APPENDICES
Appendix A

TEST OF PROCESS SKILLS IN BIOLOGICAL SCIENCE
(Draft form)

Prepared by
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Govt. College of Teacher Education
Thiruvanthapuram

Directions:

1. Read each question carefully

2. Each item has your answers indicated by a, b, c and d out of which you have to choose the most appropriate answer.

3. Answers should be marked by drawing a circle around the letter which you think represent the correct answer.

4. Answer all the test items.
1. It is seen that the mangoes put in salt water were shrunk after six months. The problem here is
   (a) How the mangoes become useless
   (b) Whether the salt water contained any other chemical
   (c) How the mangoes got shrunk.
   (d) How can the mango get its original state.

2. If a person lives exclusively on a diet of milk, eggs and bread, he is likely to suffer from scurvy. The problem here is
   (a) Deficiency of vitamin K
   (b) Deficiency of Vitamin C
   (c) Deficiency of Vitamin E
   (d) Deficiency of Vitamin A

3. The single greatest current threat to biodiversity
   (a) Greenhouse warming
   (b) The introduction of exotics
   (c) Overhunting
   (d) Habitat destruction.

4. Often in water bodies subjected to sewage pollution, fishes die. The problem here is
   (a) Pathogens released by sewage.
   (b) Reduction of dissolved oxygen caused by microbial activity.
   (c) Clogging of their gills by solid substances
   (d) Foul smell.

5. What happens when dry grapes immersed in water for sometimes?
   (a) Shrink  (b) Swell  (c) Remains the same
   (d) None of the above
6. Members of the phylum Mollusca are recognized on the basis of
   (a) segmentation
   (b) trochophore larva
   (c) the presence of a foot, visceral mass and mantle
   (d) water vascular system.

7. Observe the following organism.

![Image of a bivalve mollusc]

Find out which of the following is a distinctive character of class bivalvia of mollusca.
   (a) Absence of head
   (b) Absence of gills
   (c) Tentacles around the mouth
   (d) Presence of coiled shell.

8. Some cells contain a large number of mitochondria. What is the most reasonable hypothesis that can be made for this?
   (a) The size of the cell is large.
   (b) The size of the mitochondria is small.
   (c) The cells need more energy
   (d) The cells need less energy.

9. A marine biologist dredged up a small animal from the bottom of the ocean. It was uniformly segmented, with short, soft appendages and soft flexible skin. It has a complete digestive system and an open circulatory system, but no skeleton. What is the most suitable hypothesis that can be made for this.
   (a) Like to be a lancelet
   (b) Like to be a crustacean.
   (c) Like to a mollusc.
   (d) Like to a roundworm.
10. When a cell is kept in 0.5 m sol. of sucrose its volume doesn’t alter, but if the same cell is placed in 0.5 sol. of NaCl. What is the most reasonable hypothesis that can be made for this.
(a) The volume of cell wall increases.
(b) The volume of cell wall decreases.
(c) Cell wall will be plasmolysed
(d) Cell wall shows no change.

11. Cephalopods shows colour changes. What is the most reasonable hypothesis that can be made for this?
(a) Internal secretions make colour changes.
(b) Chromatophores make colour changes.
(c) Ink sac secretions produces colour changes
(d) Mantle shows colour changes.

12. The stem grows towards light. Which of the following method would be the most appropriate to understand this fact?
(a) Place a potted plant in a dark room for 2 or 3 days.
(b) Place a potted plant in a box with one hole for 2 or 3 days
(c) Place a potted plant in a well lighted room for 2 or 3 days.
(d) Place a potted plant in open space for 2 or 3 days.

13. Exhaled air from the lungs contains more carbon dioxide than that taken into the lungs. Which of the following is the most appropriate method to test this hypothesis?
(a) Compare equal quantities of fresh and exhaled air for carbon dioxide content by passing them through clear lime water.
(b) Pass a known quantity of exhaled air through clear lime water.
(c) Pass a known quantity of fresh air through clear lime water.
(d) Compare different quantities of fresh and exhaled air for carbon dioxide content by passing them through clear lime water.

14. To control the stored grain pests in better and safe method. Which of the following method would be the most appropriate to understand this fact?
(a) The use of chemical pesticides in small amount.
5

(b) The use of less toxic substances.
(c) The biological control of pests.
(d) Fumigation.

15. Improved varieties of economically important plants are better than wild varieties. Which of the following is the most appropriate method to test this hypothesis?
(a) Selection of seeds from healthier plants.
(b) Introduction of varieties of crops under different conditions.
(c) Judicious combination of selection, introduction and hybridization of different varieties.
(d) The scientific improvement of cultivated plants.

16. To demonstrate how osmosis takes place, which of the following is the most appropriate procedure?
(a) Place the egg membrane at the bottom of the beaker, put some sugar in it, insert a thistle funnel and add water in it.
(b) Cover the mouth of the thistle funnel with egg membrane and fill both the thistle funnel and beaker with water.
(c) Cover the mouth of the thistle funnel with egg membrane and fill it with water.
(d) Cover the mouth of the thistle funnel with egg membrane. Fill the thistle funnel with sugar solution. Place it inside the beaker and fill the beaker with water.

17. If a biochemical analysis of mitochondria is to be done, which of the following is the most appropriate procedure?
(a) Plasmolyse the cell, filter it and take the debris.
(b) Grind the cell and filter out the mixture and take the debris.
(c) Select cells which have a large number of mitochondria.
(d) Subject the cells of cell fractionation (centrifuge) and obtain mitochondria.

18. Which of the following instrument is used to measure blood pressure?
(a) Haemocytometer (b) Electrocardiograph
(c) Sphymomanometer (d) Stethascope.

