

Curriculum of Matric Tech

HVACR

GRADE IX

2020



GOVERNMENT OF PAKISTAN

Ministry Of Federal Education and Professional Training, ISLAMABAD

In collaboration with

National Vocational and Technical Training Commission

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Introduction

INTRODUCTION

Pakistan is a developing country with 5th largest population in the world. 64% of our population is below 30 years of age which makes it second youngest country in South Asia. This “youth bulge” provides unique challenges as well as opportunities for the country’s social and economic development. The only remedy is to develop youth of Pakistan through education and training. To control the increasing unemployment, promoting entrepreneurship (self-employment), alleviate poverty and provide skilled manpower for industrial/economic growth, The Govt. of Pakistan has decided to introduce Technical Scheme at Secondary School Certificate (SSC) Level. For this purpose a stream of technical subjects has been selected including HVACR as one of the elective subjects to be taught at that level.

HVACR is a sub discipline of Mechanical Engineering that makes it possible for us to live comfortably in air-conditioned spaces and enjoy a wide variety of foods. HVACR technology is still growing and will continue to grow far into the future. New technicians will need to be aware of the fact that change is inevitable which requires a complete look at the industry.

The curriculum of HVACR is designed to produce middle level human resources in the form of skilled work force equipped with knowledge, skills and attitudes related to the field of HVACR so as to meet the demand of such workforce in the country and abroad to contribute in the national streamline of poverty reduction of Pakistan.

HVACR Technician is a trade person specializing in the installation, repairing and maintenance of Heating Ventilation , Air conditioning and Refrigeration system and the related equipment. HVACR Technician may seek a job or become an entrepreneur. HVACR Technicians work in a variety of settings, including homes, industries, schools, hotels, workshops and hospitals-any type of facility that needs a HVACR system to function.

Working conditions for a HVACR technician may vary by specialization. Generally an HVACR Technician’s work is physically demanding such as climbing ladders and lifting tools and supplies. Occasionally an HVACR technician must work in a cramped space or on scaffolding, and may frequently be bending, or kneeling, to make / connections in awkward locations. He may spend much of their days in outdoor or semi-outdoor noisy and dirty worksites. He may be exposed to the heat, dust, and noise of an industrial plant. He may be called to work in all kinds of adverse weather to make emergency repairs.

Rationale

The Trade of HVACR is a profession that is increasingly getting attention in Pakistan because of the population growth and the resultant immense opportunities in the field not only among the youth, seeking to enter the industry, but also among the adults who wish to polish their skills to develop a career out of it.

On completing the curriculum/course, students should have acquired a set of knowledge and concepts, and have developed a range of technical, personal, interpersonal, organizational and generic skills, that can be applied in various contexts, both within and related to trade of HVACR. Furthermore, this course will stimulate the learners towards entrepreneurship in the industry.

Within this qualification relating to HVACR Technician's interventions in schools, there are important interventions that integrated within school settings. The purpose of this qualification is to strengthen connections between schools and trade, and drawing on the concept of the socio technical network, theories the interactions between the relevant market and school contexts.

HVACR Technician, Matric Tech (9th&10th)

Aims and Objectives

The specific objectives of developing these qualifications are as under:

- Provide students with a smooth transition to work.
- Develops job-readiness & enhance students' trade-specific employable skills and provide opportunities for the development of new skills.
- Provide students with the opportunity to obtain from Level II -IV technical training certification or equivalent in a given trade.
- To set high profile standard professions for the industry to generate standard outputs.
- To validate an individual skill, knowledge and understanding regarding relevant occupations.
- Provide flexible pathways and progressions in training and assessment field.

