INTSO EDUCATION

SCIENCE TALENT SEARCH OLYMPIAD (STSO) 2015-16

STAGE - 2 | TIME : 60 min.

CLASS : IX | Max. Marks : 50

Instructions:

⇨ *Fill the OMR sheet completely and carefully.*

⇨ *Each question carries one mark and has only one correct answer. ¼ (one fourth) marks will be deducted for indicating incorrect response of each question.*

⇨ *The question paper contains 50 questions to be answered in 60 minutes.*

PHYSICS

1. Figure shows three paths connecting points a and b. A single force F does the indicated work on a particle moving along each path in the indicated direction on the basis of this information.

   1) F must be conservative

   2) F may be conservation

   3) F must be non - conservative

   4) No sufficient information

   [   ]

   60 J
   60 J
   60 J

2. A hollow sphere of radius 1 m is filled with 3 kg water is fixed on the mouth of a cylindrical vessel. Water starts to leak from point P. Find work done by gravity when water completely drops in the cylinder. AOB is horizontal line.   [   ]

   1) 10 J

   2) 40 J

   3) – 50 J

   4) 80 J

   H = 4R
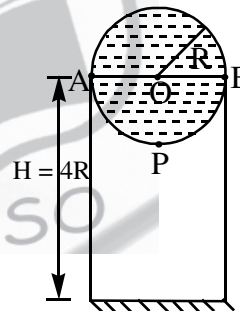
3. Initially, spring of spring constant 100N/m is in its natural length. The block of mass 1 kg released from rest, the maximum power of weight of the block is   [   ]

   1) 5 W

   2) 10 W

   3) 20 W

   4) 40 W

   k

   m= 1 kg
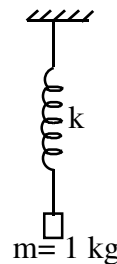
4. A billiard ball of mass $\sqrt{7}$ kg is moving in horizontal direction with a speed of 2 m/s towards a wall. After collision with the wall, the ball moves with a speed of 1 m/s in a direction making an angle 120° with its initial direction. The duration of collision between wall and ball is 0.01 s. The magnitude of average force appplied by the wall on the ball is   [   ]

   1) $10\sqrt{7}$ N   2) 700 N   3) 70 N   4) $100\sqrt{21}$ N

5. In the situation shown in the figure, block A is stopped for a moment, after 3 s system is set into motion. Find the time elapsed before the string is tight again. [   ]
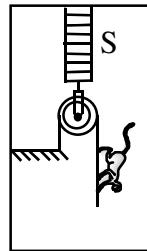   1) 1 s
   2) 2 s
   3) 3 s
   4) 4 s
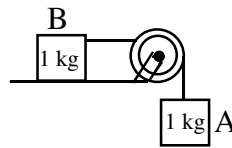
6. A monkey of mass 40 kg slides down on a light rope with an acceleration of 5 m/s^2 with respect to rope. The lift is going up with an acceleration of $a_0 = 5$ m/s^2.
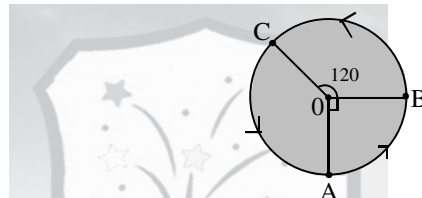
   A light spring balance S is connected with a light pulley as shown in the figure. The reading of spring balance S is [   ]

   1) 40 kg

   2) 80 kg

   3) 120 kg

   4) zero

7. Figure shows a particle starting from point A, travelling up to B with a speed 'S' then upto point C with a speed '2S' and finally upto A with a speed of '3S'. Determine its average speed.

