

Menoufia University
Faculty of Engineering, Shebin El-Kom
Basic Engineering Science Department
First Semester Examination, 2017-2018
Date of Exam: 9 / 1 / 2018



Subject: PHYSICS
Code: BES011
Year: Preparatory year for Engineering Students
Time Allowed : 3 hours
Total Marks : 75 marks

Answer the following questions

Question 1

(20 marks)

a. Choose the correct answer

Note: The correct choice without explanation will be evaluated as wrong choice.

- i. If you use micrometer to determine the volume of metallic sphere and after certain number of measurements for its radius, you found that its average radius (r) is 5 ± 0.02 mm. If the formula of the volume of a sphere is $3\pi r^3$, the % error in the volume is:
a. 0.064% b. 0.06% c. 1.2%

- ii. Which of the following formula should be describe the relation between the length of pendulum (L), period of oscillation (T) and acceleration of gravity (g):

a. $g = 2\pi LT$ b. $g^2 = 2\pi L^2 T^4$ c. $g^2 = 2\pi L^2 T$

b. True or false with explain: (Note that: the answer without explanation will be evaluated as wrong answer)

- i. Total internal reflection can occur when light is directed from a medium having a given index of refraction toward one having a higher index of refraction with incident angle equal to the critical angle.

- ii. The frequency of light must be changed when it travel from one medium to other.

c. How we can use the Balancing Columns to determine the density of unknown liquid?

d. A hydraulic lift has small piston with a cross-sectional area of 3cm^2 , and its large piston has a cross-sectional area of 200cm^2 . The maximum downward force can be applied to the small piston is 3N . Is this hydraulic lift can raising a load whose weight is 14kN ?

Question 2

(15 marks)

a. Define the following:

- i) Elastic limit ii) Specific heat iii) The latent heat of vaporization (L_V)

b. State اذكر the assumptions of ideal fluid

c. Describe and explain Hook's law

d. Derive اشتق the relation العلاقة between T_F and T_C

e. How does a piece of steel feel تبدو colder than a piece of wood at the same temperature? Explain?

Question 3

(20 marks)

a. Derive Bernoulli's Equation معادلة برنولي.

b. A blood enter a patient's at a rate $40\text{ m}^3/\text{min}$ through a needle 50 mm long and has an inside diameter 0.55 mm . If the pressure in the vein is $2 P_a$, blood density 1005 kg/m^3 and its viscosity is about $1.5 \times 10^{-3} P_a \cdot s$. Calculate the required pressure to pump the blood through the needle.

c. An elastic wire of length 10 m and cross-sectional area 2 cm^2 elongate by 2.45 cm when it supports a 1.25 kg load (i) what is the force constant (ii) determine Young's modulus of the wire.

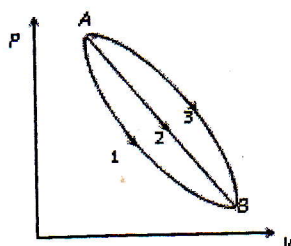
- d. The length of the column of mercury عمود الزئبق in a thermometer is 10 cm when immersed on boiling water ($T_0 = 100^\circ\text{C}$): (i) Find the length would be at 435.2°F ? (ii) When immersed in certain solution the length becomes 15.03 cm, what is the temperature (in Kelvin)? ($\alpha_{\text{mercury}} = 8.87 \times 10^{-5} \text{ }^\circ\text{C}^{-1}$)
- e. If 500 g of molten lead الرصاص المذاب at 327.3°C is poured into a cavity تجويف in a large block of ice at 0°C , how much of the ice melt? ($L_m(\text{ice}) = 3.33 \times 10^5 \text{ J/kg}$, $L_m(\text{lead}) = 2.45 \times 10^4 \text{ J/kg}$, $s_{\text{lead}} = 0.031 \text{ kcal/kg.}^\circ\text{C}$, $T_m(\text{lead}) = 600.3 \text{ K}$)

(20 marks)

Question 4

a- An ideal gas of mass m in a state A goes to another state B via three different processes as shown in figure. If Q_1, Q_2 and Q_3 denote the heat absorbed by the gas along the three paths, then

- (a) $Q_1 < Q_2 < Q_3$
- (b) $Q_1 < Q_2 = Q_3$
- (c) $Q_1 = Q_2 > Q_3$
- (d) $Q_1 > Q_2 > Q_3$



b- Comparison between isothermal and adiabatic process with draw during expansion only?

c- Carnot cycle (reversible) of a gas represented by a Pressure-Volume curve is shown in the diagram

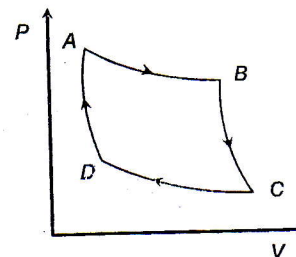
Consider the following statements

I. Area $ABCD =$ Work done by the gas

II. Area $ABCD =$ Net heat absorbed

III. Change in the internal energy in cycle = 0, which of these are correct

- (a) I only
- (b) II only
- (c) II and III
- (d) I, II and III



d- In adiabatic compression of a gas

- (a) Its temperature increases
- (b) Its temperature falls
- (c) Its density decreases
- (d) Its thermal energy increases

e- Derive the relation between molecular kinetic energy and temperature of ideal gas.

With our Best Wishes

This exam measures the following ILOs																
Question Number	Q1-b	Q1-d	Q2-a	Q3-b	Q4-c, b	Q4-a	Q2-e	Q2-b, a, d	Q2-c	Q3-a, b, e	Q3-c	Q4-b	Q4-c	Q1-d	Q1-c	
Skills	a1-1	a1-2	a1-1	a1-2	a1-3	a1-3	b3-1	b3-1	b2-1	b2-1	b3-2	b3-2	c1-3	C1-1	c1-3	
	Knowledge & Understanding Skills						Intellectual Skills						Professional Skills			