



Stage IV



Grades 9-10

CREST Teacher Science Olympiad (CTSO)

Sample Paper

Pattern and Marking Scheme

Stage	Topic/Section	No. of Questions	Marks per Question	Total Marks
For Stage IV (Grades 9-10)	Practical Science	30	3	90
	Achiever's Section	20	6	120
Grand Total		50		210

The total duration of the exam is 60 minutes.

Note: For every incorrect answer, there's a penalty of 1/3rd of the total marks allotted to that question.

Syllabus

Motion, Force and Laws of Motion, Gravitation, Work and Energy, Sound, Matter in Our Surroundings, Is Matter Around Us Pure, Atoms and Molecules, Structure of Atom, Cell - The Fundamental Unit of Life, Tissues, Diversity in Living Organisms, Why Do We Fall Ill, Natural Resources, Improvement in Food Resources, Chemical Reactions and Equations, Acids, Bases and Salts, Metals and Non-metals, Carbon and its Compounds, Periodic Classification of Elements, Life Processes, Reproduction in Organisms, Heredity and Evolution, Light-Reflection and Refraction, Human Eye and Colourful World, Electricity, Magnetic Effects of Electric Current, Sources of Energy, Our Environment and its Management

For more details visit: <https://www.crestolympiads.com/teacher-science-olympiad>

Practical Science (Each Question is 3 Marks)

- Fill in the blank:
HF is not preserved in glass bottle because _____.
 - it reacts with the visible part of light
 - it reacts with sodium oxide of glass
 - it reacts with aluminium oxide of glass
 - it reacts with silica of glass
- Blue-coloured solid anhydrous cobalt chloride is exposed to the atmosphere and forms a pink-coloured solid. What can we infer from this?
 - Cobalt chloride is hygroscopic
 - Cobalt chloride is deliquescent
 - Cobalt chloride is efflorescent
 - None of these
- In which of the following groups would you place a plant, which produces spores, has vascular tissues and bear seeds without fruits?
 - Bryophyta
 - Angiosperm
 - Pteridophyte
 - Gymnosperm
- A body travels at a speed of 10 ms^{-1} for a time interval 't' and next at a speed of 40 ms^{-1} for next time interval 't'. Find average speed for the total journey.
 - 40 ms^{-2}
 - 20 ms^{-2}
 - 5 ms^{-2}
 - 25 ms^{-2}
- Two ice blocks of 10 g each are placed in 2 L distilled water at 273 K. One of the ice blocks is made up of seawater and the other one is made up of distilled water. What will you observe if the ambient temperature is also 273 K?
 - After some time, the ice block made of seawater will disappear and the other one will remain intact.
 - After some time, both the ice block will disappear.
 - After some time, both the ice block will remain intact.
 - After some time, the ice block made of distilled water will disappear and the other one remains intact.
- Consider the following statements and choose the correct option:

Statement 1: If the earth suddenly stops rotating about its axis, then the value of acceleration due to gravity will become the same at all the places.
Statement 2: A heavy body falls at a faster rate than a light body in a vacuum.
 - Statement 1 is correct but statement 2 is incorrect.
 - Statement 1 is incorrect but statement 2 is correct.
 - Both the statements are correct.
 - Both the statements are incorrect.
- A negative ion of an atom of element X has 18 electrons and 16 protons. Calculate the number of neutrons, if the mass number is 2 units more than double the number of protons:
 - 16
 - 18
 - 17
 - 15

8. Following table shows the difference between animal cell and plant cell. Identify the incorrect one(s):

S. No.	Features	Animal Cell	Plant Cell
P.	Size & Shape	Comparatively larger in size over 100 μm long and rigid in shape.	Usually much smaller than 100 μm and vary in shape
Q.	Cell Wall	Cell wall is absent. Cell is enclosed in thin flexible plasma membrane only.	In addition to plasma membrane rigid thick cell wall is present. It is made up of cellulose.
R.	Cytoplasm	Denser and more granular.	Less denser
S.	Golgi	Generally pushed one side by sap vacuole.	Generally located in centre.

