C) 15
- (D) 10
- (E) None of the above

Ans: (B)

39. Consider the following code in C program.

```
#include <stdio.h>
int guess(int a, int b){
    if (a>b) return ++a * --b;
    return --b*--a;
}
int main() {
    int i = 3, j = 9;
    int h = guess(i,j)+ (--j);
    printf("h=%d\n", h);
    return 0;
}
```

Which of the following output is correct?

- (A) 24
- (B) 27
- (C) 33
- (D) 16
- (E) None of the above

Ans: (A)

40. Which one of the following network protocols is NOT at the application layer of the TCP/IP protocol stack?

- (A) HTTPS
- (B) DHCP
- (C) FTP
- (D) SMTP
- (E) ICMP

Ans: (E)

國立中山大學 112 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 10 頁第 9 頁

41. Which one of the following statements about DHCP is wrong?
(A) One network can only have one DHCP server.
(B) A DHCP server can function as a centralized repository for host configuration information.
(C) DHCP can assign IP addresses to individual hosts automatically.
(D) To connect a DHCP server, a newly attached host needs to send a DHCP discovery message to a broadcast IP address.
(E) DHCP stands for Dynamic Host Configuration Protocol.
Ans: (A)
42. Which one of the following statements about I/O is wrong?
(A) A computer mainly has two jobs: I/O and processing.
(B) An operating system bridges the gap between the hardware and user applications.
(C) A buffer is a memory area that stores data being transferred.
(D) User programs can issue I/O instructions without going through the operating system.
(E) A device needs a device controller to communicate with the operating system.
Ans: (D)
43. What is the evaluation result of the postfix expression $8\ 2\ 6\ * +\ 2\ 9\ 3\ / + *$?
(A) 100
(B) 200
(C) 860
(D) 1075
(E) None of the above
Ans: (A)
44. What is the prefix representation of $(A-B/C)*(D+E)-F$?
(A) $-*/+ABCDEF$
(B) $*-A/BC-+DEF$
(C) $-*-A/BC+DEF$
(D) $-*/ABC+DEF$
(E) None of the above
Ans: (C)
45. What is the postfix representation of $(A+B*C)/(D+E)-F$?
(A) $ABC*+DE+/F-$
(B) $A+BC*DE+F/-$
(C) $ABC*+DEF+/-$
(D) $ABC+*DEF+/-$
(E) None of the above
Ans: (A)
46. The ACID (Atomic, Consistency, Isolation, and Durability) properties are essential for a DBMS transaction. Which one of the following statements is wrong?
(A) All changes to data are performed as if they are a single operation.
(B) If two operations are concurrently running on two different accounts, then the value of both accounts should not get affected.
(C) Any changes that occur in a transaction will not be seen by other transactions until the change is committed.
(D) The purpose of the ACID properties is to guarantee data validity despite errors or power failures.
(E) All of the above.

國立中山大學 112 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 10 頁第 10 頁

Ans: (E)

47. Which of the following actions is an attempt to compromise a computer system?

- (A) Port scan.
- (B) Buffer overflow.
- (C) Phishing.
- (D) Password guessing.
- (E) All of the above.

Ans: (E)

48. In relational databases, which one of the following can uniquely identify a record?

- (A) Primary key.
- (B) Foreign key.
- (C) Candidate key.
- (D) Joint key.
- (E) All of the above.

Ans: (A)

49. Which one of the following statements about ICMP is wrong?

- (A) ICMP defines error messages to inform the source host when a host or a router is unable to process the data transmission properly.
- (B) ICMP stands for Internet Control Message Protocol.
- (C) ICMP can check if a host is reachable or not.
- (D) ICMP is a network protocol at the data link layer of the OSI model.
- (E) ICMP messages are typically used for diagnostic or control purposes.

Ans: (D)

50. Which one of the following statements about end-to-end communication protocols is wrong?

- (A) UDP offers end-to-end communication.
- (B) TCP offers connection-oriented connections.
- (C) UDP builds up reliable connections.
- (D) Sockets are used for establishing end-to-end communication.
- (E) Unreliable connections might loss data.

