

UNIVERSITY OF JORDAN
FACULTY OF ENGINEERING AND TECHNOLOGY
CHEMICAL ENGINEERING DEPARTMENT

CHE 905322 – CHEMICAL ENGINEERING THERMODYNAMICS I

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Question 1 (40 points). Select the **most correct** answer and circle it in the following multiple choice questions (MCQ). **More than one answer may be correct**, make your choices carefully and wisely.

1. In thermodynamics, a fixed quantity of mass selected for the purpose of study is called a:

a) System	b) Closed system	c) Open system	d) Control volume
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2. A specific property is also:

a) An extensive property	b) The product of two intensive properties	c) An amount of mass dependent property	d) An intensive property
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3. In order for a system to be in thermal equilibrium, which of the following properties must be the same throughout the system?

a) Mass	b) Pressure	c) Temperature	d) Volume
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4. A cycle consists of a series of processes that:

a) Eventually return to the first state of the first process	b) are continually repeated	c) are always in equilibrium or quasi-equilibrium	d) none of these
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5. How many independent properties are required to completely specify the state of a simple compressible system?

a) 0	b) 1	c) 2	d) 3
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6. A 0.5 m^3 container is filled with a fluid whose specific volume is $0.001 \text{ m}^3/\text{kg}$. At standard gravitational acceleration, the contents of this container weigh:

a) 2010 N	b) 3220 N	c) 4900 N	d) 7830 N
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7. Which temperature below is equivalent to 125°F ?

a) 52°C	b) 125°C	c) 602°R	d) 315 K
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8. On a day when the barometer reads 755 mm Hg, a tire pressure gage reads 204 kPa. The absolute pressure in the tire is:

a) 100 kPa	b) 204 kPa	c) 1.54 m Hg	d) 2.29 m Hg
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9. The boundaries of a system can be

a) Real or imaginary	b) May be at rest or in motion	c) may change size or shape	d) All of these
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10. The modes of contact between the system and its surroundings are

a) Mechanical, thermal, and physical.	b) Mechanical, thermal, and chemical.	c) Mechanical and thermal.	d) None of these
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11. An extrinsic property is

a) State function	b) path function	c) Dependent on the nature of the constituents of the system	d) not dependent on the nature of the constituents of the system
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12. The equilibrium state is affected by

a) Nature of the system	b) Container	c) Surroundings	d) All of these
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13. Equilibrium states can be classified as

a) Stable and unstable	b) Stable, metastable, and unstable	c) Stable, neutrally stable, and unstable	d) Stable, neutrally stable and metastable
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14. To measure very high temperatures, we use
a) Thermometers **b) Cryometers** **c) Pyrometers** **d) Thermocouples**

15. The different kinds of work that occur at the system-surroundings boundaries are
a) Shaft **b) Deforming system boundaries, shaft and fields.** **c) Accompany mass flow only** **d) All of these**

16. Heat and work are
a) Interactions between the system and its surroundings **b) Occur in the bulk** **c) Energy in transit** **d) A and C**

17. Adiabatic processes can occur in
a) A unique way **b) Two ways** **c) Three ways** **d) None of these**

18. All types of energy can be reduced to
a) Kinetic energy **b) Potential energy** **c) Internal energy** **d) Kinetic and potential energies**

19. The internal energy is related to
a) Microscopic energy **b) Macroscopic energy** **c) Both macro and microscopic energies** **d) None of these**

20. The first law of thermodynamics as derived is subject to which of the following assumptions
a) No nuclear reactions **b) No electro-magnetic fields** **c) No gravity fields** **d) A and B**

Question 2 (30 points). An average car consumes about 5 L of gasoline a day, and the capacity of the fuel tank of the car is about 50 L. Therefore, a car needs to be refueled once every 10 days. Also, the density of gasoline ranges from 0.72 to 0.78 kg/L, and its lower heating value is about 44,000 kJ/kg. Suppose all the problems associated with the radioactivity and waste disposal of nuclear fuels are resolved, and a car is to be powered by U-235. The complete fission of 1 kg of U-235 releases 6.73×10^{10} kJ of heat. If a new car comes equipped with 0.1 kg of the nuclear fuel U-235, determine if this car will ever need refueling under average driving conditions.

Question 3 (30 points). A cyclic process is carried in five (5) steps on a closed system composed of one mole of a certain gas. The following table has some missing values. Fill in the missing values.

	ΔU (J)	Q (J)	W (J)
12		1000	2000
23	1500		
34	500	-1500	
45	-1000		1000
51		2000	
123451		2000	