Ministry of Education, Youth & Information

Primary Exit Profile
Bringing Abilities to Light

STUDENT CAMPS 2022

SCIENCE BOOKLET

GRADE SIX CURRICULUM BASED TASKS

PREPARED BY CURRICULUM UNIT, SCIENCE SECTION

How to Use This Booklet?

The Booklet provides a number of activities that can be strategically used in preparation for the PEP examinations.

Concept Maps

Check for Prior Learning at the start of each unit/ topic using the Concept Maps provided. Note the concepts that are problematic for students and where misconceptions are evident.

Activity Sheets

Use the Activity Sheets to improve conceptual understanding for selected concepts and clarify misconceptions before attempting the assessment items.

Assessment Items

Use the different items to gauge student's level of preparation and understanding of the scientific concepts presented.

Areas of Focus for NSC Science

The National Standards Curriculum (NSC) is grounded on the science process skills and science practices which are used to develop an understanding of the scientific concepts (see figure 1).

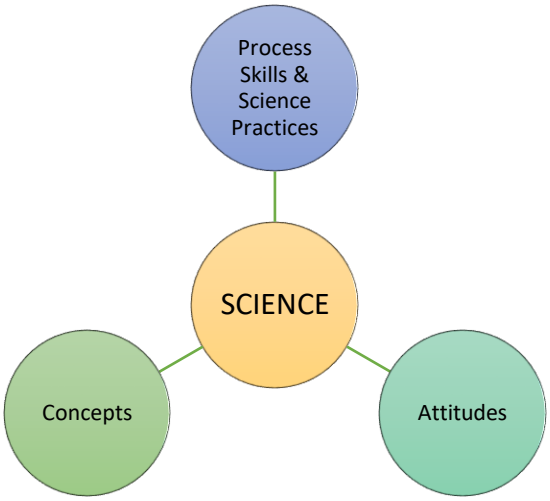


Figure 1: Elements of Science

The **Process skills** include**:**

- Observing
- Communicating
- Measuring
- Classifying
- Predicting
- Inferring
- Identifying and controlling variables
- Define operationally
- Formulating hypotheses
- Interpreting data
- Experimenting
- Creating models

The science and engineering practices, as identified by the Next Generation Science Standards (NGSS), are:

- Asking Questions or Defining Problems
- Developing and Using Models
- Planning and Carrying Out Investigations
- Analysing and Interpreting Data
- Using Mathematics and Computational Thinking
- Constructing Explanations or Designing Solutions
- Engaging in Argument From Evidence
- Obtaining, Evaluating, and Communicating Information

PRIMARY EXIT PROFILE (PEP) CURRICULUM BASED TEST

The PEP Science Curriculum Based Test is designed to target three areas:

- Core Concepts
- Science Practices and
- Crosscutting concepts.

A brief description of each area is shown in the diagram below.

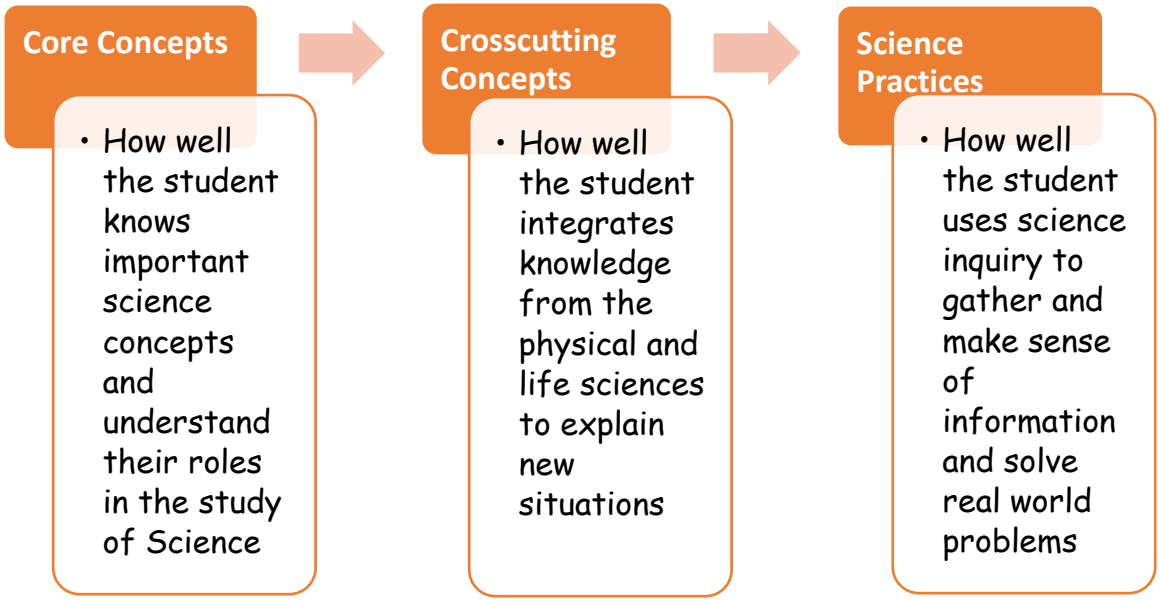


Figure 2: PEP Science Assessment Areas

Crosscutting concept areas are shown in Figure 3.

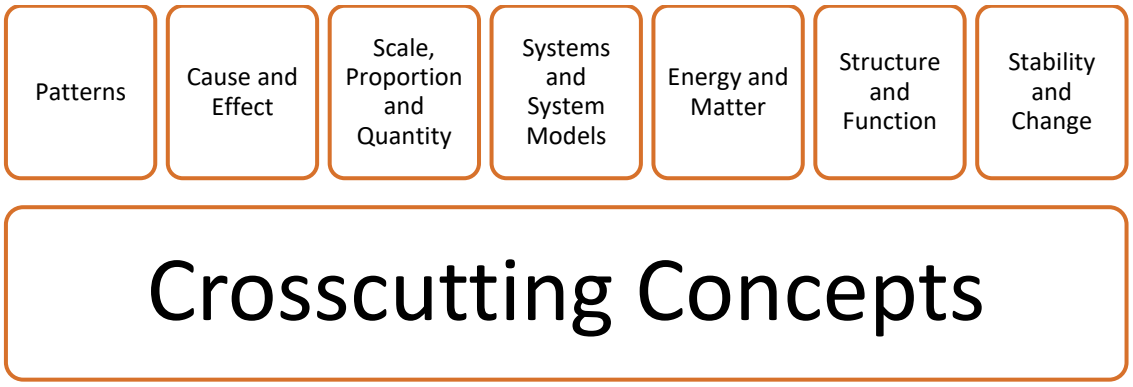


Figure 3: Crosscutting Concepts

SCIENCE AND ENGINEERING PRACTICES

The practices are explained below.

Asking Questions/ Defining Problems – involves asking and refining questions that lead to explanations of phenomena, which can be tested. Define problems to be solved and generate ideas that lead to solutions

Planning & Carrying Out Investigations – involves designing investigations to describe a phenomenon, test a theory or model. Usually requires a systematic process (aim, predict outcomes, method, conclusions from results).

Developing & Using Models – involves the use and construction of tools such as diagrams, physical replicas, or graphs to represent ideas and provide explanations and predictions.

Analysing & Interpreting Data – involves the breaking down of information into its components so as to understand its meaning.

Using Mathematics & Computational Thinking – involves using mathematics and computation as a base for representing relationships. It is also used for the analysis of data.

Constructing Explanations/ Designing Solutions – involves providing explanations for the causes of phenomena based on observations or models developed. Developing a design plan and testing models or prototypes and refining design ideas.

Engaging in Arguments from Evidence – involves the use of reasoning and argumentation to make their case (using data/ information given as evidence)

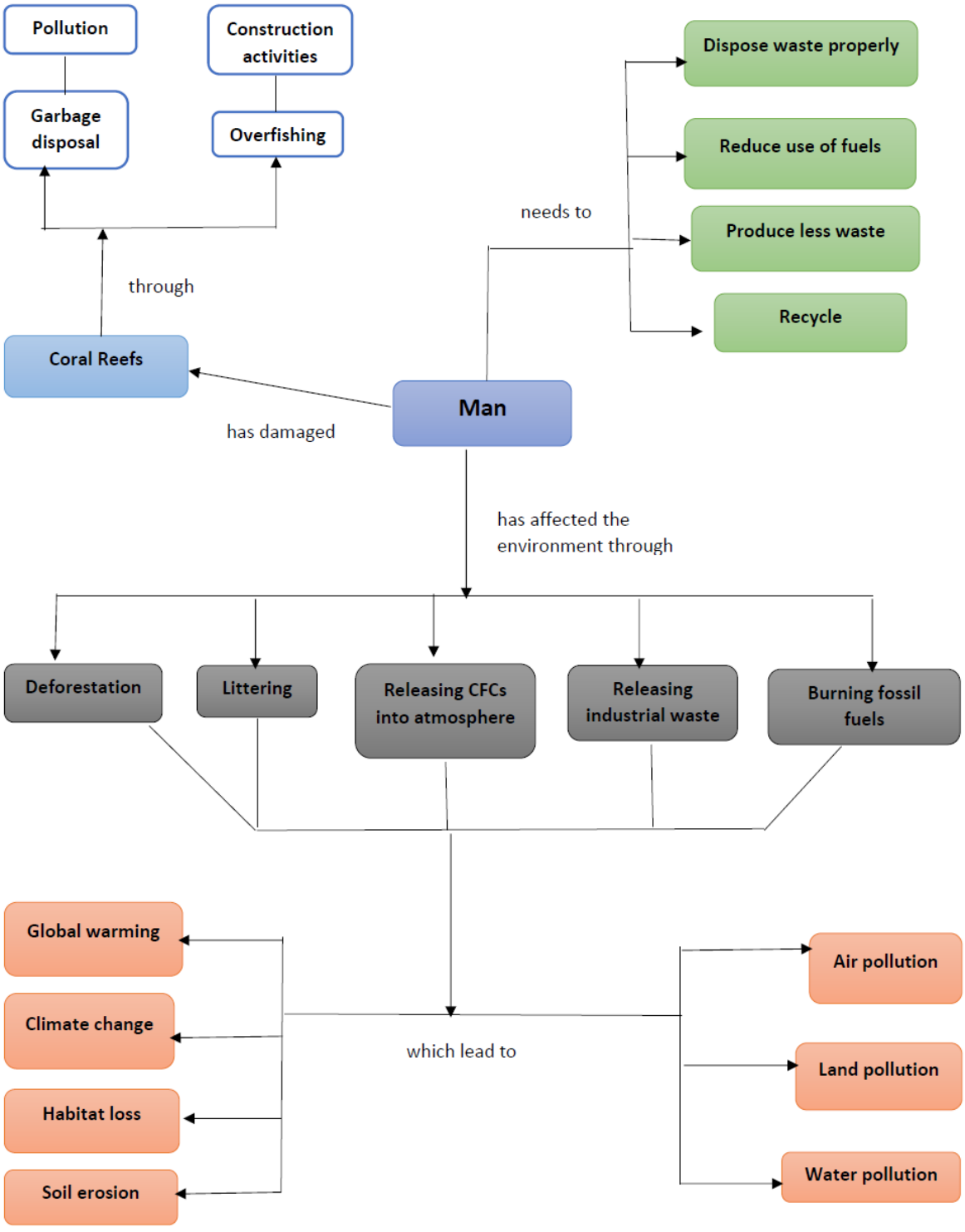
Obtaining, Evaluating and Communicating Information – involves gathering information, critiquing and making a judgment as to the merit of scientific material and communicating information in multiple ways (text, spoken word, diagrams, graphs, tables)

