



Inspiring Young Minds
Through Knowledge Olympiads

CLASS

9

QUESTION PAPER SET

C



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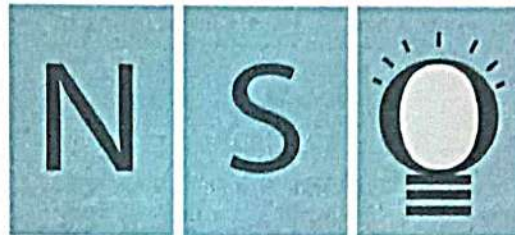
Name:

SOF Olympiad Roll No.:

Contact No.:

Total Questions: 50

Time: 1 hr.



SOF NATIONAL SCIENCE
OLYMPIAD 2022-23

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.
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.

16. ● ○ ○ ○

LOGICAL REASONING

1. Select the correct mirror image of the given combination of letters and numbers, if the mirror is placed vertically to the left.

2 6 J A N 5 4 R E P L

- A. J P E R F A N 2 1 0 5
 B. J E P R F 2 N A 1 0 5
 C. J P E R F 2 N A 1 0 5
 D. J P E R F 2 N A 1 0 5

2. Five friends, A, B, C, D and E are sitting in a row facing North. C is third to the right of E who is not at any extreme end. D is also not at any extreme end. B is sitting between E and D. Then who is sitting in the middle of the row?

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

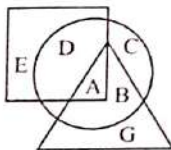
3. Pointing to a man in the photograph, a woman says, "He is the son of my brother's grandfather's only son." How is that man related to the woman?

- A. Brother B. Uncle
 C. Father D. Brother-in-law

4. If first 13 letters of the English alphabets are written in reverse order and then next 13 letters are also written in reverse order, then which of the following will be the 4th letter to the left of the 15th letter from the left end?

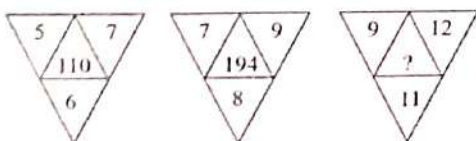
- A. C B. T
 C. B D. S

5. In the given Venn diagram, circle represents politicians, triangle represents teachers and square represents females. Which of the following letters represents the female politicians but not teachers?



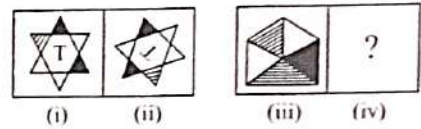
- A. C B. D
 C. A D. B

6. Find the missing number, if same rule is followed in all the three figures.



- A. 128 B. 1024
 C. 346 D. 111

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



- A. B.
 C. D.

8. Choose the correct order of signs from the options given below, so that the equation becomes correct.

$$25 \square 3 \square 14 \square 2 \square 4$$

- A. -, ×, =, ÷ B. -, ×, ÷, =
 C. -, ÷, ×, = D. ÷, -, ×, =

9. A square transparent sheet with a pattern and a dotted line on it is shown here. 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.

10. Study the following arrangement carefully and answer the question given below:

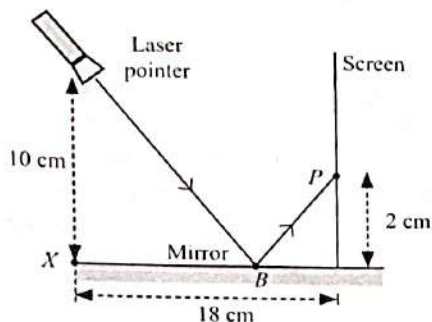
F 4 © J 2 E % M P 5 W 9 @ I Q R 6 U H 3 Z 7 * A
 T B 8 V # G S Y D

How many such consonants are there in the above arrangement, each of which is immediately preceded by a number and also immediately followed by a number?

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

SCIENCE

11. A light ray from a laser pointer is incident on a plane mirror and the reflected ray strikes a screen at point P as shown in the given figure. Find the distance BX .



