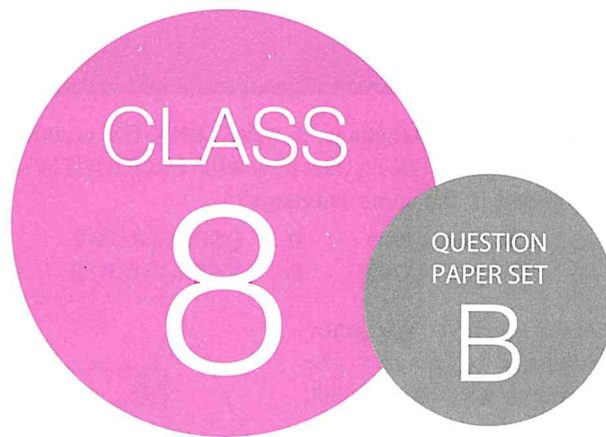


**SOF NATIONAL SCIENCE
OLYMPIAD 2019-20**



DO NOT OPEN THIS BOOKLET UNTIL ASKED TO DO SO

Total Questions: 50 | Time: 1 hr.

Name:.....

Section:..... SOF Olympiad Roll No.:..... Contact No.:.....

Guidelines for the Candidate

1. You will get additional ten minutes to fill up information about yourself on the OMR Sheet, before the start of the exam.
2. Write your **Name, School Code, Class, Section, Roll No.** and **Mobile Number** clearly on the **OMR Sheet** and do not forget to sign it. We will share your marks / result and other information related to SOF exams on your mobile number.
3. The Question Paper comprises three sections:
Logical Reasoning (10 Questions), **Science** (35 Questions) and **Achievers Section** (5 Questions)
Each question in Achievers Section carries 3 marks, whereas all other questions carry one mark each.
4. All questions are compulsory. There is no negative marking. Use of calculator is not permitted.
5. There is only ONE correct answer. Choose only ONE option for an answer.
6. To mark your choice of answers by darkening the circles on the OMR Sheet, use **HB Pencil** or **Blue / Black ball point pen** only. E.g.
Q.16: In the water cycle, condensation is the process of
A. Water vapour cooling down and turning into a liquid B. Ice warming up and turning into a liquid
C. Liquid cooling down and turning into ice D. Liquid warming up and turning into water vapour
As the correct answer is option A, you must darken the circle corresponding to option A on the OMR Sheet.
7. Rough work should be done in the blank space provided in the booklet.
8. Return the OMR Sheet to the invigilator at the end of the exam.
9. Please fill in your personal details in the space provided on this page before attempting the paper.

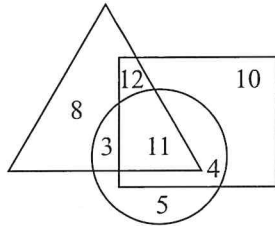


LOGICAL REASONING

1. In a certain code language, if 'MYSTERIOUS' is coded as 'FUTZNUWQKT', then how will 'PRODUCTIVE' be coded in the same language?

A. FWJUDVEPSQ B. QSPEVDUJWF
C. VEPSQGXXKVE D. VEPSQFWJUD

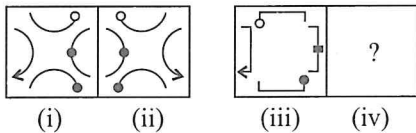
2. In the given Venn diagram, triangle represents the students who like cricket, rectangle represents the students who like football and circle represents the students who like swimming.



Which of the following numbers represents the students who like swimming and football but not cricket?

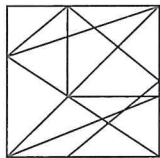
A. 3
B. 5
C. 4
D. 11

3. There is a certain relationship between figures (i) and (ii). Establish the similar relationship between figures (iii) and (iv) by selecting a suitable figure from the options which will replace the (?) in Fig. (iv).



A. B.
C. D.

4. Which of the following figures is not exactly embedded in the given figure as one of its parts?



A. B.
C. D.

5. If the signs '×' and '-' are interchanged in each of the following options, then which of the following options will be incorrect?