Objectives

After completing this, the students will be able to:

- Perform routine skilled and semi-skilled tasks to carry out a variety of HVACR installations
- Repair of equipment, facilities and system.
- Perform maintenance jobs and assist other team members in the assigned preventive maintenance.
- Perform their duties in an efficient manner
- Establish a standardized and sustainable system of Refrigeration and Air conditioning training in the institutes / colleges / schools of Pakistan.
- Improve the professional competence of Refrigeration and Air conditioning industry

Grade - IX

| Chapter 1 | | | | | |
|---|--|---|---------------------------|---|--------------------|
| Introduction to HVACR 52 Periods 16 =(T), 36 = (P) | | | | | |
| Theme/Content | Student Learning Outcome | Activities/Practical | Duration | Tools | Workplace |
| Basic Concept of HVACR | The student will be able to: <ul style="list-style-type: none"> • define HVACR • understand the basic concept of HVACR • understand the scope of HVACR • comprehend the importance of HVACR | <ul style="list-style-type: none"> • Arrange introductory visit of HVACR Lab | Periods (T) Periods(P) | HVACR Lab | Classroom/ Labs |
| Sources of HVACR | <ul style="list-style-type: none"> • understand HVACR sources • elaborate the importance of different HVACR sources • recognize different HVACR sources | <ul style="list-style-type: none"> • Identify the various sources of HVACR | Periods (T) Periods(P) | Stationary | Classroom/ Labs |
| Tools & Equipment | <ul style="list-style-type: none"> • recognize the tools, equipment & plants(T&P) • understand the function of tool & equipment • adopt the 5S Standard Operating procedures (SOPs) about tools | <ul style="list-style-type: none"> • Identify the various tools & equipment use in HVACR • Perform cleaning & maintenance of different tools & equipment • Perform safe storage of different tools & equipment | Periods (T) Periods(P) | Personal protective equipment General toolkit Locking ,pliers Adjustable screw, wrench, Ratchet wrench Open ended spanner set,Box spanner screw drivers, Electric Screw driver set, Spirit level, Digital Clamp-on Ampere Meter, Digital Optical Tacho meter. | Classroom/ Labs |

| | | | | | |
|--|---|---|---------------------------|---|--------------------|
| | | | | Digital Capacitor analyzer, Tube cutter, Digital pressure gauges set, Flaring and swaging tool kit, Laser temperature measuring device, Electronic leak detector, Digital Air Flow / Velocity meter | |
| HVACR Societies | <ul style="list-style-type: none"> define HVACR societies understand the role of HVACR societies learn types of societies | <ul style="list-style-type: none"> Enlist different HVACR societies. | Periods (T) Periods(P) | Stationary | Classroom/ Labs |
| Basic Concepts of Refrigeration and Air Conditioning | <ul style="list-style-type: none"> define refrigeration describe history of refrigeration know about the types of refrigeration understand the scope of refrigeration define air conditioning know about the types of air conditioner differentiate between air conditioning and refrigeration understand the scope of air conditioning | <ul style="list-style-type: none"> identify air conditioning circuit identify refrigeration circuit | Periods (T) Periods(P) | Refrigerator, Air Conditioners | Classroom/ Labs |
| Copper Tube Processes | <ul style="list-style-type: none"> Describe Pipe Sizes Define Cutting Define Flaring Define Swaging Describe Bending | <ul style="list-style-type: none"> Measure Length & Diameter of Pipes Cut the Copper Tube Make Flare on Copper Tube Make Swage on Copper Tube Bend Copper Tube | Periods (T) Periods(P) | Copper Tubes, Tube Cutter, Reamer, Flaring Tool, Swaging Tool, Hammer, Tube Bender, Tube Vice | Classroom/ Labs |

Chapter 2

Fundamentals of HVACR
32 Periods 16 =(T), 16 = (P)