Ans: (C)

國立中山大學 112 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。
- 可否使用計算機請依試題資訊內標註為準，如「可以」使用，廠牌、功能不拘，唯不得攜帶具有通訊、記憶或收發等功能或其他有礙試場安寧、考試公平之各類器材、物品（如鬧鈴、行動電話、電子字典等）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 112 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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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. Plant pollen is well known as a _____ that causes seasonal allergic rhinitis (hay fever) and seasonal allergic conjunctivitis.

- (A) tackle
 - (B) stem
 - (C) trigger
 - (D) gear
 - (E) matrix
- Ans: (C)

2. Demand for over-the-counter drugs has been rising. In 2022, the total _____ sales rose by 15 per cent, with the US turning in a particularly strong performance.

- (A) pharmaceutical
 - (B) alchemist
 - (C) philanthropic
 - (D) physiological
 - (E) prosthetic
- Ans: (A)

3. Research found that people who are stressed or worn out become more _____ to COVID.

- (A) infectious
 - (B) manipulative
 - (C) susceptible
 - (D) sentimental
 - (E) homogenous
- Ans: (C)

4. _____, most stem cell studies use mouse embryos, but human in vitro embryo cells are sometimes used.

- (A) Yet to date
 - (B) As of to date
 - (C) As today
 - (D) To date
 - (E) To day
- Ans: (D)

5. The man _____ by your sister is the person who used to be our mayor.

- (A) standing
 - (B) stood
 - (C) is standing
 - (D) stands
 - (E) who stand
- Ans: (A)

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6. The puppy, _____ owner runs a successful store, awaits its big meal.
(A) who
(B) whose
(C) which
(D) that
(E) whom
Ans: (B)
7. The shortage of blood donors makes the council appeal _____ blood donation.
(A) to
(B) for
(C) against
(D) of
(E) as
Ans: (B)
8. Some believe that the association between blood clots and COVID-19 _____ unclear.
(A) remain
(B) remains
(C) remained
(D) remaining
(E) do remain
Ans: (B)
9. Compared with people in some other countries, seniors in Taiwan can purchase lower-priced _____ drugs.
(A) sanction
(B) intersection
(C) prescription
(D) dedication
(E) modification
Ans: (C)
10. The surgical procedure is performed mostly under local _____ to prevent the perception of pain throughout.
(A) anesthesia
(B) anaphora
(C) synesthesia
(D) euthanasia
(E) myopia
Ans: (A)
11. We are faced with hunger and poverty, widespread disease and infant _____, illiteracy and profound inequalities of income.
(A) brutality
(B) mortality
(C) orality

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- (D) regalia
- (E) autopsy
- Ans: (B)

12. Bob says that he has suffered from low back pain which comes at _____.

- (A) intervals
- (B) danger
- (C) costs
- (D) most
- (E) least
- Ans: (A)

13. Gastric balloon is a(n) _____ medical device that is temporarily placed into the stomach to reduce weight. After it is installed in the stomach, it must be filled with air.

- (A) distilled
- (B) combusted
- (C) inflatable
- (D) affectional
- (E) oscillating
- Ans: (C)

14. Both experiments and clinical observations have led to _____ evidence that poverty in childhood can cause poor mental health through social stresses, stigma and trauma.

- (A) hilarious
- (B) converging
- (C) excruciating
- (D) commemorative
- (E) delirious
- Ans: (B)

15. SSRIs (Selective Serotonin Reuptake Inhibitors) are known to _____ the body of sodium, which may lead to severe neurological changes. Therefore, patients who are prescribed SSRIs are advised to take supplements containing key nutrients and sodium.

- (A) recapitulate
- (B) interrupt
- (C) accumulate
- (D) demolish
- (E) deplete
- Ans: (E)

16. In the late twentieth century, Japan played a role in the _____ market for elderly healthcare, as an aging society has motivated the development of related industries.

