	NATIONAL JUNIOR COLLEGE SH1 PROMOTIONAL EXAMINATIONS Higher 1	
CANDIDATE NAME		
SUBJECT CLASS	REGISTRATION NUMBER	
CHEMISTRY Paper 1 Multiple Choi Additional Materials:	ice Optical Answer Sheet Data Booklet	8873/01 Tuesday 1 Oct 2019 40 minutes

READ THESE INSTRUCTIONS FIRST

Write in soft pencil.

Do not use staples, paper clips, highlighters, glue or correction fluid.

Write your name, subject class and registration number on the Answer Sheet in the spaces provided unless this has been done for you.

There are **20** questions on 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 separate Answer Sheet.

Read the instructions on the Answer Sheet very carefully.

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.

The use of an approved scientific calculator is expected, where appropriate.

This document consists of **10** printed pages and 0 blank page.

1 Use of the Data Booklet is relevant to this question.

What is the number of atoms in 500 cm³ of oxygen under room conditions?

A 1.25×10^{22} **B** 1.34×10^{22} **C** 2.50×10^{22} **D** 2.68×10^{22}

2 Gallium nitride, GaN, could revolutionise the design of electric light bulbs because only a small length used as a filament gives excellent light at low cost.

GaN is an ionic compound containing the Ga³⁺ ion.

Which statements about GaN are correct?

- 1 The outer electronic configuration of Ga atom is $4s^24p^1$ since Ga is a Group 13 element.
- 2 The electron arrangement of the nitrogen ion in GaN is $1s^2 2s^2 2p^3$.
- **3** Ga³⁺ ion deflects less than A^{β +} ion in an electric field.
- A 1 only B 2 only C 1 and 3 only D 2 and 3 only
- **3** Oxygen has two isotopes, 16 O and 18 O.

An oxide ion, ${}_{8}^{x}O^{y-}$, has the same number of neutrons and electrons. What could be the values of x and y?

	x	У
Α	16	1
В	16	2
С	18	1
D	18	2

4 Methyl mercaptan, CH₃SH, is a substance often used to impart a smell to natural gas in a pipeline.

The chemical equation for the combustion of CH₃SH is as shown below.

$$CH_3SH + 3O_2 \rightarrow CO_2 + SO_2 + 2H_2O$$

A 10 cm³ sample of CH₃SH is exploded with 60 cm³ of oxygen and the resultant gas mixture is passed into excess NaOH(aq).

What is the percentage of the volume of the resultant gas mixture dissolved in NaOH?

[All gas volumes are measured at room temperature and pressure.]

A 40.0% **B** 28.5% **C** 20.0% **D** 14.3%

- **5** Which sketch show the correct trend in the stated property for the elements in Period 3 of the Periodic Table?
 - 1 atomic radius



2 first ionisation energy



3 electrical conductivity



Α

6 G is an element in period 4 of the Periodic Table. The first thirteen ionisation energies of **G** are plotted against the order of the removal of electrons as shown below.



What is the formula of the compound formed when G reacts with oxygen?



7 In which pair of compounds is the first member less volatile than the second one?



8 The shapes of three species P, Q, and R are bent, square planar and trigonal pyrimidal respectively.

Which of the following can be P, Q and R?

	Р	Q	R
Α	CCl_2	BrF_4^-	SbF₃
В	CS_2	BH_4^-	ICl ₃
С	F ₂ O	$\mathrm{IC}l_4^-$	BCl ₃
D	ICl_2^-	XeF ₄	SO32-

9 The thyroid gland concentrates iodine and uses it to produce thyroxine, which is a hormone that controls the metabolic rate.



Thyroxine

What are the values of the bond angles **p**, **q**, **r** and **s**?

	p	q	r	S
Α	180°	90 °	180°	90°
В	105°	90°	107°	180°
С	180°	90°	120°	180°
D	105°	109.5°	107°	120°

10 Ice is the crystalline form of water. The diagram below shows part of the structure of ice.



Which of the following statements is not true about ice?

- A Ice has a lower density than water at 0 °C due to its open structure.
- **B** The bond angle about oxygen in ice is 109.5°.
- **C** Ice does not conduct electricity.
- **D** The hydrogen bonds are stronger than the O-H covalent bond.