   1) 2 S   [   ]

   2) 1.8 S

   3) 3 S

   4) 1.2 S

8. You are on the roof of the physics building, 46.0 m above the ground as shown in figure. Your physics teacher, who is 1.80 m tall, is walking alongside the building at a constant speed of 1.20 ms^{-1}. If you wish to drop a flower on your professor's head, where should the professor be when you release the flower ? Assume that the flower is in free fall. [   ]

   1) 3.6 m

   2) 4.2 m

   3) 3 m

   4) 5.2 m
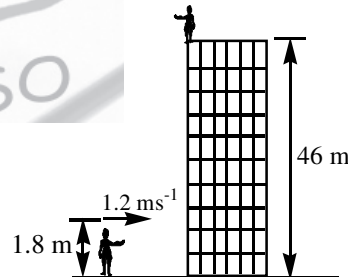
9. A sphere of mass 40 kg is attracted by a second sphere of mass 60 kg with a force equal to 4 mgf. If G = 6 × 10^{-11} Nm^2 kg^{-2}, Calculate the distance between them. (g = 10 m/s^2) [   ]
   1) 6 cm   2) 6 m   3) 0.6 cm   4) 0.6 m

10. A satellite is seen after each 8 h over the equator at a place on the earth when its sense of rotation is opposite to the earth. The time interval after which it can be seen at the same place when the sense of rotation of the earth and the satellite is the same will be [   ]
    1) 8 h   2) 12 h   3) 24 h   4) 6 h

11. The value of g at a certain height h above the free surface of the earth is $\frac{X}{4}$, where 'X' is the value of g at the surface of the earth. The height h is [   ]
    1) R   2) 2R   3) 3R   4) 4R

12. A wooden boat is in the shape of a half cylinder of length 3 m and radius 0.35 m. It weighs 1×10^3 N. The maximum weight it can hold without sinking is _____ N $\left(\rho_{water} = 1 \times 10^3 \, kg/m^3 \right)$.

    1) 3.6×10^2 2) 4.66×10^3 3) 3.66×10^3 4) 0.466×10^3[   ]

13. A floating raft of mass 600 kg has 7 cm of its thickness submerged. When a boy stands on the raft, 8.4 cm are submerged. The mass of the boy is   [   ]
    1) 100 kg   2) 70 kg   3) 120 kg   4) 80 kg

14. When equal volumes of two metals are mixed together, the specific gravity of alloy is 4. When equal mass of the same two metals are mixed together, the specific gravity of the alloy now becomes 3. Find specific gravity of each metal.   [   ]
    1) 2 g/cc, 4 g/cc   2) 6 g/cc, 4 g/cc   3) 4 g/cc, 6 g/cc   4) 2 g/cc, 6 g/cc

15. An engine approaches a hill with a constant speed. When it is at a distance of 0.9 km it blows a whistle, whose echo is heard by the driver after 5 sec. If the speed of sound in air is 330 m/s. The speed of the engine is   [   ]
    1) 20 m/s   2) 10 m/s   3) 30 m/s   4) 300 m/s

16. The speed of sound in air at NTP is 332 m/s. If air pressure becomes four times the normal, then the speed of sound will be   [   ]
    1) double   2) quadruple
    3) remains the same   4) become 1/4 of the original value

17. Factors affecting the velocity of sound are   [   ]
    i) density of the medium
    ii) amplitude of sound
    iii) temperature of the medium
    1) i, ii only correct   2) i, iii only correct   3) all are correct   4) all are wrong

CHEMISTRY
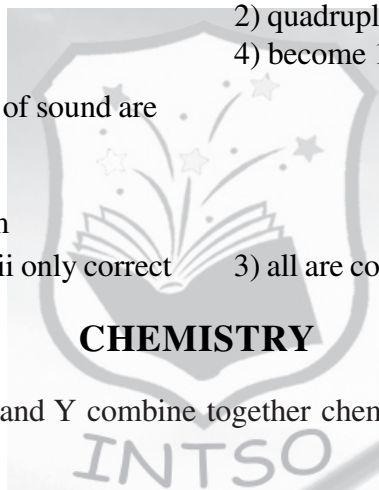
18. Two chemical substances X and Y combine together chemically to from a product 'P' which contains both X and Y
    $X + Y \rightarrow P$
    X cannot be broken down into further simpler substance. In Y, two types of atoms are present in a fixed proportion by mass.
    Which of the following statements are correct   [   ]
    i) 'P' is a compound   ii) X and Y both are elements
    iii) X is an element and Y is a compound   iv) X is an element and Y is a mixture
    1) i, ii and iii are correct   2) i, iii, iv are correct   3) only ii is correct   4) i and iii are correct

