NATURAL SCIENCE MARKING GUIDELINES

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FITTING AND MACHINING THEORY N1
11021871

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PAS-EN MASJINEERTEORIE N1
SECTION A: GENERAL PRACTICE

QUESTION 1: OCCUPATIONAL SAFETY

1.1

1. Make sure that you know how to operate the machine and to stop the machine in an emergency.
2. Replace the machine guards before you switch the power on if the guards were removed to repair or adjust the machine.
3. Keep the floors, passages ways and space around the machine clear of small objects and machine accessories.
4. Make sure that the work piece is properly secured before you switch the machine on.
5. Do not sit on, or lean against the machine.
6. Do not leave the machine unattended while it is operating.
7. Do not touch the work piece or take measurements while the machine is operating.
8. Never leave tools on machines, if they get caught in the machine they can damage the machine and the work piece.

(ANY FIVE FACTS)

OR

1.2 1.2.1 At any mine no person shall work, or cause any other persons to work, in any position from which the falling or slippery of such person may result in injury unless such person is, here practicable, secured by a lifeline or other wise suitable safe guard.

1.2.2 No person shall work or be present at any place where there may be danger of falling mineral or materials unless a hard hat is worn which is in good condition and approved by the Director general.

QUESTION 2: MEASURING INSTRUMENTS

2.1

2.1.1 A Barrel
B Thimble

2.1.2 6.80 mm
2.1.3 0,02
2.1.4 Measuring outside diameters.

2.2

2.2.1 32,32 mm
2.2.2 0,02 mm
2.2.3 An advantage is that the inside, outside and depth measurements can be taken with the same instrument.
A disadvantage is that if the corners of the measuring faces are worn the instrument will give inaccurate readings.

2.3

1. Measure the gap in piston ring.
2. Setting the gap on spark plug.
3. Setting a flat work piece parallel to the movement of the shaper ram.
4. Testing clearance between machine slides.
5. Testing clearance on taper roller bearings.

(ANY TWO FACTS)

QUESTION 3: SCREW THREADS

3.1

1. To engage mechanisms, half nuts on the lathe lead screw.
2. Where it is necessary to reduce backlash.
3. To prevent seizing and fouling due to sagging as in long lathe lead screws.

(ANY TWO FACTS)

3.2

Pitch ~ is the distance measured axially from a point on one screw thread to a corresponding point on an adjacent thread.
Lead ~ is the distance that a screw thread will move axially forward in one full revolution.

3.3

\[ P = 2 \text{ mm} \]
\[ D = 0.757 \times p \]
\[ = 0.757 \times 2 \text{ mm} \]
\[ = 1.514 \text{ mm} \]

QUESTION 4: METALS AND PLASTIC

4.1 Grey cast iron
4.2 Tempering
4.3 Solder
4.4 Black
4.5 Orange
4.6 Copper and tin
4.7 Bearing liners
4.8 Cobalt
4.9 Aluminium
4.10 Dull sound
QUESTION 5: MARKING OFF

5.1 A Jenny calliper.
   B Doting punch
   C Combination set
   D Angle plate
   E G or C clamp

QUESTION 6: KEY AND KEYWAYS

6.1

6.1.1 Rectangular keys:
   ~ a pulley to the shaft of a motor.
   ~ the change wheels of a lathe to their shaft.
   ~ a lever to a shaft.
   ~ a coupling to a shaft.
   (ANY ONE FACT)

6.1.2 Taper gibhead key:
   ~ for a driving pulley or gear keyed to a shaft.
   ~ to key a crank disc to its driving shaft.
   (ANY ONE FACT)

6.1.3 Feather key:
   ~ the feed shaft of a lathe.
   ~ the lifting spindle of a jack.
   ~ a tail stock spindle, where the key prevents the spindle from turning.
   (ANY ONE FACT)

6.1.4 Woodruff key:
   ~ locate a pulley on the end of a shaft where the pulley is secured by means of a nut.

6.2

\[ H = \frac{d}{6} = \frac{45}{6} = 7.5 \text{ mm} \]

\[ W = \frac{d}{4} = \frac{45}{4} = 11.25 \text{ mm} \]
QUESTION 7: HAND TOOLS

7.1 Sledge hammer:
~ Heavy chipping work.
~ To drive in pins and shafts.
~ For heavy work such as forging.

(ANY ONE FACT)  

7.2 Half-round file:
~ To file flat and concave surfaces.
~ To file large internal round surfaces.

(ANY ONE FACT)  

7.3 Round-nose chisel:
~ To cut a rounded oil groove in a work piece.
~ To cut a round corner on a work piece.

(ANY ONE FACT)  

7.4 Dotting punch:
~ To lightly mark intersecting layout lines.
~ To mark the centre of a hole.
~ To provide a small mark for divider points.

(ANY ONE FACT)  

7.5 Long-nose pliers:
~ Use for reaching into tight corners during mechanical assembly.
~ To form wire loops.
~ The removal of splits pins.

