



# ISTO

## Sample Papers

### Senior



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# GUIDELINES

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- ▶ This booklet contains two sample papers.
- ▶ The sample paper 1 is unsolved and the sample paper 2 is solved.
- ▶ Each sample papers contains a total of 25 questions.
- ▶ The sample papers describe the type of questions that will be asked in the examination. The sample papers do not intend to describe the pattern of ISTO 2020 exam.

1. During a hurricane, winds can blow out windows and walls, or remove the roof from a house. According to Bernoulli's principle, which of the following statements best explains why this can occur?



- A. Wind blowing around and over a house creates convection currents outside the house.
- B. Wind blowing around and over a house is at a lower pressure than the air inside the house.
- C. Wind blowing around and over a house is at a higher temperature than the air inside the house.
- D. Wind blowing around and over a house creates electrostatic charges in the air around the house.
2. Clark took a comb by which he combed his hair and the comb got statically charged and brought it near to the flow of water from the water tap after which the flow of water got deflected, what could be the best explanation from the following options for the same situation?



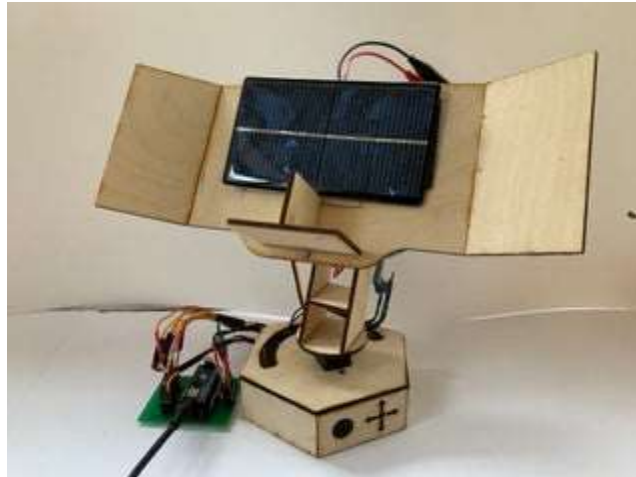
- A. Because water contains polar molecules in it.  
B. Because of the dissolved ions present in water.  
C. Because of magnetic property that is present in water  
D. Water is not deflected at all, it's attracted.
3. In many microwave ovens, a turntable slowly rotates food while the oven is in operation. The turntable, however, was not part of the original microwave oven design. Which of the following statements is the **most likely** reason the turntable was added to the microwave oven?



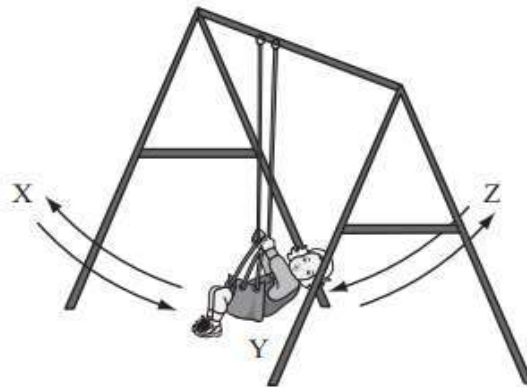
- A. Food did not cook evenly.
  - B. The oven used too much power.
  - C. Food did not receive enough energy.
  - D. The oven became too hot during operation.
4. Accelerometer is also used in laptops, what could be reason to use accelerometer in laptops?



- A. To rotate the screen
  - B. To protect hard drives from damage
  - C. To get the angle on monitor
  - D. To get the linear acceleration
5. Mohit made a 3- axis solar tracker where it will track sun's position accordingly, he has used servo motors in all the axis for the movement. What could be the reason behind to choose servo motor as he could also have used stepper motor?



- A. Servo motor have good inbuilt quality than the stepper motor.  
 B. Servo motor is more efficient than stepper motor.  
 C. Servo gives dynamic adjustment and stepper motor is start and stop motor.  
 D. Servo motor consumes less energy than stepper motor.
6. The diagram below shows a child on a swing. The child is swinging back and forth between points X and Z, through point Y. Points X and Z are at the same height.