A. $26 \times 5 - 4 = 6$ B. $18 - 6 \times 7 = 100$
C. $24 \times 6 - 3 = 6$ D. $9 - 6 \times 2 = 52$

6. Select the correct water image of the given combination of letters, numbers and symbols.

HR26DAS20?@90

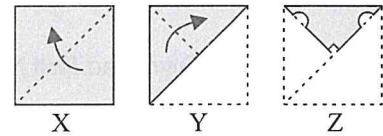
A. $\text{HK}^{\text{S}}\text{eD}\text{V}^{\text{S}}\text{J}^{\text{S}}\text{O}^{\text{S}}\text{?}\text{C}^{\text{S}}\text{d}^{\text{S}}\text{0}$ B. $\text{HR}^{\text{S}}\text{eD}\text{V}^{\text{S}}\text{S}^{\text{S}}\text{J}^{\text{S}}\text{O}^{\text{S}}\text{?}\text{C}^{\text{S}}\text{90}$
C. $\text{HK}^{\text{S}}\text{eD}\text{A}^{\text{S}}\text{S}^{\text{S}}\text{J}^{\text{S}}\text{O}^{\text{S}}\text{?}\text{a}^{\text{S}}\text{d}^{\text{S}}\text{0}$ D. $\text{HK}^{\text{S}}\text{eD}\text{V}^{\text{S}}\text{S}^{\text{S}}\text{J}^{\text{S}}\text{O}^{\text{S}}\text{?}\text{C}^{\text{S}}\text{d}^{\text{S}}\text{0}$

7. How many 6's are there in the given arrangement, each of which is immediately preceded by an odd number and immediately followed by an even number?

8 7 6 7 8 6 7 5 6 7 9 7 6 1 6 7 7 6 8 8 6 9 7 6 8 7

A. None B. One
C. Two D. Three

8. The question consists of a set of three figures X, Y and Z showing a sequence of folding of a piece of paper. Fig. (Z) shows the manner in which the folded paper has been cut. Select a figure from the options which would most closely resemble the unfolded form of Fig. (Z).

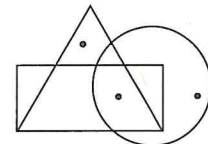


A. B.
C. D.

9. Samay travels 12 km towards West, turns right and travels 5 km and then turns left and travels another 3 km and then again turns left and travels another 5 km. How far and in which direction is he now from his starting point?

A. 11 km, West B. 11 km, East
C. 15 km, West D. 15 km, East

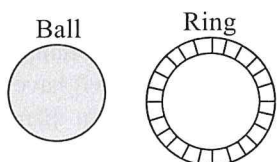
10. Select a figure from the options which does not satisfy the same conditions of placement of the dots as in the given figure.



A. B.
C. D.

11. Which of the following statements is/are always true regarding a converging lens?
- When the object approaches the focal point from the converging lens, then the size of the image increases.
 - The image formed by a thick converging lens is brighter to that formed by a thin converging lens.
 - When the object is placed very far away from the lens, the image distance approaches focal length.
- A. I and II only B. I and III only
C. I, II and III D. III only

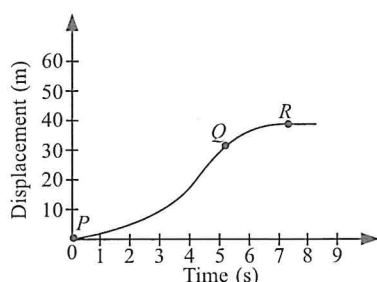
12. Consider the figures of a metal ball and a metal ring given here.



The metal ball can just pass through the metal ring. If the metal ring is heated, then

- The ball will pass through it and there is no change in the shape of the ring
- The ball will pass through it and the diameter of ring increases
- The ball gets stuck and the diameter of the ring decreases
- None of these.

13. The displacement-time graph of a lift climbing from the ground floor to the top of the building is given here.



Which of the following statements are true about the graph?

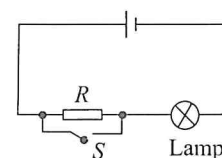
- At point *P*, the lift is stationary.
 - The lift is slowing down from point *Q* to point *R*.
 - At point *R*, the lift is at rest.
 - Velocity of the lift is minimum at point *Q*.
- A. I and III only B. II and IV only
C. I, II and III only D. II, III and IV only

14. Which of the following statements is/are correct regarding the instrument cup anemometer?
- It is used to measure the speed of the wind.