Unit: Environment

I will know that I have learned when I can:

- ✓ Formulate a definition of the environment.
- ✓ Justify the importance of conserving the natural environment
- ✓ Outline the effects of human activities on the environment
- ✓ Investigate features/ soils of different environments
- ✓ Recognise the need for and importance of conserving living things and the environment to sustain the balance in the ecosystem.
- ✓ Show concern for the impact of humans on the environment
- ✓ Show responsibility to preserve the environment
- ✓ Observe, collect and record information regarding the interacting factors within an environment
- ✓ Formulate a simple working definition of climate change
- ✓ Use evidence from everyday local/regional/international situations to explain the effects of climate change on humans
- ✓ Explore ways of reducing factors that cause climate change
- ✓ Propose measures to reduce/eliminate selected sources of solid waste pollution
- ✓ Describe the factors that cause soil degradation
- ✓ Explain how soil degradation can be prevented
- ✓ Show concern for the impact of environmental problems on humans
- ✓ Show responsibility for carrying out good environmental practices

Grade 6 – Man's impact on the Environment



Prepared by Science Section, CCU, MOE ***March 2021***

Activity: Investigating Soils

Aim: To investigate properties of different soil samples

Skills: observing, manipulating, measuring, inferring, predicting, classifying, communicating, collaborating, drawing conclusions. **Practices**: Analyzing & Interpreting Data

Materials: samples of different soils, sieve, measuring cup or cylinder, water, filter funnel or strainer, filter paper or cloth, balance or scale, glass container or cup.

Procedure:

1. Collect samples of different soils around your community. Label them A, B and C.
2. Use a plastic spoon to place some of the soil sample collected on a white piece of paper. Spread out the soil using a spoon or toothpick.
3. Look closely at the soil sample. Use a hand lens if you have one. Note the things you see. Describe the soil. ***Write this in your notebook.***
4. Rub the soil between your fingers. Note how it feels.
5. Pass samples through a sieve.
6. Arrange the soils in order of particle size from smallest to largest. **Prediction:** Which sample is clay, sand and garden soil (or loam)?
7. Place a filter paper or cloth in a sieve or strainer.
8. Take the same amount or mass of each soil sample and place it on the cloth in the sieve. Place a glass container or cup beneath the sieve. Record the mass of soil used. **Mass of soil**: _____
9. Measure 100 ml of water and pour through the soil in the sieve.
10. Note the amount of water that passed through the funnel after 2 minutes.
11. Measure the water collected and compare the volumes before and after.

Soil	Volume of water used /ml	Volume water collected /ml	Difference in volume /ml
A			
B			
C			

Questions/ Discussion:

1. Why was the same amount/ mass of soil and time (two minutes) used?

   _____

   _____

2. Which soil sample allowed water to pass through it the quickest?

   _____

3. Which soil sample allowed water to pass through it the slowest?

   _____

4. What does this tell us about the water-holding capacity of the soil samples?

_____

_____

_____

5. Compare your observations with your predictions. Did your results support your predictions?

_____

_____

6. What conclusion can you make about the type of soil found in your backyard?

_____

_____

7. Use the template below to write a report of your investigation.

Name: _____ Date: _____

Aim: What are you investigating?	**Prediction: What do you think will happen?**
Equipment: What did you use?	**Method: What did we do?**
Results: What happened?	**Conclusion: What did we find out?**
Was your prediction correct?	

Grade 6 Activity – Investigating Soil Erosion

Aim: To investigate how plants protect the soil

Skills: predict, observe, measure, analyse, interpret, draw conclusions

Materials: measuring cylinder, spray bottle, watering can, plastic containers, aluminium trays or plastic bottles, soil, patch of grass with soil, water, wood chips, leaves or twigs

Method:

1. Collect two plastic containers labelled 'A' and 'B'.
2. Add the same amount of soil to both containers. Place the patch of grass in only **one** of the containers while packing soil in the other container up to the brim.
3. Place both containers at an angle in separate aluminium trays or attach cut off bottles to the mouth of the container (**see diagram**).
4. Predict what will happen when water is poured over Container A and B.
   Prediction:
   _____
   _____
   _____
5. Use the measuring cylinder to place 150 ml of water into the spray bottle or watering can. Add the water slowly to Container A until it flows over into the aluminium tray or bottle.
6. Repeat step 5 for Container B.
7. Measure the amount of water collected. Record your observations.

Discussion:

1. Compare the amount and colour of the water collected for each container. Were there any differences? Explain.
   _____
   _____
   _____

2. Which container had more soil being washed away? Why did this happen?

_____
_____
_____

3. Compare your predictions with what you observed. Were they the same? Explain.

_____
_____
_____

4. Which variables were kept the same in the experiment?

_____
_____
_____

5. What conclusion can you make about the role plants play in protecting the soil?

_____
_____
_____
_____

Curriculum Based Items – Environment

Item #	1
Unit	Environment
Objective	Investigate features/ soils of different environments
Item type	Single Selected Response

The diagram below shows a type of environment. Use the information to answer item 1.

1. What term **best** describes the type of environment shown in the diagram?

A. Aquatic
B. Grassland
C. Rainforest
D. Wetland

Solution		
Answer	Further Information	Comment
D. Wetland	D correct – 1 mk Any other response – 0 mk **Skills/Content**: Features of different environments	Wetland environments are usually inundated with water for most of the year
Level	**DOK 1**	

Item #	2
Unit	Environment
Objective	Use evidence from everyday local/regional/international situations to explain the effects of climate change on humans
Item type	Single Selected Response

Human activities have led to more effects of climate change being felt by Caribbean territories

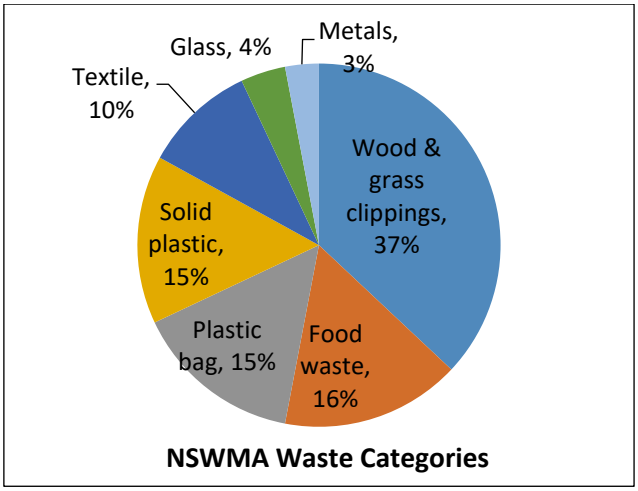
2. Which of these events in the Caribbean is **NOT** likely to be a consequence of climate change?

A. Average temperatures are higher in June than in January
B. The hurricane season lengthens into December
C. There are longer and more frequent droughts
D. There are larger and more frequent floods

Solution		
Answer	Further Information	Comment
A. Average temperatures are higher in June than in January	A correct – 1 mk Any other response – 0 mk **Skills/Content**: Identifying the effects of climate change	Higher temperatures in June – August are as a result of our tropical climate and not due to Climate Change.
Level	**DOK 2**	

Item #	3
Unit	Environment
Objective	Propose measures to reduce/eliminate selected sources of solid waste pollution
Item type	Single Selected Response

The pie chart below shows the categories of waste collected from Jamaican households. Use the information to answer item 3.



NSWMA has suggested that portions of the waste that can decompose should be composted.

