NIMS Machining Level I Preparation Guide

Grinding

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Overview

Introduction

This preparation guide or test advisor is intended to help machinists study and prepare for the National Institute for Metalworking Skills (NIMS) written credentialing exam. The sample exam will prepare machinists to take the actual credentialing exam. None of the questions are duplicates from the actual credentialing exam. However, this preparation guide is a useful tool for reviewing technical knowledge and identifying areas of strength and deficiency for adequate credentialing exam preparation.

Achieving a NIMS credential is a means through which machinists can prove their abilities to themselves, to their instructors or employers and to the customer. By passing the NIMS credentialing exam, you will earn a valuable and portable credential. Because the credentialing exam is challenging, you will have the satisfaction of proving to yourself and others that you have reached a level of competency that is accepted nationally.

Who Wrote the Questions

A panel of technical experts, from all areas of the metalworking industry, wrote the questions used on the actual credentialing exam. The panel of experts ranged from company presidents and owners, to engineers and quality personnel, to actual working machinists. Credentialing exam questions are designed to assess the knowledge skills needed for entry-level machinists. They are written to deal with practical problems, computations and decisions machinists encounter in their day-to-day work.

The technical experts must first validate the credentialing exam questions. Then, before the questions become part of the credentialing exam, qualified machinists and industry personnel again validate them on a national level. Rejected questions are then rewritten or discarded altogether.

How to Prepare for the Credentialing Exam

Become familiar with the credentialing exam content and question format by utilizing the tools provided in this exam preparation guide. The **Exam Specifications** portion of this guide contains a summary description of the content covered by the actual credentialing exam. The **Task List** describes competencies for each particular area associated with the credentialing area.

Each question on the sample exam is linked to a particular task or set of tasks found in the **Task List**. Therefore, a review of the **Task List**, with an eye on judging whether you know how to perform each task listed, will provide you with valuable information as you prepare for the credentialing exam.

The questions are multiple-choice. Note instructions that may accompany some questions. Be sure to read each question carefully (twice, if necessary) so that you know exactly what is being asked. Check each answer and your work since an error in computation or understanding may make a wrong answer appear correct.

The following four steps are suggested for effective preparation:

Step 1: Study the content list for each credentialing exam you will attempt.

Step 2: Carefully read the **Task List** for each section.

Step 3: Review the sample exam to become familiar with subject matter and question type. This is a very important step.

Step 4: Repeat steps 1 through 3 and identify the area(s) where you need additional study. Use the preparation guide as a self-diagnostic assessment tool.

Areas of Knowledge Measured by the Credentialing Exam

The knowledge and skills you will need to pass the credentialing exam are as follows:

Credentialing Exam Sections

Although the NIMS credentialing exam is not labeled, it is divided into three major sections. They are:

- **Process Improvement**
- **Grinding Wheel Characteristics and Wheel Coding**
- **Basic Grinding Operation Setup and Operation**

Following is a list of the basic knowledge areas assessed by the credentialing exam:

- **Grinding Safety:** Basic shop practices should be applied in grinding operations. Proper housekeeping and cleanup procedures are imperative in safe grinding applications. Proper dress and lifting techniques are also important. Grinding wheel safety is the first step in any grinding procedure. The grinding wheel should be checked for cracks and fractures. Proper installation and wheel dressing are also important factors.

- **Measurement:** Grinding is often considered a finishing operation after milling or rough turning. Grinding operations are usually applied in situations where high accuracy is desired. The machinist must be able to read a micrometer or vernier micrometer (capable of measuring to .0001 inches). Proper application of dial indicators and height gages is important in measuring ground surfaces of different heights. Comprehension of surface finish specifications and measuring tool selection are essential inspection skills necessary to ensure quality.

- **Grinding Wheel Dressing:** In order to achieve satisfactory surface finishes and to safely use a grinding wheel, the machinist must understand and apply proper grinding wheel dressing techniques. Knowledge of the types of grinding wheels that can and cannot be dressed with a diamond dresser is essential for safe machining. Understanding the process of wheel trueing and wheel dressing and the effects of a poorly dressed grinding wheel provide the machinist with basic troubleshooting knowledge for assessing the root cause of some grinding problems.

