10min Fillers Pack

October 2019 Edition

Multiwavelength Universe Card Game

Equipment

- A4 laminated sheets with images of objects
- Collections of images at other wavelengths (colour-coded by wavelengths)

Instructions

1. Select one of the object sheets, with a visible light image and four spaces for other images.
2. Select the images at other wavelengths that you think also show the object you've selected.
3. Justify your choice.
4. Select another object and repeat.
5. Once all pictures have been placed, ask mentees what they think each object is, and what the different images show.

Notes

The aim of this activity is to match images of astronomical objects, observed in different wavelengths, with the objects' visible images. The range of wavelengths show varying properties of the objects, so they can look very different.

- The X-ray and Radio images are typically the hardest and may need a lot of guessing.
- You could distribute the objects amongst the group, either individually or in pairs.
- Cassiopeia A is a nice example to use as a demonstration, as all the wavelengths show a circular feature.
- Answers are shown on the next page, though students are not expected to get them all right.
- You can also complete the same activity at http://chrisnorth.github.io/multiwavelength-universe
- If you would like to look at the sky at multiple wavelengths, then visit www.chromoscope.net on a phone, tablet or laptop.
- Mentees could research an object and give a short (5 minute) presentation about it the following week (though note that Accidental Discoveries also has a presentation component)

Answers

Centaurus A (Active Galaxy with radio jets)

X-ray=X3 Mid-Infrared=M7 Far-Infrared=F8 Radio=R7

The key feature of this galaxy is the radio jets, visible on either side of the galactic disc. These are due to gas and dust being emitted from a supermassive black hole inside the galaxy, and distinguishes it apart from the other galaxies in the list. It emits mostly in radio frequency, which is why we can't see it in visible light, and this could lead to a discussion about the different wavelengths we observe at.

Antennae (Colliding Galaxies)

X-ray=X5 Mid-Infrared=M6 Far-Infrared=F1 Radio=R8

Shows two galaxies colliding. This clearly shows the galactic structure.

Cassiopeia A (Supernova Remnant)

X-ray=X6 Mid-Infrared=M2 Far-Infrared=F2 Radio=R11
Similar to Orion on first glance, but these two are very different objects. Cassiopeia A is a supernova remnant, and is characterised by the “shell” expanding through space away from the supernova, which would have occurred in the centre. This object is 11,000 light years away, and is 5ly across.

Orion (Nebula)

X-ray=X2 Near-Infrared=N1 Mid-Infrared=M3 Far-IR =F9
The Orion nebula, instead of showing the remnants of a dead star, is an active star forming region. The blue/violet hue seen in the visible spectrum is due to these young, massive stars being formed.

Andromeda (Spiral Galaxy)

X-ray=X7 Ultraviolet=U3 Far-Infrared=F10 Radio=R6
Andromeda is the closest galactic neighbour to the Milky Way, and is expected to collide with the Milky Way in 4.5bn years to form one giant elliptical galaxy. This galaxy is close enough to Earth to be visible by the naked eye on moonless nights – just above the Pegasus constellation.

Connecting Wall

Equipment

- Word Wall cards

Instructions

- Mentees are aiming to organise the set of sixteen cards into four groups of four, based on any connections they can identify.
- Mentees should guess how the sixteen topics on the cards can be connected into four sets of four.
- Discuss/justify their decisions and if there are any other possible connections they can find in the cards.

Notes

- Max four mentees per group
- Hand out one set of cards per group, if more than one group, have them race to complete the challenge first
- Mentors or mentees can make their own *Word Walls* following using some alternative physics (or other) vocabulary.

Answers

There is a correct answer, but this activity is very much about the mentees backing up their choices, so this is not relevant here.

My Skillful Self

Equipment

- Skillful-self sheets
- Implements for completing the sheets, e.g.:
    - Colouring pens/pencils
    - Magazines/newspapers, glue, scissors

Instructions

- Hand out the My Skilful Self sheets to the mentees.
- They should then write words, draw pictures and decorate the person so that it reflects the mentees themselves.

Notes

This exercise is designed to both have the mentees assess themselves and reflect on what makes them who they are and give you a chance to learn more about their mentees so that you can adapt any future sessions to your group.

If they need prompts, think about the below:

- Which subjects at school do you enjoy?
- What activities in the mentoring project have you enjoyed?
- What do you do outside of school?
- What things do you think you're good at?
- What are your favourite things? Why?

