East Renfrewshire Council: Education Department
Practitioner Moderation Template

East Renfrewshire Council

WOODFARM HIGH

Prior to the moderation exercise, please complete the following information and submit it to your facilitator with assessment evidence from one learner that you judge to have successfully attained the Es' and Os'.

Experiences and Outcomes:

Forces, electricity and waves

By investigating floating and sinking of objects in water, I can apply my understanding of buoyancy to solve a practical challenge. **(SCN 2-08b)**

Through experimentation, I can explain floating and sinking in terms of the relative densities of different materials. **(SCN 4-08b)**

This series of lessons is linked to a level 4 E & O, but much of its assessment is against the inquiry and investigative skills to be developed within the sciences at Third Level:

- *Establishes links between the findings, aim and hypothesis.*
- *Demonstrates increased levels of collaboration and initiative in decision-making about samples, measurements, equipment and procedures to use.*
- *Relates findings to scientific knowledge and understanding.*
- *Draws a conclusion based on results gathered and in relation to the aim.*
- *Applies scientific analytical thinking skills, with increasing independence, working with less familiar and more complex contexts.*

Learning Intentions:

Science Benchmarks

Explores the factors which affect floating, for example, the object's shape and the density of the material that the object is made of, and collates, organises and summarises findings with assistance.

Calculates the density of a range of materials using the relationship Density = mass / volume.

LI:

- To investigate principles of floating and sinking and be able to link these principles to the density of materials.
- To use the formula density = mass / volume
- To draw conclusions based on the results of the experiment.

Success Criteria:

By the end of the lesson pupils should be able to:

- Use the formula density = mass / volume and apply the correct units.
- Draw conclusions from results and make links to real world situations.
- Explain if an object will float or sink in a given liquid by considering the relative densities.

Briefly outline the context and range of quality learning experiences that have been provided making reference to the chosen design principles.

1. Introduction to sinking / floating / density.
2. Interactive ideas shared with the class.
3. Powerpoint to introduce investigation. (Intentionally been left without clear instruction to allow pupils to practice thinking / calculation / practical skills. The object is to measure the density of some solids & liquids and decide if the solids will float or sink in the liquid.)
4. Hand-out worksheet - to help with time constraints and for differentiation purposes.
5. Revision calculations to consolidate learning.
6. Real life context analogy to offer challenge, breadth & depth.
7. Homework Questions.
8. Assessment Questions.

Generally these lessons take 2/3 periods and as a class we test each combination of solids and liquids and check to see if the hypothesis made was correct.

Record the range of assessment evidence that was gathered to meet the success criteria (Say, Write, Make, and Do) considering breadth, challenge and application.

- **Do:** Experimental observations by teacher during class
- **Write:** Experimental written results
- **Make:** Valid conclusions
- **Say:** Verbally confirm that success criteria has been achieved
- **Assessment:** Homework & End of Unit Assessment

Briefly outline the oral/written feedback given to the pupil on progress and next steps, referring to the learning intention and success criteria.

- Both oral and written feedback given to the student.
- Highlighted excellent investigative work and the structured layout of calculations.
- Annotations made and discussion about next steps for improvement in terms of both knowledge and understanding and skills.

Pupil Voice:
What have you learned? How did you learn? What skills have you developed?

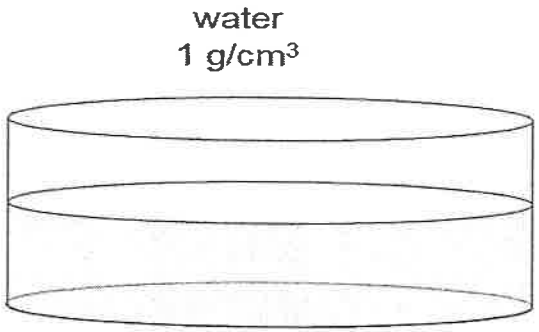
- Pupils complete plenary statements.
- Invited learners to comment on the feedback given.
- Learners explain the skills they have demonstrated and further developed.

Did the learner successfully attain the outcomes? YES/NO

7Kc Different densities

Which materials will float in water?

Click the Test button to see if your predictions are correct.



wood 0.5 g/cm³	polystyrene 0.1 g/cm³
iron 7.9 g/cm³	aluminium 2.7 g/cm³

Test

INTERACTIVE CLASS DISCUSSION

Sinking, Floating and Density

From your work with the textbook you should now know that to measure the density of a substance you must know its mass (m) and its volume (V).

Then you can use a formula to calculate its density

$$\text{density} = \frac{m}{V}$$

Sinking, Floating and Density

Density can be measured in **g/cm³**.
if the mass is in **grams** and the volume is in **cm³**.