- **Types of Abrasives:** Proper identification and application knowledge of the types of abrasives used in grinding operations provides a machinist with the proper foundation for determining which type of abrasive is the most effective for a given grinding application. The machinist should know the most common grinding abrasive as well as the hardest natural abrasive.

- **Pedestal Grinder:** The pedestal grinder is a free standing grinding machine used for roughing, snagging castings and sharpening high-speed lathe tool bits amongst other applications. Guard location and wheel dressing techniques differ for a pedestal grinder when compared to a surface grinder. The type of grinding wheel installed on the

pedestal grinder is dependent on the application and the type of material being ground.

- **Work Holding:** Proper work holding and piece part setup is important in any grinding operation. The Machinist must know how to hold both ferrous and non-ferrous materials. The setup for grinding angles and radii must be solid and accurate. The Machinist must know the purpose, theory and proper setup of magnetic parallels when grinding ferrous materials.

- **Grinding Machine Components:** To intelligently discuss grinding problems, grinding machine problems and setups, the machinist must be familiar with the names of the grinding machine components. The spindle nut on the grinder must be turned in the correct direction to either install or remove the grinding wheel from the spindle. Most machines will have a left-handed thread to self-tighten from the inertia of the grinding wheel. However, some older machines have the direction the nut must be rotated to tighten the same as wheel rotation.

- **Grinding Carbide and Carbide Tooling:** Carbide can be ground by two types of grinding wheel material. The best abrasive for machining carbide is diamond. However, due to expense, some carbide grinding applications will use a green silicon carbide wheel. The silicon carbide wheel is inferior to diamond. Diamond wheels, if properly trued and dressed, will yield surface finishes that surpass surface finishes produced by silicon carbide grinding wheels.

Before the Exam

Try to be well rested for the credentialing exam. Being well rested will make you more alert and efficient when taking the credentialing exam. Review any course material from your instructor. Review the test advisor information and sample exam found in the preparation guide. Bring at least two sharpened (#2) soft leaded pencils and an eraser. In addition, bring a calculator and the *Machinery's Handbook.* Become familiar with the procedure for taking a Scantron test. If you wish to pace yourself, bring a watch, or be aware of the location of clocks at the test site. Make sure to bring some form of identification, any necessary paperwork from NIMS and arrive at the test site at least 10 to 15 minutes prior to the specified exam time.

At the Testing Site

When you arrive at the test center, wait in the assigned area until the proctor begins the exam orientation and administration. The proctor will instruct you in the proper procedure for filling out any information on the answer sheet and will tell you the amount of time allotted for the credentialing exam, reference materials that can be used and if a calculator is permissible.

Once the credentialing exam has begun, keep track of time. Avoid spending too much time on any one question. Answer the questions to which you know the answers and then go back to those you had difficulty with if time allows. Repeat this process for each section. Again, do not spend an excessive amount of time on any one question.

It is to your advantage to answer every question. Do not leave any answers blank. Answers that are left blank will be counted as incorrect. Your score will be based on the number of correct answers.

Credentialing Exam Content, Sample Question Summary

Credentialing Exam Content and Sample Question Overview

The following material is designed to help machinists prepare for and obtain a NIMS credential in the area of Grinding. This section begins with an **Exam Specifications** section. The **Exam Specifications** will list the main categories covered on the credentialing exam. This section also lists the name of the topic, the number of questions pertaining to that topic and the percentage of the credentialing exam devoted to that topic.

The **Task List** describes competencies a machinist must have in order to receive a credential for Grinding. The **Task List** has a two-fold purpose. The first purpose is to prepare the machinist for credentialing. The second is to encourage instructors to apply the **Task List** as a measurement of the effectiveness of their curricula.

The number of questions in each content area may not be equal to the number of tasks listed. Some of the tasks are more complex and broader in scope and may be covered by several questions. Other tasks are simple and narrower in scope and one question may cover several tasks. The main objective in listing the tasks is to describe accurately what is done on the job, not to make each task correspond to a particular exam question.

