



AQA Physics Paper 1 - Topics 1-4

Higher

Separate Science

Predicted Paper A

Name.....

Date.....

1 hour 45 minutes allowed

Similar to your real exam each question in this gets harder towards the end of each question, so if you find you can do the last part of a certain question, try the next question, they all start off easier then get harder.

You will need a chemistry data sheet (periodic table)

Grade boundaries

These are VERY rough guesses! Getting an 8 or 9 on here does not guarantee you the same mark in the exam

- 9 75
- 8 65
- 7 55
- 6 45
- 5 35



Exam Analysis

Question	Marks available	Marks gained	Topic	What do you need to do to improve ...	Bits to help if you don't understand ...
1	7		Energy		https://youtu.be/L7829UGifpM
2	14		Electricity generation		https://youtu.be/tDkBhy-Y1Z8
3	13		Efficiency		https://youtu.be/GVSiL39bnrc
4	4		Electricity		
5	19		Circuits		https://youtu.be/HiVcnpDQOcI
6	5		Specific heat capacity		https://youtu.be/_gooQFvVqzk
7	23		Radioactivity		https://youtu.be/tTNW_yO2cRY
8	6		Truly hard maths question		https://youtu.be/RRm_8BDgH1M
9	9		Gases		https://youtu.be/NoSAeBc2i4A
Total	100				



Question 1

a) Describe the energy transformations that happen in a radio [2 marks]

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b) What happens to wasted energy? [1 mark]

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c) Which is the correct equation? [1 mark]

Circle **one** answer only

A	$P = E \times t$
B	$E = \frac{t}{P}$
C	$P = \frac{E}{t}$
D	$T = E \times P$

d) What are the units for power? [1 mark]

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e) A TV takes in 800J of electrical energy and gives out 150J of heat energy, 450J of light energy and 200J of sound energy, how efficient is this? [2 marks]

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Question 2

a) HEP and wind are two types of renewable energy, list three other types [3 marks]

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b) Describe how a hydroelectric power (HEP) station works. [3 marks]

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c) Define the term renewable [2 marks]

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d) Coal, oil and gas are traditional non-renewable energy sources, there are a number of complex issues surrounding their use. The UK is moving towards using alternative sources of energy such as nuclear power, approving a controversial £18 billion deal to build a new nuclear power station at Hinkley Point. Evaluate the use of traditional fuel in power stations versus nuclear power. This question will take into account the quality of your written communication [6 marks]

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Question 3

a) Heating our homes is a major cost for a family each month, but homes are very energy inefficient and lose a lot of heat. How can we see if a house is losing heat? [1 mark]

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b) To heat a house for a week uses 27kWh of energy, if there is a standard charge of 9p per day and a unit charge of 7p/kWh. How much does it cost to heat the house all week? [4 marks]

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c) Energy loss can be reduced by installing insulation; insulation comes with a U-Value. What does a U-value tell us? [1 mark]

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d) To improve the energy efficiency of a house a number of techniques can be employed, discuss these and give the advantages and disadvantages of each [5 marks]

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e) One way to evaluate a type of insulation is by looking at the payback time, what is payback time? [2 marks]

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Question 4

Scientists have looked at how GCSE results are affected by how much time a student spends watching screens (watching TV or playing computer games). The average student spent 4 hours each day in front of a screen. For every hour above this there was a drop in results by 2 GCSE grades. (Source; BBC news. "Extra screen time 'hits GCSE grades'" 4 September 2015)

- a) While playing games a computer uses 54kJ and 60W, how long was it played for?
[4 marks]

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Question 5

- a) Draw a series circuit, where you can measure the potential difference across a lit bulb. [5 marks]

- b) What does LDR stand for? [1 mark]

Circle **one** answer only

A	Level dependant resistor
B	Light diode resistor
C	Level diode resistor
D	Light dependant resistor

- c) What can LDR's be used in? [1 mark]

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d) The resistance in a wire changes as temperature changes, explain why. [6 marks]

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e) A circuit has been running for 1 minute and a student decides to find the potential difference. The circuit has a resistance of 2Ω and a charge of $120C$. What is the potential difference? [6 marks]

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Question 6

a) What are the units for specific heat capacity?

[1 mark]

Circle **one** answer only.

