# Spring Term 1
# Year 8 Separation techniques and Energy
# Extended Homework Assignment

OLD BUCKENHAM HIGH SCHOOL

Achieving excellence together

**Name: _____**

**Teacher: _____**

**Instructions**

**Please complete all sections**

**You will need to complete sections as you work through the topic**

A printed copy should be handed into your teacher.

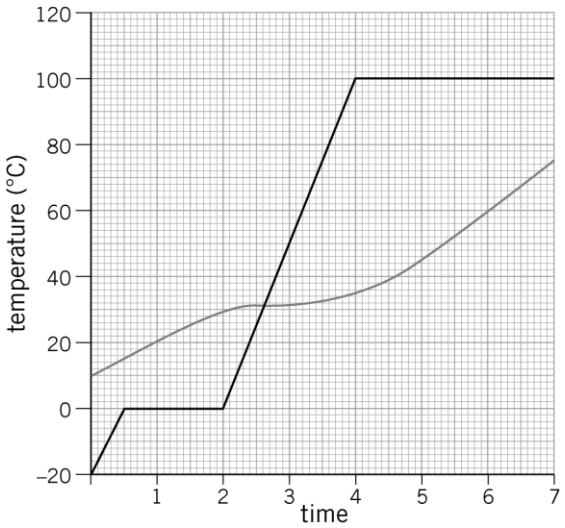
# Separation techniques

## Task 1: Identifying mixtures

**1** Draw particle diagrams in the boxes below to represent an element, a compound, and a mixture.

element compound mixture

**2** The graph below shows the heating curves of two substances.




**a** The two substances shown in the graph are water and chocolate. Label the graph.

**b** State the name of the substance that is pure. Explain your answer using the graph provided.

_____

_____

**c** Label the different states (solid, liquid, or gas) shown on this graph. Identify the changes of state. Label appropriately as boiling, freezing, and so on, as appropriate.

**d** Describe how an experiment can be set up to provide data for this graph.

_____

_____

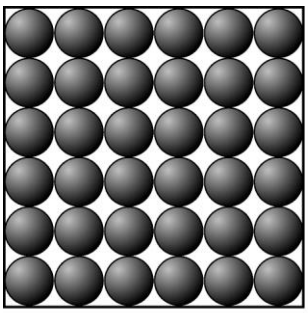
_____

_____

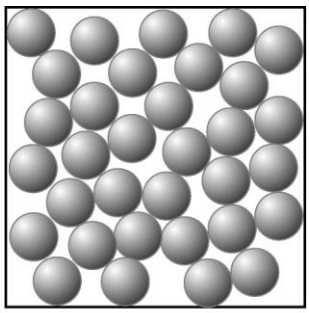
## Task 2: Solutions

**1 a** Use the words **solute**, **solvent**, and **solution** to describe how a solution is made.

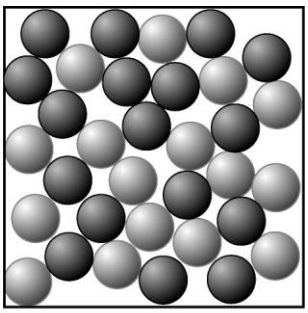
**b** Use the diagrams below to explain in detail what happens to particles when a substance dissolves.



solute



solvent



solution

**2** The table below gives information on the solubility of sugar and salt in water.

| Substance | Solubility at 20 °C (g/100g of water) |
|---|---|
| sugar (sucrose) | 202 |
| salt (sodium chloride) | 36 |

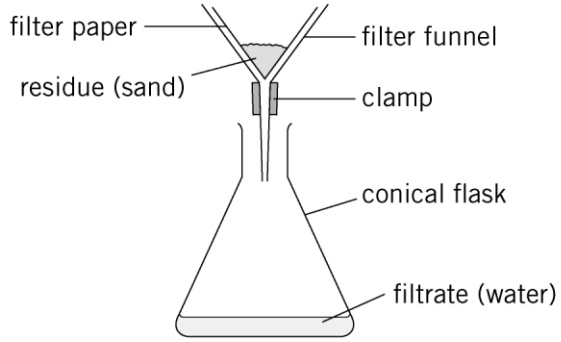
**a** State what is meant by solubility. Give an example using the data provided.