- a. Only P b. Only R
c. Both Q and R d. Both P and S
9. Which of the following is incorrectly matched?
1. Near threatened - Likely to become endangered in the near future
 2. Extinct - No known individual remaining
 3. Critically endangered - High risk of extinction
 4. Endemic - High risk of endangerment in the wild
- a. Only 1 b. Only 3
c. Only 4 d. Both 1 and 4

10. Honey bees are social insects. They demonstrate teamwork and division of labour. They exist in several morphological forms called castes. Following are some clues about a type of honey bee 'X':

Clue 1: It is a sterile female and smallest in size.

Clue 2: They are the most active members of the colony.

Clue 3: They have wax glands, pollen baskets, hypopharyngeal glands and a sting at the tip of the abdomen.

Identify 'X':

- a. Queen b. Drone
c. Worker d. None of the above

11. Consider the following statements and choose the correct option:

1. Antibiotics are effective in curing tuberculosis but not effective in curing common cold.
2. Tuberculosis is a bacterial disease and common cold is a viral disease.
3. When antibiotics are used, they stop the growth of the bacterial cycle and do not allow it to develop further.

- a. Only 1 is correct
b. Only 2 is correct
c. Only 3 is correct
d. All of the above statements are correct

12. Susan saw her mother was placing a piece of ginger in the soil after the use. Identify the reason behind this:

- a. Ginger have the capability of generating into a new plant.
b. Ginger increases the fertility of the soil.
c. Ginger increases the salt content of the soil.
d. Ginger grows into a new plant by forming seeds.

13. Rubidium, Tin and Xenon are elements in the period 5 of the periodic table. In which group of the periodic table can these elements be found?
- Group 1, Group 14, Group 18
 - Group 2, Group 16, Group 14
 - Group 1, Group 17, Group 19
 - Group 1, Group 16, Group 18
14. A student sitting on the last bench can read the letters written on the blackboard but is not able to read the letters written in his text book. Which of the following statements is correct?
- The near point of his eyes has receded away.
 - The near point of his eyes has come closer to him.
 - The far point of his eyes has come closer to him.
 - The far point of his eyes has receded away.
15. Two wires of the same material having lengths in the ratio of 1 : 2 and diameters in the ratio 2 : 1 are connected in series with a cell of 6 volt and internal resistance 1Ω . What is the ratio of the potential difference across the two wires?
- 1 : 2
 - 2 : 1
 - 1 : 8
 - 8 : 1
16. Human seminal plasma, the fluid part of semen, is produced by contributions from which of the given part?
- Prostate gland
 - Bulbourethral gland
 - Urethra
 - Seminal vesicles
- A only
 - A and D
 - A, B and D
 - A, B, C and D
17. Fossil 'X' can be considered to have evolved earlier than fossil 'Y' if fossil:
- 'Y' has vestigial structures that are homologous to functional structures in fossil 'X'
 - 'Y' is structurally more complex than fossil 'X'
 - 'Y' is in better state of preservation than 'X'
 - 'X' is found in lower stratum of undisturbed sedimentary rock than 'Y'
18. Fill in the blanks:
In a hydroelectric plant more electrical power can be generated if water falls from a greater height because _____.
- it's temperature increases
 - a larger amount of potential energy is converted into kinetic energy
 - the electricity content of water increases with height
 - more water molecules dissociate into ions
19. Which of the following limits the number of trophic levels in a food chain?
- Decrease in energy at higher trophic levels
 - Deficient food supply
 - Polluted air
 - Water
20. As the sunlight passes through the atmosphere, the rays are scattered by tiny particles of dust, pollen, soot and other minute particulate matters present there. However, when we look up, the sky appears blue during mid-day, because:
- blue light is scattered most
 - blue light is absorbed most
 - blue light is reflected most

- d. ultraviolet and yellow component of sunlight combine

21. Compounds A and B are functional isomers. 'A' exhibits metamerism while 'B' does not. The preceding homologues of 'A' do not have metamers. When 'B' is heated with ammoniacal silver nitrate, shining silver mirror is formed along the inner walls of the test tube. Identify A and B:

- a. A - Dimethyl ketone, B - Aldehyde
- b. A - Dimethyl aldehyde, B - Ketone
- c. A - Diethyl ketone, B - Aldehyde
- d. A - Diethyne ketone, B - Aldehyde

22. Identify the stage in the process of reproduction which is associated with the reduction in the number of chromosomes:

- a. Formation of pollen grains from microspores
- b. Formation of megaspores from megaspore mother cells
- c. Formation of an egg cell from megaspores
- d. Formation of PEN

23. In the following question, an assertion and a reason are given. Choose the correct option:

Assertion (A): The expulsion of carbon dioxide occurs due to the increase in pressure in the thoracic cavity.

