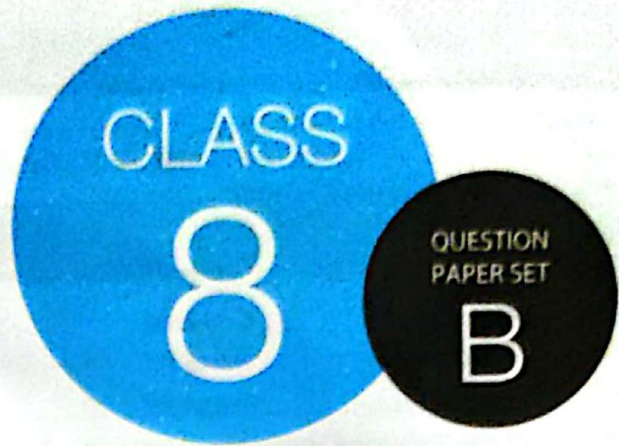




SOF NATIONAL SCIENCE
OLYMPIAD 2022-23



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, 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.

16.	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
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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.



Name:.....

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

1. There is a certain relationship between the numbers on either side of ::. Establish the relation on the left pair and find the missing number.

$$343 : 7 :: 729 : \underline{\quad ? \quad}$$

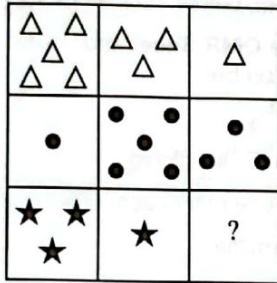
- A. 6
- B. 8
- C. 9
- D. 10

2. Which of the following options will continue the given series?

$$ABC, GHI, MNO, \underline{\quad ? \quad}$$

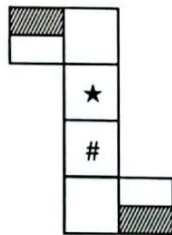
- A. PQR
- B. QRS
- C. RST
- D. STU

3. Select a figure from the options which will complete the given figure matrix.



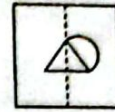
- A.
- B.
- C.
- D.

4. Select a box from the options that is similar to the box formed when the given sheet of paper is folded to form a box.



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

5. A sheet of paper is folded in a particular manner and a punch is made as shown. Select a figure from the options as to how the pattern would appear when the transparent sheet is folded along the dotted line.



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

6. How many such pairs of letters are there in the word INTERVIEW which have as many letters between them in the word as in the English alphabets?

- A. 2
- B. 3
- C. 4
- D. 5

7. In a certain code language, HEAR is written as 160. How will BORN be written in the same code language?

- A. 180
- B. 300
- C. 245
- D. 210

8. Select the correct water image of the given figure.



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

9. In a row of boys, Vinay is 10th from the right end and Sunil is 15th from the left end. When they interchange their positions, Vinay becomes 17th from the right end. How many total number of boys are there in the row?

- A. 30
- B. 31
- C. 32
- D. 33

10. Rashmi walked 4 m towards North, turned West and walked 3 m, then turned North again and walked 2 m and then turned East and walked 11 m. How far away is she now from the starting point?

- A. 10 m
B. 15 m
C. 12 m
D. 18 m

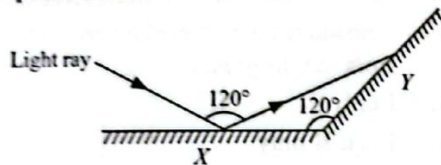
SCIENCE

11. Various forces are acting on a block of mass m as shown in the given figure. Find the value of F for which the block is at rest.



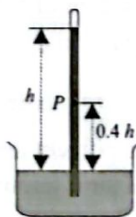
- A. 15 N
B. 10 N
C. 5 N
D. 0

12. The diagram shows a ray of light reflected by two plane mirrors X and Y . The angle between the incident ray and the reflected ray from the plane mirror X is 120° . What is the angle of reflection of the light ray due to plane mirror Y ?



- A. 60°
B. 50°
C. 45°
D. 55°

13. The diagram shows a simple mercury barometer. The mercury level is at a height h , when the atmospheric pressure is 100000 Pa.



What is the pressure at point P ?

- A. 40000 Pa
B. 60000 Pa
C. 100000 Pa
D. 140000 Pa

14. The magnitude of an earthquake is measured on Richter scale. Column I shows the intensity of an earthquake and column II shows the category of the earthquake. Match column I with column II and select the correct option from the given codes.