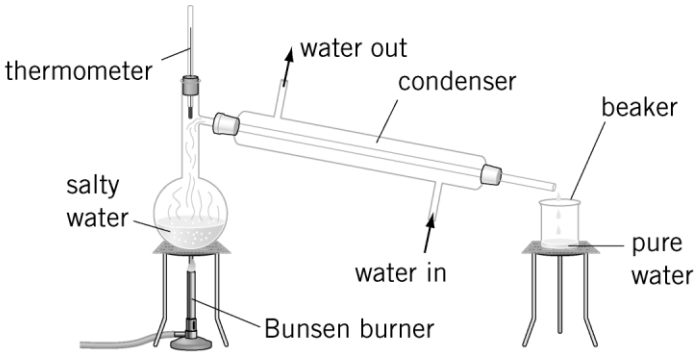
**b** Explain what is meant by a saturated solution.

## Task 3: Separation techniques

**1** Match the name of the separation technique to the correct experimental set up below. Your choices are:

**chromatography** **filtration** **evaporation** **distillation**

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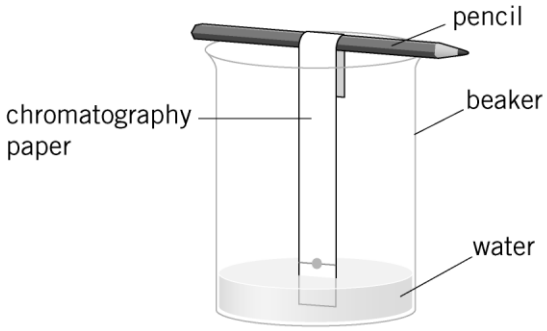
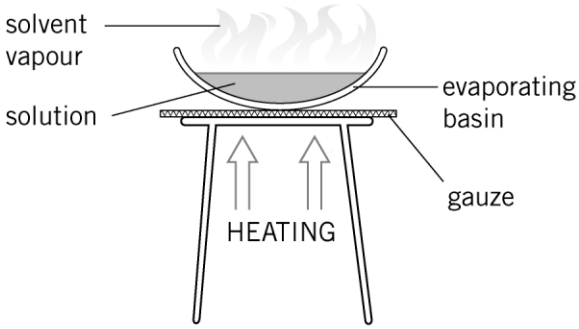



_____ _____

**2** Rearrange the sentences below to describe and explain how filtration can be used to separate sand from a mixture of sand and sugar.

| | **Order** |
|---|---|
| Sugar dissolves in water. Sand does not. | |
| Sand is left as the residue in the filter funnel. | |
| Add water to the mixture. Stir. | |
| Sugar solution passes through the filter paper as filtrate. | |
| Fold the filter paper, place in funnel, and pour the mixture into the filter funnel. | |

**3** Fill in the gaps below to explain why you can use evaporation to obtain salt from sea water but not water from an inky solution.

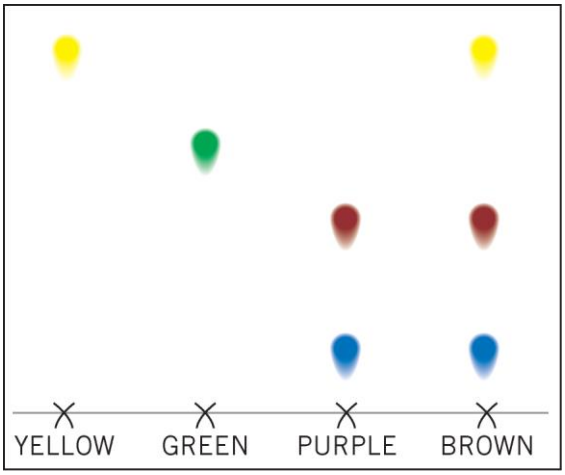
Evaporation can be used to remove a s _____ from a solution. This is the case when removing salt from sea water. In this example, s _____ is the solute, water is the s _____ , and sea water is the s _____ . Salt can be obtained simply by leaving sea water in an e _____ b _____ until the water e _____ .

On the other hand, evaporation cannot be used to obtain water from an inky solution as only the i _____ would be left at the end. In order to obtain pure water from an inky solution, d _____ must be used. This is a technique where the substance with the l _____ boiling point evaporates first, and as its vapours enter the c _____ , the gas condenses into a l _____ , ready to be collected in a beaker.

**4** Match the halves of the following sentences together to explain how chromatography works.

| | |
|---|---|
| Place a sample of each ink you would like testing on | so the mixture separates. |
| Place the chromatography paper in a beaker of solvent, | for example, water. |
| The level of solvent in the beaker must | dissolve in the solvent. |
| The solvent moves | the pencil line of the chromatography paper. |
| The ink samples | with the solvent up the chromatography paper. |
| The solvent carries the samples | up the chromatography paper. |
| Some dyes move faster than others, and some dissolve better than others, | not be above the pencil line. |

**5** The chromatogram below show the separation of ink from four different felt-tip pens.




**a** State the only coloured pen whose ink does not appear in the brown felt-tip pen.

_____

**b** Suggest whether a brown pen made by a different company would produce the same result on a similar chromatogram. Explain your answer.

