亞洲大學

109 學年度學士後獸醫學系招生考試試題紙

學系別	考試科目	考試日期	時　　間
學士後獸醫學系	化學(含普通化學、有機化學)	**109.05.02**	**10:30-12:00**

1. A student performs an experiment to determine the density of a sugar solution. She obtains the following results: 4.71 g/mL, 4.73 g/mL, 4.67 g/mL, 4.69 g/mL. If the actual value for the density of the sugar solution is 4.40 g/mL, which statement below best describes her results?
   A) Her results are precise, but not accurate. B) Her results are accurate, but not precise. C) Her results are both precise and accurate. D) Her results are neither precise nor accurate.

2. What answer should be reported, with the correct number of significant figures, for the following calculation? (249.362 + 41) / 63.498
   A) 4.6 B) 4.57 C) 4.573 D) 4.5728

3. Write the name for $Ca_3(PO_4)_2$.

   A) calcium (III) phosphite B) calcium (II) phosphite C) calcium phosphate D) tricalcium phosphorustetraoxide

4. Give the correct formula for aluminum sulfate.

   A) Al_2SO_4 B) $Al(SO_4)_3$ C) $Al_3(SO_4)_2$ D) $Al_2(SO_4)_3$

5. Determine the empirical formula for a compound that contains C, H and O. It contains 51.59% C and 35.30% O by mass. (C: 12.0 g/mol; H: 1.00 g/mol; O: 16.0 g/mol)

   A) C_2H_6O B) CHO C) $C_4H_{13}O_2$ D) CH_4O_3

6. Give the theoretical yield, in grams, of CO_2 from the reaction of 4.000 moles of

   C_8H_{18} with 4.000 moles of O_2. (C: 12.0 g/mol; H: 1.00 g/mol; O: 16.0 g/mol)

   $2\ C_8H_{18} + 25\ O_2 \rightarrow 16\ CO_2 + 18\ H_2O$

   A) 112.7 g B) 102.4 g C) 176.0 g D) 704.0 g

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7. The titration of 25.0 mL of an unknown concentration H_2SO_4 solution requires 83.6 mL of 0.12 M LiOH solution. What is the concentration of the H_2SO_4 solution (in M)?
   A) 0.20 M　B) 0.40 M　C) 0.10 M　D) 0.36 M

8. How many subshells are there in the shell with $n = 4$?
   A) 3　B) 4　C) 6　D) 18

9. How many valence electrons does an atom of C have?
   A) 1　B) 4　C) 2　D) 3

10. Place the following in order of increasing radius.

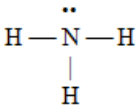
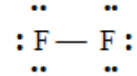
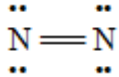
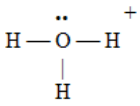
    Ca^{2+}　　S^{2-}　　Cl^-

    A) $Ca^{2+} < Cl^- < S^{2-}$　B) $Cl^- < Ca^{2+} < S^{2-}$　C) $S^{2-} < Cl^- < Ca^{2+}$

    D) $Ca^{2+} < S^{2-} < Cl^-$

11. Which of the elements listed below would most likely form a *polar covalent bond* when bonded to oxygen?
    A)　Mg　B)　H　C)　Al　D)　O

12. Assuming the octet rule is obeyed, how many covalent bonds will an oxygen atom form to give a formal charge of zero?
    A)　0　B)　1　C)　2　D)　3

13. Which of the following Lewis structures is incorrect?
    A)  　B)  　C)  　D) 

14. In the best Lewis structure for NO^+, what is the formal charge on the N atom?

    A) -1　B) 0　C) +1　D) +2

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15. Which of the elements listed below is most likely to exhibit an expanded octet in its compounds?
A) O B) S C) Na D) C

16. Give the number of lone pairs around the central atom and the molecular geometry of SCl_2.
A) 0 lone pairs, linear B) 1 lone pair, bent C) 2 lone pairs, bent
D) 3 lone pairs, bent

17. Use VSEPR theory to predict the geometry of the BF_3 molecule.
A) linear B) bent C) trigonal planar D) trigonal pyramidal

18. Which one of the following molecules has tetrahedral geometry?
A) XeF_4 B) BF_3 C) AsF_5 D) CF_4

19. Which one of the following molecules has a non-zero dipole moment?
A) $BeCl_2$ B) Br_2 C) BF_3 D) IBr

20. Which one of the following molecules is polar?
A) PBr_5 B) CCl_4 C) BrF_5 D) XeF_2

21. What is the strongest type of intermolecular force present in NH_2CH_3?
A)dispersion B) dipole-dipole C) hydrogen bonding D) ion-dipole

22. Identify the compound that does not have hydrogen bonding.
A) $(CH_3)_3N$ B) H_2O C) CH_3OH D) HF

23. What is the type of intermolecular force for dissolving NaCl in H_2O?
A)dispersion B) dipole-dipole C) hydrogen bonding D) ion-dipole

24. What is the type of intermolecular force for dissolving Br_2 in H_2O?
A)dispersion B) dipole-dipole C) hydrogen bonding D) induced dipole

25. Which of the following acids will have the strongest conjugate base?
A)HCl B) $HClO_4$ C) HNO_3 D) HCN

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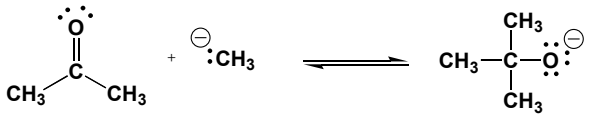
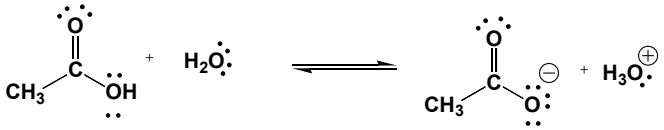
26. Which one of the following salts, when dissolved in water, produces the solution with the lowest pH?
A)NaCl　B) KCl　C) $MgCl_2$　D) $AlCl_3$

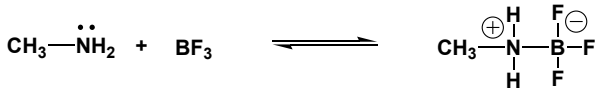
27. Which of the following is a Lewis acid?
A)BBr_3　B) CCl_4　C) NH_3　D) $CHBr_3$

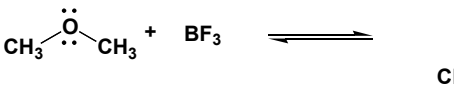
28. Which of the following is a Lewis base?
A)AlF_3　B) H_2O　C) SiF_4　D) C_5H_{12}

29. Which are acid-base reactions according to Lewis theory but not according to the Brønsted-Lowry theory?

I 

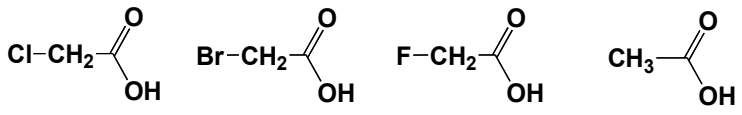
II 

III 

IV 

A) I, II　B)　III, IV　C)　I, III, IV　D)　I, II, III, IV

30. Which acid is the most acidic?



I　　II　　III　　IV

A)I　B)　II　C)　III　D)　IV

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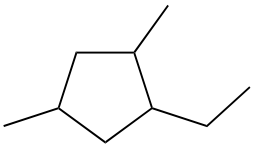
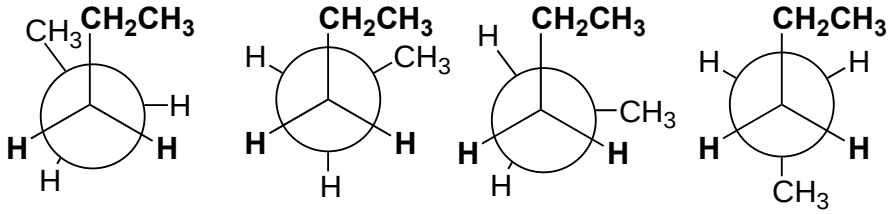
31. Which is the IUPAC name for the following cycloalkane?



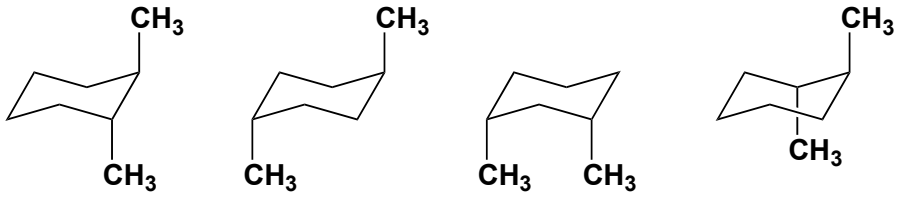
A) 2,4-dimethyl-1-ethylcyclopentane　B) 1,3-dimethyl-5-ethylcyclopentane
C) 1-ethyl-2,4-dimethylcyclopentane　D) 1-ethyl-3,5-dimethylcyclopentane

32. Which conformation of pentane is most stable?



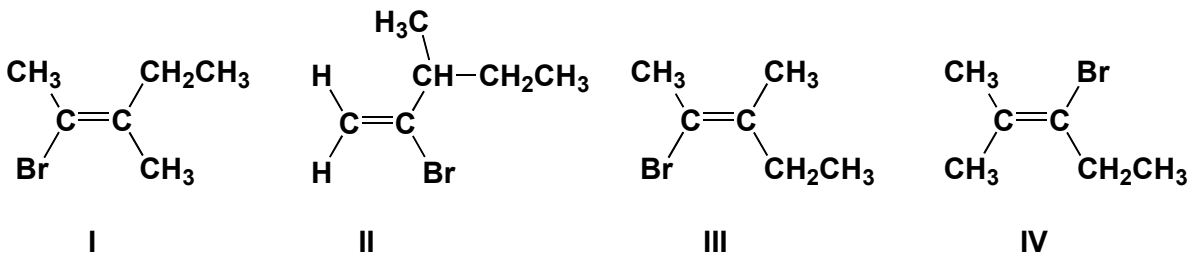
A) I　B) II　C) III　D) IV

33. Which of these diaxial conformations has the highest energy?



A) I　B) II　C) III　D) IV

34. Which structure is Z-2-bromo-3-methyl-2-pentene?



A) I　B) II　C) III　D) IV

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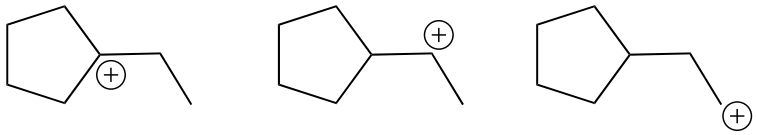
35. Arrange these carbocations in order of increasing stability (least to most).



I **II** **III**

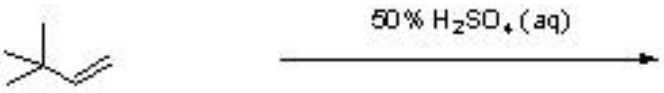
A) I, II, III B) I, III, II C) II, I, III D) III, II, I

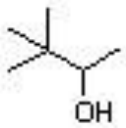
36. Which of the following alkenes is the major product when 2-bromo-2-methylpentane is treated with sodium ethoxide in ethanol?
A) 2-methylpent-1-ene B) 2-methylpent-2-ene C) (*E*)-4-methylpent-2-ene
D) (*Z*)-4-methylpent-2-ene

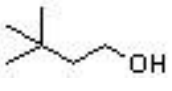
37. Which of the following alkenes is the major product when 2-bromo-2-methylpentane is treated with potassium *tert*-butoxide in *tert*-butanol?
A) 2-methylpent-1-ene B) 2-methylpent-2-ene C) (*E*)-4-methylpent-2-ene
D) (*Z*)-4-methylpent-2-ene

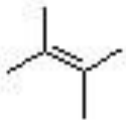
38. Which of the following statements applies to the E2 mechanism?
A) It occurs with inversion of stereochemistry.
B) It occurs with racemization of stereochemistry.
C) It proceeds through the more stable carbocation intermediate.
D) The C-H and C-X bonds that break must be anti.

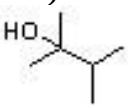
39. What is the major product of the following reaction?



A) 

B) 

C) 

D) 

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40. Provide the reagents necessary to complete the following transformation.

A) 1. $BH_3 \cdot THF$ 2. H_2O_2, HO^-　B) H_2O, H_2SO_4　C) OsO_4, H_2O_2

D) CH_3CO_3H

41. Which of the following reagents will convert 1 mole of 3-methylpent-1-yne into 3-methylpentane?

A) 1 mole of Br_2 in CCl_4　B) 2 moles of Cl_2 in CCl_4　C) 2 moles of HCl

D) 2 moles H_2, Ni and heat

42. Which of the following reagents should be used to convert hex-3-yne to (Z)-hex-3-ene?

A) H_2, Pt　B) Na, NH_3　C) H_2, Lindlar's catalyst　D) H_2SO_4, H_2O

43. Which of the following statements correctly pertains to a pair of enantiomers?

A) They rotate the plane of polarized light by exactly the same amount and in opposite directions.

B) They rotate the plane of polarized light by differing amounts and in opposite directions.

C) They rotate the plane of polarized light by differing amounts and in the same direction.

D) The have different melting points.

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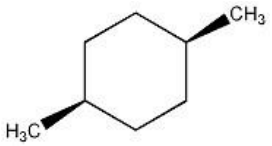
44. Predict the specific rotation of the compound shown.



A) It is impossible to predict; it must be determined experimentally.
B) Because both asymmetric centers are R, the compound is dextrorotatory.
C) Because both asymmetric centers are S, the compound is levorotatory.
D) Zero; the compound is achiral.

45. What is the major difference between an antiaromatic and aromatic compound?
A) Only aromatic compounds follow Huckle's rule.
B) Antiaromatic compounds have at least one sp3 hybridized atom in the ring.
C) Antiaromatic compounds can assume a chair-like structure while aromatic compounds are nearly flat.
D) Aromatic compounds cannot have a charged atom in the structure.

46. Which of the following is an incorrect statement about the bromination of benzene by Br_2 and $FeBr_3$?

A) FeBr3 functions to increase the electrophilicity of Br2.
B) Formation of the sigma complex is the rate-determining step of the mechanism.
C) The carbanionic intermediate is resonance stabilized.
D) There is one carbon-containing intermediates in the mechanism.

