Science lesson – organs
(Approximately one hour)

Starter activity (10 Min)
Cue up the organs PowerPoint presentation from the website.
Ask the class to name some human organs. Explain that organs are formed from tissues, which are groups of similar cells (slide 1).
- Say organ names: kidneys, heart, liver, lungs, pancreas, small bowel, and ask volunteers to come and write where they think that organ is on the body. Link to Donor Body to confirm students have organs in the correct place.
- Explain that these organs can be transplanted from one person to another.
  Elicit a definition of “transplant”, i.e. surgical replacement of a faulty organ with a working one from a donor.

Whole class activity (20 Min)
- Discuss why an organ may need replacement by transplant: genetic (inherited) diseases, infection, working environment (e.g. asbestos), lifestyle choices (e.g. alcohol abuse leading to liver disease, smoking causing lung disease, poor diet/lack of exercise contributing to heart disease).
- Explain kidney function, failure, how dialysis works (broad principles) and organ transplant (see slides 2–3).
- Refer to the Student card about Neil Robinson or the filmed Real story about Andrew Samuel for examples of individuals who need a kidney transplant.
- Explain that a successful kidney transplant frees the patient from dialysis and costs the NHS far less than a lifetime on dialysis (see slide 4).
- Explain that a kidney can be donated by a living donor. Discuss why someone might consider doing this. What loss or risk to yourself would you accept to save somebody else? What if a family member needed the donation? Would that be more reason to do it? There are no right answers, just encourage students to think about it and allow them to express their views.

Learning outcomes

- All students will: be able to name some organs which can be transplanted; know a kidney can be donated by an altruistic (i.e. living) donor; understand there is a serious and increasing shortage of organs available for transplant; actively think about becoming an organ donor themselves.
- Most students will: understand the function of the kidney and know that dialysis is a treatment for kidney failure; understand that a transplant is a life-changing and cost-effective treatment for kidney failure; know that blood group and Human Leukocyte Antigen (HLA) type must be compatible for a successful kidney match; appreciate that the need for donor organs is growing as transplant technology improves.
- Some students will: understand that some tissue, as well as organs, can be transplanted; appreciate the ethical dimensions of donor organ allocation.

www.giveandletlive.co.uk
Discuss the need for a large pool of potential donors. Most people don’t die in hospital so can’t be donors – their organs can’t be removed quickly enough (see slides 5–6).

Explain that a kidney donor and recipient must have compatible blood groups and HLA. Check your exam specification to see how much detail pupils need; many only have to understand the general principles of blood group and HLA matching (see slides 7–8).

**Kidney matching exercise** (20 Min)

This activity helps bring to life that a compatible blood group and a close match is important for a successful kidney transplant. It also highlights that there is a shortage of suitable donors.

Print out and cut up the kidney matching exercise cards which you can download from the website.

Ask six students to come to the front of the class and be volunteer kidney transplant patients. Give each of them a patient card.

Give kidney donor cards to the rest of the class – first give out the 14 kidney donor cards then (if you run out) the additional kidney donor cards.

Explain that for a kidney transplant to be successful and to limit the chance of rejection, recipient and donor blood and HLA types need to be closely matched. This game uses a small quantity of different numbers to represent HLA types but, in reality, there are hundreds of different types of HLA protein.

Ask each of the six organ transplant patients to read their HLA numbers, while donors check against their numbers.

Does anyone have a match of four or more numbers?

Is their blood type compatible? If so, then the patient has found a donor. (leave slide 7 up on the board)

Some recipients may find more than one match. The higher the HLA match the better. Some will be left without a match.

Highlight that those without a match who are seeking a new kidney can remain on a kidney machine, whereas those needing other organs, such as a new heart or pancreas, are likely to die.

Discuss the need for more organ donors, how to register on the NHS Organ Donor Register (which you can do at any age) and how more people can be encouraged to be donors. Encourage students to discuss donating with their family. When you die, your next of kin is asked to confirm what you wanted to happen after your death and although they could overrule your wishes if you registered when under 18 (12 in Scotland), this would be a lot less likely if you have discussed it with them, as they would want to respect your wishes.
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(Continued)

Plenary (10 Min)
Students go through the organs true and false quiz to review and consolidate what they have learnt about organs and organ donation. Students answer True or False to ten statements.

Extension/homework activities

You can use these extension activities as the basis for a follow up lesson, or as a homework task to consolidate learning

- Tissue can be transplanted too. Research what types of tissue can be transplanted, and some people who have donated or received tissue. Watch the filmed Real story about Brian Davies, or alternatively read the Student cards about Ambrose Field or Chris, the sportsman.

- Download the organs extension Activity sheet from the website – this involves students choosing donor matches for three kidney transplant patients and explaining their choices. They also write a letter to their local newspaper from the point of view of one of the patients.

For more able students:

- There are more patients needing organs than there are organs available. So who gets the transplants? Jot down the things you would consider when choosing who should go to the top of the list. Then find out how it happens for real:
  www.uktransplant.org.uk/ukt/about_transplants/organ_allocation/organ_allocation.jsp

- In Sweden everybody is assumed to consent to donating their organs when they die, unless they choose differently. Here, you have to opt in by joining the NHS Organ Donor Register. Which system do you think is right? Why?

- Why are more organ donors needed now than ever before? Jot down three possible reasons then visit:
  www.uktransplant.org.uk/ukt/how_to_become_a_donor/questions/answers/answers_3.jsp#q6

Answers (extension Activity sheet):

Donors 1, 3, 4, 5, 6, 7, 8 and 10 are not a good match for any of the transplant patients.

Donor 2 (blood type O; HLA numbers 4 8 9 10 11 13) is a match for all three kidney transplant patients, because:
- Both blood types O and B can receive O.
- There is a five HLA match for Renie and Sinita, and a four HLA match for Peter.

But donor 9 (blood type B; HLA numbers 3 4 8 9 11 13) is the best match for Sinita, because this donor has the same blood type and there is a six HLA match. (Sinita’s donor is likely to be her twin sister because it is a perfect genetic match).

Therefore, students are left to decide who donor 2 should donate to: Peter, who is younger but with a four HLA match, or Renie, who is older but with a five.