- A. 12 cm B. 15 cm
C. 9 cm D. 10 cm

12. Match the situations given in column I with the possible curves in column II and select the correct option from the given codes.

Column I

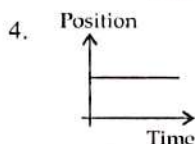
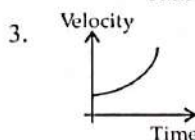
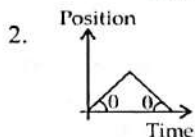
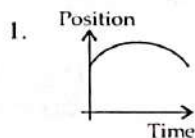
P. Particle is moving with constant speed

Q. Particle is moving with increasing acceleration

R. Particle is moving with retardation

S. Particle is stationary

Column II

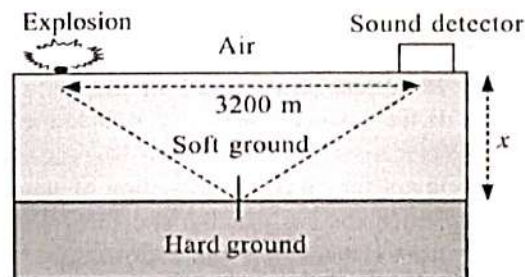


- A. P-1, Q-2, R-3, S-4
B. P-3, Q-1, R-4, S-2
C. P-2, Q-3, R-4, S-1
D. P-2, Q-3, R-1, S-4

13. An object is dropped from a tower of height $3H$. The ratio of the time intervals T_1 , T_2 and T_3 respectively to cover three equal heights H is

- A. 3 : 2 : 1
B. $1 : (\sqrt{2} - 1) : (\sqrt{3} - \sqrt{2})$
C. 1 : 2 : 3
D. $1 : (\sqrt{2} - 1) : (\sqrt{3} - 2)$

14. An explosion takes place at a distance of 3200 m away from a sound detector that detects only the sound coming from the ground as shown in the given figure.



The sound detector detects two sound signals at 0.64 s and 0.80 s after the explosion. Find the depth x of the soft ground.

- A. 1200 m B. 2400 m
C. 3200 m D. 5000 m

15. Which of the following statements is/are true?

- (i) The time period between the full Moon to the next full Moon is slightly lesser than 27 days.
(ii) The Sun is nearly 100 million km away from the Earth.
(iii) Orbital plane and axis of the Earth's rotation is inclined at an angle of 23.5° .
(iv) The period of revolution of Halley's comet is 86 years.
- A. (i), (ii) and (iii) only
B. (ii) only
C. (iv) only
D. (iii) only

16. If the mass of the Sun were ten times smaller and gravitational constant G were ten times larger in magnitudes, then which one of the following statements is incorrect?

- A. Walking on ground would become more difficult.
B. The acceleration due to gravity on Earth will not change.
C. Raindrops will fall much faster.
D. Airplanes will have to travel much faster.

17. Three blocks P , Q and R , of masses 4 kg, 2 kg and 1 kg respectively, are in contact on a frictionless surface, as shown in the given figure. If a force of 14 N is applied on the 4 kg block (as shown by arrow), then find the contact force between P and Q .



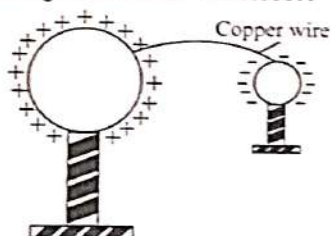
- A. 4 N B. 6 N
C. 8 N D. 10 N

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

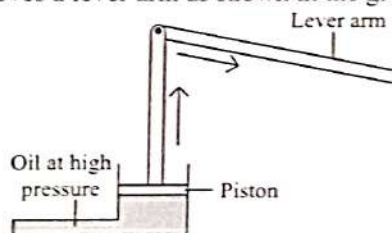
Statement 1 : Potential energy of a stretched or compressed spring is directly proportional to the square of extension or compression.