3. What percentage of the waste should be composted?

A. 16%
B. 37%
C. 53%
D. 47%

Solution		
Answer	Further Information	Comment
C. 53%	C correct – 1 mk Any other response – 0 mk **Skills/Content**: Analyse and interpret data Composting to reduce solid waste	Both wood/grass clippings and food waste from the kitchen can be composted as they readily decompose.
Level	**DOK 2**	

Item #	4
Unit	Environment
Objective	Explore ways of reducing factors that cause climate change
Item type	Multiple Selected Response

Earth has warmed by about 0.6 degrees over the past 100 years. Scientists estimate that the average temperature of the Earth will increase by 2-5 degrees in the next 30

4. Which **TWO** of these activities can help to slow down the warming of Earth?

A. Take public transport instead of driving cars
B. Make electricity by burning coal
C. Cut down forests
D. Change out all lights to LED bulbs

Solution		
Answer	Further Information	Comment
A. Take public transport instead of driving cars **D.** Change out all lights to LED bulbs	A correct – 1 mk D correct – 1 mk A or D and 1 other letter – 1 mk Any other response – 0 mk **Skills/Content**: Ways of reducing factors causing climate change	Reducing energy use and dependence on fossil fuels are means of reducing factors that cause climate change.
Level	**DOK 1**	

Item #	5
Unit	Environment
Objective	Explore ways of reducing factors that cause climate change
Item type	Single Selected Response

Hot water systems use a lot of energy in households

5. Which type of hot water system contributes **least** to global warming?

A. Electrical
B. Coal
C. Solar
D. Wood

Solution		
Answer	Further Information	Comment
C. Solar	C correct – 1 mk Any other response – 0 mk **Skills/Content**: Measures to reduce climate change/ global warming	Although wood is not a fossil fuel, burning of wood will contribute to an increase in carbon dioxide in the atmosphere.
Level	**DOK 2**	

Item #	6
Unit	Environment
Objective	Outline the effects of human activities on the environment
Item type	Multiple Selected Response

The diagram below shows the same section of a coral reef over a period of 20 years. Use the information to answer item 6.

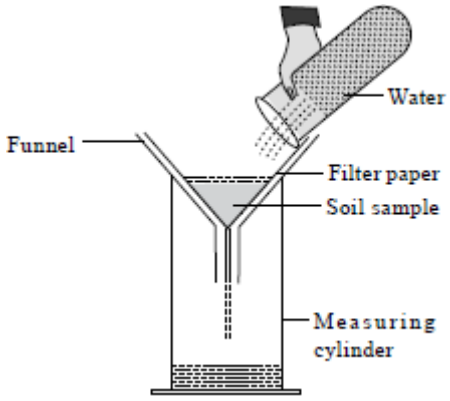
6. Which **TWO** activities would likely be responsible for the changes seen in the coral reefs after 20 years?

A. Coastal development/ construction
B. Improper dumping of garbage
C. Over-fishing
D. Slash and burn

Solution		
Answer	Further Information	Comment
A. Coastal development C. Over-fishing	A correct – 1mk C correct – 1 mk A or C and 1 other letter – 1 mk Any other response – 0 mk **Skills/Content**: Effects of human activities on coral reefs	Damage from coastal construction and fishing practices are the main threats to coral reefs.
Level	**DOK 1**	

Item #	7
Unit	Environment
Objective	Investigate features/ soils of different environments
Item type	Single Selected Response

A student measured the time it takes for water to pass through different soil samples. The diagram of the experiment is shown below. Use the information to answer items **7** and **8**.



7. What should the student do to make sure the results are accurate?

A. Check if the results match the predictions
B. Record all results in a table
C. Test each soil sample many times
D. Use the same equipment each time

Solution		
Answer	Further Information	Comment
C. Test each soil sample many times	C correct – 1 mk Any other response – 0 mk **Skills/Content**: Designing fair tests	Repeated measurements help to ensure accuracy/ reliability of results in scientific investigations.
Level	**DOK 1**	

Item #	8
Unit	Environment
Objective	Investigate features/ soils of different environments
Item type	Multiple Selected Response

The table shows the results of the student's investigation. Use the information to answer item **8**.

Table showing the volume of water and time taken for different soils

	Clay	**Loam**	**Sand**
Volume of water added to soil (cm^3)	30	30	30
Volume of water collected in cylinder (cm^3)	24	27	29
Time for water to pass through funnel (minutes)	5	2	1

8. Circle the letter that completes the conclusion below.

Water takes longer to pass through

A. Clay
B. Loam
C. Sand

soil.

A. Clay
B. Loam
C. Sand

soil has the **least** water-holding capacity of the soil samples.

Solution		
Answer	Further Information	Comment
A - Clay **C** - Sand	A correct – 1mk C correct – 1 mk 1 correct – 1 mk Any other response – 0 mk **Skills/Content**: Analyse and interpret data, draw conclusions Properties of different soils	Soil with the least water-holding capacity will allow most of the water to pass through *Carry out investigations to collect and interpret data.*
Level	**DOK 2**	

Item #	9
Unit	Environment
Objective	Observe, collect and record information regarding the interacting factors within an environment
Item type	Single Selected Response

The body temperatures of different animals in hot and cold environments are shown in the table below. Use the information to answer item **9**.

Table showing body temperatures of animals in different environments.

Name of Animal	**Animal Body Temperature °C**	
	Cold environment - 10°C	**Hot environment - 30°C**
Snake	10	30
Bobcat	38	39
Fish	10	30
Rat	38	38

A student placed a snake and a rat in an environment at 25°C.

9. Which body temperatures are they **most** likely to have after a few days?

A. Snake 20 °C and Rat 25 °C
B. Snake 25 °C and Rat 38 °C
C. Snake 37 °C and Rat 25 °C
D. Snake 38 °C and Rat 38 °C

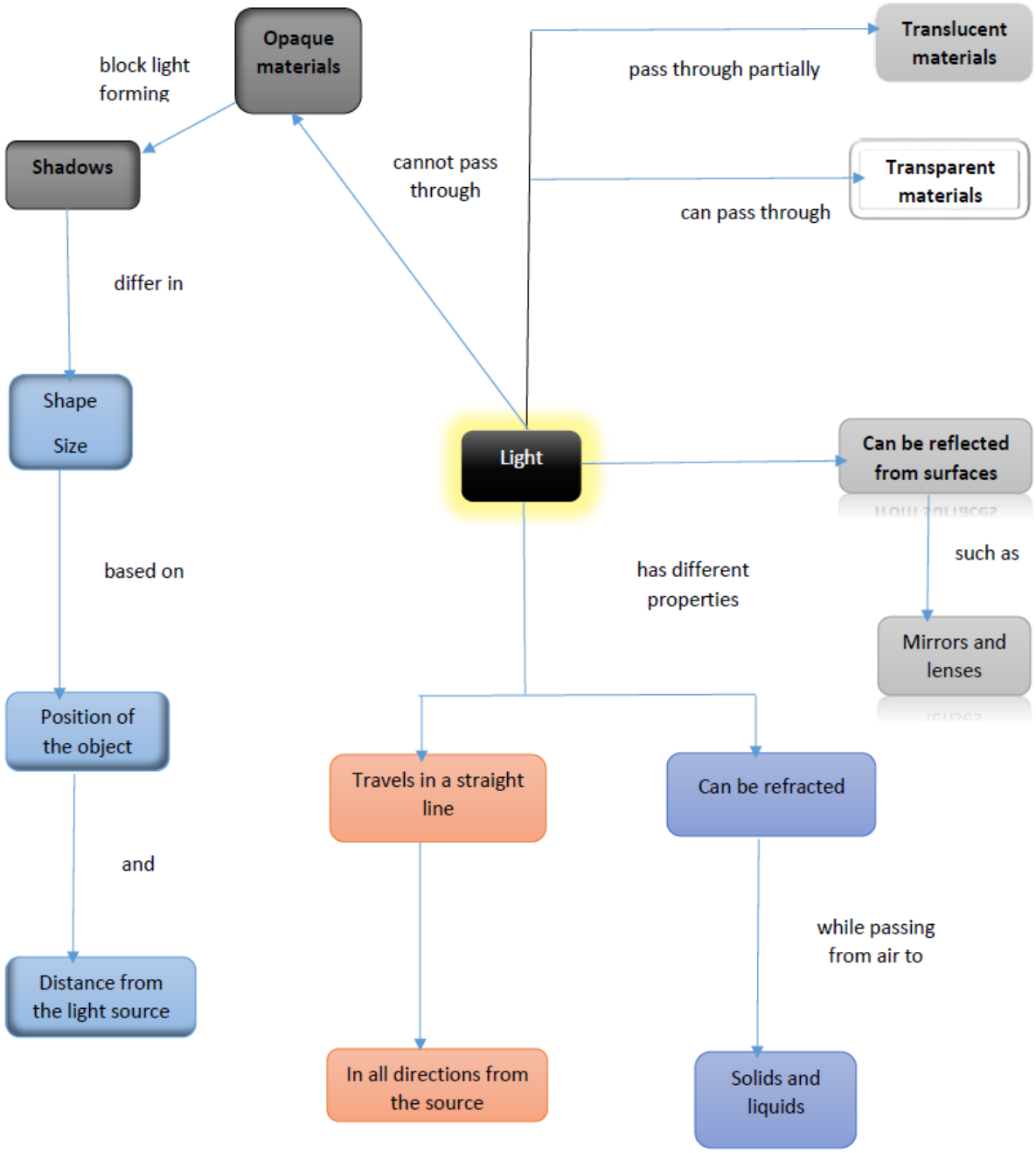
Solution		
Answer	Further Information	Comment
B. Snake 25 °C and Rat 38 °C	B correct – 1 mk Any other response – 0 mk **Skills/Content**: Identifying patterns, analysing and interpreting information	Body temperatures of mammals remain fairly constant with changing external temperatures. Reptiles' body temperatures usually change based on the external temperatures.
Level	**DOK 2**	

Unit – Light and Sound

I will know that I have learned when I can:

- ✓ Distinguish between **luminous** and **non-luminous** objects/organisms
- ✓ Investigate the properties of light
- ✓ Investigate the interaction of light with materials that are shiny, dull, transparent, translucent and opaque
- ✓ Investigate the interaction of light with lenses/mirrors
- ✓ Investigate some effects of reflection/refraction in everyday life
- ✓ Carry out fair tests in conducting investigations on the properties of light
- ✓ Show objectivity by using data and information to validate observations and explanations about light

Grade 6 – Light



Prepared by Science Section, CCU, MOE ***March 2021***

Activity - Interaction of Light with Surfaces

Unit: Light and Sound

Aim: To investigate how light interacts with different surfaces

Skills: observing, communicating, comparing, analysing, inferring, drawing conclusions

Materials: aluminium foil, mirror, eyeglass lens, wrapping paper, newspaper, piece of wood, flashlight,

Procedure:

1. Place each object on a table
2. Shine light directly from a flashlight on each object.
3. Observe the surface of the object
4. Note all observations in the table

Object	**Appearance (shiny or dull)**	**Surface (smooth or rough)**	**Reflections (clear, not clear, no)**
Aluminium foil			
Newspaper			
Notepaper			
Glass lens			
Mirror			
Wood			

Discussion:

1. Which object reflects the most light?

   _____

2. Which object reflects the least light?

   _____

3. What can you conclude about the type of surface that reflects light?

   _____
   _____

Activity - Investigating Shadows

Unit: Light and Sound

Aim: To find out how the position of an object affect the size of its shadow

Skills: measuring, observing, communicating, analysing, inferring, draw conclusions

Materials: ruler, flashlight, ball, screen,

Procedure:

Prediction: *Predict the size of the shadow when the light is close to the ball.*

1. Place the ball in front of a screen
2. Shine a flashlight 25 cm away from the ball
3. Measure the height of the shadow formed on the screen
4. Repeat with flashlight at 20 cm, 15 cm and 10 cm away from the ball
5. Record all measurements in the table

Shadow	**Distance between light and the ball (cm)**	**Height of Shadow (cm)**
A	25	
B	20	
C	15	
D	10	

Discussion:

1. How are shadows formed?

   _____
   _____

2. How did you change the height of the shadow formed?

   _____
   _____

3. How did your results compare to your predictions?

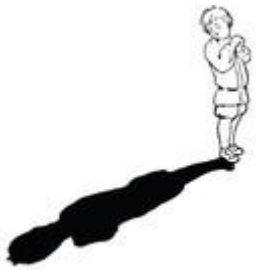
   _____
   _____

4. What conclusion can you make from the results?

   _____
   _____

Item #	10
Unit	Light and Sound
Objective	Investigate the interaction of light with materials that are shiny, dull, transparent, translucent and opaque
Item type	Single Selected Response

The diagram shows the picture of a child and his shadow. Use the information to answer item **10**.



10. Which statement best describes how shadows form?

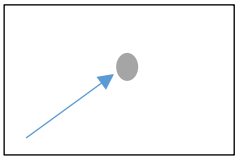
Shadows form when _____

A. The light is turned off
B. The light path is blocked by an object
C. Light shines through an object
D. Light reflects off an object

Solution		
Answer	Further Information	Comment
B. The light path is blocked by an object	B correct – 1 mk Any other response – 0 mk **Skills/Content**: Formation of shadows	Both opaque and translucent materials will form shadows. Opaque materials form darker shadows than translucent ones
Level	**DOK 1**	

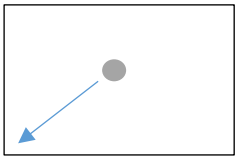
Item #	11
Unit	Light and Sound
Objective	Investigate the interaction of light with materials that are shiny, dull, transparent, translucent and opaque
Item type	Single Selected Response

The arrow shows the light ray from a flashlight shined onto a mirror. Use the information to answer item **11**.

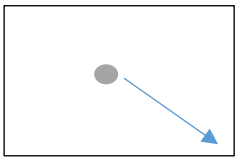


11. In which direction will the light ray **most likely** go after it hits the mirror?

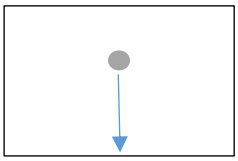
A.



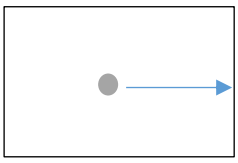
B.



C.



D.



Solution		
Answer	Further Information	Comment
B.	B correct – 1 mk Any other response – 0 mk **Skills/Content**: analyse and apply Reflection of light off surfaces	Light bounces off a mirror (at an angle) in another direction
Level	**DOK 2**	

Item #	12
Unit	Light and Sound
Objective	Investigate the interaction of light with materials that are shiny, dull, transparent, translucent and opaque
Item type	Single Selected Response

A student made some statements about shadows in the table below. Use the information to answer item **12**.

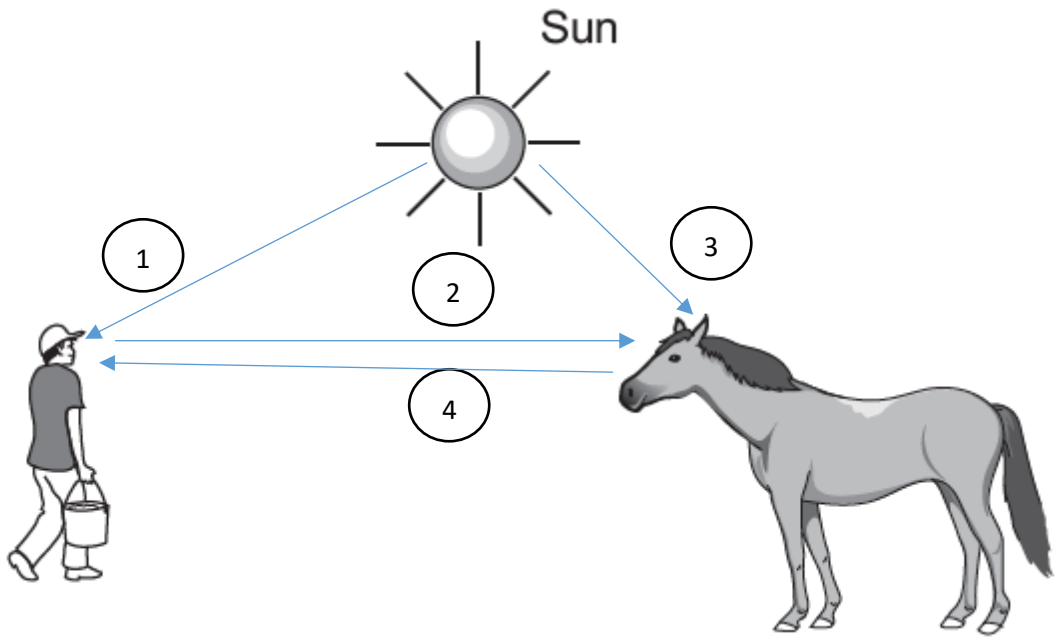
12. Circle the letter to show if each statement is true or false.

Statement	**True**	**False**
The colour of a puppet's shadow depends on the colour of the puppet	**A**	**B**
The shape of the shadow depends on the shape of the object	**A**	**B**

Solution		
Answer	Further Information	Comment
B. **A.**	(i) B correct – 1 mk (ii) A correct – 1 mk **Skills/Content**: Apply Formation of shadows from opaque objects	An opaque object that forms a shadow will not appear coloured on the screen. A dark shadow will always be formed taking the shape of the object.
Level	**DOK 2**	

Item #	13
Unit	Light and Sound
Objective	Investigate the properties of light
Item type	Multiple Selected Response

The diagram below shows a boy going to feed a horse. Use the information to answer item **13.**



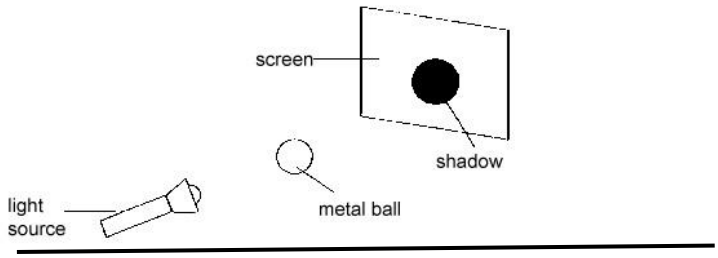
13. Which **TWO** light rays best explains how the boy is able to see the horse.

A. Ray 1
B. Ray 2
C. Ray 3
D. Ray 4

Solution		
Answer	Further Information	Comment
C. D.	C. correct – 1 mk D. correct – 1 mk Any other response – 0 mk **Skills/Content**: analyse and apply Properties of Light	We see objects as they reflect light and it is seen by our eyes The light ray from the Sun shines on the horse and the reflected light ray travels to our eyes
Level	**DOK 2**	

Item #	14
Unit	Light and Sound
Objective	Investigate the interaction of light with materials that are shiny, dull, transparent, translucent and opaque. Show objectivity by using data and information to validate observations and explanations about light
Item type	Single Selected Response

A student is investigating the formation of shadows using the apparatus set up below. Use the information to answer item 14.