- The hollow metallic cups in it are used to increase the speed of the wind.
 - The number of revolutions made by cups is directly proportional to the speed of the wind.
- A. I only B. I, II and III
C. I and III only D. None of these

15. On a new linear scale of temperature called the *W* scale, the freezing and boiling points of water are 39°W and 239°W respectively. What will be the temperature on the new scale, corresponding to a temperature of 39°C on the Celsius scale?
- A. 200°W B. 139°W
C. 78°W D. 117°W

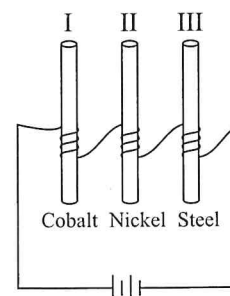
16. What happens to the brightness of the lamp when the switch *S* is closed?
- It becomes dimmer.
 - It becomes brighter.
 - It goes off.
 - It remains the same.



17. Read the given statements and select the correct option.
- Statement 1 :** Electric appliances with metallic body have three pin connections, whereas an electric bulb has two pin connections.
- Statement 2 :** Three pin connections reduce heating of connecting wires.
- Both statements 1 and 2 are true and statement 2 is the correct explanation of statement 1.
 - Both statements 1 and 2 are true but statement 2 is not the correct explanation of statement 1.
 - Statement 1 is true but statement 2 is false.
 - Both statements 1 and 2 are false.

18. When an object is made to float in two different liquids of densities d_1 and d_2 , the length of the object seen above the liquid surface are 4 cm and 5 cm respectively. Which of the following is the correct alternative?
- $d_1 > d_2$ B. $d_1 < d_2$
C. $d_1 = d_2$ D. None of these

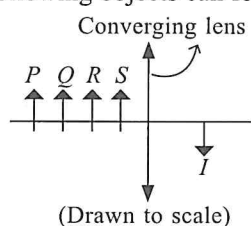
19. The diagram shows three rods made of different materials placed inside different coils. Which of the rods will not show any polarity (in context of magnetism)?
- I
 - II
 - III
 - None of these



20. If the tension in the string of a guitar is increased keeping other factors unchanged, then which of the following statements is/are incorrect?
- The sound produced is louder.
 - The sound produced has higher pitch.
 - The sound produced has lower pitch.
- II only
 - I only
 - I and III only
 - I, II and III

21. A piece of ice, with a stone embedded inside it, is floating in water in a vessel. When the ice melts completely, then the level of water in the vessel
- Remains unchanged
 - Rises
 - Falls
 - Falls in the beginning and rises to the same level later.

22. Which of the following objects can form the image *I*?



- P*
- Q*
- R*
- S*

23. If air and clouds were good conductors of electricity, then
- Lightning could occur with higher intensity
 - Lightning could occur with lower intensity
 - Lightning could not occur at all
 - None of these.

24. Match column I with column II and select the correct option from the given codes.

Column I

- Jupiter
- Saturn
- Mars
- Neptune

Column II

- Its density is less than that of water.
- Red planet
- Spins slowly in the opposite direction with respect to most planets.
- Spins so fast that a day lasts only under 10 hours
- Fourteen moons

- (a) - (iv), (b) - (i), (c) - (v), (d) - (iii), (e) - (ii)
- (a) - (i), (b) - (ii), (c) - (v), (d) - (iv), (e) - (iii)
- (a) - (iv), (b) - (v), (c) - (iii), (d) - (ii), (e) - (i)
- (a) - (iv), (b) - (i), (c) - (ii), (d) - (v), (e) - (iii)

25. Whenever the surfaces/layers in contact tend to move or move with respect to each other, the force of friction comes into play
- Only if the objects are solid
 - Only if one of the two objects is a liquid
 - Only if one of the two objects is a gas
 - Irrespective of whether the objects are solid, liquid or gas.

26. A few materials are listed in the given box.

(i) Cotton	(ii) Polythene
(iii) Bakelite	(iv) Jute
(v) Terylene	(vi) Melamine

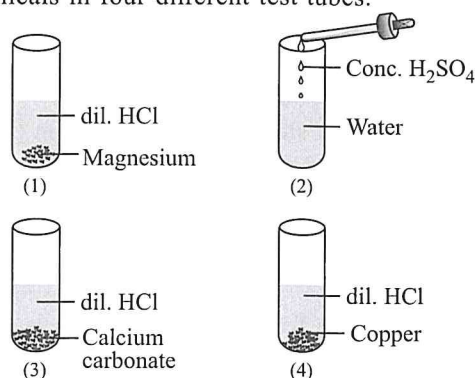
Select the incorrect statement regarding these materials.