19. In order to study the organism invisible to the naked eye we use a
   (a) Camera (b) Telescope
   (c) Microscope (d) Binocular

20. Which of the following instrument is used to demonstrate transpiration.
   (a) Potometer
   (b) Thermometer
   (c) Haemocytometer
   (d) Ammeter

21. Average pulse rate of an adult is
   (a) 72 per minute
   (b) 70 per minute
   (c) 100 per minute
   (d) 75 per minute

22. Body fat of Indians contains
   (a) 1-12 ppm DDT
   (b) 11-31 ppm DDT
   (c) 31-50 ppm DDT
   (d) No DDT at all.

23. The average life time of a red blood corpuscle is
   (a) 100 days
   (b) 120 days
   (c) 20 days
   (d) 200 days

24. The current consumption on domestic fire wood in India is about
   (a) 18.6 million tonnes
   (b) 146.5 million tonnes
   (c) 124.6 million tonnes
   (d) 218.70 million tonnes

25. The shortest distance for clear vision is
   (a) 15 cm (b) 30 cm (c) 25 cm (d) 20 cm
26. A biologist studied the population of deer in a sanctuary. He found that average natality was 300, average mortality was 280, immigration was 25 and emigration was 45 per year. If at the start of investigation there were 30 deers, how many would there be at the end of ten years.

(a) 30 (b) 300 (c) 60 (d) 600.

27. Some plants have evolved to attract specific animals. The animal receives a meal that, it does not have to compete for, and the plant is assured that its pollen will not be wasted on plants of different species. Through time, the plant gets better at attracting the animal and increases its reproductive success as a result. Simultaneously the animal improves its feeding on a specific plant and increases its reproductive success as a result. Which of the following is an example of this scenario?

(a) Coevolution (b) Mutualism
(c) Diversifying selection (d) Commensalism

28. A segment of the DNA has a base sequence AAG, GAG, GAC, CAA, CCA which of the following sequences represent a frame shift?

(a) AAG GAG GAC CAA CCA
(b) AGG AGG ACC AAC CA
(c) ACG GAC GAC CAG CCA
(d) AAG GCG GAC CCA AC

29. The following table shows the average weight and height of healthy boy of 1 to 15 years old.

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<th>Age in years</th>
<th>Height in cm</th>
<th>Weight in kg</th>
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Which of the following graphs shows the relation between height and weight?

‘X’ axis shows the height and ‘y’ axis shows the weight.

30. A long deep dive in seals promotes several physiological changes in them. During the dive, blood is shunted away from tissues like muscles and viscera towards the heart and CNS. At the end of the dive, there is great rise in lactic acid level in blood. Which of the following graph represent great rise in lactic acid.

31. The height and weight of six boys are given below:

<table>
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<th>Height (cm)</th>
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</table>

What will be weight of a boy having a height of 160 centimeters?
(a) 50 Kg  (b) 55 Kg  (c) 65 Kg  (d) 70 Kg
32. A population of strictly monogamous swans consists of 40 males and 10 females. What will be the effective population size for this population.
   (a) 50  (b) 40  (c) 20  (d) 10

33. When a leaf from a cotton plant is tested for starch, only the green portions showed the presence of starch. What do you infer from this?
   (a) Sunlight is essential for photosynthesis
   (b) Chlorophyll is essential for photosynthesis
   (c) Carbon dioxide is essential for photosynthesis
   (d) Xanthophyll is essential for photosynthesis

34. The following diagram shows an experiment related to photosynthesis. Here the gas collected in the test tube was proved to be oxygen. What do you infer from this?
   (a) Water is an important factor for photosynthesis
   (b) Water is absorbed during photosynthesis
   (c) During photosynthesis plants evolve oxygen.
   (d) Carbon dioxide is essential for photosynthesis
35. Euglena synthesizes its food with the help of chloroplasts. If a jar containing Euglena in a rich nutrient solution is kept in a dark room. What do you infer from this?
   (a) Synthesis of food will stop and the animal will die of starvation.
   (b) Synthesis of food will continue through chloroplasts
   (c) Chloroplasts and pyrenoids will disappear and the animal will derive its nourishment from the surrounding solution.
   (d) Synthesis will continue but pyrenoids will disappear.

36. Green plants are not usually affected by diseases due to the deficiency of vitamins. From this we could infer
   (a) Plants do not require vitamins
   (b) Plants can synthesis vitamins
   (c) Plants get required vitamins from the soil.
   (d) Plants get vitamins from sunlight.

37. The following graph shows the relationship between light intensity and plant growth.

Which statement describes the relationship between light intensity and plant growth?
(a) As light intensity increases, plant growth increases.
(b) As plant growth increases, light intensity increases to a point, then decreases.
(c) As light intensity increases, plant growth decreases to a plant, then decreases.
(d) As plant growth increases, light intensity increases.
38. The following diagram shows the food production in salt bush. From this we could infer:

(a) There is no food production happens at 10°C
(b) Food production is the smallest at about 20°C
(c) Food production is the greatest at about 30°C
(d) Food production at 40°C is about 5 mg of glucose per hour.

39. A cross between white-eyed female and red-eyed male Drosophila give red-eyed females and white eyed males. Rarely the cross give rise to white eyed females and red-eyed males. From this we could infer

(a) Mutation in male
(b) Loss of sex chromosome
(c) Mutation of female fly
(d) Nondisjunction of two X chromosome in female.

40. Evidences from the fossils show that living organisms in the past had simple structures. But they have complex structures today. What can you generalize from this?

(a) Living organisms in the past are not seen today.
(b) Complex forms of organisms evolved from simpler forms which existed in the past.

(c) Living organisms in the past were changed to fossils.

(d) There is similarity between living organisms in the past and the present.

41. Paddy grows best when the $P^H$ of the soil is between 5 and 6.5 what can you generalize from this?

(a) Paddy grows best in alkaline soil.

(b) Paddy grows best in neutral soil.

(c) Paddy grows best in acidic soil

(d) Paddy grows best both in acidic soil and neutral soil.

42. A foreign particle with a piece of mantle tissue is artificially introduced into the pearl oyster. What can you generalize from this?

(a) Foreign particle produces pearl

(b) Mantle tissue produces pearl.

(c) Pearl formation is a phenomenon for protection against foreign particle accidentally entering the body.

(d) None.

43. After exposure to bright light, eyes take some time to adapt for dim light. What can you generalize from this?

(a) Rhodopsin becomes temporarily degenerated.

(b) Rhodopsin gets bleached by light and requires some time for gaining normal position.

(c) Rhodopsin changes to post rhodopsin in dim light and this takes some time.

(d) None.