| Theme/Content | Student Learning Outcome | Activities/Practical | Duration | Tools | Workplace |
|--|--|--|---------------------------|--|--------------------|
| Basic Concept of Heat & Energy | <p>The student will be able to:</p> <ul style="list-style-type: none"> define energy and its unit know about the different types of energy (kinetic energy, potential energy, heat energy) define heat and its unit know about the different types of heat understand heat transfer mechanism understand various types of heat transfer methods | <ul style="list-style-type: none"> Calculate different types of energy (kinetic energy, potential energy, heat energy) | Periods (T) Periods(P) | Calculator, Pencil, Paper | Classroom/ Labs |
| Inter Relationship of Pressure, Temperature & Volume | <ul style="list-style-type: none"> define pressure and its unit know about the different types of pressure understand pressure measuring devices define temperature and its unit know about the different scales of temperature (⁰C, Kelvin, ⁰F) perform inter conversion of temperature scales define volume and its unit understand inter relationship of temperature, pressure and volume | <ul style="list-style-type: none"> Read the scale of pressure gauge Measure pressure of refrigeration system Measure temperature by thermometer | Periods (T) Periods(P) | Pressure Gauge, Thermometer, Refrigeration system, | Classroom/ Labs |

| | | | | | |
|--------------------|---|--|---------------------------|------------|--------------------|
| Refrigeration Laws | <ul style="list-style-type: none"> state refrigeration laws state Pascal`s Law state Dalton`s Law | <ul style="list-style-type: none"> Using Pascal`s law equation to solve the given problems Using Dalton`s law equation to solve the given problems | Periods (T) Periods(P) | | Classroom/ Labs |
| System Units | <ul style="list-style-type: none"> define physical quantities define unit describe systems of unit understand unit conversion | <ul style="list-style-type: none"> Perform unit conversion of different quantities | Periods (T) Periods(P) | Calculator | Classroom/ Labs |

| Chapter 3 | | | | | |
|---|--|---|---------------------------|---|--------------------|
| Refrigeration Cycle 36 Periods 14 =(T), 22 = (P) | | | | | |
| Theme/Content | Student Learning Outcome | Activities/Practical | Duration | Tools | Workplace |
| Basic Concept Refrigeration Cycle | The students will be able to: <ul style="list-style-type: none"> define cycle understand refrigeration cycle explain working principle of refrigeration cycle | <ul style="list-style-type: none"> Draw refrigeration cycle Identify pressure & temperature at various points Identify color coding in refrigeration cycle | Periods (T) Periods(P) | Refrigeration system, Pressure Gauges, Thermometer, Compressor, Condenser, Evaporator, Refrigerant control Valves | Classroom/ Labs |
| Components of Refrigeration Cycle | <ul style="list-style-type: none"> enlist basic components of refrigeration cycle define compression define compressor and its types understand working principles of compressor define condensation define condenser and its types understand working principle of condenser | <ul style="list-style-type: none"> Identify different components of refrigeration cycle Identify different types of compressor Identify different parts of compressor Identify different types of condenser Identify different types of refrigerant control Identify different types of | Periods (T) Periods(P) | Refrigeration system, Pressure Gauges, Thermometer, Compressor, Condenser, Evaporator, Refrigerant control Valves | Classroom/ Labs |

| | | | | | |
|--|---|------------|--|--|--|
| | <ul style="list-style-type: none"> define refrigerant control define expansion role of expansion in refrigeration cycle understand types of refrigerant controls define evaporation define evaporator and its types understand working principle of evaporator | Evaporator | | | |
|--|---|------------|--|--|--|

| Chapter 4 | | | | | |
|--|---|--|---------------------------|---|-----------------|
| Refrigerants | | | | | |
| 40 Periods 15 =(T), 22= (P) | | | | | |
| Theme/Content | Student Learning Outcome | Activities/Practical | Duration | Tools | Workplace |
| Refrigerant and its Properties | The Student will be able to: <ul style="list-style-type: none"> define refrigerants explain types of refrigerants enlist the properties of refrigerants. know about different properties of refrigerant classify refrigerants according to application and safety differentiate between good and bad refrigerant | <ul style="list-style-type: none"> Identify refrigerant according to color code of refrigerant Identify chemical formula of different refrigerants | Periods (T) Periods(P) | Refrigerants , Refrigerants Chart | Classroom/ Labs |
| Refrigerants application and leakage testing | <ul style="list-style-type: none"> define leakage testing understand leakage testing techniques learn the applications of refrigerants | <ul style="list-style-type: none"> Perform leakage testing of refrigerant Identify different applications of refrigerants | Periods (T) Periods(P) | Leak testing equipment, | Classroom/ Labs |
| Retrofitting of Refrigerant | <ul style="list-style-type: none"> define retrofitting define ozone depletion define global warming define green house effect understand process of retrofitting define recovery of refrigerant define reclaiming describe recycling describe techniques of | <ul style="list-style-type: none"> Perform safe handling of refrigerant Perform reclaiming and recycling Perform recovery of refrigerant | Periods (T) Periods(P) | Recovery unit, Manifold, Recovery cylinder, | Classroom/ Labs |

