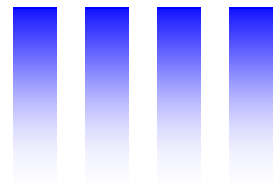


Re-Certification Exam

Version 1.1 - 2011





TECHNICIAN
COMPRESSION
MOLDING

Re-Certification Exam

This open book test consisting of forty questions is based on the eight articles in the re-certification workbook. Please read each article carefully and answer the questions for each section. Each correct answer is scored 2.5 points. As an open book test, a grade of 85% is required to pass the exam.

- Step 1** – Review the re-certification workbook
- Step 2** – Complete the re-certification application
- Step 3** – Complete the test sections and place **all** answers on *answer sheet*
- Step 4** – Send **ONLY** the completed *Application sheet*, *answer sheet* and the renewal fee to ACMA (note: Your credentials cannot be processed without the renewal fee)
- Step 5** – Upon successful completion of the test (scoring an 85% or higher), your credentials will be revalidated.

If the exam score does not qualify for revalidation, the exam workbook will be returned to the applicant for remedial review. The applicant can then correct and resubmit the test. If an applicant fails the re-certification test on the second attempt, his/her CCT credentials will not be revalidated. The candidate will be required to requalify by taking the original CCT exam.

Return Completed Exam and Re-Certification Fee to:
American Composites Manufacturers Association
CCT Re-Certification Program
1010 N. Glebe Rd., Suite 450
Arlington, VA 22201

CCT-CM Re-Certification Application
(Print Clearly)

Applicant Information

First Name: _____ MI: _____ Last Name: _____

Primary Email: _____

Home Address: _____

City: _____ State: _____ ZIP: _____

Home Phone: _____

Company Information

Company: _____

Address: _____

City: _____ State: _____ ZIP: _____

Phone: _____ Fax: _____

Payment Information

Renewal Fees: \$50 members, \$100 nonmembers

Check: _____ Amount: \$ _____

Credit Card: VISA MasterCard American Express

Please fill out the Full Credit Card Information on the following page to pay with your credit card.

VISA MASTERCARD AMEX

Full Credit Card Account Number:	
Expiration Date	
Security Code 3 Digit Code (Visa, MC) 4 Digit Code (AMEX)	
Billing Address	
Date	
Phone Number	

Federal Tax ID (52-1144059) ACMA Fax: 703-525-0743

I hereby authorize ACMA to charge my credit card for the payment of items below. I agree to pay for all requested registrations, enrollments and other items/services from ACMA, and agree that ACMA can charge my card for an amount different than what is below if the amount below is not correct.

Card Holder Name: _____

Signature: _____

Last Four Numbers of Authorized Card: _____

Amount to be charged: \$ _____

Description of Charge/ Names of CCT Candidates Paid For: _____

Name of Company Payment should be applied: _____

Internal Use Only:

Date Processed: _____ Initials: _____

Notes: _____

Answer Sheet

2.5 points each
Certification Date _____
Expiration Date _____

Instructions: Place correct answer(s) next to the corresponding number.

Mailing Information

Please note: Your test results will be sent to the address you provide below.

Today's Date ___/___/___

First Name: _____ MI: _____ Last Name: _____

Company/Institution: _____

Mailing address (cannot be a PO BOX): _____

City: _____ State: _____ ZIP: _____ Country: _____

- | | | |
|-----------|-----------|-----------|
| 1. _____ | 16. _____ | 31. _____ |
| 2. _____ | 17. _____ | 32. _____ |
| 3. _____ | 18. _____ | 33. _____ |
| 4. _____ | 19. _____ | 34. _____ |
| 5. _____ | 20. _____ | 35. _____ |
| 6. _____ | 21. _____ | 36. _____ |
| 7. _____ | 22. _____ | 37. _____ |
| 8. _____ | 23. _____ | 38. _____ |
| 9. _____ | 24. _____ | 39. _____ |
| 10. _____ | 25. _____ | 40. _____ |
| 11. _____ | 26. _____ | |
| 12. _____ | 27. _____ | |
| 13. _____ | 28. _____ | |
| 14. _____ | 29. _____ | |
| 15. _____ | 30. _____ | |

