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南洋女子中学校
NANYANG GIRLS' HIGH SCHOOL

End-of-Year Examination 2010
Secondary Three

CHEMISTRY

45 minutes

Paper 1

Multiple Choice

Friday

15 October 2010

0800 - 0845

Additional materials: Multiple Choice Answer Sheet

READ THESE INSTRUCTIONS FIRST

Do not open this booklet until you are told to do so.

Write your name, class and register number on the optical answer sheet provided.

There are 30 questions in this paper. Answer **all** questions. For each question there are four possible answers, **A, B, C** and **D**. Choose the **one** you consider correct and record your choice in **soft pencil** on the optical answer sheet.

INFORMATION FOR CANDIDATES

Each correct answer will score one mark. A mark will not be deducted for a wrong answer. Any rough working should be done in this booklet.

A copy of the Periodic Table is given on **page 8**.

You are allowed to use an approved scientific calculator.

This document consists of **8** printed pages.

Setter: CHG

NANYANG GIRLS' HIGH SCHOOL

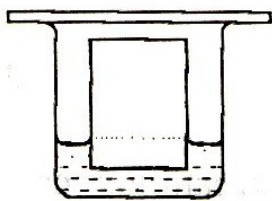
[Turn over

- 1 At which temperature does a concentrated aqueous solution of sodium chloride begin to boil?

A	96°C	C	100°C
B	99°C	D	104°C

- 2 Valeric acid is an organic liquid that is used as an industrial reactant to synthesize esters for use in perfumes and cosmetics. It does not mix with water. Which of the following apparatus below can be used to separate a mixture of valeric acid and water?

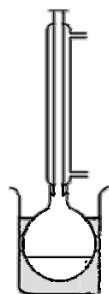
A



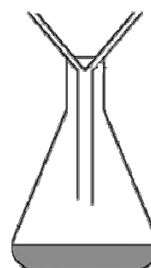
C



B



D



- 3 An element **J** forms a positive ion with an octet electronic configuration. The proton (atomic) number of **J** is most likely _____.

A	16	C	18
B	17	D	19

- 4 Why do ionic compounds have high melting points?

A Their ions are held in fixed positions in a crystal lattice and cannot move freely.
B Their forces between the ions are very strong and need to be overcome by a large amount of energy.
C The intermolecular forces between the ions are very strong and need to be overcome by a large amount of energy.
D Ionic compounds behave like metals and thus have high melting points like most metals.

- 5 Hydrazine, used as a rocket propellant, has the formula N_2H_4 . What is the number of hydrogen atoms in 640 g of hydrazine?

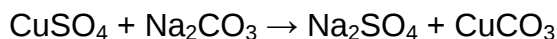
A	1.20×10^{23}	C	1.25×10^{25}
B	6.00×10^{23}	D	4.80×10^{25}

- 6** A compound Y contains 50% sulphur and 50% oxygen by mass. What is the empirical formula of compound Y?
- A** SO **C** SO₃
- B** SO₂ **D** SO₄
- 7** Which of the following contains the lowest concentration of hydrogen ions?
- A** 2 mol/dm³ H₂SO₄ **C** 2 mol/dm³ CH₃COOH
- B** 2 mol/dm³ HCl **D** 2 mol/dm³ HNO₃
- 8** The table gives information about three indicators.

Indicator	colour at pH 1	pH at which colour changes	colour at pH 12
screened methyl orange	violet	3.5	green
bromocresol green	yellow	4.6	blue
thymolphthalein	colourless	9.9	blue

Which colours would be obtained when each indicator was added separately to a colourless liquid of pH 6?

