APPENDIX A

TEST ON CREATIVITY IN PHYSICS

Name of the Student:
School:
Home Address:
Father's/Guardian's Name and Occupation:

General Instructions

In this test you will find some interesting problems. To solve those problems, you will have to use your thinking and imagination. The purpose of the test is to see how quickly and imaginatively you can think under situations which require new ways of dealing with them. Read each problem carefully and apply your best thinking in giving the responses. Write your responses in English. Responses have to be given briefly but clearly in the space provided under each problem. Give a serial number to each of your responses. There are no right or wrong responses for a number of problems. For solving them use your imagination to think of as many responses as you can. Few problems also have specific right answers. Think them accordingly.

Fourteen different types of problems are provided. Each type is separately timed. Time limit is mentioned separately in association with each problem. Complete each with the prescribed limit. After finishing each go to the next one. If necessary you return to the previous again for any addition you would like to make. Remember that you will not have to go to the next problem until the time for the first activity is over and you are told to proceed further. Examples and hints are also provided. Follow those and respond accordingly. At the end you will be giving five minutes extra time for thorough revision. Please do not omit any problem. Your response will be used for research purpose only.

Do not open the booklet until you are instructed in doing so.
Problem No. 1: Planning of a Circuit.

Direction

This is a problem in relation to design of a circuit. The problem is simple and self explanatory. You are given one minute time for this.

Problem: Two lamps $L_1$ and $L_2$ are connected to a battery $E$ through three switches $S_1$, $S_2$ and $S_3$. Name the switch/switches which you will have to close to lit

(i) only the lamp $L_1$
(ii) only the lamp $L_2$

Response:

Lamp Switch/Switches
(i) Only $L_1$
(ii) Only $L_2$

Problem No. 2: Finding Analogy

Direction

In this problem you are to follow the relationship of two given concepts and accordingly have to choose the missing one. You will be giving one minute time for this.

An example is also given. Please follow it and respond to the problem.

Example: Complete the following analogy by choosing the right word from the bracket.

Force : Acceleration :: Frequency : ? (wave, hertz, pitch, intensity)
Answer: Pitch

Problem: Complete the following analogies by choosing the right word from the bracket.

(i) Snell's law of refraction : Refractive index :: Ohm's law: ?
(Potential difference, Current, Charge, Resistance)
(ii) Motor : Motion :: Lense: ?
(Light, Image, Focal length, Refraction)

Response:

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Problem No. 3: Solving a figural problem

Direction

This is a problem in relation to a figure. This figure undergoes gradual transformation according to the given condition. You will have to perceive the change. It has no fixed solution. Give the ideas as may as come to your mind within the prescribed time limit. Your new ideas will be appreciated in particular. Write your responses in the space provided for. You will be given ten (10) minutes for this. One answer is shown as hint. Follow this and find the other accordingly.

Problem: A plane mirror is placed in front of a number of letters forming the word 'NEWS'. It is shown in the following diagram. Plane of the mirror is held perpendicular to the plane of the paper. Now the mirror is rotated in the same plane and also about its own axis as indicated by arrows. You will have to perceive how does the image of the word 'NEWS' look like for different positions of the mirror. Draw the figures as many as you can. The diagrams may be tentative, but should be conceptually correct. In each figure show the word, plane of the mirror and the corresponding image. One Hint is also provided. Follow this and find the other.

Diagram:

```
NEWS
```

Hint:

```
NEWS
W E N
```

Responses:
Problem No. 4: New Relationships

Direction

Name of two commonly available objects are mentioned in the following problem. Combination of these two objects may be used differently to make different new things utilised for various scientific purposes. You will have to find out those new things which may be obtained by combining these two objects differently. Mention them as many as you can. You may include any other object besides these two in the combination, in addition, if you feel necessary. Short description of each of those may be given. Your novel idea will be appreciated particularly. Time of response is four (4) minute. One hint is given, which you may follow. Name the other accordingly.

Problem: Name different new things which may be obtained using the combination of a glass and a spoon in various ways. Write as many as you can.

Hint: To demonstrate circular motion by moving the spoon inside the glass.

Responses:

Problem No. 5: Construction of Equations

Direction

In the problem, two particular equations are given in relation to four different variables. Out of those two equations, you will have to construct other possible equations in association with those variables. Judicious use of the given equations will be appreciated particularly. Construct new equations as many as you can. You need not show the necessary calculations. For this problem, you are given five (5) minutes. The equations what you will construct should be numbered correctly. One hint is given. Follow this and construct the others accordingly.

Problem: An object of mass 'M' moves with the velocity 'V'. Its linear momentum 'P' and kinetic energy 'E' are given by the equations P = MV and E = MV^2 /2. Write other possible equations among M, V, P and E as many as you can.
Problem No. 6: Alternate Uses

Direction
In the following problem name of a particular object is mentioned. You will have to state different scientific uses of it, as many as you can. Try also to think something novel, those which you think but no one else might have thought off. Mention each of those uses using short sentences. You are provided four (4) minutes time for this. A hint is also given. Follow this and respond accordingly.

