# The University of Palestine

| Course Name | Materials science | | | Course No. | ENGI1220 |
|---|---|---|---|---|---|
| Academic Year | 2018/2019 | Semester | 2nd | Exam Type | Final |
| Exam Date | 30/05/2019 | | Exam Time | 09 – 11 | |

| اسم الطالب( بالعربي): | الرقم الجامعي: |
|---|---|

| اسم المدرس: د حسام علي الاقرع | رقم الشعبة: | وقت المحاضرة: | الرقم المتسلسل: |
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| | | | |

## Important Instructions

- ***This is a closed-book exam; all related material must be placed away from your desk.***
- ***Cell phone use is prohibited for any purpose: Your cell phone must be turned off and placed off of the desk. Cell phones may not be accessed during the exam. Failure to comply may be treated as a violation of the Honor Code.***
- ***Headphones of any kind are not permitted.***
- ***This exam is 120 minutes long.***
- ***Make sure that you have 14 pages including this page.***
- ***Calculators can be used but cannot be shared.***
- ***When you finish, you must:***
  - ***Check that you have written your information in the spaces provided.***
  - ***Give the exam package (all papers) to the proctor before you leave.***

**For Teacher's Use Only** **For Proctor's Remarks**

| QN | KPI/ILO | SO | DL | Mark | Weight |
|---|---|---|---|---|---|
| 1 | B1 | A | 4 | | 40 |
| 2 | B1 | F | 5 | | 15 |
| 3 | B1 | E | 4 | | 15 |
| 4 | B2 | D | 5 | | 30 |
| Total | | | | | 100 |

*KPI: Key Performance Indicator, ILO: Intended Learning Outcomes, SO: ABET Student Objectives, DL: Difficulty Level (1. Very easy, 2. Easy, 3. Moderate, 4. Somewhat hard, 5. Hard, 6. Very Hard)*

Q1: Chose the correct answer (one or more). 40 marks

**Each one has 1 mark**

1- For the same materials

a- Larger section transfer more heat

b- Smaller section transfer more heat

c- Materials with lower coefficient thermal conductivity

d- Non above

2 Heat conduction occurs due to

a- The free electron

b- The lattice vibration

c- Non above

3 Thermal conductivity is

a- Stable for all materials as a function of temperature.

b- Varies with the temperature

c- Non above

4 When materials are expose to positive change of temperature they

a- Contract

b- Expand

c- Non above

5 Materials with high thermal conductivity have

a- Lower specific heat.

b- Higher specific heat

c- Non above

6 At 0°C

a- Water still presents

b- Ice still presents

c- Non above

7 When hot water at 90°C is mixed with cooled water at 20°C the mix has the temperature around

a- 35°C.

b- 90°C

c- 10°C

d- Non above

8 In order to increase the thermal diffusivity

a- The material with lower thermal conductivity diffuse less heat.

b- The material with higher thermal conductivity diffuse less heat

c- Non above

9 Exothermic and endothermic reaction can be used as

a- Reaction indicator

b- Change on the microstructure

c- Non above

10 Usually light is

a- Polychromatic

b- Monochromatic

c- Non above

11 The color is the one of the result of the interactions between

a- Incident light and the Object

b- Reflected light

c- Transmissed light

d- Non above

12 The color is psychological and physiological process due to

a- The simulation of certain chromatic receptors in the eye by visible light

b- The simulation of certain chromatic receptors in the eye by infrared light

c- Non above

13 Snell's law can be expressed as

a- $n_2 \sin(\theta_1) = n_1 \sin(\theta_2)$

b- $n_1 \sin(\theta_1) = n_1 \sin(\theta_2)$

c- non above

14- Critical angel law can be expressed as

a- $\sin(\theta_{critical}) = n_2/n_1$

b- $\sin(\theta_{critical}) = n_1/n_2$

c- non above

15- Transparency materials

a- Allow the passage of all-light through it.

b- An object can't be clearly seen through them.

c- Allow the passage of some-light through it.

d- Non above

16- Translucency materials

a- Allow the passage of all-light through it.

b- An object can't be clearly seen through them.

c- Allow the passage of some-light through it.

d- Prevent the passage of all light

e- Non above

17- Opaque materials

a- Allow the passage of all-light through it.

b- An object can't be clearly seen through them.

c- Allow the passage of some-light through it.

d- Prevent the passage of all light

e- Non above

18- Gloss is

a- a surface properties

b- a bulk properties

c- non above

19- Florescence is

a- a surface properties

b- a bulk properties

c- non above

20- Poison`s ratio

a- Usually positive

b- Usually negative

c- Non above

21- Cations are:

a- Metallic ions

b- Non-metallic ions

c- Positively charged,

d- Usually smaller.

e- Negative charge

f- Usually larger

g- Non above

22- Anions are:

a- Metallic ions

b- Non-metallic ions

c- Positively charged,

d- Usually smaller.

