PiXL Independence:

GCSE Physics – Student Booklet

KS4

Topic: Electricity

Contents:

I. Level 1- Multiple Choice Quiz – 20 credits

II. Level 2 - 5 questions, 5 sentences, 5 words – 10 credits each

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PiXL Independence – Level 1
Multiple Choice Questions
GCSE Physics – Electricity

INSTRUCTIONS **Score: /20**

- **Read the question carefully.**
- **Circle the correct letter.**
- **Answer all questions.**

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1. A charged atom is called …
   a. a neutron.
   b. a proton.
   c. an electron.
   d. an ion.

2. Charging by friction involves…
   a. rubbing an insulator and a conductor together, electrons are transferred from one material to another.
   b. rubbing two insulators together, electrons are transferred from one material to another.
   c. rubbing two insulators together, electrons are shared between the two materials.
   d. rubbing an insulator and a conductor together, electrons are shared between the two materials.

3. The force between two charged objects is…
   a. a non-contact force.
   b. an electric field.
   c. a charged force.
   d. an electrical potential force.

4. Electric current is a flow of…
   a. protons.
   b. neutrons.
   c. charge.
   d. energy.

5. Why would you use a variable resistor in an electrical circuit?
   a. To change the energy in the circuit.
   b. To vary the amount of voltage flowing.
   c. To change the resistance of a bulb.
   d. To vary the amount of current flowing.

6. Electric charge is measured in…
   a. Volts, V.
   b. Amps, A.
   c. Coulombs, C.
   d. Ohms, Ω.

7. To calculate the size of electric current from the flow rate of charge, the formula used is…
   a. $I = \frac{Q}{t}$
   b. $I = Qt$
   c. $I = \frac{t}{Q}$
   d. $Q = \frac{I}{t}$

8. What is the potential difference across a component if the energy transferred to the component is 400 J when 80 C of charge passes through it?
   a. 32,000 V
   b. 5 V
   c. 0.2 V
   d. 32 V

9. Which ONE of the following statements correctly describes Ohm's Law?
   a. The current through a resistor at constant temperature is directly proportional to the potential difference across the resistor.
   b. The current through a resistor at constant temperature is inversely proportional to the potential difference across the resistor.
   c. The current through a resistor at constant temperature has a non-linear relationship with the potential difference across the resistor.
   d. The current through a resistor at constant temperature has no relationship with the potential difference across the resistor.

10. The current through a diode flows in…
   a. the reverse direction only, called reverse direction.
   b. one direction only, called the forward direction.
   c. both directions, called the multi direction.
   d. one direction only, called the forward resistance.

11. Which ONE statement about components in series is FALSE?
   a. The same current passes through each component.
   b. The potential difference of the power supply is shared between its components.
   c. The total potential difference of cells in series is the sum of the potential difference of each cell.
   d. The sum of resistors in series is equal to $\frac{1}{The\ sum\ of\ the\ resistors}$.

12. A 6 V battery is connected in series with a 2 Ω bulb. What is the value of the current through the bulb?
   a. 4 A
   b. 3 A
   c. 12 A
   d. 0.33 A

13. Mains electricity is…
   a. an alternating current (a.c) supply.
   b. a direct current supply (d.c.) supply.
   c. a variable current (v. c) supply.
   d. a continuous current (c. c) supply.

14. The pins of a 13 A plug are usually made from…
    a. gold.
    b. aluminum.
    c. brass.
    d. copper.

15. Two-core cables are used for appliances that have…
    a. metal cases.
    b. plastic cases.
    c. low wattage.
    d. low resistance.

16. A 100 W light bulb is switched on for 30 minutes. Calculate the energy it transfers.
    a. 0.05 J
    b. 180 000 J
    c. 3.3 J
    d. 300 J

17. Which fuse would you use for a 1000 W heater connected to a 230 V supply?
    a. 13 A because it is a heater and they have high resistance.
    b. 1 A because the current value is 0.23 A.
    c. 3A because the current value is 2.3 A.
    d. 5 A because the current value is 4.35 A.

