Neap:

HSC Trial Examination 2019

Chemistry

General Instructions

- Reading time – 5 minutes
- Working time – 3 hours
- Write using black pen
- Draw diagrams using pencil
- NESA approved calculators may be used
- A formulae sheet, data sheet and Periodic Table are provided at the back of this paper
- For questions in Section II, show all relevant working in questions involving calculations

Total marks: 100

Section I – 20 marks (pages 2–7)

- Attempt Questions 1–20
- Allow about 35 minutes for this section

Section II – 80 marks (pages 8–27)

- Attempt Questions 21–38
- Allow about 2 hours and 25 minutes for this section

Students are advised that this is a trial examination only and cannot in any way guarantee the content or the format of the 2019 HSC Chemistry Examination.

Section I

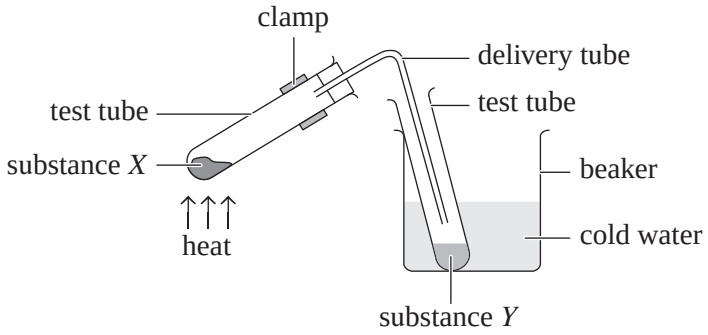
20 marks
Attempt Questions 1–20
Allow about 35 minutes for this section

Use the multiple-choice answer sheet for Questions 1–20.

1. Which of the following statements about systems is correct?

(A) An open system can transfer matter but not energy with its surroundings.
(B) An open system can transfer energy but not matter with its surroundings.
(C) A closed system can transfer energy but not matter with its surroundings.
(D) A closed system can transfer neither energy nor matter with its surroundings.

2. The diagram shows hydrated cobalt(II) chloride after it has been heated and all signs of a reaction have ceased.



Which row of the table correctly shows the most likely identities of the substances *X* and *Y*?

	Substance X	*Substance Y*
(A)	water	dehydrated cobalt(II) chloride
(B)	dehydrated cobalt(II) chloride	water
(C)	dehydrated cobalt(II) chloride	chlorine
(D)	cobalt(II) oxide	water

3. Consider the equilibrium process

$$CH_2CH_2(g) + H_2(g) \rightleftharpoons CH_3CH_3(g) \qquad \Delta H = -136 \text{ mol}^{-1}.$$

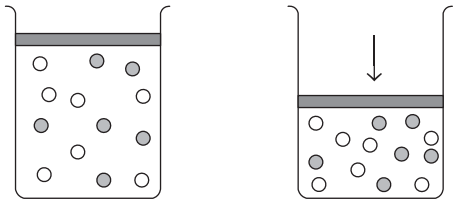
Which of the following changes would cause the magnitude of the equilibrium constant for this reaction to increase?

(A) The temperature is decreased.
(B) The pressure is decreased.
(C) The concentration of H_2 in the equilibrium mixture is increased.
(D) The concentration of CH_3CH_3 in the equilibrium mixture is increased.

4. Which of the following aqueous solutions of ionic compounds would form a precipitate when mixed?

(A) potassium chloride and sodium hydroxide
(B) magnesium sulfate and sodium chloride
(C) sodium iodide and ammonium nitrate
(D) sodium sulfate and barium nitrate

5. The diagram shows a mixture of gases in a sealed container where the volume is decreased.



Which of the following statements most accurately describes this system?

(A) As volume increases, the gas molecules move faster.
(B) As volume decreases, the gas molecules move further before colliding.
(C) As volume decreases, the gas molecules can have more collisions.
(D) Changing the volume has no effect on the movement of molecules.

6. The pH of an alkaline solution is 8.

Which of the following expressions could represent this solution?

(A) $[OH^-] = 10^{-8}$

(B) $-\log_{10}[H^+] = 8$

(C) $\log_{10}[OH^-] = 8$

(D) $\log_{10}[H^+] = 8$

7. Magnesium reacts with dilute hydrochloric acid to liberate hydrogen.

What is the volume of hydrogen produced at 298.1 K and 100 kPa when 1.22 g of magnesium is reacted with excess dilute acid?

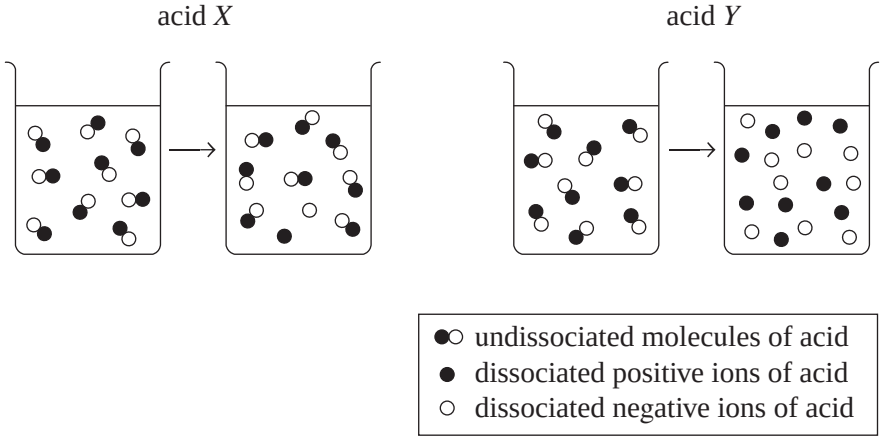
(A) 1140 mL
(B) 1240 mL
(C) 2270 mL
(D) 2450 mL

8. Nitric acid completely dissociates in aqueous solutions. 1.0 mL of 10 mol L^{-1} solution was diluted to 1 L with distilled water. 100 mL of this resulting solution was then further diluted to 1 L using distilled water.