The student makes the following statement: '**As the light moved closer the shadow got bigger'.**

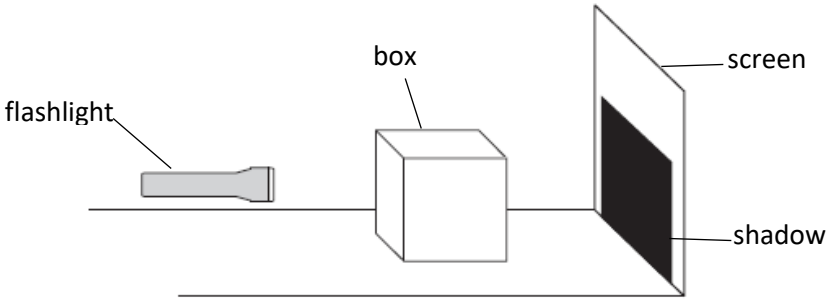
14. This type of statement is most likely _____

A. a conclusion
B. a method
C. an observation
D. a prediction

Solution		
Answer	Further Information	Comment
A.	A. correct – 1 mk Any other response – 0 mk **Skills/Content**: analyse and apply Conducting investigations	A conclusion is made based on the results of the experiment conducted. This represents a summary of the investigation.
Level	**DOK 2**	

Item #	15
Unit	Light and Sound
Objective	Investigate the interaction of light with materials that are shiny, dull, transparent, translucent and opaque Carry out fair tests in conducting investigations on the properties of light
Item type	Single Selected Response

Students in Class 6C used the apparatus below to investigate shadows. The class made four different predictions. Use the information to answer item **15**.



15. Which of the student's prediction would be correct?

A. If we make the box bigger, the shadow will get smaller
B. If we move the flashlight nearer the screen, the shadow will get bigger
C. If we use a bigger flashlight, the shadow will get bigger
D. If we move the box nearer to the light, the shadow will get smaller

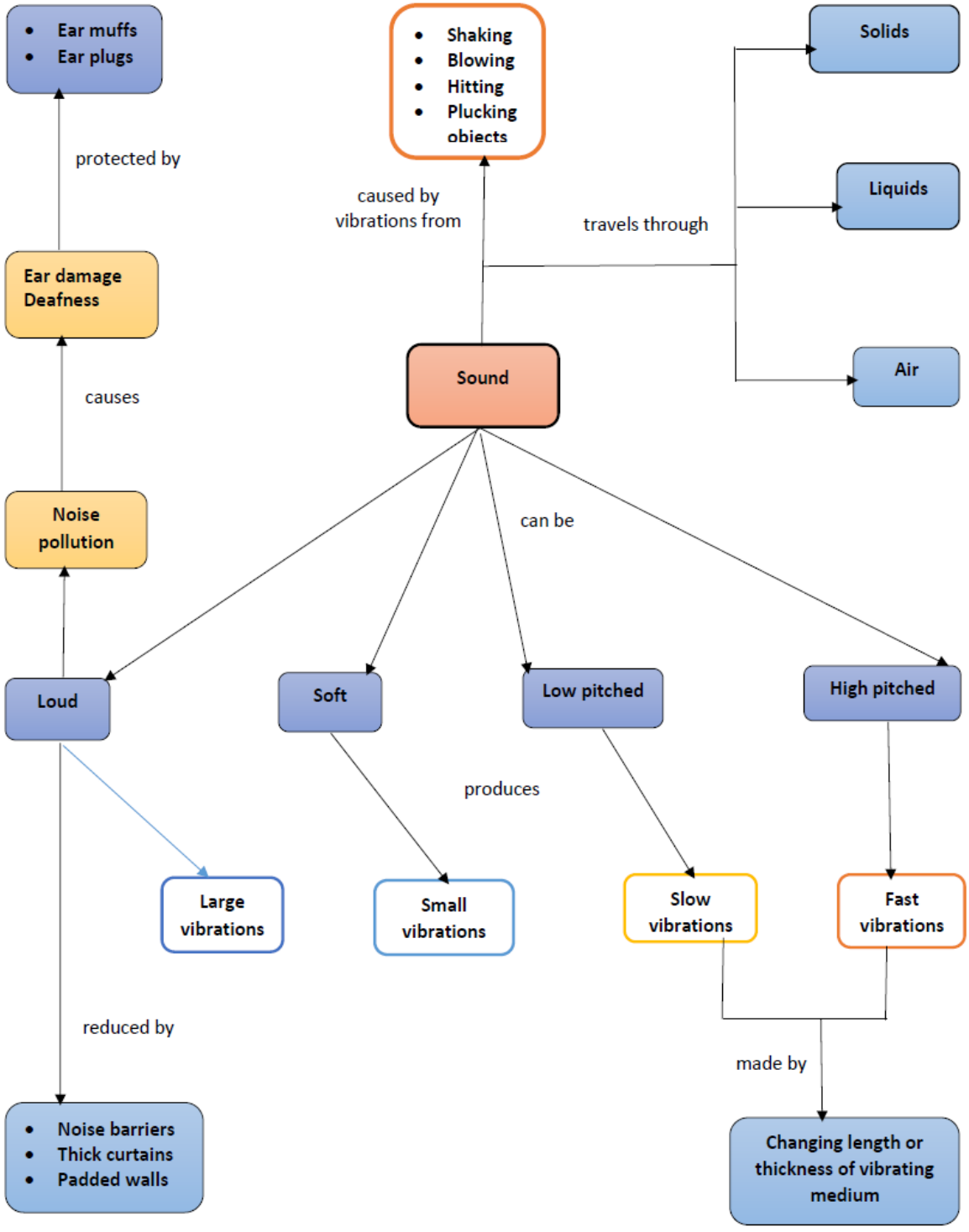
Solution		
Answer	Further Information	Comment
B.	B. correct – 1 mk Any other response – 0 mk **Skills/Content**: analyse and apply Interaction of light with objects	As light gets near to an object, the shadow will get bigger Size of a shadow will depend on the closeness/ position of the light source to the object
Level	**DOK 2**	

Unit: Light and Sound

I will know that I have learned when I can:

- ✓ Investigate some properties of sound
- ✓ Explain why sounds may be interpreted as pleasant/unpleasant
- ✓ Identify sources of noise pollution, and ways to eliminate them
- ✓ Explain why loud sounds can be harmful
- ✓ Formulate hypotheses when conducting investigations into the properties of sound
- ✓ Describe sounds using appropriate scientific language
- ✓ Show curiosity in investigating the property of sounds

Grade 6 – Sound



Prepared by Science Section, CCU, MOE *March 2021*

Activity - Making a Panpipe

Unit: Light and Sound

Aim: To investigate some properties of sounds
Skills: measuring, manipulating, analysing, communicating, drawing conclusions **Practices**: Asking Questions, Constructing Explanations, Engaging in Argument from Evidence

Materials: ruler, straws, scissors, tape

Procedure:

1. Mark of 1 cm off the end of a straw using a ruler. Cut the straw at the 1cm mark.
2. Repeat this step with other straws each time cutting off 2 cm, 3 cm, 4 cm, 5 cm, 6 cm, 7cm, 8 cm, 9 cm from each straw.
3. Arrange the straws, including one that is not cut, from longest to shortest.
4. Tape straws together to make a panpipe.

Question: Formulate a question that represents this investigation.

_____

_____

Prediction: What do you think will happen?

_____

_____

Hypothesis Statement:

_____

_____

5. Test your panpipe by blowing across the hole in the straws.

Discussion

What causes the sound made in the panpipe? How does the sound travel?

_____

_____

Which straw makes the sound with the lowest pitch?

_____

Which straw makes the sound with the highest pitch?

_____

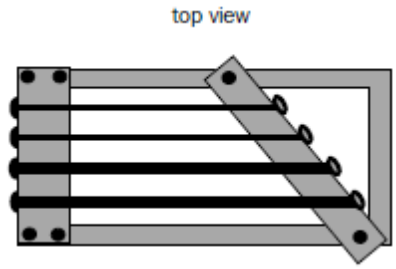
What is the relationship between the pitch and the length of the straw?

_____

_____

Item #	16
Unit	Light and Sound
Objective	Investigate the properties of sound Formulate hypotheses when conducting investigations into the properties of sound
Item type	Multiple Selected Response

When a guitar string is plucked, it makes a sound. A student made the instrument shown below using wood, string and nails. Use the information to answer item **16.**



Each string of her instrument produces a different pitch when plucked.

16. What **TWO** features of the strings would change the pitch of the sound?

A. The colour of the strings
B. The length of the strings
C. The type of material
D. The thickness of the strings

Solution		
Answer	Further Information	Comment
B. D.	B correct – 1 mk D correct – 1 mk Any other response – 0 mk **Skills/Content**: analyse and apply	Pitch of a sound depends on the length and thickness of the vibrating medium
Level	**DOK 2**	

Item #	17
Unit	Light and Sound
Objective	Investigate the properties of sound
Item type	Single Selected Response

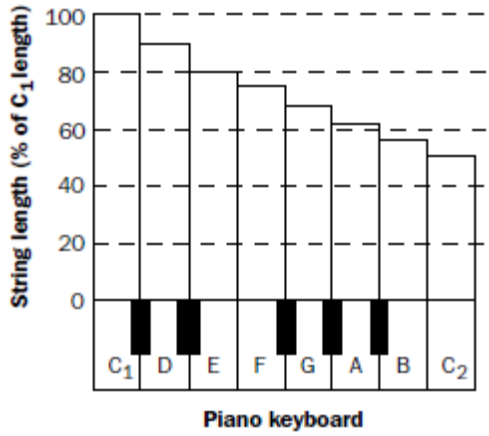
17. What can a student do to make a louder sound on her musical instrument?

A. Move the strings closer together
B. Move the strings further apart
C. Pluck the strings more gently
D. Pluck the strings harder

Solution		
Answer	Further Information	Comment
D.	D correct – 1 mk Any other response – 0 mk **Skills/Content**: analyse and apply Properties of sound	The loudness or intensity of a sound depends on how gently or hard the object is hit, shaken or plucked.
Level	**DOK 1**	

Item #	18
Unit	Light and Sound
Objective	Investigate the properties of sound Formulate hypotheses when conducting investigations into the properties of sound
Item type	Single Selected Response

The graph shows the length of some piano strings and the pitch of the sound they produce.



Piano Key	Pitch
C1	low
D	low
E, F	medium
G	medium
A, B	high
C2	high

Use the information above to answer question 18.