Problem: State various scientific uses of a metal rod.

Hint: As the bar of a beam balance.

Responses:

Problem No. 7: To guess causes

Direction
The following problem describes a particular situation. Read the problem carefully and try to identify the probable causes for its happening as many as you can. Express your responses using short sentences. You are provided five (5) minutes time for this. A hint is also given. Follow this and respond accordingly.

Problem: A certain amount of liquid is poured inside a container. An object is kept inside it. The object is immersed in the liquid completely and appears to vanish when is observed from outside the container through the liquid. Guess the probable causes of its disappearance.
Problem No. 8: To guess consequences

**Direction**

The following problem describes a situation which appear to you to be impossible. You have to think what would happen as consequences if such hypothetical situation will arise. Give as many ideas as come in your mind. Ideas should have scientific basis. Express them using short sentences. You are provided **eight (8) minutes** time for this. A hint is also given. Follow this and respond accordingly.

**Problem:** Guess the consequences if light ray would not deviate from its path while passing from one medium to another (even in case of oblique incidence).

**Hints:** Stars would not appear to twinkle.

**Responses:**

Problem No. 9: To find the opposite word

**Direction**

Some words frequently used in Physics are mentiond in the following problem. You will have to find out the correct opposite word in relation to each as per your physics knowledge. You are provided **two (2) minutes** time for this. An example is given which will help you to understand clearly what will have to do.

**Example:** Find the word opposite to ‘Rest’.

**Answer:** Motion

**Problem:** Find the words opposite to the following:

(i) Static
(ii) Resistance
(iii) Convergent
(iv) Supersonic

**Responses:**

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Problem No. 10: Product improvement

Direction

The name of a very common scientific instrument is mentioned in the following problem. You have to imagine in what ways you can modify the instruments to a more effective and a novel one. You may think of adding any number of parts, but that addition should be relevant and cost effective. Write different suggestions, as many as you can using short sentences. You are provided four (4) minutes time for this. A hint is also given. Follow this and respond accordingly.

Problem: Suggest possible improvements of a clinical thermometer as many as you can (considering the criterion cost effectiveness, durability, external feature and ease of operation).

Hint: Using a heat sensitive thermometric liquid.

Responses:

Problem No. 11: To describe elaborately

Direction

In the following problem the name of few basic concepts in physics are mentioned. You will have to state different points, as many as you can, to describe each of the concepts. Your description should be comprehensive, should highlight different aspects of the concepts. Describe your ideas using short sentences. You are provided eight minutes time for this. An example is given which will help you to understand clearly what you will have to do.

Example: Describe the concept ‘electric current’ mentioning various points as many as you can.

Answer: 1. Amount of charge flowing per second
Problem: Describe the following concepts mentioning various points as many as you can.
(i) Force
(ii) Heat

Responses:

Problem No. 12: Finding similarities

Direction

In the following problem, two pairs of concepts have been mentioned. Each of these pairs are apparently dissimilar, but also have certain similarities with one another. You will have to mention those similarities of each of these pairs. Mention as many as you can. You will be given eight (8) minutes time for this. Express using short sentences. An example is also given. Follow this and respond the problem accordingly.

Example: State different similarities between ‘a proton’ and ‘an electron’, as many as you can.

Answer: (i) both are sub-atomic particles.
(ii) both contain mass and charge.

Problem: State different similarities between each concept of the following pairs, as many as you can
(i) Acceleration and Retardation
(ii) Light and Sound

Responses:

Problem No. 13: To write words association

Direction

The name of few scientific terms are given in the following problem. You will have to mention different words (as many as you can) in
association with each. It is enough to mention the words, the detailed description is not needed. You will be given four (4) minutes for this. One example is provided which may help you to know what really you will have to do.

**Example:** Write different words (as many as you can) in association with the term: Change of state

**Answers:** Melting, Boiling, Latent heat etc.

**Problem:** Write different words (as many as you can) in association with the following terms:
(i) Motion
(ii) Structure of atom

**Responses:**

**Problem No. 14: To conduct scientific experiment creatively**

**Direction**

This problem measures your ability in conducting an experiment scientifically for testing an electric appliance (to select the suitable devices/apparatus and to arrange them accordingly). You will have to mention different ways of such experimentation as many as you can. Your suggestion for the testing may not be supported by the necessary circuit diagram. Express your suggestion using short sentences. You are provided six (6) minutes time for this. A hint is also given. Follow this and respond accordingly.

**Problem:** Suggest possible ways to test whether an electric battery is able to supply current in a circuit or not. Suggest the ways as many as you can.

**Hint:** Battery may be connected to a lamp. If the lamp glows that indicates that the battery is able to supply the current.

**Responses:**