_____

_____

_____

# Energy

## Task 1: Energy in food and in fuels

Look at the table of information below and answer the questions.

| Food or fuel | Energy (J/kg) |
|---|---|
| coal | 30 000 000 |
| wood | 15 000 000 |
| petrol | 46 000 000 |
| cheese | 16 000 000 |
| bread | 9 500 000 |
| lettuce | 550 000 |

**1** A new power station is opening in your local area. State the fuel you would choose for this power station using the table above. Explain your answer.

_____

_____

Leon and James students are in the same class. Leon is very sporty while James likes to play on his games console in his spare time.

Their typical daily energy requirements are 8700 kJ and 12 400 kJ.

**2 a** Link the correct energy requirement for each student.

Leon: _____

James: _____

**b** Describe the types of food you would recommend to Leon and James as part of their diet using the table above. Explain your answer.

_____

_____

_____

## Task 2: Conservation of energy

**1** State the law of conservation of energy.

_____

_____

**2** A coal fire is burning in the fireplace. Describe the energy before and after this change.

_____

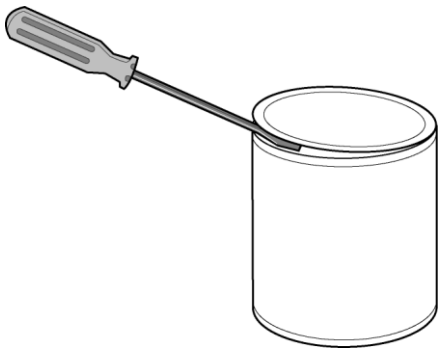
_____

_____

**3** The diagram below shows a lever in action. Explain how this lever follows the law of conservation of energy.

Fill in the gaps using the following words:

**force multiplier** **force** **distance** **pivot**
**simple machine** **bigger** **smaller**



A lever is a _____ _____.

In this example, a screwdriver is used to open a paint tin.

The _____ is where the end of the screwdriver is resting on the edge of the paint tin. The _____ applied to the lid by the lever is_____ than the _____that you apply with just your hand. This means that a lever is a _____ _____.

Energy is conserved because the_____ the lid moves up is _____ than the_____ moved by your hand.

## Task 3: Energy transfers

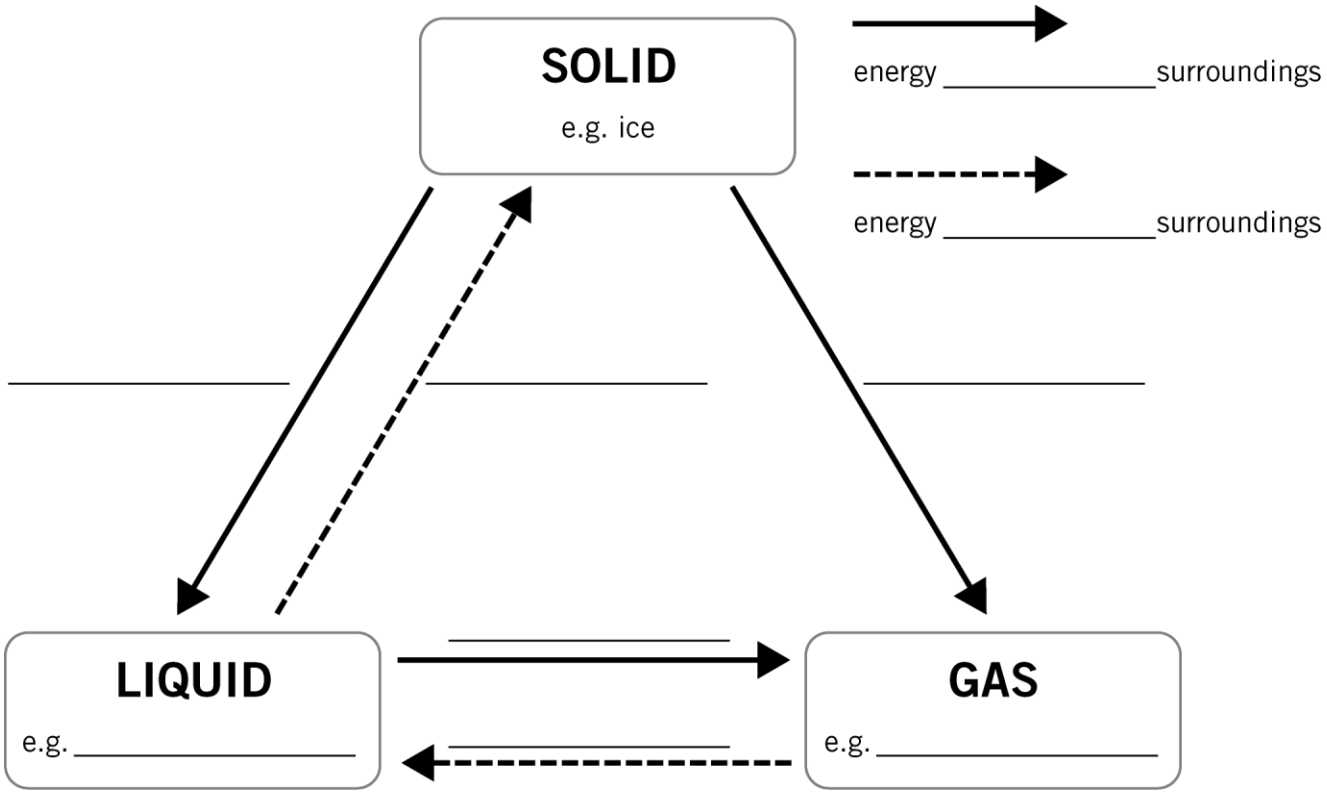
**1** Link each key word with the correct definition provided.