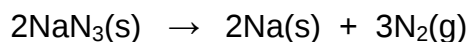
- | | screened methyl orange | bromocresol green | thymolphthalein |
|---|------------------------|-------------------|-----------------|
| A | violet | yellow | colourless |
| B | green | blue | colourless |
| C | green | blue | blue |
| D | green | yellow | blue |
- 9 Which of the following quantities is **not** equivalent to 1 mole of hydrogen gas at r.t.p.?
- | | | | |
|---|---------------------------------------|---|------------------------------------|
| A | 1.2×10^{23} hydrogen atoms | C | 24 dm ³ of hydrogen gas |
| B | 6×10^{23} hydrogen molecules | D | 2 g of hydrogen gas |
- 10 In an experiment, 4.0 cm³ of 1.0 mol/dm³ aqueous copper(II) sulfate was mixed with 8.0 cm³ of 1.0 mol/dm³ aqueous sodium carbonate.



What did the reaction vessel contain when the reaction was complete?

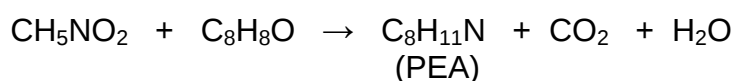
- A** A colourless solution only.
B A green precipitate and a blue solution.
C A green precipitate and a colourless solution.
D A white precipitate and a blue solution.

- 11** Sodium azide, NaN_3 , is used in car 'air bags'. On heating the compound to 300°C , it rapidly decomposes according to the equation:



What volume of gas, measured at room temperature and pressure, will be produced by the decomposition of 4 moles of sodium azide?

- | | | | |
|----------|-------------------|----------|--------------------|
| A | 64 dm^3 | C | 144 dm^3 |
| B | 96 dm^3 | D | 288 dm^3 |
- 12** Neuroscientists believe that the chemical in chocolate that may have a feel-good effect on the human brain is phenylethylamine (PEA), $\text{C}_8\text{H}_{11}\text{N}$. PEA can be made in the laboratory by the following reaction:



What is the maximum mass of PEA that can be produced starting with 50 g of CH_5NO_2 and 100 g of $\text{C}_8\text{H}_8\text{O}$?

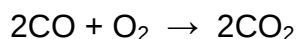
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|----------|------|----------|-------|
| A | 50 g | C | 96 g |
| B | 75 g | D | 101 g |
- 13** Solid carbon dioxide (dry ice) is used as a refrigerating agent because it changes directly from the solid into a gas at a low temperature. What is the main intermolecular bonding in solid carbon dioxide?
- | | | | |
|----------|------------------|----------|-----------------------|
| A | ionic bonding | C | dative bonding |
| B | covalent bonding | D | van der Waals' forces |
- 14** Ammonia boils at -33°C , whereas water boils at 100°C . Which of the following statements best explains this difference in the boiling points?
- | | |
|----------|--|
| A | Water has a higher molar mass than ammonia. |
| B | Water has fewer atoms per molecule than ammonia. |
| C | Each water molecule contains more electrons than ammonia. |
| D | Stronger intermolecular forces exist in water relative to ammonia. |

- 15** Atoms of elements **G** and **H** have 16 and 19 protons respectively. **G** and **H** combine to form a compound. Which of the following is/are correct?

- (1) The formula of the compound is **GH**.
- (2) The compound is an ionic compound.
- (3) The electron arrangements of **G** and **H** in the compound are the same.

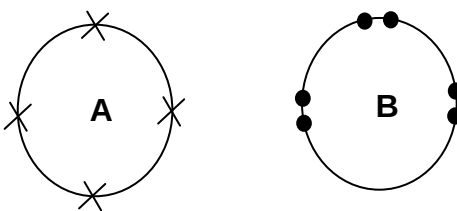
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|----------|----------|----------|------------------|
| A | (1) only | C | (2) and (3) only |
| B | (2) only | D | (1) and (2) only |

- 16** Which quantity of nickel has the smallest mass?
- A** 6×10^{22} atoms **C** 17.6 g
B 0.5 mol **D** 3.01×10^{23} Ni^{2+} ions
- 17** What is the concentration of hydrogen ions, in g/dm^3 , in 0.05 mol/dm^3 sulfuric acid?
- A** 0.05 g/dm^3 **C** 0.20 g/dm^3
B 0.10 g/dm^3 **D** 2.00 g/dm^3
- 18** A volume of ethane, C_2H_6 at r.t.p has a mass of 20 g. What is the mass of an equal volume of propene, C_3H_6 , at r.t.p.?
- A** 20 g **C** 28 g
B 21 g **D** 42 g
- 19** 20 cm^3 of carbon monoxide are reacted with 10 cm^3 of oxygen. The equation for the reaction is shown.



