NCDC
NATIONAL CURRICULUM DEVELOPMENT CENTRE

End of Year Sample Assessment Items for S.1 and S.2

PHYSICS

2022

SAMPLE ASSESSMENT ITEMS FOR S.1 AND S.2 PHYSICS

For either Physics or General Science, each short response item takes not more than 5 minutes and extended takes not more than 20 minutes. The paper should have sections and the total time for items set in a paper should not exceed 1hr and 30 minutes.

PHYSICS SAMPLE ASSESSMENT ITEMS FOR S1

Short Response (Resource) Items

1. A high mountain climber measured his mass and weight at the base of the mountain. He again measured at the top of the mountain and got the same quantity. Explain how the readings for both quantities compare at the base and top of the mountain (4 Marks)

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LOs for this item:

The learner should be able to

- **understand the existence of the force of gravity and distinguish between mass and weight.**
- **appreciate that the weight of a body depends on the size of the force of gravity acting upon it.**

2. A group of scouts camping at the lake shore hoisted their flag. They observed that during a hot day, the flag flew towards land and at night the flag flew towards the sea though there was no wind. Explain this phenomenon. (4 Marks).

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LO for this item: **The learner should be able to understand what is happening at a particle level when conduction, convection, and radiation take place and their application.**

Situational Item

1. During a hunting mission, a chief got a glittering stone which he picked and thought it was gold. When he took the stone home, he convinced his family members that he had found gold and was going to become rich. His family members did not accept that the stone had gold in it and a disagreement started.

   As a science student, prepare a comprehensive written message that will be used to settle the disagreement among the family members. (10 Marks).

LOs for this item:

The learner should be able to

- ***understand the meaning of density and solve simple numerical problems on density***
- ***relate the density and relative density of substances.***
- ***determine the densities of different solids and liquids.***

END

RESPONSE AND SCORING GRID FOR SHORT RESPONSE ITEMS

Item	Possible response	Scoring criteria
1	• The mass of the weight lifter at the base of the mountain is the same as the one at the top of the mountain. This is because mass is a quantity of matter in a substance and does not change. • The weight at the base is higher than that at the top of the mountain. This is because mass depends on acceleration due to gravity, and since acceleration due to gravity decreases with altitude, the weight will also decrease.	• Score 4 if the learner states that mass is constant with reason and weight at the top is smaller with reason. • Score 3 if the learner states that mass is constant without reason and that weight becomes smaller but with a reason. • Score 2 if the learner states that mass remains constant and weight becomes smaller with no reasons in each case. • Score 1 if the learner states either that mass remains constant **or** weight becomes smaller.
2	• During the day, the earth is heated and absorbs more heat than the water since water absorbs water slowly than the earth. The earth then heats air above it causing it to become less dense and rise. Hence cool air from above the sea moves towards the earth causing the flag to fly towards the land. This is the sea breeze. • During the night, the water which was heated slowly, but to a greater depth remains warmer than the land, hence warms the air above it causing it to rise. Cool air blows from the land to replace the rising air above the sea, causing the flag to flow towards the sea. This is the land breeze.	• Score 4 if the learner states that it is due to land breeze and sea breeze and explains each in any order. • Score 3 if the learner states that it is due to land breeze and sea breeze and explains either land breeze or sea breeze. • Score 2 if the learner state that it is due to both land breeze and sea breeze without any explanation. • Score 1 if the learner states that it is due to one of land breeze **or** sea breeze only.

RESPONSES AND SCORING GRID FOR SITUATION ITEM

OUTPUT	Relevance (3)	Accuracy (3)	Coherence (3)	Excellence
Written explanation indicating how density of the stone is measured to confirm whether it is gold or not.	• Scores 3 if he/she states that the density should be determined, identifies the formula of finding density, and indicates the apparatus without any further detail. • Scores 2 if he/she states that the density should be determined, identifies a few apparatuses without any further detail. • Scores 1 if he/she states that the density or mass should be determined without any further detail.	• Scores 3 if he/she gives six and more steps about the determination of the density of the stone without and particular order. • Scores 2 if he/she gives four to six steps about determination of the density of the stone without any particular order. • Scores 1 if he/she gives one to four steps about determination of the density of the stone without any particular order.	• Scores 3 if he/she gives six and more steps of detailed information about determination of the density of the stone in order and how the value obtained should be compared with the actual density of gold in order. • Scores 2 if he/she gives four to six steps of detailed information about determination of the density of the stone in order, and how the obtained value should be compared with the actual density of gold in order. • Scores 1 if he/she gives one to four steps of detailed information about determination of the density of the stone in order without comparing the value with that of actual gold.	Scores one for mentioning unsolicited for information such as precautions and the possible errors and in the procedure.

