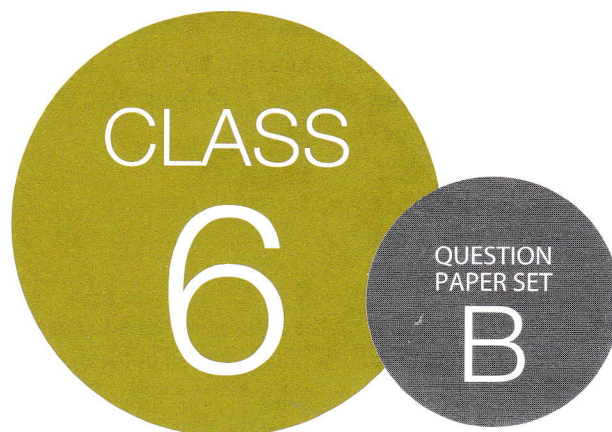


**SOF NATIONAL SCIENCE
OLYMPIAD 2023-24**



DO NOT OPEN THIS BOOKLET UNTIL ASKED TO DO SO

Total Questions: 50 | Time: 1 hr.

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 before attempting the paper.
10. **For classes 8, 9 & 10, "Innovation Challenge" is being conducted by Techfest IIT Bombay in association with SOF. For details, please visit : www.sofworld.org/sof-techfest-iit-bombay-innovation-challenge2023**



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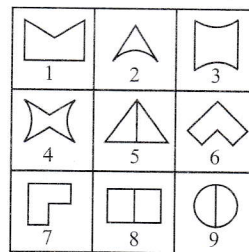
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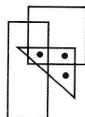
7
Olympiads

LOGICAL REASONING

1. In a certain code language, NATION is written as LCRKMP. How will SECTOR be written in the same code language?
- A. UGEVQT
 B. QBAVMT
 C. QGAVMT
 D. UMAVNT



2. Select a figure from the options which satisfies the same conditions of placement of dots as in the given figure.

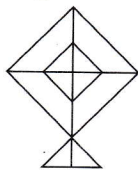


- A. B. C. D.

3. Find the missing number, if a certain rule is followed either row-wise or column-wise.

7	12	9	14
8	16	10	17
15	13	8	?

- A. 18
 B. 19
 C. 16
 D. 20
4. Find the minimum number of straight lines required to draw the given figure.



- A. 9
 B. 10
 C. 11
 D. 12
5. In a row, Navya is 7th from the left end and 15th from the right end. How many people are there in the row?
- A. 22
 B. 20
 C. 24
 D. 21
6. Group the given figures into three classes on the basis of their identical properties using each figure only once.

- A. 1, 5, 8; 2, 4, 9; 3, 6, 7
 B. 1, 6, 7; 2, 3, 4; 5, 8, 9
 C. 1, 6, 7; 2, 5, 9; 3, 4, 8
 D. 1, 6, 9; 2, 4, 7; 3, 5, 8

7. Shruti is the daughter of Lalit, who is the son of Raj. Nidhi is the sister of Shruti. How is Nidhi related to Raj?

- A. Granddaughter
 B. Mother
 C. Niece
 D. Daughter

8. Select the correct water image of the given combination of letters and numbers.

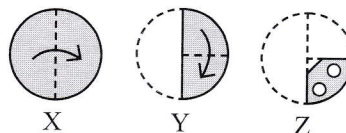
45CMSQ2

- A. †2CM202
 B. †20W205
 C. †2CWS05
 D. †2CW205

9. If '\$' stands for '×', '@' stands for '+', '#' stands for '÷' and '*' stands for '-', then find the value of $7 @ 15 \# 3 \$ 6 * 2$.

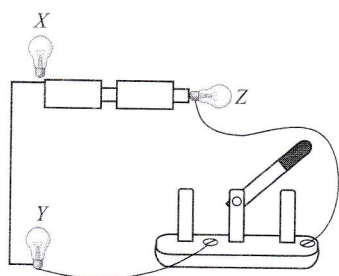
- A. 39
 B. 25
 C. 28
 D. 35

10. The given 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.

11. An electrical circuit containing three bulbs X , Y and Z is given below.



When the switch is closed, the glowing bulb(s) is/are

- A. X only
 B. X and Z only
 C. Y and Z only
 D. X , Y and Z
12. Match column I with column II and select the correct option from the given codes.

