RRB ALP Stage-II

Electrician

Electronic Mechanics
Electronics Instrumentation Mechanics

PART- A & B

Solved Papers

Index

RRB ALP Stage-II

ALP/Technician Online Exam Syllabus

Second Stage (CBT)

Total Duration : 2 hours and 30 minutes (for Part A and Part B together)
The Second Stage CBT shall have two parts viz Part A and Part B as detailed below.

PART A

Duration: 90 Min.   **No. of Questions: 100**

Minimum percentage of marks for eligibuility in various categories: UR-40%, OBC-30%, SC-30%, ST-25%. These percentages of marks for eligibility may be relaxed by 2% for PWD candidates in case of shortage of PWD candidates against vacancies reserved for them.

The marks scored in Part A alone shall be used for short listing of candidates for further stages of recruitment process subject to the condition that the candidate is securing qualifying mark in Part B.

(A) Mathematics

Number system, BODMAS, Decimals, Fractions, LCM, HCF, Ratio and Proportion, Percentages, Mensuration, Time and Work; Time and Distance, Simple and Compound Interest, Profit and Loss, Algebra, Geometry and Trigonometry, Elementary Statistics, Square Root, Age Calculations, Calendar & Clock, Pipes & Cistern etc.

(B) General Intelligence and Reasoning

Analogies, Alphabetical and Number Series, Coding and Decoding, Mathematical operations, Relationships, Syllogism, Jumbling, Venn Diagram, Data Interpretation and Sufficiency, Conclusions and Decision Making, Similarities and Differences, Analytical reasoning, Classification, Directions, Statement– Arguments and Assumptions etc.

(C) Basic Science and Engineering

The board topics that are covered under this shall be Engineering Drawing (Projections, Views, Drawing Instruments, Lines, Geometric figures, Symbolic Representation), Units, Measurements, Mass Weight and Density, Work Power and Energy, Speed and Velocity, Heat and Temperature, Basic Electricity, Levers and Simple Machines, Occupational Safety and Health, Environment Education, IT Literacy etc.

General awareness on current affairs in Science & Technology, Sports, Culture, Personalities, Economics, Politics and other subjects of importance.

PART B

Duration: 60 Min.   **No. of Questions: 75**
Qualifying Marks: 35%

Sl. No.	Engineering Discipline (Diploma/Degree)	Relevant trade for PART B Qualifying Test to be selected from
1.	Electrical Engineering and combination of various streams of Electrical Engineering	Electrician/Instrument Mechanic/Wiremen/Winder (Armature)/Refrigeration and Air Conditioning Mechanic
2.	Electronics Engineering and combination of various streams of Electronics Engineering	Electronics Mechanic/Mechanic Radio &TV

Electronic Mechanic/ Radio & Television :

Semester-I :

Importane of safety and general precautions. Trade and Orientation, Hand Tools and their uses, Basics of AC and Electrical Cables, Cells & Batteries, Passive Components, Transformers, AC & DC measurements, Soldering & De-soldering and switches, Rectifiers, IC Regulartors, Computer Hardware, OS, MS office Networking, Computer Networking.

Semester-II :

Transistor, Amplifier, Wave shaping circuits, Power Electronic Components, Mosfet & IGBT, Opto Electronics, Basic SMD (2,3,4 terminal components), Basic Gates, Combinational Circuits, Flip Flops, Electronic circuit simulation software, Counter & shift Registers, Op-Amp & Timer 555 Applications.

Semester-III :

Digital Storage Oscilloscope, SMD Soldering and De-soldering, PCB Rework, Protection devices, Electrical control circuits, Electronic Cables & Connectors, Communication electronics, Microproccessor & Microcontroller, Sensors, Transducers and Applications, Analog IC Applications, Digital IC Applications.

Semester-IV :

Fiber optic communication, Digital panel Meter, SMPS, UPS, Solar Power (Renewable Energy System), Cell phones, LED Lights, LCD and LED TV.