18. Which statement is **true**?

A. The piano key C_1 has the shortest string
B. The piano key C_2 has the longest string
C. The shorter the string, the higher the pitch of the sound
D. The longer the string, the higher the pitch of the sound

Solution		
Answer	Further Information	Comment
C.	C correct – 1 mk Any other response – 0 mk **Skills/Content**: analyse, patterns, drawing conclusions Properties of Sound Planning Investigations	Analysis of the information shows a pattern.
Level	**DOK 3**	

Item #	19
Unit	Light and Sound
Objective	Investigate the properties of sound Identify sources of noise pollution, and ways to eliminate them
Item type	Single Selected Response

Some students were carrying out an investigation to determine the best material for soundproofing. These are the steps carried out.

They measured the sound level of an alarm from a phone in an open box. They then measured the sound level of the phone alarm in the following situations:

- When the box was closed
- When the box was packed with different materials and closed

The results are shown in the table below. Use the information to answer item **19**.

Where the phone alarm was placed?	**Sound level in decibels (dB)**
Open box	80
Closed box	70
Closed box packed with bubble wrap	40
Closed box packed with cotton	50
Closed box packed with fabric	55
Closed box packed with paper	60

19. Which **TWO** things must the students do to make this investigation a fair test?

They should measure the sound level _____

A. from the boxes at the same time
B. from four different boxes
C. using the same box
D. using the same alarm clock

Solution		
Answer	Further Information	Comment
C. D.	C correct – 1 mk D correct – 1 mk Any other response – 0 mk **Skills/Content**: plan and design Planning Investigations	In a fair test only one factor is changed (type of material) while keeping the other factors constant (same clock, same box)
Level	**DOK 2**	

Item #	20
Unit	Light and Sound
Objective	Investigate the properties of sound Identify sources of noise pollution, and ways to eliminate them
Item type	Single Selected Response

The table below shows the results of an investigation to determine the best material for soundproofing. Use the information to answer item **20**.

Where the phone alarm was placed?	Sound level in decibels (dB)
Open box	80
Closed box	70
Closed box packed with bubble wrap	40
Closed box packed with cotton	50
Closed box packed with fabric	55
Closed box packed with paper	60

20. Which material is **best** for soundproofing the box?

A. Bubble wrap
B. Cotton
C. Fabric
D. Paper

Solution		
Answer	Further Information	Comment
A.	A correct – 1 mk Any other response – 0 mk **Skills/Content**: plan and design, interpret data Planning Investigations; Sound Insulators	The best soundproofing material would result in the lowest sound (40 dB)
Level	**DOK 3**	

Item #	21
Unit	Light and Sound
Objective	Identify sources of noise pollution, and ways to eliminate them Explain why loud sounds can be harmful
Item type	Single Selected Response

The man in the diagram below is using a jackhammer which can produce sounds up to 130 dB (decibels). Use the information to answer item **21.**

21. What is the **best** way for the man to protect his ears?

A. Wear earphones
B. Wear ear muffs
C. Reduce the size of the jackhammer
D. Reduce the sound of the jackhammer

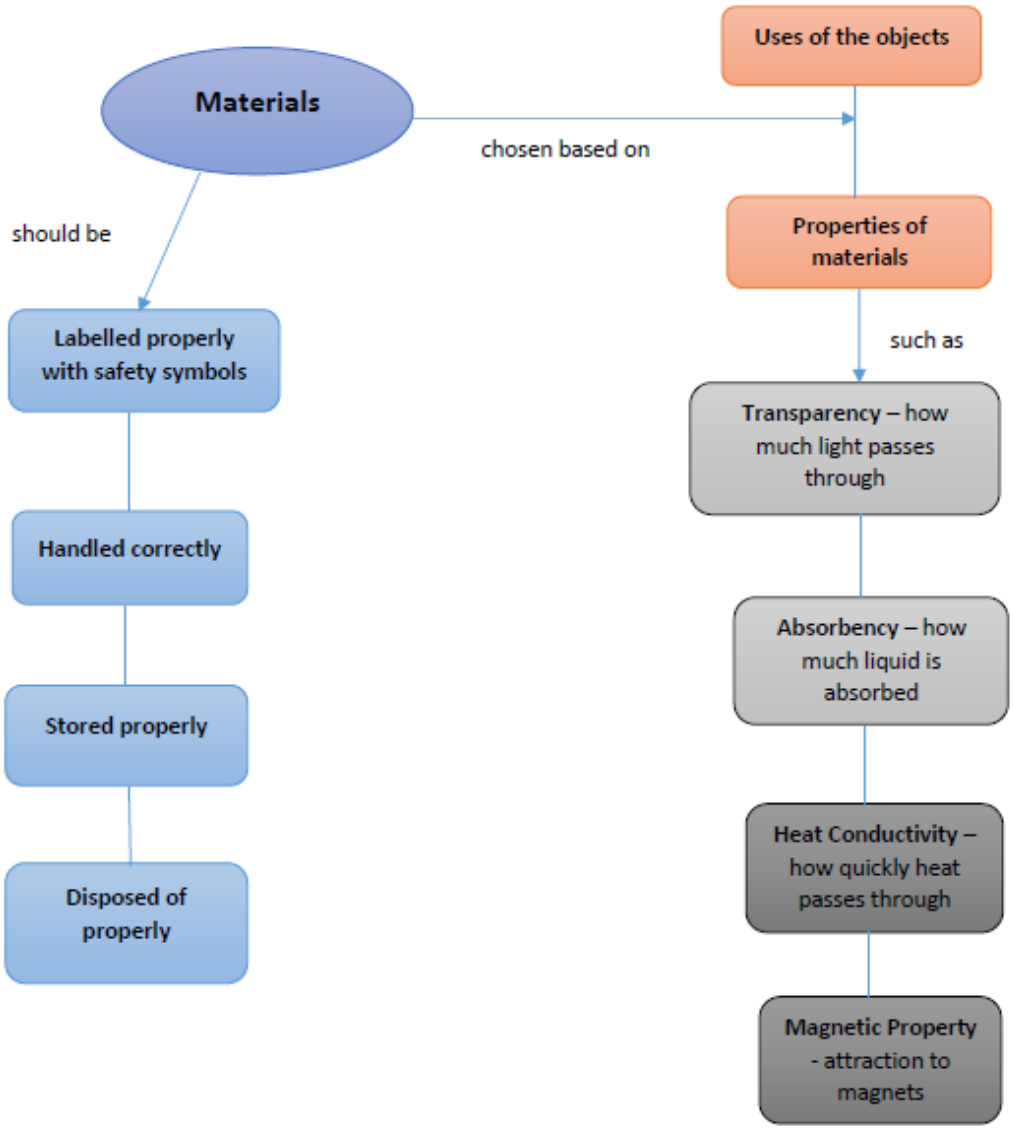
Solution		
Answer	Further Information	Comment
B.	B correct – 1 mk Any other response – 0 mk **Skills/Content**: Properties of Sound; Reducing harmful sounds	Loud sounds over prolonged periods can damage the ears and hearing. Using materials to protect our ears is the best way to reduce the impact of loud sounds.
Level	**DOK 1**	

Unit - Properties of Materials

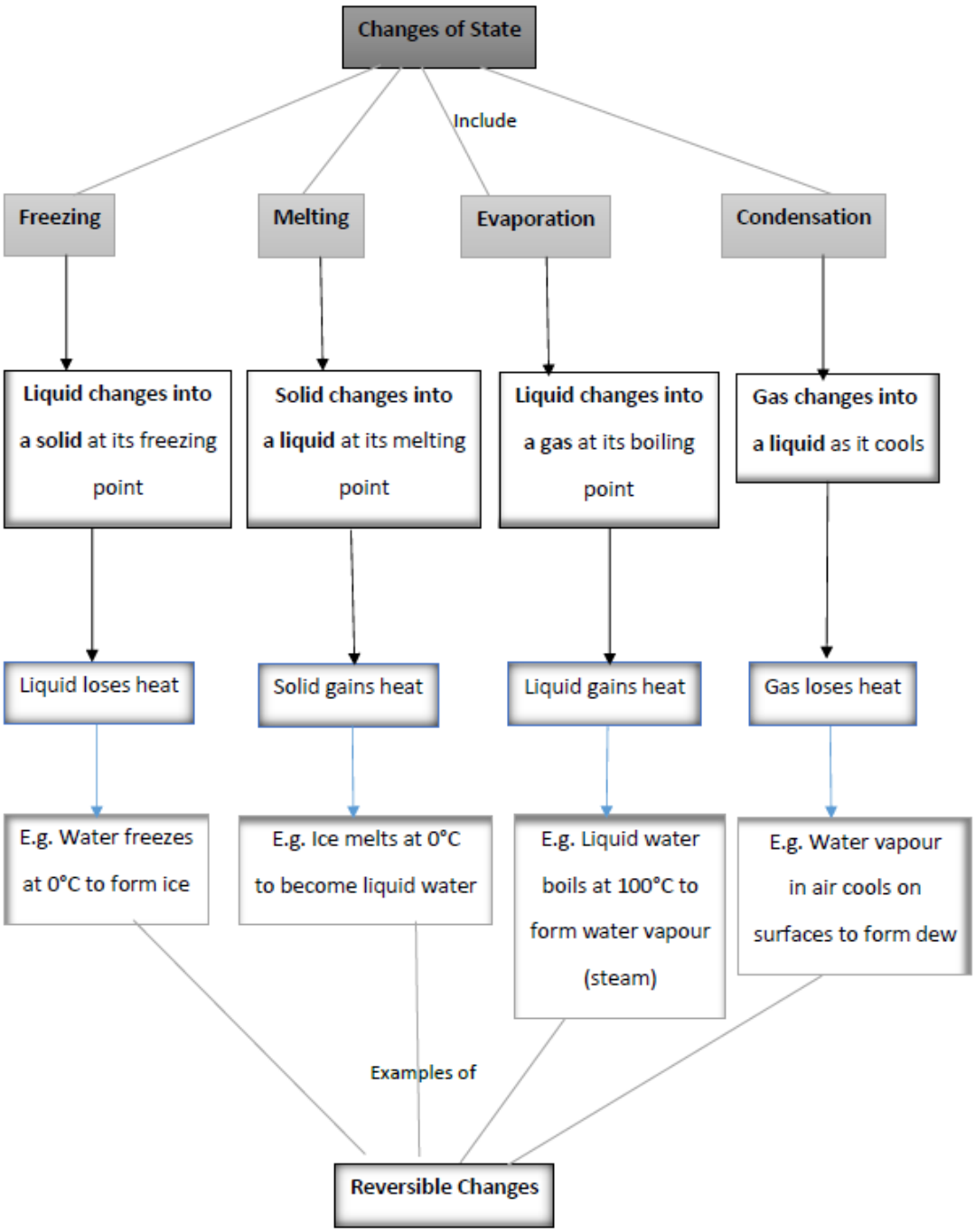
I will know that I have learned when I can:

- ✓ Identify correct and safe ways of using, storing and disposing of materials and household items.
- ✓ Examine a selection of materials/objects to determine the transparency, absorbency, strength, magnetic property, and heat conductivity of materials in everyday use.
- ✓ List some properties of materials that determine the choice of objects for specific purpose in everyday life.
- ✓ Evaluate how the disposal of selected materials affect the environment
- ✓ Assess the impact of different materials on the society
- ✓ Generate predictions of material properties based on observations and experience.
- ✓ Conduct an investigation to illustrate that some changes result in the formation of new materials and others do not.
- ✓ Distinguish between reversible and irreversible changes
- ✓ Classify some changes as reversible and others as irreversible;
- ✓ Infer that some materials can change from one state to another (solid, liquid and gas)
- ✓ Identify the processes involved when materials change from one state to another (freezing, melting, evaporating, condensing)
- ✓ Make careful observations of reversible and irreversible changes, record and explain these using suitable scientific language
- ✓ Predict the effect of heat on selected materials
- ✓ Predict whether a change will be reversible or irreversible
- ✓ Test predictions of changes with actual observations

Concept Map – Properties of Materials

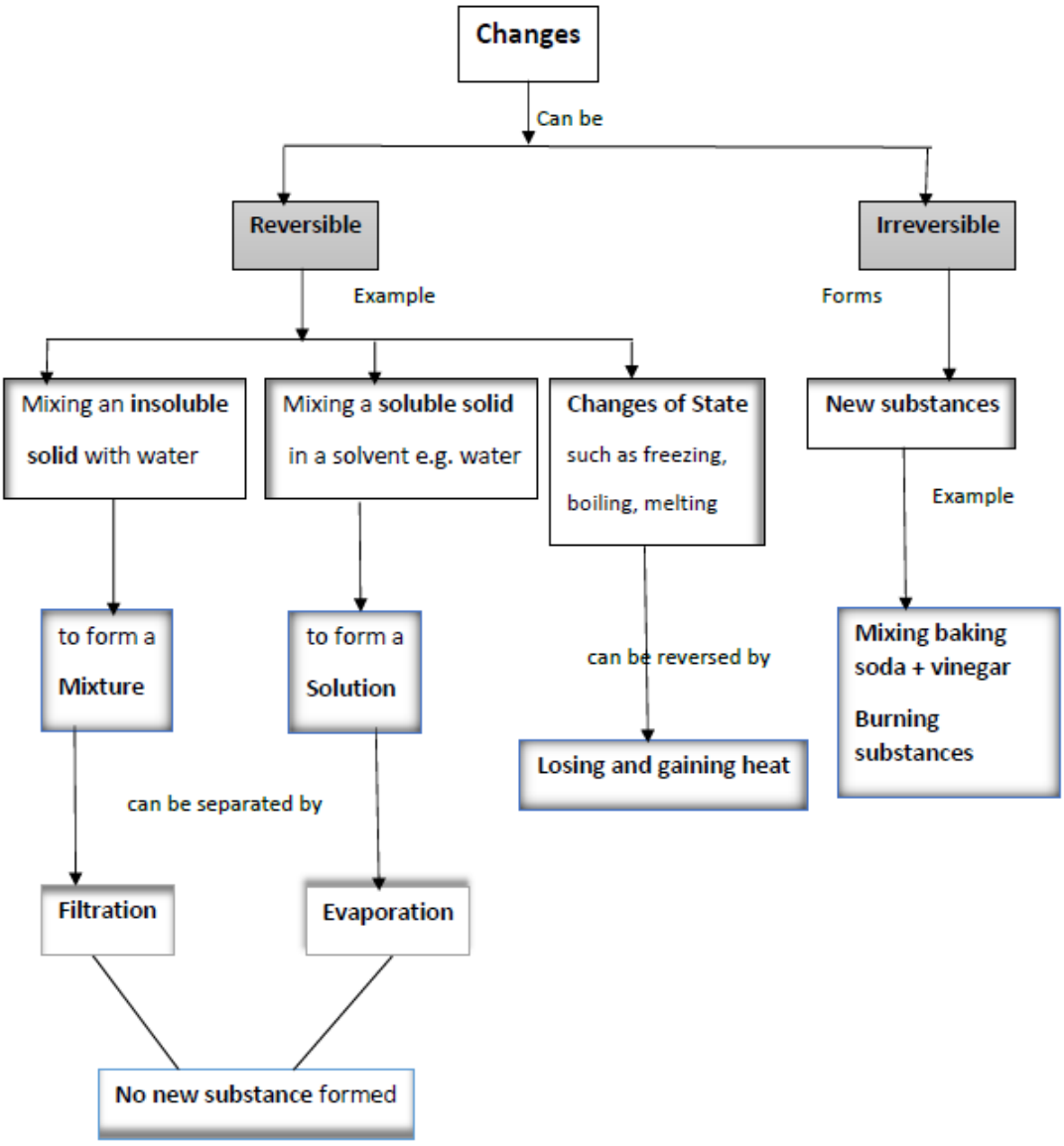


Grade 6 – Changes of State



Prepared by Science Section, CCU, MOE *April 2020*

Grade 6 – Reversible and Irreversible Changes



Prepared by Science Section, CCU, MOE *April 2020*

Activity: Which paper is best for mopping up spills?

Aim: To investigate which type of paper will take up the most water.
Skills: Observing, predicting, analyzing, interpreting, drawing conclusions **Practices**: Planning & Designing Investigations
Materials: Different types of paper such as newspaper, plain paper, brown paper and tissue paper, water, plastic cup, measuring cylinder, graph paper

Planning your investigation:
My prediction: I predict that
_____

My plan:
Which materials will I test?
_____
What am I going to change?
_____
What will I measure?
_____
What will I keep the same? How will I make it a fair test?
_____
_____
What equipment will I need?
_____
What am I going to do?
First_____
Next_____
Then _____

Carry out your investigation.
My results:

Type of paper	What happened?

Which was the best paper for mopping up spills?
_____
Explain your answer
_____

What have you learned from this experiment?
_____

Developing Scientific Concepts

Activity: Melting and Dissolving

Aim: To explain the difference between melting and dissolving

Skills: observing, inferring, drawing conclusions, communicating, classifying. **Practices:** Constructing Explanations

Materials: sugar, salt, butter, hot and cold water, petri dish

Inquiry Questions:

What happens when a substance dissolves?

What happens when a substance melts?

What is the difference between melting and dissolving?

Procedure:

Examine the samples provided. What do you know about them?

Add a sample of butter to a petri dish and float on hot water/ cold water. Note observations. Repeat using sugar and/ or salt.

Add a sample of butter to a beaker of hot/ cold water. Note observations. Repeat using sugar and/ or salt.

Discussion

Which substance melted? What evidence can you give for this?

_____

_____

Which substance dissolved? What evidence can you give for this?

_____

_____

What is the difference between melting and dissolving?

_____

_____

_____

Activity - Investigating Material Changes

Aim: To observe changes that occur when substances are mixed.

Skills: observing, inferring, drawing conclusions, communicating, classifying, **Practices:** Constructing Explanations, Engaging in Argument from Evidence

Materials: baking soda, water, lemon/lime juice, marble chips/powder, vinegar, measuring cylinder, beaker, plastic spoon

Activity : To observe the changes that occur when substances are mixed.

Substances to be mixed	**Observation**	**Is any new substance formed?**	**Is the change reversible or irreversible**
1 teaspoon of baking soda + 50 ml water			
1 teaspoon of baking soda + 50 ml lemon juice			
1 teaspoon of baking soda + 50 ml vinegar			
Few pieces of marble chips/ marl + 50 ml water			
Few pieces of marble chips/ marl + 50 ml lemon juice			
Few pieces of marble chips/ marl + 50 ml vinegar			

Discussion:

How do you know whether a change is reversible or irreversible?

_____
_____
_____

Does mixing bring about reversible or irreversible changes? Explain

_____
_____
_____

Activity: What happens when water vapour loses heat?

Aim: To determine what happens when water vapour loses heat

Skills: measure, observe, infer, analyse, draw conclusions **Practices**: Constructing explanations

Materials: clear plastic cups or beakers, hot and cold water, plastic wrap, thermometer

Procedure:

Place 100 ml of cold water into a clear plastic cup/ beaker. Measure the temperature of the water. Cover the mouth of the cup with a piece of plastic wrap. Label this Cup A.

Place 100 ml of hot water into a clear plastic cup/ beaker. Measure the temperature of the water. Cover the mouth of the cup with plastic wrap. Label this Cup B.

What do you see on the surface of Cup A? Draw your observations below.

