Question 1: A robotics team wants their robot to stop when it senses an obstacle 10 cm ahead. Which programming concept best handles that check?

a) Loop forever without checks

b) Conditional statement

c) Function to draw shapes only

d) Variable that stores battery size

Question 2: Which tool increases mechanical advantage to lift a heavy load by spreading force over distance?

a) Wedge

b) Lever

c) Wheel and axle only

d) Paintbrush

Question 3: During prototype testing a toy bridge bent slightly under load. The team adds a truss (triangles) to strengthen it. Why are triangles used?

a) Triangles are decorative only

b) Triangles distribute forces and resist shape change

c) Triangles make it lighter but weaker

d) Triangles add friction to the bridge

Question 4: Which component in an electrical circuit slows down current and protects parts (common beginner circuit element)?

a) Resistor

b) Switch

c) Battery

d) Plastic tape

Question 5: A good scientific hypothesis should be:

a) A testable prediction you can check with experiments

b) A random guess with no way to test

c) A fact you already know is true

d) A question that never needs data

Question 6: A robot needs to follow a curved line on the floor. Which sensor combo will be most helpful?

a) Light/line sensors + a program that reads sensor values and steers motors

b) Sound sensors

c) Thermometer and humidity sensor

d) A camera that prints pictures but not processed

Question 7: Which compound machine is a bicycle mostly made of?

a) An inclined plane

b) Many simple machines: wheel & axle, pedals/gears (compound machine)

c) A wedge and screw

d) Nothing mechanical at all — it's magic

Question 8: A student builds a circuit with two identical bulbs in series on one battery and then reconnects them in parallel on the same battery. What happens to brightness (assuming ideal small battery)?

a) In parallel the bulbs are usually brighter than in series (each gets more voltage)

b) In series the bulbs are brighter than in parallel always

c) Brightness is unchanged in both setups always

d) Bulbs change colour instead of brightness

Question 9: Which step should come earliest in the engineering design process?

a) Build final product first

b) Define the problem and research constraints

c) Celebrate without testing

d) Throw away all ideas and start over

Question 10: Which material is a good conductor of electricity?

a) Copper

b) Plastic

c) Wood

d) Rubber glove

Question 11: A student measures plant growth every day and notices odd big jumps when she measured with different rulers. What mistake did she likely make?

a) She used inconsistent measurement tools or methods

b) Plants can teleport taller overnight

c) Rulers make plants grow faster sometimes

d) Her eyes are always wrong

Question 12: Which machine increases force by changing the direction of effort (for example, hauling a flag up)?

a) Pulley

b) Wheelbarrow

c) Screwdriver

d) Ruler

Question 13: Which programming idea lets you reuse a block of code by giving it a name?

a) Function or subroutine

b) An empty loop only

c) A random number generator

d) Colouring the screen

Question 14: An engineering team must choose materials for a float that must be lightweight and not soak water. Which material property is most important?

a) Density and water resistance

b) Colour of material only

c) Material that melts easily in water

d) Material that is very heavy and sinks immediately

Question 15: Which is a safety rule when building and testing small electrical circuits in class?

a) Use low-voltage batteries, never short-circuit, and avoid wet hands when handling components

b) Always place batteries directly on wet cloths to cool them

c) Touch wires with metal forks while powered

d) Connect many batteries in short circuit to test heat

Question 16: A prototype wind turbine isn't producing much power. Which two changes are most likely to increase energy output?

a) Increase blade area and improve blade shape to catch more wind

b) Make blades heavier and rough with sand

c) Remove blades entirely

d) Paint blades with dark colour only

Question 17: Which simple machine is a screw most similar to in principle?

a) Inclined plane wrapped around a cylinder

b) Wheel only

c) Pulley only

d) Wedge only

Question 18: What does a millimetre measure that is useful when checking circuits?

a) Voltage, current, and resistance

b) Only colours of wires

c) How heavy a battery is

d) The taste of a resistor

Question 19: An experiment tests whether thicker insulation keeps a drink warmer. Which is the dependent variable?

a) Temperature change of the drink

b) Brand of insulation used only

c) The experimenter's name

d) Colour of the cup only

Question 20: Which of the following is an example of sustainable engineering for water conservation?

a) Rainwater harvesting and grey water reuse systems

b) Using more fresh water for washing cars daily

c) Blocking drains and dumping waste into rivers

d) Cutting wetlands to store more water on land

Question 21: Which gear setup will increase torque but reduce speed?

a) Large gear driving a smaller gear

b) Small gear driving a larger gear

c) Two equal gears always change torque randomly

d) No gears at all

Question 22: Two groups test two brands of batteries powering the same motor. One group uses new batteries; the other uses old partially used batteries. Which is the fair comparison mistake in such a setup?

a) They did not control battery age; batteries must be same condition for fair test

b) Old batteries are always better — no mistake

c) Motor brand is the only important factor always

d) It's fine to mix battery states in fair tests always

Question 23: Which programming construct repeats a set of instructions until a condition is met?

a) Loop

b) Comment only

c) Variable declaration

d) Changing screen brightness

Question 24: Which of these is a compound machine?

a) Lawn mower

b) Single fixed pulley

c) A rock

d) A single wedge

Question 25: A prototype solar cooker works well on sunny days but not on cloudy days. What engineering trade-off does this show?

a) Reliance on sunlight

b) Solar cooker works the same in all weather

c) Cloudy days produce more energy always

d) Cooker becomes cooler and freezes food always

Question 26: Which is the SI unit of electrical resistance?

