Registration No.: .....

BHARTIYA SKILL DEVELOPMENT UNIVERSITY

School of HVAC&R Skills

1st Semester, 1st In-Sem. Examination

B. Voc. Program, Winter Semester (2018-19)

Course Code: HVA-1101 **Time: 1 Hour**

Course Name: Basic of Refrigeration and Air-Conditioning **Max. Marks: 20**

Instruction: Attempt all questions.

Section – A

05X01 = 05 Marks

1. In One inch how many centimeters?
   a) 25.4cm
   b) 2.54cm
   c) 250cm
   d) 0.25cm
2. Convert 100 degree Celsius into Fahrenheit:
   a) 212
   b) 2.12
   c) 21.2
   d) 0.21
3. In which direction does heat flow?
   a) From a cold substance to cold substance
   b) Up
   c) Down
   d) From a warm substance to a cold substance
4. What is the units of density?
   a) Kg/m^3
   b) m^3/s
   c) m^3/kg
   d) T
5. What is the units of specific gravity?
   a) No units
   b) Equal units
   c) Balance units
   d) Neutral units

Section – B

03X02 = 06 Marks

1. What is the property of fluid? Write down any four properties of the fluid.
2. Derive the mathematical equation for viscosity.
3. Differentiate between the psudoplastic fluid and dilatent fluid on the basis of viscosity.

Section – C

03X03 = 09 Marks

1. What is pressure? Write down different pressure units used in RAC. Explain with neat sketch absolute pressure, gauge pressure, and vacuum pressure.
2. Calculate the pressure exerted on the floor by 150 kg person with a total foot imprint area of 50 m^2?
3. (a) Differentiate between evaporation and vaporization.
   (b) A tank is filled with oil whose density of 850 kg/m^3, if the volume of the tank is 2 m^3. Determine the amount of mass in the tank.

BHARTIYA SKILL DEVELOPMENT UNIVERSITY

School of HVAC&R Skills

1st Semester, 1st In-Sem. Examination

B. Voc. Program, Summer Semester (2018-19)

Course Code: HVA-1101 **Time: 1 Hour**

Course Name: Basic of Refrigeration and Air-Conditioning **Max. Marks: 20**

Instruction: (Attempt all questions.)

Section A

1. a
2. a
3. d
4. a
5. a

Short answer: Section B

6. property is the coordinate to describe the state of the fluid. Density, specific gravity, specific weight, specific volume
7. T= Udu/dy
8. Psudoplastic when the deformation is given shear stress increase.
   Dilatant: when the deformation is given shear stress decrease.

Long answer question Section C

9. Different pressure units are: N/m2, Pascal, Bar, atmospheric pressure, torr, PSI, mm of Hg.
10. Cooling or extracting heat from substance is called condensation. Free convection and forced convection.
11. Pressure: it is a normal force/unit area
    Different pressure units are: N/m2, Pascal, Bar, atmospheric pressure, torr, PSI, mm of Hg.
    Absolute pressure = atmospheric pressure+ gauge pressure (pressure above atmospheric)
    Absolute pressure = atmospheric pressure- gauge pressure (pressure below atmospheric)
12. Viscosity 150/50 = N
13. 850*2 = 1700 kg

Registration No.: .....

BHARTIYA SKILL DEVELOPMENT UNIVERSITY

School of HVAC&R Skills

1st Semester, 1st In-Sem. Examination

B. Voc. Program, Winter Semester (2018-19)

Course Code: HVA-1102 **Time: 1 Hour**

Course Name: Assembly and Installation of Refrigerator **Max. Marks: 20**

Instruction: Attempt all questions.