Column I

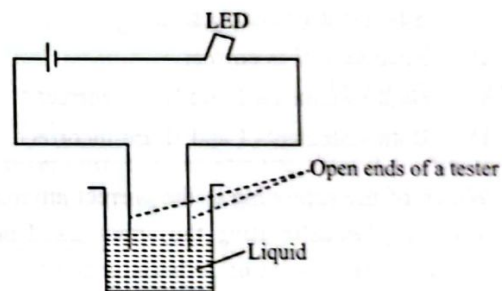
- P. 7.0 to 7.9
Q. 5.5 to 6.0
R. 8.0 or above
S. 6.1 to 6.9

Column II

- (i) Great
(ii) Major
(iii) Strong
(iv) Moderate

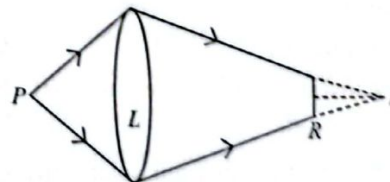
- A. P - (ii), Q - (iv), R - (i), S - (iii)
B. P - (i), Q - (ii), R - (iii), S - (iv)
C. P - (iv), Q - (ii), R - (iii), S - (i)
D. P - (iii), Q - (ii), R - (iv), S - (i)

15. A tester consisting of a battery and an LED with open ends dipped in a liquid, is as shown in the given figure. It is observed that even after some time, LED does not glow. This could be due to the liquid being



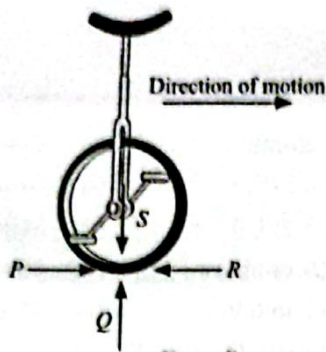
- A. Sea water
B. Molten iron
C. Vinegar
D. Pure cold water.

16. In the given figure, if P is a point source of light, R is retina, L is the lens in the eye and I is the image formed then, the person having such condition of his/her eye, is suffering from



- A. Hypermetropia
B. Myopia
C. Cataract
D. Night blindness.

17. A unicycle is being peddled and is moving in the direction as shown in the given figure. The direction which indicates the frictional force acting on the wheel is



- A. R
B. P
C. S
D. Q

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

Statement I : Laws of reflection is obeyed in regular reflection.

Statement II : Laws of reflection is obeyed in irregular reflection.

- A. Statement I is correct.
B. Statement II is correct.
C. Both statements I and II are correct.
D. Both statements I and II are incorrect.

19. Which of the following is the correct environmental condition for calibrating the upper fixed point and the lower fixed point on a thermometer?

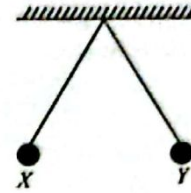
Upper Fixed Point	Lower Fixed Point
A. Steam from boiling water	Ice at minimum temperature
B. Boiling water	Melting ice
C. Steam from boiling water	Melting ice
D. Boiling water	Ice at minimum temperature

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

Column I	Column II
P. Closest celestial object to the Earth	(i) New Moon
Q. Galaxy to which our solar system belongs	(ii) Constellations
R. Recognisable patterns of stars in the sky	(iii) Moon
S. The phase when the moon is totally invisible	(iv) Milky Way
	(v) Crescent

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

21. A simple pendulum is released from one of its extreme positions, X. After 0.6 s, it reaches to another extreme position Y. The time taken by the pendulum to make twelve oscillations is



- A. 14.4 s
B. 12.2 s
C. 7.2 s
D. 10 s

22. Identify the correct statement(s) about tornadoes.

- I. Violent tornado can travel at a speed of 300 km/h.
II. Tornado may form within cyclones.
III. Tornado is a dark funnel shaped cloud that reaches from sky to ground.

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

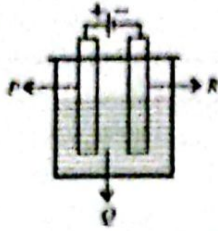
23. An object at rest is allowed to fall from a tall tower. Which of the following statements is true for the motion of the object upon its release?