Syllabus of Semester System For The Trade of
ELECTRICIAN
UNDER CRAFTSMAN TRAINING SCHEME (CTS)
By Government of India Ministry of Labour & Employment (DGE&T)

First Semester –

■ **Occupational Safety & Health**– Basic safety introduction, Personal protection:- Basic injury prevention, Basic first aid, Hazard identification and avoidance, safety signs for Danger, Warning, caution & personal safety message. Use of Fire extinguishers. Visit & observation of sections. Various safety measures involved in the Industry. Elementary first Aid. Concept of Standard. ■ **Soft Skills**– its importance and Job area after completion of training.Introduction of First aid. Operation of electrical mains. Introduction of PPEs. Introduction to 5S concept & its application. Response to emergencies eg; power failure, fire, and system failure. Identification of Trade-Hand tools-Specifications. Fundamental of electricity. Electron theory- free electron, Fundamental terms, definitions, units & effects of electric current. Solders, flux and soldering technique. Resistors types of resistors & properties of resistors. Introduction of National Electrical Code 2011 Explanation, Definition and properties of conductors, insulators and semi-conductors. Voltage grading of different types of Insulators, Temp. Rise permissible Types of wires & cables standard wire gauge Specification of wires & Cables-insulation & voltage grades -Low , medium & high voltage Precautions in using various types of cables / Ferrules ■ **Ohm's Law -** Simple electrical circuits and problems. Reading of simple Electrical Layout. ■ **Resistors -**Law of Resistance. Series and parallel circuits. ■ **Kirchoff's** Laws and applications. Wheatstone bridge principle And its applications. Effect of variation of temperature on resistance. Different methods of measuring the values of resistance. Common Electrical Accessories, their specifications in line with NEC 2011-Explanation of switches lamp holders, plugs and sockets. Developments of domestic circuits, Alarm & switches, with individual switches, Two way switch .Security surveillance, Fire alarm, MCB, ELCB, MCCB. ■ **Chemical effect of electric current-**Principle of electrolysis. Faraday's Law of electrolysis. Basic principles of Electro-plating and Electro chemical equivalents. Explanation of Anodes and cathodes. Lead acid cell-description, methods of charging-Precautions to be taken & testing equipment, Ni-cadmium & Lithium cell, Cathodic protection. Electroplating, Anodising. Different types of lead acid cells. Rechargeable dry cell, description advantages and disadvantages. Care and maintenance of cells Grouping of cells of specified voltage & current, Sealed Maintenance free Batteries, Solar battery. Inverter, Battery Charger, UPS-Principle of working. Lead Acid cell, general defects & remedies. Nickel Alkali Cell-description charging. Power & capacity of cells. Efficiency of cells. ■ **ALLIED TRADES**– Introduction of fitting trade. Safety precautions to be observed Description of files, hammers, chisels hacksaw frames & blades-their specification & grades. Care & maintenance of steel rule try square and files. Marking tools description & use. Description of carpenter's common hand tools such as saws planes, chisels mallet claw hammer, marking, dividing & holding tools-their care and maintenance. ■ **Types of drills description & drilling machines**– proper use, care and maintenance. Description of taps & dies, types in rivets & riveted joints. Use of thread gauge. Description of marking & cutting tools such as snubs shears punches & other tools like hammers, mallets etc. used by sheet metal workers. Types of soldering irons-their proper uses. Use of different bench tools used by sheet metal worker. Soldering materials, fluxes and process. ■ **Magnetism -** Classification of magnets, methods of magnetising, magnetic materials. Properties, care and maintenance. Para and Diamagnetism and Ferro magnetic materials. Principle of electro-magnetism, Maxwell's corkscrew rule, Fleming's left and right hand rules, Magnetic field of current carrying conductors, loop and solenoid. MMF, Flux density, reluctance. B.H. curve, Hysteresis, Eddy current. Principle of electro-magnetic Induction, Faraday's Law, Lenz's Law. Electrostatics: Capacitor- Different types, functions and uses. ■ **Alternating Current -**Comparison and Advantages D.C and A.C. Related terms frequency Instantaneous value, R.M.S. value Average value, Peak factor, form factor. Generation of sine wave, phase and phase difference. Inductive and Capacitive reactance Impedance (Z), power factor (p.f). Active and Reactive power, Simple problems on A.C. circuits, single Phase and three-phase system etc. Problems on A.C. circuits. Power consumption in series and parallel, P.F. etc. Concept three-phase Star and Delta connection. Line and phase voltage, current and power in a

3 phase circuits with balanced and unbalanced load. ■ **Earthing**- Principle of different methods of earthing. i.e. Pipe, Plate, etc Importance of Earthing. Improving of earth resistance Earth Leakage circuit breaker (ELCB). In absence of latest revision in respective BIS provision for Earthing it is recommended to follow IEC guidelines. ■**Basic electronics**- Semiconductor energy level, atomic structure 'P' type and 'N' type. Type of materials –P-N-junction. Classification of Diodes – Reverse and Forward Bias, Heat sink. Specification of Diode PIV rating. Explanation and importance of D.C. rectifier circuit. Half wave, Full wave and Bridge circuit. Filter circuits-passive filter.