    Based on the following figure answer the questions 19,20 and 21.
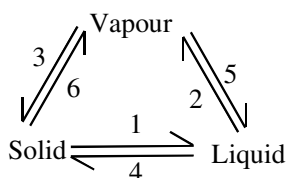
19. Which of the following are correct set of endoergic processes   [   ]
    1) 1, 5, 3   2) 1, 2, 6   3) 4, 5, 3   4) 2, 3, 1

20. In which of the following process intermolecular distances increase   [   ]
    1) 4   2) 5   3) 6   4) All of these

21. When an apple removed from refrigerator is kept on the dining table, we can observe some water droplets on the apple. Which process is involved in this situation ? [   ]
    1) 1 2) 2 3) 3 4) 5

22. Which of the following factors are responsible for the change in the state of solid CO_2 when kept exposed to air [   ]
    i) Increase in pressure ii) Increase in temperature
    iii) Decrease in pressure iv) Decrease in temperature
    1) i and ii 2) ii and iii 3) i and iv 4) ii and iv

23. The amount of heat energy required by 500 g of water to convert it into vapour at its boiling point in joules is [   ]
    1) 22.5×10^5 2) 3.34×10^5 3) 11.25×10^4 4) 1.125×10^6

24. Boiling point of 4 liquids A, B, C and D are 333K, 373K, 283K and 630K respectively. Which of the following liquids can be called as gases in their vapour state [   ]
    1) A 2) B 3) C 4) D

    Based on the following table answer the questions from 25 to 28

Element	Atomic No	Mass No	no. of electrons	no. of Protons	no. of neutrons
X	10				10
Y		24			12
Z		10		4	
W			17		20

25. Ratio of number of nucleons in X to number of neutrons in Z is [   ]
    1) 20 2) 10 3) 5 4) 4

26. What is the relationship of the element $_{17}A^{35}$ with the element W is [   ]
    1) Isotope 2) isobar 3) Isotones 4) All of these

27. No. of protons in the uni negative ion of W is [   ]
    1) 20 2) 18 3) 17 4) 37

28. Among X, Y, Z and W, the gaseous elements are [   ]
    1) X and Y 2) Y and Z 3) Z and W 4) X and W

29. Regarding the reaction $A_2O_3 + 2B \rightarrow B_2O_3 + 2A$, some statements were given below
    i) It is a displacement reaction ii) Only oxidation takes place in the reaction
    iii) Only reduction takes place in the reaction iv) 'B' acts as a reductant
    v) A_2O_3 is reduced
    Pick up the correct one from the following [   ]
    1) All are correct 2) i, ii and iv are correct
    3) i, iv and v are correct 4) iii, iv and v are correct

30. Solid solute + liquid solvent $\rightleftharpoons$ solution + heat. Solubility of this solid solute at 300 K is 20. Solubility of this same substance at 320 K in the same solvent may be [   ]
    1) 20 2) 0 3) 18 4) 25

31. The particle size in a mixture is 10 nm. Which of the following is not a characteristic of this mixture is [   ]
    a) Settle only on centrifugation b) Do not show Tyndall effect
    c) It is a heterogeneous mixture d) Can pass through animal membrane.
    1) All of these 2) a, c only 3) a, c, d only 4) b, d only

32. Bleeding from a fresh cut can be immediately stopped by applying alum. This is because
    1) Solidification of blood takes place   [   ]
    2) Diffusion of alum particles into the blood
    3) Neutralisation of colloidal particles of blood by the ions in alum.
    4) Alum acts as a protective layer

33. In magnesium sulphide, the ratio by mass of Mg and 'S' is 3 : 4. What is the ratio of number of Mg
    and S atoms.   [   ]
    1) 3 : 4   2) 1 : 1   3) 3 : 8   4) 4 : 3

34. Four students (A), (B), (C) and (D) independently observed the evaporation of water under different
    conditions, and recorded the temperature of water at regular intervals as shown below.