Section – A

05X01 = 05 Marks

1. Refrigeration is used for which purpose.....?
   a) Cooling
   b) Heating
   c) Air distribution
   d) Filter of air
2. Domestic refrigerator used which refrigerant:
   a) R22
   b) R134a
   c) R410a
   d) R600a
3. Whenever phase change takes place heat release or add is called ..... heat:
   a) Sensible heating
   b) Latent heat
   c) Specific heat
   d) Energy
4. Which component of refrigerator having most high pressure and temperature?
   a) Compressor
   b) Condenser
   c) Evaporator
   d) Expansion valve
5. Domestic refrigerator is which type cooling system?
   a) Air cooled
   b) Water cooled
   c) Mixed cooling
   d) Gas cooled

Section – B

03X02 = 06 Marks

1. What is refrigeration.? how air refrigeration system different from this.
2. Differentiate between boiling and condensation.
3. Write function of accumulator.

Registration No.: .....

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Section – C

03X03 = 09 Marks

1. Explain different types of refrigerator.
2. Draw vapor compression refrigeration cycle with neat sketch.
3. Differentiate between Heat engine and refrigerator with neat sketch.

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School of HVAC&R Skills

1st Semester, 1st In-Sem. Examination

B. Voc. Program, Summer Semester (2018-19)

Course Code: HVA-1102 **Time: 1 Hour**

Course Name: Assembly and Installation of Refrigerator **Max. Marks: 20**

Instruction: (Attempt all questions.)

Section A

1. a
2. b
3. b
4. a
5. a

Short answer: Section B

6. Refrigeration is the process of removing heat from substance or space to reduce its temperature and transferring that heat to another substance or Refrigeration is providing and maintaining the temperature below that of the surrounding temperature.
7. Cooling or extracting heat from substance is called condensation. Getting heat from evaporator is called boiling.
8. Top-Mount
9. Bottom-Mount
10. Side-by-side
11. French Door
12. Bar and drinks fridges
13.
14. It is connected between the evaporator and compressor, which accumulates liquid droplets of the refrigerant and prevent the compressor from any possible damage.

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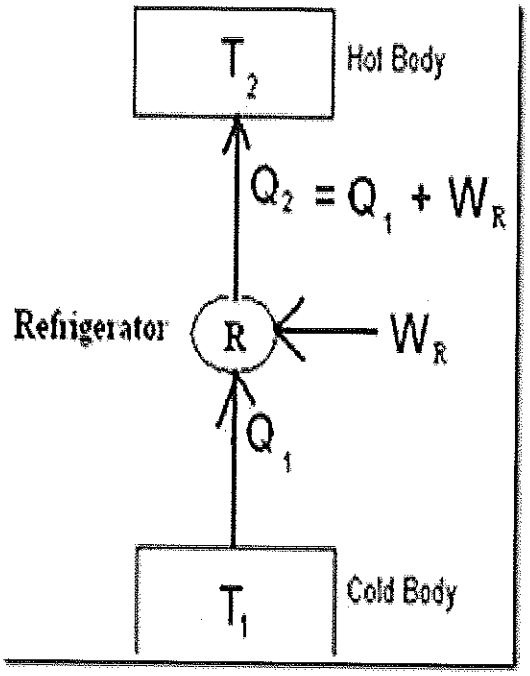
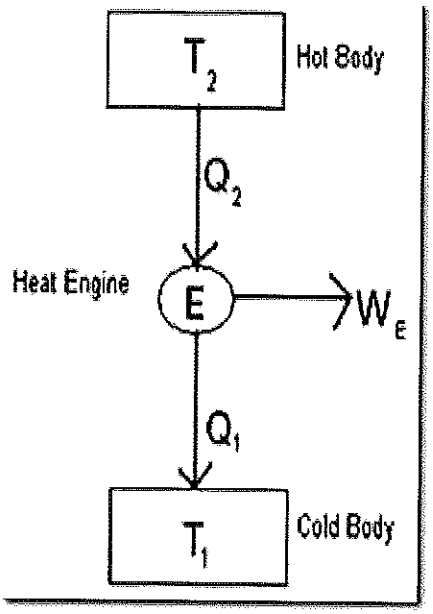


