

下列單選題每題 2 分，答錯者倒扣 0.5 分。(50 分)

1. metabolism 是指生物 (a) 將體內之廢物或過多的物質排出 (b) 因生長，維持或修補之化學作用 (c) 氧化物質之化學作用 (d) 以上皆非。
2. photosynthesis 之 light-independent reaction 之進行是在 (a) thylakoid (b) thylakoid membrane (c) stroma (d) 以上皆非。
3. C_4 pathway 之植物較 C_3 pathway 有利是因為 (a) 耗能低 (b) 耐低溫 (c) 生長快 (d) 以上皆非。
4. Monera 之生物有 (a) green algae (b) blue green algae (c) brown algae (d) red algae
5. bacteria 之有性生殖法中那一種須要 bacteriophage 之協助 (a) transformation (b) transduction (c) conjugation (d) 以上皆非。
6. Protista 生物是屬於 (a) multicellular eukaryotes (b) multicellular prokaryotes (c) unicellular or colonial eukaryotes (d) unicellular or colonial prokaryotes
7. 可固氮之藻類是 (a) green algae (b) blue green algae (c) brown algae (d) red algae
8. 烏賊是屬於 (a) Mollusca (b) Annelida (c) Arthropoda (d) 以上皆非。
9. 肌肉收縮時所需要的鈣離子的產生是在 (a) Sarcoplasm (b) sarcoplasmic reticulum (c) sarcolemma (d) 以上皆非。
10. 小腸上之 microvilli 之功能為 (a) mesentery (b) increase the surface area (c) secretion (d) 以上皆非。
11. 將 peptides 分解為 free amino acid 之酶為 (a) pepsin (b) Endopeptidases (c) Exopeptidases (d) 以上皆非
12. glycerol, amino acid 變為 glucose 之作用為 (a) glycolysis (b) glycogenolysis (c) glycogenesis (d) 以上皆非。
13. 某些動物可將代謝廢物形成 uric acid，下面那一個原因為錯誤 (a) 節省能量 (b) 節省須水量 (c) 直接產生 (d) 以上皆非。

14. 血液進入腎臟可將廢物濾出之部位稱 (a) efferent arteriole (b) glomerulus (c) Bowman's capsule (d) 以上皆非。
15. countercurrent mechanism 在腎臟中之作用是 (a) 吸收水 (b) 濃縮尿 (c) 主動運輸排出廢物 (d) 節省能量下再吸收離子。
16. mesoderm 可形成 (a) muscles (b) nervous system (c) respiratory system (d) nails.
17. evolution 與下列何者意義不同：(a) 單一突變因子所造成 (b) 天擇之結果 (c) 適生的後代生存力強 (d) 適應之結果。
18. 研究某一棲息環境中各種族群組成的集團之關係是為 (a) community (b) population (c) synecology (d) Ecology.
19. 研究生物與自然環境、生物環境相互關係的科學 (a) community (b) Ecosystem (c) synecology (d) Ecology.
20. $80S$ 之核糖體，其 S 是表示 (a) 分子量 (b) 沉降率 (c) 重量 (d) 運動速率。
21. omnivores 是 (a) 肉食性動物 (b) 草食性動物 (c) 雜食性動物 (d) 寄生性動物。
22. continental slope 是指 (a) 山之斜坡 (b) 沿岸斜坡 (c) 大陸棚斜坡 (d) 珊瑚礁斜坡。
23. 何謂 essential amino acid (a) 在水果及蔬菜中缺少者 (b) 通常存在蔬菜中較肉類多 (c) 僅存在人類之蛋白質中 (d) 動物本身無法合成，須來自於食物。
24. bone 上的 Haversian canal 是指 (a) marrow cavity 之導管 (b) spongy bone 上之空隙 (c) compact bone 上之同心圓中心導管 (d) osteocytes 之聯絡管。
25. salivary gland 所分泌之酵素為 (a) pepsin (b) amylase (c) trypsin (d) lipase.