What pH is the final solution closest to?

(A) 1
(B) 2
(C) 3
(D) 4

9. The diagram shows the behaviour of two different acids when they are dissolved in distilled water.



Which row of the table correctly describes the two acids?

	Acid X	*Acid Y*
(A)	concentrated	dilute
(B)	dilute	concentrated
(C)	strong	weak
(D)	weak	strong

10. Consider the system

$$HF(aq) + H_2O(l) \rightleftharpoons F^-(aq) + H_3O^+(aq).$$

Which of the following represents a conjugate acid–base pair present in this system?

(A) $HF(aq)/F^-(aq)$
(B) $HF(aq)/H_3O^+(aq)$
(C) $HF(aq)/H_2O(l)$
(D) $F^-(aq)/H_3O^+(aq)$

11. In an experiment, 4-hydroxybutanoic acid [$HO(CH_2)_3COOH$] forms a polymer containing 1000 monomer units.

Which of the following is closest to the approximate molar mass (in g mol^{-1}) of this polymer?

(A) 2.0×10^2
(B) 1.4×10^4
(C) 8.6×10^4
(D) 1.0×10^5

12. How many hydrogen atoms are there in one molecule of 2,2-dimethylbutan-1-ol?

(A) 8
(B) 10
(C) 12
(D) 14

13. Separate samples of hex-1-ene and hex-2-ene are reacted with bromine in the absence of light.

Which of the following statements about these reactions is correct?

(A) The product will be 1,2-dibromohexane.
(B) The products will be structural isomers of each other.
(C) The products will be isomeric dihaloalkenes.
(D) The products will be isomeric unsaturated compounds.

14. What type of reaction is represented by the conversion of hexan-3-ol to hexan-3-one?

(A) addition
(B) substitution
(C) elimination
(D) oxidation

15. The infrared spectrum of a pure compound showed a broad band between 3000 and 3200 cm^{-1}; a series of moderate bands at 2900, 2990 and 3200 cm^{-1}; an intense band at 1725 cm^{-1}; and numerous bands between 1640 and 750 cm^{-1}.

Which of the following compounds matches these absorbances?

(A) ethene
(B) ethanol
(C) ethyl ethanoate
(D) ethanoic acid

16. Which type of bonding forms between the monomers that react together to form nylon polymers?

(A) amide bonds
(B) ester bonds
(C) ionic bonds
(D) hydrogen bonds

17. Which of the following pairs of compounds are NOT isomers?

(A) hexan-2-ol and 2,2-dimethylbutan-1-ol
(B) methyl ethanoate and propanoic acid
(C) butane and cyclobutane
(D) butan-2-one and 2-methylpropanal

18. How many peaks would appear in the ^{13}C NMR spectra of pentan-3-one?

(A) 2
(B) 3
(C) 4
(D) 5

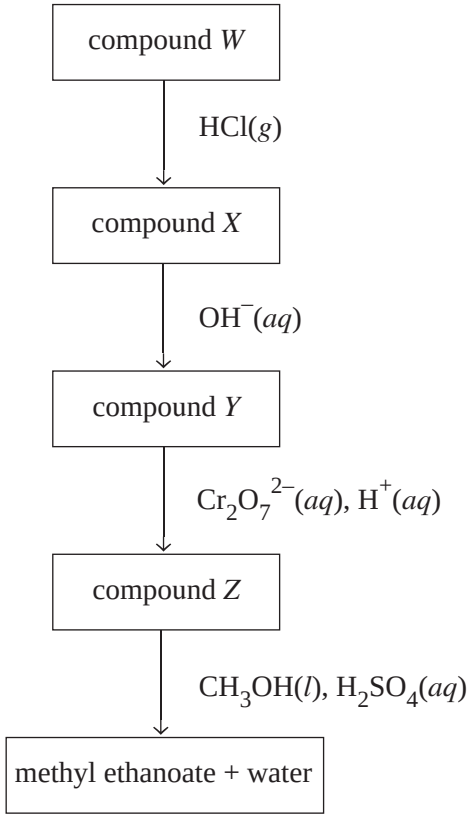
19. A solution was prepared by dissolving a pure compound in water. The solution was subjected to a series of tests. The results are shown in the table.

Test	*Reaction*
flame test	The flame turns lilac/pink.
adding $BaCl_2(aq)$	A precipitate forms.
adding $HCl(aq)$	Bubbles of gas form.

Which of the following compounds was dissolved into the water?

(A) calcium carbonate
(B) potassium carbonate
(C) sodium sulfate
(D) potassium sulfate

20. The flow chart shows a sequence of reactions that result in the formation of methyl ethanoate.



Which row of the table correctly identifies the compounds labelled *W*, *X*, *Y* and *Z*?

	Compound W	*Compound X*	*Compound Y*	*Compound Z*
(A)	ethane	chloroethane	ethanol	methanoic acid
(B)	methane	chloromethane	methanol	methanoic acid
(C)	ethane	chloroethane	ethanol	ethanoic acid
(D)	ethene	chloroethane	ethanol	ethanoic acid

Section II

80 marks
Attempt Questions 21–38
Allow about 2 hours and 25 minutes for this section

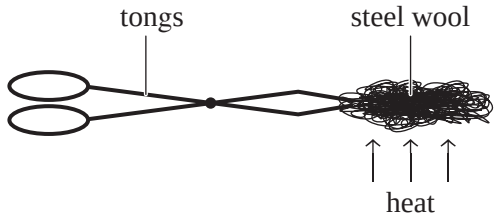
Answer the questions in the spaces provided. These spaces provide guidance for the expected length of response.

