

### Quiz #3 Solutions ME 330.3 Manufacturing Processes 2012

Circle the best answer.

Time: 25 minutes

Where indicated, circle the best answers.

1. In casting, a flask is which one of the following: (a) beverage bottle for foundry workers, (b) box which holds the cope and drag, (c) container for holding liquid metal, or (d) metal which extrudes between the mold halves? B
2. In foundry work, a runner is which one of the following: (a) channel in the mold leading from the downsprue to the main mold cavity, (b) foundry worker who moves the molten metal to the mold, or (c) vertical channel into which molten metal is poured into the mold? A
3. Turbulence during pouring of the molten metal is undesirable for which of the following reasons (two best answers): (a) it causes discoloration of the mold surfaces, (b) it dissolves the binder used to hold together the sand mold, (c) it increases erosion of the mold surfaces, (d) it increases the formation of metallic oxides that can become entrapped during solidification, (e) it increases the mold filling time, and (f) it increases total solidification time? C & D
4. Total solidification time is defined as which one of the following: (a) time between pouring and complete solidification, (b) time between pouring and cooling to room temperature, (c) time between solidification and cooling to room temperature, or (d) time to give up the heat of fusion? A
5. During solidification of an alloy when a mixture of solid and liquid metals is present, the solid-liquid mixture is referred to as which one of the following: (a) eutectic composition, (b) ingot segregation, (c) liquidus, (d) mushy zone, or (e) solidus? D
6. A riser in casting is described by which of the following (three correct answers): (a) an insert in the casting that inhibits buoyancy of the core, (b) gating system in which the sprue feeds directly into the cavity, (c) metal that is not part of the casting, (d) source of molten metal to feed the casting and compensate for shrinkage during solidification, and (e) waste metal that is usually recycled? C, D, E
7. Which one of the following casting processes is the most widely used: (a) centrifugal casting, (b) die casting, (c) investment casting, (d) sand casting, or (e) shell casting? D
8. In a sand-casting mold, the  $V/A$  ratio of the riser should be (a) equal to, (b) greater than, or (c) smaller than the  $V/A$  ratio of the casting itself? B
9. Which of the following riser types are completely enclosed within the sand mold and connected to the main cavity by a channel to feed the molten metal (two correct answers): (a) blind riser, (b) open riser, (c) side riser, and (d) top riser? A, C, D
10. In sand casting, the volumetric size of the pattern is (a) bigger than, (b) same size as, or (c) smaller than the cast part? A
11. Silica sand has which one of the following compositions: (a)  $Al_2O_3$ , (b)  $SiO$ , (c)  $SiO_2$ , or (d)  $SiSO_4$ ? C

12. Which of the following casting processes are expendable mold operations (four correct answers): (a) centrifugal casting, (b) die casting, (c) investment casting, (d) low pressure casting, (e) sand casting, (f) shell molding, (g) slush casting, and (h) vacuum molding? C, E, F, H
13. Investment casting is also known by which one of the following names: (a) fast-payback molding, (b) full-mold process, (c) lost-foam process, (d) lost-pattern process, or (e) lost-wax process? E
14. In plaster mold casting, the mold is made of which one of the following materials: (a)  $\text{Al}_2\text{O}_3$ , (b)  $\text{CaSO}_4\cdot\text{H}_2\text{O}$ , (c) SiC, or (d)  $\text{SiO}_2$ ? B
15. Which of the following qualifies as a precision-casting process (two correct answers): (a) ingot casting, (b) investment casting, (c) plaster-mold casting, (d) sand casting, and (e) shell molding? B, C
16. Which of the following casting processes are permanent mold operations (three correct answers): (a) centrifugal casting, (b) die casting, (c) expanded polystyrene process, (d) sand casting, (e) shell molding, (f) slush casting, and (g) vacuum molding. A, B, F
17. Which of the following metals would typically be used in die casting (three best answers): (a) aluminum, (b) cast iron, (c) steel, (d) tin, (e) tungsten, and (f) zinc? A, D, F
18. Which of the following are advantages of die casting over sand casting (four best answers): (a) better surface finish, (b) closer tolerances, (c) higher melting temperature metals, (d) higher production rates, (e) larger parts can be cast, and (f) mold can be reused? A, B, D, F
19. Chvorinov's rule states that total solidification time is proportional to which one of the following quantities: (a)  $(A/V)^n$ , (b)  $H_f$ , (c)  $T_m$ , (d)  $V$ , (e)  $V/A$ , or (f)  $(V/A)^2$ ; where  $A$  = surface area of casting,  $H_f$  = heat of fusion,  $T_m$  = melting temperature, and  $V$  = volume of casting? E or F
20. Shell molding is best described by which one of the following: (a) casting operation in which the molten metal has been poured out after a thin shell has been solidified in the mold, (b) casting process in which the mold is a thin shell of sand bonded by a thermosetting resin, (c) sand-casting operation in which the pattern is a shell rather than a solid form, or (d) casting operation used to make artificial sea shells? B
21. Cupolas are furnaces used to melt which of the following metals (one best answer): (a) aluminum, (b) cast iron, (c) steel, or (d) zinc? B
22. A misrun is which one of the following defects in casting: (a) globules of metal becoming entrapped in the casting, (b) metal is not properly poured into the downsprue, (c) metal solidifies before filling the cavity, (d) microporosity, and (e) "pipe" formation? C
23. Which one of the following casting metals is most important commercially: (a) aluminum and its alloys, (b) bronze, (c) cast iron, (d) cast steel, or (e) zinc alloys? C