47. Which of the following species is attacked by benzene in the electrophilic nitration reaction?

A) HNO_3　B) NO_2^+　C) NO_2　D) NO^+

48. Which of the following compounds will <u>not</u> undergo Friedel-Crafts acylation when treated with CH_3CH_2COCl, $AlCl_3$?

A) toluene　B) *p*-xylene　C) benzophenone　D) ethoxybenzene

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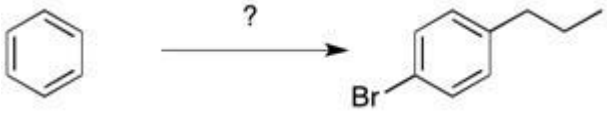
49. Which series of reagents would be required to perform the following synthesis?



A) 1. ClCH2CH2CH3, AlCl3　2. FeBr3, Br2
B) 1. ClCOCH2CH3, AlCl3　2. FeBr3, Br2
C) 1. ClCOCH2CH3, AlCl3　2. FeBr3, Br2　3. Zn(Hg), HCl
D) 1. ClCOCH2CH3, AlCl3　2. Zn(Hg), HCl　3. FeBr3, Br2

50. What are the expected products of the reaction of $PhOCH_3$ with concentrated HI?

A) phenol and methanol　B) phenol and iodomethane
C) iodobenzene and methanol　D) iodobenzene and iodomethane

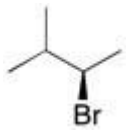
51. Which of the following is produced by the reaction of $(CH_3CH_2)_2S$ with CH_3CH_2I?

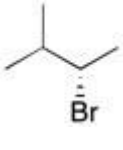
A) CH3CH2CH2CH2I　B) (CH3CH2)3S+ I-
C) (CH3CH2)3S　D) CH3SCH2CH2CH3

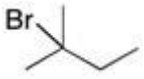
52. Through what basic mechanism is 1-methylcyclohexanol converted to 1-bromo-1-methylcyclohexane upon treatment with HBr?

A) S_N1　B) S_N2　C) E1　D) E2

53. What is the major organic product of the following reaction?

A) 

B) 

C) 

D) Both A and B

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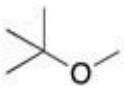
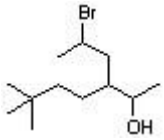
54. What is the best way to make the ether shown below using a Williamson Ether Synthesis reaction?



A) (CH3)3CO- + BrCH3　B) (CH3)3CBr + -OCH3　C) (CH3)3COH + BrCH3
D) (CH3)3CBr + HOCH3

55. When an aldehyde is treated with $LiAlH_4$ followed by addition of H_2O, what general class of product results?
A) primary alcohol　B) secondary alcohol　C) tertiary alcohol　D) ether

56. What is the correct IUPAC name of the compound below?



A) 3-(2-bromopropyl)-6,6-dimethylheptan-2-ol
B) 5-bromo-3-(3,3-dimethylbutyl)hexan-2-ol
C) 5-(2-bromopropyl)-2,2-dimethylheptan-6-ol
D) 7-bromo-5-(1-hydroxyethyl)-2,2-dimethyloctane

57. The reaction of CH_3CH_2MgBr with $CH_3COCH_2CH_3$ gives _____.

A) an achiral product　B) a mixture of diastereomers
C) the racemate of a chiral product　D) a single enantiomer

58. The acidity of a thiol proton most closely resembles which of the following acids?
A) pheno　B) ethanol　C) acetic acid　D) ammonia

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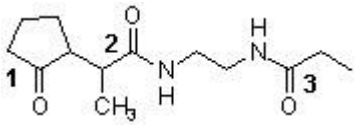
59. The positively polarized carbon atom of a carbonyl group acts as _____.
    A) an electrophile and a Lewis base
    B) a nucleophile and a Lewis base
    C) an electrophile and a Lewis acid
    D) a nucleophile and a Lewis acid

60. What reagent can be used to convert 2-methylbutan-1-ol into 2-methylbutanal?

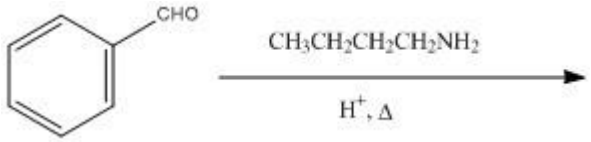
    A) $LiAlH_4$　B) $Na_2Cr_2O_7$　C) PCC　D) $KMnO_4$

61. Which sequence ranks the following carbonyl compounds in order of increasing rate of nucleophilic addition?



    A) 2 < 3 < 1　B) 3 < 2 < 1　C) 2 < 1 < 3　D) 1 < 3 < 2

62. What product will result from the reaction shown?



    A) imine
    B) amino acid
    C) amino alcohol
    D) hydrazine

63. What product will result from the reaction shown?

    A) acetal　B) hydrazine　C) ester　D) ylide

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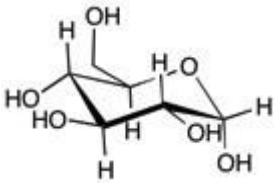
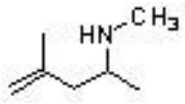
64. The cyclic structure of glucose is shown below. What functional groups are present in this molecule?



A) acetal　B) hemiacetal　C) oxime　D) hydrate

65. Provide the correct IUPAC name for the following amine.



A) 4-(methylamino)-2-methyl-1-pentene
B) 2,*N*-dimethyl-1-penten-4-amine
C) 4,*N*-dimethyl-4-penten-2-amine
D) 1,3,*N*-trimethyl-3-buten-1-amine

66. What compound results from the reaction below?

A) imine
B) amide
C) primary amine
D) quaternary ammonium salt

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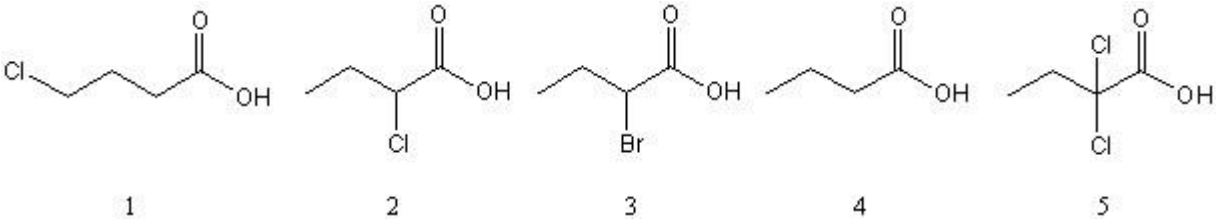
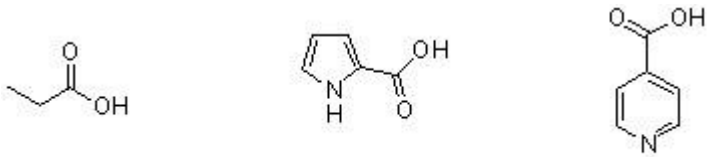
67. List the following weak acids in order of increasing acidity (from lowest to highest.).



1　　2　　3　　4　　5

A) 4 < 3 < 2 < 1 < 5 B) 4 < 1 < 3 < 2 < 5 C) 5 < 2 < 3 < 1 < 4
D) 4 < 1 < 2 < 5 < 3

68. Which of the following sequences ranks the structures below in order of increasing acidity?



1　　**2**　　**3**

A) 1 < 2 < 3　B) 2 < 3 < 1　C) 3 < 1 < 2　D) 2 < 1 < 3

69. What compound is produced when $(CH_3)_2CHCH_2Br$ is subjected to the following sequence of steps?

1. Mg, Et_2O　　2. CO_2

A) 2-methylpropanoic acid　　B) 3-methylpropanoic acid
C) 2-methylbutanoic acid　　D) 3-methylbutanoic acid

70. Acid chlorides can be prepared from carboxylic acids by treatment with _____.

A) (COCl)2
B) SOCl2
C) KCl
D) both A and B

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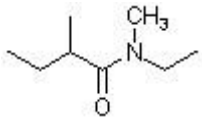
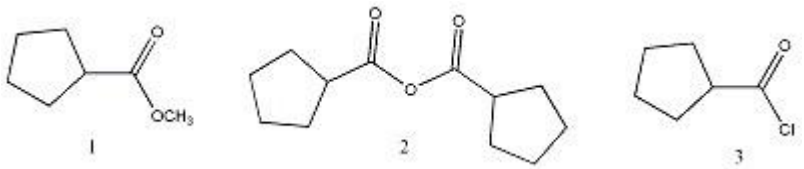
71. Cyclic amides are called _____.
A) lactones B) lactams C) aminals D) animals

72. What is the correct IUPAC name for the following compound?



A) N-ethyl-2,N-dimethylbutanamide
B) N-ethyl-N-methylisobutyramide
C) 2,N-dimethyl-N-ethylbutanamide
D)1-(ethylmethylamino)-2-methylbutanamide

73. Arrange the carboxylic acid derivatives below in order of increasing reactivity towards nucleophilic acyl substitution.



A) 1 < 2 <3 B) 1 < 3 < 2 C) 2 < 1 < 3 D) 2 < 3 < 1

74. The hydrolysis of esters in base is called _____.
A) the Fischer esterification
B) saponification
C) the Dieckmann condensation
D) transesterification

75. Lithium aluminum hydride reduces carboxylic acids, acid chlorides, and esters to _____.
A) aldehydes B) primary alcohols C) secondary alcohols
D) tertiary alcohols

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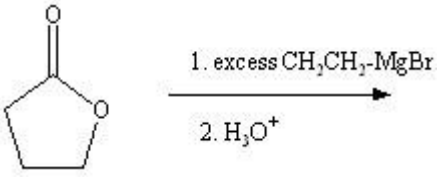
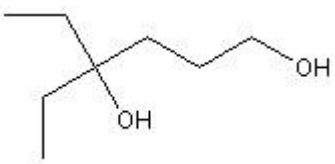
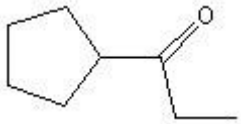
76. What compound is produced when *N*,*N*-dimethylpropanamide is treated with LiAlH4?

A) CH3CH2CONH2
B) CH3CH2CH2NH2
C) CH3CH2CH2OH
D) CH3CH2CH2N(CH3)2

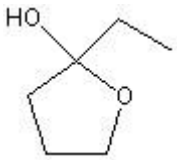
77. What is the predicted major product of the following reaction?



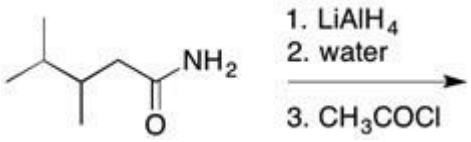
A)


B)


C)


D)


78. Predict the major organic product from the following reaction.



A) carboxylic acid　B) ester　C) nitrile　D) 2° amide

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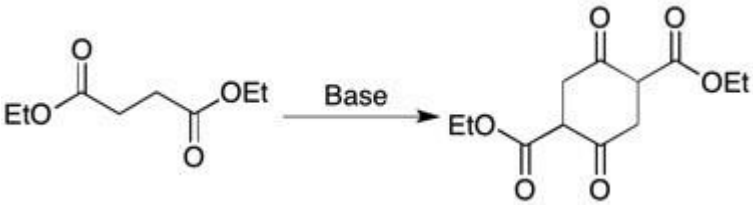
79. What type of reaction is shown below?



A) Aldol condensation　B) Claisen Condensation　C) Michael Addition
D) Alkylation

80. Which of the pairs shown below are tautomers?

A)

B)

C)

D)

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1. Specialized structures with functional distinctions, organelles, exist with cells and constrain particular biological processes that confer metabolic efficiency. Which organelle is the primary sources of energy for cells of eukaryote?
   A. Endoplasmic reticulum **B**. Golgi apparatus **C**. Mitochondria **D**. Lysosomes

2. Receives writes, which enzyme is **NOT** contained in this organelle?
   A. Rubisco **B**. Fumarase **C**. Cytochrome oxidase **D**. Citrate synthase

3. Which step of polymerase chain reaction (PCR) cycle requires DNA polymerase?
   A. Denaturation **B.** Annealing **C.** Elongation **D.** Hybridization

4. Which step of polymerase chain reaction (PCR) cycle is the binding of a primer to a DNA strand?
   A. Denaturation **B.** Annealing **C.** Elongation **D.** Hybridization

5. Which method can make copies of a specific DNA sample rapidly?
   A. Edman degradation **B.** Polymerase chain reaction **C.** Ultracentrifugation **D.** X-ray crystallography

6. Which method is typically used for separation of cellular organelles?
   A. Edman degradation **B.** Polymerase chain reaction **C.** Ultracentrifugation **D.** X-ray crystallography

7. During the separation of protein molecules, which method is related to different molecular weight and configuration of proteins?
   A. Hydrophobic interaction chromatography **B.** Affinity chromatography **C.** Ion exchange **D.** Gel filtration

8. Which one of the following amino acids is polar?
   A. Phe **B**. Ser **C**. Pro **D**. Trp

9. Which one of the following amino acids does **NOT** contain aromatic hydrocarbon?
   A. Phe **B**. Met **C**. Trp **D**. Tyr

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10. Which one of the following immunoglobulins is the first antibody to appear in the response to initial exposure to an antigen?
A. IgG **B.** IgA **C.** IgM **D.** IgY

11. What kind of immunoglobulin is the major antibody in bird?
A. IgG **B.** IgA **C.** IgM **D.** IgY

12. Which of the following is **NOT** fat-soluble vitamin?
A. Vitamin A **B.** Vitamin B **C.** Vitamin D **D.** Vitamin K

13. Which of the following is related to the regulatory function in blood clotting?
A. Vitamin A **B.** Vitamin B **C.** Vitamin D **D.** Vitamin K

14. Which type of RNA is the least abundant in a cell??
A. Transfer RNA **B.** Messenger RNA **C.** 30S rRNA **D.** 50S rRNA

15. Which type of RNA is the smallest?
A. Transfer RNA **B.** Messenger RNA **C.** 30S rRNA **D.** 50S rRNA

16. Which one of the following enzymes can introduce negative supercoils into DNA in DNA replication?
A. DNA gyrase **B.** DNA primase **C.** DNA helicase **D.** DNA ligase

