**Year 12 3A Chemistry 2011**

**Year 11 (2A/2B) Revision Test**

**Name:**

**Total: /60**

For each question shade the box to indicate your answer.

Use **only** a blue or black **pen** to shade the boxes.

For example, if b is your answer: ⬜ a ⬛ b ⬜ c ⬜ d

If you make a mistake, place a cross through that square, **do not** erase or use correction fluid and shade your new answer.

X

For example, if b is a mistake and d is your answer: ⬜ a ⬛ b ⬜ c ⬛ d

|  |  |
| --- | --- |
| **1** | ⬜ a ⬜ b ⬜ c ⬜ d |
| **2** | ⬜ a ⬜ b ⬜ c ⬜ d |
| **3** | ⬜ a ⬜ b ⬜ c ⬜ d |
| **4** | ⬜ a ⬜ b ⬜ c ⬜ d |
| **5** | ⬜ a ⬜ b ⬜ c ⬜ d |
| **6** | ⬜ a ⬜ b ⬜ c ⬜ d |
| **7** | ⬜ a ⬜ b ⬜ c ⬜ d |
| **8** | ⬜ a ⬜ b ⬜ c ⬜ d |
| **9** | ⬜ a ⬜ b ⬜ c ⬜ d |
| **10** | ⬜ a ⬜ b ⬜ c ⬜ d |
| **11** | ⬜ a ⬜ b ⬜ c ⬜ d |
| **12** | ⬜ a ⬜ b ⬜ c ⬜ d |

**PART 1 (24 marks)**

Answer ALL questions on the separate multiple choice answer sheet provided. Each question in this part is worth 2 marks.

1. A covalent bond would **not** be expected to form between atoms of electron configuration:
2. 2.8.7 and 2.7
3. 2.8.4 and 2
4. 2.8.1 and 2.8.7
5. 2.8 and 2.6
6. What is the conjugate acid of HSO4- ?
7. H2SO4
8. SO42-
9. H+
10. H2O
11. Which of the following aqueous solution combinations will form precipitates? (an equal number of moles of each of the substances are present)
12. Sodium chloride, barium nitrate, and potassium hydroxide
13. Tin (II) nitrate, caesium nitrate, sodium sulfate
14. Copper (II) sulfate, sodium hydroxide, and hydrochloric acid
15. Barium hydroxide, sodium chloride, and iron (II) sulfate

4. Which species would be found in a 2M H3PO4 solution?

1. H3PO4, H2PO4-, H+, PO43-, OH-
2. H2PO4-, PO43-, H2O, H+, H3PO3
3. H2O, OH-, H+, PO32-, H2PO4-
4. H2PO4+, H3PO4, H+, H2O

5. Which of the following lists contain only strong electrolytes?

I BaSO4, AgCl, HCl

II glucose, ethanol, tartaric acid

III HCl, CH3COOH, HNO3

IV NH3, NaCl, KNO3

1. IV only
2. II and III
3. I and III and IV
4. I only

6. Which of the following reactions is NOT a redox reaction?

1. K(s) + O2(g) ⭢ KO2(s)
2. 2Na(s) + 2H2O(l) ⭢ 2NaOH(aq) + H2(g)
3. Li2O(s) + H2O(l) ⭢ 2LiOH(aq)
4. 2Na(s) + H2(l) ⭢ 2NaH(s)

7. Consider the following reactions:

I NH3(g) + H2O(l) ↔ NH4+(aq) + OH-(aq)

II HCO3-(aq) + H2O(l) ↔ H2CO3(aq) + OH-(aq)

III H2O(l) + NH4+(aq) ↔ NH3(g) + H3O+(aq)

IV HSO4-(aq) + H2O(l) ↔ H3O+(aq) + SO42-(aq)

In which of the above forward reactions is water acting as a base?

(a) I and II.

(b) III and IV.

(c) I, II, III and IV.

(d) None of the above since water is a neutral substance.

8. The combustion of natural gas (mainly methane) can be represented by:

CH4(g) + O2(g) ⭢ CO2(g) + H2O(g); ∆H = -ve

Which of the following would **decrease** the rate of the reaction?

1. Increasing the volume at constant temperature.
2. Increasing the temperature at constant volume.
3. Passing the gases over the surface of a catalyst.
4. Increasing the concentration of reactants at constant temperature.

9. Element X is in group 2, and element Y in group 7, of the periodic table. Which ions will be present in the compound formed when X and Y react together?

(a) X + and Y–

(b) X 2+ and Y–

(c) X + and Y2−

(d) X 2− and Y+

10. What change(s) occur(s) as a liquid boils?

I. The average kinetic energy of the particles increases.

II. The attractive forces between the particles become stronger.

III. The spacing between the particles increases.

(a) I only

(b) III only

(c) II and III only

(d) I and III only

11. From the relative positions of the elements in the Periodic Table, it may be

predicted that removal of a second electron, after previous removal of one

electron, would require most energy in the case of:

(a) aluminium.

(b) magnesium.

(c) sodium.

(d) silicon

12. Typical energy distribution curves for a gas system at two different temperatures (T1 and

T2) can be represented as:

No. of molecules

Kinetic energy

T1

T2

Consider the following statements:

I As temperature increases the kinetic energy of all molecules increase.

II At T2 more molecules have a higher kinetic energy than at T1.

III Those molecules with higher kinetic energy will collide more frequently.