Which volume of carbon dioxide will be produced? (all volumes are measure at r.t.p.)

- A** 10 cm^3 **C** 30 cm^3
B 20 cm^3 **D** 40 cm^3
- 20** Which of the following is used in the chemical test for hydrogen gas?
- A** burning splint **C** potassium manganate(VII)
B glowing splint **D** red litmus paper
- 21** The number of valence electrons of atoms **A** and **B** are shown in the diagram.



What is the most likely formula of the compound formed between **A** and **B**?

- A** AB_2 **C** A_2B
B AB_4 **D** A_2B_3

- 22** 25.0 cm³ of 0.100 mol/dm³ dilute sulfuric acid was placed in a conical flask. Which of the following aqueous sodium hydroxide solutions would exactly neutralize the sulfuric acid in the flask?

A	25.0 cm ³ of 0.050 mol/dm ³	C	50.0 cm ³ of 0.050 mol/dm ³
B	25.0 cm ³ of 0.100 mol/dm ³	D	50.0 cm ³ of 0.100 mol/dm ³

- 23** When aqueous sodium hydroxide is added dropwise until in excess to an unknown salt solution, a green precipitate is formed and is insoluble in excess aqueous sodium hydroxide. The precipitate turns brown slowly.

Which of the following is the unknown salt?

A	copper(II) sulfate	C	iron(III) sulfate
B	iron(II) sulfate	D	lead(II) sulfate

- 24** Two bottles in a chemical store are unlabelled. One bottle is known to contain potassium chloride solution and the other aqueous sodium iodide.

Which tests would identify the solutions?

A Addition of aqueous lead(II) nitrate.
B Addition of dilute sulfuric acid.
C Addition of blue litmus paper.
D Addition of aqueous sodium hydroxide.

- 25** When heated, solid **P** gives off a gas which forms a white precipitate with limewater. The residue reacts with dilute acid and also with aqueous alkali.

What is **P**?

A	copper(II) carbonate	C	zinc oxide
B	zinc carbonate	D	copper(II) oxide

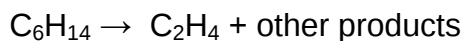
- 26** Which of the following sets show a list of compounds with boiling points in descending order?

	Highest boiling point	—————→	Lowest boiling point
A	sodium chloride	chlorine	bromine
B	sodium chloride	iodine	bromine
C	chlorine	bromine	iodine
D	iodine	bromine	chlorine

- 27** Dichloromethane, CH₂Cl₂, has a structure similar to methane. How many valence electrons are not involved in covalent bonding in a molecule of dichloromethane?

A	8	C	14
B	12	D	18

- 28** Which salt is best prepared by a titration method?
- | | | | |
|----------|----------------|----------|--------------------|
| A | sodium nitrate | C | copper(II) sulfate |
| B | zinc nitrate | D | lead(II) sulfate |
- 29** Two aqueous solutions, **K** and **L**, are mixed together. Which one of the following pairs would **not** give a white precipitate?
- | | K | L |
|----------|-------------------|------------------|
| A | barium nitrate | sodium sulfate |
| B | calcium nitrate | sodium carbonate |
| C | lead(II) nitrate | sodium chloride |
| D | magnesium nitrate | sodium sulfate |
- 30** Ethene, C_2H_4 , an important industrial organic chemical, can be prepared by heating hexane, C_6H_{14} , at $800^\circ C$:



If the yield of ethene is 42.5%, what mass of hexane must be heated to produce 481 g of ethene?

- | | | | |
|----------|-------|----------|--------|
| A | 157 g | C | 1132 g |
| B | 368 g | D | 3476 g |

The volume of one mole of any gas is 24 dm^3 at room temperature and pressure (r.t.p.)

a = relative atomic mass
X = atomic symbol
b = proton (atomic) number

Key