- (A) curdling
- (B) smothering
- (C) burgeoning
- (D) faltering
- (E) articular
- Ans: (C)

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17. CT scans are available for doctors of discovering and locating patients' _____, even showing the blood vessels that feed them.
(A) dramas
(B) symptoms
(C) tumors
(D) portions
(E) manipulations
Ans: (C)
18. A healthy relationship is one in which you feel secure and your partner does not engage in behaviors that would _____ the relationship.
(A) apprehend
(B) mitigate
(C) jeopardize
(D) relegate
(E) rectify
Ans: (C)
19. Whenever she's in a bad mood she's _____ to everyone, a major cause for her inability to ascend to a higher position.
(A) obnoxious
(B) ephemeral
(C) empathetic
(D) indolent
(E) listless
Ans: (A)
20. Recognized as the first _____ in Chinese mythology, Shennong is said to have tasted hundreds of herbs for their medicinal value.
(A) ruler
(B) herbalist
(C) emperor
(D) dictator
(E) physician
Ans: (B)
21. Medical centers may be sued for disclosing patients' sexual _____ and gender identity.
(A) orientation
(B) illustration
(C) illumination
(D) inhibition
(E) manifestation
Ans: (A)
22. Cytomegalovirus (CMV) is a virus with many similarities to the herpes virus. The _____ person usually complains of aches and pains, headache, sore throat, loss of appetite, and general malaise.
(A) adverse
(B) afflicted
(C) impaired
(D) infested

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(E) inflected

Ans: (B)

23. The problems that fester in our healthcare system are not _____. Quite on the contrary, they constitute major challenges in today's hospitals.

(A) perpendicular

(B) eccentric

(C) holistic

(D) epicenter

(E) peripheral

Ans: (E)

24. First, weigh the benefits _____ the costs, then act.

(A) for

(B) between

(C) of

(D) or

(E) against

Ans: (E)

25. Neither auditory _____ nor delusion is his symptom, so I think he is far from schizophrenia.

(A) subconscious

(B) feeling

(C) redemption

(D) hallucination

(E) abomination

Ans: (D)

26. A fire broke _____ in the night, _____ eight lives and leaving two homeless.

(A) up / depriving

(B) down / taking

(C) in / killing

(D) out / claiming

(E) off / burning

Ans: (D)

27. What the world learns from the Ebola pandemic is that effective organizations should not be hampered by bureaucratic structures; they should be _____ in anticipating disease outbreaks and making deployments in advance.

(A) lumbering

(B) sequential

(C) intrinsic

(D) proactive

(E) intuitive

Ans: (D)

28. As long as monkeypox spreads faster than health authorities can contain it, there is a risk that it is going to _____ new variants, potentially driving up the death toll.

(A) spawn

(B) scaffold

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- (C) assess
- (D) stalk
- (E) array
- Ans: (A)

II. Cloze Test. Questions 29-34 are based on the following passage. For each question, choose the best answer that fills in the blank in its context.

With more than 1,400 species, bats comprise the second-largest order of mammals and provide critical ecological services _____ 29 _____ insect consumers, pollinators, and seed dispersers. Yet, bats are frequently associated with infectious human diseases such as SARS, MERS, and Ebola. As early as the end of January 2020, several virological studies have suggested bats as a probable origin for SARS-CoV-2, the causative agent of COVID-19. How does the public view the role of bats in COVID-19? Here we report pilot data collected shortly after the outbreak of COVID-19 using two online surveys, _____ 30 _____ with a conservation intervention experiment, primarily on people who are receiving or have received higher education in China. We found that 84% of the participants of an online survey (n = 13,589) have misunderstood the relationship between bats and COVID-19, which _____ 31 _____ negative attitudes towards bats. Knowledge of bats, gender, and education level of the participants affected their attitudes towards bats. Participants who indicated a better knowledge of bats had a more positive attitude towards bats. The proportion of female participants who had negative attitudes towards bats was higher than _____ 32 _____ of male participants. Participants with a higher education level indicated a more positive attitude towards bats after the outbreak of COVID-19. A specially prepared bat conservation lecture improved peoples' knowledge of bats and the positive attitudes, _____ 33 _____ failed to correct the misconception that bats transmit SARS-CoV-2 to humans directly. We suggest that the way virologists frame the association of bats with diseases, the countless frequently inaccurate media coverages, and the natural perceptual bias of bats carrying and transmitting diseases to humans _____ 34 _____ to the misunderstandings. This probably led to a rise in the events of evicting bats from dwellings and structures by humans and the legislative proposal for culling disease-relevant wildlife in China. A better understanding of the relationship between disease, wildlife and human health could help guide the public and policymakers in an improved program for bat conservation.

