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.

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:

   (a) 2.8.7 and 2.7

   (b) 2.8.4 and 2

   (c) 2.8.1 and 2.8.7

   (d) 2.8 and 2.6

2. What is the conjugate acid of HSO_4^- ?

   (a) H_2SO_4

   (b) SO_4^{2-}

   (c) H^+

   (d) H_2O

3. Which of the following aqueous solution combinations will form precipitates? (an equal number of moles of each of the substances are present)

   (a) Sodium chloride, barium nitrate, and potassium hydroxide

   (b) Tin (II) nitrate, caesium nitrate, sodium sulfate

   (c) Copper (II) sulfate, sodium hydroxide, and hydrochloric acid

   (d) Barium hydroxide, sodium chloride, and iron (II) sulfate

4. Which species would be found in a 2M H_3PO_4 solution?

   (a) H_3PO_4, $H_2PO_4^-$, H^+, PO_4^{3-}, OH^-

   (b) $H_2PO_4^-$, PO_4^{3-}, H_2O, H^+, H_3PO_3

   (c) H_2O, OH^-, H^+, PO_3^{2-}, $H_2PO_4^-$

   (d) $H_2PO_4^+$, H_3PO_4, H^+, H_2O

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

I $BaSO_4$, AgCl, HCl
II glucose, ethanol, tartaric acid
III HCl, CH_3COOH, HNO_3
IV NH_3, NaCl, KNO_3

(a) IV only

(b) II and III

(c) I and III and IV

(d) I only

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

(a) $K(s) + O_2(g) \rightarrow KO_2(s)$

(b) $2Na(s) + 2H_2O(l) \rightarrow 2NaOH(aq) + H_2(g)$

(c) $Li_2O(s) + H_2O(l) \rightarrow 2LiOH(aq)$

(d) $2Na(s) + H_2(l) \rightarrow 2NaH(s)$

7. Consider the following reactions:

I $NH_3(g) + H_2O(l) \leftrightarrow NH_4^+(aq) + OH^-(aq)$

II $HCO_3^-(aq) + H_2O(l) \leftrightarrow H_2CO_3(aq) + OH^-(aq)$

III $H_2O(l) + NH_4^+(aq) \leftrightarrow NH_3(g) + H_3O^+(aq)$

IV $HSO_4^-(aq) + H_2O(l) \leftrightarrow H_3O^+(aq) + SO_4^{2-}(aq)$

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:

$$CH_4(g) + O_2(g) \rightarrow CO_2(g) + H_2O(g); \quad \Delta H = -ve$$

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

(a) Increasing the volume at constant temperature.

(b) Increasing the temperature at constant volume.

(c) Passing the gases over the surface of a catalyst.

(d) 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 Y^{2-}

(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:

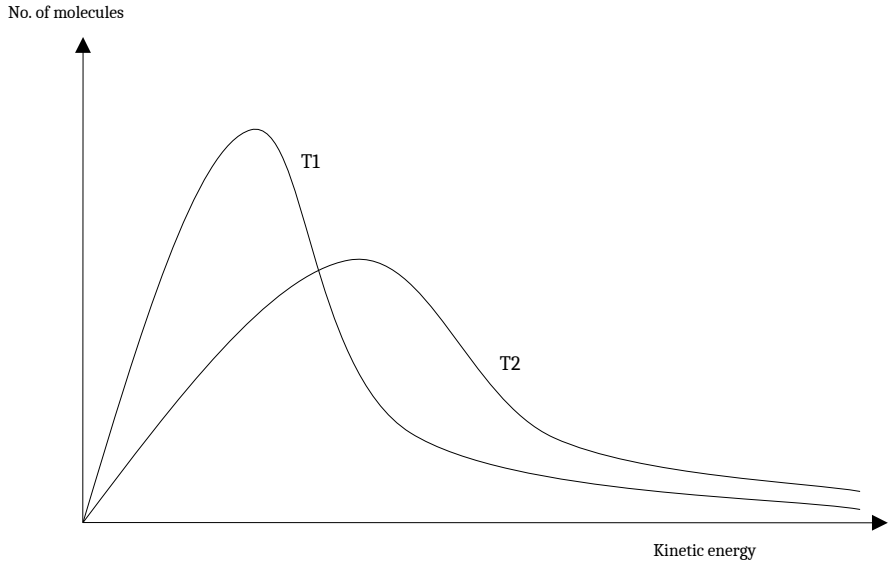
(a) aluminium.