17. RNA serves as a primer in DNA replication. Which one of the following enzymes can catalyzes the synthesis of the RNA primer?
A. DNA gyrase **B.** DNA primase **C.** DNA helicase **D.** DNA ligase

18. Which complex in the respiratory chain can **NOT** directly enhances the electrochemical proton gradient?
A. Complex I **B.** Complex II **C.** Complex III **D.** Complex VI

19. Which complex in the respiratory chain is inhibited by cyanide (CN^-)?
A. Complex I **B.** Complex II **C.** Complex III **D.** Complex VI

20. What is the central pathway in nitrogen metabolism?
A. Citric acid cycle **B.** Calvin cycle **C.** Cori cycle **D.** Urea cycle

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21. What is the second messenger system for the insulin response?
A. Cyclic AMP **B.** Calcium ion (Ca^{2+}) **C.** G protein **D.** Receptor Tyrosine Kinases

22. Which amino acids have negative charge at pH 7.4?
A. Phe, Tyr, Trp **B**. Ser, Asn, Gln **C**. Lys, Arg **D**. Asp, Glu

23. Which of the following are **NOT** glucogenic amino acid?
A. Leu, Lys **B.** Ala, Gly **C.** Ser, Thr **D.** Cys, Glu

24. What force **NOT** drives the formation of protein tertiary structure?
A. Van der Waals force **B.** Electrostatic interaction **C.** H-bonds **D.** Ionic bonds

25. The buffers that have wide use are zwitterions. Which of the following substances **NOT** have zwitterionic form?
A. Potassium chloride (KCl) **B.** N-*tris*[hydroxymethyl]methyl-2-aminoethane sulfonate (TES) **C.** N-2-hydroxyethylpiperazine-N'-2-ethane sulfonate (HEPES) **D.** 3-[N-morpholino]propane-sulfonic acid (MOPS)

26. Sickle-cell disease (SCD) is a group of blood disorders typically inherited from parents. Which of the following single amino acid substitution in the β-chains of hemoglobin result SCD?
A. Gly→Ala **B.** Leu→Ile **C.** Glu→Val **D.** Arg→Lys

27. Which one of the following ions plays a key role in extracting electrons from NADH to ubiquinone (UQ) in the respiratory complexes?
A. Calcium **B.** Natrium **C.** Manganese **D.** Iron

28. In the living organism, adenosine triphosphate (ATP) functions as the most important energy intermediate. Which one of the following processes produces the most ATP?
A. Fermentation **B.** Glycolysis **C.** Tricarboxylic acid cycle **D.** Oxidative phosphorylation

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29. Which one of the following aqueous solutions has the highest pH? The solutions have H^+ concentration respectively of
A. 1.3×10^{-4} mol/L **B**. 4.2×10^{-3} mol/L **C**. 2.1×10^{-10} mol/L **D**. 3.5×10^{-6} mol/L

30. Formic acid (HCOOH) has a pKa of 3.744 What is the molar ratio of potassium formate (HCOOK) to formic acid at pH 3.744?
A. 10:1 **B**. 1:10 **C**. 21 **D**. 1:1

31. *O*-linked glycosylation is important in many diseases including cancer, diabetes and Alzheimer's. Which amino acids play a key role in this process? (*O*-glycans are attached to the oxygen atom of these amino acids)
A. Asn, Asp **B.** Gly, Ala **C**. Lys, Arg **D**. Ser, Thr

32. Which of the following is a standard start codon for protein synthesis in eukaryotes?
A. AUG **B.** UAG **C.** UGA **D.** UAA

33. Which one of the following forces can maintain the quaternary structure of a protein?
A. Electrostatic interaction **B.** Van der Waals force **C.** H-bonds **D.** All of the above

34. Which nucleosides below contain purines?
A. A, G **B.** C, T, U **C.** C, G **D.** A, G, U

35. Which one of the following organelles does **NOT** contain DNA?
A. Nucleus B. Chloroplast C. Lysosome D. Mitochondria

36. Which organelles are surrounded by a double membrane?
A. Nucleus **B.** Chloroplast **C.** Mitochondria **D.** All of the above

37. Which one of the following diseases is **NOT** caused by misfolded protein?
A. Sickle-cell disease **B.** Creutzfeldt-Jakob disease **C.** Alzheimer's disease **D.** Parkinson's disease

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38. Which description is **NOT** correct?
A. RNA is initially synthesized using a DNA template in transcription. **B.** Both DNA template and primer are required in RNA synthesis. **C.** The enzyme that catalyzes the RNA synthesis is DNA-dependent RNA polymerase. **D.** The enzyme uses one strand of the DNA as the template for RNA synthesis.

39. In prokaryotes, transcription is controlled in four principal ways. Which of the following can control the production of β-galactosidase in *E. coli*?
A. Alternative σ factors **B.** Enhancers **C.** Operons **D.** Transcription attenuation

40. Which of the following enzymes is **NOT** required in forming recombinant DNA?
A. Restriction endonucleases **B.** DNA ligase **C.** Taq DNA polymerase **D.** DNA gyrase

41. Which of the following is contained in the promoter of the eukaryotes?
A. GC box **B.** TATA box **C.** Initiator element **D.** All of the above

42. Which description is **NOT** correct?
A. DNA synthesis is bidirectional. **B.** The direction of DNA synthesis is from the 3' end to the 5' end of the newly formed strand. **C.** The leading strand is formed continuously, while the lagging strand is formed discontinuously. **D.** On the lagging strand, Okazaki fragments are subsequently linked by ligase.

43. Five DNA polymerases have been found in *E. coli*. Which of the following is primarily responsible for the synthesis of new strands in DNA replication?
A. Polymerases I **B.** Polymerase II **C.** Polymerase III **D.** Polymerase IV and V

44. Five DNA polymerases have been found in eukaryotes. Which of the following is primarily responsible for the synthesis of new strands in DNA replication??
A. Polymerases α **B.** Polymerase β **C.** Polymerase γ **D.** Polymerase δ and ε

45. Which one of the following molecules is the key regulator of membrane fluidity?
A. Glycolipids **B.** Glycoprotein **C.** Peripheral membrane proteins **D.** Cholesterol

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46. Which one of the following mechanisms can regenerates NADH inside the mitochondrial matrix?
A. Malate-aspartate shuttle **B.** Glycerol phosphate shuttle **C.** Mitochondrial shuttle **D.** All of the above

47. Which one of the following molecules is **NOT** the second messenger in the phosphoinositol signaling pathway?
A. Calcium ions (Ca^{2+}) **B.** Inositol 1,4,5-trisphosphate (IP_3) **C.** Diacylglycerol (DAG) **D.** Hydroxytryptamine (5-HT)

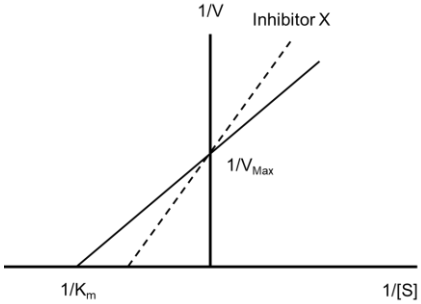
48. What is the major product in pentose phosphate pathway (PPP)?
A. ATP **B.** NADH **C.** NADPH **D.** $FADH_2$

49. Which type of DNA is the principal form that occurs in nature?
A. A-DNA **B.** B-DNA **C.** Z-DNA **D.** None of above

50. Which of the following provides the energy to drive many processes in cells?
A. ATP **B.** NADH **C.** NADPH **D.** $FADH_2$

51. What is the net gain of ATP production in the lactic acid fermentation?
A. 30 **B.** 8 **C.** 4 **D.** 2

52. What type of inhibitor X is this Lineweaver–Burk plot shown?



A. Competitive inhibition **B.** Uncompetitive inhibition **C.** Noncompetitive inhibition **D.** Irreversible inhibitors

53. The value of V_{max} decreases, but that of K_m remains the same. What kind of inhibition does this description represent?
A. Competitive inhibition **B.** Uncompetitive inhibition **C.** Noncompetitive inhibition **D.** Irreversible inhibitors

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54. A Lineweaver–Burk plot shows parallel lines. What kind of inhibition does this description represent?
A. Competitive inhibition **B.** Uncompetitive inhibition **C.** Noncompetitive inhibition **D.** Irreversible inhibitors

55. Which of the following is a nonessential amino acid in human nutrition?
A. Phenylalanine **B.** Arginine **C.** Methionine **D.** Tryptophan

56. Fetal hemoglobin has a higher affinity for oxygen. What is the critical amino acid difference between the β-chain (adult) and the γ-chain (fetal) of hemoglobin?
A. β-chain:His^{143} γ-chain:Ser^{143} **B.** β-chain:Gly^{143} γ-chain:Ala^{143} **C.** β-chain:Leu^{143} γ-chain:Ile^{143} **D.** β-chain:Arg^{143} γ-chain:Lys^{143}

57. During the protein separation, which method relates to antibody specificity?
A. Immunoprecipitation **B.** SDS-PAGE **C.** Ion exchange **D.** Gel filtration

58. Which of the following is **NOT** included in the central dogma of molecular biology?
A. DNA **B.** RNA **C.** Protein **D.** Lipid

59. Which of the following is a key metabolite derived from glucose, fatty acid, and amino acid catabolism?
A. Pyruvate **B.** Ethanol **C.** Glucose **D.** Acetyl CoA

60. What is the main place for the oxidative phosphorylation in cells?
A. Golgi apparatus **B.** Endoplasmic reticulum **C.** Mitochondria **D.** Peroxisome

61. Which one of the following coenzymes is involved in a wide range of metabolic processes primarily related to the utilization of fats, carbohydrates, and amino acids?
A. Folic acid **B.** Biotin **C.** Flavin adenine dinucleotide **D.** Pyridoxal phosphate

62. Which one of the following coenzymes is essential for the body to make DNA and RNA and metabolize amino acids?
A. Folic acid **B.** Biotin **C.** Flavin adenine dinucleotide **D.** Pyridoxal phosphate

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63. Microtubules make up the internal structure of cilia and flagella. What is the structural type of the microtubules?
A. 8+1 array **B.** 8+2 array **C.** 9+1 array **D.** 9+2 array

64. Which one of the following descriptions about membrane is correct?
A. A membrane consists of a layer of proteins sandwiched between two layers of lipids. **B.** All membrane proteins are bound to the interior of the membrane. **C.** Lipid bilayers are an important component of membranes. **D.** The compositions of the inner and outer lipid layers are the same in any individual membrane.

65. In eukaryotes, which of the following is the most common mechanism for targeting protein for destruction in a proteasome?
A. Ubiquitylation **B.** Glycosylation **C.** Methylation **D.** Phosphorylation

66. What is the major components of bacterial cell walls?
A. Homopolysaccharide **B.** Peptidoglycan **C.** Cellulose **D.** Glycosaminoglycans

67. What is the major components of plant cell walls?
A. Homopolysaccharide **B.** Peptidoglycan **C.** Cellulose **D.** Glycosaminoglycans

68. What is the starting material for steroid biosynthesis?
A. NADH **B.** NADPH **C.** Acetyl-CoA **D.** $FADH_2$

69. Which of the following is the key controlling enzyme during the synthesis of cholesterol?
A. HMG-CoA synthase **B.** HMG-CoA reductase **C.** HMG-CoA lyase **D.** None of the above

70. Which one of the following enzymes does **NOT** catalyze the control point in the glycolytic pathway?
A. Hexokinase **B.** Phosphofructokinase **C.** Pyruvate kinase **D.** Aldolase

71. Which of the following is **NOT** generated in fatty acid oxidation?
A. NADH **B.** NADPH **C.** Acetyl-CoA **D.** $FADH_2$

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72. Which organelle in liver cells is the principal site of ketone body synthesis?
A. Endoplasmic reticulum **B**. Golgi apparatus **C**. Mitochondria **D**. Lysosomes

73. Cholesterol is converted to other steroid hormones. Which one of the following hormones is **NOT** derived from cholesterol?
A. Progesterone **B.** Glucocorticoids **C.** Mineralocorticoids **D.** Prostaglandin

74. Which of the following can **NOT** regulate the metabolism of glycogen?
A. Insulin **B.** Epinephrine **C.** Glucagon **D.** Calcitonin

75. Which of the following plays a key role in controlling cholesterol metabolism?
A. VLDL receptor **B.** LDL receptor **C.** IDL receptor **D.** HDL receptor

76. Which description for photosynthesis is **NOT** correct?
A. The site of photosynthesis in eukaryotes such as green plants and green algae is the chloroplast. **B.** In the dark reactions, water is oxidized to produce oxygen, accompanied by the reduction of NAD^+ to NADP. **C.** The overall reaction pathway of sugar production is cyclic and is called the Calvin cycle. **D.** C4 plants grow more quickly than C3 plants.

