

Chemistry, 2016 EC, natural science, entrance exam

Grade 12 · Chemistry · 2016 E.C.

Time allowed: 120 minutes

Questions: 29

Total marks: 29

Name _____ Grade _____ ID No. _____ Date _____

1. What is the equilibrium constant expression for the heterogeneous reaction: $\text{CaCO}_3(\text{s}) \rightleftharpoons \text{CaO}(\text{s}) + \text{CO}_2(\text{g})$? (1)
 - A. $K_c = [\text{CaO}][\text{CO}_2]$
 - B. $K_c = [\text{CaO}][\text{CO}_2] / [\text{CaCO}_3]$
 - C. $K_c = [\text{CO}_2]$
 - D. $K_c = [\text{CaO}] / [\text{CaCO}_3]$
2. Which of the following is CORRECT about the formation of a covalent bond? (1)
 - A. A covalent bond is formed between positively and negatively charged ions.
 - B. A covalent bond is formed between mobile and stationary electrons.
 - C. A covalent bond is formed by the sharing of valence electrons.
 - D. A covalent bond is formed by the transfer of valence electrons.
3. A sample of a certain gas has a volume of 100 L at 27°C and 750 torr. The gas is expanded to a volume of 250 L at 200 torr. What is the final temperature of the gas? (1)
 - A. -83°C
 - B. -73°C
 - C. -17°C
 - D. -273°C
4. Which of the following reaction is used for the preparation of bases? (1)
 - A. Reaction of metal hydroxides with dilute acids.
 - B. Reaction of active metal oxides with water.
 - C. Heating of a salt with a non-volatile acid.
 - D. Heating of carbonates with dilute acids.
5. Which of the following characteristics of an electromagnetic radiation is CORRECT? (1)
 - A. The speed of an electromagnetic radiation decreases with increase in its wavelength.
 - B. The speed of an electromagnetic radiation increases with increase in its frequency.
 - C. The speed of an electromagnetic wave is independent of the nature of the medium it travels through.
 - D. The wavelength of an electromagnetic radiation is directly proportional to its frequency.
6. Which of the following is the general formula for saturated monocarboxylic acids? (R is an alkyl group) (1)
 - A. $\text{R} - \text{C} - \text{H}$
 - B. $\text{R} - \text{C} - \text{OR}$
 - C. $\text{R} - \text{C} - \text{R}$
 - D. $\text{R} - \text{C} - \text{OH}$
7. Which of the following is NOT the industrial application of electrochemistry? (1)
 - A. Electrolytic refining
 - B. Electroplating
 - C. Electromagnetism
 - D. Electrosynthesis
8. The component of the environment consisting earth's upper outer most skin and accessible to human beings is known as _____. (1)
 - A. biosphere
 - B. hydrosphere
 - C. lithosphere
 - D. atmosphere

9. What is the pOH of pure water at 37°C, where K_w equals 2.5×10^{-14} and its pH is 6.8? (1)
- A. 6.8
B. 7.2
C. 8.8
D. 8.2

10. What is the molecular formula and IUPAC name of a saturated monocarboxylic acid having six carbon atoms? (1)
- A. $C_{(5)}H_{(11)}COOH$, heptanoic acid
B. $C_{(6)}H_{(13)}COOH$, heptanoic acid
C. $C_{(5)}H_{(11)}COOH$, hexanoic acid
D. $C_{(6)}H_{(13)}COOH$, hexanoic acid

11. Which of the following is the core electron configuration of the metal ion in ferric sulfate, $Fe_2(SO_4)_3$? (Atomic Number of Fe = 26) (1)
- A. $[Ar] 4s^2 3d^6$
B. $[Ar] 4s^2 3d^5$
C. $[Ar] 3d^5$
D. $[Ar] 3d^6$

12. A 250 mL solution is formed from 24.5 g of sulfuric acid (H_2SO_4). What is the normality of this solution? (Molecular weight of H_2SO_4 = 98 g/mol) (1)
- A. 4.00N
B. 2.00N
C. 0.250N
D. 0.125N

13. A water molecule has two bond pairs and two lone pairs of electrons. Which of the following is CORRECT about these pairs of electrons? (1)
- A. The repulsion between the two bonding pairs is greater than the repulsion between the two lone pairs.
B. The repulsion between the two lone pairs is greater than the repulsion between the two bonding pairs.
C. Bonding pair - lone pair repulsion is greater than lone pair - lone pair repulsion.
D. Lone pair - lone pair repulsion is exactly identical with bonding pair - bonding pair repulsion.

14. Which of the following descriptions of the property of a covalent compound is CORRECT? (1)
- A. Covalent compounds have low melting and boiling points.
B. Most covalent compounds are solids at room temperature.
C. Most covalent compounds are soluble in water.
D. Covalent compounds are non-volatile.

15. A student is interested in determining the content of a leaf from his/her environment and performed the following steps: (1)

- 1) Dried the leaves up in sunlight,
- 2) Evaluated the work and drew conclusions,
- 3) Collected leaves from around his village,
- 4) Boiled the leaves and collected the leaves extract,
- 5) Analyzed the content of the leaves extract using an instrument.

Which of the following is the CORRECT procedure if a student developed an experimental skill?