- Materials (i) and (iv) are derived from natural sources and are completely biodegradable.
 - Materials (ii) and (v) contain linear polymer chains and become soft on heating.
 - Materials (iii) and (vi) have polymer chains with crosslinks which help them to change shape on heating.
 - None of these
27. A group of class 8 students categorised a few elements as shown in the table.

	Characteristic	K	Zn	C	Fe	Cu	P
a.	Metal	✓	✓	✗	✓	✓	✗
b.	Hardness	✗	✓	✗	✓	✓	✓
c.	Malleability	✗	✓	✗	✗	✓	✓
d.	Ductility	✗	✗	✓	✓	✓	✗
e.	Conductor of electricity	✗	✓	✓	✓	✓	✓

Which characteristic(s) is/are correctly matched for all the elements?

- a and e only
 - a, b and e only
 - b, c and d only
 - a only
28. Observe the given figures showing the mixing of chemicals in four different test tubes.



Which of the following statements is/are correct?

- I. H_2 gas is evolved in test tube (1).
 - II. Test tube (2) will burst as a large amount of heat is evolved.
 - III. No reaction takes place in test tube 3.
 - IV. In test tube 4, yellowish-green chlorine gas is evolved.
- A. II and IV only B. I only
C. II and III only D. I and IV only

29. Read the given statements and select the correct option.

Statement 1 : Coal, charcoal and cow dung cakes are inflammable substances.

Statement 2 : Inflammable substances have high ignition temperature.

- A. Both statements 1 and 2 are true and statement 2 is the correct explanation of statement 1.
- B. Both statements 1 and 2 are true but statement 2 is not the correct explanation of statement 1.
- C. Statement 1 is true and statement 2 is false.
- D. Both statements 1 and 2 are false.

30. A brief information about substances *X*, *Y* and *Z* is given here.

X : A gaseous fuel obtained by the strong heating of coal in the absence of air.

Y : A thick black liquid having an unpleasant smell obtained by heating coal in the absence of air.

Z : A tough and porous black solid prepared by heating coal in the absence of air.

Which of the following statements is incorrect about *X*, *Y* and *Z*?

- A. *X* is a mixture of methane, hydrogen, carbon monoxide and some other gases.
 - B. *Y* is a mixture of about 200 substances which can be separated by simple distillation.
 - C. *Z* contains almost 98 percent carbon.
 - D. Nowadays *X* is used as a source of heat while earlier it was used for lighting purposes.
31. An unknown metal *X* when placed in copper sulphate solution, red brown pieces of copper fall to the bottom of the test tube. When metal *X* is placed in aluminium sulphate solution, no change is observed. Metal *X* can be
- A. Sodium B. Potassium
C. Iron D. Calcium.

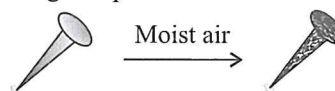
32. Consider the following statements :

- I. Washing soda is an acidic salt whereas baking soda is a basic salt.
- II. Tamarind juice does not change the colour of red litmus solution.
- III. Slaked lime neutralises the acidic nature of the soil.
- IV. Milk of magnesia is acidic in nature.

The correct statements are

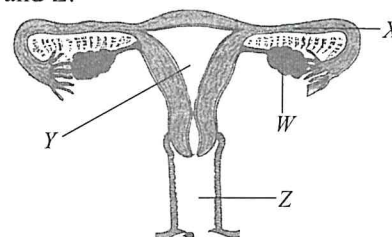
- A. I, II and IV only B. II, III and IV only
C. I, III and IV only D. II and III only.

33. Observe the given process and select the correct option.



- A. The given process becomes faster when humidity is high in the atmosphere.
- B. The process represents a reversible chemical change.
- C. The change can be reversed by galvanisation.
- D. None of these

34. Refer to the given figure of female reproductive system and select the correct statement regarding *W*, *X*, *Y* and *Z*.



- A. Fertilisation of ovum takes place in *Y*.
- B. Development of fetus takes place in *Z*.
- C. *X* is the site of implantation of embryo.
- D. *W* controls secondary sexual characters in females.