77. Which of the following can be converted to glucose by gluconeogenesis?
A. Fatty acid **B.** Glycerol **C.** Glycogen **D.** Ribonucleic acid

78. What are ribozymes made of?
A. Lipid **B.** Carbohydrate **C.** Ribonucleic acid **D.** Protein

79. SARS-CoV-2 is a positive-sense single-stranded RNA virus. Which of the following components does **NOT** appear in virus particles in theory?
A. Adenine **B.** Guanine **C.** Cytosine **D.** Thymine

80. Receives writes, which of the following methods is most likely to be used for the clinical diagnosis of RNA virus?
A. Real-time reverse transcription polymerase chain reaction (rRT-PCR) **B.** Polymerase chain reaction (PCR) **C.** Restriction fragment length polymorphism, (RFLP) **D.** Random amplification of polymorphic DNA (RAPD)

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1. The fax machine and the telephone _____ on the separate line.
   (A) am
   (B) is
   (C) are
   (D) be
2. Attach this cable _____ the computer.
   (A) with
   (B) into
   (C) in
   (D) to
3. Tomorrow _____ a new day with no mistakes in it.
   (A) is
   (B) are
   (C) is going
   (D) is yet to
4. The case has not been solved, and nearly two and a half years later, Gilberto is still trying to make sense of what _____ that night.
   (A) occurred
   (B) take place
   (C) happened
   (D) is happened
5. The number of immigrant students who have arrived in the last three years and speak a language other than Mandarin has nearly doubled in my school district____ 2014.
   (A) before
   (B) since
   (C) after
   (D) in
6. This year, one in _____ high schoolers in the district are immigrant students.
   (A) seven
   (B) seventh
   (C) sevenness
   (D) sevenless

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7. There are also signs that new immigrants in Taiwan may be increasingly _____.
   (E) vulnerable
   (F) endurable
   (G) inaccurate
   (H) compatible
8. More than 60 people have been killed by gunshot wounds each year in the city for the past several years. People of color are disproportionately_____.
   (A) affect
   (B) affective
   (C) affection
   (D) affected
9. Many victims were fatally shot in what appeared to be robberies, because non-English speaking immigrants may be targeted because they are less likely to _____ police.
   (A) notable
   (B) notify
   (C) notice
   (D) note
10. In Ramirez's case, older teenage boys seemed to have been after him. On a few occasions, the boy came home beaten up. Once, he was robbed of his cellphone.
    "He was _____," his father recalled.
    (A) bullied
    (B) bulldozed
    (C) bulldogged
    (D) bulletined
11. Bats are nature's pest patrol. Every night the winged mammals venture forth from their caves and roosts to chow down on millions of _____.
    (A) consent
    (B) insects
    (C) incentives
    (D) insecurities
12. But habitat loss and climate change, as well as infectious diseases, are _____ bats' ability to do their job.
    (A) hampering
    (B) hammering
    (C) humming
    (D) humiliating

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13. In California's natural preserves, bats have adapted to occasional wildfires. Scientists wanted to see how these changes might be influencing _____.
    (A) biochemistry
    (B) biodiesel
    (C) biodiversity
    (D) bioengineering
14. Seventeen bat species call these forests home. The study revealed that eight of them tended to frequent the unburned patches, whereas 11 expanded to the burned areas, while some species visited both. This is a proof that some species of bats _____ from wildfire.
    (A) beneficial
    (B) benefit
    (C) benevolence
    (D) belittle
15. When there's lots of variation in habitat after a wildfire, many species benefit in different ways. On the whole, the community becomes more diverse, and that's a good thing for the _____.
    (A) land mines
    (B) landlords
    (C) landfall
    (D) landscape
16. For decades the mature brain was understood to be incapable of growing new neurons. Once an individual reached adulthood, the brain began losing neurons rather than _____ them.
    (A) extending
    (B) connecting
    (C) cutting
    (D) gaining
17. New evidence was building that the adult brain could generate new neurons. In one particularly striking experiment with mice, scientists found that simply running on a wheel led to the birth of new neurons in the hippocampus, a brain _____ that is associated with memory.
    (A) module
    (B) structure
    (C) contexture
    (D) symptoms

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18. New studies have established that exercise also has positive effects on the brains of humans, especially as we age, and that it may even help reduce the risk of Alzheimer's disease and other neurodegenerative _____.
    (A) conducive
    (B) conductive
    (C) conditions
    (D) conditionals
19. Physical activity improves the function of many organ systems in the body, but the effects are usually linked to better athletic performance. For example, when you walk or run, your muscles demand more oxygen, and over time your cardiovascular system responds by building new blood _____.
    (A) vessels
    (B) streams
    (C) circulars
    (D) pressures
20. The cardiovascular changes from exercises are primarily a response to the physical challenges which can enhance _____.
    (A) endurance
    (B) encouragement
    (C) ennui
    (D) environment
21. Researches carried out over the past decade indicate that exercise seems to be as much a cognitive activity as a physical one. This link between physical activity and brain health may trace back millions of years to the origin of _____.
    (A) humiliation
    (B) humidity
    (C) humankind
    (D) humbleness
22. If we can better understand why and how exercise engages the brain, perhaps we can leverage the relevant physiological pathways to design novel exercise routines that will boost people's cognition as they _____.
    (A) ascend
    (B) accelerate
    (C) aggregate
    (D) age

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23. To explore why exercise benefits the brain, we need to first consider which aspects of brain structure and cognition seem most _____ to it.
    (A) responsible
    (B) responsive
    (C) repulsive
    (D) resistant
24. Researchers have documented clear links between aerobic exercise and benefits to other parts of the brain. Such augmentation of this region has been tied to sharper executive cognitive functions, which involve aspects of planning and decision-_____.
    (A) taking
    (B) caking
    (C) making
    (D) junking
25. Scientists suspect that increased connections between existing neurons, rather than the birth of new neurons, are responsible for the beneficial effects of _____.
    (A) excellence
    (B) expulsion
    (C) exercise
    (D) examination
26. We have to be grateful to Taiwan's medical administrations and practitioners for keeping the outbreak under _____.
    (A) control
    (B) concussion
    (C) consecutive
    (D) concession
27. To keep fans watching on their smartphones, PCs and TVs, the league is encouraging teams to give their stadiums a _____, lively feel.
    (A) realistic
    (B) recessive
    (C) regressive
    (D) repetitive
28. All professional baseball leagues around the world have been postponed due to the global _____.
    (A) pentagon
    (B) pancake
    (C) pandemics
    (D) panorama

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29. Beyond baseball, organized sports worldwide have canceled or delayed _____.
    (A) concealment
    (B) composition
    (C) compensation
    (D) competition
30. The Tokyo Olympic Games have been _____ back a year.
    (A) excelled
    (B) pushed
    (C) accentuated
    (D) backfired
31. No fans have come to any local games of the professional baseball league in Taiwan as a result of the decision to bar spectators over concerns of spreading COVID-19 in a crowded _____.
    (A) spec
    (B) space
    (C) span
    (D) spectrum
32. Taiwanese professional baseball league decided it was safe to let in players, coaches, cheerleaders, costumed mascots, mask-wearing batboys and the media, as the nation has _____ few cases of the coronavirus.
    (A) relatedly
    (B) previously
    (C) preciously
    (D) relatively
33. Although no fan is allowed to enter the stadium, we consider ourselves still lucky. We have not stopped our season and people can still see the _____.
    (A) spectrum
    (B) spectacle
    (C) game
    (D) gymnastics
34. Baseball with no fans may not be as entertaining as it used to be, but it is a good way to stop the coronavirus _____ spreading.
    (A) from
    (B) out of
    (C) into
    (D) at

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35. The fact that we're playing in front of empty seats is acceptable. It's comforting to know that some part of the world still goes on as it used to _____.
    (A) be
    (B) going to be
    (C) will be
    (D) being
36. Our ways of life will not be the same after COVID-19. Nor should they _____.
    (A) be
    (B) are
    (C) will be
    (D) being
37. In Italy, inadequacy in hospital accommodates and the lack of awareness of a public-health crisis have _____ contagion.
    (A) fulfilled
    (B) fueled
    (C) followed
    (D) flourished
38. As a result of negligence, the coronavirus is shutting down the engine of ideas and interactions that drives social dynamism and economic _____.
    (A) gross
    (B) galaxy
    (C) glacier
    (D) growth
39. Because contagion might turn out to be a long-term or chronic threat, how to adapt urban design and management accordingly has become a _____ question.
    (A) sacrificial
    (B) savvy
    (C) satellite
    (D) salient
40. It is clear that cities cannot build urban spaces with a single function if they want them to be useful in emergencies. Both the thinkable and the unthinkable must be part of urban _____.
    (A) detachment
    (B) delusion
    (C) design
    (D) delirium

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41. Numerous people accused the WHO Director-General of being dishonest, some posting images of Taiwan's national flag in _____ to his tweets.
    (A) response
    (B) accordance
    (C) counteraction
    (D) reflection
42. The sports documentary publicized last week gives a definitive account of Michael Jordan's career and the Chicago Bulls, with unaired footages of his final season _____ the team.
    (A) with
    (B) off
    (C) from
    (D) to
43. Michael Jordan, also known by his initials MJ, is an American professional basketball player and the principal owner of the Charlotte Hornets of the National Basketball _____.
    (A) Association
    (B) Astronomy
    (C) Anatomy
    (D) Astronauts
44. He played 15 seasons in the NBA and won six _____ with the Chicago Bulls.
    (A) championships
    (B) comrades
    (C) constipation
    (D) conspiracies
45. His biography on the official NBA website states, "By acclamation, Michael Jordan is the greatest basketball player of _____ time."
    (A) a
    (B) all
    (C) altogether
    (D) accompanying
46. Bob Dylan is an American singer, songwriter and author who remained a lively major _____ of popular culture for more than 50 years.
    (A) fizzle
    (B) figure
    (C) entity
    (D) personification

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47. Many of Dylan's most celebrated works from the 1960s became anthems for the civil rights and anti-war _____.
    (A) impeachments
    (B) celebrations
    (C) movements
    (D) entertainments
48. Dylan's lyrics _____ a range of political, social, philosophical, and literary influences that turned out to defy pop music conventions.
    (A) initial
    (B) insecure
    (C) incorporated
    (D) inappropriate
49. The Pulitzer Prize Board in 2008 awarded Bob Dylan for his _____ impact on popular music and American culture.
    (A) profound
    (B) proficient
    (C) porcelain
    (D) profane
50. Dylan was awarded the Nobel Prize in Literature for having created new poetic expressions within the great American song _____.
    (A) tangerine
    (B) temple
    (C) tambourine
    (D) tradition

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51-55.

Modern life creates a lot of stress in people's lives. Many people spend all their time working and studying and do not get a chance to relax. All the problems we deal with every day can make us wan to just __(51)___ our head in our hands and cry. This is not healthy, especially for teenagers. Senior high school is where most people start making deeper friendships and begin to think about what they want to do with their lives. Too much ___(52)___ can make this into a difficult experience. All this can be a problem later in life. ___(53)____ say that one of the most important things we can do to fight stress is to get enough rest. While ____(54)____ are nice, we should focus more on sleeping at night. Just like any part of the body, our ____(55)____ can be a little delicate and need to be taken care of. If you are having problems, see a doctor and be sure to get more rest.

51.（A）bury（B）bumble（C）bundle（D）burgle
52.（A）allusion（B）allegory（C）aspiration（D）anxiety
53.（A）chemists（B）psychologists（C）physical（D）chemotherapist
54.（A）naps（B）napkins（C）nature（D）maturity
55.（A）naive（B）nerds（C）nerves（D）lullaby

56-60

Apple is beginning to ___(56)___ the power of the localized pitch. As popular ___(57)___ Apple is, cheaper smart-phone brands like Samsung sell better in China. Local Apple clones that rip off iPhone styling have also captured a chunk of the market. Part of this is simply a matter of ___(58)__. In a country where an urban Chinese person's ___(59)___ income averages less than $3,500, an iPhone is a luxury product that costs more to buy in China than in the U.S. To compete, Apple in mid-June at long last unveiled targeted features to woo Chinese consumers. Updated software makes it easier to use Chinese Web offerings ___(60)___ Weibo, a microblogging server; video site Youku; and search engine Baidu.

56.（A）reboot（B）recognize（C）rebate（D）refuse
57.（A）as（B）like（C）such（D）such as
58.（A）turbo（B）pervert（C）price（D）pride
59.（A）anniversary（B）annual（C）announcement（D）anchor
60.（A）however（B）such（C）for example（D）like

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61-65.

The way typhoons and hurricanes are named has changed over the years and no doubt will change again. Originally, weather forecasters described typhoons and hurricanes by their positions on a map. For instance, a typhoon might be called 21.50˚ south, 146.52˚ east. But this was terribly confusing because storms did not stay in the same position. Other methods were therefore created to identify the storms.

An Australian weatherman used to name storms after politicians he disliked. His weather forecasts would contain comments such as "Typhoon Taylor is on a destructive path." Later on, during World War I, typhoons and hurricanes were named according to the military alphabet: Abel, Baker, Charlie, and so on. After that, during World War II, women's names were used, so weather forecasters would name them "Typhoon Betty" or "Hurricane Alice." Then in the 1970s, because of protests from the women's liberation movement, weather forecasters also used men's names. After about 1975, we could hear about a storm named "George" instead of "Grace."

61. The author believes that names of typhoons and hurricanes _____.
    (A) are necessary to weather forecasting, and should not be changed.
    (B) are extremely important to describe their strength and positions.
    (C) should be taken from the leaders of the women's liberation movement.
    (D) have changed many times and will certainly change again.

62. In 2004, which description of a typhoon or hurricane is NOT heard?
    (A) Typhoon Queen Elizabeth
    (B) Typhoon George
    (C) Hurricane Grace
    (D) Hurricane Charles

63. According to this passage, what does the word "identify" in the last line of the first paragraph mean?
    (A) to recognize something clearly
    (B) to know somebody's name
    (C) to treat something as the same
    (D) to prove someone's social status

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64. Which of the following statements is NOT mentioned in this passage?

(A) Queen Elizabeth is the first queen to announce the official naming of hurricanes.

(B) Feminist activists were also part of the history of climatology.

(C) Naming hurricanes and typhoons after both men's and women's names is a sign of improvement of gender equality.

(D) Typhoons are named after military alphabets during the First World War.

65. 65. Which of the following statements is WRONG.

(E) (A) Naming typhoons after its position is problematic because their movement is difficult to predict.

(F) (B) Naming typhoons after women is a collective resolution to show respect for women.

(G) (C) Naming typhoons and hurricanes after disliked politicians shows contempt and irony.

(H) (D) Transformations of naming typhoons and hurricanes reveal a path of development of human civilization.

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66-70.

The human brain weighs about three pounds and is, without a doubt, the most complex organ in the human body. This three-pound brain has two halves, left and right, that can easily be seen.

People used to think that certain activities such as logical thinking and speech occurred only in the left half of the brain and other things like writing, music, art, and so on, occurred only in the right half of the brain.

In recent years, new technology has made it possible to study the brain in great detail. We can see which parts of the brain are being used during a human activity such as watching a ball game, reading a book, solving a math problem, and so on. Now we know that many parts of the brain work together at the same time when a human is listening to music, reading a story, or learning math.

When the brain has been injured, other parts of the brain try to take over the work the injured part was doing. Now we understand that the brain is very flexible and it never stops learning. Scientists are learning how to grow new cells to repair parts of the brain that have been injured.