- A. The acceleration of the object increases.
B. The acceleration of the object decreases.
C. The acceleration of the object remains same.
D. The velocity of the object remains same.

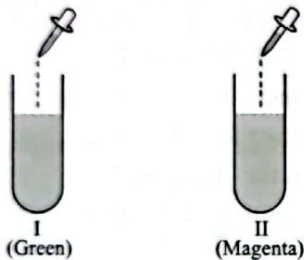
24. Select the incorrect statements for the usage of a fuse.

- I. It is used to prevent the current from coming out from the neutral terminal.
II. It is used to prevent damage to electrical appliances by melting, whenever current exceeds the maximum value.
III. It is used to prevent the current from coming out from the live terminal.
IV. It is used to allow current to discharge to the Earth.
- A. I and III only
B. I, III and IV only
C. II, III and IV only
D. II and III only

25. In the given figure, electrolyte, anode and cathode respectively are



- A. P, Q and R
 B. Q, P and R
 C. Q, R and P
 D. P, R and Q
26. Which zone of the flame is used by goldsmith to melt silver and gold?
- A. Middle zone
 B. Outermost zone
 C. Innermost zone
 D. Either A or C
27. The given figure shows the colour changes in test tubes, I and II, when China rose indicator is added to them. The solutions present in test tubes I and II are respectively



- A. Spinach juice and washing soda
 B. Lime water and glucose solution
 C. Window cleaner and apple juice
 D. Sugar solution and tamarind juice.
28. Observe the given figure carefully.



Which of the following represents the correct order of temperature range in different zones of the candle flame?

- A. $Y > X > Z$
 B. $Z > Y > X$
 C. $X > Y > Z$
 D. None of these

29. Which of the following changes have been classified correctly?

- I. Rusting of iron - Physical, irreversible change
 II. Digestion of food - Chemical, irreversible change
 III. Cooking of food - Physical, reversible change
 IV. Woollen yarn to - Physical, reversible change knitted sweater

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

30. Read the following statements carefully.

X : It is a fossil fuel used in thermal power plants to produce electricity.

Y : It is a porous, black and almost pure form of carbon.

Z : It is a mixture of about 200 substances.

X, Y and Z are respectively

- A. Petroleum, coal gas, coke
 B. Coal, coke, coal tar
 C. CNG, bitumen, diesel
 D. Coal gas, petrol, paraffin wax.

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

Statement 1 : Great care should be taken while handling strong acids and bases in the laboratory.

Statement 2 : Strong acids and bases are corrosive in nature, irritating and harmful for skin.

- A. Both statement 1 and statement 2 are true and statement 2 is the correct explanation of statement 1.
 B. Both statement 1 and statement 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 statement 1 and statement 2 are false.

32. Identify the substances S, T, U and V from the following description.

S - Used in the manufacture of steel

T - Used to obtain naphthalene balls

U - Was used for street lighting

V - Fuel for home and industry

- | | S | T | U | V |
|----|----------|-----------|----------|--------|
| A. | Coal gas | Coal tar | Bitumen | CNG |
| B. | Coal tar | Coal gas | Coke | LPG |
| C. | Coke | Water gas | Coal tar | Petrol |
| D. | Coke | Coal tar | Coal gas | LPG |

33. Which of the following statements are true?

- (i) Luminous zone is the zone of complete combustion
 - (ii) Dark zone is the least hot zone of a candle flame.
 - (iii) Incomplete combustion occurs in the non-luminous zone of a candle flame.
 - (iv) Non-luminous zone is the hottest part of the candle flame.
- A. (i) and (iv) only
 B. (ii) and (iii) only
 C. (ii) and (iv) only
 D. (ii), (iii) and (iv) only

34. Rust and Smut diseases of wheat are caused by _____.

- A. Protozoa
 B. Bacteria
 C. Fungi
 D. Virus

35. Identify the odd one out from the following and select the correct option.

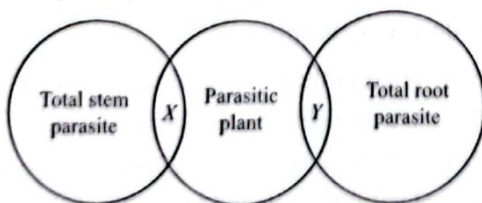
- (i) *Spirogyra*, *Ulothrix*, *Gelidium*
- (ii) *Sargassum*, *Laminaria*, *Polysiphonia*
- (iii) *Polysiphonia*, *Fucus*, *Gelidium*