Some of the classification of non-chordates are given below:

1. Phylum – Coelenterata
2. Phylum – Annelida
3. Phylum – Mollusca
4. Phylum – Echinodermata

Choose the phylum to which the following characteristic is related
44. Body is generally soft, unsegmented without appendages and bilaterally symmetrical.
   (a) 1    (b) 2    (c) 3    (d) 4

45. Organism show pentamerous radial symmetry.
   (a) 1    (b) 2    (c) 3    (d) 4

46. The three principles of Mendalism are:
   
   1. Law of Segregation
   2. Law of Dominance
   3. Law of Independent assortment

Choose the law to which the following statement is related.

"Gametes are never hybrids."

This is a statement of
   (a).1    (b) 2    (c) 3    (d) None

47. It is essential to plant trees in densely populated areas. Because
   (a) Timber is useful.
   (b) Plants utilize the carbon dioxide given out by human beings during respiration and thus purify the air.
   (c) Trees provide shade.
   (d) Trees help to get wind.

48. Consumption of green vegetables helps in blood formation. Because
   (a) Green vegetables are easily digestible
   (b) They contain prophyrin which promotes haemoglobin formation.
   (c) After digestion they go directly to the blood.
   (d) They help in the formation of aminoacids and fattyacids.
Nuclear energy is an important source of energy that we use today. But the radiations from this cause genetic deformity and diseases like cancer. If so, the new problem scientists have to investigate is,

(a) How to reduce consumption of nuclear energy.
(b) How to avoid use of nuclear energy.
(c) How to prevent nuclear radiation.
(d) How to produce a substitute for nuclear energy.

The waste from factories cause water pollution in rivers and ponds. If so, the new problem scientists have to face is

(a) How to reuse these wastes after purifying
(b) How to dispose these wastes.
(c) How to prevent the discharge of wastes to ponds and rivers.
(d) How to prevent the formation of wastes in factories.
### Test of Process Skills in Biological Science (Draft form)

#### Scoring Sheet

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   c. Clogging of their gills by solid substances
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Find out which of the following is a distinctive character of class bivalvia of mollusca.

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d. Mantle shows colour changes.

7. Exhaled air from the lungs contains more carbon dioxide than that taken into the lungs. Which of the following is the most appropriate method to test this hypothesis?
   a. Compare equal quantities of fresh and exhaled air for carbon dioxide content by passing them through clear lime water.
b. Pass a known quantity of exhaled air through clear lime water.

c. Pass a known quantity of fresh air through clear lime water.

d. Compare different quantities of fresh and exhaled air for carbon dioxide content by passing them through clear lime water.

8. Improved varieties of economically important plants are better than wild varieties. Which of the following is the most appropriate method to test this hypothesis?
a. Selection of seeds from healthier plants.
b. Introduction of varieties of crops under different conditions.
c. Judicious combination of selection, introduction and hybridization of different varieties.
d. The scientific improvement of cultivated plants.

9. If a biochemical analysis of mitochondria is to be done, which of the following is the most appropriate procedure?
a. Plasmolyse the cell, filter it and take the debris.
b. Grind the cell and filter out the mixture and take the debris.
c. Select cells which have a large number of mitochondria.
d. Subject the cells of cell fractionation (centrifuge) and obtain mitochondria.

10. In order to study the organism invisible to the naked eye we use a
    (a) Camera  (b) Telescope
    (c) Microscope (d) Binocular

11. Which of the following instrument is used to demonstrate transpiration.
    (a) Potometer
    (b) Thermometer
    (c) Haemocytometer
    (d) Ammeter

12. Average pulse rate of an adult is
    (a) 72 per minute
    (b) 70 per minute
    (c) 100 per minute
    (d) 75 per minute
13. The shortest distance for clear vision is
   (a) 15 cm (b) 30 cm (c) 25 cm (d) 20 cm

14. Some plants have evolved to attract specific animals. The animal receives a meal
    that, it does not have to compete for, and the plant is assured that its pollen will not
    be wasted on plants of different species. Through time, the plant gets better at
    attracting the animal and increases its reproductive success as a result. Simultaneously
    the animal improves its feeding on a specific plant and increases its
    reproductive success as a result. Which of the following is an example of this
    scenario?
       (a) Coevolution   (b) Mutualism
          (c) Diversifying selection  (d) Commensalism

15. A long deep dive in seals promotes several physiological changes in them. During
    the dive, blood is shunted away from tissues like muscles and viscera towards the
    heart and CNS. At the end of the dive, there is great rise in lactic acid level in
    blood. Which of the following graph represent great rise in lactic acid.

   X axis corresponds to time and 'y' axis corresponds to % of oxygen dissociation.

16. The height and weight of six boys are given below:

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<tr>
<th>Height (cm)</th>
<th>Weight (Kg)</th>
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<tbody>
<tr>
<td>120</td>
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<td>180</td>
<td>80</td>
</tr>
<tr>
<td>195</td>
<td>85</td>
</tr>
</tbody>
</table>
What will be weight of a boy having a height of 160 centimeters.

(a) 50 Kg       (b) 55 Kg       (c) 65 Kg       (d) 70 Kg

17. The following diagram shows an experiment related to photosynthesis. Here the gas collected in the test tube was proved to be oxygen. What do you infer from this?

![Diagram of photosynthesis experiment]

(a) Water is an important factor for photosynthesis
(b) Water is absorbed during photosynthesis
(c) During photosynthesis plants evolve oxygen.
(d) Carbon dioxide is essential for photosynthesis

18. Euglena synthesizes its food with the help of chloroplasts. If a jar containing Euglena in a rich nutrient solution is kept in a dark room. What do you infer from this?

(a) Synthesis of food will stop and the animal will die of starvation.
(b) Synthesis of food will continue through chloroplasts
(c) Chloroplasts and pyrenoids will disappear and the animal will derive its nourishment from the surrounding solution.
(d) Synthesis will continue but pyrenoids will disappear.

19. Green plants are not usually affected by diseases due to the deficiency of vitamins. From this we could infer

(a) Plants do not require vitamins
(b) Plants can synthesis vitamins
(c) Plants get required vitamins from the soil.
20. A cross between white-eyed female and red-eyed male Drosophila give red-eyed females and white eyed males. Rarely the cross give rise to white eyed females and red-eyed males. From this we could infer
a. Mutation in male
b. Loss of sex chromosome
c. Mutation of female fly
d. Nondisjunction of two X chromosome in female.