- A. Steps: $3 \rightarrow 5 \rightarrow 4 \rightarrow 1 \rightarrow 2$
B. Steps: $3 \rightarrow 4 \rightarrow 1 \rightarrow 5 \rightarrow 2$
C. Steps: $3 \rightarrow 1 \rightarrow 4 \rightarrow 5 \rightarrow 2$
D. Steps: $3 \rightarrow 1 \rightarrow 5 \rightarrow 4 \rightarrow 2$

16. What is the scientific notation for 0.000055? (1)
- A. $55 \times 10^{(-7)}$
B. $5.5 \times 10^{(-6)}$
C. $5.5 \times 10^{(-5)}$
D. $5.5 \times 10^{(-4)}$

17. Upon standing long, 'Tella' or 'Tej' turns sour. Which of the following is the CORRECT explanation for the observed effect? (1)
- A. The reduction of alcohol to an acid.
 - B. The oxidation of alcohol to an acid.
 - C. Addition reaction of alcohol with an acid.
 - D. . Decomposition reaction of alcohol.
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18. What are the molecular formulae of an alkene and alkyne containing seven carbon atoms, respectively? (1)
- A. C_7H_{14} and C_7H_{12}
 - B. C_7H_{16} and C_7H_{14}
 - C. C_7H_{14} and C_7H_{16}
 - D. C_7H_{12} and C_7H_{14}
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19. A student collected the following information from the community on the preparation of the local alcoholic drink "ARAKI":
- Step 1: Distillation of the liquid mixture in traditional utensils.
- Step 2: Adding a proportional amount of water to liquidify the dough-like mixture and leaving for 1-2 days for further fermentation
- Step 3: 'Bikel' preparation from barely, the starter ('Tinses') by mixing the Bikel with Gesho (Rhamnusprnoides) powder and fermentation of the starter for a few days
- Step 4: Baking of bread from different ingredients and breaking down the bread and mixing with the fermented starter and leaving for fermentation for a couple of days
- Which of the following is the correct procedure for the preparation of Araki?
- A. Step 2 → Step 4 → Step 3 → Step 1
 - B. Step 2 → Step 3 → Step 4 → Step 1
 - C. Step 3 → Step 4 → Step 2 → Step 1
 - D. Step 4 → Step 3 → Step 2 → Step 1
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20. Which of the following is the CORRECT structure of benzene? (1)
- A. Hexagon with three double bonds at alternate positions
 - B. Hexagon with no double bonds
 - C. Circle inside a hexagon
 - D. Hexagon with alternating single and double bonds
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21. Which of the following is CORRECT about equivalents of acids and bases? (1)
- A. The volume of an acid or base required to reach equivalence point during acid-base titration reaction.
 - B. The number of moles of an acid or base required to form a one molar aqueous acidic or basic solution.
 - C. It is the amount of a substance that is required to react with one mole of hydroxide ions in redox reactions.
 - D. It is the amount of a substance that is required to react with one mole of hydrogen ions in acid-base reactions.
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22. Which of the following CORRECTLY describes conjugate acids and conjugate bases? (1)
- A. Conjugate acid is a species formed after a removal of a proton from a base whereas conjugate base is formed after addition of proton to an acid.
 - B. Conjugate base is a species formed after removal of a proton from an acid whereas conjugate acid is formed after addition of a proton to a base.
 - C. Conjugate acid has one fewer hydrogen and one more minus charge than the corresponding acid.
 - D. Conjugate base has one more hydrogen and one fewer minus charge than the corresponding base.
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23. Which of the following is the general formula of alkenes? (1)
- A. $C_nH_{(2n-2)}$
 - B. $C_nH_{(2n+2)}$
 - C. C_nH_n
 - D. $C_nH_{(2n)}$

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24. A given element has atomic number of 55 and mass number of 133. Which of the following describes CORRECTLY the property of this element? (1)
- A. The non-metallic character of the element is high.
 - B. The metallic character of the element is high.
 - C. The element has high electron affinity.
 - D. The element has high electronegativity.
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25. Among the following which one is a ternary acid? (1)
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|----------------------------|-------------------------|
| A. HBr | B. HCl |
| C. H_2SO_4 | D. H_2S |
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26. Which of the following is CORRECT about molten electrolytes and aqueous electrolytes? (1)
- A. The possible half reactions in molten electrolytes are more compared to aqueous electrolytes.
 - B. Both molten and aqueous electrolytes involve preferential discharge of ions at each electrode.
 - C. An electrolyte that conducts electricity when dissolved in a certain liquid is molten electrolyte.
 - D. During the electrolysis of a molten electrolyte, the reduction of cations occurs at the cathode.
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27. Which of the following is the CORRECT method of preparation of alkenes in the laboratory? (1)
- A. Alkylation of sodium acetylide with a primary alkyl halide.
 - B. Heating of sodium salt of an organic acid with soda lime.
 - C. Reaction of halogenated alkane with sodium.
 - D. Dehydration of alcohols with concentrated sulfuric acid.
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28. Which of the following is the product of fractional distillation of crude oil? (1)
- | | |
|-----------------|----------------|
| A. Producer gas | B. Naphthalene |
| C. Water gas | D. Kerosene |
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29. Given the following structure: (1)

What is the IUPAC name for the above structure?

 Question Diagram

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|---------------------|-------------------|
| A. Methyl ethanoate | B. Propyl formate |
| C. Ethyl ethanoate | D. Ethyl acetate |

— END OF EXAMINATION —