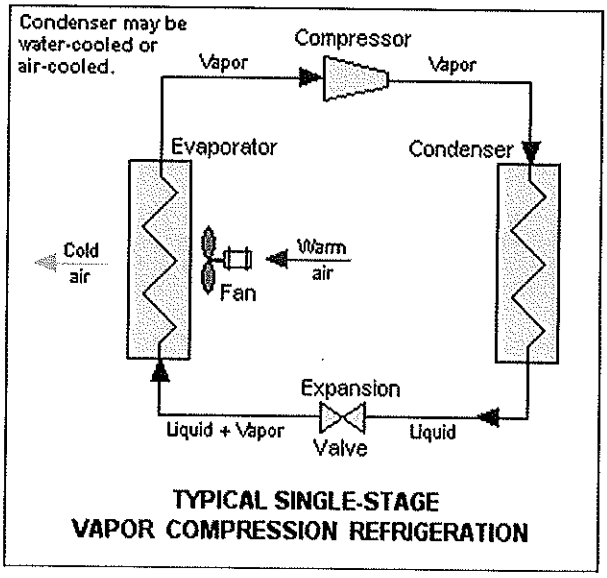
$T_1 < T_a$



$T_1 > T_a$

15.

16.



TYPICAL SINGLE-STAGE VAPOR COMPRESSION REFRIGERATION

Registration No.: .....

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School of **HVAC&R**

I Semester, 1st In-Sem. Examination

B. Voc. Program, Winter Semester (2018-19)

Course Code: HVA1103 **Time: 1 Hour**

Course Name: Assembly and Installation of Air-conditioning **Max. Marks: 20**

Instructions:

1. Attempt all Questions.
2. Each question of Section – A carries 01 mark.
3. Each question of Section – B carries 02 marks.
4. Each question of Section – C carries 03 marks.

Section – A

05X01 = 05 Marks

1. Refrigeration is the cooling of a system below the temperature of:

   A. A Chilled Liquid,

   B. A Hot gas,

   C. Its surroundings.

   D. All of the above

2. A continued extraction of heat from a body whose temperature is already below the temperature of its surroundings is called:

   A. Heating

   B. Ventilation

   C. Refrigeration

   D. All of the above

3. the process of treating air is called:

   A. Air Conditioning,

   B. Refrigeration,

   C. Humidification,

   D. Not from the above.

4. Evaporator function in Air-conditioning is:

   A. Absorb heat inside a room

   B. Release heat outside of a room

   C. Absorb heat outside of a room

   D. Both A and B.

5. System pressure in Air-conditioning is measured with :

   A. Center gauge

   B. high-side gauge

   C. low-side gauge

   D. Pressure Gauge

Section – B

03X02 = 06 Marks

1. What is an Air-conditioner?
2. Write the classifications of history of refrigeration.
3. What is expansion in refrigeration system?

Section – C

03X03 = 09 Marks

1. Describe the role of evaporator and condenser in a Vapour Compression Refrigeration System.
2. Describe the safety step in servicing of Air conditioners.
3. Write short note on:

   i) Refrigeration,

   ii) Limitations of Natural Refrigeration.

Registration No.: .....

BHARTIYA SKILL DEVELOPMENT UNIVERSITY

School of **HVAC&R**

I Semester, 1st In-Sem. Examination

B. Voc. Program, Winter Semester (2018-19)

Answer Sheet

Course Code: HVA1103 **Time: 1 Hour**

Course Name: Assembly and Installation of Air-conditioning **Max. Marks: 20**

Instructions:

1. Attempt all Questions.
2. Each question of Section – A carries 01 mark.
3. Each question of Section – B carries 02 marks.
4. Each question of Section – C carries 03 marks.