| | | | | | |
|--|--|--|--|--|--|
| | safe handling and storage of refrigerants <ul style="list-style-type: none"> • study refrigerants charts for GW and ODP | | | | |
|--|--|--|--|--|--|

| Chapter 5 | | | | | |
|---------------------------------------|--|--|---------------------------|--|--------------------|
| Personal And Professional Development | | | | | |
| 16 Period 06 (T) 10 (P) | | | | | |
| Themes | Students' Learning Outcomes | Activities | Duration | Tools | Workplace |
| CV & Resume Writing | The students will be able to: <ul style="list-style-type: none"> • learn the importance of cv in job application • create and format CV/resume | <ul style="list-style-type: none"> • Create a CV with the help of teacher | Periods (T) Periods(P) | Computer system with MS office | Classroom/ Labs |
| Job Portals | <ul style="list-style-type: none"> • access and register email account on various online job portals • search job as per job description and title | <ul style="list-style-type: none"> • Register on online job portals, follow job hunting procedure and steps to apply for an advertised job | Periods (T) Periods(P) | Computer system with internet connection | Classroom/ Labs |
| Introduction to e-commerce | <ul style="list-style-type: none"> • familiarize oneself with online travel e-commerce websites • learn about hotel websites • learn about freelancing websites | <ul style="list-style-type: none"> • Create a travel booking on any online travel website • Create an account on any freelancing website | Periods (T) Periods(P) | Computer system with internet connection | |

Assessment and Evaluation

Assessment is the practice of collecting evidence of student learning. It aims at improving learning and teaching as well as recognizing the achievement of students. It determines students' progression through their learning experiences and enables them to demonstrate that they have achieved the intended learning outcomes. The assessment is aligned with curriculum aims, design and learning processes.

Evaluation is an integral part of teaching-learning process. It involves gathering information through various assessment techniques, making valuable judgment and sound decisions. Assessment provides information and teaching about students' achievement in relation to learning objectives. With this information, the teacher makes informed decisions about what should be done to enhance the learning of students or to improve teaching methods. Assessment must be:

- mainly open-ended, allowing for discussion and revision of new understanding.
- tolerant of divergent thinking of students and promote the notion of no 'one right answer'.
- presented in alternative mode, not just paper-and-pencil responses to limiting questions.
- designed to foster analysis, comparison, generalization, prediction, and modification according to the grade and development level.
- capable of promoting collaboration and team effort in demonstration of competence.
- ongoing and cumulative, showing growth over time.

Formative (Internal) Assessment

Internal assessment refers to the assessment practices employed as part of the learning and teaching process. It is an ongoing process throughout the session and uses Test — Feedback — Adjust cycle repeatedly to improve students' performance and efficiency in learning and teaching. In designing internal assessment for the subject, teachers should maintain a proper balance between the formative and summative functions of assessment. It should be comprehensive to cover all the objectives as per curriculum. A diversity of assessment modes should be adopted so that students are given opportunities to develop and demonstrate the full range of learning outcomes of the curriculum, including those of knowledge, skills, values and attitudes.

Methods for Internal/Formative Assessment

Following tasks can help in formative assessment.

- Assignments
- Quizzes
- Tests
- Group discussions
- Oral/multimedia presentations
- Worksheets
- Online interactive activities
- Role play
- Demonstration
- Practical exercises

Feedback on students' work in all the above tasks must be prompt, effective, and efficient assessment should have questions setting that specifically help in finding out knowledge, understanding and skills.