a) Ohm (Ω)

b) Meter (m)

c) Watt (W)

d) Litre (L)

Question 27: A student designed a test to find which soil keeps water longest. He uses identical pots, same plant type, and same amount of water. These same conditions are called —

a) Controlled variables

b) Variables to change randomly

c) Hypotheses only

d) Invalid reasons to test

Question 28: Which mechanism converts rotary motion to linear motion?

a) Cam and follower or screw jack

b) Simple pulley

c) Spring

d) Magnet

Question 29: In a circuit with a single battery and two equal bulbs connected in series, the total current is I. If a third equal bulb is added in series, the current will:

a) Decrease

b) Increase

c) Stay exactly the same always

d) Turn the battery into salt

Question 30: Which step is essential before building a physical prototype?

a) Make sketches and simple models to test ideas

b) Buy final materials before any plan

c) Build without any design thinking

d) Hide design from team members always

Question 31: Which is true about renewable energy sources?

a) They are naturally replenished (sun, wind, hydro) and reduce fossil fuel use

b) They are always dirtier than coal

c) They never work at all

d) They make water taste salty

Question 32: A robot program uses sensors to maintain balance like a human. Which type of sensor would help detect tilt?

a) A pencil

b) Ultrasonic

c) Thermistor

d) Gyroscope or accelerometer

Question 33: Which simple machine is useful for splitting wood or cutting (it converts force into separation)?

a) Wedge

b) Wheel and axle

c) Pulley

d) Screwdriver

Question 34: A student collects height data from 30 plants and uses the average to compare groups. Why is a larger sample helpful?

a) Larger samples reduce random variation and give more reliable results

b) Larger samples always cause wrong results only

c) A sample of one is always best

d) Small samples are always better than large ones

Question 35: Which electrical connection type gives the same voltage across each parallel branch?

a) Parallel connection

b) Series connection only

c) Open circuit only

d) Short-circuit connection only

Question 36: A design brief asks for a low-cost water filter for a village. Which is an important constraint the team must consider?

a) Making it extremely complex and expensive is best

b) Only colour of the filter matters

c) Cost, available materials, ease of use, and maintenance

d) Building a filter that uses gold parts only

Question 37: Which of the following explains why gears with different sizes change speed and force?

a) Gear ratio

b) Gears always act randomly with no rule

c) Gears make electricity instead of changing motion

d) Gears are only decoration

Question 38: An experiment shows one fertilizer gave taller plants but the leaves looked unhealthy. What should researchers do next?

a) Measure more variables (height, leaf health, soil tests) and possibly run more trials to understand trade-offs

b) Ignore leaf health and publish immediately

c) Use random fertilizer without testing

d) Stop science forever

Question 39: Which electrical safety device protects circuits from excessive current by breaking the circuit?

a) Fuse

b) A rubber band

c) Glue

d) Scissors

Question 40: A prototype uses biodegradable packaging but is slightly more expensive. Which sustainability trade-off is this an example of?

a) Environmental benefit vs. higher cost

b) Biodegradable packaging always costs nothing

c) Making packaging non-biodegradable fixes all problems

d) Trade-offs never exist in engineering

Question 41: Which of these is an advantage of 3D printing for prototyping?

a) Rapid iteration and making complex shapes quickly from digital models

b) 3D printing never makes accurate parts at all

c) 3D printing always costs more than building full scale in metal shops with no advantages

d) 3D printing only prints food

Question 42: A student uses a hypothesis: "If I increase water for the plant, then it will grow taller." Which is the independent variable?

a) Amount of water

b) Plant height

c) The soil brand always

d) The colour of the lab coat

Question 43: Which device turns electrical energy into motion (common in small robots)?

a) Motor

b) Resistor

c) Light bulb

d) Capacitor

Question 44: An engineering team must reduce waste in their product's life cycle. Which idea helps most?

a) Design for reuse, repair, and recyclable materials

b) Use non-repairable sealed parts to force replacements

c) Increase packaging to sell more

d) Throw prototypes away in the river

Question 45: Which machine is an example of a first-class lever where effort and load are on opposite sides of the fulcrum?

a) See-saw (teeter-totter)

b) Wheelbarrow

c) Stapler

d) A fixed pulley

Question 46: A battery shows 1.5 V on a voltmeter when new but drops when many bulbs are connected. Why does voltage drop under heavy load?

a) Internal resistance of battery and higher current draw cause terminal voltage to fall

b) Voltage is a magic number that always increases with load

c) Bulbs sing and steal volts only

d) The battery needs sleep to work

Question 47: Which is a reliable way to share and analyse experimental data with team members?

a) Use pictures with no labels or axis

b) Only tell someone verbally with no numbers

c) Hide data in drawings only

d) Use tables, graphs (bar/line), and clear labels to show results and comparisons

Question 48: A student plans to test which material makes the best insulator for a lunch box. He tests cardboard, foam, and thin metal foil (wrapped) and measures temperature loss. Which material is expected to be the worst insulator?

a) Thin metal foil

b) Foam

c) Cardboard

d) Thick wool

Question 49: Which engineering drawing tool helps communicate scale and dimensions for a prototype?

a) Technical (orthographic) drawing or CAD showing dimensions and scale

b) A random doodle with no sizes

c) Only a photograph of a hammer

d) A storybook page

Question 50: A group uses recycled plastic to make building bricks. Over time they plan tests for strength and durability. Which tests are most relevant?

a) Compressive strength, water absorption, and weathering tests

b) Smell test

c) Taste test

d) Looking at bricks from a distance

ROUGH WORK
(NOT TO BE EVALUATED)

DATE