Section – A

05X01 = 05 Marks

1. Refrigeration is the cooling of a system below the temperature of:

   A. A Chilled Liquid,

   B. A Hot gas,

   C. Its surroundings.

   D. All of the above

2. A continued extraction of heat from a body whose temperature is already below the temperature of its surroundings is called:

   A. Heating

   B. Ventilation

   C. Refrigeration

   D. All of the above

3. The process of treating air is called:

   A. Air Conditioning,

   B. Refrigeration,

   C. Humidification,

   D. Not from the above.

4. Evaporator function in Air-conditioning is:

   A. Absorb heat inside a room

   B. Release heat outside of a room

   C. Absorb heat outside of a room

D. Both A and B.

5. System pressure in Air-conditioning is measured with :

   A. Center gauge

   B. high-side gauge

   C. low-side gauge

   D. Pressure Gauge

Section – B

03X02 = 06 Marks

1. What is an Air-conditioner?

   The process of treating air so as to control simultaneously :

   a. Temperature

   b. Humidity

   c. Cleanliness

   d. Air Distribution

2. Write the classifications of history of refrigeration.

   History can be broadly classified into two categories:

   a) Age of natural refrigeration

   b) Age of artificial refrigeration

3. What is expansion in refrigeration system?

   Decreases Refrigerant pressure to decrease saturation temperature

Section – C

03X03 = 09 Marks

1. Describe the role of evaporator and condenser in a Vapour Compression Refrigeration System.

   Evaporator changes refrigerant from liquid to gas on low Pressure and low Temperature to absorb heat of evaporation.

   Condenser changes refrigerant from Gas to Liquid on High Pressure and High Temperature to Discharge heat of condensation.

2. Describe the safety step in servicing of Air conditioners.

   Do not install the appliance if it is connected to the power supply.

- **The Installation and service/repair must be performed by a qualified technician, in compliance with the producer's instructions and following local safety norms.**
- **Do not repair or replace any parts of the appliance unless it is specifically written in the user instructions.**
- **The grounding of this appliance is compulsory.**
- **Make sure that the power supply cord is long enough to allow the right connection. Do not use any extension cord for power supply.**
- **Do not pull the power supply cord to remove it from the socket.**
- **Do not twist or press the power supply cord, and make sure it is not broken.**
- **Once installation is completed, the electric components must not be accessible to the users.**
- **Do not touch the operation buttons when your hands are wet and don't use the appliance when you are barefoot.**

3. Write short note on:

- i) Refrigeration: **Refrigeration is the cooling of a system below the temperature of its surroundings. Therefore , refrigeration means a continued extraction of heat from a body whose temperature is already below the temperature of its surroundings.One of the most important applications of refrigeration has been the preservation of perishable food products by storing them at low temperatures.**

ii) Limitations of Natural Refrigeration.

- **They are uncertain due to dependence on weather.**
- **They depend on local conditions.**
- **Not available to everyone.**
- **Difficult to produce large amount of refrigeration.**

Registration No.: .....

BHARTIYA SKILL DEVELOPMENT UNIVERSITY

School of HVAC&R

I Semester, 1st In-Sem. Examination

B. Voc. Program, Winter Semester (2018-19)

Course Code: HVA1104 **Time: 1 Hour**

Course Name: Sheet Metal and Welding **Max. Marks: 20**

Instructions:

1. Attempt all Questions.
2. Each question of Section – A carries 01 mark.
3. Each question of Section – B carries 02 marks.
4. Each question of Section – C carries 03 marks.

Section – A

05X01 = 05 Marks

1. Process of sheet metal joining is,
   A. Forming,
   B. Shearing,
   C. Punching,
   D. Riveting.
2. One of the Sheet metal cutting process is:
   A. Bending
   B. Riveting
   C. Punching
   D. Embossing
3. Name of the process of folding sheet on an angle is:
   A. Embossing
   B. Spring back
   C. Hem
   D. Bending
4. One of the HERF process is:
   A. Punching
   B. Drawing
   C. Electromagnetic forming
   D. Piercing

5. Large metal sheets and plates are formed into curved sections using rolls in sheetmetal is:

   A. bending
   B. rolling
   C. punching
   D. spinning

Section – B

03X02 = 06 Marks

1. What is Lap seam and grooved seam?
2. Name the hand tools used in forming of sheet metal.
3. What are cutting processes of sheet metal?