Statement 2 : Graph between potential energy of a spring versus the extension or compression of the spring is a straight line.

- 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.
19. A large positively charged metal sphere is connected to a small negatively charged metal sphere by a piece of copper wire as shown in the given figure. Which of the following statements is correct?

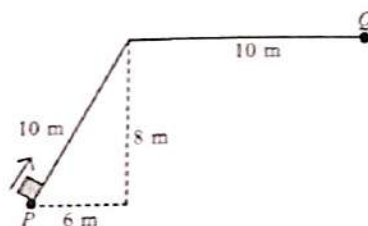


- A. The large sphere will acquire a net negative charge.
 B. The charges on the small sphere will be neutralized.
 C. A momentary conventional current will flow from the small sphere.
 D. Both the spheres will be at the same potential after equilibrium is established.
20. The rudder of a large ship is operated hydraulically. Oil at high pressure exerts a force F on a piston that in turn moves a lever arm as shown in the given figure.



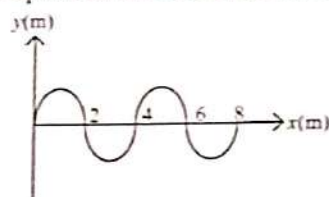
The oil is at a pressure of 500 kPa and the surface area of the piston is 0.20 m^2 . Find the value of F .

- A. 100 N B. 2500 N
 C. 100000 N D. 250000 N
21. A box of 5 kg mass moves up a ramp from point P to point Q at a constant speed as shown in the given figure. What is the gain in the potential energy of the box? (Take $g = 10 \text{ m/s}^2$)
 Given that, all the surfaces are smooth (frictionless).

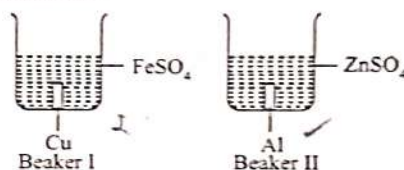


- A. 400 J B. 100 J
 C. 200 J D. 220 J

22. The rate of vibrations of the given sound wave (see figure) is 80 vibrations per second in a medium. What is the speed of sound in the medium?



- A. 320 m/s B. 300 m/s
 C. 340 m/s D. 360 m/s
23. Mr. Rahul, a science teacher performed the experiment as shown below :



Select the correct statement regarding it.

- A. The reaction will occur in beaker I and not in beaker II.
 B. The reaction will not occur in both the beakers.
 C. The reaction will not occur in beaker I, but will occur in beaker II.
 D. The reaction will occur in both the beakers.
24. The average atomic mass of boron is 10.8 u. If the isotopic mass of B-10 is 10.013 and that of B-11 is 11.009, then the relative abundance of these isotopes is respectively
- A. 80.1% and 19.9%
 B. 11% and 89%
 C. 20.98% and 79.02%
 D. 10.001% and 89.9%

25. Which of the following represents an incorrect match?
- A. Hottest part of the flame – Outermost zone ✓
 B. Consists of unburnt wax vapours – Luminous zone
 C. Least hot part of the flame – Dark zone ✓
 D. Zone of incomplete combustion – Middle zone

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

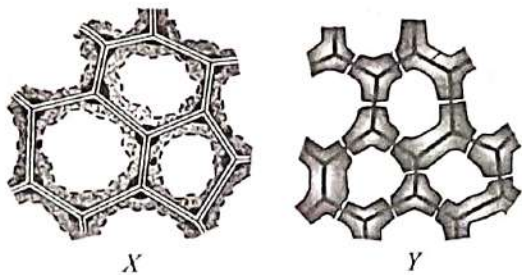
Column I		Column II	
(i) Lysosome	p.	Robert Brown	
(ii) Nucleus	q.	Robert Hooke	
(iii) Ribosome	r.	C. de Duve	
(iv) Plant cell wall	s.	George Palade	