Student	Placing of experimental set up in / under	Temperature recording for 15 minutes
(A)	sun	increased gradually
(B)	open air	decreased gradually
(C)	a fan	initially increased, then became constant
(D)	a corner of the room	initially increased, then gradually decreased

The correct recording or observations is that of the student :   [   ]
    1) (A)   2) (B)   3) (C)   4) (D)

BIOLOGY

35. Centrioles take part in   [   ]
    1) Muscle contraction   2) DNA recognition   3) Cell division   4) Intracellular transport

36. The cross section of a trunk of a tree shows 80 annual rings. The age of tree is   [   ]
    1) 80 years   2) 160 years
    3) 40 years   4) Age of the tree can not be predicted

37. Following consist of simple columnar ciliated epithelium except   [   ]
    1)Ventricles of the brain 2) Central canal of spinal cord
    3) Oviducts   4) Pancreatic duct

38. The structure of DNA proposed by Watson and Crick is characterised by   [   ]
    1) The right - handed hlix with 12 bases pairs per turn
    2) The left - handed helix with 10 bases pairs per turn
    3) The right - handed helix with 10 base pairs per turn
    4) The right - handed helix with 20 bases pairs per turn

39. For active transport to occur, the following must be present   [   ]
    1) Carrier proteins, ATP, and cell membrane   2) Carrier proteins, ADP, and cell membrane
    3) ATP, cell membrane, and vacuole   4) Cell membrane, water, and ATP

40. Plasma membrane is made up of :   [   ]
    1) Lipids   2) Proteins   3) Carbohydrates   4) Both 1 and 2

41. *Ulothrix* is an example of :   [   ]
    1) Bryophyta   2) Thallophyta   3) Pteridophyta   4) Gymnosperm

42. Find the odd one   [   ]
    1) Spider   2) Scorpion   3) Crab   4) Leech

43. Identify the correct statement : [   ]
    1) Poriferans do not have holes on their body
    2) Hydra cannot move from one place to other
    3) Round worms are not parasitic in nature
    4) All chordates possess a notochord and dorsal nerve chord

44. Identify the correct pair : [   ]
    i) Mollusca - Snail   ii) Arthropoda - Earthworm
    iii) Protochordata - Amphioxus   iv) Coelenterata - Hydra
    1) i and ii   2) i and iii   3) i, iii, and iv   4) ii only

45. Identify the animal with fimbriae and abundant stinging cells [   ]
    1) The animal is a sponge   2) The animal is an annelid
    3) The animal is a mollusc   4) The animal is a coelenterate

46. Match the items under column A with those under column B. [   ]

    Column - A   **Column - B**
    1) Hirudin   a) Echinodermata
    2) Canal system   b) Mollusca
    3) Feather star   c) Arthropoda
    4) Book lungs   d) Leech
                                  e) Porifera
    1) 1 - b, 2 - a, 3 - e, 4 - c   2) 1 - d, 2 - e, 3 - a, 4 - c
    3) 1 - e, 2 - a, 3 - b, 4 - c   4) 1 - d, 2 - e, 3 - a, 4 - b

47. Siva went to a botanical garden along with his friends, he found a plant growing in the garden. Which shows the following characteristics.
    Sporophyte has foot, seta and capsule based on the information identify the plant from following options. [   ]
    1) The plant is a gymnosperm   2) The plant is a pteridophyte
    3) The plant is analgae   4) The plant is a bryophyte

48. Identify the correct statements [   ]
    I) Ligament is a connective tissue at joints of bones
    II) Tendon attaches a bone with muscles.
    III) Cartilage smoothens bones at their surface
    IV) Cartilage has widely spaced matrix
    Correct statements are
    1) I & II   2) II & III   3) III & IV   4) I, II, III & IV

49. Which cells of SER plays a crucial role in detoxifiying many poisons and drugs in vertebrates?
    1) Kidney cells   2) Liver cells   [   ]
    3) White blood cells   4) Pancreatic cells

50. Largest group of animalia : [   ]
    1) Nematoda   2) Annelida   3) Protochordata   4) Arthropoda