GRADE 10 SCIENCE (20F)

Practice Midterm Examination

Grade 10 Science

Practice Midterm Examination

Name: _____

Student Number: _____

Attending ❑ Non-Attending ❑

Phone Number: _____

Address: _____

_____

_____

For Marker's Use Only

Date: _____

Final Mark _____ /100 = _____%

Comments:

Instructions

- You have a maximum of 2.5 hours to write this exam.
- Supplies required: pencil or pen, eraser, paper—you are permitted to bring a calculator, but it is not required
- This exam covers course material from Modules 1 and 2.
- This exam is worth 20 percent of your final mark.

Part A: Dynamics of Ecosystems

Section 1: Multiple Choice

Choose the best answer. Each question is worth one mark. This section of the midterm exam is worth 20 marks.

1. The relationship between a producer and a primary consumer is best illustrated by
   a. sheep eating grass
   b. wolves eating a moose
   c. mushrooms growing on rotting logs
   d. leaves growing on trees

2. Denitrification is defined as
   a. the conversion of nitrate and ammonia into plant proteins
   b. the cycling of nitrogen through an ecosystem
   c. the conversion of nitrate and ammonia into nitrogen gas
   d. the removal of nitrogen from the atmosphere

3. In a predator-prey relationship, an increase in the predator population is usually followed by
   a. an increase in the damage to the environment by the prey
   b. an decrease in the prey population
   c. an increase in the birth rate of the prey
   d. starvation of the prey

4. Which of the following is abiotic?
   a. water
   b. bacteria
   c. grass
   d. a skunk

5. A species is _____ when it is in danger of disappearing from the area in which it lives.
   a. extinct
   b. threatened
   c. endangered
   d. extirpated

6. The increase in the concentration of toxins along each level of a food chain is known as
   a. bioaccumulation
   b. biogeochemical
   c. biotoxification
   d. biocarcinogenics

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7. A rabbit eats grass, and a fox eats the rabbit. In this food chain, the fox is a
   a. producer
   b. primary consumer
   c. secondary consumer
   d. scavenger

8. Which process does ***not*** directly affect the carbon cycle?
   a. ammonia levels in soil
   b. the eruption of a volcano
   c. algal blooms
   d. deforestation

9. Which statement is ***true*** for a pyramid of energy?
   a. Primary consumers contain the greatest amount of energy.
   b. The pyramid represents the total amount of living material per tropic level.
   c. The least amount of energy is within the producers.
   d. Less energy is available to organisms higher up the pyramid.

10. How do bacteria contribute to the nitrogen cycle?
    a. They are not involved in the nitrogen cycle.
    b. They allow primary consumers to use atmospheric nitrogen.
    c. They are responsible for nitrogen fixation.
    d. They absorb excess nitrogen gas from the atmosphere.

11. Which level of a food chain is at greatest risk due to the bioaccumulation of toxins?
    a. producers
    b. primary consumers
    c. secondary consumers
    d. tertiary consumers

12. Algal blooms are most likely to occur during
    a. spring
    b. summer
    c. autumn
    d. winter

13. A decomposer is
    a. an organism that eats plants
    b. a dead organism
    c. an organism that breaks down dead matter and waste
    d. an organism that lives inside a host organism and eats the host

14. The variety of organisms found within an ecosystem is known as its
    a. sustainability
    b. food web
    c. population dynamics
    d. biodiversity

15. Carrying capacity refers to
    a. the largest population of a species that a particular environment can support
    b. the greatest amount of biodiversity that a particular environment can support
    c. the largest size of predators that a particular environment can support
    d. the maximum number of plant species that a particular environment can support

16. If population growth is greater than zero, then the following is ***true***:
    a. There are more deaths and emigrants than there are births and immigrants in a population.
    b. The size of the population begins to decrease.
    c. There are more births and immigrants than there are deaths and emigrants in a population.
    d. The size of a population remains the same.

17. A tree produces acorns, and a squirrel eats the acorns. The squirrel dies and crows eat its dead body. In this food chain, the crows are defined as
    a. scavengers
    b. secondary consumers
    c. tertiary consumers
    d. decomposers

18. How did human use of DDT affect predatory birds such as the peregrine falcon?
    a. Falcons ingested the pesticide through their food.
    b. The pesticide caused the birds to lay eggs with thin, brittle shells.
    c. DDT affected the birds' behaviour, causing them to abandon their nests.
    d. All of the above.

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19. Which of these is ***not*** a producer?
    a. a tomato plant
    b. a pine tree
    c. a mushroom
    d. a dandelion

20. Why is the spread of zebra muscles a concern in Canada?
    a. The species has few natural predators in North America.
    b. They remove large quantities of plankton and algae from aquatic ecosystems.
    c. They are capable of reproducing in large numbers.
    d. All of the above.