- A. (i)-r, (ii)-p, (iii)-s, (iv)-q
 B. (i)-r, (ii)-q, (iii)-p, (iv)-s
 C. (i)-q, (ii)-p, (iii)-s, (iv)-r
 D. (i)-s, (ii)-r, (iii)-q, (iv)-p

34. Select the correct match.

Plastid	Storage product
A. Amyloplast	- Fatty acids
B. Elaioplast	- Lipids
C. Aleuroplast	- Starch
D. Chromoplast	- Proteins

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



- A. Cells of X are living whereas that of Y are dead.
 B. Cells of X have non-uniform wall thickening whereas Y have uniform wall thickening.
 C. Cells in X are empty with narrow lumen whereas in Y are filled with protoplasm.
 D. Cells of X manufacture sugar and may store it as starch whereas Y provides protective covering around seeds and nuts.

36. Refer to the given table of differences between tendons and ligaments.

	Tendons	Ligaments
I.	They are very tough and inelastic.	They are strong but elastic.
II.	They connect skeletal muscles with the bones.	They connect bones to other bones at joints.
III.	They are made up of yellow fibrous connective tissue.	They are made up of white fibrous connective tissue.
IV.	Fibroblasts lie scattered.	Fibroblasts occur in rows.

- Select the option that correctly identifies the incorrect pair of differences.

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

37. Given below is a list of few crops.

Paddy, Soybean, Pea, Mustard, Cotton, Wheat

How many of these are rabi crops?

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

38. Which among the following is an indigeneous breed of buffalo?

- A. Jaffrabadi
 B. Nageri
 C. Sahiwal
 D. Gir

39. The process shown in the given figure is



- A. Harvesting
 B. Threshing
 C. Winnowing
 D. Ploughing.

40. Select the group that contains only the micronutrients essential for plant growth.

- A. Sulphur, Molybdenum, Phosphorus
 B. Zinc, Copper, Manganese
 C. Magnesium, Iron, Potassium
 D. Boron, Chlorine, Calcium

41. Read the given passage and select the option that correctly fills in the blanks.

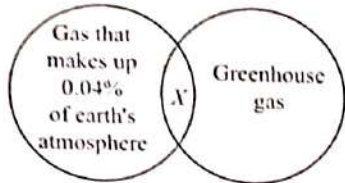
Some bacteria convert atmospheric nitrogen into nitrogenous compounds. (i) and (ii) are free living nitrogen fixing bacteria. (iii) lives in root nodules of leguminous plants and helps to fix atmospheric nitrogen.

- | (i) | (ii) | (iii) |
|-----------------------|--------------------|--------------------|
| A. <i>Nostoc</i> | <i>Anabaena</i> | <i>Azotobacter</i> |
| B. <i>Rhizobium</i> | <i>Nostoc</i> | <i>Anabaena</i> |
| C. <i>Azotobacter</i> | <i>Rhizobium</i> | <i>Nostoc</i> |
| D. <i>Azotobacter</i> | <i>Clostridium</i> | <i>Rhizobium</i> |

42. Embryo gets embedded in the soft and thick lining of uterus, this process is called _____.

- A. Parturition B. Implantation
C. Gestation D. Brooding

43. Refer to the given Venn diagram and select the correct statement regarding X.



- A. Deforestation could reduce excessive amount of X in atmospheric air.
B. X is produced by burning of fossil fuels.
C. X could react with ozone gas of the atmosphere and destroy it gradually.
D. Inhaling excessive X could cause bronchitis and lung cancer.

44. Which of the following is not an effect of deforestation?

- A. Biodiversity loss B. Global warming
C. Soil erosion D. None of these

45. Match column I (Biosphere Reserve/National Park) with column II (Location) and select the correct option from the given codes.