Second Semester–

■ **Working principle and uses of an oscilloscope**–Explanation of principle of working of a transistor & configuration. Types of transistors & its application. Specification and rating of transistors. Explanation of transistor Amplifiers, Amplifiers. – class A,B and C Power amplifier ■ **Explanation of oscillator**–working principle Explanation of stages and types. Multivibrator – applications. Introduction of basic concept of ICs, U.J.T., F.E.T. Basic concept of power electronics devices e.g. S.C.R., Diac, Triac, power MOSFET, G.T.O and I.G.B.T. ■ **Digital Electronics** -Binary numbers, logic gates and combinational circuits, ■ **Electric wirings**– I.E. rules. Types of wirings both domestic and industrial. Specifications for wiring. Grading of cables and current ratings. Principle of laying out in domestic wiring. Voltage drop concept. ■ **Wiring system**– P.V.C., concealed system. Maintenance and Repairing data sheet preparation. Specifications, standards for conduits and accessories - Power Wiring - Control Wiring - Information Communication - Entertainment Wiring. Testing of wiring installation by meggar. Study of Fuses, Relays, Miniature circuit breakers (MCB), ELCB, etc. ■ **D.C. Machines**– General concept of Electrical Machines. ■ **Principle of D.C. generator**– Use of Armature, Field Coil, Polarity, Yoke, Cooling Fan, Commutator, slip ring Brushes, Laminated core. Explanation of **D.C. Generators**-types, parts. **E.M.F.** equation-self excitation and separately excited Generators-Practical uses. Brief description of series, shunt and compound generators. Explanation of Armature reaction, inter poles and their uses, connection of inter poles, Commutation. Losses & Efficiency of D.C.Generator, Parallel Operation of D.C.Generator. Application of D.C. generators. Care, Routine & preventive maintenance. ■ **DC Motors**– Termsused in D.C. motor-Torque, Brake Torque, speed, Back-e.m.f. etc. and their relations, Types of D.C.Motor. Starters used in D.C. motors Related problems Characteristics of D.C.Motor, Losses & Efficiency, Application of D.C. motors. Care, Routine & preventive maintenance. Types of speed control of DC motors in industry. Control system. AC-DC, DC-DC control. ■ **Working principle of Transformer**– classification C.T., P.T. Instrument and Auto Transformer(Variac), Construction, Single phase and Poly phase. E.M.F. equation, parallel operation of transformer, their connections. Regulation and efficiency. Type of Cooling for transformer. Protective devices. Specifications, simple problems on e.m.f. Equation, turn ratio, regulations and efficiency. Special transformers. Transformer –Classification of transformer. Components, Auxiliary parts i.e. breather, Conservator, buchholze relay, other protective devices. Transformer oil testing and Tap changer (off load and on load). Dry type transformer. Bushings and termination. ■ **Electrical Measuring Instruments**– -types, indicating types. Deflecting torque, Controlling torque and Damping torque , PMMC & MI meter (Ammeter, Voltmeter) -Range extension -Multimeter(Digital/Analog) -Wattmeter - P.F. meter - Energy meter (Digital/analog) – Insulation Tester (Megger), Earth tester. -Frequency meter -Phase Sequence meter -Multimeter –Analog and Digital -Tong tester -Techometer.

Third Semester–

■ **Three phase Induction motor** –Working principle –Production of rotating magnetic field, Squirrel Cage Induction motor, Slip-ring induction motor. Construction , characteristics and Speed control, Slip & Torque . Control & Power circuit of starters D.O.L Starter, Star /Delta starter, Autotransformer starter, Rotor resistance starter, etc Single phasing preventer. Losses & efficiency. Application of Induction Motor Care, Routine & preventive maintenance. ■ **Single phase induction motor-** Working principle, different method of starting and running (capacitor start, permanent capacitor, capacitor start & run, shaded pole technique). FHP motors, Repulsion motor, stepper motor, Hysteresis motor, Reluctance motor. Application of Single phase induction motor ■ **Universal motor**-advantages, Principle, characteristics, applications in domestic and industrial appliances, Fault Location and Rectification. Braking system of motor. Application of Universal motor. ■ **Alternator**–Explanation of alternator, types of prime mover, efficiency, regulations, phase sequence, Parallel operation. Specification of