一、生物生殖的系統有那幾種？(10分)

二、詳述細胞骨骼 (cytoskeleton) 的種類、構造、功能。(15分)

三、ATP在細胞的作用為何？(10分)

四、給圖說明 neurolypophysis 和 adenolypophysis。(10分)

五、影响L-半血糖的荷爾蒙有那些？(5分)

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1~30 題每題 3 分，31~35 題每題 2 分。答錯每題倒扣 2 分。

1. A sample of pure ice water (containing solid ice at 0°C, the melting point) is an example of a
 - a. heterogeneous mixture
 - b. homogeneous mixture
 - c. heterogeneous substance
 - d. homogeneous substance
 - e. none of these
2. If two samples labeled "NaCl" are analyzed and found to contain different percentages of chlorine, which of the following is probably true?
 - a. There must be at least two different compounds with the formula NaCl.
 - b. The two samples must have been from different origins.
 - c. The ratio of the two different chlorine percentages must result in a small integer value.
 - d. At least one of the samples must not be pure.
 - e. None of these.
3. Which one of the following could not be an empirical formula?
 - a. $C_{17}H_{25}NO_3$
 - b. $C_{14}H_{10}CuO_4$
 - c. $C_9H_{15}N_3O_6$
 - d. $C_8H_{18}O_3$
 - e. All of these could be empirical formulas.
4. The outermost electrons of an atom determine most of its chemistry, because those electrons are
 - a. more negatively charged due to their distance from the center.
 - b. more shielded from the effects of approaching atoms.
 - c. more strongly affected when other atoms approach.
 - d. All of these are correct.
 - e. None of these is correct.
5. Which of the following Lewis structures can be drawn as two or more resonance forms?
 - a. $\begin{array}{c} \cdot\cdot\cdot\cdot \\ \cdot\cdot \\ \text{O}=\text{O}-\text{O}: \\ \cdot\cdot\cdot\cdot \end{array}$
 - b. $\begin{array}{c} \cdot\cdot \\ \text{[:N}\equiv\text{N}-\text{N:}]^- \\ \cdot\cdot \end{array}$
 - c. $\begin{array}{c} \cdot\cdot\cdot\cdot \\ \text{[:O}-\text{N}=\text{O:}]^- \\ \cdot\cdot \end{array}$
 - d. all of these
 - e. none of these
6. The formation of an aqueous solution of an ionic compound requires that the attractions between the water molecules and the ions are strong enough to replace the
 - a. bonds normally found within the water molecule.
 - b. covalent bonds between atoms of the ionic compound.
 - c. electrical attractions between the ions in the ionic compound.
 - d. All of these are correct.
 - e. None of these is correct.
7. Which of the following can serve as a Lewis acid?
 - a. NH_3
 - b. Cl^-
 - c. $AlCl_3$
 - d. all of these
 - e. none of these

1~30 題每題 3 分，31~35 題每題 2 分。答錯每題倒扣 2 分。

8. Which of the following would be expected to have the highest normal boiling point?
- I₂
 - ICl
 - HI
 - KI
 - cannot be predicted
9. Which of the following represents the most general definition of a solution?
- a homogeneous mixture formed by adding a solid to a liquid
 - a homogeneous mixture of two or more substances
 - a homogeneous mixture formed by adding one or more solids to a liquid
 - a homogeneous mixture formed by dissolving any gas, liquid, or solid in a liquid
 - None of these definitions is truly general.
10. The vapor pressure of a dilute solution of a nonvolatile solute is
- greater than that of the pure solvent.
 - less than that of the pure solvent.
 - equal to that of the pure solvent.
 - equal to that of the pure solute.
 - none of these
11. As the equilibrium state of a chemical reaction is approached,
- the rate of the forward reaction approaches zero.
 - the rate of the backward reaction approaches zero.
 - the rates of the forward and backward reactions approach the same value.
 - Both a and b are correct.
 - none of these
12. A weak acid is characterized by
- a K_a with a value smaller than one.
 - a pK_a with a value larger than zero.
 - a substantial quantity of undissociated acid in aqueous solution.
 - all of these.
 - none of these.
13. In many ways, the properties of dissolution-precipitation equilibria closely parallel those of vaporization-condensation equilibria. For example, the case of a vapor present in a closed container in the absence of the condensed phase is analogous to
- a saturated solution.
 - a supersaturated solution.
 - an unsaturated solution.
 - a concentrated solution.
 - none of these
14. For $\text{CaF}_2(\text{s})$, $K_{\text{sp}} = 3.9 \times 10^{-11}$. As the pH is lowered, K_{sp} for CaF_2 in water should
- increase.
 - decrease.
 - remain constant.
 - This cannot be predicted.
 - none of these.
15. The First Law of Thermodynamics is the law of
- conservation of energy
 - conservation of matter
 - conservation of enthalpy
 - All of these are involved.
 - none of these