66. Which of the following statements is TRUE?
(A) Left-brained learners like to connect new things with what they have known.
(B) Scientists have solved all the secrets of left and right halves of the brain.
(C) People use only one side of their brains to learn languages.
(D) Many parts of the brain are used to learn things.

67. What is the main concern of this passage?
(A) Recent medical research on humans.
(B) Discoveries of left and right halves of the brain.
(C) How the human brain functions.
(D) The secrets of human brains.

68. After reading this passage, what assumption could you make?
(A) That we do not have enough technology to study the human brain.
(B) That scientists are learning many new and exciting things about the brain.
(C) That each half of the brain can only do certain things.
(D) That scientists now know everything about the human brain.

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69. Which of the following statement is TRUE?
    (A) According to recent studies, left half is devoted to sense, right half to sensibility.
    (B) With the amazing recent discoveries, scientists are just one step away from the truth of human brains.
    (C) Human brains have potentials far more than we used to presume.
    (D) Human brains lack the overall coordination capacity and the function of spinal cords is essential.

70. Which of the following statements is WRONG?
    (A) When some parts of the brain are injured, certain function relevant to these parts are paralyzed for sure and would never be taken back by other parts.
    (B) Human brain is a complicated organ we have not really explored thoroughly.
    (C) Recent discoveries of human brain bring confidence for scientists.
    (D) Human beings remain hopeful in the mission to explore the function of human brain.

71-80.

The following are excerpts from Malcolm Gladwell's *David and Goliath: Underdogs, Misfits, and the Art of Battling Giants*, in which he challenges the way we think about obstacles and disadvantages. By referring and reconstructing the Bible story of the shepherd boy and the giant, Gladwell offers a new interpretation of what it means to cope with obvious setbacks in demonstrating how much of what is successful in the world comes out of what looks like suffering and adversity.

Passage I:

This is what Goliath was expecting—a warrior like himself to come forward for hand-to-hand ___(71)___. It never occurred to him that the battle would be fought on anything other than those terms, and he prepared ___(72)___. To protect himself against blows to the body, he wore an ___(73)___ tunic made up of hundreds of overlapping bronze fishlike scales. It covered his arms and reached to his knees and probably weighed more than a hundred pounds. He had bronze shin guards protecting his legs, with ___(74)___ bronze plates covering his feet. He wore a heavy metal ___(75)___.

71. (A) combat (B) comrade (C) command (D) compensation
72. (A) additionally (B) early (C) accordingly (D) previously
73. (A) acoustic (B) electrified (C) eccentric (D) elaborate
74. (A) accompanied (B) attached (C) appendix (D) apprenticed
75. (A) casket (B) helmet (C) costume (D) covenant

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Passage II:

Goliath had three separate weapons, all ___(76)___ for close combat. He held a thrusting javelin made entirely of bronze, which was capable of ___(77)___ a shield or even armor. He had a sword on his hip. And as his primary option, he carried a special kind of short-range spear with a metal shaft as "thick as a weaver's beam." It had a cord attached to it and an elaborate set of weights that allowed it to be released with extraordinary force and ___(78)___. As the historian Moshe Garsiel writes, "To the Israelites, this extraordinary spear, with its heavy shaft plus long and heavy iron ___(79)___, when hurled by Goliath's strong arm, seemed capable of piercing any bronze ___(80)___ and bronze armor together." Can you see why no Israelite would come forward to fight Goliath?

76. (A) optimzied (B) optional (C) outlawed (D) outcast
77. (A) sharpening (B) penalizing (C) penetrating (D) concentrating
78. (A) accuracy (B) aperture (C) appointment (D) adaptation
79. (A) blasphemy (B) blade (C) bladder (D) blaze
80. (A) splendour (B) spectacle (C) shred (D) shield

※ 試題請隨卷繳回

亞洲大學

109 學年度學士後獸醫學系招生考試試題紙

學系別	考試科目	考試日期	時　　間
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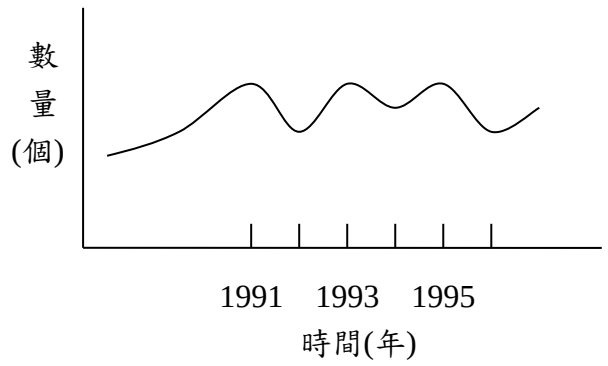
1. 下列哪個敘述最能描寫下圖的狀況？
   (A)本圖代表某生物體的成長，早期成長快速，後來成長趨於穩定。
   (B)本圖代表某生物體的成長，後來因為疾病以致於成長下降，等病好了又恢復成長，如此不斷循環。
   (C)本圖代表某生物族群的成長，因環境負荷量有限而穩定的上下波動。
   (D)本圖代表某生物族群的成長，因為季節的更替而跟著上下起伏。



2. 在動物的演化過程中，不同的系統依序產生，下列何者的先後順序正確？
   (A)消化，呼吸，循環
   (B)消化，循環，呼吸
   (C)呼吸，消化，循環
   (D)呼吸，循環，消化

3. 以上不同系統的產生順序受什麼因素影響？
   (A)系統愈複雜的愈晚才產生
   (B)系統愈耗能的愈晚才產生
   (C)運送物質愈小的愈晚才產生
   (D)以上皆是

4. 下列有關生物多樣性的敘述何者正確？
   (A)外來種的引進有助於全球生物多樣性的增加
   (B)族群愈大的地區，其生物多樣性愈大
   (C)生物多樣性較大的地區，其病蟲害的危害程度和機會也較大
   (D)生物多樣性愈高的生態系，其穩定性愈不易受外來種的破壞

5. 現有甲乙丙三個密閉水族箱，若甲箱內只有生產者，乙箱則含有生產者和消費者，丙箱含有生產者和分解者。如果太陽能可以源源不絕，且一開始各箱均給予相同定量的無機元素和相同重量的有機生命體，則三個水族箱維持有機生命時間長短應如何？
   (A)甲＝乙＝丙
   (B)甲＜乙＝丙
   (C)丙＞乙＞甲
   (D)丙＞甲＞乙

6. 反芻類和非反芻類的比較何者錯誤?
   (A)尿素再吸收程度；反芻類較好
   (B)對於養分較差的草料適應力；反芻類較強
   (C)糞便內的纖維粗細程度；反芻類的較粗
   (D)以上皆錯誤

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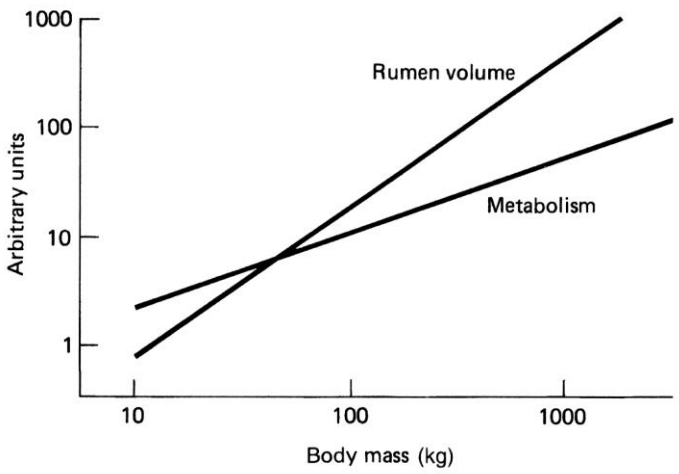
7. 下列何者是反芻類動物？
   (A)所有的偶蹄目動物
   (B)偶蹄目且頭上長角的動物
   (C)所有的奇蹄目動物
   (D)奇蹄目且頭上長角的動物

8. 下圖是體重和新陳代謝率(耗能)以及瘤胃容量(獲能)的關係圖，根據此圖下列有關反芻類動物的哪個推論不合理?
   (A)體型愈大愈有利於獲得正能量
   (B)體型愈小時對於食物的選擇會愈嚴謹
   (C)體型太小的種類將難以存活
   (D)體型大小和生存環境、領域或禦敵行為沒有關係



9. 下列有關食物的消化何者正確？
   (A)當食物的顆粒遠大於細胞時，動物多會進行胞內消化
   (B)食物在腸道內的消化屬於胞外消化
   (C)沒有牙齒的動物其消化道只能進行化學性消化，不能進行物理性消化
   (D)食物在人體消化道內的移動主要靠重力慢慢往下降

10. 下列有關人體消化腺的敘述何者正確？
    (A)膽汁由膽囊合成且不含消化酶
    (B)胃液不含消化酶，沒有幫助消化的功能
    (C)醣類、脂肪和蛋白質都可被胰液分解
    (D)肝臟可分泌酵素至小腸內，幫助消化蛋白質

11. 下列有關營養素的主要功能，那一項最正確？
    (A)蛋白質：能量供需
    (B)脂質：合成荷爾蒙
    (C)礦物質：調節生理機能
    (D)維生素：構成細胞膜

12. 有關於兔子的吃糞行為(Coprophage)何者正確？
    (A)讓糞便內未完全發酵消化的食物再進一步發酵分解
    (B)將糞便直接傳送到盲腸
    (C)人工飼養的異常行為
    (D)礦物質缺乏時的補救行為

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13. 有關肝醣和脂肪的敘述何者正確?
(A)經常面臨缺氧環境的動物偏好以脂肪的形式儲藏能量
(B)需要長距離遷移的動物偏好以肝醣的形式儲藏能量
(C)儲藏同等能量時在體內累積的重量；脂肪＞肝醣
(D)氧化分解成能量的速度；肝醣＞脂肪

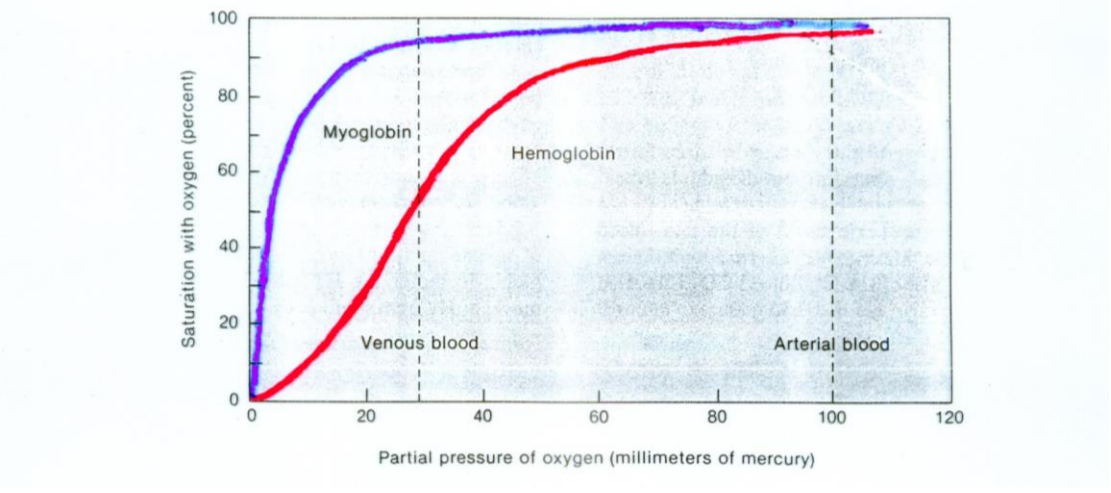
14. 哺乳類的幼仔需攝食母奶一段時間後才能開始吃其他的食物，已知母奶先以脂肪的形式儲藏在母體內，依此原理推論下列何者敘述最正確?
(A)愈胖的雌體產生的子代數愈多
(B)愈胖的雌體愈容易受孕
(C)瘦肉特多的牛(Charolais)價格較高但較難繁殖
(D)肌肉量多的健美女性可以改善經期不正常的問題

15. 有關新陳代謝的敘述何者正確?
(A)新陳(Anabolism)是合成新物質的需能反應不會放出熱能
(B)新陳代謝常用耗氧量測量，因為醣類、脂肪或蛋白質產生相同能量時也耗掉相近的氧氣量
(C)新陳代謝以耗氧量測量可以適用於所有的動物
(D)動物休眠時新陳代謝會趨近於零

16. 已知飛魚、石狗公和小丑魚單位重量鰓面積值分別是 2000、200 和 1000，請推測造成此差別的原因為何？
(A)活動性愈強的鰓面積愈大
(B)生活環境洋流愈強的鰓面積愈大
(C)生活環境溶氧愈高的鰓面積愈大
(D)生活水層愈淺的鰓面積愈大

17. 紅肉因為富含肌紅素(Myoglobin)而呈現紅色，肌紅素類似於血紅素(Hemoglobin)都能攜帶氧氣，但它們和氧氣結合的曲線不同如下圖，根據此圖請問下列敘述何者不正確？
(A)肌紅素和氧氣的結合力比血紅素更強
(B)體內氧分壓愈高時肌紅素和血紅素對於氧的結合程度差異越大
(C)肌紅素在體內氧分壓很低時開始大量釋放結合的氧氣
(D)肌紅素可以在肌肉缺氧時快速補充氧氣避免乳酸的堆積

Figure 15.39. A comparison of the dissociation curves for hemoglobin and for myoglobin. At the P_{O_2} of venous blood, the myoglobin retains almost all of its oxygen, indicating a higher affinity than hemoglobin for oxygen. The myoglobin does, however, release its oxygen at the very low P_{O_2} value found inside the mitochondria.