Section 2: Explain

Answer the following questions in complete sentences. The mark allocations are provided for each question. This section of the midterm exam is worth 30 marks.

1. Describe the carbon cycle. You may use a diagram to help your explanation. (*3 marks*)

2. Hannah has studied a population of elk in northern Manitoba over the last decade, and she noticed that the herd has never grown over a hundred members. What factors may have limited the growth of this population? (*6 marks*)

3. Kingsley is a farmer who grows canola. Recently, a salesperson has been visiting Kingsley's farm to advertise a new fertilizer spray made of pure nitrogen gas (N_2). By spraying his crops with this new gaseous fertilizer, the salesperson claims that Kingsley will be able to grow healthy crops in an environmentally responsible manner.

   a. Why do plants such as canola need nitrogen? (*1 mark*)

   b. Do you think this fertilizer is a good investment? Use your knowledge of the nitrogen cycle to explain your reasoning. (*3 marks*)

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4. Kingsley's neighbour, Elizabeth, grows corn. In previous years, Elizabeth has lost many of her crops due to worms. This season, Elizabeth sprays her crops with a brand-new pesticide to get rid of the worms. Over the summer, Elizabeth notices dozens of dead sparrows in her corn field, each body surrounded by buzzing flies.
   a. Identify the food chain in Elizabeth's corn field. Label each trophic level. (*4 marks*)

   _____

   _____

   _____

   _____

   b. Why are the sparrows dying? Suggest two reasons. (*4 marks*)

   _____

   _____

   _____

   _____

5. What is biodiversity, and how does it benefit an ecosystem? (*3 marks*)

   _____

   _____

   _____

6. Use the table below to answer the following questions.

Year	Wolf Population	Deer Population
1991	20	4000
1992	24	4600
1993	33	5000
1994	44	4800
1995	56	4500
1996	48	4200
1997	42	3900
1998	36	3850
1999	38	3900
2000	38	3950

a. How would you describe the relationship between the wolf population and the deer population? (*2 marks*)

b. How did the deer population change between 1993 and 1997? What might have caused this change? (*4 marks*)

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Part B: Chemistry

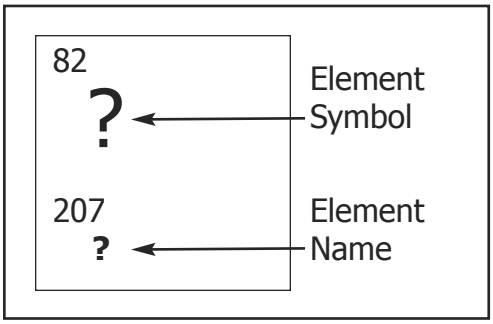
Section 1: Multiple Choice

Choose the best answer. Each question is worth one mark. This section of the midterm exam is worth 25 marks.

A copy of the Periodic Table of Elements is available at the end of this exam booklet.

1. An atom of barium has an atomic number of 56 and an atomic mass of 137u. What is the total number of protons and neutrons in one atom of barium?
   a. 56
   b. 81
   c. 137
   d. 193

2. The diagram below shows the atomic number and atomic mass of an element. Identify that element.
   a. Ga (gallium)
   b. Sb (antimony)
   c. Pb (lead)
   d. Po (polonium)



3. Sulphur is a member of which family?
   a. chalcogens
   b. halogens
   c. noble gases
   d. hydrogen

4. Which of the following ions would form a stable ionic compound with a single ion of iodide (I^-)?
   a. Na^+
   b. $Mg2^+$
   c. Cl^-
   d. Ar

5. What process takes place whenever a covalent bond is formed?
   a. proton transfer
   b. electron transfer
   c. proton sharing
   d. electron sharing

6. Which of the elements listed must bond with four atoms of hydrogen in order to fill its valence shell?
   a. B
   b. C
   c. N
   d. O

7. Which of the following compounds is an example of a diatomic molecule?
   a. H_3O
   b. NH_4
   c. Cl_2
   d. HBr

8. If calcium and oxygen were to form a stable ionic compound, which of the following chemical formulas would best represent that compound?
   a. CaO
   b. CaO_2
   c. Ca_2O
   d. CaO_3

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9. An ionic bond forms when
   a. a noble gas combines with a halogen
   b. a metal combines with a non-metal
   c. an alkali metal gains an electron
   d. a chalcogen combines with hydrogen

10. Carbon and chlorine combine to form
   a. a covalent compound
   b. an ionic compound
   c. a strong acid
   d. carbon dichloride

11. Compound X is a newly discovered acid. Which statement best describes the properties of compound X?
   a. It feels slippery when touched.
   b. It reacts with many metals.
   c. It turns red litmus paper blue.
   d. All of the above.