Which of the following statements **best** describes the kinetic energy and the gravitational potential energy of the child?

- A. The child has no potential energy and no kinetic energy at position X and position Y.  
 B. The child has the same kinetic energy and potential energy at position X and position Y.  
 C. The child has more potential energy and less kinetic energy at position X than at position Y.  
 D. The child has more kinetic energy and less potential energy at position X than at position Y.

7. Deepak was performing an experiment in which he took a bottle of coke and Mentos. He poured some Mentos into the bottle and he observed a huge fountain coming out from the bottle. What could be the best explanation for such nucleation of coke?



- A. Mentos are heavy enough to sink, they react with the soda all the way to the bottom.  
B. Sugar in the Mentos reacts with carbonized drink  
C. Because of rough surface of the Mentos that activates the carbonized molecules to come out from the bottle.  
D. Because mint in the Mentos reacts with the CO<sub>2</sub> present in the coke which nucleates it to come out from the bottle.
8. John is assembling a Quadcopter Drone, for which he require few components like Flight Controller, ESC(Electronic Speed Controller), Motors, Propellers, Batteries etc. Which type of Motor he should select for the drone for better speed and stability?



- A. AC brushless motors** -: They use induction of a rotating magnetic field, generated in the stator, to turn both the stator and rotor at a synchronous rate. They rely on permanent electromagnets to operate.
- B. DC brushed motor** -: brush orientation on the stator determines current flow. In some models, the brush's orientation relative to the rotor bar segments is decisive instead. The commutator is especially important in any DC brushed motor design.
- C. DC brushless motors** -: developed to achieve higher performance in a smaller space. An embedded controller is used to facilitate operation in the absence of a slip ring or commutator.
- D. Linear Motors**:- These electric motors feature an unrolled stator and motor, producing linear force along the device's length.
9. Sam is doing a science experiment in which he filled an empty glass with water then he placed a thick paper sheet on the top of the glass then he turned the glass upside down without removing his hand on the sheet, he removed his hand from the bottom and watch in amazement as the paper stays covering the glass and the water doesn't spill out. What could be the suitable reason behind that?



- A. Pressure inside of the glass is higher than outside the glass acting on paper sheet.



- B. Balance in the pressure inside the glass and outside the glass acting on paper sheet.
- C. Pressure outside of the glass is higher than inside the glass acting on paper sheet.
- D. Water should spill out because of gravitational force

10. A farmer places a sprinkler on top of a platform in the middle of a field. Water is pumped to the sprinkler from a water supply tank. The spray from the sprinkler, however, does not reach the edges of the field. Which of the following should the farmer do to increase the range of the sprinkler?



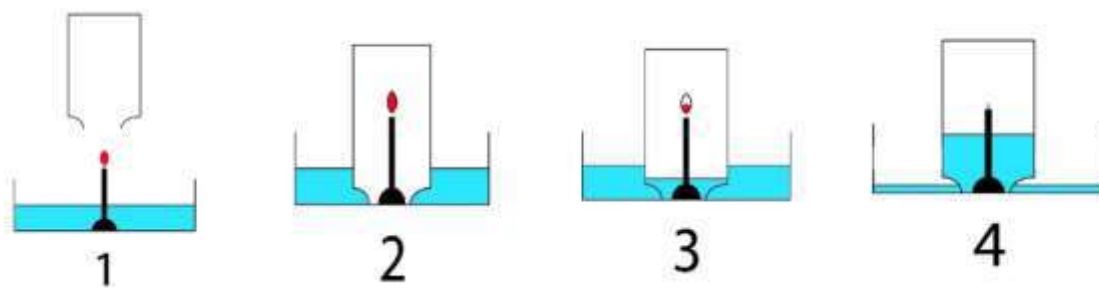
- A. Place the sprinkler at ground level.
- B. Reduce the diameter of the sprinkler nozzle.
- C. Move the water supply tank closer to the field.
- D. Increase the diameter of the water supply tank.

11. Many current smartphones, tablets and other **mobile** devices screen is a control display that uses the conductive **touch** of a human finger which sensor is used in mobile phones?