Summative /External Assessment

Summative assessment will be managed by concerned Board of Intermediate and Secondary Education. It will be composed of two parts.

1) Theory Assessment /Written examination: The theory examination is suggested to consist of a wide variety of questions. Its overall weight age should be 40 %. It should be based on the curriculum rather than textbook. The assessment should be designed to examine the candidate's understanding of the whole syllabus and should test the range of abilities according to Bloom Taxonomy.

2) Practical Assessment/Practical examination: This is designed to test Practical skills of students. Its overall weight age should be 60%. It will comprise of written exam (10%), practical (70 %) and viva/oral exam (20%).

A standards-referenced approach will be adopted for grading and reporting student performance. The purpose of this approach is to recognize what each student can do in the subject at the end of the 2-year secondary school level education. The performance of each student will be matched against a set of performance standards, rather than comparing to the performance of other students. It makes the implicit standards explicit by providing specific indication of individual student performance. Descriptions will be provided for the set of standards.

Guidelines for Writing a Textbook

A textbook is an important teaching and learning resource and one of the most extensively used resources in classrooms. To reflect national needs and aspirations the needs and aspirations, the textbooks should be written in accordance with this curriculum. This curriculum meets not only the general aims and objectives but also fulfills the specific requirements of the individual subject. As the textbook serves as a framework for teaching, the author/authors should consider the following features:

- A textbook must include an introduction to the textbook, explaining how to use the textbook
- The textbook must be in line with the National Curriculum, covering all SLOs of each theme or concept.
- Content and illustrations must be culturally, contextually and age appropriate.
- All text and material must be accurate, up-to-date and error-free.
- The continuity of the concepts, their integration and logical development should be ensured.
- Horizontal and vertical overlapping of the concepts should be avoided.
- The textbook should be informative and interactive with questions to be put at suitable intervals to provoke the students to think.
- The language used should be simple, clear, straight forward, unambiguous, and easily comprehensible by the students of the level.

- Simple questions may be asked within the chapter, which requires students to recall, think, and apply what they have just learnt as well as to reinforce the learning of the concepts and principle.
- The examples and applications should be from everyday life and be supportive of our cultural values.
- Photographs and illustrations should be clear, labeled, and supportive of the text. Tables, flow charts and graph may be given wherever needed.
- Key points at the end of each chapter should provide a summary of the important concepts and principles discussed in the chapter.
- End-of-the-Chapter exercises must include a variety of assessment styles based on levels of Bloom's Taxonomy. These should encourage students to think, develop skills, and use information for a variety of purposes.
- Textbooks should be free from all kinds of biases including, gender, religion, occupation, social background etc.
- To make the students self-learner use of IT based resources may be encouraged. Relevant internet links and other online resources may be included.
- Glossary of the new vocabulary must be included.

Guideline for planning and writing a chapter

The textbook author may decide the titles of each chapter and can choose to cover students' learning outcomes (SLOs) from any themes in developing the content of the chapter. The textbook author must also keep in mind that a number of SLOs cannot be addressed in the text (as if this is done it would lead students to simply memorize the text and not serve the realization of the curriculum). These SLOs could be realized through questions and practical activities within and at the end of the chapter exercises.

- Learning outcomes must be given at beginning of each chapter.
- Decide on key ideas, facts, concepts, skills, and values that can be developed.
- Illustrations must clearly convey the desired concept.
- Activities must demand from students to do inquiry and problem solving according to grade level.
- Ensure that the content is up to date, accurate and developmentally appropriate.
- Contents must be in line with chapter outcomes.
- Language must be consistent, culturally appropriate, and grammatically correct (as if talking to a group).
- Language must engage and hold reader's attention.
- Recall previous learning, where possible.
- Structure the writing so that the sentence is simple, paragraphs deal with single ideas etc.
- Interesting information in the form of tidbits, fact file, point to ponder etc. must be given.
- Write a summary/concept map at end of each chapter, reviewing key knowledge and skills.
- End-of-chapter exercises
- Recall and integrate previous learning
- Engage students and develop their creativity
- Move from lower to higher order thinking