Density can be measured in **kg/m³**.
if the mass is in **kilograms** and the volume is in **m³**.

In the following experiments you will find it easier to use **g/cm³**.

Sinking, Floating and Density

- Your task in this activity is to plan experiments to measure the density of samples of carrot, apple, wood, rubber and a metal.
- Then to measure the density of water, brine and ethanol.
- Then you will have to make a hypothesis of whether the solids will sink or float in each liquid.
- Finally you will test your hypothesis experimentally!

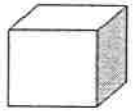
A worksheet is available to record your results.

POWERPOINT SUPPORT

7Kc Different densities

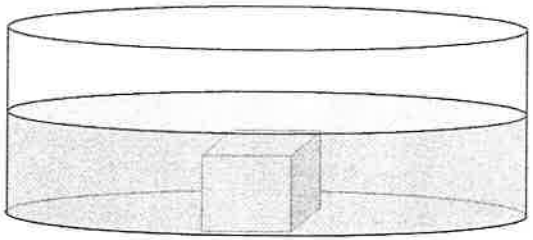
Were you correct?

How did you make your predictions?

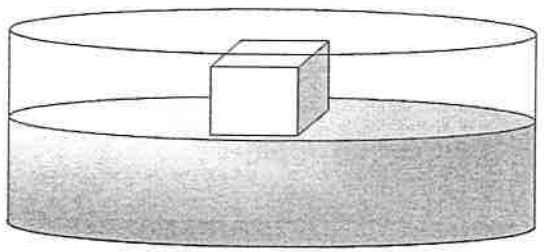


wax 0.9 g/cm³

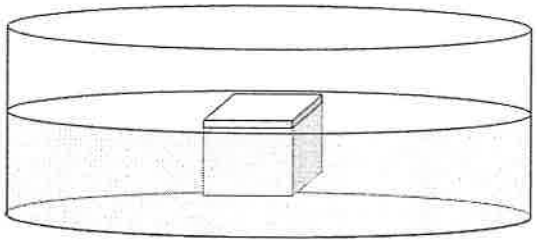
cooking oil 0.85 g/cm³



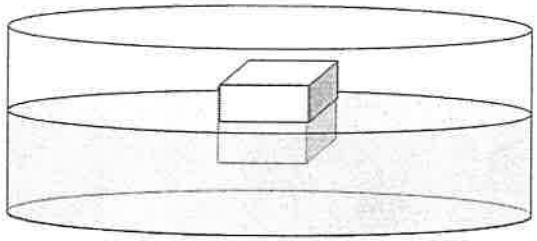
mercury 11.3 g/cm³



water 1.0 g/cm³



dry cleaning fluid 1.6 g/cm³



INTERACTIVE CLASS DISCUSSION

Sinking, Floating and Density
Worksheet

Part 1- Solids

Equipment
Balance, Ruler and 5 solid objects (metal/carrot/rubber/apple/wood)
Instructions

1. Use your ruler to measure the lengths of the sides. Calculate the volume of each object.
2. Measure the mass using the top pan balance.

3. Calculate the density of each object. Complete the table above.

Object	Mass (g)	Volume (cm^3)	Density (g/cm^3)
METAL	7.1g	1 cm^3	7.1 g/cm^3
CARROT	1.7g	0.77 cm^3	2.2 g/cm^3
RUBBER	2.1g	0.5 cm^3	4.2 g/cm^3
APPLE	1.5g	0.66 cm^3	2.3 g/cm^3
WOOD	5.3g	6.4 cm^3	0.8 g/cm^3

Density = m ÷ V
= 5.3 ÷ 6.4
= 0.8 g/cm^3

Part 2- Liquids

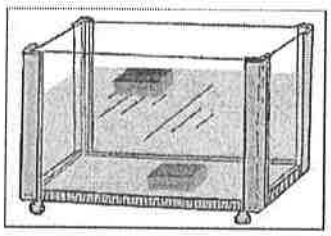
Equipment
Balance, Measuring cylinder and 3 liquids
Instructions

1. Measure the mass of the measuring cylinder.
2. Pour some of the liquid into the measuring cylinder and measure the volume.
3. Measure the mass of the measuring cylinder again with the liquid.
4. Calculate the density of each liquid. Complete the table below.

Liquid	Mass of empty measuring cylinder (g)	Mass of measuring cylinder with liquid (g)	Mass of liquid (g)	Volume (cm^3)	Density (g/cm^3)
Water	54.5	93.7	39.2	40	0.98
Ethanol	54.6	85.0	30.4	40	0.76
Brine	55.0	96.2	41.2	40	1.03

Excellent Calculation work!