Sample questions follow the **Task List**. Although these same questions will not appear on the actual credentialing exam, they are in the same format as the actual exam questions. All questions on the credentialing exam are in the multiple-choice format. Some concepts evaluated on the credentialing exam are assessed in greater depth in the sample exam questions. The sample exam questions are developed to evaluate conceptual knowledge of machining rather than specific competencies. The sample exam may be longer than the actual credential exam.

Answers to the sample questions are located at the end of the sample exam. Work with your instructor to identify weak areas and evaluate answers. Use the sample exam as a study guide and diagnostic tool.

Exam Specifications – Grinding

Content Area	No. Of Questions	% of Test
Wheel Characteristics and Grinding Wheel Codes	8	17
Basic Grinding Setup and Operation	6	12.8
Process Improvement	5	10.6
Grinding Safety	4	8.5
Measurement	4	8.5
Dressing a Grinding Wheel	4	8.5
Type of Abrasives	4	8.5
Work Holding	4	8.5
Pedestal Grinder	3	6.4
Grinding Machine Components	3	6.4
Grinding Carbide and Carbide Tooling	2	4.3
	Total of 47	**100 %**

Task List
Grinding

Reading this **Task List** will allow the machinist to focus preparation on those subject areas that need attention. The instructor can use the **Task List** to fine-tune the curricula to meet the standards. If you feel comfortable with your knowledge about a particular task, you are probably ready to answer the questions on that subject matter. If, on the other hand, you have any doubts, you and your instructor can work on these areas to build up proficiencies. Many texts and other resources are available to provide information.

Wheel Characteristics and Grinding Wheel Codes

- Identifying the type of abrasive from a grinding wheel code
- Identifying the grain (grit) size of the abrasive from a grinding wheel code
- Identifying the type of bond used for the grinding wheel from a grinding wheel code
- Determining if a grain (grit) size is coarser or finer than another grain (grit) size
- Identifying the hardness of a grinding wheel from a grinding wheel code
- Identifying the most common bonding agent found in grinding wheels
- Defining bond for a grinding wheel

Sample questions:

1) Which grain size would be considered the finest grain?
   a) 46
   b) 150
   c) 80
   d) 60

2) The structure of a grinding wheel is:
   a) The material that keeps the grinding wheel intact
   b) The strength of the bonding agent
   c) The size of the grains of abrasive material
   d) Spacing of the abrasive grains in the wheel

Use the following grinding wheel code for the five questions: **A60J8VBE**

3) What type of abrasive is used for this grinding wheel?
   a) Astral diamond
   b) Aluminum oxide
   c) Aliphatic silicon
   d) Silicon carbide (A grade)

4) What is the size of the grain (grit)?
   a) 60
   b) 8
   c) 480
   d) 608

5) What is the hardness of the wheel?
   a) A – very soft
   b) B – soft
   c) J – medium
   d) V – very hard

6) What is the structure of the wheel?
   a) 60 – very open
   b) A – aluminum oxide
   c) 8 – medium
   d) E – extraneous

7) What is the bonding agent used for the grinding wheel?
   a) Metal, resinoid and rubber
   b) Vitrified, resinoid and shellac
   c) Vitrified, shellac and metal
   d) Rubber, metal and resinoid

8) The grit size of a grinding wheel can also be specified to by:

   a) Letter size

   b) Symbol size

   c) Note size

   d) Grain size

9) The bonding agent used in the majority of grinding wheels is:

   a) Metal

   b) Shellac

   c) Vitrified

   d) Resinoid

10) The hardness grade of a grinding wheel refers to the:

   a) Bond strength of the wheel

   b) Spacing between the grains

   c) Bonding agent used to keep the wheel intact

   d) Type of material and grain size used for the grinding wheel

Basic Grinding Setup and Operation

- Purpose of a coolant when surface grinding
- Purpose of the blotters when mounting a grinding wheel on the spindle
- The most widely utilized grinding machine in tool rooms
- The most important characteristic for proper wheel selection when grinding copper, brass and other non-ferrous materials
- The number of sides that can be ground square and parallel on a surface grinder when using only the magnetic chuck
- The method by which each grain of the grinding wheel removes material from the work surface