e- Negative charge

f- Usually larger

g- Non above

23- Ceramics have usually

a- Some covalent character but is usually mostly metallic

b- Some covalent character but is usually mostly ionic

c- Some ionic character but is usually mostly metallic

d- Non above

24- Polymerization occurs via:

a- Thermal activation

b- Chemical activation

c- Light activation

d- Non above

25- Solvent is present

a- In greatest amount

b- In minor amount

c- Non above

26- Thermoset polymers are

a- Soften by heating

b- Hardened by heating

c- Non above

27- Thermoplastic polymers are

a- Soften by heating

b- Hardened by heating

c- Non above

28- Polymers and plastic

a- Polymers are plastic with additive

b- Plastics are polymers with additive

c- Non above

29- In phase diagrams phases are

a- Solid

b- Liquid

c- Gas

d- Non above

30- Factors that Influence the diffusion are

a- Relative sizes of atoms

b- Openness of lattice

c- Metallic charges

d- Non above

31- In Vacancy diffusion

a- Vacancy moves in opposite direction of atomic motion

b- Vacancy moves in same direction of atomic motion

c- Non above

32- Dislocations are considered as

a- 1D defect

b- 2D defect

c- 3D defect

d- Non above

33- Images obtained by optical microscope results from

a- Reflection of light

b- Transmission of light

c- Scattering of light

d- Non above

34- Dislocations are responsible of deformation for

a- Metals

b- Ceramics

c- Polymers

d- Non above

35- Amorphous and crystalline

a- Polymers are usually amorphous

b- Ceramics are usually amorphous

c- Metals are usually amorphous

d- Non above

36- Unit cellis

a- Smallest repeat unit which defines the crystal structure

b- Smallest repeat unit which defines the amorpous structure

c- Non above

37- Number of atoms in the FCC are

a- 1

b- 2

c- 3

d- 4

e- Non above

38- In wave-mechanical atomic model

a- Electrons revolve around nucleus in discrete orbitals

b- Electrons exhibit both wave-like and particle-like properties

c- Electrons position based on probability distribution

d- Non above

39- Electronegativity of the element is the responsible for

a- Covalent bonds

b- Ionic bonds

c- Metallic bonds

d- Non above

40- Macroscopic scale can be seen

a- Directly by the eyes

b- With tools

c- Non above

Q2: 15 marks

1- Discuss the dislocation motion on meta(draw)? 3 mark

2- Discuss the mechanism of heat conduction on metals and ceramics 3 mark

3- Discuss the fatigue and the creep (draw)? 3 mark

4- Discuss the critical angel on refraction (draw)? 3 mark

5- Discuss the elastic deformation, plastic deformation and recovery deformation (draw)? 3 mark

Q3 15 marks

1- Numerate 4 applications of ceramics. 4 marks

A-

B-

C-

D-

2- Numerate 2 classifications of ceramics according to their chemistry. 2 marks

A-

B-

3- Numerates 3 factors affect the cracks growth in the ceramic 3 marks

A-

B-

C-

4- Numerate 3 types of glass 3 marks

A-

B-

C-

5- Numerate 3 Other Diffusion Paths 3 marks

A-

B-

Q4 30 marks

1- A steel cylinder of diameter 1cm at room temperature is to be slid into a hole in an Aluminum plate. The hole has a diameter of 0,997cm. $\alpha$=1.1*10-5/°C for steel and $\alpha$=1.7*10-5/°C for the Aluminum.

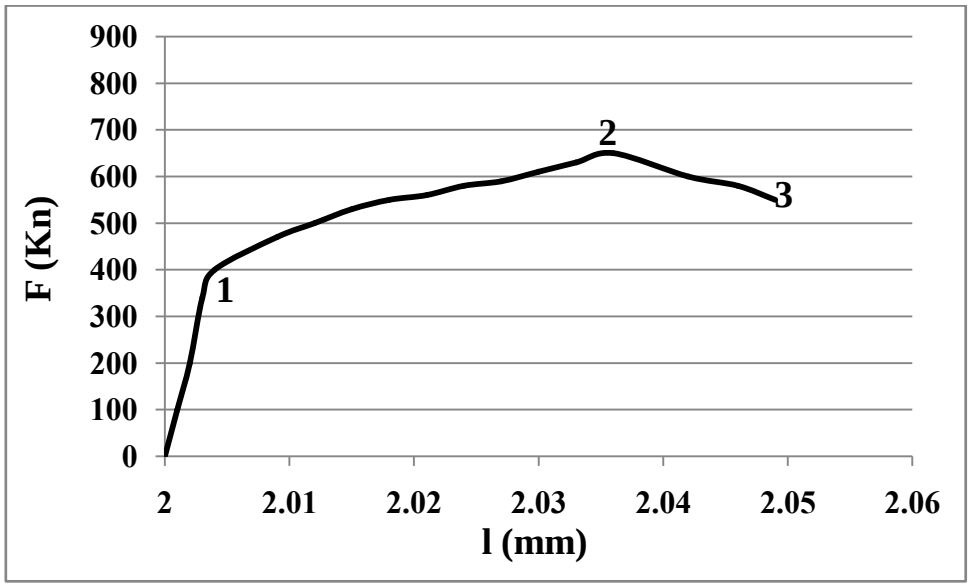
a- If you need to enter the cylinder in the hole, you will heat or cool them together? Why? (2 marks)

b- At what temperature must the cylinder start to inter into the hole. (5 marks)

2- Determine the final temperature results when 50g of ice at -10°C is mixed with 500g of water at 80°C. Noted that heat needed to melt ice if 80cal/g and c of water = 1 cal/g and for ice = 0,5 cal/g. 5 marks

1- 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

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 $\varepsilon_z$ at the linear part 2 Marks

H- Calculate its Radial deformation $\varepsilon_x$ at the linear part 2 Marks

I- Calculate its Poisson's ratio at the linear part 2 Marks

End of Questions
Good Luck