Reason (R): Exhaled air contains a lower percentage of carbon dioxide than normal air.

- a. Both A and R are true and R is the correct explanation for A
- b. Both A and R are true, but R is not the correct explanation for A
- c. A is true and R is false
- d. A is false and R is true

24. Choose the correct option and complete the following sentence:

A positively charged particle moving due east enters a region of uniform magnetic field directed vertically upwards. The particle will _____.

- a. get deflected in vertically upward direction
- b. move in a circular path with increased speed
- c. move in a circular path with a decreased speed
- d. move in a circular path with a uniform speed

25. In the following question, an assertion and a reason are given. Choose the correct option:

Assertion: When the length of a wire is doubled, then its resistance also gets doubled.

Reason: The resistance of a wire is directly proportional to its length and area of cross-section.

- a. Both assertion and reason are true and reason is the correct explanation of assertion
- b. Both assertion and reason are true, but reason is not the correct explanation of assertion
- c. Assertion is true, but reason is false
- d. Assertion is false, but reason is true

26. Arrange the following compounds in the decreasing order of covalency of the non-metallic elements:

- A. PCl_5
- B. NCl_3
- C. CH_4
- D. SO_3
- E. Cl_2O_7

- a. EDACB
- b. BCADE
- c. ECADB
- d. BDACE

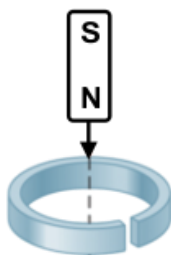
27. Exposure of silver chloride to sunlight for a long duration turns grey due to:

- i. the formation of silver by decomposition of silver chloride.
- ii. sublimation of silver chloride.
- iii. decomposition of chlorine gas from silver chloride.
- iv. oxidation of silver chloride.

Which among the following statement is(are) false?

- a. i only
- b. ii only
- c. i and ii only
- d. ii, iii and iv only

28. A copper ring having a cut so as not to form a complete loop, is held horizontally and a bar magnet is dropped through the ring with its length along the axis of the ring. The acceleration of the falling magnet is _____.



- a. g
- b. less than g
- c. 0
- d. more than g

29. 2 mL of ethanoic acid was taken in each of the three test tubes A, B and C. To these test tubes 2 mL, 4 mL and 8 mL of water was added respectively. Which test tube will give a clear solution?

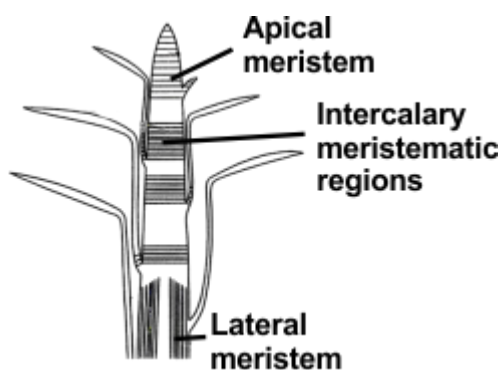
- a. Test tube A only
- b. Test tube B only
- c. Test tube A and B only
- d. All the test tubes

30. When metal M is heated in the presence of air, an oxide Y is formed, which is soluble in water. The aqueous solution of this acid has no effect on blue litmus paper but changes the colour of the phenolphthalein indicator. Identify the nature of the oxide:

- a. acidic
- b. basic
- c. amphoteric
- d. neutral

Achievers' Section (Each Question is 6 Marks)

31. If a plant's lateral meristems are damaged, which of the following outcomes is most likely to occur? Consider the role of lateral meristems in plant growth and development, and how their impairment would affect the plants' physical structure.



- a. The plant will stop growing in length, affecting its overall height and reach.
- b. The plant will stop growing in thickness, leading to a thinner, potentially weaker structure.
- c. The plant will be unable to produce new leaves, impacting photosynthesis and energy production.
- d. The plant will be unable to transport water and nutrients effectively, leading to overall wilting and nutrient deficiency.

32. Which phylum of animals is characterised by the absence of a true coelom, a cylindrical body shape, and includes both free-living and parasitic species?

- a. Nematoda b. Mollusca
c. Arthropoda d. Annelida

33. Fill in the blank:

When MgO is dissolved in water, Mg(OH)₂ is obtained. A red litmus paper dipped in this solution turns blue; this shows that the solution is _____ in nature.