29.

- (A) for
- (B) to
- (C) with
- (D) as
- (E) on
- Ans: (D)

30.

- (A) combined
- (B) compatible
- (C) aligned
- (D) incorporated
- (E) proven
- Ans: (A)

31.

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- (A) restored
 - (B) acquired
 - (C) strengthened
 - (D) convened
 - (E) collaborated
- Ans: (C)

32.

- (A) that
 - (B) some
 - (C) most
 - (D) those
 - (E) all
- Ans: (A)

33.

- (A) but
 - (B) and
 - (C) which
 - (D) whatsoever
 - (E) therein
- Ans: (A)

34.

- (A) contributing
 - (B) contributed
 - (C) contributive
 - (D) contributable
 - (E) contributory
- Ans: (B)

III. Discourse Structure. In this part, you will read a passage with five of its sentences missing. A box containing five options for the missing sentences is provided. Choose the best answer from the box for each blank in the passage.

Read the following passage and answer **questions 35-39**.

There is no data on global plastic pollution that is equivalent to the regular measurements of carbon dioxide in the Earth's atmosphere. But as with greenhouse gases, the recent news has been nearly all bad. In 1950, worldwide production of plastics stood at 2m tons per year. In 2020, it was 367m tons (down from 368m the year before due to the coronavirus pandemic). This enormous increase is hard to visualise. But the 8.8m tons of plastic waste that is estimated to enter the world's marine environment each year is the equivalent of a rubbish truck filled with plastic being tipped into the sea every minute.

So the agreement struck by 173 countries at the UN environment assembly in Nairobi last week was a huge relief. At last, something is going to be done multilaterally about a problem that no government can solve on its own. Without the legally binding treaty that will be negotiated over the next two years, it was hard to see where progress would come from.

_____35_____ The pollution and destruction of nature are material phenomena. As with cutting emissions (or failing to), fine words about plastics are no use unless they are accompanied by strong actions, including mechanisms to ensure reductions in consumption. _____36_____ But as a statement of

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intent, and proof that multilateral cooperation to protect our shared environment is still possible, the agreement is more than welcome. Like global heating, plastic pollution is a matter of social justice issue as well as conservation, with people in poor countries suffering disproportionately.

_____ 37 _____ Research for the US federal government last year found that Americans now generate about 42m tonnes of plastic waste a year – more than all European Union member countries combined. Another report found that 20 companies are responsible for producing 55% of the world's plastic waste. Some are the same companies responsible for fossil fuel production, since plastics are made from petrochemicals.

Efforts to clean up the Great Pacific Garbage Patch, and television footage of plastic waste in an albatross's nest, have imprinted themselves on public consciousness in countries where these reports have been widely seen. But policymakers' efforts to tackle the plastic problem have been limited to waste management, including the bans on plastic waste imports imposed by China and other countries, and restrictions in many countries on the sale of single-use plastic items such as bags.