35. Take a beaker and fill half of it with water. Put some wheat seeds in it, stir it and wait for some time. Which of the following holds true regarding the observation and inference of this experiment?

- A. Healthy seeds being lighter float on the surface of water.
- B. Damaged seeds being lighter float on the surface of water.
- C. Some healthy seeds and some damaged seeds float on the surface of water.
- D. Damaged seeds being heavier settle down at the bottom.

36. Read the given paragraph.

Organism *P* has leathery lips and a big hump on its back, organism *Q* has thick layer of subcutaneous fat and a dense fur covering on its body whereas organism *R* is brightly coloured and has long, large and colourful beak.

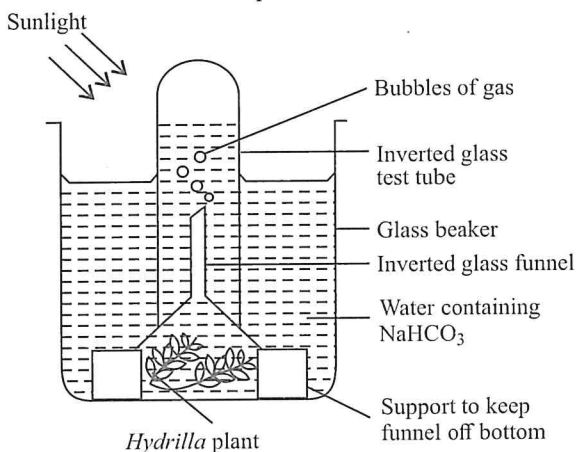
Which of the following does not hold true for organisms *P*, *Q* and *R*?

- A. Organism *P* excretes very little water in the form of urine.
- B. Organism *Q* undergoes hibernation in extreme conditions.
- C. Organism *R* has poison glands in its skin.
- D. Both A and B

37. Consider the following statements and select the option that correctly identifies true (T) and false (F) ones.
- Thyroxine hormone is released in the body at the time of stress.
 - Hermaphrodite animals have separate male and female individuals.
 - The animals which lay eggs are called viviparous animals.
 - Parathyroid hormone regulates the calcium and phosphate balance in the body.

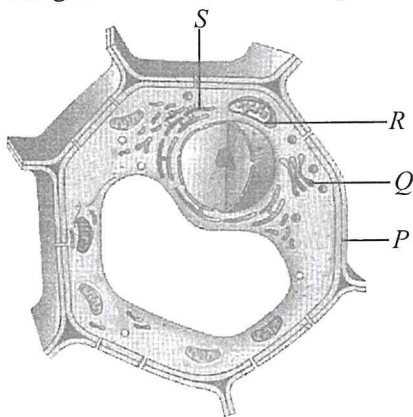
	(i)	(ii)	(iii)	(iv)
A.	F	F	F	T
B.	F	T	F	T
C.	T	T	F	F
D.	F	F	T	T

38. Rahul conducted an experiment as shown here.



Which of the following statements is incorrect regarding this?

- Hydrilla* plant cannot photosynthesise as CO_2 is not available to the plant.
 - NaHCO_3 present in the water provides CO_2 to the plant.
 - Sunlight can reach the plant properly and hence the plant can photosynthesise.
 - The bubbles produced in water within the test-tube are mainly of oxygen gas.
39. Refer to the given ultrastructure of a plant cell.



Identify the labelled parts *P-S* and select the incorrect statement regarding them.

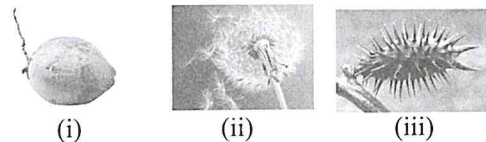
- P* provides strength and support to the plant.
 - S* is known as the secretory organelle of the cell.
 - Q* synthesises proteins and lipids and serves as transport channel for materials to pass.
 - R* is absent in animal cell.
- A. (i) and (ii) only B. (ii) and (iii) only
C. (i) and (iii) only D. (ii) and (iv) only

40. Refer to the given table and identify *L, M, N* and *O*.

Wildlife Conservation Sites	Organism for which they are known
Kaziranga National Park	<i>L</i>
<i>M</i>	Kashmir stag
Sundarban National Park	<i>N</i>
<i>O</i>	Asiatic lion