Column I

Column II

- | | |
|------------|--|
| P. Uranus | (i) Takes 88 days to complete one revolution around the Sun and does not have any natural satellite |
| Q. Pluto | (ii) Has only one natural satellite and existence of the life |
| R. Mercury | (iii) Made up of gases and ice and takes 84 earth years to revolve around the Sun |
| S. Earth | (iv) Was a planet but now classified as a dwarf planet
(v) Has faint rings and takes 165 earth years to revolve |

- A. P-(v); Q-(ii); R-(iii); S-(i)
 B. P-(iv); Q-(iii); R-(ii); S-(i)
 C. P-(v); Q-(iv); R-(iii); S-(ii)
 D. P-(iii); Q-(iv); R-(i); S-(ii)

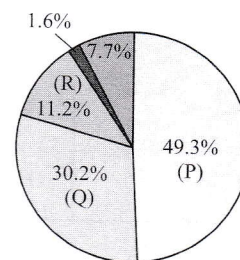
13. Read the given statements and select the correct option.

Statement 1 : The axis passing through geographical north and geographical south coincides with the axis passing through magnetic north and magnetic south.

Statement 2 : Magnetic field of the Earth is considered due to iron and nickel present in the crust of the Earth.

- 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 but statement 2 is false.
 D. Both statements 1 and 2 are false.

14. The given pie chart represents energy generation in India by different sources. Select the correct set of sources with their approximate percentage energy generation contribution.



Energy generation in India (2023)

- A. (P) – Wind + Solar; (Q) – Hydro; (R) – Geothermal
 B. (P) – Fossil fuels; (Q) – Wind + Solar; (R) – Hydro
 C. (P) – Solar + Wind; (Q) – Fossil fuels; (R) – Hydro
 D. (P) – Fossil fuels; (Q) – Wind + Solar
 (R) – Geothermal

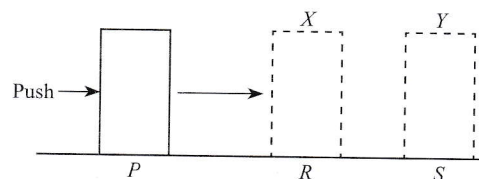
15. Read the given statements and select the option which correctly identifies them as true (T) and false (F) ones.

- (i) For a lady travelling in a bus, her co-passenger is at rest whereas a person passing nearby is in motion.
 (ii) The units like cubit, length of foot and distance of step are standard units for measurement of length.
 (iii) The value of length of 1 lakh cm is equivalent to 1 km.
 (iv) For a person travelling along a circular path, distance covered in one round will be zero.

(i) (ii) (iii) (iv)

- A. T F T F
 B. T T F F
 C. F T F T
 D. F F T T

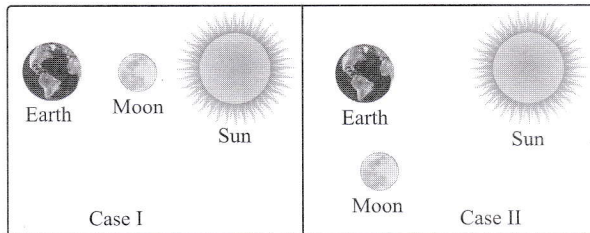
16. A person pushes two blocks, X and Y , from point P to the right. The person applies same amount of force on both the blocks but block X comes to rest at point R while block Y comes to rest at point S as shown in the given figure.



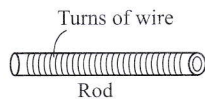
The reason(s) behind the difference in the distances travelled by blocks X and Y can be

- (i) The mass of block X is greater than that of Y
 (ii) The surface of block X is more rough than that of Y
 (iii) Block Y experiences greater frictional force than that of block X
 (iv) There are fewer number of forces acting on block Y than on block X .
- A. (i) only
 B. (i) and (ii) only
 C. (ii) and (iii) only
 D. (ii), (iii) and (iv) only.

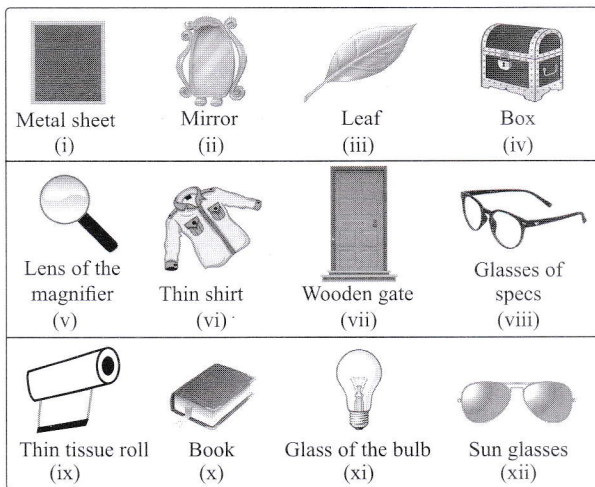
17. The given figures represent two locations of the Moon. The highest tides will form