Show all relevant working in questions involving calculations.

Extra writing space is provided at the back of this booklet. If you use this space, clearly indicate which question you are answering.

Question 21 (5 marks)

The diagram shows heat applied to steel wool.



Steel wool is a mass of fine wire made of iron. When a flame is applied, the iron strands start to burn in air to produce iron(III) oxide according to the equation

$$2Fe(s) + 1\frac{1}{2}O_2(g) \rightarrow Fe_2O_3(s) \qquad \Delta H = -ve.$$

(a) What is the type of energy supplied by the flame to start the reaction? **1**

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(b) What is the overall energy exchange with the surroundings for this reaction? Explain your answer. **1**

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Question 21 continues on page 9

Question 21 (continued)

(c) At the completion of the reaction it is said to be in static equilibrium. **1**

What is meant by the term ‘static equilibrium’?

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(d) Describe how entropy changes in this reaction. **2**

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End of Question 21

Question 22 (5 marks)

Solutions of iron(III) nitrate and potassium thiocyanate react according to the equation

$$Fe^{3+}(aq) + SCN^{-}(aq) \rightleftharpoons FeSCN^{2+}(aq).$$

The iron thiocyanate ion has a blood-red colour, whereas other ions present have little or no colour.

Equimolar solutions of iron(III) nitrate and potassium thiocyanate were mixed. The concentrations of the various ions at equilibrium are shown in the table.

Ion	Fe^{3+}	SCN^{-}	$FeSCN^{2+}$
Concentration at equilibrium (mol L^{-1})	0.0184	0.0184	0.0932

(a) Calculate the equilibrium constant (K_{eq}) for the reaction. **2**

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(b) What does the calculated value of the equilibrium constant for this reaction indicate? **1**

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(c) Explain what would happen to the colour of this equilibrium mixture if an aqueous solution of sodium hydroxide was added. **2**

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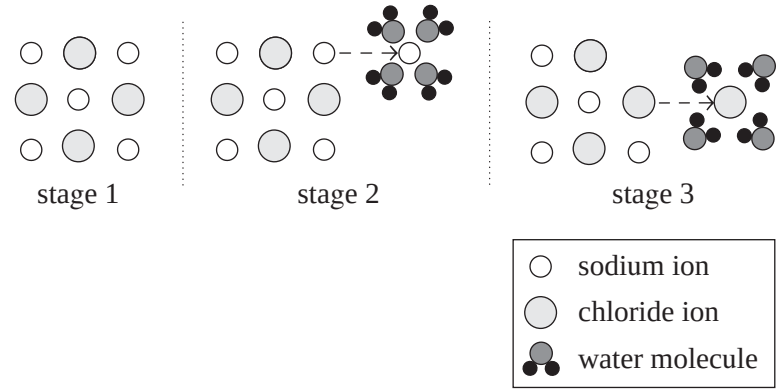
Question 23 (5 marks)

The diagram shows sodium chloride (common salt) dissolving in water.



(a) A saturated solution of sodium chloride in water was found to have a concentration of 359 g L^{-1}. **3**

With reference to the diagram, describe the dissociation of sodium chloride.

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(b) Calculate the value of K_{sp} for this system. **2**

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Question 24 (4 marks)

Consider the reaction

$$2NO_2(g) \rightleftharpoons N_2O_4(g) \qquad \Delta H = -57.20 \text{ kJ mol}^{-1}.$$

(a) Using the reaction, outline how activation energy (E_a) varies for the forward and the reverse reactions in equilibrium reactions. **2**

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(b) How would increasing the temperature affect this reaction? Explain your answer. **2**

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Question 25 (5 marks)

Carbonic acid is formed when carbon dioxide dissolves in water. Carbonic acid plays a major part in the buffering of human blood, which has a typical pH of 7.40. One way to show the ionisation of carbonic acid is

$$H_2CO_3(aq) \rightleftharpoons HCO_3^-(aq) + H^+(aq).$$

(a) Write an expression for the equilibrium constant (K_{eq}) for this reaction. **1**

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(b) Buffers play a role in many natural systems. **3**

Using human blood, or another relevant example, explain why buffers are important.

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(c) What is the typical hydrogen ion concentration in human blood? Show your working. **1**

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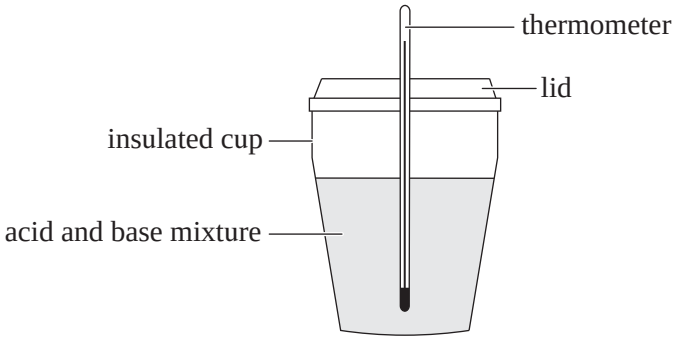
Question 26 (8 marks)

The diagram shows a coffee cup calorimeter used by a student to measure the enthalpy of neutralisation of an acid–base reaction.



120 mL of 0.500 mol L^{-1} sodium hydroxide was added to 60.0 mL of 0.500 mol L^{-1} sulfuric acid. Both solutions were at a temperature of 24.2°C. After mixing, the final temperature was 26.3°C.