Sample questions:

11) The most widely used grinding machine is the:

a) Electrical discharge grinder

b) Universal tool cutter grinder

c) Centerless grinder

d) ID/OD grinder

e) Surface grinder

12) Each grain on the surface of a grinding wheel removes material by a:

a) Cutting action

b) Wearing action

c) Burning action

d) Forming action

13) Which of the following is **not** a benefit of applying coolants in a grinding operation?

a) The area between the grinding wheel and the work piece is lubricated

b) Bits of the grinding wheel and metal (swarf) are flushed away from the work

c) Metal is washed off the surface of the grinding wheel providing a continuous cleaning action

d) The temperature of the grinding wheel and work piece is reduced

14) Using only the magnetic chuck with no other work holding devices, how many sides of a cube can be ground parallel?

a) 6

b) 4

c) 3

d) 2

15) Which of the following statements **best** describes the purpose of using blotters on each side of the grinding wheel during installation?

a) The blotters provide a cushion between the hard grinding wheel material and the steel mounting flange

b) The blotters provide a rough surface to prevent the wheel from slipping and creates a rough driving surface

c) The blotters provide an even bearing surface compensating for irregularities between the grinding wheel and the mounting flange or nut

d) The blotters are used for identification of the grinding wheel

e) Both a and c are correct

16) The most important parameter for grinding wheel selection when grinding copper or bronze is:

a) Structure

b) Grain size

c) Diameter of the wheel

d) Feed

17) The most common type of wheel found in most machine shops and tool rooms is:

a) Silicon carbide wheel with a hard bond hardness

b) Aluminum oxide wheel with a soft bond hardness

c) Diamond wheel with standard bond hardness

d) Rubber wheel with a soft bond hardness

Process Improvement

- Method to improve the surface finish using either a surface grinder or a universal grinder
- Defining a “loaded” grinding wheel and the cause for the condition
- Identifying the root cause for chatter during a surface grinding operation
- The best application to use a soft grinding wheel
- The root cause for lack on flatness of a work piece that was ground on a surface grinder

Sample questions:

18) One method of obtaining a fine finish when using a surface grinder is to:

a) Take a light cut and apply coolant

b) Take a depth of cut that exceeds .003”

c) Increase the feed rate by .5

d) Use an soft wheel with an open structure

19) A grinding wheel becomes “loaded” when:

a) Bits of the ground material become embedded in the wheel

b) The grinding wheel becomes very small in diameter, losing cutting speed

c) The grinding wheel cutting surface becomes dull, shiny and burns the work piece

d) The coolant is dirty and swarf embeds into the face of the grinding wheel, not the cutting surface

20) Which of the following statements is **not** a root cause for parts that cannot maintain flatness after a grinding operation:

a) A dirty or burred chuck

b) Stresses relieved from the heat-treating process

c) Too hard a grade of grinding wheel

d) Too soft a grade of grinding wheel

e) Insufficient coolant causing heat checking

21) A ground piece part has evidence of chatter marks. Which of the following statements best describes the root cause of this problem?

a) The diamond is dull and the grains on the cutting face of the grinding wheel are dull

b) The grade of the wheel is too hard, causing glazing and a “skipping action” over the work piece

c) The grinding wheel has too fine a grain size

d) The chuck is out of alignment with the machine axis

22) When grinding harder materials at normal speed, the grinding wheel characteristics should be:

a) A very coarse grain size and a harder grade

b) A coarse grain size and a soft wheel

c) A finer grain size and a soft wheel

d) A finer grain size and a harder wheel

23) Which of the following characteristics of a grinding wheel produce the least amount of heat when cutting?

a) Hard grade, closed structure and a very fine grain size

b) Soft grade, open structure and a coarse grain size

c) Hard grade, open structure and a very fine grain size

d) Soft grade, closed structure and a coarse grain size

24) A grinding wheel continuously glazes when grinding soft mild steel. Which of the following statements can be considered a root cause?