CCT-CM Re-Certification Exam

Section 1 – Defining Composites

1. The function of the matrix in a composite is to
 - A. Reduce the cost of the compound
 - B. To provide a relatively rigid media that is capable of transferring loads to the fiber in the material
 - C. To bring together all the materials into one group

2. **Indicate three** of the material combinations that qualify as composites under the broad definition.
 - A. Wood
 - B. Aluminum alloy
 - C. Adobe brick
 - D. Steel belted tires

3. What is “aspect ratio”?
 - A. Fiber diameter
 - B. Length to width
 - C. The amount of material in a mixture

4. Particles (fillers) in a resin matrix do not effectively transfer loads because they have:
 - A. Lower density
 - B. Uniform shape
 - C. Low aspect geometry

5. The precise definition of composites includes that: “... the reinforcement has an aspect ratio that enables the transfer of loads between fibers, and the fibers are chemically bonded to the resin matrix.”
 - A. True
 - B. False

6. In the combination of a thermoplastic resin (such as polypropylene) and glass fiber, the fiber is
 - A. Encapsulated by the resin matrix
 - B. Molecularly bonded to the resin
 - C. Used as a filler

Section 2- Understanding Materials

7. **Indicate three** main areas in compression molding:
 - A. Material
 - B. Supervision
 - C. Mold
 - D. Equipment

8. Understanding and controlling materials in the compression molding process is critical to producing consistent, high quality parts.
- A. True
 B. False
9. The decision as to which type of raw material to purchase should be determined by:
(Indicate all that apply:)
- A. Size of the company
 B. Available resources
 C. Volumes of materials required
 D. The salesman
10. In compression molding the flow, or movement of the material (compound) within the mold is critical. This flow is dependent upon the viscosity of the material during the various stages of the “molding” cycle. There are definite relationships between the compound viscosity and:
(Indicate all that apply:)
- A. Temperature
 B. Pressure
 C. Time
 D. Pattern size
11. The control of raw materials is very important to the compression molder. Which of the following is the recommended method of controlling inventory:
- A. Last in, first out
 B. First in, last out
 C. First in, first out
12. The following are typical tests used for incoming control of unsaturated polyester resins:
(Indicate all that apply:)
- A. Cure
 B. Particle size distribution
 C. Viscosity
 D. Specific gravity
13. The importance of maintaining a history of raw materials tests is that:
- A. It can be used when investigating process problems
 B. It justifies hiring a laboratory technician
 C. It is impressive for customers
14. A monomer, referred to as a reactive diluent, is a major additive that::
(Indicate all that apply:)
- A. Reduces initial viscosity of the resin
 B. Is added to the compound for cosmetic purposes
 C. Provides necessary cross-linking sites necessary for polymerization
15. Thickeners are additives that are used to
- A. Increase the viscosity of a compound
 B. Cure in hot weather
 C. Increase resin exotherm

16. Which additive in the formulation and compounding process will affect flow and cure:
- A. Calcium carbonate
 - B. Reinforcement
 - C. Initiator
17. An additive that forms a barrier between the molded part and the mold surface is:
- A. A release agent
 - B. A pigment
 - C. A reinforcement
18. Formulations are developed by technical people with a background in polymers and compounding, and they are developed after a careful review of the desired properties of the finished product. These properties are dependent upon the types and ratios of the basic raw materials.
- A. True
 - B. False

Section 3 – Molding Compounds

19. A typical SMC formulation would have the following ingredients and amounts:
(Indicate all that apply:)
- A. Resin: 60 – 70 parts
 - B. Fillers: 100 – 200 parts
 - C. Thickeners: 2.8 – 4.9 parts
 - D. ¼” to ½” glass fibers: 40 – 65 parts
20. SMC is thickened chemically to a viscosity of 15 –30 million centipoises. This is about the stiffness of wet cardboard. SMC thickening is achieved by the reaction of:
- A. The initiator and the inhibitors
 - B. Various earth oxides or earth hydroxides (usually magnesium oxide or hydroxide)
 - C. The styrene monomer
21. In the SMC compounding process the purpose of the doctor box is to:
- A. Contain and distribute the resin paste
 - B. Provide medical supplies in case of an emergency
 - C. Separate the nylon film used in SMC production
22. In compression molding, SMC refers to:
(Indicate all that apply:)
- A. A process: SMC compression molding
 - B. A molding material: Sheet Molding Compound
 - C. Sales Management Corporation
23. In the SMC process, once the compound is collected, either in rolls or festooned, it must be stored in a hot room at 80° F minimum until:
- A. It is needed at the press
 - B. Its molding viscosity is reached
 - C. It reached 95° F