- a. acidic b. neutral
c. alkaline d. reactive

34. Fill in the blank:

A body is thrown vertically upwards and then falls back on the ground. Its potential energy is maximum _____.

- a. on the ground
b. at the maximum height
c. during the return journey
d. both on the ground and at the maximum height

35. A wire has a resistance of 12 Ω. A second wire, made of the same material, has half the length and half the cross-sectional area.

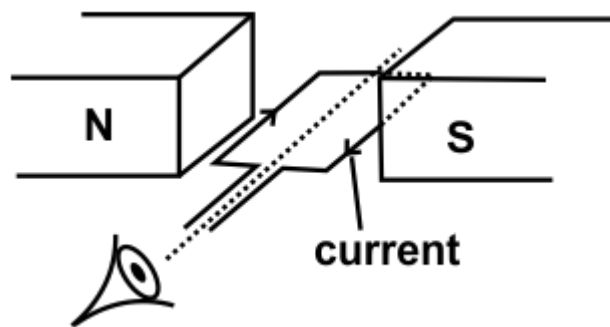
What is the resistance of the second wire?

- a. 3 Ω b. 6 Ω
c. 12 Ω d. 48 Ω

36. The diagram shows a pivoted coil held between the two poles of a magnet. The pivoted coil carries a steady current in the direction shown. When the coil is released, it rotates and then stops at an angle θ to its initial position.

When viewed as shown, in which

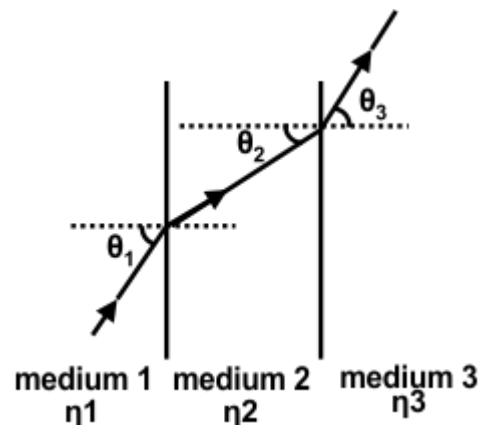
direction does the coil rotate and what is the value of θ ?



- a. Direction - Anticlockwise
 $\theta - 90^\circ$
b. Direction - Anticlockwise
 $\theta - 180^\circ$
c. Direction - Clockwise
 $\theta - 90^\circ$
d. Direction - Clockwise
 $\theta - 180^\circ$

37. A light ray passes through three media of refractive indices η_1 , η_2 and η_3 respectively.

Given that $\theta_1 > \theta_3 > \theta_2$, which of the following is correct?



- a. $\eta_1 > \eta_2 > \eta_3$ b. $\eta_2 > \eta_1 > \eta_3$
c. $\eta_1 > \eta_3 > \eta_2$ d. $\eta_2 > \eta_3 > \eta_1$

38. Xylem is a plant tissue responsible for transporting water and dissolved minerals from the roots to the leaves. Certain features of xylem vessels make them particularly well-suited for this function, such as:

- A. No end walls in individual xylem elements
- B. Lignified walls

Select the option that explains how these features adapt xylem vessels for their function of transporting water from roots to leaves.

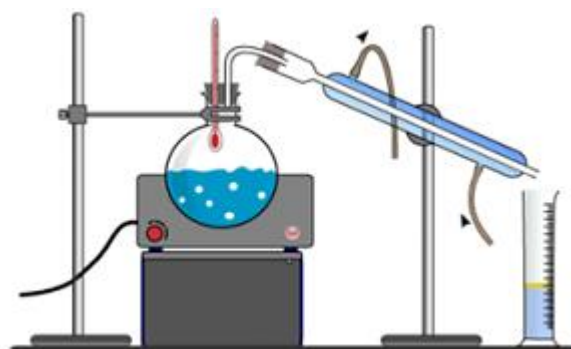
- a. A: allow continuous water flow
B: prevents vessels from collapsing inwards
 - b. A: allow continuous water flow
B: prevent water loss from the xylem
 - c. A: allow water storage
B: allow water to move into and out of them
 - d. A: allow water storage
B: make vessels waterproof, preventing water loss
39. 'A' and 'B' are two oxides of carbon. 'A' is a poisonous gas and 'B' is a non-poisonous gas. On exposing to 'A', the victim should be given artificial respiration with carbogen which contains 'B' in small fraction. Identify A, B:
- a. A - O₂, B - CO₂
 - b. A - CO, B - CO₂
 - c. A - CO₂, B - CO₃
 - d. A - O₂, B - CO

40. What is the reason to pivot the compass needle on a sharp pin?
- a. To minimise the magnetic effect on the pin.
 - b. To maximize the magnetic effect on the pin.
 - c. To minimise the friction between the pin and the compass needle.
 - d. To ensure that the compass needle will not drop from the pivoted point.