a) The coolant is dirty

b) The grinding wheel grade is too soft

c) The grinding wheel structure is too dense

d) The piece part has heat treat stresses causing a binding of the grinding wheel

Grinding Safety

- The proper procedure to check for cracks in grinding wheels
- Maintaining safety in the work area when performing a grinding operation
- Basic safety procedures and practices for jewelry, long hair and loose clothing
- The proper procedure for lifting heavy objects

Sample questions:

25) The best method to determine if a grinding wheel is cracked is to:

a) Visually inspect the grinding wheel

b) Mount the wheel on the spindle and run the wheel for one minute

c) Ring test the grinding wheel

d) Dress the wheel with the diamond dresser and listen for cracks

26) The best procedure for lifting a heavy object is to:

a) Keep the back straight and lift with the legs

b) Round the back, lock the knees and lift with the back

c) Lock the knees, hunch the back and lift with the arms

d) Keep the back straight, lock the knees and lock the arms

27) Loose clothing, long hair and long jewelry are potential safety hazards when:

a) Mounting a grinding wheel on the spindle

b) Operating machining that rotates

c) Testing the grinding wheel for cracks

d) Indicating the surface of the magnetic chuck for parallelism

28) Which of the following statements is **false** concerning grinding safety:

a) Test the wheel for cracking before installation

b) Grinding wheels can rotate 25% higher than the maximum RPM stated on the blotter

c) The mounting nut should not be tightened excessively

d) The blotters must be on each side of the wheel

Measurement

- Graduations on the thimble and sleeve of a micrometer
- Application of a height gage and dial indicator for checking surfaces of different heights
- Parameters that determine the correct measuring tool
- Methods to measure the surface finish on a ground surface

Sample questions:

29) An acceptable method for checking the surface finish without a profilometer is:

a) Optivisor

b) Magnifying glass

c) Machinery's Handbook

d) Comparison chart

30) The graduations on the sleeve of an inch micrometer measure:

a) .002 inches

b) .010 inches

c) .025 inches

d) .075 inches

31) The graduations on the thimble of an inch micrometer measure:

a) .010 inches

b) .001 inches

c) .100 inches

d) .025 inches

32) One of the most important factors to consider when choosing the correct measuring instrument is:

a) The surface finish of the piece part

b) The cleanliness of the measuring tool and work piece

c) The number of dimensions that must be measured on the part

d) The tolerance of the dimension to inspect

e) The time allotted for inspection

33) The quickest and most accurate method for checking the height on three separate blocks is to use a:

a) Surface plate and a dial caliper

b) Surface plate, dial indicator and stand

c) Surface plate, dial indicator and a height gage

d) Vernier depth gage on any surface

34) The best measuring setup for inspecting ground angles is:

a) Dial indicator, surface gage and a sine bar

b) Plate protractor and an Optivisor

c) Vernier protractor and a surface plate

d) Protractor, surface plate and scriber

Dressing a Grinding Wheel

- Type of a grinding wheel that cannot be dressed with a diamond dresser
- Type of device used to dress and true a grinding wheel on a pedestal grinder
- Defining the terms: *trueing* and *dressing*
- Proper orientation and placement of a single-point diamond dresser when dressing a grinding wheel mounted on a surface grinder

Sample questions:

35) Which of the following type of grinding wheel material **cannot** be dressed with a single point diamond dresser?

a) Diamond

b) Silicon carbide

c) Aluminum oxide

d) Ceramic aluminum oxide

36) Which of the following is **not** considered acceptable when using a single point diamond dresser to dress a grinding wheel?

a) Rotate the diamond periodically to distribute wear on the point

b) Locate the diamond to the left of the centerline for a grinding wheel rotating clockwise

c) Point the diamond into the wheel rotation

d) The diamond dresser should be magnetically secure to the magnetic chuck

37) Which of the following dressing devices is most often used to true a pedestal grinding wheel?