- A. In case I only
 B. In case II only
 C. In both cases I and II
 D. Neither in case I nor in case II.
18. A wire is wrapped around a rod such that the turns are not overlapping as shown in the given figure. If length of the wire is 18 cm, and length of wire used in one turn is 0.04 mm, then the number of turns in the wrapped wire will be

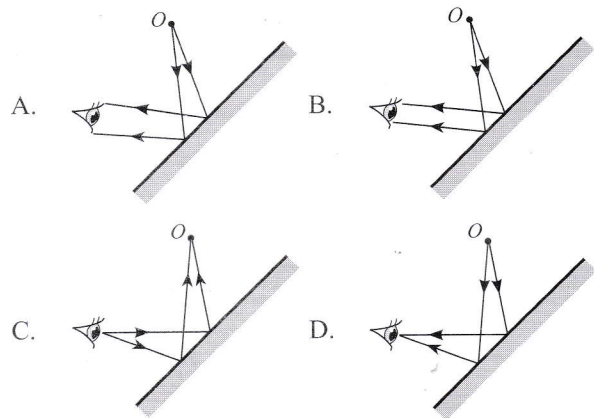


- A. 450
 B. 45000
 C. 4500
 D. 45
19. In the given figures, many objects are listed. Classify them in terms of transparent, translucent and opaque objects and select the correct option.



- | | Transparent | Translucent | Opaque |
|----|--------------|-------------|-------------|
| A. | (i), (v) | (ii), (vii) | (ii), (iii) |
| B. | (x), (xii) | (ix), (x) | (vii), (xi) |
| C. | (viii), (xi) | (ix), (xii) | (vii), (x) |
| D. | (i), (vi) | (iii), (iv) | (x), (xi) |

20. A person is observing the image of an object (O) in a mirror. The ray diagram which correctly represents the observation is



21. Read the following statements carefully and select the option that correctly identifies them as true (T) and false (F) ones.

- I. To make a cooking pan, we need a material which is heavy, brittle and good conductor of electricity.
 II. We can see partially through a frosted glass.
 III. The forces of attraction in honey are stronger than forces of attraction in an iron rod.
 IV. Oils and paints sink in water because the densities of these substances are higher than that of water.

	I	II	III	IV
A.	T	T	F	F
B.	F	T	F	F
C.	T	F	T	F
D.	F	T	F	T

22. Select the incorrect match.

- A. Conversion of solid to liquid – Melting
 B. Conversion of liquid to solid – Freezing
 C. Conversion of solid to gas – Sublimation
 D. Conversion of gas to liquid – Evaporation

23. Which of the following statements are incorrect?

- I. Larger solid particles can be separated from smaller solid particles by filtration.
 II. Cream can be separated from milk by centrifugation.
 III. A mixture of mud and water can be separated by loading, sedimentation and decantation.
 IV. Grains can be separated from husk by threshing.
- A. I and II only
 B. II and IV only
 C. I, II and III only
 D. I and IV only

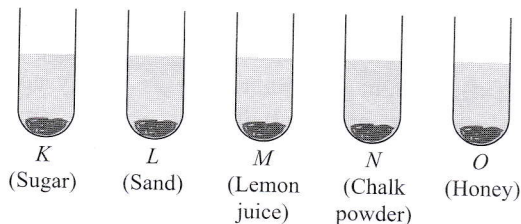
24. The following table shows the characteristics of three different objects P, Q and R.

Characteristic	Object		
	P	Q	R
Opaque	✓	✓	✓
Sinks in water	✓	✗	✓
Lustrous	✓	✗	✗

Which of the following could be *P*, *Q* and *R*?

	<i>P</i>	<i>Q</i>	<i>R</i>
A.	Book	Glass	Leaf
B.	Oil	Rubber band	Iron nail
C.	Copper rod	Coin	Paper
D.	Gold ring	Wooden block	Brick

25. Deepak, a class VI student, conducted an experiment to check the solubility of few common substances in water.

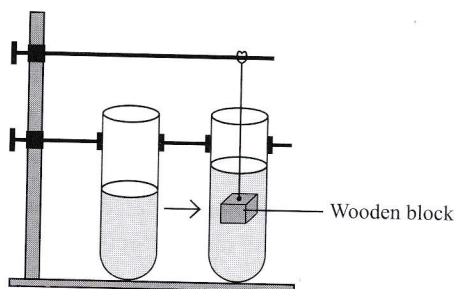


Which of the following statements are incorrect regarding the above experiment?