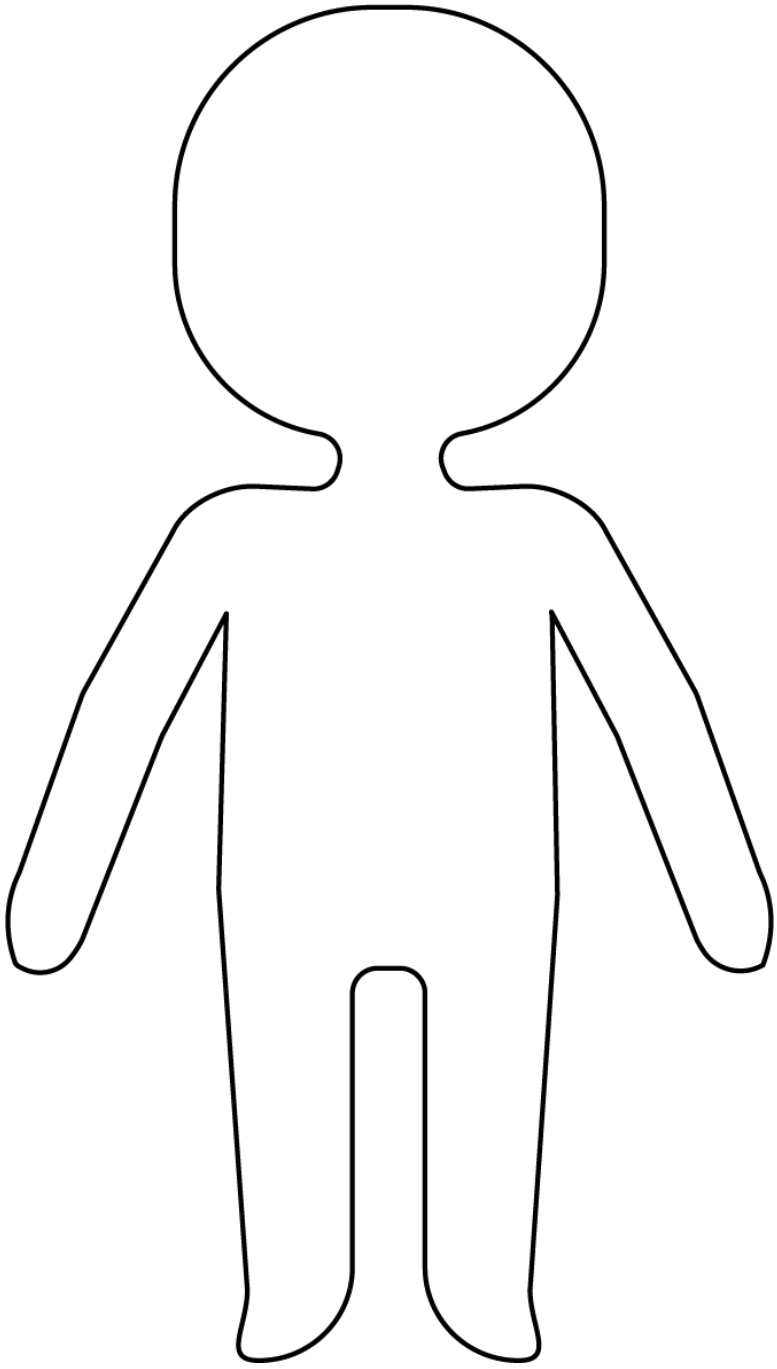
Complete your own Skillful Self sheet to show your mentees as an example – or even keep this until the end so you don't inform their creative process!

Please collect photos of the completed sheets for the project team to see!

Answers

There is absolutely no correct way to fill out these sheets. Students should be encouraged to be creative in their own way and just note down/draw/write anything they think reflects them as a person!

My Skillful Self

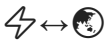


Emojis Explain

Equipment

- Emoji mindmap sheet (1 per mentee/pair)
- pens

Instructions

- The mentees should pick some emojis to explain a simple physics concept
- When they have something, they should guess each other's emoji sentences ask them to elaborate on any scientific points or help them with the explanations.
- You could then draw one of the below statements and ask them to guess what you're explaining:
  1. 
  2. 
  3. 
  4. 
  5. 
  6. 

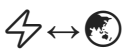
Notes

Make sure the mentees are keeping it simple! You could point them to the following emoji to start them off:

- Rainbow
- Sunglasses
- Ear

Answers

Be sure to explain the background and science of these in a non-alienating way. Some of these students may not have heard of these concepts. Only pick ones you are comfortable with explaining.

1.  : Newton's law of gravity
2.  : $e=mc^2$
3.  : Schrodinger's cat
4.  : Archimedes' principle
5.  : The Big Bang
6.  : Photoelectric Effect

Emoji Mindmap

Can you use the below emoji to explain some physics? It doesn't need to be too complicated!