(a) Calculate the enthalpy change per mole of water formed in this reaction. **3**

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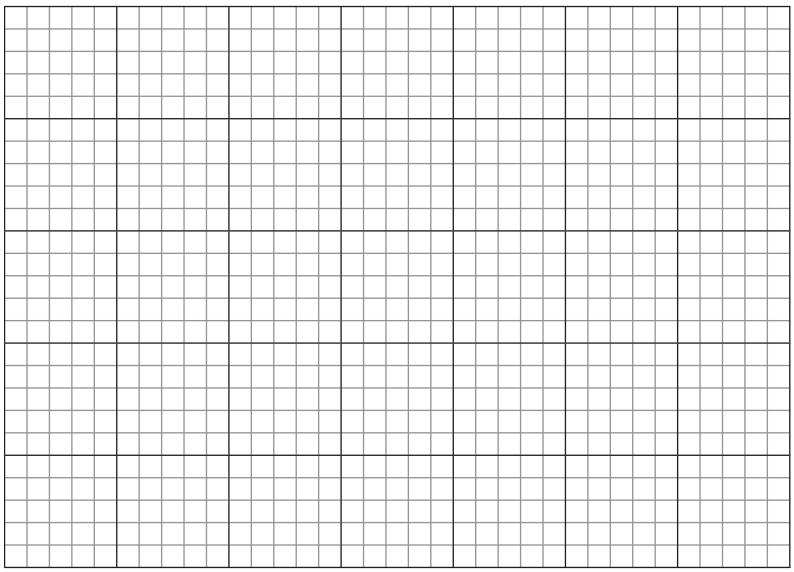
Question 26 continues on page 15

Question 26 (continued)

(b) The heat of combustion of a number of alcohols was measured. The results are shown in the table. **3**

Alcohol	*Enthalpy of combustion (kJ mol^{-1})*
methanol	–726
propan-1-ol	–2021
butan-1-ol	–2676
pentan-1-ol	–3331
hexan-1-ol	–3984

Using the data provided, construct a graph that shows the relationship between chain length (number of carbon atoms) and enthalpy of combustion for these alcohols.



(c) Using the graph constructed in part (b), predict the value of the enthalpy of combustion of ethanol in kJ per gram of ethanol. **2**

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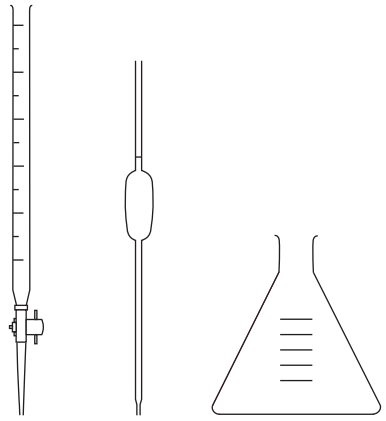
End of Question 26

Question 27 (3 marks)

The diagram shows three pieces of glassware (*X*, *Y* and *Z*) used in conventional acid–base titrations (indicator colour change). **3**



Identify each piece of equipment and outline its role in a titration.

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Question 28 (4 marks)

Various models of acids and bases have been used over time. **4**

Compare the theories of Arrhenius and Brønsted–Lowry.

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Question 29 (6 marks)

A class was set the task of conducting a chemical analysis of a common household substance for its acidity or basicity. **6**

Describe TWO different methods of how this analysis could be conducted. In your answer, include any advantages and disadvantages of the methods.

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Question 30 (5 marks)

Complete the table by drawing the structural formulae for the products and naming the catalyst, if required. **5**

Reactants		*Products*	*Catalyst*
propene + H_2	$\rightarrow$		
but-2-ene + HCl	$\rightarrow$		no catalyst
hex-3-ene + H_2O	$\rightarrow$		

Question 31 (3 marks)

Describe how to prepare an ester in the school laboratory. Include a specific safety precaution in your answer. **3**

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Question 32 (3 marks)

A 50.00 g sample contaminated with a small amount of potassium permanganate was dissolved into sufficient water to give 2.00 L of solution. The molar absorptivity, ε, of sodium permanganate at 526 nm is known to be 22 400 L mol^{-1} cm^{-1}. **3**

Light of 526 nm was passed through a 1.00 cm wide sample of this solution. The absorbance was measured and found to be 0.398.

Determine the concentration, in parts per million (ppm), of potassium permanganate in the original 50.0 g sample.

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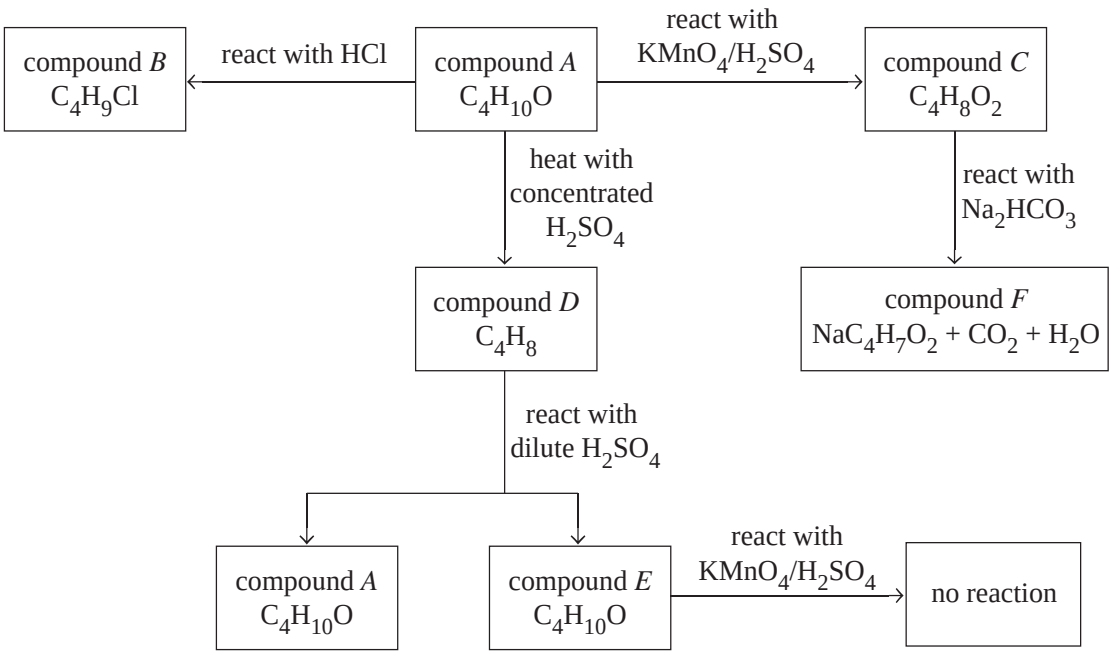
Question 33 (6 marks)

The flow chart shows the reactions of six different organic compounds. **6**



Complete the table by drawing the structural formulae for the compounds and justifying your answers with reference to the information provided.