- Focus on multiple intelligences
- Keep the text contextually relevant in line with local teaching and learning.
- Provide website links for further research

Guidelines for Writing Learner Workbook

Workbooks are books that contain writing activities and exercises that build upon each chapter in the textbook. Workbook exercises help students to develop conceptual understanding of the concepts dealt with in the text, to develop skills and to apply knowledge to new situations. Basic features of a workbook A workbook should have:

- Various exercises and activities for each chapter, topic, subtopic.
- Exercises and activities that will enable student to develop and practice the content knowledge, skills and higher order thinking.
- Accurate and variety of exercises.
- Clear illustrations/ examples/ explanations to show what students are supposed to do, and/or what product looks like.
- Exercises and activities with a variety of purposeful, stimulating, challenging and innovative items to encourage students to review and practice the knowledge and skills they have learnt.
- Exercises that include both constructed and restricted response items.
- Activities, which requires readily available, acceptable, and affordable materials and resources.

Basic Requirements for Lab (Tools/Equipment)

Trade: - HVACR (40 Trainee)

1. Adjustable screw wrench,
2. Air Conditioner and its parts,
3. AVO meter, Tool kit
4. Battery,
5. Box spanner screw drivers,
6. Capacitor,
7. Clamp on meter, Tool Kit
8. Compressor,
9. Condenser,
10. Copper Tubes,
11. Deep Freezer and its parts,
12. Digital Air Flow / Velocity meter
13. Digital Capacitor analyzer,
14. Digital Clamp-on Ampere Meter,
15. Digital Optical Taco meter,
16. Digital pressure gauges set,
17. Electric Screw driver set,
18. Electronic leak detector,
19. Evaporator,
20. Flaring and swaging tool kit,
21. General toolkit
22. Hammer,

23. Laser temperature measuring device,
24. Leak testing equipment,
25. Locking, pliers
26. Manifold,
27. Multimeter
28. Pressure Gauges,
29. Ratchet wrench Open ended spanner set,
30. Reamer,
31. Recovery cylinder,
32. Recovery unit,
33. Refrigerant control Valves
34. Refrigerants Chart
35. Refrigerants,
36. Refrigeration system,
37. Refrigerator and its parts,
38. Resistor,
39. Spirit level,
40. Swaging Tool,
41. Thermometer,
42. Tube Bender,
43. Tube Cutter,
44. Tube Vice
45. Water Cooler and its parts

Consumable or Training Materials

| S.No | Specification | Quantity |
|-------------|--|-----------------|
| 1 | Filling of oxygen Gas cylinder | 3 Cylinder |
| 2 | Filling of fan Gas cylinder | 28 kg |
| 3 | Silver soldering Rod (chandi Rod) | 02 kg |
| 4 | Brass Rod (Petal Rod) | 02 kg |
| 5 | Copper Tube dia 1"/4 (50 feet / Coil) | 04 koil |
| 6 | Copper Tube dia 5"/16 (50 feet / Coil) | 04 koil |
| 7 | Capillary Tube dia 0.031" | 02 koil |
| 8 | Gastric Sheet (4'x6') | 02 sheet |
| 9 | Seal Threading Tap | 10 nos |
| 10 | Majic defoxi (small size) | 10 nos |
| 11 | wooden Board (10"x12" single) | 06 doz |
| 12 | single way switch (5A open) | 10 doz |
| 13 | Two Way Switch (5A Open) | 08 doz |
| 14 | Batten Holder Baculite | 12 doz |
| 15 | Two Pin socket (5A open) | 08 doz |
| 16 | Cut out fuse (10 A Porcelain) | 08 doz |
| 17 | Electric LAMP (Bulb 100 w) | 06 doz |