- A. Capacitive Touch Sensor
- B. Temperature Sensor
- C. Resistive Touch Sensor
- D. Weight Sensor

12. Alex poured water in a plate and lit a candle in it, after some time he covered the candle by a glass lid, he observed that after some time, the candle dims and goes out. Just before the candle dies, the water level rises to almost 1/10th of glass height. No air bubbles are seen. The water level stays up for many few minutes more.



What could be the reason behind this phenomena?

- A. Because of water condensation.
  - B. Because of heat produced by the burning of candle
  - C. Because of cooling & decrease in volume of air.
  - D. Because of heat & increase in volume of air.
13. A balloon is inflated with room temperature air and then put in a sunny place. The balloon expands slightly due to a rise in temperature. Which of the following **best** describes the molecules of air inside the balloon when the balloon is left in the sunlight as compared to when it was first inflated?



- A. The molecules are moving faster.
- B. There are more molecules in the balloon.
- C. There are fewer interactions between the molecules.
- D. The molecules stop colliding with the walls of the balloon

14. John is going to ride a bicycle where he is applying an unbalanced force to the bicycle pedals when not in motion. As a result, the bicycle would gain acceleration and therefore begin to move. Which Phenomena of motion could be best applied here?



- A. Law of Inertia
- B. Newton's First Law
- C. Force of Friction
- D. Force of Air Resistance

15. Many home entertainment devices such as televisions, stereos, and DVD players can be operated wirelessly utilizing infrared remote controls. Which of the following is a limitation of this type of communication technology?



- A. The remote control cannot use rechargeable batteries.
  - B. The remote control can operate only one component of a system.
  - C. The infrared signal cannot be activated in a brightly lit environment.
  - D. The infrared signal must have an unobstructed path to the receiving component.
16. Hydraulic pistons are commonly used to hold a load in an exact position. Why might an air-driven piston be an inappropriate tool to use for this purpose?



- A. Air is invisible.
- B. Air is insulating.
- C. Air is weightless.
- D. Air is compressible.

17. Sandeep was doing a small experiment, he took AA cell, a coin magnet and copper wire of spring structure. He sticks the magnet to negative terminal of the cell and spring structure copper to positive terminal and other terminal to the magnet over the cell. What would change would be there?



- A. Copper wire will get heated up.
  - B. Copper wire will start rotating.
  - C. Magnet will lose its magnetic property.
  - D. No change will occur.
18. John is working on a project “Obstacle avoider” using Arduino Uno, Ultrasonic Sensor and Motor. His friend was also working on the same project, he was using L293d and his friend was using L298n as a motor driver. What is the difference between L293d and L298n?
- A. L293d consumes less energy than L298n.
  - B. L298n consumes less energy than L298n.
  - C. L293 operates less than L298 operates in terms of voltage.
  - D. L293 operates more than L298 operates in terms of voltage.

19. Kevin, Joseph, and Nicholas are 3 brothers. If the following statements are all true, which of them is the youngest?

- ✓ Kevin is the oldest.
- ✓ Nicholas is not the oldest.
- ✓ Joseph is not the youngest.

Choose one of the options given below.

- A. Joseph
- B. Kevin
- C. Nicholas
- D. Both Joseph and Nicholas

20. The car dealer found that there was a tremendous response for the new XYZ's car booking with long queues of people complaining about the duration of business hours and arrangements.

Courses of action:

I. People should make their arrangement of lunch and snacks while going for car XYZ's booking and be ready to spend several hours.

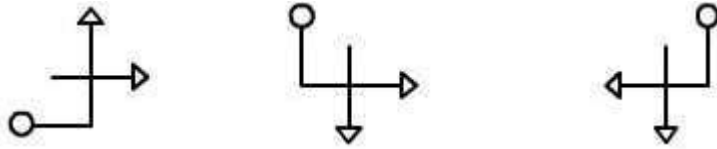
II. Arrangement should be made for more booking desks and increase business hours to serve more people in less time.

- A. Only I follows
- B. Only II follows
- C. Either I or II follows
- D. Neither I nor II follows

21. If in a certain code language BOSTON can be written as SNSNSN, then how would you write CALIFORNIA in the same code language?