Explain your observations.

What do you see on the surface of Cup B? Draw your observations below.

Explain your observations.

Discussion

Which variables are kept constant in the experiment?

Where did the droplets of water that formed on the outside of the flask come from?

What process resulted in the formation of water droplets inside and outside the flask?

Conclusion:

_____

_____

Item #	22
Unit	Properties of Materials
Objective	• List some properties of materials that determine the choice of objects for specific purpose in everyday life.
Item type	Single Selected Response

A student is building a house for his pet dog. He puts a window in the dog house to be able to see the dog. Use the information to answer item **22.**

22. What property should the material for the window have?

A. Waterproof
B. Transparent
C. Strong
D. Flexible

Solution		
Answer	Further Information	Comment
B.	B correct – 1 mk Any other response – 0 mk **Skills/Content**: analyse and apply Properties of materials for everyday use	The property of transparency allow us to see through materials clearly
Level	**DOK 1**	

Item #	23
Unit	Properties of materials
Objective	• Make careful observations of reversible and irreversible changes, record and explain these using suitable scientific language
Item type	Single Selected Response

Adding baking soda (or baking powder) to vinegar in a bottle can create a rocket. A student wanted to find out how the amount of baking soda would affect the height of the rocket. The results are shown in the table below. Use the information to answer items **23** and **24.**

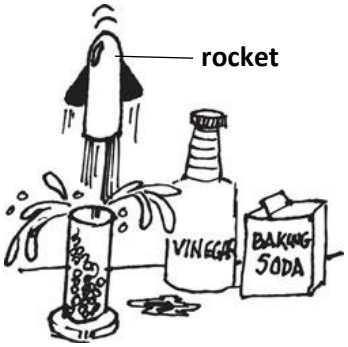


Table showing amount of baking soda used and the height of the rocket formed

Teaspoons of baking soda	Rocket height/ cm
1	70
2	130
3	170
4	180

23. What should the student keep the same in this experiment to make it a fair test? Circle all answers

A. The number of teaspoons of baking soda
B. The type of baking soda used
C. The amount of vinegar in each bottle
D. The number of bottles used

Solution		
Answer	Further Information	Comment
B. C.	B correct – 1 mk C. correct – 1 mk Any other response – 0 mk **Skills/Content**: plan and design Reversible and Irreversible Changes; Planning Fair Tests	A fair test requires changing only one variable and keeping the other variables the same Change – amount of baking soda Keep the same – type of baking soda and amount of vinegar used
Level	**DOK 2**	

Item #	24
Unit	Properties of Materials
Objective	• Make careful observations of reversible and irreversible changes, record and explain these using suitable scientific language
Item type	Single Selected Response

Use the data in the table to answer item **24.**

Table showing amount of baking soda used and the height of the rocket formed

Teaspoons of baking soda	**Rocket height/ cm**
1	70
2	130
3	170
4	180

24. What is a **likely** conclusion from this investigation?

A. As the amount of baking powder increased the rocket height increased
B. Baking powder reacts with bottled soda
C. If the amount of baking powder is increased then the rocket height will change
D. When baking powder and soda are mixed a rocket is produced.

Solution		
Answer	Further Information	Comment
C.	C correct – 1 mk Any other response – 0 mk **Skills/Content**: analyse and apply Reversible and Irreversible Changes	Using the pattern of results, the rocket height increases as the amount of baking soda added increase
Level	**DOK 3**	

Item #	25
Unit	Properties of Materials
Objective	Classify some changes as reversible and others as irreversible
Item type	Single Selected Response

Substances melt or burn when heated.

25. Choose the letter to show if each statement in the table describes melting or burning.

Statement	Melting	Burning
A new material is formed	**A**	**B**
The process is reversible	**A**	**B**
A solid changes to a liquid	**A**	**B**

Solution		
Answer	Further Information	Comment
B. **A.** **A.**	(i) B correct – 1 mk (ii) A correct – 1 mk (iii) A correct – 1 mk Any other response – 0 mk **Skills/Content**: analyse and apply Reversible and Irreversible Changes; Changes of State	When a substance is burnt, the new material formed cannot return to the original substance
Level	**DOK 1**	

Item #	26
Unit	Properties of Materials
Objective	• Identify the processes involved when materials change from one state to another (freezing, melting, evaporating, condensing) • Predict the effect of heat on selected materials
Item type	Single Selected Response

Use the information to answer item **26**

A student heated some water in a pot. After some minutes, the level of water in the pot decreased.

26. What process is **likely** responsible for this observation?

A. Melting
B. Evaporation
C. Condensation
D. Boiling

Solution		
Answer	Further Information	Comment
B.	B correct – 1 mk Any other response – 0 mk **Skills/Content**: analyse and apply Changes of State	As the water is heated, it changes to vapour which is released so the level of water in the pot decreases
Level	**DOK 2**	

Item #	27
Unit	Properties of Materials
Objective	• Generate predictions of material properties based on observations and experience. • Identify the processes involved when materials change from one state to another (freezing, melting, evaporating, condensing)
Item type	Single Selected Response

Droplets of water formed on a window near a pot of hot water. Use the information to answer item **27**.

27. What **best** explains why droplets formed on the window?

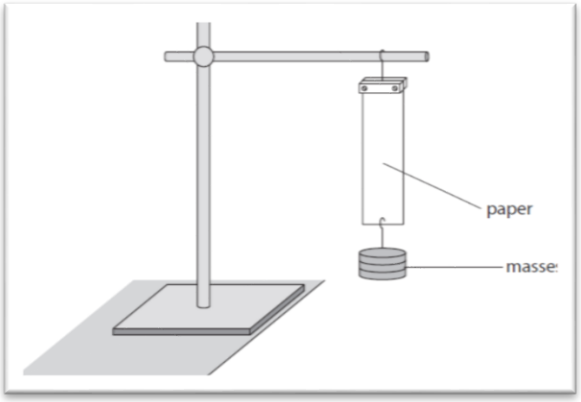
The window is

A. cold
B. hard
C. smooth
D. transparent

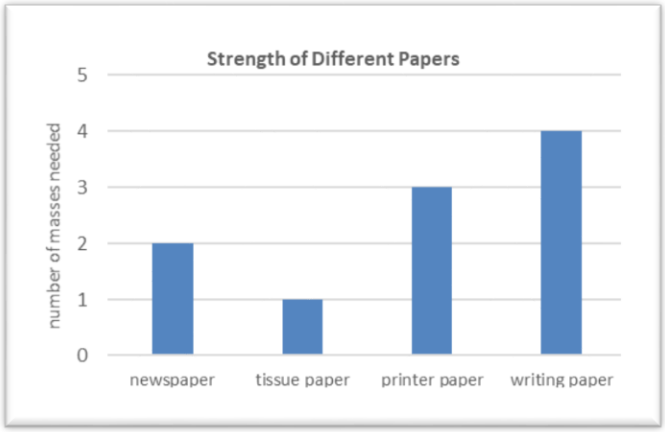
Solution		
Answer	Further Information	Comment
A.	A correct – 1 mk Any other response – 0 mk **Skills/Content**: Infer Changes of State; Material Properties	Condensation occurs when water vapour meets upon a cold surface
Level	**DOK 2**	

Item #	28
Unit	Properties of Materials
Objective	Examine a selection of materials/objects to determine the transparency, absorbency, strength, magnetic property, and heat conductivity of materials in everyday use.
Item type	Single Selected Response

A student investigated the strength of different types of paper by hanging different masses on the paper until the paper tears. Use the information in the diagram and graph to answer item 28.



The results are shown in the bar graph.



28. Which type of paper was the strongest?

A. Printer paper
B. Newspaper
C. Tissue paper
D. Writing paper

Solution		
Answer	Further Information	Comment
D.	D correct – 1 mk Any other response – 0 mk **Skills/Content**: analyse and interpret data Material Properties	The strongest paper would hold the most masses
Level	**DOK 2**	

Item #	29
Unit	Properties of Materials
Objective	• Examine a selection of materials/objects to determine the transparency, absorbency, strength, magnetic property, and heat conductivity of materials in everyday use.
Item type	Single Selected Response

A student wanted to determine which material could keep her soup warm for the longest time. She carried out the steps below.

1. She placed the same amount of soup in cups made of different materials, A, B, C and D.
2. She measured the temperature of the soup in each cup at the beginning and at the end of 10 minutes.

The student obtained these results. Use the information to answer item **29**.

Material	Start Temperature/ °C	End Temperature/ °C
A	70	56
B	70	51
C	70	61
D	70	62

29. Which material is the **worst** insulator?

A. Material A
B. Material B
C. Material C
D. Material D

Solution		
Answer	Further Information	Comment
B.	B correct – 1 mk Any other response – 0 mk **Skills/Content**: analyse and interpret data Material Properties	The best conductor is usually the worst insulator (and vice versa)
Level	**DOK 3**	

Item #	30
Unit	Properties of Materials
Objective	• Examine a selection of materials/objects to determine the transparency, absorbency, strength, magnetic property, and heat conductivity of materials in everyday use.
Item type	Single Selected Response

Mr. Smith wants to determine the best brand paper towels he should use in his kitchen to soak up water by carrying out an investigation. The number of pieces of paper towel used to soak up 150 ml of water in each case is given in the table. Use the information to answer item **30**.

Paper Towel	Number of pieces used
Brand A	8
Brand B	4
Brand C	6
Brand D	5

30. Which is the **best** brand paper towel for Mr Smith to use?

A. Brand A
B. Brand B
C. Brand C
D. Brand D

Solution		
Answer	Further Information	Comment
B.	B correct – 1 mk Any other response – 0 mk **Skills/Content**: analyse and apply Material Properties	The most absorbent towel will require the least number of pieces
Level	**DOK 3**	