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16. In a bomb calorimeter, reactions are carried out
- at fixed pressure.
 - at fixed volume.
 - at fixed temperature.
 - in the liquid and solid states only.
 - All of these are true.
17. Which one of the following elements is not in its standard state?
- $F_2(g)$
 - $H_2(g)$
 - $O_3(g)$
 - $Hg(l)$
 - $I_2(s)$
18. Which of the following is an example of a process which cannot occur spontaneously?
- Gaseous hydrogen and oxygen react to form water when ignited with a spark.
 - $NaCl(s)$ crystallizes out of a supersaturated $NaCl(aq)$ solution.
 - Heat flows from a cold object to a hot object when the two are placed in contact.
 - All of these processes can occur spontaneously under suitable conditions.
 - None of these can occur spontaneously.
19. If ΔS_{univ} is positive for a process, the process is _____, if ΔS_{univ} for a process is negative, the process is _____, and if the ΔS_{univ} accompanying a process is zero, the process is _____.
- at equilibrium, spontaneous, impossible
 - impossible, spontaneous, at equilibrium
 - spontaneous, at equilibrium, impossible
 - spontaneous, impossible, at equilibrium
 - none of these
20. Which of the following statements is not true concerning ozone?
- It is an allotrope of oxygen having the formula O_3 .
 - It is a stronger oxidizing agent than O_2 .
 - It is a stronger oxidizing agent than H_2O_2 .
 - It is a more effective oxidizing agent in basic solution than in acidic solution.
 - All of these statements are true.
21. Reaction rates can change with
- temperature.
 - the addition of a catalyst.
 - reactant concentrations.
 - all of these
 - none of these
22. The rate law relates the rate of a chemical reaction to
- the concentrations of reactants.
 - the reaction mechanism.
 - the activation energy.
 - the temperature.
 - all of these
23. In a living organism, the ^{14}C concentration
- continually increases.
 - continually decreases.
 - remains approximately constant.
 - varies unpredictably during the lifetime of the organism.
24. The property that is common to all wave phenomena is
- the necessity of a medium for propagation.
 - a fixed velocity of propagation, independent of medium.
 - the oscillatory variation of some property with time, at a fixed location in space.
 - all of these
 - none of these

25. In the Bohr model of the one-electron atom, the electron travels in fixed orbits, the radii of which _____ as the principle quantum number n increases and _____ as the nuclear charge Z increases.
- increase, increase
 - increase, decrease
 - decrease, increase
 - decrease, decrease
 - The radii of the Bohr orbits are all equal to the Bohr radius, a_0 .
26. Generally, there is a decrease in atomic size as one moves
- down a group
 - up a group
 - from left to right across a period
 - from right to left across a period
 - both b and c
27. Molecular oxygen has _____ unpaired electrons and therefore is _____
- 0, diamagnetic
 - 1, paramagnetic
 - 2, paramagnetic
 - 3, paramagnetic
28. The species bonded to the central atom in a coordination complex are called
- coordinants
 - complex ions
 - Lewis acids
 - chelates
 - ligands
29. Solids with long-range microscopic order in their structures are called
- amorphous.
 - crystalline.
 - glasses.
 - metals.
 - none of these
30. In a face-centered cubic lattice, each lattice point located in a side of the unit cell is shared equally with _____ other unit cells.
- 1
 - 3
 - 5
 - 7
 - none of these
31. A sample of pure silicon is doped with equal molar amounts of gallium and arsenic. The resulting material is
- an n-type semiconductor
 - a p-type semiconductor
 - an np-type semiconductor
 - a metallic conductor
 - none of the above
32. Which of the following is not a possible way to dispose of the by-products of a chemical process?
- sell them as starting materials for another process
 - recycle them into the original process
 - bury them in an approved land-fill
 - ship them abroad for burial
 - all of the above are possible
33. Large amounts of sodium carbonate are essential in which one of the following industries?
- glass
 - steel
 - fertilizer
 - paint
 - petrochemical
34. In addition polymerization, the reaction to form a polymer chain occurs
- by splitting out small molecules
 - without net loss of atoms
 - by forming an initiator
 - without need for initiation
 - none of the above
35. All graft copolymers are
- random copolymers
 - straight-chain polymers
 - block copolymers
 - cross-linked polymers
 - branched-chain polymers