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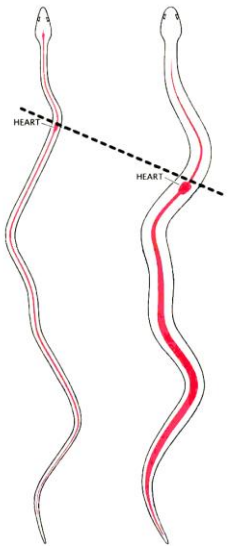
18. 請依據肌紅素的特性推測下列敘述何者最正確？
(A)紅肉可以持續收縮的時間高於白肉
(B)紅肉可以收縮的速度高於白肉
(C)四隻腳的動物都是紅肉，兩隻腳或沒有腳的動物則是白肉
(D)雞胸肉是紅肉，雞腿則偏白肉

19. 某同學的左右心室分隔不完全，下列敘述何者最正確？
(A)心室收縮時血液容易倒流入心房
(B)心室舒張時動脈內的血液容易倒流入心室
(C)充氧血和缺氧血容易混在一起，不宜激烈運動
(D)充氧血和缺氧血容易混在一起，不宜接受輸血

20. 已知有些魚類的血液內完全沒有血紅素，下列的推論那個不正確？
(A)活動能力應較弱
(B)生活在水溫較低的環境
(C)血液完全無法攜帶氧氣
(D)牠們的鰓不呈紅色

21. 下圖中左邊為樹棲蛇類，右邊為陸棲蛇類，當牠們的姿勢從水平的地面被改成直立在空中時，體內血液的分佈如圖所示，而且樹棲和陸棲蛇類腦部中的血流量分別變成原來的 70%和 0%，根據此圖下列敘述或推論何者不正確？
(A)陸棲蛇類血液堆積在身體下方是因為肥胖所致
(B)改成直立的姿勢若在水中進行，則陸棲蛇類血液堆積在下方的情況會改善
(C)樹棲蛇類心臟較接近腦部有助於垂直上爬時腦部的供血不受太大的影響
(D)樹棲蛇類也可以透過加快心跳或增高血壓維持垂直上爬時腦部的供血



22. 下列哪個部位的功能喪失時，腦部的能量供應會立即受到影響？
(A)胃
(B)小腸
(C)腎臟
(D)肺臟

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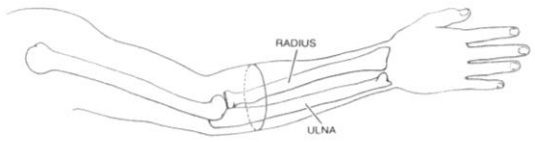
23. 下圖為手臂的橫切面圖，左右兩圖是處於不同狀態下的情況，下列推論何者錯誤?

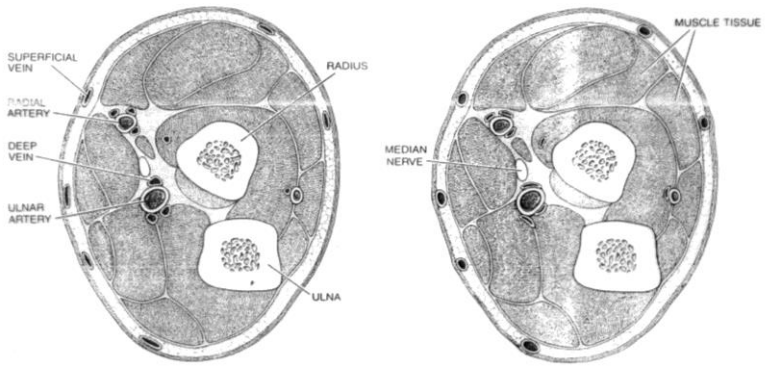
(A)若左圖為休息時的狀態則右圖為運動後

(B)若左圖為泡冷泉時的狀態則右圖為浸泡之前

(C)若左圖為泡溫泉時的狀態則右圖為浸泡之前

(D)若左圖為樹蔭下時的狀態則右圖為太陽之下





24. 下列何者是排泄器官的功能?

(A)排除部份的代謝廢物

(B)維持滲透壓的恆定

(C)清除外來物質或其產物

(D)以上都是

25. 在正常的情況下，下列何者不應該出現在鮑氏囊內？

(A)紅血球

(B)鹽類

(C)葡萄糖

(D)尿素

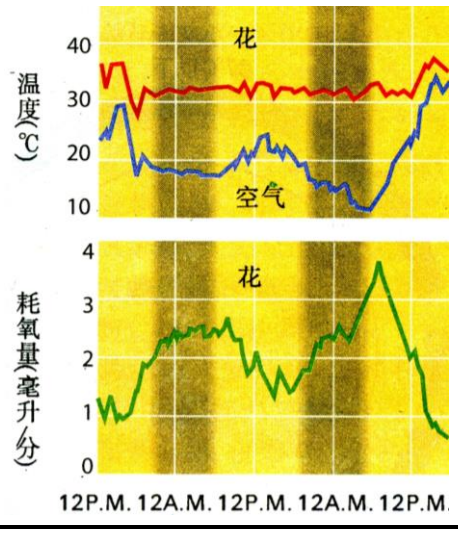
26. 下圖為沙漠鼴鼠(右)和蓮花(左上)的體溫變化圖，以及蓮花的耗氧量(左下)，下列敘述或推論何者正確?

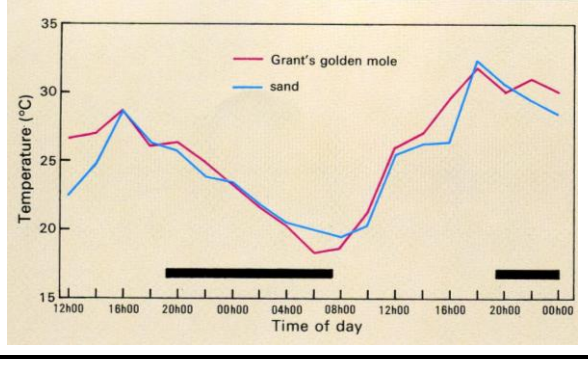
(A)鼴鼠生病了所以體溫上下劇烈變動

(B)蓮花的溫度恆定是因為其周遭的環境溫度恆定

(C)氣溫太高時蓮花就無法維持體溫恆定，這一點和恆溫動物不同

(D)鼴鼠的新陳代謝率會隨著沙地溫度的起伏而上下變化





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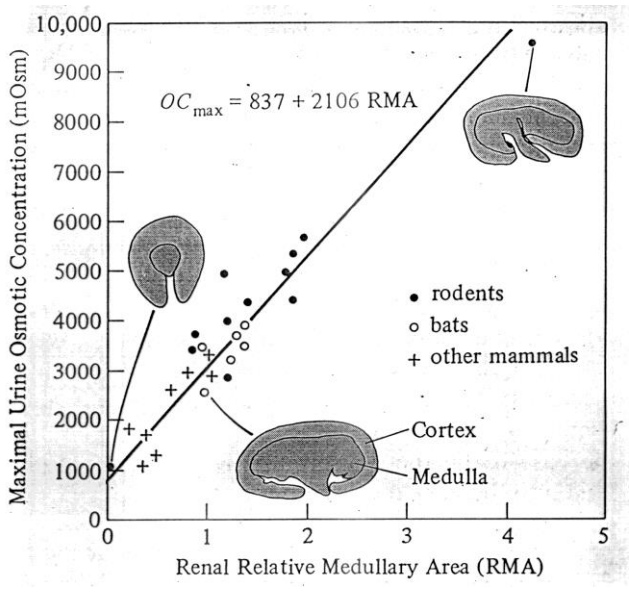
27. 下圖是腎臟髓質部的相對比例和尿液濃度的關係圖，下列敘述何者正確?

(A)尿液濃度除了受髓質部的相對比例影響更受動物親緣類群關係的影響

(B)腎臟髓質部的相對比例愈高代表亨利氏管的長度愈長

(C)腎臟髓質部的相對比例愈高代表鮑氏囊的數量愈多

(D)以上皆是



28. 有關水和滲透壓的敘述何者正確?

(A)水是很好的溶劑是因為它的液態特性

(B)水的比熱很高是因為它的雙極特性並在分子間形成了許多的氫鍵

(C)等透壓就是等張溶液

(D)以上皆是

29. 根據表一和表二的資料選出一個正確的敘述

(A)最早進入淡水的魚類是真骨魚

(B)體液滲透壓和生活在該環境的年代長短無關

(C)隨著年代的演進淡水魚和真骨魚的體液滲透壓會再上升

(D)海水的真骨魚類應該不是一開始就在海裏而是後來才從淡水再進入海洋

表一：淡水魚類的體液滲透壓（mOsm）和進入淡水的最早年代

淡水魚類	滲透壓	年代
淡水魟	680	近代
多鰭魚	200	泥盆紀（古生代中期）
真骨魚	300	白堊紀（中生代末期）
肺魚	250	二疊紀（古生代末期）

表二：各類海洋動物的體液滲透壓以及海水的滲透壓（mOsm）

海洋或動物	海水	軟體動物	甲殼類	軟骨魚類	真骨魚類
滲透壓	1000	1010	1002	1050	330

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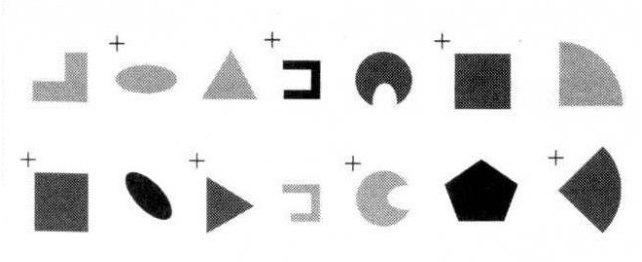
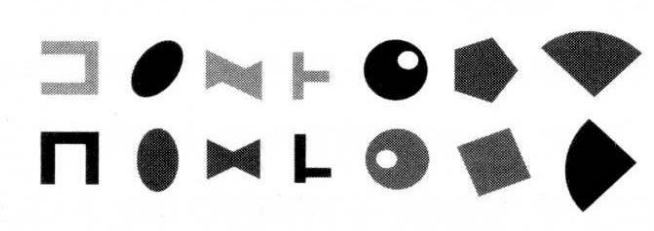
30. 下列敘述何者是視、聽、嗅、味、觸等不同感覺器官的共通特性?
(A)都是特定的受體接受刺激後引發神經衝動，傳到特定中樞神經解碼
(B)引發神經衝動的最低值都非常小
(C)都只能感應一定範圍頻率或強度的刺激
(D)以上都是

31. 脊椎動物從水裡演化上陸的過程中，四隻腳和羊膜是兩個關鍵的構造，下列　　何者不屬於有羊膜的四腳類動物?
(A)蛙類
(B)蛇類
(C)鳥類
(D)哺乳類

32. 科學家測試鴿子是否有歸納的能力?每次用一組的兩個圖形訓練，圖一中左上角有＋號的圖才有食物獎勵(訓練時不會顯示那個＋號)，用圖一的七組圖形訓練一段時間後，改用圖二中配對的兩個圖形測試，結果鴿子都能選對正確的圖形，圖二中上下兩列配對的圖，由左到右，正確的組合是下列何者?
(A)上，下，下，上，下，上，下
(B)下，下，下，上，下，下，下
(C)上，下，下，上，下，下，下
(D)下，下，下，上，下，上，下



圖一



圖二

33. 下列何者是脊索和脊椎動物的差別?
(A)脊椎動物的背部神經索在前端彭大為腦，脊索動物沒有膨大的腦
(B)脊索動物終生有咽鰓裂，脊椎動物只有胚胎時期有
(C)脊椎動物只有脊椎骨沒有脊索
(D)以上皆是

34. 下列何不屬於有顎類的動物?
(A)軟骨魚
(B)硬骨魚
(C)管口魚
(D)文昌魚

※ 試題請隨卷繳回

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35. 根據下表的資料回答 33-34 題，下表為五類脊椎動物在全世界和台灣的種類數以及其相對比例，還有牠們在台灣的特有種數和其佔台灣該類群的比例。

	魚	兩生	爬蟲	鳥	哺乳
世界種類數	20000	3500	10000	9000	4000
台灣種類數	2000	35	150	500	70
比例(%)	10	1	1.5	5.6	1.8
台灣特有種的種類數	--	--	21	15	15
比例(%)	--	--	14	3	21

已知渡海能力的強弱順序為：魚＞鳥＞＞哺乳≧爬蟲＞兩生類。下列有關台灣各類群脊椎動物佔世界的比例的推論哪個合理？

(A)與其演化的先後順序有關

(B)與其受地理隔離的程度有關

(C)與其生存環境是否為水有關

(D)以上皆是

36. 承續上題的資料，有關台灣特有種的推論何者正確？

(A)特有種的比例應該是，兩生＞魚＞哺乳

(B)特有種的數目應該是，兩生＞哺乳＞魚

(C)特有種的比例應該是，兩生＞哺乳＞魚

(D)特有種的數目應該是，兩生＞魚＞哺乳

37. 生活在水裏和陸上的脊椎動物，其運動、骨骼結構、和攝食方式都不同，而這些不同都和水以及空氣的下列何者差異有關?

(A)比熱

(B)化學特性

(C)密度

(D)以上皆是

38. 胸帶和腰帶是脊椎動物演化到陸上的重要構造，魚類的腰帶只有一片骨頭，四腳類的腰帶則由三片骨頭形成，以下的敘述何者正確?

(A)恥骨是形成腰帶的骨頭之一

(B)附著在腰帶的骨頭是肱骨

(C)附著在胸帶的骨頭是橈骨

(D)以上皆是

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39. 根據下表的資料選擇一個正確的論述

(A)在空氣中要獲得氧氣遠比水中容易，但魚鰓在陸上會乾燥無法獲得足夠的氧氣，所以會窒息死亡

(B)在空氣中要獲得氧氣遠比水中容易，但魚的鰓絲在陸上會黏合，表面積降低太多無法獲得足夠的氧氣，所以會窒息死亡

(C)在水中要獲得氧氣遠比空氣中容易，所以魚在陸上會窒息死亡

(D)魚不是窒息而死，是因為脫水或腦震盪而死

氧氣含量在水和空氣中的比較

	介質		
	水	空氣	水中：空氣中
氧氣濃度(L/L)	0.007	0.209	約1：30
密度(kg/L)	1	0.0013	約800：1
動態黏度(cP)	1	0.02	約50：1
擴散係數(cm^2/s)	0.000025	0.198	約1：8000
含1公升氧氣的介質體積(L)	143	4.8	約30：1
含1公升氧氣的介質重量(KG)	143	0.0062	約23,000：1

資料來源：Schmidt-Nielsen, K. 1997 Animal Physiology - Adaptation and environment. Published by Cambridge University Press.