_____ 38 _____ But they have not touched the source of the problem: the total amount of plastic waste in the world is predicted to almost quadruple by 2050 and the oil industry is heavily invested in expansion, partly as a means of coping with reduced demand in other areas, as people switch to greener technologies. This has to change. _____ 39 _____

- (A) The announcement was only the beginning of a long and fraught process.
- (B) Such measures can have localised effects, and influence attitudes and behaviour.
- (C) As with emissions, the richest countries and companies are the worst culprits.
- (D) Plastic pollution is closely linked to economic growth, and changing our way of life will not be simple.
- (E) In the words of oceans campaigner Christina Dixon, the "plastics tap must be turned off".

35. Ans: (A); 36. Ans: (D); 37. Ans: (C); 38. Ans: (B); 39. Ans: (E)

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

Read the following passage and answer **questions 40-42**.

While the private and public sectors need to take climate action, the scale of the crisis requires in-depth, long-lasting, and rapid decarbonization carried out by government policy, laws, and regulations across all sectors. The health care sector is no exception, with a global greenhouse gas contribution of 4.4%. More than 60 governments, making up more than 47% of net global health care emissions, have committed to low-carbon health systems.

40. What is the aim of the scheme?
- (A) To make medication available for the poor
 - (B) To justify high medical cost
 - (C) To protect the environment
 - (D) To improve medical education
 - (E) To cut unnecessary medical waste
- Ans: (C)

41. The name of this campaign is "Make medicines _____." Which word best fits in the blank?
- (A) affordable

試題請隨卷繳回，請留意背面是否有題

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- (B) sustainable
 - (C) count
 - (D) exceptional
 - (E) innovative
- Ans: (B)

42. What can be inferred from this passage?
- (A) This is an international campaign.
 - (B) Medical waste has been lowered by half.
 - (C) Healthcare is a major source of greenhouse emission.
 - (D) Private sectors play a leading role in this campaign.
 - (E) 47% of net global carbon emission comes from healthcare.
- Ans: (A)

Read the following passage and answer **questions 43-47**.

Last week an artificial intelligence – called NooK – beat eight world champion players at bridge. That algorithms can outwit humans might not seem newsworthy. IBM’s Deep Blue beat world chess champion Garry Kasparov in 1997. In 2016, Google’s AlphaGo defeated a Go grandmaster. A year later the AI Libratus saw off four poker stars. Yet the real-world applications of such technologies have been limited. Stephen Muggleton, a computer scientist, suggests this is because they are “black boxes” that can learn better than people but cannot express, and communicate, that learning.

NooK, from French startup NukkAI, is different. It won by formulating rules, not just brute-force calculation. Bridge is not the same as chess or Go, which are two-player games based on an entirely known set of facts. Bridge is a game for four players split into two teams, involving collaboration and competition with incomplete information. Each player sees only their cards and needs to gather information about the other players’ hands. Unlike poker, which also involves hidden information and bluffing, in bridge a player must disclose to their opponents the information they are passing to their partner.

This feature of bridge meant NooK could explain how its playing decisions were made, and why it represents a leap forward for AI. When confronted with a new game, humans tend to learn the rules and then learn to improve by, for example, reading books. By contrast, “black box” AIs train themselves by deep learning: playing a game billions of times until the algorithm has worked out how to win. It is a mystery how this software comes to its conclusions – or how it will fail.

NooK nods to the work of British AI pioneer Donald Michie, who reasoned that AI’s highest state would be to develop new insights and teach these to humans, whose performance would be consequently increased to a level beyond that of a human studying by themselves. Michie considered “weak” machine learning to be just improving AI performance by increasing the amount of data ingested.

His insight has been vindicated as deep learning’s limits have been exposed. Self-driving cars remain a distant dream. Radiologists were not replaced by AI last year, as had been predicted. Humans, unlike computers, often make short work of complicated, high-stake tasks. Thankfully, human society is not under constant diagnostic surveillance. But this often means not enough data for AI is available, and frequently it contains hidden, socially unacceptable biases. The environmental impact is also a growing concern, with computing projected to account for 20% of global electricity demand by 2030.