- Components will disappear completely in test tubes *L* and *M*.
 - Components in test tubes *L*, *M* and *N* are completely soluble in water.
 - Components in test tubes *K*, *M* and *O* are insoluble in water.
 - Components in test tubes *K* and *O* will disappear completely.
- A. II and IV only
 B. I and III only
 C. I, II and III only
 D. I and II only
26. Brass is a solution of
- A. Solid in liquid
 B. Liquid in solid
 C. Solid in solid
 D. Gas in solid.

27. Which of the following statements is correct?
- A. A soluble material does not disappear in water.
 B. Oil is completely miscible with water.
 C. A soft material can be scratched easily.
 D. Air is a heterogeneous mixture.

28. Observe the given experimental set-up carefully and select the correct statement.



The rise in the volume of water after dropping the wooden block suggests that the wooden block has

- A. Volume same as that of water

- B. No volume
 C. Mass and it occupies space
 D. Density lower than that of water.

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

Column I (Mixture)	Column II (Method of separation)
P. Kidney beans and wheat flour	(i) Separating funnel
Q. Mustard oil and water	(ii) Magnetic separation
R. Camphor and salt	(iii) Centrifugation
S. Rice flour and iron pins	(iv) Sieving
T. Fat from milk	(v) Sublimation

A. P-(iv); Q-(i); R-(ii); S-(v); T-(iii)
 B. P-(iv); Q-(i); R-(v); S-(ii); T-(iii)
 C. P-(v); Q-(i); R-(iv); S-(iii); T-(ii)
 D. P-(ii); Q-(iii); R-(i); S-(iv); T-(v)

30. Select the incorrect matches.

(i)	Simple carbohydrate – Fructose
(ii)	Protein – Milk
(iii)	Complex carbohydrate – Sucrose
(iv)	Fat – Pulses

- A. (ii) and (iv) only
 B. (iii) and (iv) only
 C. (i), (iii) and (iv) only
 D. (i), (ii) and (iv) only

31. Refer to the given table and select the correct option regarding *X*, *Y* and *Z*.

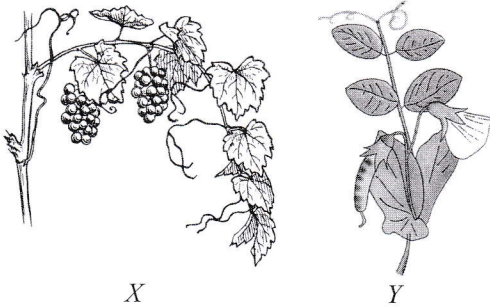
Mineral	Importance
<i>X</i>	Helps in proper functioning of nervous system
<i>Y</i>	Helps in formation of haemoglobin
<i>Z</i>	Helps in keeping bones and teeth strong

- | | <i>X</i> | <i>Y</i> | <i>Z</i> |
|----|----------|------------|----------|
| A. | Fluorine | Phosphorus | Calcium |
| B. | Sodium | Iron | Calcium |
| C. | Iron | Iodine | Sodium |
| D. | Fluorine | Sodium | Iodine |

32. Ritika took crushed food sample *P* in a test tube and added few drops of water to it. Then she added two drops of copper sulphate and ten drops of caustic soda to it. She then shook the test tube for few minutes and found that the food sample turned purple in colour. Food sample *P* could be

- A. Butter
 B. Rice
 C. Banana
 D. Egg.

33. Refer to the given figures X and Y and select the incorrect statement regarding them.



- A. In X, stem is modified to form tendril whereas in Y leaf is modified to form tendril.
 B. Both X and Y are weak-stemmed plants.
 C. X type of tendrils are also found in passion flower whereas Y type of tendrils are also found in *Gloriosa*.
 D. In X, leaf is modified to form tendril whereas in Y, stem is modified to form tendril.
34. Read the given statements and select the incorrect one.
 A. Roots of plants are usually negatively phototropic and positively geotropic.
 B. Underwater, crocodiles breathe through gills.
 C. Carbon dioxide produced during respiration is utilised by plants during photosynthesis.
 D. Rose and mint are propagated by stem cuttings.