21. Evidences from the fossils show that living organisms in the past had simple structures. But they have complex structures today. What can you generalize from this?
   a. Living organisms in the past are not seen today.
   b. Complex forms of organisms evolved from simpler forms which existed in the past.
   c. Living organisms in the past were changed to fossils.
   d. There is similarity between living organisms in the past and the present.

22. A foreign particle with a piece of mantle tissue is artificially introduced into the pearl oyster. What can you generalize from this?
   a. Foreign particle produces pearl
   b. Mantle tissue produces pearl.
   c. Pearl formation is a phenomenon for protection against foreign particle accidentally entering the body.
   d. None.

Some of the classification of non-chordates are given below:
1. Phylum – Coelenterata
2. Phylum – Annelida
3. Phylum – Mollusca
4. Phylum – Echinodermata
Choose the phylum to which the following characteristic is related

(d) Plants get vitamins from sunlight.
23. Body is generally soft, unsegmented without appendages and bilaterally symmetrical.
   (a) 1   (b) 2   (c) 3   (d) 4

24. Orngaism show pentamerous radial symmetry.
   (a) 1   (b) 2   (c) 3   (d) 4

25. Consumption of green vegetable helps in blood formation. Because
   a. Green vegetables are easily digestible
   b. They contain prophyrin which promotes haemoglobin formation.
   a. After digestion they go directly to the blood.
   b. They help in the formation of aminoacids and fattyacids.

26. The waste from factories cause water pollution in rivers and ponds. If so, the new problem scientists have to face is
   (a) How to reuse these wastes after purifying
   (b) How to dispose these wastes.
   (c) How to prevent the discharge of wastes to ponds and rivers.
   (d) How to prevent the formation of wastes in factories.
## Test of Process Skills in Biological Science (Final form)

**Scoring Sheet**

Name: ................................................. Standard: ............... Division:

Class No. ...................... School: .................................................

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<thead>
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<th>Answers</th>
<th>Question No.</th>
<th>Answers</th>
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Appendix F

Scoring Key of Test of Process Skills in Biological Science (Final form)

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### Appendix G

**Item Numbers in the Test of Science Process Skills Classified into 17 Process Skills Sub-Categories (Final form)**

<table>
<thead>
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<th>Main Process Skills</th>
<th>Process Skill Sub-category</th>
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<td>Botany</td>
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<td>I. Initiation</td>
<td>A₁ – Recognition of the problem</td>
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<td>A₂ – Observation of objects and phenomena</td>
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<td>II. Hypothesising</td>
<td>B₁ – Formulation of hypothesis</td>
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<td>B₂ – Selection of suitable test of hypothesis</td>
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<td>B₃ – Design of appropriate procedure for experimental test</td>
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<td>III. Manipulation</td>
<td>C₁ – Selection of proper instrument</td>
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<tr>
<td>Gathering Data</td>
<td>C₂ – Measuring of objects and changes</td>
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<td>C₃ – Estimation of measurement</td>
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<td>IV. Processing Data</td>
<td>D₁ – Organisation and manipulation of data</td>
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<td>D₂ – Preparation of graphs</td>
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<td>D₃ – Interpolation and extrapolation</td>
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<td>V. Conceptualisation</td>
<td>E₁ – Interpreting experimental data</td>
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<td></td>
<td>E₂ – Evaluation of hypothesis</td>
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<td>VI. Generalization</td>
<td>F₁ – Formulation of generalization</td>
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<td>F₂ – Developing a mental model</td>
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<td>VII. Open-endedness</td>
<td>G₁ – Application of discovered knowledge</td>
<td>25</td>
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<tr>
<td></td>
<td>G₂ – Identification of a new problem</td>
<td>0</td>
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</table>

Total 17 | 7 | 19 | 26
TEST OF CREATIVITY IN BIOLOGICAL SCIENCE  
(Draft form) 
Prepared by  
Dr. B. Suresh & Tessy Xavier  
Govt. College of Teacher Education,  
Thiruvananthapuram  

The purpose of this test is to reveal how creatively you can think of scientific matters. There are seven types of items in the test. Instructions for answering the items have been given at the beginning of each test, using a sample item as illustration. Answer the questions after carefully reading the instructions: the sample item will illustrate the procedure to be adopted.

Please note that, the more the number of answers, the better will be your answer. Also please note that if you can think of a wide variety of answers which are related to Biological Sciences, it will add to value of your answer.

Start answering only when the teacher says ‘START’ and stop answering when the teacher says ‘STOP’. 
TEST –I

Instructions
There are four items in this part. Some letters are given in each. Write down any number of words related to biological science, by adding more letters to what is given. Examine the sample item given here.

Sample Question : Mi..........................................................
Responses : Microscope, Microscopic structure, Microscopic Organisms, Microbes......

Four questions of this type are presented below. Try to write as many words as possible within the time allowed.

Question No. I : Nu..........................................................
Responses : ..........................................................
Question No. II : Bi..........................................................
Responses : ..........................................................
Question No. III : Pa..........................................................
Responses : ..........................................................
Question No. IV : Na..........................................................
Responses : ..........................................................

(Time: 6 minutes)

TEST –II

Instructions
There are four items in this part of the test. Answer them after examining the sample item given here.

Sample Question : That which can be called “Hexagon”
Responses : Structure of benzene, glycogen, cellulose Structure of beehive.

Try to give as many responses as possible within the time allowed.

Question No. I : That which can be called “Circle”
Responses : ..........................................................
Question No. II : That which can be called “Spiral”
Responses : ..........................................................
Question No. III : That which can be called “Star”
Responses : ..........................................................
Question No. IV : That which can be called “Oval”
Responses : ..........................................................

(Time: 5 minutes)
TEST – III

Instructions

Certain improbable events are given. Imagine that these events occur, and write down the consequences. As an example, see the sample item

Sample Question : All our deceased ancestors come back.
Responses : Shortage of food and water, knowledge of ancient history, knowledge of ancient agricultural methods, lifestyle patterns, knowledge of hell and heaven, difference between man living with soul and soul alone, knowledge of ‘death’.

Try to give as many responses as possible. Answer need not be in complete sentences.