IV In a gas system with reacting gases, at T1 less molecules will have the required activation energy (Ea) for chemical change.

The **correct** statements are:

1. II, III, and IV

1. I, II, and III
2. II, and III
3. I, II, III, and IV

**PART 2 (36 marks)**

Answer ALL questions in Part 2 in the spaces provided below.

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1. Write equations for any reactions that occur in the following procedures. If no reaction occurs write “no reaction”. **NO observations are necessary.**

1. Solid sodium chloride is added to an aqueous solution of silver nitrate.

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1. A solution of hydrochloric acid is added to and aqueous solution of potassium carbonate.

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1. Solid zinc powder is added to a copper (II) sulphate solution.

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1. Chlorine gas is bubbled through an aqueous solution of sodium iodide.

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1. Bromine water is added to cyclo-hexene (for the product, provide the name only).

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[10 marks]

2. Classify the following solids as: ionic (I), metallic (M), covalent molecular

(CM), or covalent network (CN)

|  |  |  |  |
| --- | --- | --- | --- |
| Bronze |  | Iodine |  |
| Diamond |  | Magnesium sulfate |  |
| Silicon dioxide |  | Hydrogen peroxide |  |
| Dry ice (CO2) |  | Benzene |  |

[4 marks]

3. Write **observations** for any reactions that occur in the following procedures. If no change is observed, then you should state this. **NO chemical equations are required to be written.**

1. Burning magnesium is placed in a gas jar full of carbon dioxide gas.

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1. A citric acid/tartaric acid solution combination is added to an aqueous solution of baking soda.

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1. Copper (II) oxide is added to a beaker containing an aqueous solution of sulfuric acid.

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1. Solid aluminium hydroxide is added to a 5M solution of sodium hydroxide.

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[8 marks]

4. For each chemical species listed in the table below, draw an electron dot diagram showing all valence electrons. [4 marks]

|  |  |
| --- | --- |
| Species | Electron dot diagram |
| Sodium chloride |  |
| Carbon monoxide |  |
| Ammonia |  |
| Nitrate ion |  |

5. **Draw** and **name** the following:

|  |  |
| --- | --- |
| 1. **Three** structural isomers of C5H12 | 1. **Two** geometric isomers of C4H6Cl2 |

[10 marks]

**PART 3 (5 marks)**

Answer ALL questions in Part 3. The calculations are to be set out in detail in this Question/Answer Booklet. Marks will be allocated for correct equations and clear setting out, even if you cannot complete the problem.

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Ethylene glycol has a multitude of uses, including antifreeze and anti-boil agent in car radiators and as a de-icing substance for aircraft windshields. It contains the elements carbon, hydrogen and oxygen.

Combustion of a 3.10 g sample of ethylene glycol produced 4.40 g of carbon dioxide and 2.70 g of water. Using either a “mole method” or a “percentage composition method”, determine the empirical formula of ethylene glycol.

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[5 marks]

SOLUTIONS: Section 1 - Multiple Choice

1. c
2. a
3. d
4. a
5. d
6. c
7. b
8. a
9. b
10. d
11. c
12. a

Section 2 - Short Answer

1. *[1 mark for correct species, 1 mark for balanced equation]*

*Do not penalise for missing or incorrect state symbols*

*Maximum 1 mark if molecular or formula equation used*

(a) Ag+ + NaCl → AgCl + Na+[2]

(b) 2 H+ + CO32- → CO2  + H2O [2]

(c) Zn + Cu2+  → Zn2+ + Cu [2]

(d) Cl2 + 2I- → 2Cl- + I2 [2]

(e) Br2 + C6H10 → 1,2-dibromocyclohexane [2]

2.

|  |  |  |  |
| --- | --- | --- | --- |
| Bronze | **M** | Iodine | **CM** |
| Diamond | **CN** | Magnesium sulfate | **I** |
| Silicon dioxide | **CN** | Hydrogen peroxide | **CM** |
| Dry ice (CO2) | **CM** | Benzene | **CM** |

[4 marks]

3. *Majority of observations required.*

(a) Flame disappears/goes out. [1]

(b) A colourless gas is evolved. [1]

(c) Black solid dissolves to form a blue/green coloured solution. [1]

(d) White solid dissolves to form a colourless solution. [1] [4 marks]

4.



+

-



Na

Sodium chloride Carbon monoxide Ammonia Nitrate ion [8 marks]

5.

|  |  |
| --- | --- |
| 1. **Three** structural isomers of C5H12   [1]  **pentane**  [1]  [1]  **methylbutane** [1]  [1]  **dimethylpropane** [1] | 1. **Two** geometric isomers of C4H6Cl2   [1]  **cis-2,3-dichloro-2-butene**  [1]  [1]  **trans-2,3-dichloro-2-butene** [1] |

Section 3 – Calculation

1. m(C) = 12.01 / 44.01 x 4.40 = 1.2008 g

**%C in 3.10 g** = 1.2008 / 3.10 x 100% = **38.73%** [1]

m(H) = 2 x 1.008 / 18.016 x 2.70 = 0.3021 g

**%H in 3.10 g** = 0.3021 / 3.10 x 100% = **9.75%** [1]

%O = 100 – 38.74 - 9.75 = **51.52%** [1]

C : H : O

n 38.73 / 12.01 9.75 / 1.008 51.52 / 16.00

n 3.225 9.673 3.220 (÷ 3.22) [1]

n 1 3 1

**EF = CH3O** [1]