- A. OAOAOA
- B. LONLON
- C. LOILOILOI
- D. LONLONLON

22. Which of the figures, you think best fits the series below?



- A.
- B.
- C.
- D.

23. What comes next in the given series?

10, 18, 13, 21, 16, 24, 19, 27 ...

- A. 21
- B. 22
- C. 23
- D. 24

24. If  $A + B$  means A is the sister of B;  $A \times B$  means A is the wife of B,  $A \% B$  means A is the father of B and  $A - B$  means A is the brother of B. Which of the following means T is the daughter of P?

- A.  $P \times Q \% R + S - T$
- B.  $P \times Q \% R - T + S$
- C.  $P \times Q \% R + T - S$
- D.  $P \times Q \% R + S + T$

25. In each of the following questions find out the alternative which will replace the question mark.

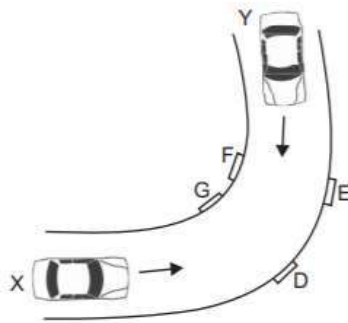
NUMERAL:UEALRMN :: ALGENRA: ?

- A .LRBAGEA
- B. BARLAGE
- C. LERAGBA
- D. LERABGA

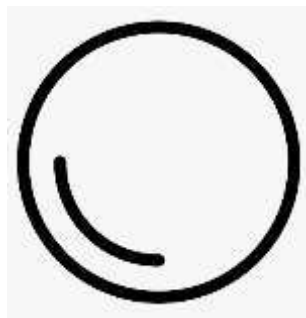


- 1) Two cars X and Y are travelling in opposite directions on a narrow road as shown here.

Four possible positions for placing a mirror are labelled D, E, F and G. In order to avoid an accident, a mirror could be placed at position \_\_\_\_\_.



- A. E
  - B. D (Answer)
  - C. G
  - D. F
- 2) A metal sphere of mass 12 kg has the same diameter as another sphere of mass 4 kg. Both spheres are dropped simultaneously from a tower. When they are 8 m above the ground, they have the same \_\_\_\_\_. (Neglect air resistance.)



- A. Kinetic energy
- B. Potential energy
- C. Momentum
- D. Acceleration(answer)

- 3) Sam is doing a science experiment in which he filled an empty glass with water then he placed a thick paper sheet on the top of the glass then he turned the glass upside down without removing his hand on the sheet, he removed his hand from the bottom and watch in amazement as the paper stays covering the glass and the water doesn't spill out. What could be the suitable reason behind that?



- A. Pressure inside of the glass is higher than outside the glass acting on paper sheet.
- B. Balance in the pressure inside the glass and outside the glass acting on paper sheet. (Answer)
- C. Pressure outside of the glass is higher than inside the glass acting on paper sheet.
- D. Water should spill out because of gravitational force

- 4) A bolt cutter has long handles with handle grips that are located as far away as possible from the neck. Which statement provides the best reason for this design?



- A. Longer handles make the cutting blade move faster.
  - B. It provides mechanical advantage which allows cutting through thick bolts.(Answer)
  - C. The appearance of the tool is significantly more aesthetic with longer handles.
  - D. It makes the bolt cutter more durable when dropped accidentally.
  - E. Longer handles are more ergonomic and allows easier storage.
- 5) Alex was doing a small experiment, he took AA cell, a coin magnet and copper wire of spring structure, he sticks the magnet to negative terminal of the cell and spring structures copper to positive terminal and other terminal to the magnet over the cell, what would change would be there?