35. Select the correctly matched pair.
 A. Herb – Rose, Tomato
 B. Creeper – Grapevine, *Bougainvillea*
 C. Climber – Pea, Money plant
 D. Shrub – Wheat, Mint

36. Identify the plant in the given figure and select the correct statement regarding it.
-
- A. It has stems with air pockets to help it float in water.
 B. Its leaves are devoid of stomata.
 C. It is rooted in the soil at the bottom of the water body.
 D. All of these

37. Unscramble the given letter groups to get the name of a phenomenon which is responsible for the formation of dew.
 A. OSNTCIENDANO
 B. MLUSBITAOIN
 C. IVRTAAOONEP
 D. SAXEPNOIN

38. Which of the following is not a way to reduce air pollution?
 A. Planting more and more trees

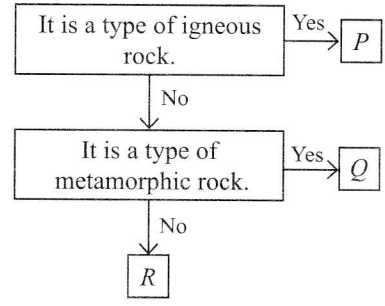
- B. Treating sewage before dumping it into a water body
 C. Using LPG and CNG instead of fossil fuels
 D. Regularly checking vehicles for emission of harmful gases

39. Which of the following statements is/are incorrect?
 (i) Fats deposited in our body act as shock absorbers and protect us from injury.
 (ii) Kwashiorkor is caused by deficiency of protein, carbohydrate and fat.
 (iii) Roughage neither releases energy nor helps in tissue or body building.
 (iv) Starch containing food items turn bluish-black in colour on undergoing iodine test.
 A. (i) and (ii) only
 B. (ii) only
 C. (iii) only
 D. (ii) and (iv) only

40. Select the odd one out on the basis of body covering.
 A. Penguin
 B. Swallow
 C. Toucan
 D. Armadillo

41. What should not be done in case of a severe burn?
 A. Prick the blisters that are formed.
 B. Make a wet compress using baking soda solution and apply it over the burnt area.
 C. Immerse the burnt part in cold water.
 D. Remove jewellery before the formation of blisters.

42. Refer to the given flow chart and select the option that correctly identifies P, Q and R.

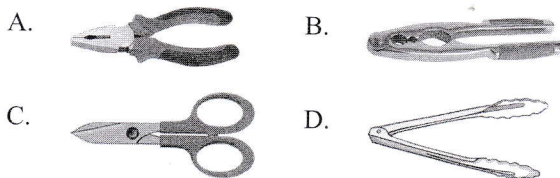


- | | P | Q | R |
|----|----------|-----------|-----------|
| A. | Basalt | Limestone | Pumice |
| B. | Obsidian | Slate | Shale |
| C. | Marble | Sandstone | Gneiss |
| D. | Granite | Basalt | Quartzite |

43. Read the given statements related to a planet carefully and select the option that correctly identifies the hindi name of the planet.
 I. It is the second largest planet in the Solar System.
 II. It takes about 30 years to revolve around the Sun.
 III. It has prominent rings of ice and rocks around it.

- A. Shukra
- B. Arun
- C. Shani
- D. Varun

44. Which of the following is an example of second class lever?



45. The given table represents characteristics of three objects *a*, *b* and *c*.

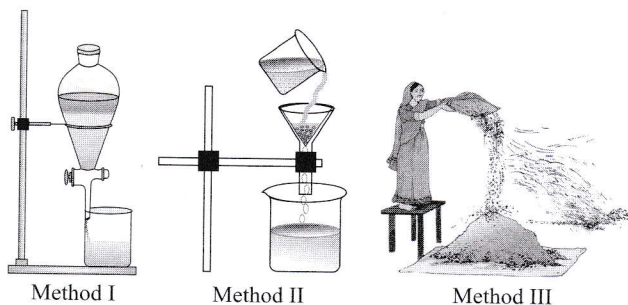
Characteristic	Object		
	<i>a</i>	<i>b</i>	<i>c</i>
Transparent	✓	✗	✗
Hard	✓	✓	✓
Magnetic	✗	✓	✗

Select the option that correctly identifies objects *a*, *b* and *c*.