alternators and Brushless alternator. Verify the effect of changing the field excitation and Power factor correction of Industrial load. ■ **SYNCHRONOUS MOTOR**– Working principle, effect of change of excitation and load. V and anti V curve. Cause of low power factor. Method of power factor improvement. Rotary Converter- Inverter, M.G. Set description, Characteristics, specifications- running and Maintenance. Solid state controller and Invertors. ■ **TRANSFORMER Winding**– Small Transformer winding techniques ■ **DC machine Winding--** Armature winding terms, pole pitch, coil pitch, back pitch, front pitch , Lap and Wave winding , Progressive and retrogressive Winding, developed diagram. Growler construction, working & application. ■ **ACmachine Winding—**Motor winding terminology – classification of conducting and insulating materials used in winding – Types and methods of winding in single and three phase motors. Stator winding terms, coil side, end coil and grouping of coils. Connection to adjacent poles, connected stator winding, alternate pole connection, developed diagram. ■ **Illumination**– Laws of Illuminations, terminology used , Illumination factors, intensity of light –importance of light, human eye factor, , units. Types of illumination Type of lamps -Neon sign Halogen, Mercury vapour, sodium vapour, Fluorescent tube, CFL, LED, Solar lamp & photo cell applications, Decoration lighting, Drum Switches, efficiency in lumens per watt, Calculations of lumens. Estimating placement of lights, fans and ratings. ■ **Industrial wiring**– Code of practice and relevant span. Wiring of electric motors, control panel, etc. Types, specifications, advantages of different types of circuit brackets construction and maintenance. Working principle and construction of domestic and agricultural appliances-their maintenance. ■ **Complete House**– wiring layout. Splitting load wire in accordance with NEC I.E.E. Rules. Multi-storeyed system. Fault finding and trouble shooting.

Fourth Semester–

■ **Machine control cabinet /Control Panel Layout, Assembly & Wiring**:– Layout of Control cabinet & control panel Study & Understand Layout drawing of control cabinet , panel, power & control circuits. ■ **Control Elements:**– Isolator, pushbutton switches, Indicating lamps, MCB, Fuse, Contactor, Relays, Overload Relay, Timers, Rectifier, Limit switches, control transformers. Wiring Accessories: Race ways/ cable channel, DIN Rail, Terminal Connectors, Thimbles, Lugs, Ferrules, cable binding strap & buttons, nylon cable ties, sleeves, Gromats& clips ■ **Domestic Appliances:**– Working principles and circuits of common domestic equipment and appliances. – Calling Bell, Buzzer, Alarms, Electric Iron, Heater, Light. Electric Kettle, Heater / Immersion Heater, Hot Plate, Oven, Geyser, Cooking range, Mixer, Washing machine, , Motor Pump set, etc. Concept of Neutral and Earth. ■ **POWER GENERATION :**– Generation sources of energy, Comparison of energy resources. Types of fuels. Advantages of liquid fuel & solid fuel. Various ways of electrical power generation. • Thermal • Hydro electric • Nuclear • Non-Conventional Thermal Coal based, diesel based & Gas based Turbine. Constituents in steam power station. ■ **Hydro Electric:**– Schematic arrangement of Hydro-Electric Power Station. Constituents of Hydro Electric Plant. Types of Hydro Electric Power station. Advantages &disadvantages. ■ **Nuclear:**– Schematic arrangement of Nuclear Power Station. Composition of an atomic Nucleus. Advantages & disadvantages. Comparison of above Power Plant. ■ **Non-Conventional**– An introduction to Power generation through non-conventional power generation such as Solar, Bio-Gas, Wind energy and Micro-hydel, Tidal waves, etc. Basic principal, Advantages & disadvantages of each. ■ **TRANSMISSION OF ELECTRICAL POWER**– Electrical Supply System : Comparison of AC and DC transmission. Advantages of High transmission voltage. Introduction to Single phase , three phase-3 wire system in transmission lines Overhead Lines: Main components of overhead lines-Types of power line Low voltage line medium Voltage line & high voltage line Voltage standard Conductor materials, line supports, Insulators, types of Insulators ■ **Under Ground Cable:**– Construction of cables. Material for cables, its insulation. Classification of cables, cables for 3-phase service, Laying of underground cable. Types of cable faults and their location. ■ **DISTRIBUTION OF POWER**– Function and equipment used in substation. Classification of distribution system-AC distribution, Overhead v/s underground distribution system. Essential features of switchgears. Isolator, Switch gear equipments, bus-bar arrangement, Short circuit, faults in power system. ■ **Circuit breakers**– Introduction & Classification of circuit breakers lightening arrestors used in HT lines. Introduction, Construction & Working of power transistor, thyristor. Introduction, Construction, Working, Parameters & application of DC drive. Speed control of 3 phase induction motor by using VVVF/AC Drive. Introduction, Construction, Working, Parameters & application of AC drive Schedule of electrical preventive maintenance. Break down, Routine & Preventive maintenance of DC/AC machines, Voltage stabilizer, U.P.S. &Equipments.