Question No. I : Man understands the languages of birds and animals.
Responses :

Question No. II : We can fly like birds.
Responses :

(Time: 5 minutes)

TEST – IV

Instructions

A pair of words are given to you. The word pair is connected by some implied relationship. Write down as many words as possible, which will have association with the given pair. Examine the sample item given here.

Sample Question : Animal Kingdom, Invertebrates
Responses : Protozoa, Porifera, Coelenterata.

Answer the four questions given below using the above method. Try to write as many words as possible within the permitted time.

Question No. I : Insects, Pests
Responses :

Question No. II : Cell, Blood cells
Responses :

Question No. III : Organic compounds, carbohydrates.
Responses :

Question No. IV : Invertebrates, Phylum Mollusca
Responses :

(Time: 5 minutes)
TEST –V

Instructions

The names of certain articles in daily use are given. Given any number of common, unusual uses for them. Try to write a variety of uses. It is better if you write uses which others may not think of.

Examine the sample item given here.

Sample Question : Book
Responses : To read, as a pillow, as a paper weight, as an umbrella
            To cover one’s face.

Answer the four questions given below in the manner indicated. Responses need not be in complete sentences.

Question No. 1 : Microscope
Responses : .................................................................
Question No. II : Handlens
Responses : .................................................................
Question No. III : Scissors
Responses : .................................................................
Question No. IV : Coverglass
Responses : .................................................................

(Time : 5 minutes)

TEST –VI

Instructions

The names of certain lab equipments in everyday use are given to you. Suggest different ways in which these articles can be improved. The practicability of your suggestions is in material. Examine the sample item given here.

Sample Question : “Centrifuge”
Responses : to be light, automatic, visible, easy handling.

Answer the 4 questions given below as explained here. Answers may be very short. Try to include answers which other may not think of.

Question No. 1 : “Test tube”
Responses : .................................................................
Question No. II : “Microscope”
TEST VII

Instructions

There are two items in this part. An incomplete figure is given in each. Add any number of lines and complete the figure in scientific pattern. You are free to draw any number of picture. Give a suitable caption when the picture is completed.

Sample Questions

Responses.

(1) CHITON

(2) TEREDO
All the figures given as responses are drawn by adding more lines to the incomplete figure, consisting of given lines. Answer the three questions given below in the manner just explained.

Question I

Question II

Question III

(Time: 8 minutes)
TEST VIII

SECTION A: Note what you have seen in the pictures given below (Time 4 mts)

(a)

(b)

(c)

(d)

Section B: Hidden in the puzzle box are names of some animals. They may be spelled backwards, up, down or in any direction in a diagonal. Write them with numbers and classify them as arthropods and mollusks (Time 5 mts.)

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TEST OF CREATIVITY IN BIOLOGICAL SCIENCE
RESPONSE SHEET (Draft Form)

Name ..............................................
Standard ......................................... Division: ..............................
School .............................................. Class No. ..............................
Place ..............................................

TEST I
Question I ......................................................................................
Question II ...................................................................................
Question III ...................................................................................
Question IV ...................................................................................

TEST II
Question I ......................................................................................
Question II ...................................................................................
Question III ...................................................................................
Question IV ...................................................................................

TEST III
Question I ......................................................................................
Question II ...................................................................................
Question III ...................................................................................

TEST VII

Question I

Question II

Question III
Test VIII

Responses

SECTION A

a) .............................................................................................
.............................................................................................
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b) .............................................................................................
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c) .............................................................................................
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d) .............................................................................................
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SECTION B

ARTHROPODES | MOLLUSCS
### Scoring Sheet of Test of Creativity in Biological Science (Draft form)

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**Class No.:** ............  
**Standard:** ........ Division: .......  
**School:**  .........................................

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TEST OF CREATIVITY IN BIOLOGICAL SCIENCE
(Final form)
Prepared by
Dr. B. Suresh & Tessy Xavier
Govt. College of Teacher Education,
Thiruvananthapuram

The purpose of this test is to reveal how creatively you can think of scientific matters. There are seven types of items in the test. Instructions for answering the items have been given at the beginning of each test, using a sample item as illustration. Answer the questions after carefully reading the instructions: the sample item will illustrate the procedure to be adopted.

Please note that, the more the number of answers, the better will be your answer. Also please note that if you can think of a wide variety of answers which are related to Biological Sciences, it will add to value of your answer.

Start answering only when the teacher says ‘START’ and stop answering when the teacher says ‘STOP’.
TEST –I

Instructions

There are two items in this part. Some letters are given in each. Write down any number of words related to biological science, by adding more letters to what is given. Examine the sample item given here.

Sample Question : Mi...........................................
Responses : Microscope, Microscopic structure, Microscopic organisms, Microbes......

Two questions of this type are presented below. Try to write as many words as possible within the time allowed.

Question No. I : Nu...........................................
Responses : ...........................................
Question No. II : Na...........................................
Responses : ...........................................

(Time : 3 minutes)

TEST –II

Instructions

There are two items in this part of the test. Answer them after examining the sample item given here.

Sample Question : That which can be called “Hexagon”
Responses : Structure of benzene, glycogen, cellulose
Structure of beehive.

Try to give as many responses as possible within the time allowed.

Question No. I : That which can be called “Circle”
Responses : ...........................................
Question No. II : That which can be called “Spiral”
Responses : ...........................................
Question No. III : That which can be called “Oval”
Responses : ...........................................

(Time : 4 minutes)
TEST –III

Instructions

Certain improbable events are given. Imagine that these events occur, and write down the consequences. As an example, see the sample item.

Sample Question : All our deceased ancestors come back.
Responses : Shortage of food and water, knowledge of ancient history, knowledge of ancient agricultural methods, life style patterns, knowledge of hell and heaven, difference between man living with soul and soul alone, knowledge of ‘death’.

Try to give as many responses as possible. Answer need not be in complete sentences.

Question No. 1 : Man understands the languages of birds and animals.
Responses :

Question No. II : We can fly like birds.
Responses :

(Time : 4 minutes)

TEST –IV

Instructions

A pair of words are given to you. The word pair is connected by some implied relationship. Write down as many words as possible, which will have association with the given pair. Examine the sample item given here.

Sample Question : Animal Kingdom, Invertebrates
Responses : Protozoa, Porifera, Coelenterata.