PLENARY



I think the wood is floating because the water is pushing it up and the force of up thrust is in action.

I think the wood is floating because the wood has tiny holes in it which traps air to make it float.

I think the wood is floating because it has a large surface area.

What do you Think??

Liquids and gases exert _____ forces on objects which are placed in them.

Objects which are _____ than the surrounding liquid (or gas) will _____, whilst objects which are less _____ than the surrounding liquid (or gas) will _____.

sink float upthrust denser dense

7Kc That floating feeling

4 a Copy and complete this table. 6-7

Material	Mass (g)	Volume (cm^3)	Density (g/cm^3)	Float or sink in water?
W	40	10		
X	50	100		
Y	80	20		
Z	200	250		

PUPIL RESPONSE OVERLEAF

Which two materials could be the same? Explain your answer.

7Kc That floating feeling

7 Steel is denser than water, so how can a steel ship float? (*Hint*: think about what is inside the ship.) 7

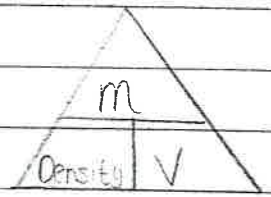
The ship includes air spaces, so the overall density of the ship including the air inside it is less than the density of sea water.

VERBALLY COMPLETED

28th August 2017

Density (Floatation)

Density = mass ÷ volume
= m ÷ V



What volume of liquid do you have if the density is 2 g/cm³ and the mass is 6.3g?

V = m ÷ Density
V = 6.3 ÷ 2.1
V = 3 cm³

Experiment Aim -

To measure the density of solids & liquids and test whether they will float or sink.

31st August 2017

W) Density = m ÷ V (Sink) ✓
= 40 ÷ 10
= 4 g/cm³ ✓

X) Density = m ÷ V (Float) ✓
= 50 ÷ 100
= 0.5 g/cm³ ✓

Y) Density = m ÷ V (Sink) ✓
= 80 ÷ 20
= 4 g/cm³ ✓

Z) Density = m ÷ V (Float) ✓
= 200 ÷ 250
= 0.8 g/cm³ ✓

L.I. Achieved
G.R. ✓

HOMEWORK QUESTIONS

2. Before Safiah conducts an experiment on sinking and floating she collects some data on the substances she will use. The data is shown in the tables below.

Solids

substance	metal	barley	Tar	Soya bean
Density (g/cm^3)	8.94	0.61	1.15	0.72

Liquids

substance	Water	Petrol	acid	ether	mercury
Density (g/cm^3)	1.00	0.88	1.20	0.74	13.5

(a) In which of the liquid(s) will Tar sink? Explain your answer.

Liquid(s) Water, petrol and ether

Explanation It will sink because tar has a higher density than the water, petrol and ether which ... / cause it to sink

2

(b) Which solid(s) will float in all the liquids? Explain your answer.

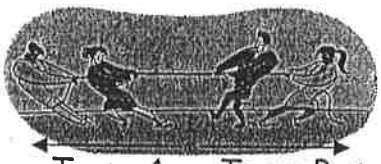
Excellent understand G.R.

Solid(s) Barley and Soya Bean

Explanation It will float because Barley and Soya Bean have a lower density than all the liquids

2

3. The picture shows a 'tug of war'
Complete the following passage.



When team A and team B apply equal forces in opposite directions, we say the forces are balanced. This means that neither team will move. Their speed stays the same!

If team B applies a greater force than team A, the teams will move towards the right because the forces are unbalanced. The speed of the teams will change!

Wordbank: same equal greater unbalanced opposite balanced

6

Parent/guardian signature: _____

Unit Assessment Questions

6. Complete the following table on the answer grid:

Mass (g)	Volume (cm^3)	Density (g/cm^3)
40	4	
20	10	
600	1200	
50	2	

4

7. Each of the parcels below has a mass of 20 kg:

A

B

C

Which parcel will have the greatest density? Explain your answer. 2

12. An object has a volume of 15 cm^3 and a mass of 2.5 g. Use the formula $density = \frac{mass}{volume}$ to calculate its density. 3

UNIT ASSESSMENT

Pupil Response

6.

Mass (g)	Volume (cm^3)	Density (g/cm^3)
40	4	10 ✓
20	10	2 ✓
600	1200	0.5 ✓
50	2	25 ✓

7. Parcel C ✓

Expalanation: because it has a smaller volume which makes the density value higher. ✓

12. *Working and answer*

Density = m ÷ v ✓

= 2.5 ÷ 15 ✓

= 0.16 g/cm³

Density = 0.16 g/cm³ ✗ (rounding)