- | | (i) | (ii) | (iii) |
|----|------------------|---------------------|---------------------|
| A. | <i>Gelidium</i> | <i>Polysiphonia</i> | <i>Fucus</i> |
| B. | <i>Ulothrix</i> | <i>Laminaria</i> | <i>Polysiphonia</i> |
| C. | <i>Gelidium</i> | <i>Sargassum</i> | <i>Fucus</i> |
| D. | <i>Spirogyra</i> | <i>Sargassum</i> | <i>Fucus</i> |

36. Select the correct statement regarding different zones of a biosphere reserve.

- A. Buffer zone is also known as natural zone.
 B. Limited human activity is permitted in core zone.
 C. Several human activities are permitted in manipulation zone.
 D. None of these

37. Refer to the given Venn diagram and select the correct option regarding X and Y.



- | | X | Y |
|----|------------------|------------------|
| A. | <i>Rafflesia</i> | <i>Cuscuta</i> |
| B. | <i>Nepenthes</i> | <i>Rafflesia</i> |
| C. | <i>Cuscuta</i> | <i>Rafflesia</i> |
| D. | Mistletoe | Bladderwort |

38. Read the given statements and select the option that correctly fills the blanks.

- (i) _____ reproduces through multiple fission.
- (ii) Organisms that have both male and female sex organs are called _____ organisms.
- (iii) _____ exhibits well marked sexual dimorphism.

- | | (i) | (ii) | (iii) |
|----|-------------------|---------------|--------------|
| A. | <i>Paramecium</i> | Hermaphrodite | Earthworm |
| B. | <i>Plasmodium</i> | Hermaphrodite | Human beings |
| C. | <i>Euglena</i> | Morphallaxis | <i>Hydra</i> |
| D. | <i>Plasmodium</i> | Unisexual | Human beings |

39. Which among the following are herbicides?

- (i) Malathion
- (ii) Metolachlor
- (iii) Simazine
- (iv) MCPA
- (v) Disyston
- (vi) Gammexane
- (vii) Butachlor
- (viii) 2, 4-D
- (ix) Dalapon
- (x) BHC

- A. (ii), (iii), (iv), (vii), (viii) and (ix) only
 B. (i), (ii), (iii), (iv) and (ix) only
 C. (iv), (vi), (vii), (viii) and (x) only
 D. (i), (iii), (v), (vi) and (x) only

40. Select the mismatched pair.

- A. Camel - Leathery lips
 B. Fennec fox - Large ears
 C. Macaw - Long beak
 D. Penguin - Camouflage

41. Given below is a list of names of few animals.

- (i) Angora goat
- (ii) Alpaca
- (iii) Yak
- (iv) Deer
- (v) Changthangi
- (vi) Merino sheep

How many among them yield wool?

- A. 3
 B. 4
 C. 2
 D. 5

42. Read the following statements and select the correct ones.

- (i) The seeds of *Hiptage* are dispersed by animals.
- (ii) The male gamete fuses with the female gamete to form embryo.
- (iii) Maize is a monoecious plant.
- (iv) Autogamy always occurs in bisexual flowers.

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

43. Read the given paragraph.

Organism *X* and organism *Y* live in symbiotic association in such an intimate way that they form a new structure called lichen.

X provides food to *Y* whereas *Y* helps in attachment to surface and absorption of nutrients which it provides to *X*.

Identify *X* and *Y* and select the correct statement regarding them.

- A. *X* is a eukaryote whereas *Y* is a prokaryote.
- B. *X* constitutes cell wall and *Y* is devoid of chlorophyll.
- C. Some species of *X* are responsible for causing typhoid in humans.
- D. Some species of *Y* are responsible for fixing nitrogen in root nodules of leguminous plants.

