北京化工大学 2017—2018 学年《材料导论》期末考试 A 卷 答案

I. What do the following abbreviations stand for? Translate the abbreviations into Chinese (10 points)

Number	Abbreviation	Full spelling	Translation
1	SMC	sheet molding compound	片状模塑料
2	RTM	resin transfer molding	树脂转移模塑
3	HB	Brinell hardness	布氏硬度
4	PVC	polyvinyl chloride	聚氯乙烯
5	FCC	face-centered cubic	面心立方
6	MSE	materials science and engineering	材料科学与工程
7	SiC	silicon carbide	碳化硅
8	TPE	thermoplastic elastomer	热塑性弹性体
9	PMC	polymer matrix composite	聚合物基复合材料
10	P/M	powder metallurgy	粉末冶金

II. Choose the BEST TERM to match the definition and translate the selected term into Chinese (10 points)

Question No.	Term	Chinese
1	M) Adhesives	胶黏剂
2	I) In vitro testing	体外测试
3	F) Ultimate strength	极限强度
4	J) Hydrocarbons	碳氢化合物，烃
5	P) Specific stiffness	比刚度，比刚性，比模量
6	G) Hysteresis	滞后作用
7	D) Creep	蠕变

8	L) Interface	界面
9	H) Biocompatibility	生物相容性
10	O) Densification	密实化，致密化

III. Choose the correct answer(s) to the following questions. (30 points)

Question	1	2	3	4	5	6	7	8	9	10
Answer	C	D	B	D	C	B	D	C	D	D
Question	11	12	13	14	15	16	17	18	19	20
Answer	B	A	D	B	C	B	B	B	A	B
Question	21	22	23	24	25	26	27	28	29	30
Answer	A	D	B	B	B	C	C	A	B	D

IV. Choose a correct word or phrase according to the basic concepts and write it in the space provided. (15 points)

1. crystal impurity	2. crystal defect，disorder of crystal structure
3. flow	4. wet
5. cure / set	6. viscoelasticity
7. viscosity	8. elasticity
9. hemocompatibility	10. tissue compatibility
11. coupling agent	12. E-glass
13. Unit cell	14. Silicone
15. Life cycle analysis (LCA)	

V. True or false questions. If you think the statement is true, write the letter "T"; otherwise, write the letter "F". (10 points)

Number	1	2	3	4	5	6	7	8	9	10

Answer	F	T	F	T	T	T	T	F	T	T

VI. Give a simple answer to the questions. (25 points)

1. (3 points)

(1) carbon content: carbon fiber < graphite fiber

(2) modulus: carbon fiber < graphite fiber

(3) pyrolysis temperature: carbon fiber < graphite fiber

2. (3 points)

(1) addition polymerization 加成聚合: the monomer is unsaturated hydrocarbons, ethylene can be used to synthesize polyethylene (PE)

(2) condensation polymerization 缩聚反应: saturated hydrocarbons with bifunctional groups, hexamethylendiamine and adipic acid can be used to synthesize nylon 6,6.

3. (3 points)

(1) soft glass and hard glass

(2) coefficient of thermal expansion: soft glass > hard glass

heat resistance: soft glass < hard glass

4. (2 points)

Plasticizer is the additive that can increase the flexibility of plastics. Plasticizer can reduce the attraction between polymer chains within plastics.

5. (3 points)

(1) The difference between yield strength and tensile strength

(2) The difference in the amount of plastic deformation prior to fracture

(3) The total area under the stress-strain curve

(4) The difference in stiffness (modulus of elasticity) in elastic region.

Draw a typical Stress-Strain diagram of ductile material and brittle material.

6. (2 points)

The molecular chains of natural rubbers are crosslinked after vulcanization.

Before vulcanization, natural rubbers are thermoplastic.

The vulcanized natural rubbers are thermosetting

7. (4 points)

(1) Fiber: loading, continuous lengths, orientation, and defects;

(2) Matrix: ability to adhere to the fibers; inherent toughness

(3) Coupling agent

(4) Processing aspect

8. (5 points)

(1). A curve is for isostrain condition.

(2). Isostrain is more efficient.

(3). ROM (Isostrain condition):

$$E_c = V_f E_f + V_m E_m$$

Inverse ROM (Isostress Condition):

$$1/E_c = V_m/E_m + V_f/E_f$$

where: E: Modulus of elasticity;

V: volume fraction;

f refers to fibers;

m refers to matrix;

c refers to composite material.