(b) magnesium.

(c) sodium.

(d) silicon

12. Typical energy distribution curves for a gas system at two different temperatures (T_1 and T_2) can be represented as:



Consider the following statements:

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

II At T_2 more molecules have a higher kinetic energy than at T_1.

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

IV In a gas system with reacting gases, at T_1 less molecules will have the required activation energy (Ea) for chemical change.

The **correct** statements are:

(a) II, III, and IV

(b) I, II, and III

(c) II, and III

(d) 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.**

   (a) Solid sodium chloride is added to an aqueous solution of silver nitrate.

   (b) A solution of hydrochloric acid is added to and aqueous solution of potassium carbonate.

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

   (d) Chlorine gas is bubbled through an aqueous solution of sodium iodide.

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

[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 (CO_2)		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.**

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

_____

_____

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

_____

_____

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

_____

_____

(d) Solid aluminium hydroxide is added to a 5M solution of sodium hydroxide.

_____

_____

[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:

(i) **Three** structural isomers of C_5H_{12}	(ii) **Two** geometric isomers of $C_4H_6Cl_2$

[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.

_____

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.

[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) $Ag^+ + NaCl \rightarrow AgCl + Na^+$ [2]

(b) $2\ H^+ + CO_3^{2-} \rightarrow CO_2 + H_2O$ [2]

(c) $Zn + Cu^{2+} \rightarrow Zn^{2+} + Cu$ [2]

(d) $Cl_2 + 2I^- \rightarrow 2Cl^- + I_2$ [2]

(e) $Br_2 + C_6H_{10} \rightarrow$ 1,2-dibromocyclohexane [2]

2.

Bronze	**M**	Iodine	**CM**
Diamond	**CN**	Magnesium sulfate	**I**
Silicon dioxide	**CN**	Hydrogen peroxide	**CM**
Dry ice (CO_2)	**CM**	Benzene	**CM**

[4 marks]

3. *Majority of observations required.*

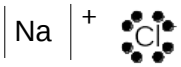
(a) Flame disappears/goes out. [1]

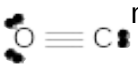
(b) A colourless gas is evolved. [1]

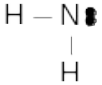
(c) Black solid dissolves to form a blue/green coloured solution. [1]

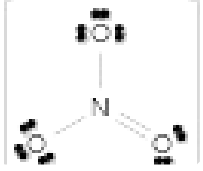
(d) White solid dissolves to form a colourless solution. [1]

[4 marks]

4. 

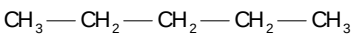
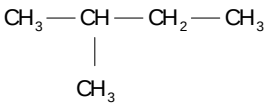
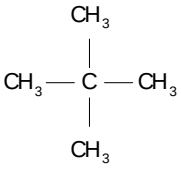
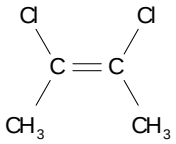
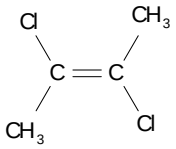






Sodium chloride Carbon monoxide Ammonia Nitrate ion
[8 marks]

5.

(iii) **Three** structural isomers of C_5H_{12}	(iv) **Two** geometric isomers of $C_4H_6Cl_2$
 [1] **pentane** [1]  [1] **methylbutane** [1]  [1] **dimethylpropane** [1]	 [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 $_{\text{in 3.10 g}}$ = 1.2008 / 3.10 x 100% = **38.73%** [1]

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

%H $_{\text{in 3.10 g}}$ = 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 = CH_3O [1]