12. Complete the following neutralization reaction:

$$\_\_\_\_\_ + NaOH \rightarrow Na_2CO_3 + H_2O$$

   a. $C(OH)_4$
   b. CH_2O_3
   c. H_2CO_3
   d. CO_2

13. Which of the following chemical reactions is a single replacement reaction?
   a. $C_2H_5OH + O_2 \rightarrow CO_2 + H_2O$
   b. $Ca + AlCl_3 \rightarrow CaCl_2 + Al$
   c. $NaBr + KI \rightarrow KBr + NaI$
   d. $Ca^{+2} + 2F^- \rightarrow CaF_2$

14. In the chemical reaction below, which compound is a salt?

$$HCl + Ca(OH)_2 \rightarrow H_2O + CaCl_2$$

a. HCl
b. $Ca(OH)_2$
c. H_2O
d. $CaCl_2$

15. What change is required to balance the following reaction?

$$Mg(OH)_2 + H_2S \rightarrow MgS + H_2O$$

a. Double the amount of magnesium hydroxide reacted.
b. Double the amount of hydrogen sulfide reacted.
c. Double the amount of magnesium sulfide produced.
d. Double the amount of dihydrogen monoxide produced.

16. What pH is considered neutral?
a. 9.5
b. 7.0
c. 5.3
d. 3.0

17. Pickles are cucumbers soaked in acetic acid. Acetic acid is best categorized as
a. a strong base
b. a weak base
c. a weak acid
d. a strong acid

18. What compound does the pancreas use to help neutralize fluid leaving the stomach?
a. sulfuric acid
b. sodium bicarbonate
c. citric acid
d. calcium hydroxide

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19. What two groups of chemicals are responsible for the formation of acid rain?
    a. carbon monoxide and carbon dioxide
    b. chlorofluorocarbons and halons
    c. methane and gasoline
    d. sulfur oxides and nitrogen oxides

20. Which property of bases makes them useful as household cleaners?
    a. their ability to conduct electricity
    b. their ability to dissolve fats and proteins
    c. their ability to not react with metals
    d. their bitter taste

21. Which equation represents a neutralization reaction?
    a. $HCl + LiOH \rightarrow LiCl + H_2O$
    b. $Ca + S \rightarrow CaS$
    c. $CH_4 + O_2 \rightarrow CO_2 + H_2O$
    d. $4Cu + O_2 \rightarrow 2Cu_2O$

22. How does ozone contribute to human life on Earth?
    a. Ozone reduces the occurrence of acid rain.
    b. In the upper atmosphere, ozone filters harmful radiation from the Sun.
    c. Ozone breaks down harmful smog in the lower atmosphere.
    d. It is not useful at all and, in fact, causes lung damage in children.

23. What type of reaction is illustrated below?

$$2Hg + O_2 \rightarrow 2HgO$$

    a. synthesis reaction
    b. decomposition reaction
    c. combustion reaction
    d. single replacement reaction

24. The Montreal Protocol is an international agreement designed to
    a. ban the use of chlorofluorocarbons (CFCs)
    b. reduce industrial greenhouse gas emissions
    c. protect Canada's arctic wildlife
    d. eliminate the use of bisphenol-A in plastic products

25. How does a catalytic converter help reduce air pollution?
    a. A catalytic converter is used in post-combustion reduction of sulfur in industry.
    b. A catalytic converter is used to increase the efficiency of a car's combustion engine.
    c. A catalytic converter reduces nitrogen oxide emissions in vehicles.
    d. A catalytic converter is used to scrub impurities such as sulfur and ash from coal.

Section 2: Explain

Answer the following questions in complete sentences. The mark allocations are provided for each question. This section of the midterm exam is worth 25 marks.

1. List the four categories of clean coal technologies and briefly explain how they work. (*8 marks*)

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2. The combustion engine inside a car burns hydrocarbons in order to produce the mechanical energy that will move the vehicle. The skeleton chemical equation for the combustion of gasoline is written as follows:

$$C_8H_{18} + O_2 \rightarrow CO_2 + H_2O + \text{energy}$$

If carbon dioxide and water are the only chemical products created in a car's combustion reaction, explain how cars are able to emit nitrogen oxides (such as NO and NO_2). (*2 marks*)

_____

_____

_____

3. Write a balanced chemical equation for the following reactions. Identify the type of reaction occurring.

   a. Barium fluoride and lithium bromide react to produce barium bromide and lithium fluoride. (*2 marks*)

   _____

   _____

   _____

   b. The process of electrolysis splits water into hydrogen gas and oxygen gas. (*2 marks*)

   _____

   _____

   _____

   c. Solid potassium and chlorine gas combine to form potassium chloride. (*2 marks*)