Answer the two questions given below using the above method. Try to write as many words as possible within the permitted time.

Question No. I : Organic compounds, Carbohydrates
Responses :

Question No. II : Invertebrates, Phylum Mollusca.
Responses :

(Time : 4 minutes)
TEST –V

Instructions

The names of certain articles in daily use are given. Given any number of common, unusual uses for them. Try to write a variety of uses. It is better if you write uses which others may not think of.

Examine the sample item given here.

Sample Question : Book
Responses : To read, as a pillow, as a paper weight, as an umbrella
            To cover one’s face.

Answer the three questions given below in the manner indicated. Responses need not be in complete sentences.

Question No. 1 : Microscope
Responses :

Question No. II : Handlens
Responses :

Question No. III : Scissors
Responses :

(Time : 4 minutes)

TEST –VI

Instructions

The names of certain lab equipments in everyday use are given to you. Suggest different ways in which these articles can be improved. The practicability of your suggestions is in material. Examine the sample item given here.

Sample Question : “Centrifuge”
Responses : to be light, automatic, visible, easy handling.

Answer the 3 questions given below as explained here. Answers may be very short. Try to include answers which other may not think of.

Question No. 1 : “Test tube”
Responses :

Question No. II : “Microscope”
Responses :
TEST VII

Instructions

There are two items in this part. An incomplete figure is given in each. Add any number of lines and complete the figure in scientific pattern. You are free to draw any number of picture. Give a suitable caption when the picture is completed.

Sample Question

Responses.

All the figures given as responses are drawn by adding more lines to the incomplete figure, consisting of given lines. Answer the two questions given below in the manner just explained.
TEST VIII

SECTION A: Note what you have seen in the pictures given below (Time 4 mts)

(a) 

(b) 

(c) 

(d) 

SECTION B: Hidden in the puzzle box are names of some animals. They may be spelled backwards, up, down or in any direction in a diagonal. Write them with numbers and classify them as arthropods and molluscs (Time 5 mts.)

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Appendix L

TEST OF CREATIVITY IN BIOLOGICAL SCIENCE
RESPONSE SHEET (Final form)

Name ....................................... Standard ........................................
Division .................................. School........................................
Class No. ..............................

TEST I
Question I
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Question II
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TEST II
Question I
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TEST III
Question I
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Question II
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TEST IV

Question I

Question II

TEST V

Question I

Question II

Question III

TEST VI

Question I

Question II
Question III

Question I

Question II

TEST VII
Test VIII

Responses

SECTION A

a) ..............................................................................................

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b) ..............................................................................................

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SECTION B

| ARTHROPODES | MOLLUSCS |
Scoring Sheet of Test of Scientific Creativity in Biological Science (Final form)

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Standard: ........ Division: ........ School: ...........................................

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Given below are a number of questions. To every question there are four items of work, which you like to be engaged in and to each of which particular letter is given.

You are given full freedom to do any of these activities. You must choose the work you like test. The response you have chosen is to be marked with (X) given to you.

40 such questions are given. Begin work only when you are asked to do so.
1. Which of the following arrangement would you prefer?
(a.) Amoeba → Earthworm → Spider → Starfish
(b) Chess → Cricket → Tennis → Badminton
(c) Kerala → India → China → America
(d) Kitchen → Home → School → Town

2. What type of book would you like to read?
(a) Science books (b) Cartoon
(c) Novel (d) Religious books

3. What would you like to watch during recreation time?
(a) Movie (b) Museum
(c) Beach (d) Sports

4. Which among the following organization would you like to become a member?
(a) N.C.C (b) Science club
(c) Lions club (d) Community services

5. What sort of publication would you like to read?
(a) Malayala Manorama (b) Science magazines
(c) Vanitha (d) Holy Bible or Ramayana or Khuran

6. Which of the following exhibition makes you more interested?
(a) Arts and craft exhibition (b) Book fair
(c) Science exhibition (d) Vasthramela and food exhibition

7. Which among the following would you like to observe the most?
(a) Pictures (b) Science laboratory (c) Garden (d) Market
8. Which of the following science generates in you the maximum enthusiasm?
   a) Picture of politicians  (b) Picture of film stars
   (c) Sports picture  (d) Animals picture

9. Which one would you like to visit during an excursion?
   (a) Power house  (b) Ooty
   (c) Taj Mahal  (d) Zoological park

10. What do you want to become in your future?
    (a) Scientist  (b) Farmer
     (c) Policeman  (d) Businessman

11. Which of the following would you like to get explained?
     (a) Skate & rattle  (b) Food-web diagram
      (c) Historical events  (d) Modern movies

12. Where in the following would you like to spent most of your time?
    (a) Park  (b) Library
     (c) Text book  (d) Laboratory

13. Which among the following activity would you like to engage in?
    a) Social activities  (b) Sports activities
     (c) Scientific activities  (d) Cultural activities

14. Which among the following place would you like to visit?
    a) Scientifically important places
    (b) Historically important places
     (c) Geographically important places
     (d) Religiously important places.

15. Which one would like to handle the most?
    a) Lab Equipments  (b) Musical equipments
     (c) Sports equipments  (d) Kitchen equipments

16. Which personality attracts you the most?
    a) Sachin Tendulkar  (b) Matha Amruthananthamai
17. Which of the following would you like to draw?

(a) 
(b) 
(c) 
(d) 

18. Which among the following subject interests you the most?

a) English
b) Mathematics
(c) Science
d) History

19. Which of the following would you like to collect?

a) Stamps
b) Pictures of animals
(c) Historical pictures
d) Maps of different countries

20. Which of the following historically important place would you like to visit?

(a) National Park (Bird sanctuary)
(b) Temples
(c) Historical places
d) Power houses

21. What sort of magazine would you like to read?

a) Science magazines
b) Times
(c) Aksharakairali
d) Sports magazines

22. Which of the following seems to you the most thought provoking?

a) Holy Bible
b) Science books
(c) Readers digest
d) Sports magazines

23. Which of the following sight attracts you the most?
24. Which among the following T.V.Channel you would like to see?
   a) Discovery channel  
   b) Asianet news channel  
   c) Sports  
   d) Shalom

25. Which among the following would you like to discuss?
   a) Discoveries  
   b) Arts and sports matters  
   c) Business matters  
   d) Political matters