A	J Kg °C
B	J/Kg/°C
C	J/Kg °C
D	J Kg/°C

b) 35.91J of energy is needed to heat 1500g of a liquid from 12.2°C to 17.9°C. Calculate the specific heat capacity of this liquid

[4 marks]

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Question 7

a) What are the similarities and differences between carbon-12 and carbon-13?

[3 marks]

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b) Which is the correct representation of an alpha particle?

[1 mark]

Circle **one** answer only

A	α^4_2
B	α^2_4
C	α^0_2
D	α^4_{-1}

c) Describe the process of radioactive decay

[2 marks]

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d) Workers who have contact with radioactivity need to wear radiation safety badges to monitor their exposure. Where are these places and why?

[2 marks]

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e) Describe the process that takes places inside a nuclear reactor. You may use a diagram if you wish

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f) There are a large number of different isotopes of different types of radiation. Each has an application in industry. For the following questions, you are expected to give the type of radiation emitted and why you have chosen this isotope, not the specific isotope

i. What type of radiation would you use in a home smoke detector?

Type of radiation.....[1 mark]

Reasoning.....

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.....[2 marks]

ii. What type of radiation would you use in industry checking the thickness of foil?

Type of radiation.....[1 mark]

Reasoning.....

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.....[2 marks]

iii. What type of radiation would you use in medicine to check the function of internal organs?

Type of radiation.....[1 mark]

Reasoning.....

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.....[2 marks]



Question 8

A climber reaches the top of climbing wall, and after a break, secures her ropes and jumps off, if she falls with a velocity of 13.2m/s how far has she jumped? Give your answer to 3 significant figures. [6 marks]

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Question 9

a) Describe the arrangement of particles in a gas. [2 marks]

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b) What is the process of going from a solid to a gas called? [2 mark]

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c) How does the temperature of a gas relate to the average kinetic energy of a system? [5 marks]

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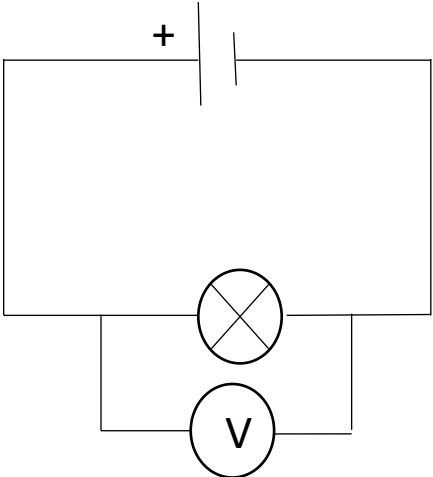
Answers

Question	Answer	Guidance
1a	-Electrical energy in -Sound energy out	1 mark for each bullet point
1b	Dissipates into the surrounding	1 mark
1c	C	1 mark
1d	W or Watt This must be a capital W, lower case does not credit marks	1 mark
1e	$(450+200) / 800 = 0.81$ or 81%	-1 mark for working -1 mark for answer Do not accept 0.81% as an answer
2a	-solar -wave -tidal -geothermal	1 mark for each bullet point up to a total of three
2b	-water is stored behind a dam -when electrical is required water is released and falls through a turbine -the spinning turbine leads to the generation of electricity -if required water can be pumped from the bottom back to the top to be stored	1 mark for each bullet point up to a total of three
2c	-is not going to run out -can be regenerated	1 mark for each bullet point
2d	An opinion and a justification for that opinion must be given to gain full marks Examples of scientific points may be; Traditional fossil fuels; -non-renewable -release CO_2 -quick start up time -easy available -sources running out -infrastructure in place Nuclear power;	1-2 marks This answer will have some valid points but will lack structure and not be complete 3-4 marks The majority of the points are valid and correct but the answer is lacking scientific clarity 5-6 marks This is a fluid answer, all points mentioned are correct and relevant, and the SPG is almost flawless