- 11 In which of the following substances, must covalent bonds break on melting?
 - A Phosphorus(V) chloride, PCl₅
 - **B** Aluminium chloride, Al₂Cl₆
 - C Silicon carbide, SiC
 - **D** Iron(II) hydroxide, Fe(OH)₃

12 What is the most likely ΔH value for KOH(aq) + HC*l* (aq) → KC*l*(aq) + H₂O(*l*)? Given that NaOH(aq) + H₂SO₄(aq) → Na₂SO₄(aq) + 2H₂O(*l*) ΔH = −114 kJ mol⁻¹

- **A** -54 kJ mol⁻¹ **B** -57 kJ mol⁻¹ **C** -114 kJ mol⁻¹ **D** -228 kJ mol⁻¹
- **13** The reaction shown is a first-order reaction.

$$N_2O_5(g) \rightarrow 2NO_2(g) + \frac{1}{2}O_2(g)$$

Which graph shows how the concentration of N₂O₅ varies with time?





Which statement is correct for the number of molecules with molecular energies A, B and C?

- **A** n_c decreases when more gas **E** is added at the same temperature.
- **B** n_A decreases when temperature is lowered.
- **C** n_A and n_B increases when temperature is increased.
- **D** Addition of catalyst at the same temperature has no effect on n_A , n_B and n_C .
- 15 A chemical plant illegally dumped two radioactive isotopes **P** and **Q** in a landfill. The amount of **P** is 4 times the amount of **Q**. The radioactive decay of isotopes follows first-order kinetics.

The half-life of **P** is 2 days whereas that of **Q** is 8 days. By the time the authorities found out about this illegal dumping and analysed a sample of the waste, the ratio of **P** to **Q** was found to be **1**:**2**.

How long was the waste in the landfill before the authorities arrived?

- A 8 days
- B 16 days
- **C** 32 days
- D 64 days

- **16** A catalytic converter is part of the exhaust system of many modern cars. Which reactions occur in a catalytic converter?
 - 1 $2CO + 2NO \rightarrow 2CO_2 + N_2$
 - $2 \quad CO_2 + NO \rightarrow CO + NO_2$
 - $\mathbf{3} \quad 2\mathrm{SO}_2 + 2\mathrm{NO} \rightarrow 2\mathrm{SO}_3 + \mathrm{N}_2$
 - A 1 only B 1 and 2 only C 1 and 3 D 1, 2 and 3
- 17 Which statement is **incorrect** for the compound shown below?



- **A** There are 6π bonds.
- **B** There are 8σ bonds.
- **C** There are two different bond angles.
- **D** There are three sp^2 hybridised carbons.
- **18** A halogenoalkane has the formula of $C_3H_5Cl_3$.

Which of the isomers have the correct IUPAC name?

- **1** 1,1,1-trichloropropane
- **2** 1,2,2-trichloropropane
- **3** 2,2,3-trichloropropane
- A 1 only
- **B** 1 and 2
- C 2 and 3
- **D** 1, 2 and 3

- **19** The Russian composer Borodin was widely respected for his work as a chemist. In 1869, he discovered a reaction in which two ethanol molecules combine to form a new β-hydroxy carbonyl compound. A similar reaction is shown below.
 - I $2CH_3COCH_3 \rightarrow CH_3COCH_2C(OH)(CH_3)_2$
 - II $CH_3COCH_2C(OH)(CH_3)_2 \rightarrow CH_3COCH=C(CH_3)_2 + H_2O$

Which of the following best describes reactions I and II?

	I	I
Α	subsitution	elimination
В	addition	elimination
С	addition	reduction
D	condensation	elimination

- 20 Which molecules do **not** have all the carbon atoms lying in one plane?
 - 1 benzene 2 cyclohexene 3 ethene 4 methylbenzene
 - A 2 only
 - **B** 2 and 4 only
 - **C** 1, 3 and 4
 - **D** 2, 3 and 4

End of paper

1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
С	С	D	А	В	С	С	A	D	D
11.	12.	13.	14.	15.	16.	17.	18.	19.	20.
С	В	А	D	А	А	D	В	В	А