18. Appliances are often not 100% efficient. Which ONE of the following is NOT a reason for less than 100% efficiency?
    a. Current in wires and components causes a heating effect due to resistance.
    b. Energy loss due to friction between moving parts.
    c. Appliances transferring heat to the surroundings.
    d. Mains electricity has a variable supply.

19. 1500 J of energy is supplied to an appliance that has an efficiency of 80%. The appliance transfers how much output energy?
    a. 1200 J
    b. 120 000 J
    c. 1875 J
    d. 375 J

20. Which ONE of the following statements about conventional current flow and electron flow is correct?
    a. Conventional current flow and electron flow are inversely proportional to each other.
    b. Conventional current flow and electron flow are perpendicular to each other.
    c. Conventional current flow and electron flow are in opposite directions.
    d. Conventional current flow and electron flow are parallel to each other.

PiXL Independence – Level 2
5 questions, 5 sentences, 5 words
GCSE Physics – Electricity

INSTRUCTIONS

- **For each statement, use either the suggested website or your own text book to write a 5-point summary. In examinations, answers frequently require more than 1 key word for the mark, so aim to include a few key words.**
- **It is important to stick to 5 sentences. It is the process of selecting the most relevant information and summarizing it, that will help you remember it.**
- **Write concisely and do not elaborate unnecessarily, as it is harder to remember and revise facts from a big long paragraph.**
- **Finally, identify 5 key words that you may have difficulty remembering and include a brief definition. You might like to include a clip art style picture to help you remember it.**

Example:

QUESTION:	**What is inside an atom?**
Sources:	**Website –** **1.** http://www.explainthatstuff.com/atoms.html **2.** https://www.absorblearning.com/chemistry/demo/units/LR302.html#Introduction

1. **Proton – this has a positive charge the same size as an electron.**
2. **Neutron – this has a neutral charge.**
3. **Electron - this has a negative charge the same size as a proton.**
4. **Electrons can be gained or lost by an atom, a charged atom is called an ion.**
5. **Gaining electrons makes the atom more negative, losing electrons makes the atom more positive.**

Proton – positive.	**Neutron – neutral.**	**Electron – negative.**	**Ion – gain or loss of electrons.**	**Gain – negative charge.** **Loss – positive charge.**

QUESTION 1:	**Describe an investigation to investigate the force between two charged objects.**
Sources:	**Website –** 1. http://physics.ucsc.edu/~pgraham/spr2009_7b/phys7b_lab2.pdf 2. http://practicalphysics.org/forces-due-electric-charges.html

QUESTION 2:	**Compare the following electric circuit components: a filament bulb, diode, thermistor, light emitting diode and light dependent resistor.**
Sources:	**Website –** **1.** http://www.bbc.co.uk/education/guides/zqqfr82/revision/2 **2.** http://www.passmyexams.co.uk/GCSE/physics/potential-difference-graphs.html

QUESTION 3:	**What is Ohm's Law and when it is suitable to use it? Use a graph and a worked example in your explanation.**
Sources:	**Website –** **1.** https://electronicsclub.info/ohmslaw.htm **2.** https://phet.colorado.edu/en/simulation/ohms-law **3.** https://www.youtube.com/watch?v=iLzfe_HxrWI

QUESTION 4:	**Compare and contrast series and parallel electric circuits.**
Sources:	**Website –** 1. https://www.youtube.com/watch?v=-w-VTw0tQlE 2. https://learn.sparkfun.com/tutorials/series-and-parallel-circuits/all.pdf

QUESTION 5:	**What is inside a three-pin plug, where do the wires go and what colour are they?**
Sources:	**Website –** 1. http://www.diydoctor.org.uk/projects/wireaplug.htm 2. http://www.bbc.co.uk/education/guides/zwwnb9q/revision/2

PiXL Independence – Level 3
Science in the News
GCSE Physics – Electricity

Fake news

Sensationalised news stories have been around for some time, but with the mass growth of social media, the problem seems to have grown in recent years. At the very least, the US Presidential election has certainly highlighted the impact that misleading information can have. www.tiny.cc/fakenews2

At home, the Brexit vote also suffered from the circulation of misleading news stories www.tiny.cc/fakenews3

Therefore, the ability to identify real information, track it back to the source article and make your own judgement is a very important skill. This activity will help you develop that skill.