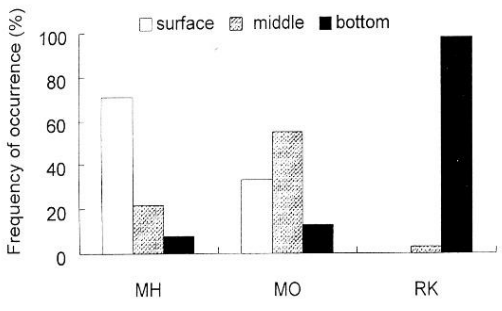
40. 下左圖為 MH、MO 和 RK 三種蝌蚪在不同水層停留的時間比例，下右圖中 a、b、c 三種蝌蚪為牠們的形態，以下的敘述何者正確?

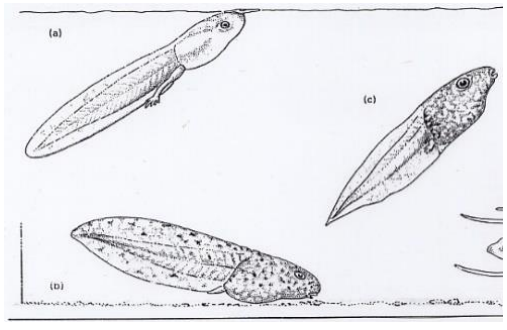
(A)MO 是蝌蚪 a

(B)MH 的比重大於 MO

(C)RK 的比重大於 1 而 MO 的比重等於 1

(D)以上皆是





41. 下列何種生殖形式較符合雄蛙很快速的求偶鳴叫策略？

(A)生殖季很長

(B)生殖場所很集中

(C)生殖季的溫度較高

(D)雌蛙的密度較低

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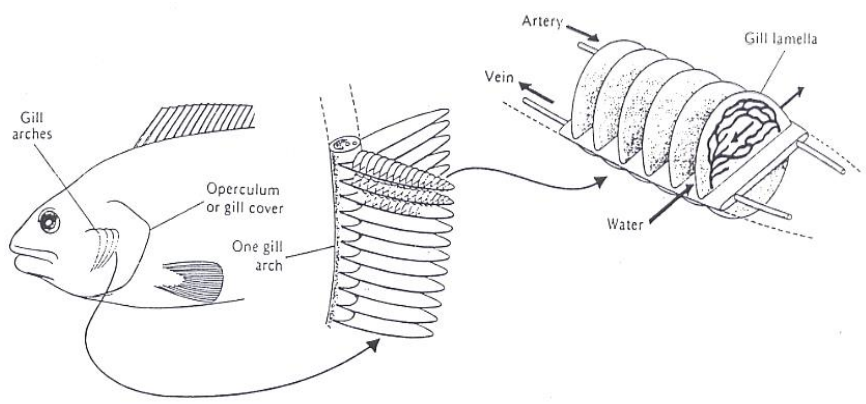
42. 請根據下圖回答 42-43 題，下圖為魚鰓的構造和水流的路徑，請問魚和人的呼吸差異為何?

(A)魚鰓有對流交換系統，人的肺沒有

(B)水流經鰓絲上的葉片(lamella)是單行道，空氣在肺泡和氣管是雙向道

(C)鰓和肺增加其表面積的方式不一樣，鰓是向外凸出而肺是向內凹入

(D)以上皆是



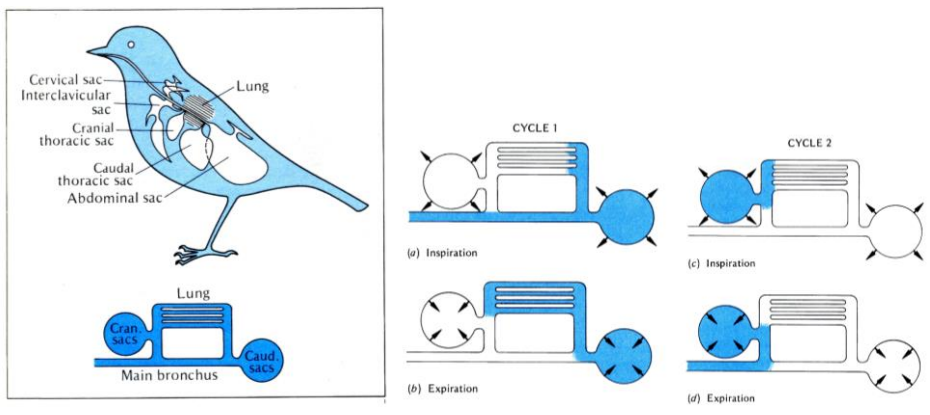
43. 鳥類的呼吸系統有許多表面光滑沒有血管的氣囊，下圖為鳥類呼吸時的空氣流徑，請問魚、鳥和人的呼吸敘述何者正確?

(A)氧氣交換的效率最差的是鳥類因為要有兩次的呼吸才經過肺一次

(B)帶有氧氣的介質在呼吸器官內的流徑鳥類較像人類

(C)帶有氧氣的介質在呼吸器官內的流徑鳥類較像魚類

(D)氣囊應可以進行氧氣的吸收和二氧化碳的排除



44. 穴居的爬行動物，其形態上有何適應的趨勢？

(A)體型變小

(B)尾巴變短或變鈍

(C)眼睛變小

(D)以上皆是

45. 爬蟲類開始產生了什麼重要的構造，讓牠們可以完全離開水而生活？

(A)角質層

(B)羊膜

(C)鱗片

(D)以上皆是

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46. 海龜為何常有流淚的行為？
(A)感恩放生的人類
(B)排除體內過多的鹽類
(C)海水刺激眼睛
(D)保持眼睛潮溼

47. 以下哪兩個類群是在不同的分類位階(界、門、綱、目、科、屬、種)上？
(A)兩生和爬蟲類
(B)龜鱉和鱷類
(C)鱷類和蛇類
(D)蛇類和蜥蜴類

48. 以下哪個是蛇和蛇蜥的差別？
(A)蛇無外耳孔，蛇蜥有外耳孔
(B)蛇最多只有一列腹鱗，蛇蜥有好幾列的腹鱗
(C)蛇的尾巴長度比蛇蜥的短很多
(D)以上皆是

49. 以下哪個外來種蜥蜴已入侵台灣南部並危害農作物？
(A)沙氏變色蜥
(B)美洲綠鬣蜥
(C)多線南蜥
(D)庫氏南蜥

50. 以下哪個是鳥類減輕重量的適應機制？
(A)骨骼結構特殊或減少骨骼
(B)器官減少或不用時可以萎縮至很小
(C)排遺或代謝廢物不堆積
(D)以上皆是

51. 有關於哺乳類的角，何者正確？
(A)所有的角分為髮角、鹿角和洞角三類
(B)犀牛和牛的角是中空的洞角
(C)鹿角每年會掉落重新再長而且只有雄性有角
(D)以上皆是

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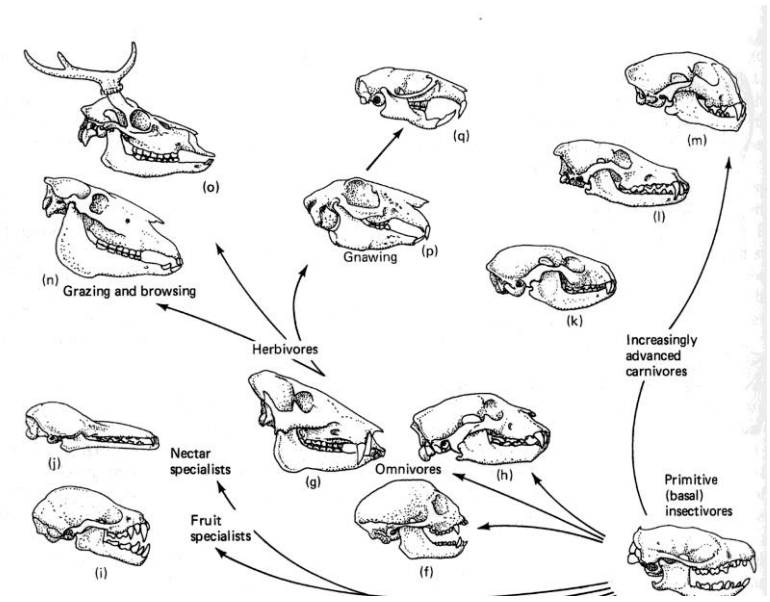
52. 下圖顯示草食和肉食獸的頭骨演進方向，何者正確？

(A)草食獸的口吻部拉長，有利於深入草叢吃草

(B)肉食獸的臉部扁平兩眼接近同一平面，有利於距離的判斷

(C)肉食獸的下顎骨大面積與頭骨相嵌，避免下顎左右移動，口中獵物逃脫

(D)以上皆是



53. 哺乳類的重要特徵是具有乳腺、毛髮和分化的牙齒，但有些哺乳類例外，下列何者正確？

(A)鯨類和雄性有袋類缺乏乳腺

(B)鯨類和貧齒類缺乏毛髮

(C)鯨類和鱗甲類的牙齒沒有分化

(D)以上皆是

54. 哺乳類因為哺乳而衍生了什麼特有的特徵？

(A)臉部有表情

(B)內鼻孔向後延伸

(C)雌性的脂肪含量增加

(D)以上皆是

55. 哺乳類的乳汁成份中，脂肪和水份是兩個主要的成份，已知下列動物的脂肪和水份百分比分別是：牛(19：80)、海豹(65：33)、沙漠跳鼠(68：30)、人(18：80) 、北極熊(25：72)、海象(73：25)、沙漠大耳狐(63：34)。有關於哺乳類的乳汁成份何者正確？

(A)寒冷地區的哺乳類其乳汁富含脂肪

(B)淡水取得不易的環境其乳汁中水份較少

(C)幼獸需要快速成長的種類其乳汁富含脂肪

(D)以上皆是

56. 下列何者是人類獨有，其他動物沒有的特質？

(A)創造使用文字

(B)具備自我意識

(C)擁有道德觀念

(D)以上皆是

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57. 五次生物大滅絕中，以二億四千五百萬年前，二疊紀至三疊紀之間的大滅絕最為顯著，估計當時約有 76%至 96%的生物物種滅絕。二疊紀末所有的陸塊匯集在一齊，此一狀態和今日的何種情況類似？
(A)外來種入侵
(B)地震海嘯
(C)海平面上升
(D)環境破壞

58. 下列各生態系的描述何者錯誤？
(A)海洋生態系中，遠洋區的範圍較沿岸區大，但其生物的種類數卻較少
(B)溪流上游生態環境的主要能量來源靠浮游植物的光合作用
(C)河口生態系的營養鹽豐富，生產力非常高
(D)芒草是台灣草原生態系的主要植物

59. 下列有關環境與生態的敘述何者錯誤？
(A)生態系內元素會循環利用，但能量只會隨各食物階層逐漸流失
(B)生態系食物階層愈高的種類，其總能量愈小
(C)物理環境許可時，草原生態系會演替成森林生態系
(D)族群是由許多不同種類的生物組成的團體

60. 下列哪個免疫細胞可以記憶外來的細菌、病毒或毒素，並在身體第二次被感染時快速的產生防禦的功能？
(A)巨噬細胞
(B)T 細胞
(C)嗜中性白血球
(D)肥大細胞

61. 以下關於寄生蟲或傳染性病源和宿主的關係何者正確？
(A)傳染性病源對於宿主的危害程度愈低，愈有利於自己基因的擴散
(B)公共衛生愈好的環境，致病菌或病毒往溫和不致命的方向演化愈慢
(C)寄生蟲對於長久關係的最終宿主的危害程度常大於非長久關係的宿主
(D)以上皆是

62. 動物的壽命常和體重呈正相關，但有些動物比預期的還長壽，例如人、刺蝟、蝙蝠、烏龜等，下列何者正確？
(A)人因為醫藥發達而延長了最長壽命的年限
(B)烏龜因為新陳代謝率低而延長了壽命
(C)體重愈長壽命愈長的原因和刺蝟以及蝙蝠長壽的原因相同
(D)以上皆是

63. 下列何種外來種植物不但入侵台灣還會對人體產生危害？
(A)銀膠菊
(B)銀合歡
(C)大花咸豐草
(D)小花蔓澤蘭

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64.下列何種化合物成分是植物類中藥材的有效成分？

(A)生物鹼

(B)糖苷

(C)多酚和萜烯

(D)以上皆是

請根據以下的短文回答問題 65-69

深海環境沒有藻類行光合作用（photosynthesis）提供食物，所有的食物都由上層沉降下來的有機物質，包括海洋生物微細殘骸的海雪（marine snow）及所有動植物的屍體。因食物少，故深海魚的攝食相關構造經常很發達，而且活動緩慢以便節省能量的支出。然而 1977 年深海潛艇愛文號(Alvin)，在加拉巴哥群島 2500 公尺深處，意外發現一個生意盎然的熱泉生態系後，深海生態系一再顛覆科學家的傳統認知。

巨型管蟲是深海熱泉附近最重要的生物之一，牠們無口、無消化道、無肛門，體內有大量互利共生的嗜硫細菌，嗜硫細菌約佔體重的三分之一。管蟲紅色的羽狀組織中含有血紅蛋白。血紅蛋白和硫化氫以及氧氣結合，並且轉移給體內的細菌。細菌則回饋管蟲含有碳水化合物的養分。2005 年科學家又在墨西哥海岸附近 2,500 公尺深海底發現有依賴光線存活的細菌存在。這些綠硫菌門的細菌擁有光吸收蛋白，可以利用熱泉發出的微光來進行光合作用。

另一個生意盎然的深海生態系是鯨落（Whale Fall），夏威夷大學研究人員在 1988 年發現北太平洋深海中，至少有 43 個種類的 1 萬多個生物體是依靠鯨落生存。當鯨魚死去沉入數千米的海底，成為許多生物賴以維生的食物，造成海洋荒漠中的綠洲。起初由移動的食腐動物，如：盲鰻、睡鯊、深海魚類等先吃掉 90%的軟組織。接著輪到多毛類和甲殼類小型生物等寄生在殘餘鯨落身上，此外，還有許多肉眼看不到的微生物也會蠶食殘渣。最後只剩骨架的鯨屍釋放硫化氫，並開始提供能量給化能自養生物（chemoautotroph）。一頭大型鯨落形成到完全被分享殆盡，可長達幾十年甚至上百年。

65.在生態功能上深海熱泉中的管蟲相當於下列何者?

