Part A
Answer all questions in this part.

Directions (1-24): For *each* statement or question, record on your separate answer sheet the *number* of the word or expression that, of those given, best completes the statement or answers the question. Some questions may require the use of the *2011 Edition Reference Tables for Physical Setting/Chemistry*.

1 As energy is released during the formation of a bond, the stability of the chemical system generally

(1) decreases
(2) increases
(3) remains the same

2 Which kind of energy is stored in a chemical bond?

(1) potential energy (3) activation energy
(2) kinetic energy (4) ionization energy

3 Energy is released when the atoms of two elements bond together to form a compound. Compared to the total potential energy of the atoms before bonding, the total potential energy of the atoms after bonding is

(1) higher and the compound formed is stable
(2) higher and the compound formed is unstable
(3) lower and the compound formed is stable
(4) lower and the compound formed is unstable

4 Atom X has an electron configuration 2-8-2. Which electron dot diagram correctly represents this atom?

(1)  (3) 

(2)  (4) 

5 Which electron dot diagram represents an atom of chlorine in the ground state?

(1)  (3) 

(2)  (4) 

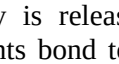
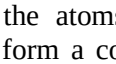
6 Which element has a crystalline lattice through which electrons flow freely?

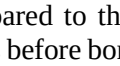
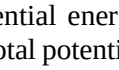
(1) bromine (3) carbon
(2) calcium (4) sulfur

7 Which element has good electrical conductivity and luster and exists as a liquid at STP?

(1) Hg (3) I
(2) Br (4) C

8 The correct electron dot diagram for hydrogen chloride is

(1)  (3) 

(2)  (4) 

9 A covalent bond forms when

(1) two nuclei share electrons in order to achieve a complete octet of electrons
(2) atoms form ions and then electrostatic forces of attraction bond the ions together
(3) repulsive forces between atoms are greater than the attractive forces
(4) a metal combines with a nonmetal atom

10 Which of the following bonds is the most polar in nature?

(1) Cl_2 (3) HBr
(2) HCl (4) HI

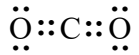
11 Polar covalent bonds are caused by

(1) unbalanced ionic charges
(2) unequal electronegativity values
(3) the transfer of electrons from one atom to another
(4) equally shared valence electrons

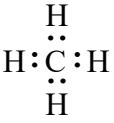
12 The bond in a diatomic nitrogen molecule (N_2) is best described as

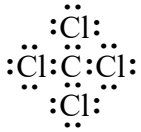
(1) polar
(2) polar double covalent
(3) nonpolar triple covalent
(4) polar ionic

13 Which electron dot diagram represents a polar molecule?

(1) 

(3) 

(2) 

(4) 

14 The diagram below represents a hydrogen fluoride molecule

This molecule is best described as

(1) polar with polar covalent bonds
(2) polar with nonpolar covalent bonds
(3) nonpolar with polar covalent bonds
(4) nonpolar with nonpolar covalent bonds

15 Which diagram best represents a polar molecule?

(1) 
Cl_2

(3) 
HCl

(2) 
H_2

(4) 
NaCl

16 Which electron dot diagram represents an atom in Period 4 with the highest first ionization energy?

(1) 

(3)

(2) 

(4) 

17 When a calcium atom loses its valence electrons, the ion formed has an electron configuration that is the same as an atom of

(1) Cl
(2) Ar
(3) K
(4) Sc

18 The bond between which pair of elements is the least ionic in character?

(1) H-F
(2) H-Cl
(3) H-I
(4) H-O

19 Which compound has the greatest degree of ionic character?

(1) NaF
(2) MgF_2
(3) AlF_3
(4) SiF_4

20 Given the Lewis electron dot formula shown below:

The attraction of X for the bonding electrons would be greatest when X represents an atom of:

(1) S
(2) O
(3) Se
(4) Te

21 Which compound contains both ionic and covalent bonds?

(1) HBr
(2) CBr_4
(3) NaBr
(4) NaOH

22 Which element forms an ionic bond with fluorine?

(1) fluorine
(2) potassium
(3) carbon
(4) oxygen

23 The elements Li and F combine to form an ionic compound. The electron configuration of the fluorine within this compound is the same as the electron configuration of atoms in Group:

(1) 1
(2) 14
(3) 17
(4) 18

24 An atom of which element has the same electron configuration as O^{2-}?

(1) Li
(2) Na
(3) Ar
(4) Ne

Part B–1
Answer all questions in this part.

Directions (25-31): For *each* statement or question, record on your separate answer sheet the *number* of the word or expression that, of those given, best completes the statement or answers the question. Some questions may require the use of the *2011 Edition Reference Tables for Physical Setting/Chemistry*.

25 The electrical conductivity of $KI_{(aq)}$ is greater than the electrical conductivity of $H_2O_{(l)}$ because the $KI_{(aq)}$ contains mobile

(1) molecules of H_2O
(2) ions from H_2O
(3) molecules of KI
(4) ions from KI

26 Which substance has a high melting point and conducts electricity in the liquid phase but not in the solid phase?

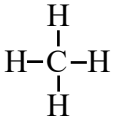
(1) Ne
(2) Hg
(3) NaCl
(4) CO

27 Which compound in the solid state has a high melting point and conducts electricity only after it has been liquified?

(1) carbon dioxide
(2) silicon dioxide
(3) hydrogen chloride
(4) potassium chloride

28 Which molecule is a dipole?

(1) 

(2) 

(3) $O=C=O$

(4) $N\equiv N$

29 Hydrogen bonding is strongest between molecules of

(1) H_2S
(2) H_2O
(3) H_2Se
(4) H_2Te

30 In which liquid is hydrogen bonding the most significant force of attraction?

(1) HF
(2) HCl
(3) HBr
(4) HI

31 Which atom has the *least* attraction for the electrons in a bond between that atom and an atom of hydrogen?

(1) carbon
(2) nitrogen
(3) oxygen
(4) fluorine

Part B–2
Answer all questions in this part.

