

**Lesson Plan Very Special Cells: 90 or 60 min delivery time**

**Age 14-16 (KS4)**

<b>Teaching and learning about stem cells</b>	<b>Timing</b>	<b>Activity</b>	<b>Notes</b>
<p><b>Learning objectives for the workshop</b> <b>Student should...</b></p> <ul style="list-style-type: none"> <li>• Appreciate how the scientific method is a means of problem solving.</li> <li>• Understand how effective experiments are designed.</li> <li>• Understand the properties of various types of stem cell.</li> <li>• Appreciate the various ways stem cells can be obtained and some of the problems associated with them.</li> <li>• Understand that genes control the properties of stem cells.</li> </ul> <p><b>Key words</b></p> <ul style="list-style-type: none"> <li>• Stem cell, differentiate, embryo, gene, mutation, DNA, cloning</li> </ul>	<b>Introduction</b> <b>5 mins</b>	Students open the VL website	Give a very brief description of the VL experiment.
	<b>Starter</b> <b>10 mins</b>	How “Eggsperiments” work	Ask the students to form groups of 4-5. <i>See Teacher Handbook</i> for further details.
	<b>10 mins</b>	What’s in the box? OPTIONAL ACTIVITY	Ask the students to form groups of 4-5. <i>See Teacher Handbook</i> for further details.
	<b>Experiment Presentation:</b> <b>15 mins</b>	The presentation gives information about stem cells and their uses, provides background information and a guide to the online experiment and supports all the Virtual Lab classroom activities.	Notes are provided within the Powerpoint file.

	<b>5 mins</b>	Demonstration of nuclear transfer using eggs OPTIONAL ACTIVITY	Set up the equipment at the front of the room and ask for a volunteer to “have a go at nuclear transfer”. Ask the other students to gather round to watch. <i>See Teacher Handbook</i> for further details.
	<b>20 -30 mins</b>	Online experiment	<i>See Teacher Handbook</i> for further details. Students register on VL website.
	<b>Plenary 15 mins</b>	Stem Cell Grid OPTIONAL ACTIVITY (1)	Ask the students to form groups of 4-5. <i>See Teacher Handbook</i> for further details.
	<b>5 mins</b>	Stem cells in the News OPTIONAL ACTIVITY (2)	<i>See Teacher Handbook</i> for further details.
	<b>15 mins</b>	Scientist interview OPTIONAL ACTIVITY (3)	<i>See Teacher Handbook</i> for further details.

**Age 16-19 (KS5/post 16)**

<b>Teaching and learning about stem cells</b> <b>Learning objectives for the workshop</b> <b>Student should...</b>	<b>Timing</b>	<b>Activity</b>	<b>Notes</b>
<ul style="list-style-type: none"> <li>• Critically evaluate the experimental approaches described in Virtual Lab</li> <li>• Understand the features of different types of stem cells and their sources</li> <li>• Understand the terms pluripotent and multipotent</li> <li>• Understand how stem cells can be used in medicine</li> <li>• Appreciate the benefits and disadvantages of different types of stem cell</li> <li>• Understand that genes control the properties of stem cells</li> <li>• Understand that genes can be manipulated through genetic engineering to investigate biological mechanisms such as cell differentiation</li> <li>• Understand that genes can be manipulated through genetic engineering to produce useful biological products</li> </ul>	<b>Introduction</b> <b>5 mins</b>	Students open the VL website	Give a very brief description of the VL experiment.
	<b>Starter</b> <b>10 mins</b>	How “Eggsperiments” work	Ask the students to form groups of 4-5. <i>See Teacher Handbook</i> for further details.
	<b>10 mins</b>	What’s in the box? OPTIONAL ACTIVITY	Ask the students to form groups of 4-5. <i>See Teacher Handbook</i> for further details.
	<b>Experiment Presentation:</b> <b>15 mins</b>	The presentation gives information about stem cells and their uses, provides background information and a guide to the online experiment and supports all the Virtual Lab classroom activities.	Notes are provided within the Powerpoint file.
	<b>5 mins</b>	Demonstration of nuclear transfer using eggs OPTIONAL ACTIVITY	Set up the equipment at the front of the room and ask for a volunteer to “have a go at nuclear transfer”. Ask the other students to gather round to watch.

<b>Key words</b> Stem cell, multipotent, pluripotent, transplantaion, differentiate, embryo, gene, mutation, genetic engineering, recombinant DNA, plasmid, cloning	<b>5 mins</b>		See <i>Teacher Handbook</i> for further details.
	<b>20 -30 mins</b>	Online experiment	See <i>Teacher Handbook</i> for further details. Students register on VL website.
	<b>Plenary 15 mins</b>	Stem Cell Grid OPTIONAL ACTIVITY (1)	Ask the students to form groups of 4-5. See <i>Teacher Handbook</i> for further details.
	<b>5 mins</b>	Stem cells in the News OPTIONAL ACTIVITY (2)	See <i>Teacher Handbook</i> for further details.
	<b>15 mins</b>	Scientist interview OPTIONAL ACTIVITY (3)	See <i>Teacher Handbook</i> for further details.