(A)環節動物

(B)軟體動物

(C)真菌蕈類

(D)綠色植物

66.在生態功能上深海熱泉中的嗜硫細菌相當於下列何者?

(A)綠色植物

(B)分解菌類

(C)葉綠體

(D)粒線體

67.深海熱泉(甲)和鯨落(乙)生態系最正確的差別是下列何者?

(A)甲的能源是熱泉的化合物或光線，乙的能源是太陽的光線

(B)甲沒有腐蝕者，乙沒有分解者

(C)甲有生產者，乙沒有生產者

(D)甲可以持續不斷，乙最多只能維持百年

※ 試題請隨卷繳回

亞洲大學

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68. 已知乳酸去氫酶(lactate dehydrogenase) 的活性愈高時動物的耗氧量也愈高，下圖是各種魚類捕獲的最淺深度和牠體內乳酸去氫酶的活性關係，則本圖的趨勢和原因最正確的為何?

(A)生活在愈深的魚，其耗氧量愈低，可能因活動性較低

(B)生活在愈深的魚，其耗氧量愈低，可能因水中溶氧很低

(C)生活在愈深的魚，其耗氧量愈低，可能因水中壓力很大

(D)生活在愈深的魚，其耗氧量愈低，可能因水中漆黑一片

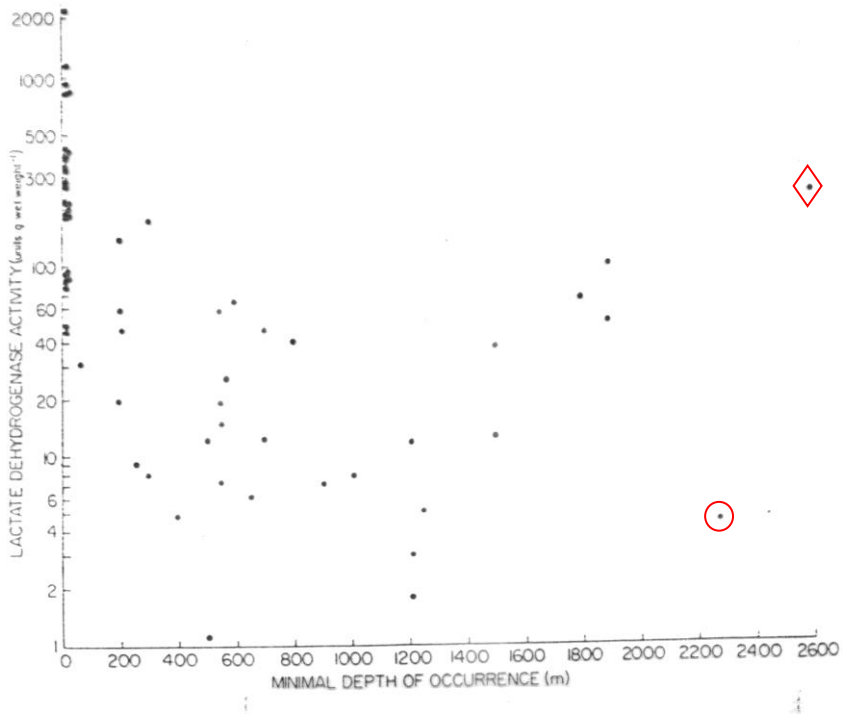
69. 圖中菱形內的魚(甲)和圓形內的魚(乙)，其比較描述何者正確?

(A)甲是深海鯨落，乙是深海熱泉生態系的魚類

(B)甲是一般深海，乙是深海鯨落生態系的魚類

(C)甲是深海熱泉，乙是一般深海生態系的魚類

(D)甲是一般深海，乙是深海熱泉生態系的魚類



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請根據以下的短文回答問題 70-77

全世界有一百萬種以上的動物，只有鳥類和哺乳類是溫血動物，牠們合起來還不到一萬五千種，其他絕大多數的動物都屬於冷血動物。鳥類和哺乳類的表皮特化成羽毛或毛髮，這些構造可以在其間形成一層不流動的空氣，而空氣正是傳導熱能最差的導體之一。具有羽毛或毛髮的動物，藉其形成的空氣層便有助於熱能的保存，使熱不易流失到環境中。除了表皮特化的構造外，溫血動物的新陳代謝速率也遠大於冷血動物，高的新陳代謝率會產生較多的熱能，再加上有防止熱能散失的構造，這兩個特點是演化成溫血動物的重要條件。

從能量利用的角度來看，冷血動物是非常有效的一群，由於牠們的新陳代謝率低，所以浪費掉的熱能也很少，一般來說，從攝入的食物中，溫血動物只能轉換 2%左右的能量成為自己的體質，而冷血動物的轉換率多在 50%左右，這樣的特性使牠們可以充分的將食物轉換成生長或生殖上所需的物質。當食物不足時，牠們耐飢餓的能力也遠大於溫血動物，尤其在食物來源很不穩定或食物每年只短暫出現一次的環境，冷血動物仍可以生存，但溫血動物就不一定能撐得下去。在體型的變化上，冷血動物也幾乎沒有限制，不管是在大小的尺度上或體型的變化上，牠們都可以充分發揮。相對的，溫血動物的體型大小有明顯的限制，形狀上也不可能太細長或扁平，因為愈偏離圓形，相對的表面積就愈大，體溫和能量的散失也愈快。這些特別小、扁或細長的體型，讓冷血動物更能充分利用生態系的不同區位，也豐富了地球的生物多樣性。

已知爬行動物約出現在古生代的上石炭紀，並在中生代稱霸地球，而哺乳類約出現在中生代並在新生代時達到非常興盛的狀態。研究人員在古生代的岩層中發現一些掠食者和被掠食者的骨骼化石，經估算各自的體重後，算出掠食者的總體重和被掠食者的總體重比值為 50:100。另外他們在新生代的岩層內也找到許多哺乳類的化石，用同樣的方法，他們估算出掠食者哺乳類和被掠食者哺乳類的總體重比值為 2:100。

70. 下列何者是冷血動物的生存優勢？
(A)耐飢餓的能力強，較容易生存在食物不穩定的環境
(B)食物的轉換效率高
(C)體型的變化較大
(D)以上皆是

71. 四隻體型和性別一樣的蜥蜴，兩隻穿上合身特製的毛線衣，一隻放在太陽下(甲)，另一隻放在陰涼處(乙)，另外兩隻沒有穿毛線衣也將牠們分別放在太陽下(丙)和陰涼處(丁)，一小段時間後測量體溫，何者的體溫最高？
(A)甲
(B)乙
(C)丙
(D)丁

72. 一個池塘生態系內，其初級、次級和三級消費者分別是浮游動物、蝦蟹和魚類，則初級、次級和三級消費者三者之間的總體重比應最接近：
(A)1:10:100
(B)1:50:500
(C)100:50:25
(D)100:50: 1

73. 深海熱泉(甲)、熱帶雨林(乙)和沙漠(丙)生態系的消費者能量金字塔，它們的底角大小順序應如何？
(A)甲＞乙＞丙
(B)甲＞丙＞乙
(C)乙＞丙＞甲
(D)乙＞甲＞丙

※ 試題請隨卷繳回

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74. 假如地球上現生的生態系，消費者能量金字塔的底角為 60°，則地球在古生代的生態系中，消費者能量金字塔的底角應如何？

(A)＝60°

(B)＞60°

(C)＜60°

(D)＜60°但＞10°

75. 某個農場養殖一群老鼠和蜥蜴，如果飼料的消化吸收率相當，在各自吃掉 10 公斤的飼料後老鼠和蜥蜴各增加了多少的重量?

(A)老鼠 200 公克 蜥蜴 5 公斤

(B)老鼠 2 公斤　 蜥蜴 5 公斤

(C)老鼠 200 公克 蜥蜴 2 公斤

(D)老鼠 2 公斤　 蜥蜴 4 公斤

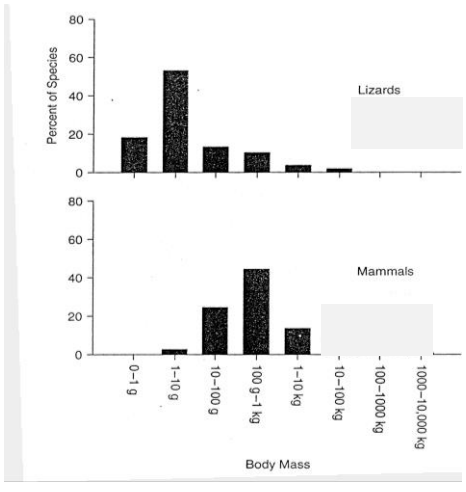
76. 下圖為甲(上圖)和乙(下圖)兩類動物的體重範圍和各體重間距內的種類數百分比，下列敘述何者錯誤?

(A)甲的種類數最多的體重間距是 1 至 10 公克

(B)乙的體重不可能太小

(C)甲是冷血動物

(D)甲是哺乳類



甲圖

乙圖

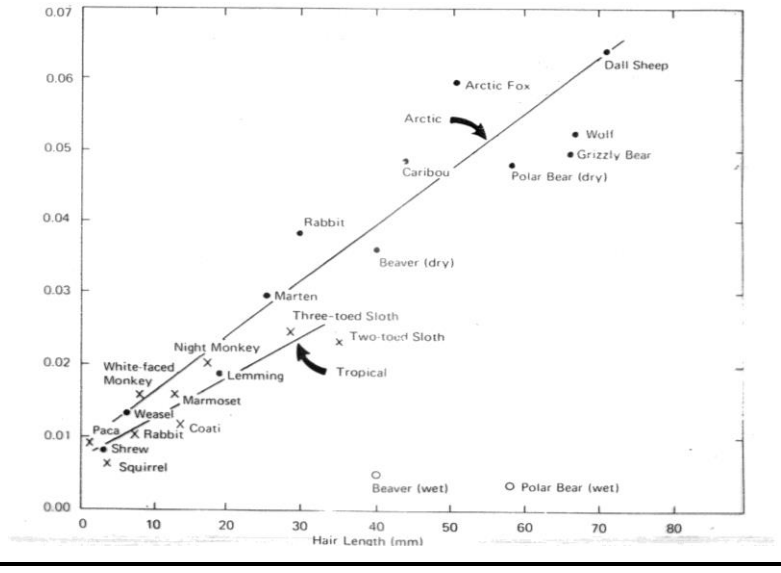
77. 下圖為動物的毛髮長度和絕緣係數的關係圖，下列敘述何者錯誤?

(A)生活於極地的動物其毛髮的長度大多比熱帶動物的長

(B)絕緣係數只受毛髮長度的影響

(C)濕掉的毛髮其絕緣係數會降低非常多

(D)某些熱帶動物的毛髮長度會比極地動物還長



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請根據以下的短文回答問題 78-80

當爬行動物學者愈深入瞭解時，愈發現所謂卵胎生和胎生的區隔並不清楚，因為整個的過程其實是一個連續的變化。一開始只是受精卵延長在母體內的逗留時間，接著逗留更久，但畢竟其卵黃的量相當多，所以尚可自給自足，隨後有些種類的卵黃已明顯的變少，如果沒有從母體獲得養分，可能無法發育完成幼體。後來更發現有些蜥蜴和蛇也有類似胎盤的構造，因此要界定一種爬行動物是卵胎生或胎生並不容易，即使沒有養分供給構造，也不能保證胚胎真的沒有從母體獲得養分。實驗發現，有些種類若從母體內注入特定的電解質，很快的就能在胚胎體內找到這些電解質，顯然不一定要有胎盤的構造，母體才能將養分傳給胚胎。

早在 1952 年便有學者提出廢棄卵胎生(ovoviviparity)的建議，這樣的看法後來又陸續受到其他學者的支持，所以在 1970 年當爬行動物學者在整理爬行動物的生殖方式時，便只以胎生(viviparity)和卵生(oviparity)這兩種生殖方式來稱呼。目前被認定的卵生是指幼體一出母體時尚有卵殼，且通常還需一個月以上或大多在數月後才能孵化者；而胎生則是指幼體一出母體時，胚胎已完全發育好，有時剛出生的幼體會包覆在薄薄的膜內，數天後才出來，有時在母體內或一出生即破膜而出。

爬行動物現生的四個目：龜鱉目、喙頭目、鱷魚目和有鱗目，前三個目都是卵生種類，唯獨有鱗目具有胎生的方式。有鱗目的種類數佔了整個爬行動物的 96%以上，約有 1/5 的有鱗目是胎生的，而卵生的種類又大多會保留受精卵在母體內，受精卵在體內的時間常佔整個發育期的一半左右，所以大多數的爬行動物都有朝向胎生演化的現象。然而胎生並不一定優於卵生，胎生的好處是胚胎可以受到較完善的保護，例如減少略食者的捕食和真菌的感染，或改善胚胎發育的環境，如水份和溫度的恆定性更好。但是將胚胎放在母親的體內顯然會增加母親的負擔，當胚胎在雌體內的時間延長時，雌體能順利攝食的時間便縮短，可以再生一胎的機會也變小，而懷孕時增加的體重會降低其爬行的速度，所以被天敵捕殺的機會也可能上升。

78. 下列有關卵胎生與胎生的敘述何者錯誤？

(A)依照舊的定義，有些蛇和蜥蜴會包含胎生和卵胎生以及難以界定的種類

(B)大多數的爬行動物都有朝向胎生演化的現象，因為胎生較有利於生存

(C)卵胎生在爬行動物已經都改稱為胎生

(D)爬行動物的四個目中只有有鱗目具有胎生的種類

79. 下列的敘述何者正確？

(A)卵生是較原始的生殖方式，所以有鱗目是爬行動物中最進化的類群

(B)母體必須透過胎盤或類似的構造才能將養份傳給胚胎

(C)卵生的胚胎存活率應高於胎生的胚胎

(D)卵生的母體能攝食的時間較長

80. 下列的推論何者不正確？

(A)毒蛇的胎生比例應高於無毒蛇，因為毒蛇較晚才演化出來

(B)海生的爬蟲類胎生的比例應該較高

(C)海龜的蛋孵化時不能被轉動且溫度恆定只會產生單一性別，因此不利於演化為胎生

(D)生活在寒冷地區的爬行動物較會演化出胎生的生殖方式

※ 試題請隨卷繳回