Section – C

03X03 = 09 Marks

1. Describe the commonly used tools in sheet-metal?
2. State advantages of sheet metals.
3. Explain following with marked sketch:
   a) Punch and Die tool
   b) Spring back.

Registration No.: .....

BHARTIYA SKILL DEVELOPMENT UNIVERSITY

School of HVAC&R

I Semester, 1st In-Sem. Examination

B. Voc. Program, Winter Semester (2018-19)

Answer Sheet

Course Code: HVA1104 **Time: 1 Hour**

Course Name: Sheet Metal and Welding **Max. Marks: 20**

Instructions:

1. Attempt all Questions.
2. Each question of Section – A carries 01 mark.
3. Each question of Section – B carries 02 marks.
4. Each question of Section – C carries 03 marks.

Section – A

05X01 = 05 Marks

1. Process of sheet metal joining is,
   A. Forming,
   B. Shearing,
   C. Punching,
   D. Riveting.
2. One of the Sheet metal cutting process is:
   A. Bending
   B. Riveting
   C. Punching
   D. Embossing
3. Name of the process of folding sheet on an angle is:
   A. Embossing
   B. Spring back
   C. Hem
   D. Bending
4. One of the HERF process is:
   A. Punching
   B. Drawing
   C. Electromagnetic forming
   D. Piercing

5. Large metal sheets and plates are formed into curved sections using rolls in sheetmetal is:

   A. bending

   B. rolling

   C. punching

   D. spinning

Section – B

03X02 = 06 Marks

1. What is Lap seam and grooved seam?

   1. **Lap seam:** This is the simplest seam used in sheet metal work (Figure (a)). This consists of one edge lapping over the other and joint is made by soldering or riveting.
   2. **Grooved seam:** A grooved seam is made by hooking two-folded edges together and then off setting them . This joint is self-locking and stronger to some extent than lap seam.

2. Name the hand tools used in forming of sheet metal.

   Mallet and stakes

3. What are cutting processes of sheet metal?

Shearing, Blanking, Punching

Section – C

03X03 = 09 Marks

1. Describe the commonly used tools in sheet-metal?

   Marking tools, Cutting tools, forming tools, Joining tools

2. State advantages of sheet metals.

   High strength, Good dimensional accuracy, Good surface finish, Relatively low cost

   For large quantities, economical mass production operations.

3. Explain following with marked sketch:

   a) Punch and Die tool

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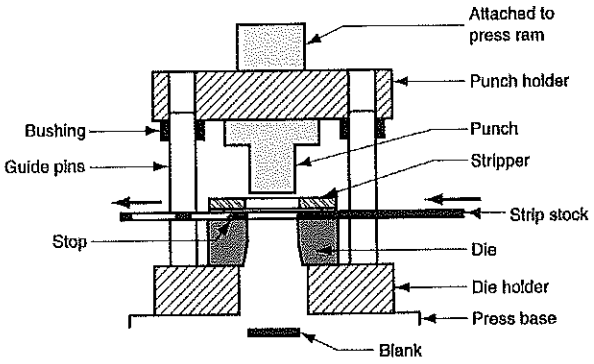
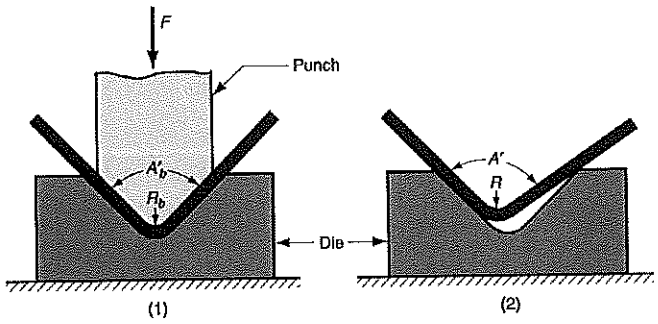


b) Spring back.