RRB Assistant Loco Pilot
Technician (Electrician)
Solved Paper

Exam Date: 23.01.2019]　　　　　　　　　　　　　　　　　　**[Timing: 08:30 to11:00 AM**

PART-A: NON –TECHNICAL

1. Who was the chairman of the Constitution Drafting Committee?
　(a) Dr. Rajendra Prasad　(b) Jawaharlal Nehru
　(c) Dr. B.R. Ambedkar　(d) Sardar Patel

Ans. (c): The Drafting committee was set up on 29th August 1947 under the chairmanship of Dr. B.R. Ambedkar.

The drafting committee had seven members
1. Alladi Krishnaswami Ayyar
2. N. Gopalaswami
3. B.R. Ambedkar
4. K.M. Munshi
5. Mohammad Saadulla
6. B.L. Mitter (Resigned due to health issue and replaced by T.T. Krishnamichari.)
7. D.P. Khaitan (D.P. Khaitan died in 1948 and was replaced by N. Madhav Rao.)

The constitution of India was adopted on 26th November 1949. At its 1st meeting on 30th August 1947, the drafting committee elected B.R. Ambedkar as its chairman.

Chairman of some major committees were-

(i) Rajendra Prasad- Adhoc Committee on National Flag, Committee on Rules of Procedure (iii) Finance and Staff Committee (iv) Steering Committee.

(ii) Pt. Jawaharlal Nehru– Union Constitution Committee, Union Powers Committee, States Committee.

(iii) Sardar Vallabhbhai Patel– Provincial constitution committee, Advisory Committee on Fundamental rights, Committee on Minorities and Tribal and Excluded Areas.

2. The Living Planet Report, released every two years, is the flagship publication of which organisation?
　(a) The Nature Conservancy
　(b) Wildlife Conservation Society
　(c) World Wide Fund for Nature
　(d) Conservational International

Ans. (c) : The living planet, is a biennial report released by World Wide Fund for Nature. This report is a comprehensive study of trends in global biodiversity and the health of the planet.

This Report revealed an average decline of 69% in species population since 1970. The World Wide Fund for Nature is an International NGO, founded in 1961 that works in the field of preservation of wildlife & reducing the harmful impacts of human activities on enviorment. Its headquarters lies in Gland, Switzerland.

3. The National Skills Development Corporation (NSDC) is a public-private partnership formed under India's_____.
　(a) Ministry of Finance
　(b) Ministry of Electronics & Information Technology
　(c) Ministry of Science and Technology
　(d) Ministry of Corporate Affairs

Ans. (a) : National Skill Development Corporation (NSDC) was set up by Ministry of Finance as public private partnership(PPP) model in the year 2008. It is a not for profit public limited company. NSDC aims to promote skill development by catalyzing creation of large, quality and for- profit vocational institutions. It acts as a catalyst in skill development by providing funds to enterprises, companies and organisations providing skill training.

4. Which of the following recipients of the Dadasaheb Phalke Award received it posthumously?
　(a) Naushad　　　　　(b) Durga Khote
　(c) Vinod Khanna　　　(d) Satyajit Ray

Ans. (c) : Dadasaheb phalke award is awarded for "outstanding contribution to the growth and development of Indian Cinema".

