

JULY 2023  
EBS 357  
INTRODUCTORY ATOMIC PHYSICS,  
HEAT AND OPTICS  
30 MINUTES

Candidate's Index Number
Signature:

UNIVERSITY OF CAPE COAST  
COLLEGE OF EDUCATION STUDIES  
SCHOOL OF EDUCATIONAL DEVELOPMENT AND OUTREACH  
INSTITUTE OF EDUCATION  
  
COLLEGES OF EDUCATION  
FOUR-YEAR BACHELOR OF EDUCATION (B.ED)  
THIRD YEAR, FIRST SEMESTER MID-SEMESTER QUIZ, JULY 2023

27<sup>TH</sup> JULY 2023

INTRODUCTORY ATOMIC PHYSICS,  
HEAT AND OPTICS

8:00 AM – 8:30 AM

Answer ALL the questions.  
(20 MARKS)

For items 1 to 12, each stem is followed by four options lettered A to D. Read each item carefully and circle the letter of the correct or best option.

- Which of the following statements is/are true?
  - The Zeroth law of thermodynamics is analogous to the basic rule in algebra that if  $A = C$  and  $B = C$ , then  $A = B$ .
  - The First law of thermodynamics deals with the entropy of a system.
  - The Second law of thermodynamics is essentially the 'Law of Conservation of Energy'.  
a system.
  - I only
  - II only
  - III only
  - II and III only
- Which of the Gas laws is applicable **only** for isothermal processes? ..... law.
  - Boyles's
  - Charles's
  - Combined Gas
  - Ideal Gas

3. Which of the following statements is/are **true**?
- I. Open system: One that freely exchanges matter and energy with its surroundings.
  - II. Closed system: One that freely exchanges only matter with its surroundings.
  - III. Isolated system: One that cannot exchange either matter or energy with its surroundings.
- A. I and II only
  - B. I and III only
  - C. II and III only
  - D. I, II and III
4. The work done when a gas is compressed in a cylinder is 200 J. At the same time, the system gains 300 J of heat from the surrounding. What is the energy change of this system?
- A. 100 J
  - B. 100 J
  - C. 500 J
  - D. 500 J
5. Which of these equations **correctly** expresses Avogadro's law?
- I.  $V_1 n_2 = V_2 n_1$
  - II.  $\frac{V_1}{n_1} = \frac{V_2}{n_2}$
  - III.  $\frac{V_1}{n_2} = \frac{V_2}{n_1}$
- A. I only
  - B. II only
  - C. I and II only
  - D. II and III only
6. The volume of a cylinder containing CO<sub>2</sub> was initially 3.543 L at 90.07°C; what would the volume be if the temperature of the gas increased to 120.4°C?
- A. 0.21 L
  - B. 0.26 L
  - C. 3.84 L
  - D. 4.74 L
7. A sample of gas occupies a volume of 275 ml at 20°C and 1 atm pressure. Calculate the volume in millilitres of the gas at 0°C and 1 atm pressure.
- A. 256 ml
  - B. 356 ml
  - C. 456 ml
  - D. 556 ml
8. When the internal energy and volume of an ideal gas are doubled, the pressure .....
- A. doubles the original amount.
  - B. halves the original amount.
  - C. quadruples the original amount.
  - D. remains same.

9. The pressure of a gas is given as 235 Pa when kept at a temperature of 27°. If the temperature is increased to 47°C, calculate the new pressure of the gas.
- A. 135.0 Pa
  - B. 220.3 Pa
  - C. 250.7 Pa
  - D. 409.1 Pa
10. A gas at 110 Pa at 37.0°C fills a flexible container with an initial volume of 2.00 L. If the temperature is raised to 87.0°C and the pressure increases to 440 Pa, what is the new volume?
- A. 0.21 L
  - B. 0.43 L
  - C. 0.58 L
  - D. 1.18 L
11. Which of the following concepts describes the kinetic theory of gases?
- I. It explains the macroscopic as well as transport properties of gases.
  - II. It accounts for related phenomena, such as Brownian motion.
  - III. It relates the macroscopic to the microscopic property of gases.
- A. I only
  - B. II only
  - C. III only
  - D. I, II and III
12. Which of the laws of thermodynamics deals with the total change in entropy of a system?  
..... law.
- A. First
  - B. Second
  - C. Third
  - D. Zeroth

**For items 12 to 15, write the appropriate responses in the spaces provided.**

13. Differentiate between heat and temperature.

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14. List **one** variable that controls the physical properties of a gas.

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15. Give any **one** of the postulates of the Kinetic theory **not** obeyed by real gases.

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**Items 15 to 20 are statements followed by True and False options. Read each statement carefully and indicate whether it is True or False by circling the letter of the correct option.**

16. The entropy of a system gives a measure of the amount of energy unavailable to do work, which is a measure of the randomness of the system.
  - A. True
  - B. False
  
17. In Charles's law, volume decreases as temperature increases, while pressure is kept constant.
  - A. True
  - B. False
  
18. According to the kinetic theory of gasses, at absolute zero temperature, all molecular motion ceases, with the exception of only energetic ones.
  - A. True
  - B. False
  
19. Real gases show marked deviation from ideal gas behaviour at high pressure and low temperature.
  - A. True
  - B. False
  
20. The temperature of a gas is solely determined by the average kinetic energy of its molecules.
  - A. True
  - B. False