Column I	Column II
(i) Kanha National Park	P. Arunachal Pradesh
(ii) Namdapha National Park	Q. Meghalaya
(iii) Nokrek Biosphere Reserve	R. Uttarakhand
(iv) Nanda Devi Biosphere Reserve	S. Madhya Pradesh

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

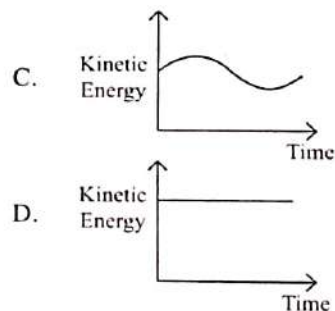
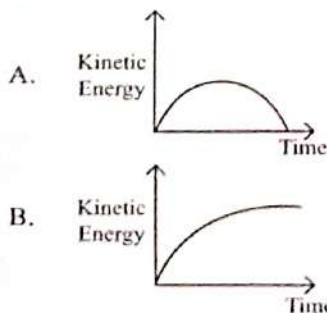
ACHIEVERS SECTION

46. Fill in the blanks by selecting an appropriate option.

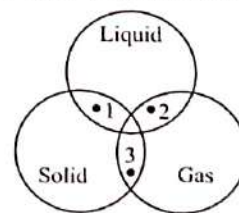
Earthquakes generate sound waves inside the Earth. Unlike gas, the Earth can experience both transverse (T) and longitudinal (L) waves. Typically the speed of transverse waves is 4 km s^{-1} and that of longitudinal waves is 8 km s^{-1} . A (i) records T and L waves from Earthquakes. The first (ii) wave arising from Earthquakes at a distance of (iii) km arrives four minutes before the first (iv) wave. Assume that the waves travel in straight line.

	(i)	(ii)	(iii)	(iv)
A.	Richter scale	L	1140	T
B.	Seismograph	T	1100	L
C.	Richter scale	T	1745	L
D.	Seismograph	L	1920	T

47. Which of the following graphs shows the variation in kinetic energy of the Moon as it moves once around the Earth in its elliptical orbit?



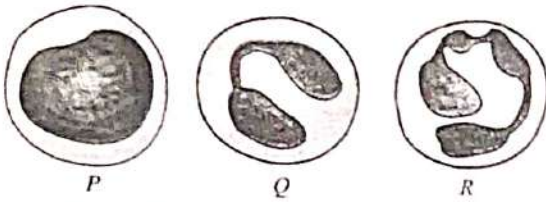
48. Study the given Venn diagram carefully.



Which of the following statements are incorrect regarding 1, 2 and 3?

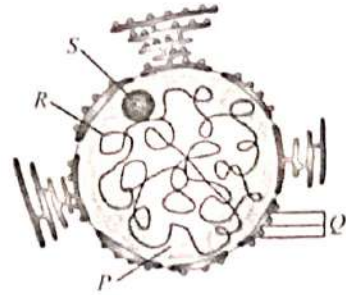
- I. Point 1 represents a sol type colloidal solution and it can be milk of magnesia.
II. Point 2 represents an aerosol like fog.
III. Point 3 represents a foam type colloidal solution, e.g., sponge.
IV. Point 2 can represent face cream as well as jelly.
- A. II and IV only B. I and II only
C. III and IV only D. II, III and IV only

49. Refer to the given figures *P*, *Q* and *R* and select the correct statement regarding them.



- A. *P* and *Q* are phagocytic in nature whereas *R* is non-phagocytic.
- B. Cytoplasm of *P* and *R* contain cytoplasmic granules whereas that of *Q* does not contain cytoplasmic granules.
- C. Both *Q* and *R* help to transport oxygen in blood whereas *P* helps to carry out function of body's defence.
- D. *P* and *R* could engulf disease causing pathogens whereas *Q* could show allergic responses.

50. Refer to the given figure and select the incorrect statement regarding *P*, *Q*, *R* and *S*.



- A. *P* is transparent, semi-fluid material containing enzymes for synthesis of nucleic acids.
- B. *Q* is porous and selectively permeable to regulate exchange of materials.
- C. *R* is made up of DNA and RNA only.
- D. *S* is membraneless organelle that is rich in RNAs and proteins.

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