26. Which one would you like to listen every day?
   a) Science news  
   b) Accident news  
   c) Political news  
   d) War news or Political news

27. Which of the following chart makes you more homely?

28. Which of the following TV Programme entertain you the most?
   a) Sports  
   b) Tom & Jerry  
   c) Idea star singer  
   d) Science news

29. Which of the following home appliance would you prefer to bring.
   a) Television  
   b) Computer  
   c) Furniture  
   d) Kitchen utensils

30. Whose contribution would you value the most?
   a) Sugathakumari  
   b) Madam Curie
31. Which examination would you like to write.
   a) English  
   b) Biology  
   c) Mathematics  
   d) Social studies

32. Which among the following attracts you the most?
   (a) (b) (c) (d)

33. Which of the following group activity would you like to engage in?
   a) Laboratory activities  
   b) Sports activities  
   c) Club activities  
   d) Religious activities

34. If you become a teacher which subject will you like to teach?
   a) Mathematics  
   b) Drill  
   c) Malayalam  
   d) Science

35. Which of the following equation makes you more familiar?
   (a) $E = mc^2$  
   (b) $(a+b)^2 = a^2 + 2ab + b^2$  
   (c)  
   (d) $I = PNR$

36. Whose field of activity would you like to engage yourself?
   (a) Dr. M.S. Swaminadhan  
   (b) Soniya Gandhi  
   (c) Sree Budha  
   (d) Mohanlal

37. Which among the following would you like to purchase?
(a) Computer          (b) Science books
(c) Chocolates        (d) Cosmetics.

38. Which one would you like to listen every day?
    (a) Accidents          (b) War
    (c) Scientific investigation  (d) Business matter

39. Which among the following symbol attracts you the most?

    (a)红色十字架 (b) DNA结构 (c) 共产主义象征 (d) 螺旋星系

40. What do you like to do while you are at home?
    (a) Sleeping          (b) Cooking
    (c) Painting          (d) Reading Scientific Books
**SCIENCE CURIOSITY INVENTORY (Draft form)**

**SCORING SHEET**

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Class No. ............

Standard: ........ Division: .. School ...........

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### Appendix P

#### Scoring Key for Science Curiosity Inventory (Draft form)

<table>
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Given below are a number of questions. To every question there are four items of work, which you like to be engaged in and to each of which particular letter is given.

You are given full freedom to do any of these activities. You must choose the work you like best. The response you have chosen is to be marked with (X) given to you.

30 such questions are given. Begin work only when you are asked to do so.
1. Which of the following arrangement would you prefer?
   (a.) Amoeba → Earthworm → Spider → Starfish
   (b) Chess → Cricket → Tennis → Badminton
   (c) Kerala → India → China → America
   (d) Kitchen → Home → School → Town

2. What type of book would you like to read?
   (a) Science books (b) Cartoon
   (c) Novel (d) Religious books

3. What sort of publication would you like to read?
   (a) Malayala Manorama (b) Science magazines
   (c) Vanitha (d) Holy Bible or Ramayana or Khurum

4. Which of the following exhibition makes you more interested?
   (a) Arts and craft exhibition (b) Book fair
   (c) Science exhibition (d) Vasthramela and food exhibition

5. Which among the following would you like to observe the most?
   (a) Pictures (b) Science laboratory (c) Garden (d) Market

6. Which of the following science generates in you the maximum enthusiasm?
   (a) Picture of politicians (b) Picture of film stars
   (c) Sports picture (d) Animals picture

7. Which among the following activity would you like to engage in?
   (a) Social activities (b) Sports activities
   (c) Scientific activities (d) Cultural activities

8. Which among the following place would you like to visit?
9. Which one would like to handle the most?
   a) Lab Equipments
   b) Musical equipments
   c) Sports equipments
   d) Kitchen equipments

10. Which personality attracts you the most?
    a) Sachin Tendulkar
    b) Matha Amruthananthamai
    c) Gregor Mendel
    d) Mohan Lal

11. Which among the following subject interests you the most?
    a) English
    b) Mathematics
    c) Science
    d) History

12. Which of the following would you like to collect?
    a) Stamps
    b) Pictures of animals
    c) Historical pictures
    d) Maps of different countries

13. What sort of magazine would you like to read?
    a) Science magazines
    b) Times
    c) Aksharakairali
    d) Sports magazines

14. Which of the following seems to you the most thought provoking?
    a) Holy Bible
    b) Science books
    c) Readers digest
    d) Sports magazines

15. Which of the following sight attracts you the most?
    a) Airport
    b) Town
16. Which among the following T.V. Channel you would like to see?
   a) Discovery channel
   b) Asianet news channel
   c) Sports
   d) Shalom

17. Which among the following would you like to discuss?
   a) Discoveries
   b) Arts and sports matters
   c) Business matters
   d) Political matters

18. Which one would you like to listen every day?
   a) Science news
   b) Accident news
   c) Political news
   d) War news or Political news

19. Which of the following chart makes you more homely?

20. Which of the following home appliance would you prefer to bring.
   a) Television
   b) Computer
   c) Furniture
   d) Kitchen utensils

21. Whose contribution would you value the most?
   a) Sugathakumari
   b) Madam Curie
   c) Indira Gandhi
   d) Budha

22. Which examination would you like to write.
   a) English
   b) Biology
23. Which among the following attracts you the most?

(a) Mathematics
(b) Social studies

d) Science

24. Which of the following group activity would you like to engage in?

(a) Laboratory activities
(b) Sports activities
(c) Club activities
(d) Religious activities

25. If you become a teacher which subject will you like to teach?

(a) Mathematics
(b) Drill
(c) Malayalam
(d) Science

26. Which of the following equation makes you more familiar?

(a) \( E = mc^2 \)
(b) \( (a+b)^2 = a^2 + 2ab + b^2 \)
(c) \( \text{Some math equation} \)
(d) \( I = PNR \)

27. Whose field of activity would you like to engage yourself?

(a) Dr. M.S. Swaminathan
(b) Soniya Gandhi
(c) Sree Budha
(d) Mohanlal

28. Which among the following would you like to purchase?

(a) Computer
(b) Science books
(c) Chocolates
(d) Cosmetics.
29. Which among the following symbol attracts you the most?