   _____

   _____

   _____

4. Write word equations for the following chemical reactions. (*2 marks each x 3 = 6 marks*)

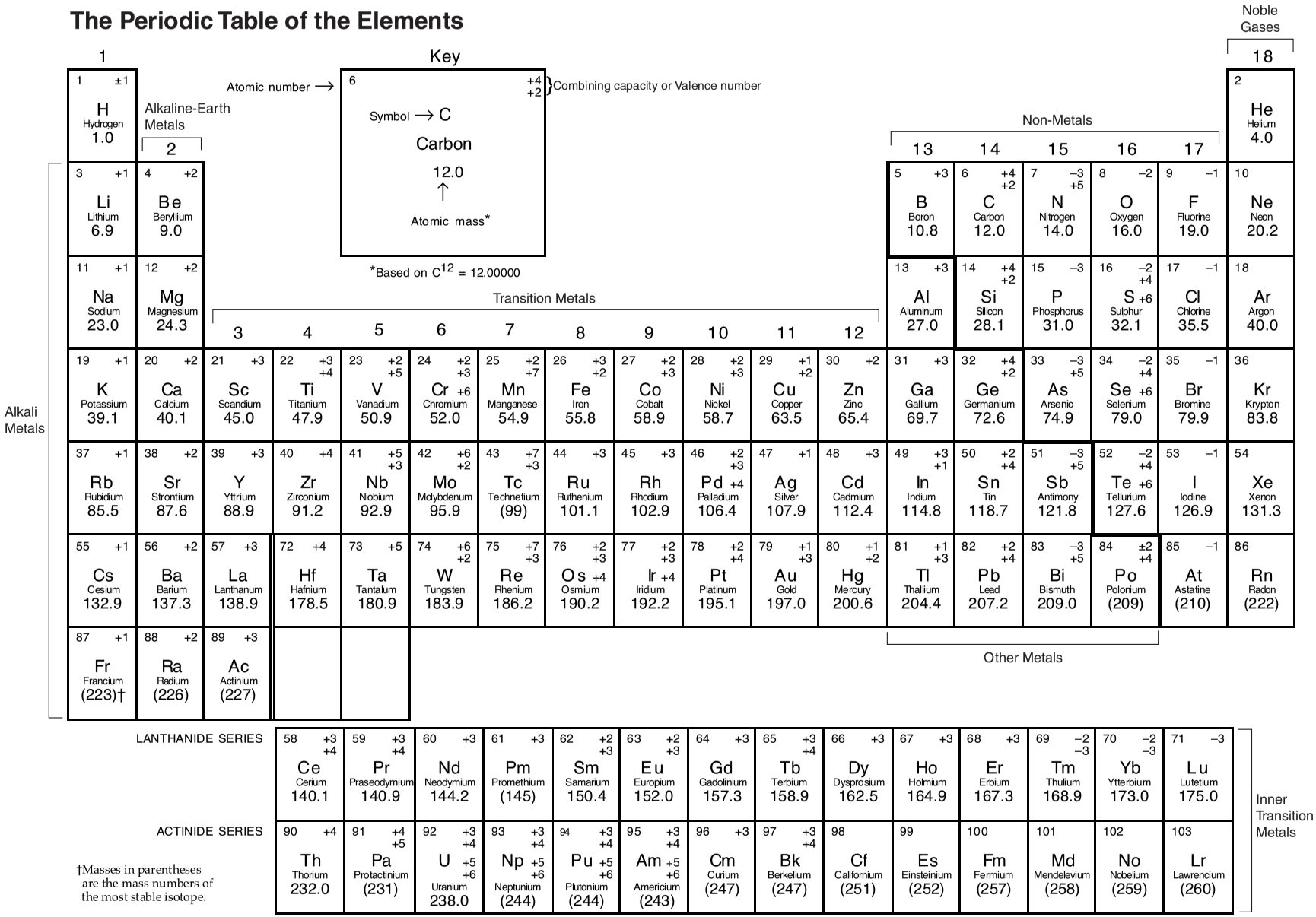
   a. $Ba + O_2 \rightarrow BaO$

   b. $AlCl_3 \rightarrow Al + Cl_2$

   c. $CH_4 + O_2 \rightarrow CO_2 + H_2O$

5. Acids and bases are commonly used in our homes, in industrial settings, and even in our bodies. Select specific acids or bases from the following list, and describe three ways that they may be used. You may describe three uses for one chemical, or a single use for three different chemicals. (*3 marks*)
   - sulfuric acid (H_2SO_4)
   - nitric acid (HNO_3)
   - hydrochloric acid (HCl)
   - sodium bicarbonate ($NaHCO_3$)
   - citric acid
   - ammonium hydroxide (NH_4OH)
   - sodium hydroxide (NaOH)
   - aluminum hydroxide ($Al[OH]_3$)

The Periodic Table of the Elements



†Masses in parentheses are the mass numbers of the most stable isotope.