24. The viscosity of SMC continues to increase over time, so there is a definite shelf life of the material.
- A. True
 - B. False
25. BMC is typically made in:
- A. A high speed, high shear dispersion mixer
 - B. A double arm sigma blade mixer
 - C. An extruder
26. BMC is always thickened, just like SMC.
- A. True
 - B. False
27. A typical BMC formulation would have the following ingredients and amounts:
(Indicate all that apply:)
- A. resin: 60 – 70 parts
 - B. fillers: 150 – 250 parts
 - C. thickeners: 2.8 – 4.9 parts
 - D. ¼” to ½ glass fibers: 40 – 65 parts
28. After mixing, BMC is run through an extruder that:
- A. Sizes it to a cross-section
 - B. Heats and thickens the material
 - C. Charges the mold
29. LCM (Liquid Composite Molding) is a thermosetting polyester resin based paste that has fillers, pigments, initiators, inhibitors, low profile additives and mold releases combined together. This paste is weighed onto _____ and placed in a compression mold. **(Indicate all that apply:)**
- A. Fiberglass mat
 - B. A preform
 - C. Nylon film
30. LCM is recommended for molding of panels with varying thickness. It is ideal for molding bosses, ribs and inserts.
- A. True
 - B. False
31. GMT (Glass Mat Thermoplastic) uses a thermoplastic polymer combined with a stitched fiberglass mat. Which thermoplastic resin accounts for the largest usage?
- A. PBT (Poly Butylene Terephthalate)
 - B. PET (Poly Ethylene Terephthalate)
 - C. PP (Polypropylene)

Section 4 – Controlling the Process

32. When a job enters the shop floor, it is with a lot of advanced planning. There are four basic steps to this planning. Which of the following basic steps are used in this planning?

(Indicate all that apply:)

- A. Product planning
- B. Purchasing materials
- C. Parts development
- D. Process Planning
- E. Hiring workers

33. A CCT will be called upon to serve on various quality deployment teams, both for problem solving and continuous improvement. What are the four basic phases of the problem solving cycle? **(Indicate all that apply:)**

- A. Plan
- B. Define
- C. Do
- D. Act
- E. Study

34. There are seven basic tools that a quality engineer will use in problem-solving. A chart that graphically ranks causes from least to most significant is called a:

- A. Scatter diagram
- B. Flow chart
- C. Pareto chart

35. A histogram :

- A. Is a graphic summary of the variation in a set of data
- B. Is a graph that shows the relationship between two variables
- C. A diagram that lists causes and effects of a problem

Section 5 – MACT and the Compression Molder

36. The MACT rule is complicated, but in general, existing compression molding facility (Closed Molding), compounding, mixing, materials storage and cleaning operations must comply with:

- A. Table 3 of the MACT rule
- B. The *Workpractice standards* in Table 4 of the MACT rule
- C. Capture and control

37. The definition of HAP is:

- A. Hazardous air pollutant
- B. High access pollutant
- C. High atmospheric pollutant

38. A facility emissions limit (i.e., pounds of HAP emitted per year) is a function of:
- A. MACT limitations
 - B. A negotiated State operating permit
 - C. A fire
39. Which of the following is used for estimating emissions from compression molding?
- A. ANS UEF-1-2004
 - B. AP-42
 - C. CMRC
40. By definition a major source is a facility with the *potential* to emit: **(Indicate all that apply:)**
- A. 10 tons per year (tpy) of any *single* HAP
 - B. Odor, or smell
 - C. 25 tpy of any combination of HAP