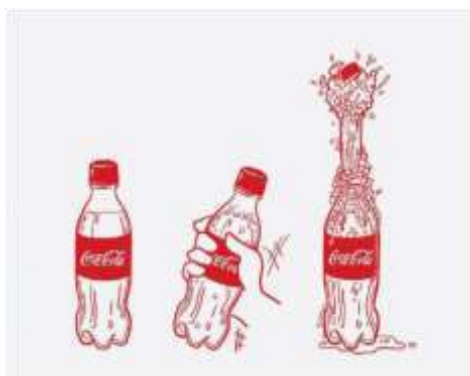
- A. Copper wire will get heated up.
- B. Copper wire will start rotating. (Answer)
- C. Magnet will lose its magnetic property.
- D. No change will occur.

- 6) Samuel did an experiment in which he took two ice cubes and two glass of water, in one of the glass of water he added salt and other one was normal water, he observed that the ice cube in the salt water was melting slower than the normal water, what could be the feasible reason for the same?



- A. Because of impurities presence in the salt water.
- B. Because of high melting point than fresh water.
- C. Because of lower freezing point than fresh water. (Answer)
- D. Because of lower freezing point than salt water.

- 7) John bought a bottle of a carbonated cold drink and shook it before opening the bottle, after opening the cap of the bottle he observed the explosion and half of the contents of the bottle came out, what could be the suitable reason for the same?



- A. Because of the pressure increases inside the bottle after shaking the bottle.
- B. Because of the pressure decreases inside the bottle after shaking the bottle.
- C. Because of nucleation of CO<sub>2</sub> bubbles inside the bottle after shaking. (Answer)
- D. Because of pressure increase outside the bottle.

8) Two students are standing next to each other on a level field. One of the students throws a table tennis ball forward toward a line 2.0 m away. At the same time, the second student throws a bowling ball in the same direction. Both balls take the same time to travel the 2.0 m. Only the second student feels a noticeable backward push when she throws her ball. Which of the following statements explains why only the second student feels a noticeable backward push?



- A. The bowling ball exerts a much larger reaction force. (Answer)
- B. The bowling ball undergoes a much larger acceleration.
- C. The bowling ball requires more force to overcome gravity.
- D. The bowling ball converts more inertia into kinetic energy

- 9) A boy rolls a rubber ball on a wooden surface. The ball travels a short distance before coming to rest. To make the same ball travel longer distance before coming to rest, he may



- A. spread a carpet on the wooden surface.
  - B. cover the ball with a piece of cloth.
  - C. sprinkle talcum powder on the wooden surface. (Answer)
  - D. sprinkle sand on the wooden surface.
- 10) A farmer places a sprinkler on top of a platform in the middle of a field. Water is pumped to the sprinkler from a water supply tank. The spray from the sprinkler, however, does not reach the edges of the field. Which of the following should the farmer do to increase the range of the sprinkler?

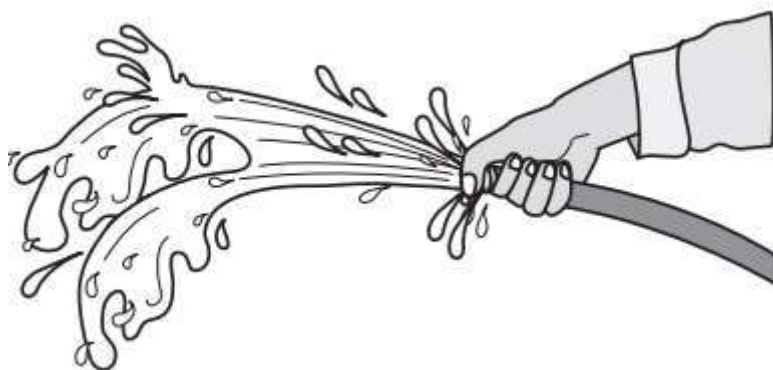


- A. Place the sprinkler at ground level.
- B. Reduce the diameter of the sprinkler nozzle. (Answer)
- C. Move the water supply tank closer to the field.
- D. Increase the diameter of the water supply tank.

- 11) Several college students want to design and build a solar-powered car. They have chosen a design. Which of the following should they do next to follow an engineering design process



- A. Build a prototype of the car. (Answer)  
B. Sell the design to a car company.  
C. Research the demand for solar powered cars.  
D. Use the design to mass-produce solar-powered cars.
- 12) A person is using a 1 in. diameter garden hose to wash his bike. The hose does not have a nozzle. To make the water spray, the person covers part of the hose opening with his thumb, as shown below. After the person sprays the bike, he drops the hose to the ground.