41. A boy is trapped in a large area of very soft mud. A man rescues the boy by crawling across a long, light board rather than by walking into the mud. What effect, if any, does the board have on the force and the pressure on the mud compared with walking?

- a. **Force** - decreased
Pressure - decreased
- b. **Force** - decreased
Pressure - unchanged
- c. **Force** - unchanged
Pressure - decreased
- d. **Force** - unchanged
Pressure - unchanged

42. While using the given apparatus, what must be kept in mind?



- a. The mixture in the distillation flask must contain a solid.
 - b. The temperature difference between the boiling points of components of the mixture must be less than 25°C.
 - c. The temperature difference between the boiling points of components of the mixture must be more than 25°C.
 - d. All of these
43. An element X has atomic mass 16 and atomic number 8. Which one of the following ions it will form on ionising one electron?
- a. X⁺ ion
 - b. X⁻ ion
 - c. X⁺⁺ ion
 - d. X⁻ ion

44. A bullet is fired straight up at 30 metres per second. If air resistance is negligible, how high will the bullet rise? ($g = 9.8 \text{ m/s}^2$)
- 80.5 m
 - 91.2 m
 - 45.9 m
 - 38.5 m
45. Which of the following is the main difference between onion peel cells and human cheek cells?
- Presence of mitochondria in onion peel cells only.
 - Presence of cell wall in onion peel cells only.
 - Absence of plasma membrane in human cheek cells.
 - Absence of endoplasmic reticulum in human cheek cells.
46. In the following question, an assertion and a reason are given. Choose the correct option:
- Assertion:** If the pH inside the mouth increases above 5.5, the decay of tooth enamel begins.
- Reason:** The bacteria present in mouth degrades the sugar and left-over food particles and produce acids that remain in the mouth after eating.
- Both assertion and reason are true and reason is the correct explanation of the assertion
 - Both assertion and reason are true, but reason is not the correct explanation of the assertion
 - Assertion is true, but reason is false
 - Assertion is false, but reason is true
47. The reaction of KMnO_4 and HCl results in:
- Oxidation of Mn in KMnO_4 and production of Cl_2
 - Reduction of Mn in KMnO_4 and production of H_2
 - Oxidation of Mn in KMnO_4 and production of H_2
 - Reduction of Mn in KMnO_4 and production of Cl_2
48. Identify the combination that represents phenotypically similar, but genotypically different plants:
- RRYY and RrYy
 - Rryy and rrYY
 - rrYY and rryy
 - RrYY and rrYy
49. What happens on the prolonged supply of $\text{CO}_2(\text{g})$ in lime solution (lime-water)?
- Lime solution changes to gaseous state
 - The milkiness of lime water disappears
 - The colour of lime water changes from white to red
 - The colour of lime water becomes black
50. Dilute hydrochloric acid is added to granulated zinc taken in a test tube. The following observations are recorded. Point out the correct observation.
- The surface of metal becomes shiny.
 - The reaction mixture turns milky.
 - Odour of a pungent smelling gas is recorded.
 - A colourless and odourless gas is evolved.

Answer Key

1.	d	2.	a	3.	d	4.	d	5.	a	6.	a	7.	b
8.	d	9.	c	10.	c	11.	d	12.	a	13.	a	14.	a
15.	c	16.	c	17.	d	18.	b	19.	a	20.	a	21.	c
22.	b	23.	c	24.	d	25.	c	26.	a	27.	d	28.	a
29.	a	30.	b	31.	b	32.	a	33.	c	34.	b	35.	c
36.	a	37.	d	38.	a	39.	b	40.	c	41.	c	42.	c
43.	a	44.	c	45.	b	46.	d	47.	d	48.	a	49.	b
50.	d												