

元智大學 100 學年度研究所 碩士班 招生試題卷

系(所)別： 化學工程與材料  
科學學系碩士班

組別： 不分組-選考 A

科目： 科技英文

用紙第 1 頁共 3 頁

● 不可使用電子計算機

Choose the answer to complete each of these sentences (2 points per question)

- Which of the following organic molecules is a major storage carbohydrate used to store energy in plants?  
(a) cellulose (b) maltose (c) fructose (d) starch (e) glycogen
- A solution with a pH of 10 is how many times more basic than a solution with a pH of 8?  
(a) 2 (b) 4 (c) 10 (d) 100 (e) 1000
- All of the following organic compounds are polymers EXCEPT.  
(a) starch (b) cellulose (c) polypeptide (d) glycine (e) glycogen
- All of the following contribute to the unique properties of water EXCEPT.  
(a) cohesion (b) adhesion (c) polarity (d) capillary action (e) low heat capacity
- Enzymes are affected by all of the following EXCEPT.  
(a) pH (b) temperature (c) chemical (d) concentration of substrates (e) concentration of water
- A baseball is thrown straight upward. What is the ball's acceleration at its highest point?  
(a) 0 (b) 0.5 g, downward (c) g, downward (d) 0.5 g, upward (e) g, upward
- If all of the forces acting on an object balance so that the net force is zero, then.  
(a) the object must be at rest (b) the object's speed will decrease (c) the object will follow a parabolic trajectory (d) the object's direction of motion can change, but not its speed (e) none of the above.
- A box of mass  $m$  slides down a frictionless inclined plane of length  $L$  and vertical height  $h$ . what is the change in its gravitational potential energy?  
(a)  $-mgL$  (b)  $-mgh$  (c)  $-mgL/h$  (d)  $-mgh/L$  (e)  $-mgLh$
- If the temperature and volume of a sample of an ideal gas are both doubled, then the pressure  
(a) decreases by a factor of 4 (b) decreases by a factor of 2 (c) increases by a factor of 2 (d) increases by a factor of 4 (e) remains unchanged
- If the electric field does negative work on a negative charge as the charge undergoes a displacement from Position A and Position B within an electric field, then the electrical potential energy.  
(a) is negative (b) is positive (c) increase (d) decrease (e) cannot be determined from the information given

Questions 11-14

(a) C (b) N (c) O (d) F (e) Ne

- This is the most electronegative element.
- The nuclear decay of an isotope of this element is used to measure the age of archaeological artifacts.
- All of the electrons in this element are spin-paired.
- This element, present as a diatomic gas, makes up most of the earth's atmosphere.

Questions 15-17

(a) Hg (b) Si (c) Cu (d) Zn (e) Ag

- This element is commonly used in the manufacture of semiconductors.
- This element is a liquid at room temperature.
- After oxygen, this is by far the most common element in the earth's crust.

Questions 18-20

(a)  $\text{BF}_3$  (b)  $\text{CO}_2$  (c)  $\text{H}_2\text{O}$  (d)  $\text{CF}_4$  (e)  $\text{PH}_3$

- The central atom in this molecule forms  $sp^2$  hybrid orbitals.
- This molecule has a tetrahedral structure.
- This molecule has a linear structure.

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Questions 21-25 refer to the following renewable energy sources.

- (a) Solar energy (b) hydrogen fuel cells (c) tidal energy (d) geothermal energy (e) wind energy
21. This source can harm migratory birds.
  22. Water and electricity are products of this source.
  23. This source of energy relies on water flowing in and out of bays.
  24. This source converts radiant energy into heat or electricity.
  25. This source utilizes heat or steam from deep underground.

Questions 26-29

- (a) Metallic bonding (b) network covalent bonding (c) hydrogen bonding (d) ionic bonding (e) London dispersion forces
26. Solids exhibiting this kind of bonding are excellent conductors of heat.
  27. This kind of bonding is the reason that water is more dense than ice.
  28. This kind of bonding exists between atoms with very different electronegativities.
  29. The stability exhibited by diamonds is due to this kind of bonding

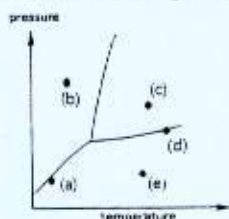
Questions 30-32

- (a) moles (b) liters (c) grams (d) atmospheres (e) volts
30. One mole of solid zinc has a mass of 65.39 of these.
  31. These units can be calculated by dividing a quantity by  $6.02 \times 10^{23}$ .
  32. Four grams of helium gas occupy 22.4 of these at standard temperature and pressure.

Questions 33-37

- (a)  $H_2$  (b) He (c)  $O_2$  (d)  $N_2$  (e)  $CO_2$
33. This is the most plentiful gas in the earth's atmosphere.
  34. A 1 mole sample of this gas occupying 1 liter will have the greatest density.
  35. At a given temperature, this gas will have the greatest rate of effusion.
  36. The molecules of this nonpolar gas contain polar bonds.
  37. The molecules of this gas contain triple bonds.
  38. A sealed container containing 8.0 grams of oxygen gas and 7.0 grams of nitrogen gas is kept at a constant temperature and pressure. Which of the following is true?
    - (a) The volume occupied by oxygen is greater than the volume occupied by nitrogen.
    - (b) The volume occupied by oxygen is equal to the volume occupied by nitrogen.
    - (c) The volume occupied by nitrogen is greater than the volume occupied by oxygen.
    - (d) The density of nitrogen is greater than the density of oxygen.
    - (e) The average molecular speeds of the two gases are the same.
  39. Which of the following conditions would be most likely to cause the ideal gas laws to fail?
    - I. high pressure II. high temperature III. large volume
    - (a) I only (b) II only (c) I and II only (d) I and III only (e) II and III only

Questions 40-41 refer to the phase diagram below



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40. At this point, the substance represented by the phase diagram will be solely in the solid phase at equilibrium.
41. This point represents a boiling point of the substance
42. At this point, the substance represented by the phase diagram will be undergoing sublimation
43. At this point, the substance represented by the phase diagram will be solely in the liquid phase at equilibrium
44. During which of the following phase changes must heat be added to overcome intermolecular forces.  
I. vaporization II. sublimation III. deposition  
(a) I only (b) II only (c) I and II only (d) I and III only (e) I and III only
45. The temperature above which gas molecules become too energetic to form a true liquid, no matter what the pressure, is called the .  
(a) melting point (b) critical point (c) boiling point (d) triple point (e) freezing point
- Questions 46-49
- (a) free energy change ( $\Delta G$ ) (b) entropy change ( $\Delta S$ ) (c) heat of vaporization (d) heat of fusion (e) heat capacity
46. If this has a negative value for a process, then the process occurs spontaneously.
47. This is a measure of how the disorder of a system is changing.
48. This is the energy given off when a substance condenses
49. This is the energy taken in by a substance when it melts.
50. The addition of a catalyst will have which of the following effects on a chemical reaction?  
I. the enthalpy change will decrease  
II. the entropy change will decrease.  
III. The activation energy will decrease  
(a) I only (b) II only (c) III only (d) I and III only (e) I and III only