	<ul style="list-style-type: none">-non-renewable-no CO₂ released-slow start up time-more power stations need to be build-expensive to establish	
3a	<ul style="list-style-type: none">-infra-red camera	1 mark
3b	<ul style="list-style-type: none">-9p x 7 days = 63p-27kWh x 7p/kWh = 189- 63 + 189 = 252-p	1 mark for each bullet point
3c	<ul style="list-style-type: none">-how good an insulator is	1 mark
3d	<p>At least two of the following must be mentioned</p> <p>Double glazing</p> <ul style="list-style-type: none">-reduce energy loss-sound insulation-visually appealing-very expensive to install/ long payback time <p>Carpets/curtains</p> <ul style="list-style-type: none">-reduce energy loss-can be cheap-easy to install <p>Loft insulation</p> <ul style="list-style-type: none">-reduce energy loss-easy to install-cheap to install <p>Cavity wall insulation</p> <ul style="list-style-type: none">-reduce energy loss-requires specialist company to install-cheap to install	5 marks split across at least 2 different methods, same point does not gain more than one mark. For example, you cannot gain a mark for reduce energy loss of double glazing and carpets.
3e	Payback time = cost to install/cost of energy saved each year	-2marks
4a	<ul style="list-style-type: none">-$E = P \times t$-54000/60-=900 (15 minutes)-s	1 mark for each bullet point



5a		1 mark for each bullet point -straight lines use ruler and pencil, no credit for pen or wobbly lines -correct symbol for cell -correct symbol for bulb -correct symbol for voltmeter -voltmeter in parallel across bulb
5b	D	1 mark
5c	Street lights Night lights	1 mark
5d	<ul style="list-style-type: none">-resistance is different at different temperatures-at high temperatures particles are moving around lots-electrons find it hard to flow-resistance is high-at low temperatures metal particles are not moving around lots-electrons can flow freely-resistance is low	1-2 marks This answer will have some valid points but will lack structure and not be complete 3-4 marks The majority of the points are valid and correct but the answer is lacking scientific clarity 5-6 marks This is a fluid answer, all points mentioned are correct and relevant, and the SPG is almost flawless
5e	<ul style="list-style-type: none">-$Q=IT$-$I = 120/60$ (seconds)-$V=IR$-$V=2 \times 2 = 4$-V (correct unit)	1 mark for each bullet point
6a	c	1 mark
6b	<ul style="list-style-type: none">-$E = mc\Delta\theta$ or rearranged-1.5kg used-$35.91 = 1.5 \text{ (kg)} \times c \times 5.7$-=4.2	1 mark for each bullet point
7a	<ul style="list-style-type: none">-both have 6 protons-both atoms have 6 electrons-carbon 12 has 6 neutrons and carbon 13 has 7 neutrons	1 mark for each bullet point
7b	A	1 mark



7c	<ul style="list-style-type: none">-half of the atoms-will lose radioactivity turning into something else	1 mark for each bullet point
7d	<ul style="list-style-type: none">-around the middle of the body-near the reproductive organs	1 mark for each bullet point
7e	<ul style="list-style-type: none">-nuclear fission-chain reaction describe or shown-started by a neutron-splitting U nuclei into smaller nuclei, at least three new neutrons, and energy-these new neutrons go onto further spilt more U nuclei-energy goes on to generate electricity	1 mark for each bullet point
7fi	<ul style="list-style-type: none">-Alpha-with a long half life-easily stopped by smoke	1 mark for each bullet point
7fii	<ul style="list-style-type: none">-beta-with a long half life-stopped by too thick foil, too much will be seen on too thin foil	1 mark for each bullet point
7fiii	<ul style="list-style-type: none">-beta-with a short half life-will penetrate skin but not be too ionising	1 mark for each bullet point
8	<ul style="list-style-type: none">-$E_k = \frac{1}{2} mv^2$-$E_p = mgh$-thus $\frac{1}{2} mv^2 = mgh$, and $\frac{1}{2}v^2 = gh$-$0.5 \times 13.2^2 = 9.8 \times h$-8.89-m	1 mark for each bullet point
9a	<ul style="list-style-type: none">-random-rapid movement	1 mark for each bullet point
9b	Sublimation	2 marks
9c	<ul style="list-style-type: none">-evaporation is the loss of particles from a liquid as they turn into a gas or converse-to evaporate a particle must escape the surface tension of the liquid or converse-to do this a particle must have enough energy-and be travelling in the right direction-as particles with energy are gained or lost, the overall average kinetic energy of the liquid changes	1 mark for each bullet point