END

PHYSICS SAMPLE ITEMS S2

Structured/short answer (resource items)

1. A heap of weed of mass 3 tonnes is moving towards the turbines at Jinja power station. A group of engineers use a machine operating at 20 kW for 5 minutes to remove the weed from the river as shown in Figure 1 and place it at the bank, which is 15m above the river.

Figure 1

Using the above data, describe the efficiency that the machine used to perform the task. (4 Marks)

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LO for this item: The learner should be able to understand the meaning of machines and explain how simple machines simplify work

2. During a thunderstorm, a farmer's cow that was sheltering under a tall tree was struck by lightning and it fell dead as shown in Figure 2. The community attributed this incidence to witchcraft.

Figure 2

As a student of Physics, use science to explain this incident to the community. (4 Marks)

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LO for this item: *The learner should be able to understand everyday effects of static electricity and explain them in terms of the build-up and transfer of electrical charge.*

EXTENDED RESPONSE ITEMS

1. Figure 3 shows the arrangement of apparatus by a learner to investigate the relationship between the mass of lead shots, m, and the immersion depth, h, of the cylinder. The learner placed different masses of lead shots in the cylinder and measured the corresponding immersion depths.

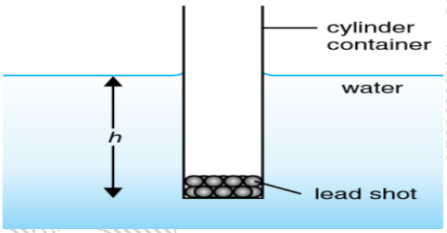

Figure 3

Table 1 shows the immersion depth, h, against mass of lead shots, m.

Table 1

Depth, h (cm)	Mass, m (kg)
0	0
5	20
10	60
12	70

Study Figure 3 and Table 1, analyse and interpret them completely so that you make a conclusion from the data in a write up. (10 Marks)

LOs for this item:

The learner should be able to:

a) *understand density and its application to floating and sinking*
b) *understand the concept of sinking and flotation in terms of forces acting on a body submerged in a fluid*
c) *understand and apply the Archimedes' Principle in different situations.*

2. In some areas, there has been a challenge of structures collapsing before completion and killing human beings. People have been buried alive under the collapsed buildings. Security personnel have always blamed site engineers for using substandard materials, leading to the tumbling down of buildings.

Task

If you were the engineer, prepare a detailed written message about what should be done to avoid such accidents. (10 Marks)

LOs for this item:

The learner should be able to:

- *understand how the mechanical properties of common materials can be utilised in physical structures.*
- *understand that the tensile strength of materials is determined by the properties of the substances they are composed of.*