a) Desmond dresser or star dresser

b) Roll dresser

c) Single point diamond dresser

d) Cluster diamond dresser

38) To make an aluminum oxide grinding wheel concentric to the spindle with a diamond is termed:

a) Crushing

b) Trueing

c) Tempering

d) Forming

39) What is the recommended down feed of the grinding wheel for each pass across the single point diamond dresser?

a) .010 inches

b) .0001 inches

c) .100 inches

d) .001 inches

Type of Abrasives

- The hardest natural abrasive
- The most common grinding wheel abrasive
- Material usually cut with a rubber wheel
- Type of material usually ground with a borazon (CBN) wheel

Sample questions:

40) The hardest **natural** abrasive :

a) CBN (cubic boron nitride)

b) Aluminum oxide

c) Diamond

d) CVSG

e) Garnet

41) Which of the following abrasives will cut carbide:

a) Silicon carbide

b) Aluminum oxide

c) Ceramic aluminum oxide

d) Rubber

42) Rubber wheels are most often used in cutoff operations to cut:

a) Tungsten carbide
b) Hard and soft steel
c) Glass
d) Aluminum oxide

43) CBN (also known as Borazon) grinding wheels are used to grind:

a) Mild low carbon steel
b) Copper based alloys
c) Hardened ferrous alloys
d) Cobalt and nickel super alloys
e) Both c and d

44) The most commonly found grinding wheel abrasive is:

a) Silicon carbide
b) Aluminum oxide
c) CBN
d) Diamond

Work holding

- Work holding device used to hold non-ferrous material on a magnetic chuck
- Method for grinding angles
- The most common work holding device used with a surface grinder
- Application and theory of magnetic parallels

Sample questions:

45) The most accurate method for locating and holding work to grind an angle of 35.25° is to use a:

a) Protractor and a grinding vise
b) 45° V-block
c) Magnetic sine plate with the proper gage block buildup
d) Layout lines, surface gage with a scriber, eye loupe
e) Swivel type drill press vise

46) The most common work holding device on a grinder for the largest variety of work is a:

a) Drill press vise

b) Magnetic V-blocks

c) Magnetic chuck

d) Spin fixture

47) Which method will hold non-ferrous materials in place for grinding?

a) Steel (magnetic) tooth clamps

b) Sine plate

c) Precision vise

d) Magnetic V-block

e) Only a and c

48) How does a set of magnetic parallels hold the work piece?

a) The magnetic field is extended and weakened slightly

b) The natural metallic affinity of two materials that are not alike

c) Ionization of two ferrous materials and one non-ferrous material

e) Heat, gravity and friction between the work piece and parallels

Pedestal Grinder

- Maximum distance the tool rest and guards must be from the grinding wheel on a pedestal grinder
- Type of wheel installed on a pedestal grinder to grind cemented carbide tools
- Types of material that can be ground with aluminum oxide wheels mounted on the pedestal grinder

Sample questions:

49) The best grinding wheel material to use for cutting cemented carbide tools on a pedestal grinder is:

a) Silicon carbide

b) Garnet

c) Aluminum oxide

d) Aluminum carbonate

50) Which of the following is an **unsafe** distance between the grinding wheel and the tool rest on a pedestal grinder?

a) 3/32 inches

b) .100 inches

c) 1/8 inches

d) .203 inches

51) Which of the following is an **unsafe** practice when using a pedestal grinder?

a) Ring test a new wheel prior to installation

b) Material can be ground on both the sides and cutting face of the grinding wheel

c) The spark guard should be adjusted to within 1/16th inches from the wheel

d) Use a piece of wood to hold the wheel in place while removing the spindle nut

52) Pedestal grinders using an aluminum oxide wheel cannot grind:

a) High speed steel such as twist drills

b) Drift punches

c) Brazed carbide tooling

d) Iron and steel

Grinding Machine Components

- The direction the spindle nut should be tightened
- Main components of a surface grinder

Sample questions:

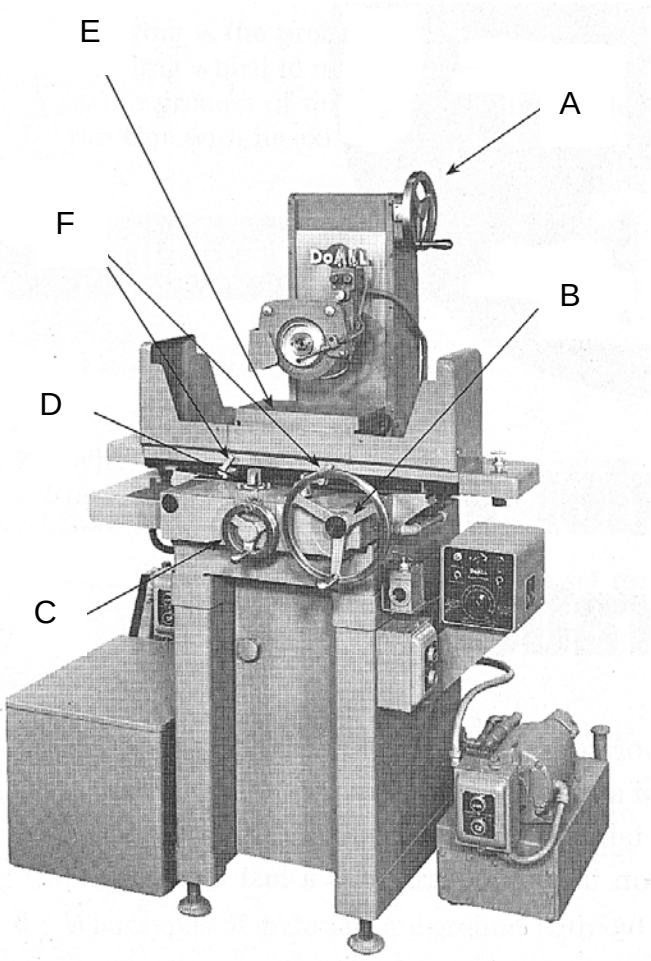
53) What is the general direction of wheel rotation on a surface grinder and which direction is the spindle nut tightened?

a) Counterclockwise wheel rotation, counterclockwise direction to tighten

b) Clockwise wheel rotation, clockwise direction to tighten

c) Clockwise wheel rotation, counterclockwise to tighten

d) Any of the above will work



54) In the illustration, the longitudinal hand wheel is designated by the letter:

a) A
b) B
c) C
d) D
e) E

55) In the illustration, the down feed hand wheel is designated by the letter:

a) A
b) B
c) C
d) D
e) E

56) In the illustration, the traverse or cross feed hand wheel is designated by the letter:

a) A

b) B

c) C

d) D

e) E

Grinding Carbide and Carbide Tooling

- The types of grinding wheels that can grind tungsten carbide tooling
- The best abrasive for grinding carbide

57) The best abrasive for grinding carbide without excessive wheel breakdown is:

a) Aluminum oxide

b) Silicon carbide

c) Aluminum carbide

d) Diamond

e) Phosphor carbide

58) Two of the following abrasives can grind tungsten carbide. Identify the correct pair.

a) Aluminum oxide and CBN

b) Diamond and silicon carbide

c) CBN and rubber

d) Aluminum oxide and diamond

59) Which of the following methods is the best method for applying coolant when grinding carbide?

a) Mister

b) Partial coolant flow

c) Full coolant flow

d) Light spray

60) The best way to dress a diamond wheel for grinding carbide is with a:

a) Brake type dresser

b) Single point diamond dresser

c) Cluster diamond dresser

d) Carborundum

Grinding
Sample Test Answers

1) B
2) D
3) B
4) A
5) C
6) C
7) B
8) D
9) C
10) A
11) E
12) A
13) C
14) D
15) C
16) A
17) B
18) A
19) A
20) D
21) B

22) D

23) B

24) C

25) C

26) A

27) B

28) B

29) D

30) C

31) B

32) D

33) C

34) A

35) A

36) C

37) A

38) B

39) D

40) C

41) A

42) B

43) E

44) B

45) C

46) C

47) E

48) A

49) A

50) D

51) B

52) C

53) C

54) B

55) A

56) C

57) D

58) B

59) C

60) A