

Course No: ENGI 1220  
Course Title: Introduction of  
Materials Science for  
Engineering  
Date: 10/09/2018  
No. of Questions: (4)  
Time: 2 hours  
Using Calculator (yes)

University of Palestine



Final Exam  
Summer Semester  
2017/2018  
Total Grade: 100

Instructor Name: Dr. Hossam ELAQRA  
Student No.: \_\_\_\_\_  
Student Name: \_\_\_\_\_  
College Name: Engineering  
Dep. / Specialist: \_\_\_\_\_  
Using Dictionary (No)

## Question One:

27 Marks

Which of these sentences are true and which are false and correct the false one?

- 1- Solubility Limit is the maximum allowed concentration of solute in solvent.
- 2- A mixture is a single homogeneous phase.
- 3- Any object to be seen must have: emitted light, reflect or transmit in the object.
- 4- A solution is heterogeneous phase.
- 5- Usually light is monochromatic.
- 6- The color is psychological and physiological process due to the stimulation of certain achromatic receptors in the eye by visible light.
- 7- Reflection law is defined by incident angle is equal to reflected angle.
- 8- Refraction law is defined by  $n_1 \sin(\theta_2) = n_2 \sin(\theta_1)$ .
- 9- The addition of Yellow to Blue with equal percentage gives white color.
- 10- The addition of Green, Red and Blue gives black color.
- 11- Black and White color are translucency.
- 12- Diffuse reflection is the amount of light that reflected in equal and opposite to the incident light.
- 13- An extremely rough surface appears darker.
- 14- Heat capacity is defined as the energy required raising the temperature of tow kilogram of water by tow degree Celsius.
- 15- In order to increase the thermal conductivity of a material the use of large section is very useful.
- 16- Thermal conductivity of ceramics decreases with the increase of the temperature.
- 17- The thermal expansion is based on the distance between atoms.

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- 18- Materials with lower thermal conductivity have higher heat capacity.
- 19- Heat needed to change ice at 0°C to water at 0°C is 60cal/g.
- 20- Stress strain curve is described by Hook law.
- 21- Polymers and Ceramics have high Modulus of elasticity while metals have lower modulus of elasticity.
- 22- Proportional limit is the limit between elastic and plastic region.
- 23- Metal has higher ductility and toughness than ceramics and polymers in tensile stress strain curve.
- 24- Creep is a function of cycle number while fatigue is a function of time.
- 25- Metals are brittle while ceramics are ductile in room temperature under tensile stress.
- 26- Thermoplastic polymer is softening by heating while Thermosets is hardened by heating.
- 27- Plastic materials are polymers with additives.

## Question Two:

18 Marks

Choose the correction answer:

- 1- Diffusion occurs in
  - A- Solids
  - B- Liquids
  - C- Gases
  - D- All above
  - E- Non above
- 2- Phase diagram can be defined by;
  - A- Temperature
  - B- Pressure
  - C- Composition
  - D- All above
  - E- Non above

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**Using Dictionary (No)**

3- Parameters affect the thermal conductivity are:

- A- The coefficient of thermal conductivity
- B- The cross section
- C- The heat capacity
- D- All above
- E- A and B
- F- A and C

4- Thermal conductivity mechanism are:

- A- Thermal conductivity of lattice
- B- Thermal conductivity of electrons
- C- All above

5- Thermal expansion is governed by:

- A- Material type
- B- Temperature changes
- C- Thermal stress
- D- All above
- E- A and B
- F- A and C

6- Inward force causes:

- A- Expansion in the length
- B- Expansion in the cross section
- C- All above
- D- Non above

7- Outward force causes:

- A- Contraction in the length
- B- Contraction in the cross section
- C- All above
- D- Non above.

8- In general Poisson's ratio has:

- A- Negative value
- B- Positive value
- C- All above
- D- Non above

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**Using Dictionary (No)**

9- Deformation in metals are described by:

- A- Motion of dislocation
- B- Micro cracks
- C- All above
- D- Non above

10- Deformation in ceramics are described by;

- A- Motion of dislocation
- B- Micro cracks
- C- All above
- D- Non above

11- Plastic deformation in metals are described by:

- A- Breaking of bonds with atoms neighbors
- B- Reforming bonds with new neighbors
- C- All above
- D- Non above

12- Ductility is the area under the:

- A- Elastic part
- B- Plastic part
- C- All above
- D- Non above

13- Fatigue and Creep are affected by:

- A- Temperature
- B- Yield stress of the material
- C- Applied stress
- D- All above
- E- Non above

14- Polymerization occurs by:

- A- Thermal action
- B- Chemical action
- C- Mechanic action
- D- Light
- E- A, B and C
- F- A, B and D

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15- If you need to keep you're the café hot for long time, your cup must be made from:

- A- Metal
- B- Ceramic
- C- Polymer
- D- All above
- E- A and B
- F- B and C

16- If you need to cool the milk quickly, your cup must be made from:

- A- Metal
- B- Ceramic
- C- Polymer
- D- All above

17- Toughness is the area under the:

- A- Elastic part
- B- Plastic part
- C- All above
- D- Non above

18- Glass transition temperature is:

- A- Materials change from solid to liquid
- B- Materials change from liquid to solid
- C- All above
- D- Non above

### Question Three:

21 Marks

1- Numerate 3 Diffusion is necessary:

- 1-
- 2-
- 3-

2- Numerate 2 diffusion mechanisms and describe one of them

- 1-
- 2-

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3- Numerate 3 Factors that Influence Diffusion

- 1-
- 2-
- 3-

4- Numerate 3 Other Diffusion Paths

- 1-
- 2-
- 3-

5- Numerate 4 Classifications by application of ceramics

- 1-
- 2-
- 3-
- 4-

6- Numerate 3 classifications by chemistry of ceramics

- 1-
- 2-
- 3-

7- Numerate 3 types of glass

- 1-
- 2-
- 3-

#### Question Four:

36 Marks

1- Calculate the total heat need to change 300g of ice at  $-20^{\circ}\text{C}$  to water at  $20^{\circ}\text{C}$ , noted that the specific heat of water is  $1\text{cal}/(\text{g }^{\circ}\text{C})$  and for ice is  $0.5\text{cal}/(\text{g }^{\circ}\text{C})$ .

10 Marks

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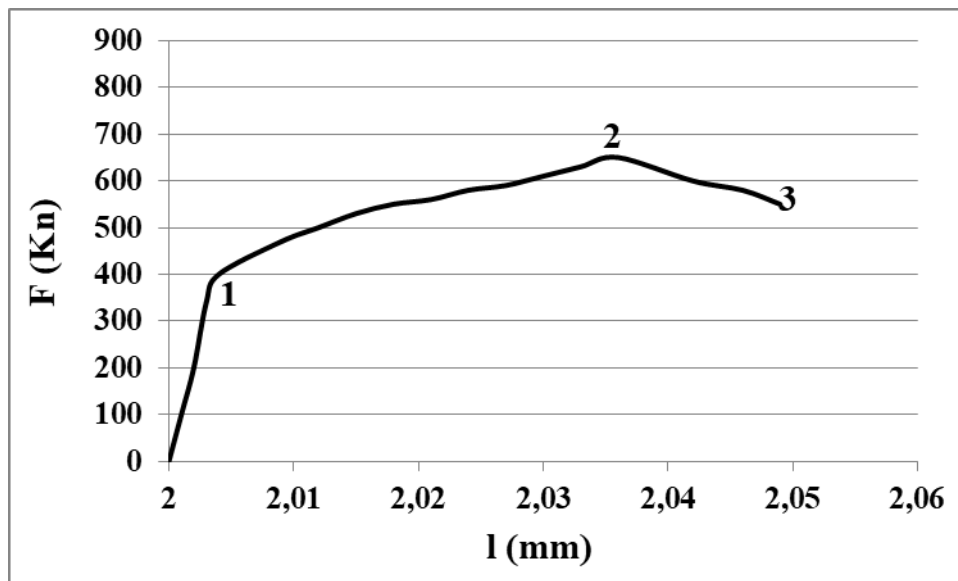


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**Using Dictionary (No)**

2- In the graph the values are described by the table below:

	0	1	2	3
Force	0 Kn	400 Kn	650 Kn	550 Kn
Length	2 cm	2.004 cm	2.036 cm	2.049 cm
Diameter	1 cm	0.9995 cm	0.998 cm	0.996 cm



A- Calculate the Yield stress in the wire

2 Marks

B- Calculate the apparent maximum stress in the wire

2 Marks

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- 
- C- Calculate the apparent broken stress in the wire 2 Marks
- D- Calculate its modulus of elasticity 2 Marks
- E- Calculate the elastic deformation 2 Marks
- F- Calculate the plastic deformation 2 Marks
- G- Calculate its axial deformation  $\epsilon_z$  at the linear part 2 Marks
- H- Calculate its Radial deformation  $\epsilon_x$  at the linear part 2 Marks
- I- Calculate its Poisson's ratio at the linear part 2 Marks



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3- Calculate the temperature after which a cylinder with 1 cm at 30°C (from steel  $\alpha = 1.1 \cdot 10^{-5} \text{ } ^\circ\text{C}^{-1}$ ) slides into a hole of 0.9997cm (from aluminum  $\alpha = 1.7 \cdot 10^{-5} \text{ } ^\circ\text{C}^{-1}$ ).

A- If the hole is heated or the cylinder is cooled

3 Marks

B- Both are heated or cooled

6 Marks

**End of Questions**  
**Good Luck**