Compound	*Structural formula*	*Justification*
Compound *A* $C_4H_{10}O$		
Compound *B* C_4H_9Cl		

Question 33 continues on page 21

Question 33 (continued)

Compound	*Structural formula*	*Justification*
Compound *C* $C_4H_8O_2$		
Compound *D* C_4H_8		
Compound *E* $C_4H_{10}O$		
Compound *F* $NaC_4H_7O_2$		

End of Question 33

Question 34 (3 marks)

Many people wash their dirty dishes with soapy water.

(a) Describe how soapy water is able to clean dishes covered with grease or fat while fresh water is not. **2**

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(b) Draw a diagram to show how soaps form micelles in water. **1**

Question 35 (3 marks)

A student collected a 50.0 mL sample of river water. He determined the concentration of chloride ions in the water by adding excess silver nitrate solution, filtering to collect the resulting precipitate, drying the precipitate overnight and weighing the dried precipitate. The mass of dried precipitate obtained was 1.05 g.

(a) Write a balanced net ionic equation to account for the formation of the precipitate. **1**

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(b) Calculate the percentage mass of chloride ion in the water sample. **2**

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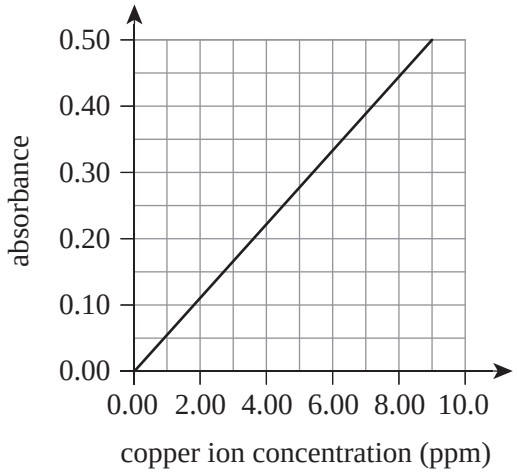
Question 36 (3 marks)

A copper mine was monitoring copper concentration in a stream. Five samples were collected from the stream and the absorbance of each sample was measured. The results are shown in the table. **3**

Sample	*Absorbance*
1	0.37
2	0.39
3	0.40
4	0.13
5	0.44

The absorbance of a series of standard $Cu(NO_3)_2$ solutions was then prepared. The measurements were graphed to obtained the standard curve shown.



Using the absorbance data and standard curve provided, determine a reliable value for the concentration of copper in the stream.

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Question 37 (4 marks)

Methanamide, $HCONH_2$, is used in both drug manufacture and as an industrial solvent. **4**

Compare the factors that need to be considered when synthesising methanamide for these two purposes.

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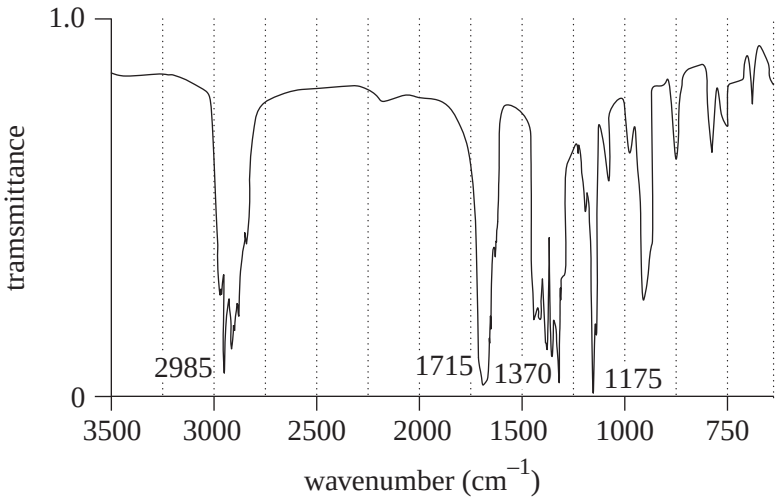
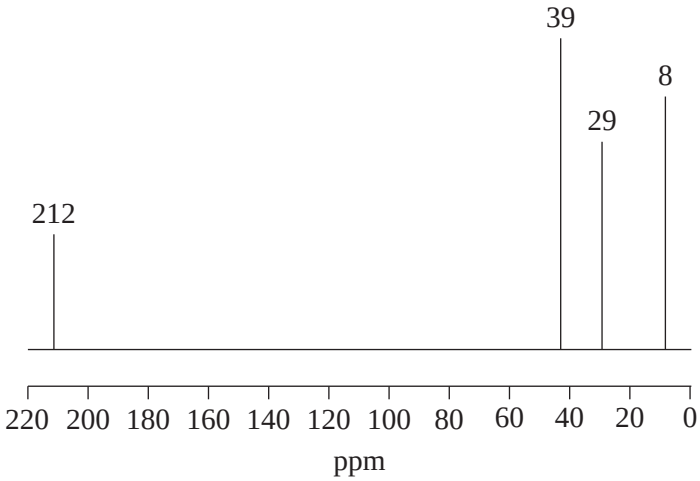
Question 38 (5 marks)