Dadasaheb phalke award was introduced in the year 1969 & Devika Rani was the 1st recepient. Prithviraj Kapoor (1971) and actor Vinod Khanna (2017) are the only awardees who received this award posthumously. This award comprises a cash prize of Rs. 1,000,000. Dadasaheb Phalke is regarded as the "father of Indian Cinema". For the year 2020 and 2019, Asha Parekh and Rajnikant were awarded with this prestigious award respectively.

5. Who invented the blue jeans?
　(a) Todd Oldham　　　(b) Calvin Klein
　(c) Levi Strauss　　　(d) Gianni Versace

Ans. (c) Jeans are pants made from denim or dungaree clothes. "Jeans" is a short for "blue jeans" which was invented by Jacob Devis and Levi Strauss in 1873.

6. The author of 'The Monk Who sold His Ferrari' is_____.
    (a) Manohar Malgonkar (b) Arundhati Roy
    (c) Arvind Adiga   (d) Robin Sharma

Ans. (d):

Author	Book
Robin Sharma	The Monk who sold his Ferrari
Manohar Malgonkar	A bend in the Ganges, The Devil's wind
Arunbhati roy	The God of small things
Arvind Adiga	White Tiger, Amnesty

7. Which team won the Indian Premier League (IPL) in 2018?
    (a) Royal Challengers Bangalore
    (b) Kolkata Knight Riders
    (c) Chennai Super Kings
    (d) Hyderabad Sunrisers

Ans. (c): IPL 2018 was won by Chennai Super Kings defeating Sunrisers Hyderabad in the finals. Shane Watson was the player of the Match. IPL 2022 was won by Gujarat Titans defeating Rajasthan Royals in the finals.

8. The Umaid Bhawan Palace is in which city?
    (a) Udaipur   (b) Jaipur
    (c) Bikaner   (d) Jodhpur

Ans. (d): Umaid Bhawan palace is located in Jodhpur Rajasthan. The groundbreaking for the foundation of the building was carried out on 18 November 1929 by Maharaja Umaid Singh and construction completed in 1943. It is one of the world's largest private residences.
A part of palace is managed by Taj Hotels.

9. Classical musician Shivkumar Sharma is associated with which musical instrument?
    (a) Tabla   (b) Shehnai
    (c) Violin   (d) Santoor

Ans. (d): Shivkumar Sharma is associated with Santoor. Famous Santoor Players are- 1. Rahul Sharma 2. Bhajan Sopori 3. Shiv Kumar Sharma 4. Abhoy sopori etc.
Famous Sehnai players are- 1. Pandit Ram Sahay 2. Anant Lal 3. Bismillah Khan etc.
Hariprashad Chaurasia - Flute
Ustad Zakir Hussain - Tabla

10. Which of the following folk dances is from Assam?
    (a) Nati   (b) Bagurumba
    (c) Giddha   (d) Lezim

Ans. (b): The Bagurumba is a traditional dance of the indigenous Boro people living in the state of Assam and North East India.
Nati- is an Indian folk dance of the states of Himachal Pradesh and Uttarakhand.
Lezim- is a folk dance of Maharashtra
Giddha- is a folk dance form of the State of Punjab.

11. Find the power (in W) of a pump if it can lift 1 tonne of water by 90m in 30 minutes. (Assume 100% efficiency and use g = 10 m/s^2)
    (a) 50   (b) 250
    (c) 25   (d) 500

Ans. (d): Given,
    M = 1 tonne = 1000 kg
    d = 90 m
    t = 30 minutes = 30×60 sec = 1800 sec
    f = m × g = 1000×10 = 10000N

$$P = \frac{\text{work done}}{\text{time}} = \frac{f \times d}{t} = \frac{10000 \times 90}{1800}$$

    P = 500 joule/sec = 500 watt.

12. 210 mm × 297 mm are the dimensions of____size paper.
    (a) A3   (b) A2
    (c) A1   (d) A4

Ans. (d): 210 mm × 297 mm are the dimension of A4 size paper.