Which of the following statements describes the water coming out of the hose on the ground compared to when the person covered part of the hose opening?

- A. The density of the water is now less.
- B. The density of the water is now greater.
- C. The velocity of the water is now faster.
- D. The velocity of the water is now slower. (Answer)

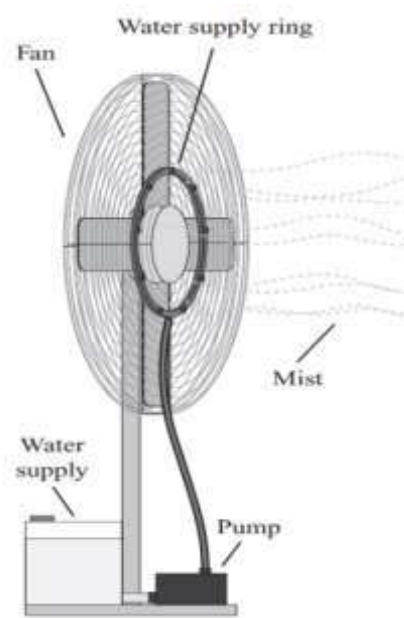
13) A group of students is going to design and build a new set of shelves for a school. Which of the following describes the first steps of the design process that the students need to do?



- A. Draw a diagram of the shelf design on the computer, select the materials, and build the shelves.
- B. Find out why the shelves are needed, research current options, and brainstorm possible solutions. (Answer)
- C. Measure the space for the shelves, select the possible materials, and get prices for the materials proposed for use.
- D. Brainstorm some ideas for the shelves, use the computer to design the shelves, and find the strongest materials to build the shelves.



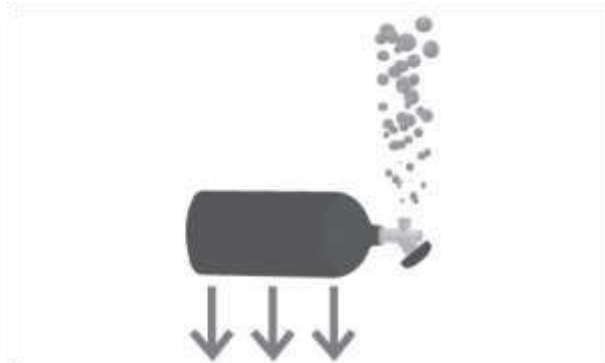
- 14) The diagram below shows a cooling system that works by releasing water directly in front of a high-speed fan. Which of the following statements explains why this cooling system is considered an open system?



- A. The system causes a decrease in air temperature.
  - B. The water is not recirculated during operation. (Answer)
  - C. The water is pressurized during operation.
  - D. The system is only used outdoors.
- 15) Since the introduction of the cellular phone, many advances in wireless communication have been made. Which of the following features has been added to cellular phones for the purpose of finding someone who has placed an emergency call?



- A. A caller identification
  - B. digital camera
  - C. global positioning system (Answer)
  - D. text messaging
- 16) A cylindrical metal tank filled with air is submerged underwater. As the air escapes, the tank gradually moves deeper underwater. Which statement provides the best reason for this motion?



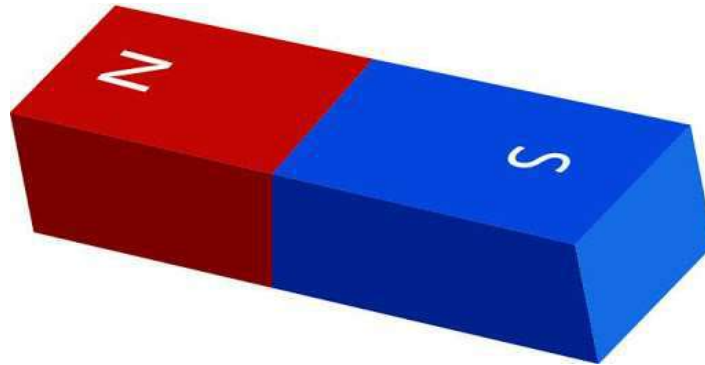
- A. The bubbles provide a downward thrust on the tank
- B. The metal increases in density so it gets heavier
- C. The bubbles lower the density of the water which lowers its buoyancy (Answer)
- D. Water replaces the air in the tank which makes it heavier

- 17) Sarah presented an idea for recycling used tires to an automotive company. If she followed the engineering design process, what was the first step in developing her idea?