- | | <i>a</i> | <i>b</i> | <i>c</i> |
|----|-----------------|--------------|--------------|
| A. | Paper bag | Coin | Feather |
| B. | Thermocol sheet | Rubber band | Jute carpet |
| C. | Ceramic tile | Plastic ball | Wax candle |
| D. | Glass tumbler | Iron nail | Ceramic bowl |

ACHIEVERS SECTION

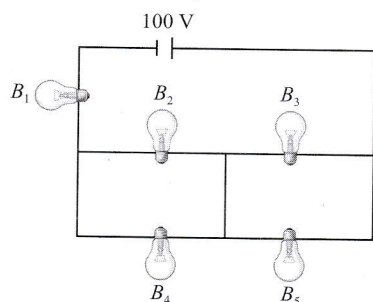
46. Observe the given figures carefully and select the correct statements.



- (i) Method (I) can be used to separate platelets from blood plasma.
- (ii) Method (II) can be used to separate a mixture containing an insoluble solid and a liquid.
- (iii) Method (III) is used to separate grains from stalks and kidney beans from flour.
- (iv) Method (I) can be used to separate a mixture of kerosene and water and method (II) can be used to separate a mixture of sand and water.

- A. (i) and (iii) only
- B. (i) and (iv) only
- C. (ii) and (iv) only
- D. (i), (iii) and (iv) only

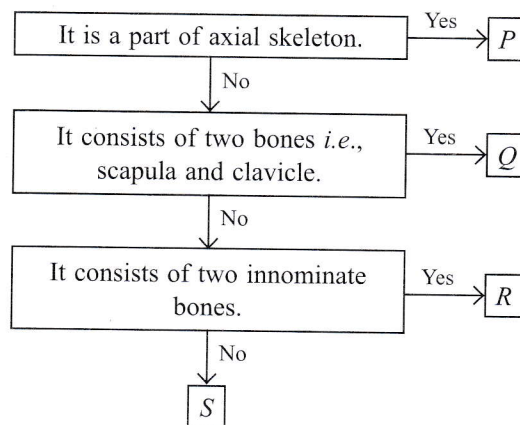
47. Five identical bulbs are connected in the circuit as shown in the given figure.



Which of the following would occur if the bulb B_2 has blown?

- | | B_1 | B_3 | B_4 | B_5 |
|----|----------|----------|----------|----------|
| A. | Dimmer | Brighter | Dimmer | Dimmer |
| B. | Dimmer | Dimmer | Brighter | Brighter |
| C. | Brighter | Dimmer | Brighter | Dimmer |
| D. | Dimmer | Dimmer | Brighter | Dimmer |

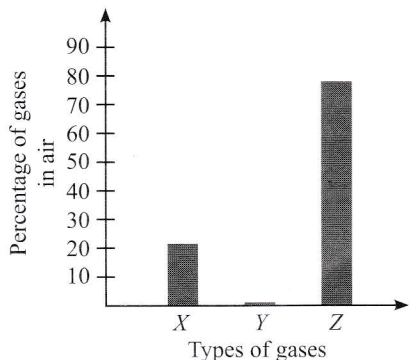
48. Refer to the given flow chart.



Identify *P*-*S* and select the correct statement regarding them.

- A. *P* could help us to move our neck whereas *Q* provides protection to our brain.
- B. *R* supports the posterior region of the trunk whereas *Q* helps in the movement of the shoulder and arms.
- C. *R* protects the heart and lungs whereas *S* could be 30 in total in each forelimb.
- D. *P* could be longer in length to support the weight of the body whereas *S* protects the delicate spinal cord.

49. Identify X , Y and Z in the given graph showing percentage of different gases in air and select the incorrect statement regarding them.



- A. Gas X helps to convert the food that we eat into energy whereas gas Y helps to keep the Earth warm by trapping the heat radiated from the Earth.
 B. Gas Z does not support combustion whereas gas X supports the process of burning.

- C. Gas Z is used in food packaging to keep the food fresh whereas gas Y is used to extinguish fire.
 D. Gas Z is required by plants to perform photosynthesis whereas gas X is an important component of fertilisers.

50. Refer to the given dichotomous key.
- I. (a) It is a type of vitamin. – Go to II
 (b) It is a type of mineral. – Go to III
 - II. (a) It is fat soluble. – P
 (b) It is water soluble. – Q
 - III. (a) It is the main constituent of thyroxine. – R
 (b) It is found mainly in common salt. – S
- Identify P - S and select the correct statement regarding them.
- A. Deficiency of P could cause scurvy.
 B. Deficiency of Q could cause rickets in children.
 C. Deficiency of R causes anaemia.
 D. Deficiency of S causes hyponatremia.

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