	<i>L</i>	<i>M</i>	<i>N</i>	<i>O</i>
A.	Neelgai	Dachigam National Park	Desert fox	Rann of Kutch Sanctuary
B.	One horned rhinoceros	Dachigam National Park	Royal Bengal tiger	Gir National Park
C.	Flamingo	Gir National Park	Siberian crane	Rann of Kutch Sanctuary
D.	One horned rhinoceros	Mudumalai Sanctuary	African elephant	Gir National Park

41. Refer to the given figures showing seeds/fruits of three different plants.



Select the option which contains name of plants that can correctly replace (i), (ii) and (iii) respectively, based on the mode of dispersal of their seeds.

	(i)	(ii)	(iii)
A.	<i>Hiptage</i>	Pea	<i>Calotropis</i>
B.	Madar	Balsam	Cotton
C.	<i>Acer</i>	Lotus	Castor
D.	Lotus	<i>Calotropis</i>	<i>Urena</i>

42. Read the given statements and select the option that correctly fills the blanks in any two of these statements.
- _____ is the only naturally occurring mineral fibre.
 - Mohair is obtained from _____.

- (c) The process of unwinding the silk filaments from the cocoon and combining them to make a thread of raw silk is called _____.
- A. (a)-Asbestos, (b)-Angora rabbit
 B. (b)-Angora goat, (c)-Scouring
 C. (a)-Asbestos, (c)-Reeling
 D. (b)-Angora goat, (c)-Carding

43. Select the incorrect statement.

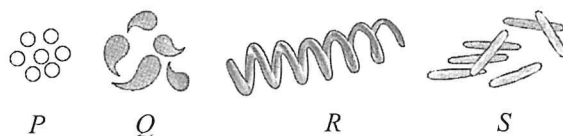
- A. Anthrax is a bacterial disease that affects both humans and cattle.
 B. Rust of wheat is a fungal disease that spreads by air.
 C. Citrus canker is a viral disease that affects citrus fruits.
 D. Yellow vein mosaic is a viral disease that affects ladyfinger.

44. Which of the following will help in controlling air pollution?

- I. Use of bicycles instead of cars for covering short distances.
 II. Spraying pesticides in agricultural fields to control pests.

- III. Use of unleaded petrol and smokeless fuels like CNG, LPG, etc.
 IV. Use of CFCs in refrigeration and air conditioning.
- A. I and III only B. II and III only
 C. I and IV only D. II and IV only

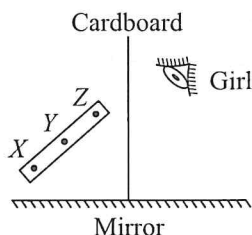
45. Refer to the given figures of bacteria *P*, *Q*, *R* and *S* and read the given statements regarding them.



- (i) Bacterium *P* can be the causal organism of tuberculosis.
 (ii) Bacterium *Q* can cause pneumonia.
 (iii) Bacterium *S* can convert lactose sugar of milk into lactic acid.
 (iv) Bacterium *R* can be the causal organism of syphilis.
- Which of these statements is/are correct?
- A. (i) and (ii) only B. (iii) and (iv) only
 C. (i), (iii) and (iv) only D. (ii) and (iii) only

ACHIEVERS SECTION

46. The figure shows a girl viewing a rod placed in front of a plane mirror. When the cardboard is removed vertically upwards, which points will be seen first and last by her?



- | | Seen first | Seen last |
|----|------------|-----------|
| A. | X | Z |
| B. | Y | X |
| C. | Z | X |
| D. | X | Y |

47. Read the given paragraph where few words have been italicised.

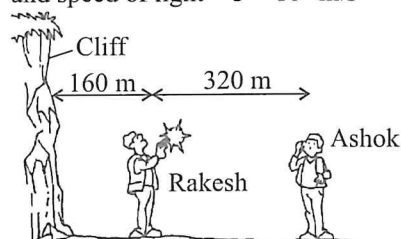
Preparation of soil in a field, before sowing of seeds involves two steps : *broadcasting* and levelling. Soil in the crop field is enriched with nutrients by adding manures and fertilisers to it. Crop fields need to be irrigated, from time to time. In *sprinkler system* of irrigation water is allowed to fall drop by drop from a pipe just near the plant roots whereas in *drip irrigation* water escapes from a revolving nozzle. Weeding in crop fields can be done using *combine*. After the crop is harvested, the grain is separated from cut crop using a machine called *thresher*.