A student investigating the identity of compound *X* examined the following spectroscopic data. **5**

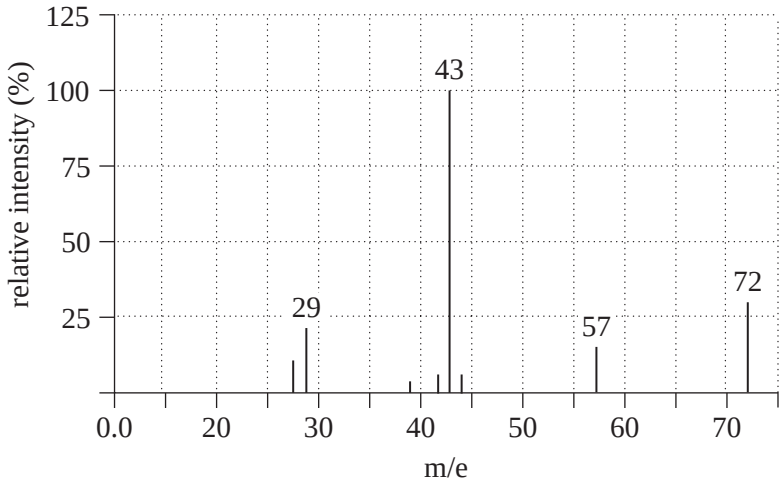
Infrared spectrum of compound *X*



^{13}C NMR spectra of compound *X*



Mass spectrum of compound *X*



Question 38 continues on page 27

Question 38 (continued)

After narrowing down the identity of compound *X* to one of two possibilities, the student conducted a final chemical test to identify the compound. The student tested the reaction of compound *X* with acidified potassium permanganate and no colour change was observed.

Identify compound *X*. Support your answer with an analysis of the evidence provided.

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Section II extra writing space

If you use this space, clearly indicate which question you are answering.

Section II extra writing space

If you use this space, clearly indicate which question you are answering.

FORMULAE SHEET

$n = \frac{m}{MM}$ $\quad c = \frac{n}{V}$ $\quad PV = nRT$

$q = mc\Delta T$ $\quad \Delta G° = \Delta H° - T\Delta S°$ $\quad \text{pH} = -\log_{10}[\text{H}^+]$

$pK_a = -\log_{10}[K_a]$ $\quad A = \varepsilon lc = \log_{10}\frac{I_o}{I}$

Avogadro constant, N_A . . . . . 6.022×10^{23} mol^{-1}

Volume of 1 mole ideal gas: at 100 kPa and

at 0°C (273.15 K). . . . . 22.71 L

at 25°C (298.15 K). . . . . 24.79 L

Gas constant . . . . . 8.314 J mol^{-1} K^{-1}

Ionisation constant for water at 25°C (298.15 K), K_w . . . . . 1.0×10^{-14}

Specific heat capacity of water . . . . . 4.18×10^3 J kg^{-1} K^{-1}

DATA SHEET

Solubility constants at 25°C

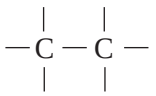
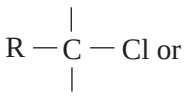
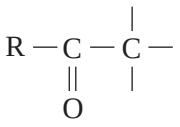
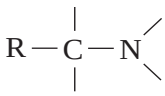
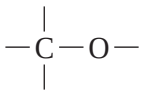
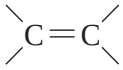
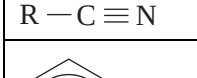
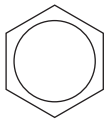
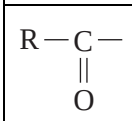
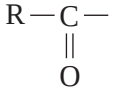
Compound	K_{sp}	*Compound*	K_{sp}
Barium carbonate	2.58×10^{-9}	Lead(II) bromide	6.60×10^{-6}
Barium hydroxide	2.55×10^{-4}	Lead(II) chloride	1.70×10^{-5}
Barium phosphate	1.3×10^{-29}	Lead(II) iodide	9.8×10^{-9}
Barium sulfate	1.08×10^{-10}	Lead(II) carbonate	7.40×10^{-14}
Calcium carbonate	3.36×10^{-9}	Lead(II) hydroxide	1.43×10^{-15}
Calcium hydroxide	5.02×10^{-6}	Lead(II) phosphate	8.0×10^{-43}
Calcium phosphate	2.07×10^{-29}	Lead(II) sulfate	2.53×10^{-8}
Calcium sulfate	4.93×10^{-5}	Magnesium carbonate	6.82×10^{-6}
Copper(II) carbonate	1.4×10^{-10}	Magnesium hydroxide	5.61×10^{-12}
Copper(II) hydroxide	2.2×10^{-20}	Magnesium phosphate	1.04×10^{-24}
Copper(II) phosphate	1.40×10^{-37}	Silver bromide	5.35×10^{-13}
Iron(II) carbonate	3.13×10^{-11}	Silver chloride	1.77×10^{-10}
Iron(II) hydroxide	4.87×10^{-17}	Silver carbonate	8.46×10^{-12}
Iron(III) hydroxide	2.79×10^{-39}	Silver hydroxide	2.0×10^{-8}
Iron(III) phosphate	9.91×10^{-16}	Silver iodide	8.52×10^{-17}
		Silver phosphate	8.89×10^{-17}
		Silver sulfate	1.20×10^{-5}

Aylward and Findlay, *SI Chemical Data* (5th Edition) is the principal source of data for this examination paper. Some data may have been modified for examination purposes.