13. Find the specific latent heat of vaporisation of 1.25 g of nitrogen (in Jg^{-1}), if it release 250 joules of heat when it condenses at its boiling point of 196°C.
    (a) 312.5   (b) 500
    (c) 400   (d) 200

Ans. (d): From Q = ml
Where Q = Heat release
m = mass
l = latent heat
Speciffic latent heat of vaparisation

$$l = \frac{Q}{m} = \frac{250}{1.25}$$
$$= 200 Jg^{-1}$$

14. Which of the following is the correct relation between resistance 'R', conductivity 'σ', length 'L' and area of cross section 'A' of a metal wire?
    (a) Rσ A = L   (b) RA = Lσ
    (c) σ = RL/A   (d) RL = Aσ

Ans. (b): We know that, when current flow in wire then resistance is directly proportional to the length of wire and inversely proportional to area cross section of wire.

$$R \propto L \text{ and } R \propto \frac{1}{A}$$

$$R \propto \frac{L}{A} \Rightarrow R = \rho \frac{L}{A}$$

$$RA = \rho L$$

Where ρ Specific Resistivity of wire.

15. An arrowhead at the end of a dimension line is approximately_____long and 1 mm wide.

(a) 1.5 mm   (b) 1 mm

(c) 3 mm   (d) 5 mm

Ans. (c): An arrowhead is placed at each end of a dimesion line. It painted end touches on autline and extension line or center line. The length of the arrowhead is approximately 3 times the width.

16. Find mass of an iron cube of side 2 cm. (Density of iron is 7.8 gm/cm^3)

(a) 0.975 gm   (b) 62.4 gm

(c) 3.9 gm   (d) 15.6 gm

Ans. (b): Given- Density of iron = 7.8 gm/cm^3

One side of iron cube = 2 cm

$$d = \frac{m}{V}$$

Where

d = Density

m = Mass and

v = volume

$m = d \times v = 7.8 gm \times 2^3$

$= 7.8 \times 8 = 62.4$ gm

17. Find the work done (in kJ) if a force of 750 N pushes a cart of mass 30 kg by 16m.

(a) 24   (b) 12

(c) 48   (d) 36

Ans. (b): Given that:- Force F = 750 N

Mass = 30 kg

d = 16 m

Work done = Force × displacement

$= 750 \times 16 = 12000$ J

$$= \frac{12000}{1000} = 12 \text{ kJ}$$

18. In a certain gear train, the driver gear has 18 teeth while the follower gear has 8 teeth. For every 16 turns of the driver, the follower turn_____times.

(a) 36   (b) 8

(c) 18   (d) 9

Ans. (a): Let the follower gear turns = x times

According to the question,

$x \times 8 = 16 \times 18$

$$x = \frac{16 \times 18}{8} = 36$$

The follower gear turns = 36 times

19. Which hazardous substance can cause lung cancer?

(a) Benzene vapours   (b) Asbestos particles

(c) Arsenic   (d) Herbicides

Ans. (b): Asbestos is made up of microscopic fibrils that can easily becomes airborne when inhaled.

Asbestos exposure may increase the risk of asbestosis (an inflammatory condition affecting the lungs, causing shortness of breath, coughing and permanent lung damage) and other pleural damages or disorders.

20. A/An_____is software used to maintain the security of a private network.

(a) clickbait   (b) encryption

(c) firewall   (d) malware

Ans. (c): Firewall prevents unauthorized internet users from accessing private networks connected to the internet.

It is considered as the 1st line of defence

Clickbait- is a text or a thumbnail link designed to attract attention and to entice users to follow that link and read, view, or listen to the linked piece of online content, which is either deceptive, or misleading.

Encryption- is the process of encoding information. In Encryption information is converted into secret code, that hides the information's true meaning.

Malware- is a malicious software, which is designed to damage and destroy computers and computer system.

21. Acceleration due to gravity on moon is 1/6th that on earth. How much would an astronaut weigh on moon if he weights 90 kgf on earth? (acceleration due to gravity on earth = 10 m/s^2)

(a) 90 N   (b) 15 N

(c) 150 N   (d) 9 N

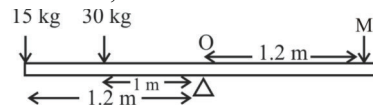**Ans. (c):** Based on Newton's second law of motion given:-

$F = m \times a$

$$= 90 \times \frac{1}{6} \times 10$$

$= 150$ N

22. Two children, weighing 30 kg and 15 kg, sit on one side of a see-saw at a distance of 1 m and 1.2m respectively, from the fulcrum. A boy of 'M' kg sits on the other side of the see-saw at a distance of 1.2 m from the fulcrum, and the see-saw is in equilibrium. Find M.