Why do mobile phones catch fire?

News article: http://www.huffingtonpost.com/2014/07/28/girl-smartphone-fire-pill_n_5626373.html

News article: http://www.mirror.co.uk/news/uk-news/mans-samsung-galaxy-s4-catches-6089025

Discussion article: http://www.telegraph.co.uk/technology/2016/10/11/why-is-the-samsung-galaxy-note-7-catching-fire-the-lithium-ion-b/

Real article: https://www.digitaltrends.com/mobile/explosions-electrocution-fatal-phone-accidents-are-rarer-than-you-think/

Task 1:

You need to produce a 1 page essay on the evidence that mobile phones are dangerous when charging and precautions you could take.

Essay section	Activity
Introduction	Define what a battery is and what type of energy store is it. How does it transfer energy out of the store?
Describe	Describe what a battery is made from and how it works to store charge.
Explore	Explore what happens when mobile phones are re-charging using a mobile phone charger.
Evaluate	Evaluate what is the likelihood of having a mobile phone set on fire and what precautions you could take to reduce the risk of accidents.

Electricity pylons cause leukaemia.

News article: http://www.dailymail.co.uk/health/article-28385/Pylons-linked-leukaemia.html

Health article: http://www.leukaemiacare.org.uk/leukaemia

Discussion article: http://news.bbc.co.uk/1/hi/health/4602315.stm

Real article: http://www.cancerresearchuk.org/about-cancer/causes-of-cancer/cancer-controversies/mobile-phones-wifi-and-power-lines

Task 2:

You need to produce a 1 page essay on whether there is evidence to support the claim that electricity pylons cause cancers such as leukaemia.

Essay section	Activity
Introduction	What is leukaemia and who does it effect?
Describe	Describe how people think that pylons cause leukaemia.
Explore	Explore what evidence is there to prove that pylons cause leukaemia? Where has this evidence come from?
Evaluate	Evaluate what recent research is there into whether pylons cause cancers such as leukaemia?

PiXL Independence – Level 4
Scientific Posters
GCSE Physics – Electricity

INSTRUCTIONS

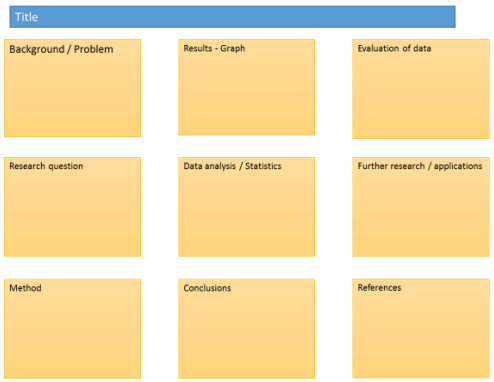
Scientific Posters

Scientists communicate research findings in three main ways. Primarily, they write journal articles much like an experiment write up. These are very concise, appraise the current literature on the problem and present findings. Scientists then share findings at conferences through talks and scientific posters. During a science degree, you would practice all three of these skills.

Scientific posters are a fine balance between being graphically interesting and attracting attention and sharing just the right amount of text to convey a detailed scientific message. They are more detailed than a talk and less detailed than a paper.
Use this information to help structure your poster – www.tiny.cc/posterskills (that's Poster Skills not Posters Kill!) More detailed guidance is available at: www.tiny.cc/posterskills2

Creating your poster

It is easiest to create a poster in PowerPoint; however, you need to add custom text boxes rather than using the standard templates.