Select the incorrect option regarding these.

- A. *Broadcasting* should be replaced by *tilling*.
 B. Positions of *sprinkler system* and *drip irrigation* should be interchanged.
 C. *Thresher* should not be replaced as it is correctly mentioned.
 D. *Combine* should be replaced by *harvester*.

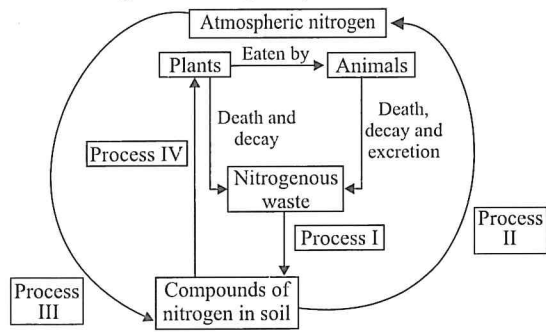
48. Rakesh fires a gun 160 m from a cliff. Ashok who is standing 320 m further away from the cliff hears the gunshot (i) second after he sees the flash. Ashok and Rakesh will hear the echo from the cliff (ii) second and (iii) second respectively after (iv) the (v).

Speed of sound = 320 m/s (approximate)
 and speed of light = 3×10^8 m/s



- | | (i) | (ii) | (iii) | (iv) | (v) |
|----|-----|------|-------|---------|---------|
| A. | 1 | 2 | 1 | Seeing | Flash |
| B. | 1 | 2 | 1 | Hearing | Gunshot |
| C. | 2 | 1 | 2 | Hearing | Gunshot |
| D. | 1 | 1.5 | 1 | Seeing | Flash |

49. Refer to the given nitrogen cycle occurring in nature.

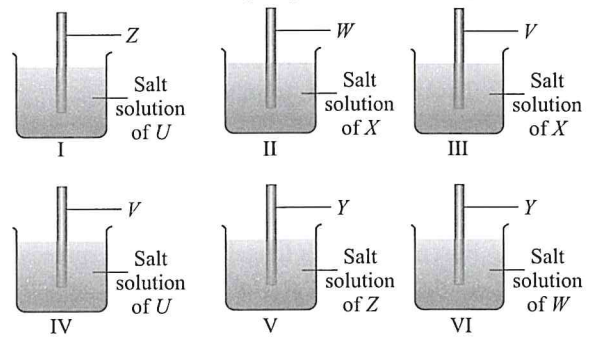


Identify processes I-IV and select the correct statement regarding them.

- A. Process II represents the conversion of ammonia into nitrates and is accomplished in two steps.
- B. In process IV, plants absorb inorganic nitrogen compounds from the soil and convert them into organic compounds.
- C. Process I represents the conversion of nitrates to free molecular nitrogen.

D. Process III represents nitrogen fixation by *Nitrosomonas*.

50. Observe the following experimental set-ups carefully.



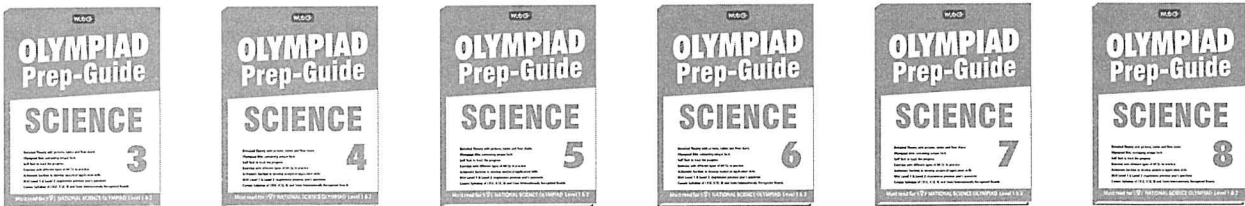
If no reaction occurs in beakers II, IV and V, then which of the following statements is correct?

- A. *X* is less reactive than *U* but more reactive than *V*.
- B. *W* and *X* are more reactive than *V*.
- C. *Z* and *W* are less reactive than *Y*.
- D. *V* is more reactive than *W* but less reactive than *U*.

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