(ANY ONE FACT)  

7.6 Stillson wrench:
~ To turn a round work piece such as a pipe.

(ANY ONE FACT)  

QUESTION 8: FASTENERS

8.1
1. External circlip  
2. Internal circlip  

(1)  

8.2
1. Tread cutting screw  
2. Self tapping screw  
3. Drive screw

(ANY TWO FACTS)  

(2)  

[6]
QUESTION 9: HAND TAPS; STOCKS AND DIES AND REAMERS

9.1 1. Parallel hand reamer (1)
     2. Taper reamers (1)
     3. Expanding reamers (1)
     4. Adjustable reamers (1)

TOTAL SECTION A 60

SECTION B: MACHINE CUTTING TOOLS AND MACHINES

QUESTION 10: DRILLING MACHINES

10.1 1. Sensitive drilling machine
      2. Pedestal drilling machine
      3. Pillar-type drilling machine
      4. Radial drilling machine
      5. Portable hand drilling machine
         (ANY THREE FACTS) (3)

10.2 The speed can be changed by adjusting the V-belt on the pulleys. (1)

10.3 1. The shape and size of the work piece.
      2. The force which the drill exerts depending on its size.
      3. The allowable clamping pressure on the work piece.
      4. The distortion which may be caused by clamping.
         (ANY THREE FACTS) (3)

10.4 \[ D = 15 \text{ mm} \]
     \[ S = 600 \text{ mm/sec} \]
     \[ R.T.C = \frac{N}{\text{r/min}} \]

\[ D = \frac{15}{1000} = 0.015 \]
\[ S = \frac{600 \times 60}{1000} = 36 \text{ m/min} \]
\[ S = \pi D N \]
\[ N = \frac{S}{\pi D} \]
\[
\frac{36 \text{ m/min}}{\pi \times 0.015 \text{ m}}
\]
\[
N = 764 \text{ r/min}
\]

**QUESTION 11: GRINDING MACHINES AND MACHINE CUTTING TOOLS**

11.1 ~ Guards around the wheel
~ Work rest
~ Transparent screen for eyes

11.2 The nut will tend to tighten as the spindle revolves.

11.3 The grinding wheel dresser provides a means to "true" or align and dress the wheel.

11.4

11.4.1 Trial angle
11.4.2 Side rake angle
11.4.3 Side clearance angle
11.4.4 Front clearance angle
11.4.5 Top clearance angle

**QUESTION 12: SHAPING MACHINE**

12.1 ~ Tool slide
~ Clapper box
~ Tool post

12.2 ~ Trueing
~ Setting the vice parallel to the movement of the ram
~ Setting the vice at right angles to the movement of the ram

12.3 Length of stroke = 450 mm = 0.45 m
Width = 200 mm
Feed = 0.15 mm per stroke
Cutting speed = 30 m/min
Stroke ratio = 3 : 2

Cutting stroke ratio = \(\frac{3}{5}\)
Strokes / min = \text{cutting speed} \text{ m/min} \times \text{stroke ratio} / \text{length of stroke} \times 3 \over 5 = 30 \text{ m/min} \times \frac{3}{5} = 40 \text{ strokes/min} \hspace{1cm} (1)

Time = \text{width of work (mm)} / \text{feed/stroke} \times 40 \text{ strokes/min} = 200 \text{ mm} \times \frac{0.15 \text{ mm/stroke} \times 40 \text{ strokes/min}}{33.3 \text{ min or 33 minutes 20 sec}} \hspace{1cm} (1)

**QUESTION 13: CENTRE LATHE**

13.1 ~ Flat bed  
~ V-bed  
~ V-flat bed  

(ANY TWO FACTS)

13.2 ~ The four jaw independent chuck has considerable gripping power.  
~ The chuck can hold a wide range of regular and irregular shapes.  
~ You can set work pieces to run concentrically or eccentrically.  
~ You can set jaws for external or internal work.  
~ The chuck stays accurate even it is worn.  
~ You can readily do facing and boring.  

(ANY THREE FACTS)

13.3 Mandrels are used to hold work pieces accurately in position between pieces.

13.4 ~ The CNC lathe has ball screws while the conventional lathe has a lead screw.  
~ CNC machines has little backlash in movement when compared to the conventional lathe.  
~ Unskilled labour can be used in the CNC lathe if the lathe has been set up and programmed, but it is not possible on the conventional lathe.  
~ CNC machines have hydraulic clamping chuck and tail stock for support, while the conventional lathe works manually.  
~ The CNC lathe has electronic position encodes and linear scales, while the conventional lathe has manual vernier scales and a digital readout.  

(ANY TWO FACTS)

13.5 Regular and irregular shapes of work pieces can be held on a face plate.
QUESTION 14: MILLING MACHINE

14.1
~ Never use an air hose to remove the chips.
~ Make sure that you are thoroughly familiar with the machine before you attempt to use it.
~ Wear proper clothing and approved safety goggles.
~ Never reach over or near the rotating cutter.
~ Stop the machine before you make adjustments or take measurements.
~ Make sure that the work holding device is mounted solidly to the table.
~ Keep the floor around the machine clear of chips and wipe up spilled cutting fluid immediately.
~ Take care to prevent running the saddle or work into the column.

(ANY TWO FACTS)

14.2

Spindle — provides the drive to the arbor and cutters.
Arbor — drives and holds the cutters in the correct position.
Arbor support — fits and clamps the over arm to align and support the arbor.
Over arm — provide support and correct alignment for the arbor.
Column — supports and guides the knee vertically.
Table trips — trip the automatic feed at pre-set positions.
Adjustable foot stock — supports the work piece on the opposite side of the dividing head.
Bracing arm — provide better support to the arbor and prevent vibration and chatter when heavy cuts are taken.

(ANY FOUR FACTS)

TOTAL SECTION B
40

GRAND TOTAL
100