Posters need to be eye catching, but readable from a distance. If you use PowerPoint, start with a 4:3 slide (for easier printing, it can then be printed on A3) and use a 14-16 pt font.
The first box could be larger to draw people in. You can use a background image, but pick a simple one that is of high quality. Select 'text box fill' and select 'change the transparency' to maintain the contrast and partially show the picture.
You can experiment with different layouts and you should include images. Avoid a chaotic layout, posters are read from top left column downwards.
Remember to include the authors and references.
Finally, look at the examples given on the University of Texas website which also offers an evaluation of each www.tinyurl.com/postereg

What is the National Grid and how does it deliver electricity around the U.K.

Background
The National Grid is the high voltage electric power transmission network in the U.K. The Grid connects power stations and major substations and ensures that electricity can be delivered to all the towns and cities that are part of this immense system.

Source articles:
http://www2.nationalgrid.com/About-us/
http://gridwatch.co.uk/
http://www.bbc.co.uk/schools/gcsebitesize/science/aqa/mains/generatingelectricityrev8.shtml
http://www2.nationalgrid.com/WorkArea/DownloadAsset.aspx?id=39111

Use other sources as necessary.

Task:
Produce a scientific poster on the National Grid.

Recall	Define all the components of the National Grid and what they do.
Describe	Describe the function of the National Grid and how it links all the power stations and substations together.
Compare	Compare the safety aspects of underground and over ground cabling.
Evaluate	Evaluate the adaptability of the National Grid in responding to the changing demand of electricity across the U.K.

PiXL Independence – Level 5
Video summaries
GCSE Physics – Electricity

Cornell Notes

At A level and University, you will make large amounts of notes, but those notes are only of use if you record them in a sensible way. One system for recording notes is known as the Cornell notes system. This method encourages you to select relevant information, rather than trying to write a transcript of everything said. More importantly, it forces you to spend a few minutes reviewing what you have written, which has been scientifically proven to aid learning and memory retention.

The ideal is to write everything on one page, but some students may prefer to type and others will to handwrite their notes. Whichever option you use, remember the aim is to summarise and condense the content with a focus on the objectives that you are trying to learn and understand.

There are three main sections to the Cornell notes

1. **Cue/ Objectives** – This can be done before or after the lecture. You may have been provided with the objectives or you may need to decide what they were or you may want to make the link to your learning if this is an additional task or lecture you are viewing, such as this video.
2. **Notes** – In this space you record concisely, simply the things you are LESS likely remember - **The NEW knowledge.**
3. **Summary** – The most important step that is carried out after the lecture or video. This helps to reinforce learning.

Background

The following short TED talks present two topics that link to your learning. The first is on using homemade play dough to demonstrate electrical properties such as by lighting up LEDs and spinning motors. The second video how to build LED throwies at home.

Source article:
Video 1 – Hands on science with squishy circuits
Ted Ed talks : https://www.ted.com/talks/annmarie_thomas_squishy_circuits

Video 2 – How to make LED throwies
RI YouTube channel: https://www.youtube.com/watch?v=AkgeeqakB7Y

Task:

You need to produce a set of Cornell notes for the videos given above.
Use the following objective to guide your note taking, this links to your learning.

1. Discuss how LEDs and spinning motors work.
2. Discuss how 'LED throwies' work.

Objectives What are the main learning outcomes that have been shared with you? This will help guide you to taking the RIGHT notes during the video.	Title Date Sketch down note and key words Do not write in full sentences whilst you listen, put quick sketches, single words, mind maps, short hand etc. To help train you for university, try not to pause the video because you could not pause a live lecture (However, a lecture may give more natural pauses for you to catch up).

Summary (after the video)
What are your main points of learning from this video.
This is your chance to make sense of your notes.
Make clear connections to the things you need to know

Objectives:	**Title:** **Date:**
Summary:	

Objectives:	**Title:** **Date:**
Summary:	

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