Technologies build trust if they are understandable. There’s always a danger that black box AI solves a problem in the wrong way. And the more powerful a deep-learning system becomes, the more opaque it can become. The House of Lords justice committee this week said such technologies have serious implications for human rights and warned against convictions and imprisonment on the basis of

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AI that could not be understood or challenged. Nook will be a world-changing technology if it lives up to the promise of solving complex problems and explaining how it does so.

43. Which of the following would be the most appropriate title for the passage?

- (A) Bridging Human and Machine Learning
- (B) AI: the Future is in its Grip
- (C) The Ethical and Legal Issues AI Faces
- (D) AI Benefits Humans?: Pros and Cons
- (E) What Humans can Learn from AI?: The Challenge to Take

Ans: (A)

44. What is the author's attitude toward AI in this passage?

- (A) Optimistic, because it is developing in line with the well-being of the human society
- (B) Optimistic, because AI starts simulating the process of human mind
- (C) Indifferent, because Humans may or may not benefit from AI
- (D) Pessimistic, because technology is losing control of the fast development of AI
- (E) Pessimistic, because AI is like a "black box" that humans cannot see through

Ans: (B)

45. Which is NOT the features of Nook mentioned in the passage?

- (A) It can play games for four people instead of two, which is a remarkable advancement in AI technology.
- (B) It is designed according to a brand new concept about how AI should function.
- (C) Its user may not be committing legal offenses unwittingly.
- (D) Its "mental" process is understandable to its user.
- (E) How it makes its playing decisions is traceable.

Ans: (C)

46. Which of the following is NOT true about the passage?

- (A) Donald Michie was one of the first researchers of AI.
- (B) Nook "thinks" like a human when making decisions for a new situation.
- (C) "Black box" is a laudatory term to describe the current success of AI.
- (D) Human society may not offer enough data for AI to function satisfactorily.
- (E) AI may solve a problem in a wrong way, causing trouble to humans.

Ans: (C)

47. The passage does not supply information concerning which of the following questions?

- (A) How can humans benefit from the development of AI, especially Nook?
- (B) How can technology build trust with the invention of Nook?
- (C) How did Nook beat eight world champions players at bridge?
- (D) Why does Nook trigger a new trend of AI technology?
- (E) How did the use of Nook violate human rights?

Ans: (E)

Read the following passage and answer **questions 48-50**.

Epidemiologist Gerardo Heiss, and other researchers from the University of North Carolina, looked for signs that could be used to predict a person's mortality rate. The researchers studied 2541 men, aged 40 to 69, over a 10-year span. Among the men who had cardiovascular disease at base line, those with high blood cholesterol levels (above 6.19 mmol per liter) had a higher risk of death from

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cardiovascular disease, including coronary heart disease, which was 3.45 times higher than that for men with desirable blood cholesterol levels. Cholesterol levels were also significant predictors of death from cardiovascular disease in men without preexisting cardiovascular disease, although at a lower level of absolute risk of death.

48. Based on contextual clues, what does an epidemiologist study?

- (A) how diseases are found, spread, and controlled in groups of people
- (B) how synthetic materials can be developed for medical applications
- (C) how characteristics are passed down to children by parents' genes
- (D) how diets and supplementary nutrients influence human health
- (E) the characteristics and effects of poisons and toxins

Ans: (A)

49. In this study, what is reported as an indicator of the risk of death?

- (A) blood pressure
- (B) age
- (C) gender
- (D) cholesterol level
- (E) previous signs of cardiovascular diseases

Ans: (D)

50. What is the best summary of this study?

- (A) Cardiovascular diseases are the cause of rising cholesterol levels, especially among those with high blood pressure.
- (B) Cholesterol levels predict mortality among men, especially those with preexisting cardiovascular disease.
- (C) The myocardial damages were higher among men, as compared with other risk factors such as lipid levels.
- (D) Men aged 40 to 69 with previous signs of cardiovascular disease have a higher risk of death.
- (E) A stress level below 6.19 mmol per liter is a predictor of longer life span, especially among men.

Ans: (B)