Infrared absorption data

Bond	Wavenumber/cm^{-1}
N—H (amines)	3300–3500
O—H (alcohols)	3230–3550 (broad)
C—H	2850–3300
O—H (acids)	2500–3000 (very broad)
C≡N	2220–2260
C═O	1680–1750
C═C	1620–1680
C—O	1000–1300
C—C	750–1100

^{13}C NMR chemical shift data

Type of carbon		δ/ppm
		5–40
		10–70
		20–50
		25–60
	alcohols, ethers or esters	50–90
		90–150
		110–125
		110–160
	esters or acids	160–185
	aldehydes or ketones	190–220

UV absorption

(This is not a definitive list and is approximate.)

Chromophore	**λ_{max} (nm)**
C—H	112
C—C	135
C═C	162

Chromophore	**λ_{max} (nm)**
C≡C	173 178 196 222
C—Cl	173
C—Br	208

Some standard potentials

$K^+ + e^-$	$\rightleftharpoons$	$K(s)$	–2.94 V
$Ba^{2+} + 2e^-$	$\rightleftharpoons$	$Ba(s)$	–2.91 V
$Ca^{2+} + 2e^-$	$\rightleftharpoons$	$Ca(s)$	–2.87 V
$Na^+ + e^-$	$\rightleftharpoons$	$Na(s)$	–2.71 V
$Mg^{2+} + 2e^-$	$\rightleftharpoons$	$Mg(s)$	–2.36 V
$Al^{3+} + 3e^-$	$\rightleftharpoons$	$Al(s)$	–1.68 V
$Mn^{2+} + 2e^-$	$\rightleftharpoons$	$Mn(s)$	–1.18 V
$H_2O + e^-$	$\rightleftharpoons$	$\frac{1}{2}H_2(g) + OH^-$	–0.83 V
$Zn^{2+} + 2e^-$	$\rightleftharpoons$	$Zn(s)$	–0.76 V
$Fe^{2+} + 2e^-$	$\rightleftharpoons$	$Fe(s)$	–0.44 V
$Ni^{2+} + 2e^-$	$\rightleftharpoons$	$Ni(s)$	–0.24 V
$Sn^{2+} + 2e^-$	$\rightleftharpoons$	$Sn(s)$	–0.14 V
$Pb^{2+} + 2e^-$	$\rightleftharpoons$	$Pb(s)$	–0.13 V
$H^+ + e^-$	$\rightleftharpoons$	$\frac{1}{2}H_2(g)$	0.00 V
$SO_4^{2-} + 4H^+ + 2e^-$	$\rightleftharpoons$	$SO_2(aq) + 2H_2O$	0.16 V
$Cu^{2+} + 2e^-$	$\rightleftharpoons$	$Cu(s)$	0.34 V
$\frac{1}{2}O_2(g) + H_2O + 2e^-$	$\rightleftharpoons$	$2OH^-$	0.40 V
$Cu^+ + e^-$	$\rightleftharpoons$	$Cu(s)$	0.52 V
$\frac{1}{2}I_2(s) + e^-$	$\rightleftharpoons$	I^-	0.54 V
$\frac{1}{2}I_2(aq) + e^-$	$\rightleftharpoons$	I^-	0.62 V
$Fe^{3+} + e$	$\rightleftharpoons$	Fe^{2+}	0.77 V
$Ag^+ + e^-$	$\rightleftharpoons$	$Ag(s)$	0.80 V
$\frac{1}{2}Br_2(l) + e^-$	$\rightleftharpoons$	Br^-	1.08 V
$\frac{1}{2}Br_2(aq) + e^-$	$\rightleftharpoons$	Br^-	1.10 V
$\frac{1}{2}O_2(g) + 2H^+ + 2e^-$	$\rightleftharpoons$	H_2O	1.23 V
$\frac{1}{2}Cl_2(g) + e^-$	$\rightleftharpoons$	Cl^-	1.36 V
$\frac{1}{2}Cr_2O_7^{2-} + 7H^+ + 3e^-$	$\rightleftharpoons$	$Cr^{3+} + \frac{7}{2}H_2O$	1.36 V
$\frac{1}{2}Cl_2(aq) + e^-$	$\rightleftharpoons$	Cl^-	1.40 V
$MnO_4^- + 8H^+ + 5e^-$	$\rightleftharpoons$	$Mn^{2+} + 4H_2O$	1.51 V
$\frac{1}{2}F_2(g) + e^-$	$\rightleftharpoons$	F^-	2.89 V