(a) 48   (b) 36   (c) 40   (d) 45

Ans. (c): Given that,

Torque = F×r = (M×g)×r

Torque at LHS=Torque at RHS (for equilibrium)

$30 \times g \times 1 + 15 \times g \times 1.2 = M \times g \times 1.2$

$g(30 \times 1 + 15 \times 1.2) = g(M \times 1.2)$

$30 + 18.0 = 1.2$ M

$48 = 1.2$ M

$$M = \frac{48}{1.2} = 40 \text{ kg}$$

23. _____is when we cover a surface with a pattern of flat shapes so that there are no overlaps or gaps.
(a) Kerning   (b) Tracking
(c) Tessellation   (d) Gradient

Ans. (c): A tessellation or tilling is the covering of a surface often a plane using one or more geometric shapes with no overlaps and no gaps.
Kerning- amount of space between two letters.
Gradient- is the rate of regular or graded ascent or descent inclination.

24. _____curves employ at least three points to define a curve. The two endpoints of the curve are called anchor points. The other points, which define the shape of the curve, are called handles, tangent points, or nodes.
(a) Bicorn   (b) Deltoid
(c) Kappa   (d) Beizer

Ans. (d): Beizer curves employ at least three points to define a curve. The two endpoints of the curve are called anchor points. The other points, which define the shape of the curve, are called handles, tangent points, or nodes.

25. A_____map converts colour intensity or grayscale information to heights to give the apperance that features are raised above the surface, like embossed letters.
(a) shade   (b) tint
(c) bump   (d) tone

Ans. (c): Bump mapping is a method which is used in computer graphics for simulating wrinkles and bumps on the surface of the object. It was introduced by James Blinnin 1978.

26. Which of the following is NOT a base unit?
(a) candela   (b) radian
(c) mole   (d) ampere

Ans. (b): A base unit ,also referred as fundamental unit is adopted for measurement of base quantity. A base quantity is one of the conventionally chosen subset of physical quantities where no quantities in the subset can be expressed in term of others.
There are seven base unit
1. Meter (m) 2. second (s) 3. Kilogram (kg)
4. Kelvin (k) 5. Ampere (A) 6. Mole (mol)
7. Candela (cd)

27. Farad/meter is the unit of_____.
(a) electric conductance   (b) permittivity
(c) permeability   (d) watt per steradian

Ans. (b):

SI unit	Physical Quantities
Farad/metre (F/m)	Electric permittivity
Siemens (S)	Electric conductance
Henry per meter (H/m)	Magnetic Permeability
Watt/Steradian (Watt/Sr)	Radiant intensity

28. An object with greater_____has greater inertia.
(a) velocity   (b) mass
(c) acceleration   (d) volume

Ans. (b): Newton's 1st law of motion states that "An object at rest stays at rest and an object in motion stays in motion with the same speed and in the same direction unless an external force acts on the body. Newton's 1st Law of motion is also known as "Law of Inertia". Tendency to resist change in their state is described as inertia.
We know that inertia is defined as
$$I_P = \sum_{i=1}^{N} m_i r_i^2$$
$I_P \propto m,$
$I_P \propto r^2$
Hence we can say that an object with greater mass has greater inertia.

29. Fine the length (in cm) of the edge of a cube of a piece of wood which weights 80N. (Use g = 10 m/s², density of wood = 1g/cm³)
(a) 40   (b) 20
(c) 60   (d) 80

Ans. (b): Given that,
Weight = 80 N
W = mg
$m = \dfrac{80}{10} = 8kg$
$= 8 \times 10^3 gm$
Density (d) $= \dfrac{m}{V}$
$1 = \dfrac{8 \times 10^3}{V}$
V = 8 × 10³ cm³
$a^3 = 8 \times 10^3$ cm³ -------   [Volume of cube = a³ where a = side of cube]
a = 2 × 10 = 20cm

30. If the speed of a car increases from 54 km/hr to 90 km/hr, its kinetic energy would increase in the ratio_____.
(a) 3/5   (b) 4/9
(c) 9/16   (d) 9/25

Ans. (d): Given,
$V_1 = 54$ km/hr, $V_2 = 90$ km/hr
formula for kinetic energy $= \dfrac{1}{2} mv^2$
Here mass remains constant
$Required = \dfrac{\frac{1}{2}mv_1^2}{\frac{1}{2}mv_2^2} = \dfrac{(54)^2}{(90)^2} = \dfrac{2916}{8100} = \dfrac{9}{25}$