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BHARTIYA SKILL DEVELOPMENT UNIVERSITY

School of HVAC & R Skills

First Semester, 1st In-Sem. Examination

B. Voc. Program, Winter Semester (2018-19)

Course Code: HVA 1105 **Time: 1 Hour**

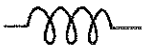
Course Name: RAC Electrical **Max. Marks: 20**

Instruction: All questions are compulsory. Answer all questions from section A, each question carries one mark. Answer all questions from section B, each question carries two marks. Answer all questions from section C, each question carries three marks. Scientific calculator can be used.

Section – A

05X01 = 05 Marks

Q.1. The symbol of resistor is:

(a)  b.  c.  d. None of these

Q.2. The unit of power is:

(a) W (b) Wh (c) A (d) V

Q.3. A 500-ohm resistor is directly connected to 50V battery, Calculate the current through the resistor.

(a) 0.5 A (b) 0.1 A (c) 10 A (d) 5 A

Q.4. The unsafe act or unsafe condition can leads to an:

(a) Accident (b) Safety (c) Both a and b (d) none of these

Q.5. In an atom particles having positive charge is called:

(a) Proton (b) Neutron (c) Electron (d) None of these

Section – B

03X02 = 06 Marks

Q.1. What is a resistance? How can you describe conductor and insulator in terms of resistance?

Q.2. State and explain ohms law.

Q.3. Explain KCL and KVL.

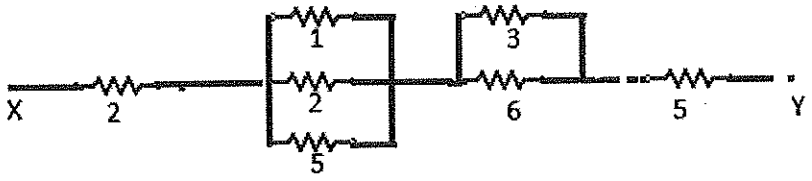
Section – C

03X03 = 09 Marks

Q.1. What are the safety precautions to be taken care when working with electricity?

Q.2. Describe the color coding of resistor and show how to represent a 20 kΩ resistance with 5% tolerance with color codes.

Q.3. Find the equivalent resistance between X and Y (Given all the resistances are in ohms).



Answer Key (HVA 1105)

BHARTIYA SKILL DEVELOPMENT UNIVERSITY

School of HVAC & R Skills

First Semester, 1st In-Sem. Examination

B. Voc. Program, Winter Semester (2018-19)

Course Code: HVA 1105

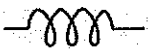
Course Name: RAC Electrical

Max. Marks: 20

Section – A

05X01 = 05 Marks

Q.1. The symbol of resistor is:

(a)  b.  c.  d. None of these

Ans. (a)

Q.2. The unit of power is:

(a) W (b) Wh (c) A (d) V

Ans. (a)

Q.3. A 500-ohm resistor is directly connected to 50V battery, Calculate the current through the resistor.

(a) 0.5 A (b) 0.1 A (c) 10 A (d) 5 A

Ans. (b)

Q.4. The unsafe act or unsafe condition can leads to an:

(a) Accident (b) Safety (c) Both a and b (d) none of these

Ans. (a)

Q.5. In an atom particles having positive charge is called:

(a) Proton (b) Neutron (c) Electron (d) None of these

Ans. (a)

Section – B

03X02 = 06 Marks

Q.1. What is a resistance? How can you describe conductor and insulator in terms of resistance?

Ans. Resistance is the 'opposition' to the current flow measured in ohms (Ω)

Conductors have a low value of resistance.

Insulators have a very high resistance.

Load in DC/AC circuits.

Q.2. State and explain ohms law.

Ans. Ohm's law states that in any closed circuit the current is directly proportional to the voltages applied and inversely proportional to the resistance of the circuit, keeping the physical conditions are constant.

$I \propto V$,

$I \propto 1/R$

$I = V/R$

$V = IR$

Where,

V=applied voltage in volt

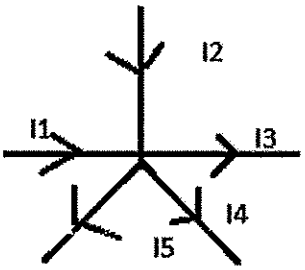
I is the current flowing through the circuit in A

R is the resistance of the circuit in **Ω**

Q.3. Explain KCL and KVL.