44. Which of the following organisms undergo metamorphosis?

- (i) Silk moth
- (ii) Snake

- (iii) Frog
 - (iv) Hen
 - (v) Butterfly
 - (vi) Human
 - (vii) Cat
 - (viii) Cockroach
 - (ix) Whale
 - (x) Dog
- A. (i), (ii), (iii), (v) and (x) only
 - B. (i), (iii), (v) and (viii) only
 - C. (ii), (iii), (iv) and (v) only
 - D. (iv), (vi), (vii) and (ix) only

45. Match the columns and select correct option from the given codes.

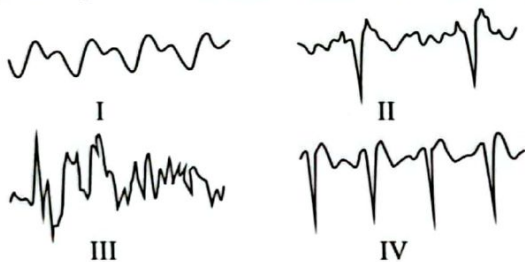
Column I (Organism)	Column II (Mode of excretion)
(i) <i>Hydra</i>	P. Uricotelic
(ii) Frog	Q. Ureotelic
(iii) Lizard	R. Ammonotelic

- A. (i)-P, (ii)-Q, (iii)-R
- B. (i)-Q, (ii)-P, (iii)-R
- C. (i)-R, (ii)-P, (iii)-Q
- D. (i)-R, (ii)-Q, (iii)-P

ACHIEVERS SECTION

Direction (Q.No. 46 and 47) : Read the given statement and answer the following questions.

Graphical representation of four sound waves are as shown.



- 46. Which sound wave represents the noise?
 - A. II
 - B. I
 - C. III
 - D. IV
- 47. Which graph represents the sound with the lowest pitch?
 - A. II
 - B. I
 - C. III
 - D. IV

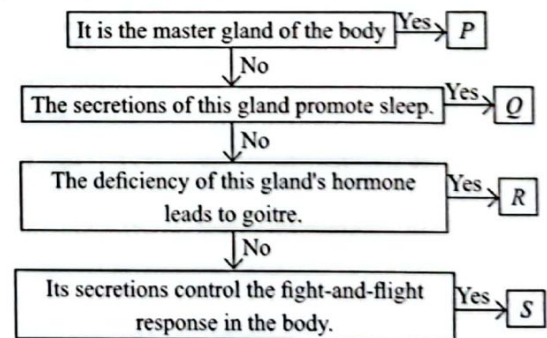
48. Refer to the given table. Identify *P-S* and select the option that correctly identifies any two of them.

Disease	Causal organism	Mode of transmission
Amoebic dysentery	<i>P</i>	Contaminated water and food
Athlete's foot	Fungus	<i>Q</i>

<i>R</i>	Bacteria	Contamination of cut and wounds
Typhoid	<i>S</i>	Contaminated water

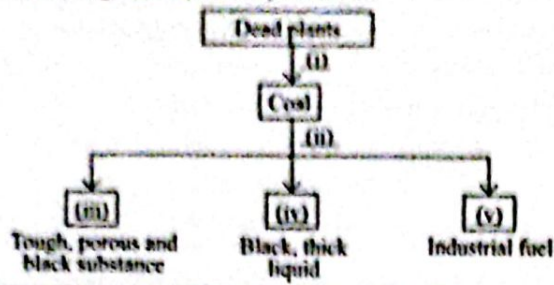
- A. *P* - Protozoa, *S* - Fungi
- B. *Q* - Air, *R* - Pneumonia
- C. *P* - Protozoa, *R* - Tetanus
- D. *Q* - Droplet infection, *S* - Protozoa

49. Refer to the given flow chart and select the correct option regarding *P*, *Q*, *R* and *S*.



- A. *P*-Pituitary gland, *Q*-Adrenal gland, *R*-Pineal gland, *S*-Thyroid gland
- B. *P*-Pituitary gland, *Q*-Pineal gland, *R*-Thyroid gland, *S*-Adrenal gland
- C. *P*-Adrenal gland, *Q*-Pineal gland, *R*-Pituitary gland, *S*-Thyroid gland
- D. *P*-Thyroid gland, *Q*-Adrenal gland, *R*-Pituitary gland, *S*-Pineal gland

50. Fill in the blanks in the following flow chart by selecting the correct option.



- | | (i) | (ii) | (iii) | (iv) | (v) |
|----|---------------|--------------------------|----------|----------|-------------|
| A. | Decomposition | Fractional distillation | Coal gas | Coke | Natural gas |
| B. | Decomposition | Destructive distillation | Coal tar | Coke | Petrol |
| C. | Carbonisation | Fractional distillation | Coal tar | Bitumen | Natural gas |
| D. | Carbonisation | Destructive distillation | Coke | Coal tar | Coal gas |

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