| | |
|---|---|
| energy | The energy in the store associated with the temperature of an object. |
| temperature | A measure associated with changes in temperature or with work, measured in joules. |
| internal energy | A measure of how hot or cold something is, measured in degrees Celsius. |

**2** Complete the diagram to describe what happens during changes of state. Fill in the gaps and label each arrow using the words and phrases below.

**melting** **evaporation or boiling** **sublimation** **condensation**

**freezing** **to** **from** **water** **steam**



**3** Two objects are in contact with each other. Explain what brings about the transfer of energy between the two objects using the term **equilibrium**.

**4** Use the image below to answer the following questions.


**a** Draw an arrow on the diagram to show the direction of energy transfer.

**b** Describe how conduction occurs through the sides of the cup. You should include the phrase **vibration of particles** in your answer.

**c** Suggest a suitable material for the manufacture of this cup. Explain your answer in terms of conduction and insulation.

**5 a** Choose from the following list sources of infrared radiation.
Circle the correct answers.

**ice cube** **the Sun** **a metal saucer** **a lamp** **a fire**

**b** Describe what all sources of infrared radiation have in common.

_____

_____

**c** Explain how energy is transferred by radiation. State whether particles are required for this method of energy transfer.

_____

_____

## Task 4: Energy resources

**1** Wood and coal are two different types of energy resources. Describe the difference between them in terms of renewable and non-renewable energy sources.

_____

_____

**2** Describe how electricity is generated in a power station by completing the table below. Use these phrases:

**heats water to steam** **generates electricity**
**spins the generator** **burns the fuel**

| Part of the power station | Function |
|---|---|
| furnace | |
| boiler | |
| turbine | |
| generator | |

## Task 5: Energy, power, and work done

**1** Explain the difference between energy and power by filling in the table below. Use the following phrases to help you:

**increases** **joule** **stays the same** **watt**

| | **Energy** | **Power** |
|---|---|---|
| Unit | | |
| How this quantity changes as the circuit component is left running | | |

**2** An incandescent light bulb and an energy-saving light bulb have power ratings of 40 W and 12 W respectively.

**a** Calculate the energy transferred by both light bulbs over 10 hours in kWh. Show your working.

Remember: 1000 W = 1 kW

energy (kWh) = power (kW) × time (h)

_____

_____

_____

_____

**b** Compare the costs of running these two light bulbs over a 10-hour period. You should include the relative amounts of fuel used in each case.

_____

_____

_____

_____

**3 a** Pete pulls a pulley and lifts a 20 N weight by 0.5 m. Calculate the work done.

Work done = force (N) × distance moved (m)

= _____ × _____

= _____ J

**b** Pete uses the pulley again to lift another weight. Pete's energy supplied 40 J to lift the weight. The weight gains 30 J. Calculate the amount of energy dissipated to the surroundings. Show your working.