Directions (32-39): Record your answers in the spaces provided in your answer booklet. Some questions may require the use of the *2011 Edition Reference Tables for Physical Setting/Chemistry*.

32 Explain, in terms of electron configuration, why arsenic and antimony are chemically similar. [1]

33 Explain, in terms of electrons, the change in radius when a sodium atom becomes a sodium ion. [1]

Base your answer to question 34 through 36 on the information below and on your knowledge of chemistry.

The balanced equation below represents a reaction.

$$O_{2\,(g)} + \text{energy} \rightarrow O_{(g)} + O_{(g)}$$

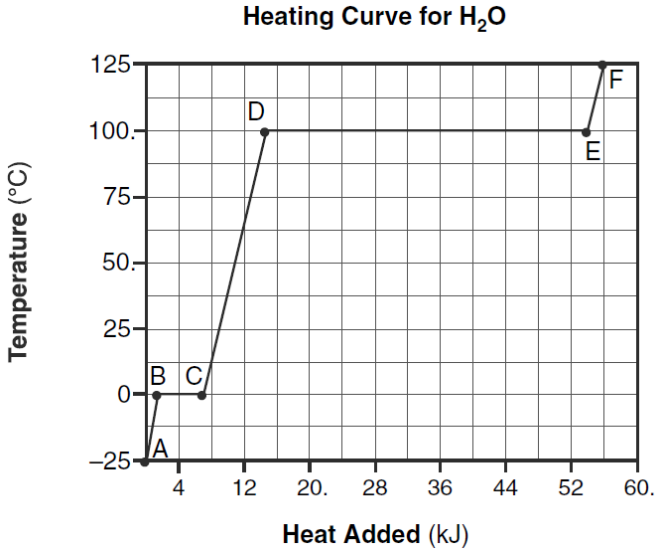
34 Identify the type of chemical bond in a molecule of the reactant. [1]

35 In the space *in your answer booklet*, draw a Lewis electron-dot diagram of one oxygen atom. [1]

36 Explain, in terms of bonds, why energy is absorbed during this reaction. [1]

Base your answer to question 37 through 39 on the information below and on your knowledge of chemistry.

Starting as a solid at –25°C, a sample of H_2O is heated at a constant rate until the sample is at 125°C. This heating occurs at standard pressure. The graph below represents the relationship between temperature and heat added to the sample.



37 Describe what happens to both the potential energy and the average kinetic energy of the molecules in the H_2O sample during interval *AB*. [1]

38 Using the graph, determine the total amount of heat added to the sample during interval *CD*. [1]

39 Explain, in terms of heat of fusion and heat of vaporization, why the heat added during interval *DE* is greater than the heat added during interval *BC* for this sample of water. [1]

Part C
Answer all questions in this part.

Directions (40-43): Record your answers in the spaces provided in your answer booklet. Some questions may require the use of the *2011 Edition Reference Tables for Physical Setting/Chemistry*.

The table below gives information about two isotopes of element *X*.

Isotope	Mass	Relative Abundance
X-10	10.01	19.91%
X-11	11.01	80.09%

40 Show a numerical setup for calculating the average atomic mass of element *X*. [1]

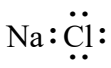
Base your answer to question 41 on the information below and on your knowledge of chemistry.

A student made a copper bracelet by hammering a small copper bar into the desired shape. The bracelet has a mass of 30.1 grams and was at a temperature of 21°C in the classroom but reached at temperature of 33° as the student wore it. The specific heat capacity of copper is 0.385 J/g·K.

41 Show a numerical setup for calculating the amount of heat absorbed by the bracelet when the student wore the bracelet on her arm. [1]

42 An atom has an atomic number of 9, a mass number of 19, and an electron configuration of 2-6-1. What is the total number of neutrons in the described atom? [1]

43 A student drew the Lewis electron-dot diagram below to represent sodium chloride.



Explain why this diagram is not an accurate representation for the bonding in NaCl. [1]

The University of the State of New York

REGENTS HIGH SCHOOL EXAMINATION

PHYSICAL SETTING
CHEMISTRY

Wednesday, December 19, 2018 — 8:00 a.m. to 2:47 p.m., only

ANSWER BOOKLET

Student . . . . . .

Teacher . . . . . .

School . . . . . Grade . . . . .

Record your answers for Part B–2 and Part C in this booklet.

32 _____

_____

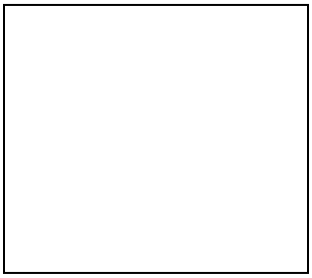
33 _____

_____

34 _____

_____

35 LED for one oxygen atom



36 _____

_____

37 Potential energy: _____

Average kinetic energy: _____

38 _____

39 _____

_____

40 Show a numerical setup.

41 Show a numerical setup.

42 _____ neutrons

43 _____

_____