| | | |
|----|---|---------------|
| 18 | Electric Lam (Bulb 200w) | 02 doz |
| 19 | Electric Call bell (Bizzes 220v/5W) | 06 doz |
| 20 | Push button (5A open) | 06 doz |
| 21 | Fuse wire (5A) | 06 reel |
| 22 | P.V.C WIRE (3/.029") | 04 coil |
| 23 | P.V.C WIRE (1/.044") | 04 coil |
| 24 | Insulation Tap (Nitto) 3"/4 | 30 nos |
| 25 | Wooden Screw 1"/2, 3"/4 | 10 pkt / each |
| 26 | Hand Hack Saw Blade (Double Edge) | 10 doz |
| 27 | M.S Flat (64mmx8mm) | 100 kg |
| 28 | Mobil Oil | 10 Litr |
| 29 | Cotton Waist Cleaning Cloth | 50 kg |
| 30 | Detergent Soap | 02 doz |
| 31 | Thermostat switch cooler water | 12 nos |
| 32 | Thermostat for Refrigerator | 12 nos |
| 33 | Thermostat for A.C | 12 nos |
| 34 | Amperage type relay Cap type 1/4, 1/3, 1/5, 1/6, 1/8 (6 No each)220v | 30 nos |
| 35 | Overload 1/8, 1/6, 1/5, 1/4, 1/3 (220v) | 30 nos |
| 36 | Electronic Relay (Denfas) | 12 |
| 37 | Electronic Relay two point | 12 |
| 38 | Current Relay for 110v Refrig | 12 |
| 39 | Over load for 110v = (1/4, 1/3) Refrig | 12 |
| 40 | starting capacitor 80/110 uf | 12 |
| 41 | Starting capacitor 138/182 uf | 12 |
| 42 | Running capacitor 50 uf | 12 |
| 43 | Running capacitor 60 uf | 12 |
| 44 | Timer for Refrigerator 220v | 12 |
| 45 | Bi metal fuse 12 no 220v Elect | 24 |
| 46 | Timer for 110v Refrigerator | 6 |
| 47 | Fan capacitor 2, 2.5, 3, 3.5 μ F | 25 |
| 48 | copper tub 1"/2 | 3 coils (50') |
| 49 | Protentional Relay | 12 |
| 50 | Split Control circuit with display | 12 |
| 51 | Sensor for Split A.C | 60 |
| 52 | F-134a Gas cylinder | 2 cylinders |
| 53 | F-22 Gas | 2 Cylinder |
| 54 | G-I pipe 1"/2 dia | 4 length |
| 55 | G-I pipe 3"/4 dia | 4 length |
| 56 | G-I union 1"/2 | 12 |

| | | |
|----|---|---------|
| 57 | G-I Tee | 12 |
| 58 | G-I Socket | 12 |
| 59 | P.V.C wire 7/044 | 2 coils |
| 60 | Three pin shoe 20 A | 12 |
| 61 | Power Plug 2, A | 2 dozen |
| 62 | Circuit Breaker 20 A | 2 dozen |
| 63 | Three Pin Shoe 5A | 2 dozen |
| 64 | Two Pin Shoe 5A | 2 dozen |
| 65 | Flair nuts 1/4" | 3 nos |
| 66 | Union 1/4" | 3 nos |
| 67 | Flair nuts 5"/16 | 3 nos |
| 68 | union 5/6" | 3 nos |
| 69 | Flour mint 1"/2 | 3 nos |
| 70 | union 1/2" | 3 nos |
| 71 | compressor out 1349 | 4 lit |
| 72 | Kit kat fuse 20 A | 2 dozen |
| 73 | Liquid service valve 1/4" Split A.C | 2 dozen |
| 74 | Suction service valve for | 2 dozen |
| 75 | Filter dryer | 3 dozen |
| 76 | Nut and Bolt (M10) | 2 pkt |
| 77 | Nut and Bolt (M12) | 3 pkt |
| 78 | Nut and Bolt (M14) | 3 pkt |
| 79 | Flexible cable (copper) wire 110-76 | 1 coil |
| 80 | Arab flax insulation 1"/4,1/2",3/8" | 3 dozen |
| 81 | Arab flax insulation 5/8", 3"/4 for tub | 3 dozen |