(a) Red Cross  (b) DNA Structure  (c) Symbol of Communism  (d) Spiral Galaxy

30. What do you like to do while you are at home?

(a) Sleeping  (b) Cooking
(c) Painting  (d) Reading Scientific Books
**SCIENCE CURIOSITY INVENTORY (Draft form)**

**SCORING SHEET**

Name: .......................  Class No. ............
Standard: .......... Division: ............ School ...........

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### Appendix S

Scoring Key for Science Curiosity Inventory (Final form)

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ACHIEVEMENT TEST
CLASS XI
SUBJECT: ZOOLOGY

Max Marks: 50
Time: 2 Hrs

Instructions: Attempt all questions.

PART – A
Choose the correct answers out of the alternatives given of the questions (1 to 15).

1. Visceral mass in mollusca known as
   (a) Shell                (b) Mantle
   (c) Ventral Muscular Foot (d) all of these

2. Buccal Cavity of molluscs contains a special rasping organ. What is it known as?
   (a) Tongue               (b) Dental Palp
   (c) Radula               (d) Mantle Plate

3. Molluscan characters do not include one of the following:
   (a) Soft body            (b) Presence of Mantle folds
   (c) Segmentally ganglionated nerve cord
   (d) Foot simple median and muscular

4. Members of the Phylum Mollusca are categorised on the basis of
   (a) Segmentation          (b) trochophore larva
   (c) The presence of a foot, visceral mass and mantle
   (d) Presence of cuttle bone

5. Ink gland of molluscs are meant for
   (a) Excretion             (b) Reproduction
   (c) Protection            (d) None of these

6. Which of the following is commonly known as cuttlefish?
   (a) Teredo                (b) Sepia
   (c) Loligo                (d) Solen
7. From which of the following head and tentacles of cephalopoda derived?
   (a) Foot  (b) Visceral mass  
   (c) Mantle  (d) all of the above

8. Cephalopods shows colour changes. What is the most reasonable hypothesis that can be made for this?
   (a) Internal secretions make colour changes  
   (b) Chromatophores make colour changes  
   (c) Ink sac secretions produces colour changes  
   (d) Mantle shows colour changes.

9. Which of the following have eye structure nearest to that of vertebrates?
   (a) Insecta  (b) Polychaeta 
   (c) Cephalopoda  (d) Crustacea

10. Ciliary mode of feeding is common in
   (a) Sepia  (b) Pila 
   (c) Fresh water mussel  (d) none of the above

11. Oyster secretes the chemicals of pearl to
   (a) Strengthen its mantle cavity  
   (b) Regenerate injured parts  
   (c) Protect itself against invading foreign particles  
   (d) Isolate damaged tissue of the body.

12. Members of Polyplacophora are categorised by having
   (a) Shell  (b) Single shell  (c) 8 shells  (d) Many shell

Some of the classification of Phylum Mollusca are given below.

1. Class -  Gastropoda
2. Class -  Aplacophora
3. Class -  Cephalopoda
4. Class -  Scaphopoda

Choose the class to which the following characteristic is related.

13. Body is soft and enclosed in a spirally coiled univalve shell.
   (a) 1  (b) 2  (c) 3  (d) 4
14. Body is cylindrical, elongated and is enclosed by a tubular shell open at both ends.
   (a) 1   (b) 2   (c) 3   (d) 4

15. Organism show worm-like body and without shell.
   (a) 1   (b) 2   (c) 3   (d) 4

PART – B

16. Molluscs are closely related to .........................................
17. Culture of molluscs falls under .........................................
18. Gastropods have ..................................................
19. A snail’s shell is made up of ........................................
20. Pearl is secreted by the ...........................................
21. Pelecypoda have ...................................................
22. Threat to ship industry is ...........................................
23. True pearl is made up of ...........................................
24. Dentalium belongs to the class ....................................
25. Complete the following diagram.

![Diagram]

PART – C

Write ‘T’ against the true item and ‘F’ against the false item of the following questions.

26. Neopilina is an example of living fossil.
27. Chaetoderma is gastropod.
28. Chiton is a cephalopod with lateral fins.
29. Shell is completely absent in class aplacophora.
30. Shells of dentalium are used as money by Red Indians in America.

\[(1 \times 30 = 30\) marks\]

**PART – D**

Answer the following questions in two or three sentences from 31 to 35.

31. Why fresh water mussel is included under Phylum mollusca?
32. Mention four diagnostic characters of Phylum mollusca.
33. Give a labelled diagram of ‘Radula’.
34. What is cuttle bone? What is its function?
35. Assign the following animals to their respective classes.
   (a) Neopilina
   (b) Chaetoderma

\[(2 \times 5 = 10\) marks\]

**PART – E**

36. Pinctada is considered as an economically important mollusc. Why?
   Briefly describe the mechanism of pearl formation?
37. Identify the following organism on the basis of its special features and find out its class?
LIST OF EXPERTS

1. Dr. A. Sukumaran Nair, 
   Former Vice Chancellor, 
   Mahatma Gandhi University, 
   Kottayam.

2. Dr. P.J. Jacob, 
   Dean, School of Pedagogical Sciences, 
   Mahatma Gandhi University, Kottayam.

3. Dr. J. Exemmal, 
   Former Dean, Department of Education 
   University of Kerala, Thiruvananthapuram.

4. Dr. Theresa Susan A. 
   Head, Department of Education, 
   University of Kerala, Thiruvananthapuram.

5. Dr. V.T. Mathew, 
   Former Principal and Professor in Natural Science 
   St. Joseph's Training College, Mannanam.

6. Sr. Sicily K.C. 
   Former Principal, 
   St. Joseph's Training College, Mannanam.

7. Dr. Valsamma Jacob 
   Former Sl. Grade Lecturer, 
   Peet Memorial Training College, 
   Mavelikkara.

8. Dr. K.Y. Benedict, 
   Associate Professor, Mar Theophilus Training College, 
   Nalanchira, Thiruvananthapuram.

9. Dr. Sudha S. 
   H.S.S.T. in Zoology, 
   Govt. Model Girls' H.S.S., Pattom.

10. Prof. Thampy Varghese, 
    Head, Department of Zoology, 
    Newman College, Thodupuzha.