END

RESPONSES TO RESOURCE ITEMS

	Responses	Scoring Criteria
1.	- Mass, m = 30 tonnes = 30,000 kg, - machine power, P = 20 kW =20,000 W, - time, t = 5 min = 300 s, - height, h = 15 m. - Work output, W_o = mgh = 30,000x10x15 = 4,500,000 J. - Work input, W_i = Pt = 20,000x300 = 6,000,000 J. - $Efficiency = \frac{W_o}{W_i} \times 100 = \frac{4500000}{6000000} \times 100 =$ 75% Since the efficiency is less than 100%, some input energy is being wasted and hence the machine will take longer time to remove the weed.	- Award 4 if; formula is stated, substitution made, correct answer is found (even without units) and a comment, 'energy wastage', is stated. - Award 3; for substitution only without formula, correct answer is found (even without units) and a comment, 'energy wastage', is stated. - Award 2; for the correct answer without formula and substitution and a comment, 'energy wastage', is stated. - Award 1; if for energy wastage by the machine without formula, substitution and the answer.
2.	- During a thunderstorm, the random movement of clouds causes them to rub against each other. Hence, they acquire electric charges by friction. - The positive hydrogen ions rise higher to the sky due to their less weight, while the negative hydroxyl ions remain attached to the lower clouds. - When the negatively charged clouds collide, they produce sparks by releasing high electron currents, which find their way to the earth through high points on the earth's surface. - Hence, if a cow is sheltering under a tall tree, the tree provides a short route for the electrons to the earth. The high electron currents will therefore pass through the cow, killing it instantly. Hence this is a scientific phenomenon not related to witchcraft.	- Award 4 if the learner; explains that the clouds get charged by friction, the concentration of light and heavy ions, collision of ions to form sparks that release electrons into earth and high electron currents from earth that kill the cow. - Award 3; if the learner explains that the clouds get charged by friction, learner identifies the distribution of charges and collision of ions to form sparks that release electron currents that kill the cow. - Award 2; if the learner explains that the clouds get charged by friction causing charges that kill the cow. - Award 1; if the learner can only state that lightning is due to friction of clouds in air without further explanation.

POSSIBLE RESPONSES TO SITUATIONAL ITEMS

1.	- The hypothesis is that the depth of the cylinder increases with increase in the number of lead shots in the cylinder. - 2 cm when m = 0. - A graph of volume against mass for all the quantities in the table - Gradient = $\frac{\Delta h}{\Delta m} = \frac{11-2}{65-0} = 0.138$ cm g^{-1}. - $A = \frac{1}{Gradient} = \frac{1}{0.138} = 7.25$ cm^2. - $Volume = Ah = 7.25 \times 9 = 65.25$ cm^3. - Principle of floatation i.e. A floating body displaces its own weight of the fluid in which it is floating. **Precautions for accuracy** - Ensure that the cylinder is upright. The water surface should be still (calm).

Scoring Grid

Output	Relevance	Accuracy	Coherence	Excellence
A write up with graphs, hypothesis, calculations analysing the data	The graph • Score 3 if the learner indicates the axes, title, scale, plots all the points, irrespective of what is on the axes. • Score 2 if the learner indicates the plotting with scale, but does not indicate title. • Score 1 if the learner indicates plotting only with no scale and title.	Calculating the gradient • Score 3 if the learner calculates the gradient using a formula and states the units. • Score 2 if the learner calculates the gradient without a formula but states units. • Score 1 if learner states gradient without formula and units.	Step by step methods in calculating the volume and gradient. • Score 3 if the learner indicates the procedure for calculating gradient using line of best fit and states its implication to sinking and floating of ships, etc. • Score 2 if gradient is calculated but with no conclusion. • Score 1 if the	Score 1 if the learner states any unsolicited for responses such as the precautions, accuracy etc.

			learner only indicates the implication of the gradient.	

Score question 2 using RACE

OUTPUT	Relevance	Accuracy	Coherence	Excellence
A write up message about how to build safe buildings that do not collapse	• Score 3 if the candidate identifies any three or more materials that build a strong house such as wood, steel, concrete, glass, cement, etc., and the site for the building such as avoiding swamps and the personnel for proper construction. • Score 2 if the candidate identifies just a few materials like cement and steel, the site of the building that can be durable such as avoiding swamps, etc. • Score 1 if the candidate identifies /mentions about the right materials without mentioning anything about personnel and site for the construction.	• Score 3 if the candidate identifies five correct materials for the construction in the right quantities and the reason why. • Score 2 if candidate identifies three correct materials for the construction in the right quantities and the reason why. • Score 1 if the candidate identifies any one or two correct materials for the construction in the right quantities and the reason why.	• Score 3 if the candidate states the logical flow of five and more construction materials in terms of mixing and setting procedures. • Score 3 if the candidate states the logical flow of three to four construction materials in terms of mixing and setting procedures. • Score 1 if the candidate states the logical flow of one to two construction materials in terms of mixing and setting procedure.	Score 1 for any unsolicited response that adds value to the write up; such as time it takes for the work, etc.