Quiz 3 (Module 7) Class: Name: Student #:

Translate English into Chinese

1. ceramic matrix composites 陶瓷基复合材料
2. nanocomposites 纳米复合材料
3. interphase 界面相
4. reinforcement 增强
5. pyrolysis 热解
6. preimpregnation 预浸
7. boron fiber 硼纤维
8. coupling agent 偶联剂
9. critical length of a fiber 临界纤维长度
10. filament 单丝
11. aramid fiber 芳纶纤维
12. aspect ratio 长径比

(注：1-12, 0.5pt/题, 17-32, 2pt/题)

13. Which statement is NOT true about Matrix Materials:

A. A discontinuous phase B. Acting as a Binder material

C. Distribute load among fibers or particles D. Protecting Fibers or particles

14. (**T** or F) In short fiber composites, the length of short fiber must be over its Critical length (lc) in order to provide efficient load transfer from polymer matrix to the fibers.

15. _____ is NOT the used to produce carbon fibers.

A. Rayon, B. Polyacrylonitrile, C. Pitch, **D. Prepreg**

16. Which of the following statements is NOT true for describing an interphase in a fiber-reinforced composite.

A. It is a region between two interfaces.

B. It is a distinct phase.

C. It does not have its own identity.

D. It plays an important role in contributing to the properties of composites.

17. (**T** or F) Specific stiffness is also called specific modulus.

18. Which of the following is not a requirement for Matrix used in composites?

A. Ability to wet fibers

B. Higher Strength and Modulus compared to reinforcement

C. Thermochemical compatibility between fibers and matrix

D. No significant chemical reaction between the two phases

19. Which of the following statement is not true for describing Kevlar fiber.

A. It is a liquid-crystalline polymer;

B. It is an aromatic polyamide fiber;

C. It has low thermal stability;

D. It is anisotropic with high strength and tensile modulus in the fiber-longitudinal direction

20. Plywood and safety glass are examples of _____.

A. laminar composites B. sandwich composites

C. particulate composites D. foam composites

21. Which fiber has the highest Modulus?

A. Glass Fiber, B. Kevlar Fiber, C. Carbon Fiber, **D. Graphite Fiber**

22. Which fiber is the toughest one?

A. Glass Fiber, **B. Kevlar Fiber**, C. Boron, D. Graphite Fiber

23. In terms of density, which order (from low to high) is correct as far as glass, carbon, and Kevlar fibers are concerned?

A. Kevlar fiber, carbon fiber, glass fiber;

B. Glass fiber, Kevlar fiber, carbon fiber;

C. Carbon fiber, glass fiber, Kevlar fiber.

24. Which statement about fiber loading is not correct?
A. Fiber loading is the amount of reinforcement in a composite material
B. Fiber loading can be expressed in volume fraction
C. A maximum fiber loading can be achieved in composites when the fibers are arranged parallel to each other
D. The strength of the composite is inversely proportional to the volume fraction of fiber present

25. Which of the following statement is NOT true for compression molding.
A. The process uses a matched die.
B. Can accommodate high fiber volume fractions and long fiber lengths.
C. This process can produce any parts with no size limitation.
D. Pressure and heat are required in the process.

26. (**T** or F) The materials in fiber form have much higher strength and stiffness than in bulk form.

27. (**T** or F) Properties of laminar composites can be accented by a wise selection of different constituent layer.

28. Which Composite fabrication techniques are continuous processes?
A. Spay up, B. Compression Molding, **C. Pultrusion,**
D. Resin Transfer Molding, **E. Filament Winding**

29. Which composite fabrication techniques are closed molding processes?
A. Spay up, **B. Compression Molding,**
C. Resin Transfer Molding, D. Hand Layup

30. When a fiber-reinforced composite subjected to fatigue loading, the occurrence of fiber pullout may be caused by_____.
A. Low Matrix strength B. Low Fiber strength **C. Poor matrix-fiber adhesion**

31. (**T** or F) Compared to injection molding, compression molding can accommodate high fiber volume fractions and long fiber lengths.

32. (**T** or F) The reasons why carbon blacks have good reinforcement effects on rubber are mainly due to their good adhesive bonding with rubber molecules, and their uniformly well-dispersion in rubber.

33. Hybrid composites combine two or more different fibers in a common matrix. The four basic types of hybrids are A) **Interply hybrid composite** B) **Intraply hybrid composite** C) **Interply/Intraply hybrid composite** and **superhybrids**. (8pt)

34. There are two stages involved in the processing of most fiber composites: A) **layup 铺放 or combining of the reinforcement & matrix** and B) **cure or solidification of resin**. (4pt)

35. Write down the full names for the following abbreviations and translate them into Chinese. (6pt)
(1) PMC
Polymer matrix Composite 聚合物基复合材料
(2) SMC
Sheet Molding Compounds 片状模塑料
(3) BMC
Bulk Molding Compounds 团状模塑料
(4) RTM
Resin Transfer Molding 树脂传递模塑
(5) SRIM
Structural Reaction Injection Molding 结构反应注射成型
(6) GRP
Glass-reinforced Plastics or Glass fiber reinforced Plastics 玻璃纤维增强塑料

36. List the factors which affect the properties of fiber-reinforced composites. (12pt)
The intrinsic properties of fiber, for example the types of fibers, amount (or loading, volume fraction), orientation, aspect ratio etc.

The properties of matrix: for example, the toughness, heat resistance etc

Interfacial compatibility (or adhesion) between reinforcement and matrix;

The processing method (or the mode of fabrication)

37. The following figure is the graphical plot of the tensile modulus of a unidirectional composite material loaded under isostrain and isostress conditions as a function of volume fraction of reinforcing fiber. (20pt)

(a) Which curve is for isostrain condition? (4pt) **a**

(b) For a given volume fraction of fiber, which condition is more efficient in increasing the modulus? (4pt)
A (isostrain condition)

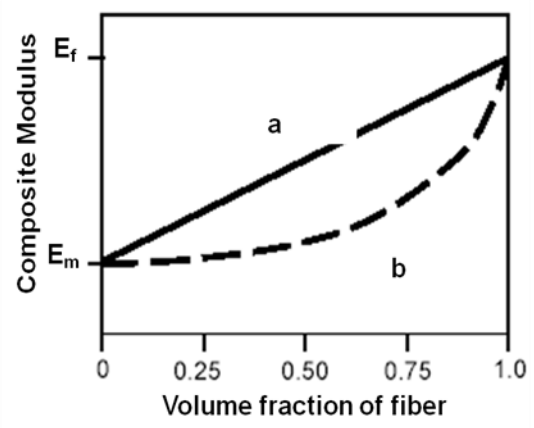
(c) Write out the equations expressing the Rule of Mixture (ROM) and Inverse ROM in terms of the elastic modulus for the isostrain and isostress condition. (12pt)

Isostrain: $E_c = V_f E_f + V_m E_m$

Isostress:

$$\frac{1}{E_C} = \frac{V_m}{E_m} + \frac{V_f}{E_f}$$

where: E is Modulus of elasticity, V is Volume fraction
c refers to composite, m refers to matrix, f refers to fiber



38. Indicate how the hoop strength and axial strength change with wind angle (θ) in filament winding? (4pt)

画出示意图，或者文字叙述

As θ increases to 90°, the hoop tensile strength increases and the axial tensile strength decrease.

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