Ans. ***Kirchhoff's Current Law (KCL)***

The algebraic sum of the currents at any junction of a network is zero. In other words, the sum of current entering in to a junction is equal to the sum of current leaving from the junction.



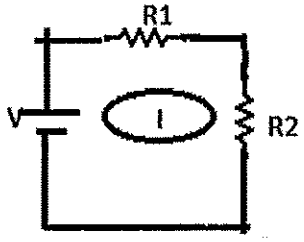
I1+I2-I3-I4-I5=0

Or

I1+I2=I3+I4+I5

Kirchhoff's Voltage Law (KCL)

It states that the algebraic sum of the all the voltages in any closed electrical circuit is equal to the zero.



V-I*R1-I*R2=0 or V= I*R1+I*R2

BSDU

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Section – C 03X03 = 09 Marks

Q.1. What are the safety precautions to be taken care when working with electricity?

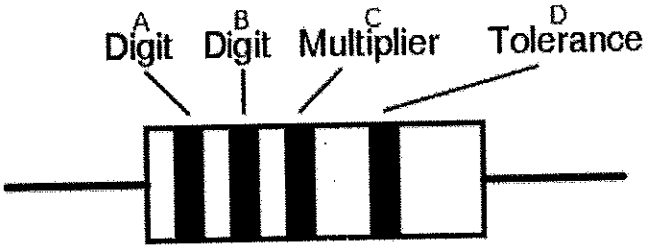
Ans.

- Avoid water at all times when working with electricity.
- Never touch or try repairing any electrical equipment or circuits with wet hands. It increases the conductivity of the electric current.
- Never use equipment with damaged insulation or broken plugs.
- If you are working on any electrical socket at your home then always turn off the mains. It is also a good idea to put up a sign on the service panel so that nobody turns the main switch ON by accident.
- Always use insulated tools while working.
- Always use appropriate insulated rubber gloves and goggles while working on any branch circuit or any other electrical circuit.
- Never try repairing energized equipment. Always check that it is de-energized first by using a tester. When an electric tester touches a live or hot wire, the bulb inside the tester lights up showing that an electrical current is flowing through the respective wire. Check all the wires, the outer metallic covering of the service panel and any other hanging wires with an electrical tester before proceeding with your work.
- Never use an aluminum or steel ladder if you are working with electricity at height in your home. An electrical surge will ground you and the whole electric current will pass through your body. Use a bamboo, wooden or a fiberglass ladder instead.

Q.2. Describe the color coding of resistor and show how to represent a 20 kΩ resistance with 5% tolerance with color codes.

Ans.

Color	Digit
Black	0
Brown	1
Red	2
Orange	3
Yellow	4
Green	5
Blue	6
Violet	7
Grey	8
White	9
Gold	5%
Silver	10%
(none)	20%



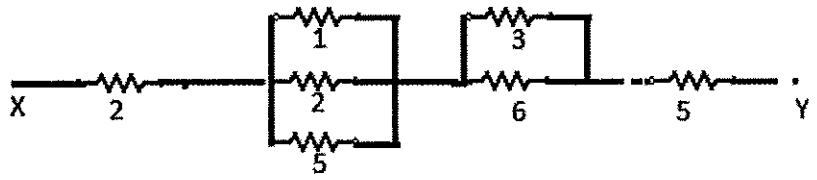
The value of resistance can be calculated by

$R = AB * 10^{C} \pm D$

Hence the 1 kΩ resistance with 5% tolerance can be represented as

Red, Black, Orange, Gold.

Q.3. Find the equivalent resistance between X and Y (Given all the resistances are in ohms).



Ans.

REq= [1||2||5]+[3||6]+5+2

REq=({[10/17]+[2]+5+2

REq=10/17+9

REq=9.58