PERIODIC TABLE OF THE ELEMENTS

1 **H** 1.008 Hydrogen																	2 **He** 4.003 Helium
3 **Li** 6.941 Lithium	4 **Be** 9.012 Beryllium											5 **B** 10.81 Boron	6 **C** 12.01 Carbon	7 **N** 14.01 Nitrogen	8 **O** 16.00 Oxygen	9 **F** 19.00 Fluorine	10 **Ne** 20.18 Neon
11 **Na** 22.99 Sodium	12 **Mg** 24.31 Magnesium											13 **Al** 26.98 Aluminium	14 **Si** 28.09 Silicon	15 **P** 30.97 Phosphorus	16 **S** 32.07 Sulfur	17 **Cl** 35.45 Chlorine	18 **Ar** 39.95 Argon
19 **K** 39.10 Potassium	20 **Ca** 40.08 Calcium	21 **Sc** 44.96 Scandium	22 **Ti** 47.87 Titanium	23 **V** 50.94 Vanadium	24 **Cr** 52.00 Chromium	25 **Mn** 54.94 Manganese	26 **Fe** 55.85 Iron	27 **Co** 58.93 Cobalt	28 **Ni** 58.69 Nickel	29 **Cu** 63.55 Copper	30 **Zn** 65.38 Zinc	31 **Ga** 69.72 Gallium	32 **Ge** 72.64 Germanium	33 **As** 74.92 Arsenic	34 **Se** 78.96 Selenium	35 **Br** 79.90 Bromine	36 **Kr** 83.80 Krypton
37 **Rb** 85.47 Rubidium	38 **Sr** 87.61 Strontium	39 **Y** 88.91 Yttrium	40 **Zr** 91.22 Zirconium	41 **Nb** 92.91 Niobium	42 **Mo** 95.96 Molybdenum	43 **Tc** Technetium	44 **Ru** 101.1 Ruthenium	45 **Rh** 102.9 Rhodium	46 **Pd** 106.4 Palladium	47 **Ag** 107.9 Silver	48 **Cd** 112.4 Cadmium	49 **In** 114.8 Indium	50 **Sn** 118.7 Tin	51 **Sb** 121.8 Antimony	52 **Te** 127.6 Tellurium	53 **I** 126.9 Iodine	54 **Xe** 131.3 Xenon
55 **Cs** 132.9 Caesium	56 **Ba** 137.3 Barium	57–71 Lanthanoids	72 **Hf** 178.5 Hafnium	73 **Ta** 180.9 Tantalum	74 **W** 183.9 Tungsten	75 **Re** 186.2 Rhenium	76 **Os** 190.2 Osmium	77 **Ir** 192.2 Iridium	78 **Pt** 195.1 Platinum	79 **Au** 197.0 Gold	80 **Hg** 200.6 Mercury	81 **Tl** 204.4 Thallium	82 **Pb** 207.2 Lead	83 **Bi** 209.0 Bismuth	84 **Po** Polonium	85 **At** Astatine	86 **Rn** Radon
87 **Fr** Francium	88 **Ra** Radium	89–103 Actinoids	104 **Rf** Rutherfordium	105 **Db** Dubnium	106 **Sg** Seaborgium	107 **Bh** Bohrium	108 **Hs** Hassium	109 **Mt** Meitnerium	110 **Ds** Darmstadtium	111 **Rg** Roentgenium	112 **Cn** Copernicium	113 **Uut** Ununtrium	114 **Fl** Flerovium	115 **Uup** Ununpentium	116 **Lv** Livermorium	117 **Uus** Ununseptium	118 **Uuo** Ununoctium

KEY

Atomic Number
Symbol
Standard Atomic Weight
Name

79
Au
197.0
Gold

Lanthanoids

57 **La** 138.9 Lanthanum	58 **Ce** 140.1 Cerium	59 **Pr** 140.9 Praseodymium	60 **Nd** 144.2 Neodymium	61 **Pm** Promethium	62 **Sm** 150.4 Samarium	63 **Eu** 152.0 Europium	64 **Gd** 157.3 Gadolinium	65 **Tb** 158.9 Terbium	66 **Dy** 162.5 Dysprosium	67 **Ho** 164.9 Holmium	68 **Er** 167.3 Erbium	69 **Tm** 168.9 Thulium	70 **Yb** 173.1 Ytterbium	71 **Lu** 175.0 Lutetium

Actinoids

89 **Ac** Actinium	90 **Th** 232.0 Thorium	91 **Pa** 231.0 Protactinium	92 **U** 238.0 Uranium	93 **Np** Neptunium	94 **Pu** Plutonium	95 **Am** Americium	96 **Cm** Curium	97 **Bk** Berkelium	98 **Cf** Californium	99 **Es** Einsteinium	100 **Fm** Fermium	101 **Md** Mendelevium	102 **No** Nobelium	103 **Lr** Lawrencium

Standard atomic weights are abridged to four significant figures. Elements with no reported values in the table have no stable nuclides. Information on elements with atomic numbers 113 and above is sourced from the International Union of Pure and Applied Chemistry Periodic Table of the Elements (November 2016 version). The International Union of Pure and Applied Chemistry Periodic Table of the Elements (Febuary 2010 version) is the principal source of all other data. Some data may have been modified.

Neap:

HSC Trial Examination 2019

Chemistry

DIRECTIONS:

Write your name in the space provided.
Write your student number in the boxes provided below. Then, in the columns of digits below each box, fill in the oval which has the same number as you have written in the box. Fill in **one** oval only in each column.

Read each question and its suggested answers. Select the alternative A, B, C, or D that best answers the question. Fill in the response oval completely, using blue or black pen. Mark **only one** oval per question.

A ⬭ B ⬬ C ⬭ D ⬭

If you think you have made a mistake, put a cross through the incorrect answer and fill in the new answer.

A ⬬ B ⬭ C ⬭ D ⬭

If you change your mind and have crossed out what you consider to be the correct answer, then indicate this by writing the word *correct* and draw an arrow as follows.

correct

A ⬭ B ⬭ C ⬭ D ⬭

STUDENT NAME: _____

STUDENT NUMBER:

1	1	1	1	1	1	1	1	1
2	2	2	2	2	2	2	2	2
3	3	3	3	3	3	3	3	3
4	4	4	4	4	4	4	4	4
5	5	5	5	5	5	5	5	5
6	6	6	6	6	6	6	6	6
7	7	7	7	7	7	7	7	7
8	8	8	8	8	8	8	8	8
9	9	9	9	9	9	9	9	9
0	0	0	0	0	0	0	0	0

SECTION I
MULTIPLE-CHOICE ANSWER SHEET

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 ⬭
13.	A ⬭	B ⬭	C ⬭	D ⬭
14.	A ⬭	B ⬭	C ⬭	D ⬭
15.	A ⬭	B ⬭	C ⬭	D ⬭
16.	A ⬭	B ⬭	C ⬭	D ⬭
17.	A ⬭	B ⬭	C ⬭	D ⬭
18.	A ⬭	B ⬭	C ⬭	D ⬭
19.	A ⬭	B ⬭	C ⬭	D ⬭
20.	A ⬭	B ⬭	C ⬭	D ⬭

STUDENTS SHOULD NOW CONTINUE WITH SECTION II

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