- A. communicating the results of her research  
B. developing a prototype she wanted to make  
C. selecting the best possible solution to her problem  
D. identifying the specific problem she wanted to solve (Answer)
- 18) Chris and his friends playing a treasure hunt game. In that game, they need a compass to find the directions and they don't have the compass but they have some materials like:  
Cork, Bowl, Water Bottle, Needle, Battery, Wheel, Motors, Magnets  
Chris is making a homemade compass and he is using cork, needle, water bottle, and using one more thing out of the materials mentioned above. Can you help Chris what will be the fourth material Ravi can use?
- A. Magnets (Answer)  
B. Wheel  
C. Motors  
D. Ravi doesn't require any fourth materials

- 19) Jose has two bar magnets. He pushes the ends of the two magnets together and then he lets go. The magnets move quickly apart. Which of the following statements best explains why this happens?



- A. The north poles of the two magnets are facing each other. (Answer)  
B. One magnet is a north pole and one magnet is a south pole.  
C. The ends of magnets repel each other but the centres attract.  
D. One magnet is storing energy and one magnet is releasing energy.
- 20) Before releasing a newly designed video game to the public, the developer distributes the game to a few hundred people free of charge. After playing the game, the people complete a survey and return it to the developer. What part of the engineering design process does this scenario represent?



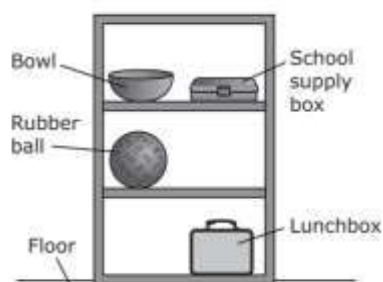
- A. redesign  
B. testing and evaluation (Answer)  
C. selection of a solution  
D. construction of prototypes

- 21) A teacher performs an experiment for a group of students. The teacher uses long, thin copper wires to connect a battery to a small light bulb. The teacher then applies heat to the copper wires. The students observe that the light bulb becomes dimmer. As the wires cool, the students observe that the light bulb becomes bright again. Which of the following relationships is the teacher most likely trying to demonstrate?



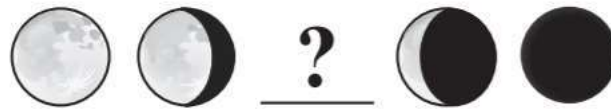
- A. Light affects heat.  
B. Wire material affects voltage.  
C. Temperature affects resistance. (Answer)  
D. Wire diameter affects transformation
- 22) Several objects are located on a set of shelves in a classroom. The mass of each object is given in the table, and the diagram shows the location of each object on the set of shelves.

Object	Mass (kg)
bowl	0.40
school supply box	0.95
rubber ball	0.55
lunchbox	1.10



- A. bowl  
B. lunchbox  
C. rubber ball  
D. school supply box (Answer)

23) A student made the drawing below to show the order of several phases of the Moon. One of the phases is missing.



Which of the following pictures shows the phase of the Moon that is missing from the drawing?

A.  (Answer)

B. 

C. 

D. 

24) A student measured three objects made of different materials. The table shows each object’s mass and volume.

Object	Mass (g)	Volume (cm <sup>3</sup> )
block of wood	250	580
large glass marble	50	21
rubber ball	500	540

Which of the following lists the materials in order from least dense to most dense?

- A. glass → wood → rubber
- B. glass → rubber → wood
- C. rubber → glass → wood
- D. wood → rubber → glass (Answer)

25) How many times during the day do the hands of a clock overlap?



- A. 22 (Answer)
- B. 12
- C. 24
- D. 23