WJEC : GCSE Specification 1370

GCSE Additional Science

First certification Summer 2008

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Name : _____

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# Additional Science # Physics 2 (P2)	**Page numbers in New Physics for You**
Radioactivity, Electricity, Forces and Motion ***Radioactivity***	
1. RADIOACTIVE EMISSIONS	
Where does radiation come from? **How dangerous is it?** **How can I protect myself?** **Candidates should:**	
(a) know that radioactive emissions from unstable atomic nuclei arise **because of an imbalance between the numbers of protons and neutrons.** (w(i)c)	(worksheet)
(b) use secondary sources, e.g. the website of the Health Protection Agency, to investigate the sources of background radiation.	340, 350
(c) be aware of the dangers associated with radon in the home and use secondary sources to investigate the geographical distribution of radon-affected houses, and the measures that can be taken against radon. (w(iv)a)	350
(d) investigate experimentally, or use secondary sources to investigate the penetrating power of nuclear radiation and to determine the types of radiation, α(alpha), β(beta) or γ(gamma) emitted by a radioactive material. (w(i)b)	340-1
(e) know how the different penetrating powers of α, β and γ radiation relate to the dangers of external and internal exposure to radioactive sources. (w(i)c)	346
(f) discuss the health risks associated with exposure to radioactive emissions, discuss the ethics of using radiation-based treatments and describe the precautions needed to protect medical staff and patients from over-exposure to radioactivity. (w(i)d;(iv)a,b)	346, 350, (357)

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2. THE HALF LIFE OF RADIOACTIVE MATERIALS	
How long does a radioactive material last? **Candidates should:** (a) investigate experimentally, or using an ICT simulation or secondary sources, the decay of a short-lived radioactive material and determine its half life. (w(i)a) (b) perform simple calculations involving the activity and half life of radioactive materials.	 344, worksheet 344, (352)
3. USES AND DANGERS OF RADIOACTIVITY	
How can we make use of radioactivity and what problems are there? (a) use physics knowledge to respond to information describing contemporary uses of radioactive materials, relating to the half life, penetrating power and biological effects of the radiation e.g. *radioactive tracers, carbon dating, thickness monitoring and cancer treatment.* (w(i)d) (b) discuss the scientific and ethical problems associated with the long-term disposal of radioactive waste materials and appreciate the problems posed by the uncertainties in the behaviour of these materials and their containers over thousands of year. (w(i)d;(iv)b,c)	 346-7, 352, (357) 350, worksheet
Electricity	
4. SIMPLE ELECTRICAL CIRCUITS	
How can we make control electricity and make measurements? **Candidates should:** (a) use voltmeters and ammeters to measure the voltage across and current through electrical components. (w(i)a) (b) understand qualitatively, the relationship between current, voltage and resistance. (c) select and use the equation: resistance = voltage / current (d) use a circuit, which includes a variable resistor, to investigate how current changes with voltage for a resistor (or wire) at constant temperature, a filament lamp and a diode. (w(i)a)	 250, 252 253 253 255, 259

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5. SAFETY FEATURES USED IN MAINS CIRCUITS	
How do we protect ourselves from the dangers of electricity? **Candidates should:**	
(a) understand the roles of the live, neutral and earth leads and insulation in domestic electrical circuits.	268
(b) know how the earth lead and fuse operate to protect consumers against fire and electrical shocks. (w(iv)a)	269
(c) select and use the equation: current = $\frac{\text{power of appliance}}{\text{voltage}}$ to calculate the current taken by the appliance in normal use and hence the correct fuse required to protect the cable to the appliance.	270
(d) explain the roles of miniature circuit breakers (m.c.b.) and residual current devices (r.c.d.) and compare their actions to those of fuses. (w(iv)b)	269, 272
(e) discuss how ideas of risk and cost play a part in deciding what voltage domestic electricity supplies should use and appreciate that different countries have adopted different voltages. (w(i)d;(iv)b)	(303)
Forces and Motion	
6. DISTANCE, SPEED AND ACCELERATION	
How can we measure and display motion? **Candidates should:**	
(a) describe motion using speed, acceleration, speed-time and distance-time graphs.	122-6
(b) select and use the equations: speed = $\frac{\text{distance}}{\text{time}}$ and acceleration [or deceleration] = $\frac{\text{change in speed}}{\text{time}}$ in the context of the motion of objects.	122, 126 122, 125

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7. THE EFFECT OF FORCES	
How do forces affect the movement of objects? **Why do things reach a steady speed?** **Candidates should:** (a) investigate experimentally, e.g. using an air track and data logger, or computer simulation, the effect of balanced and unbalanced forces on an object. (w(i)a,b)	(87)
(b) select and use the equation: resultant force = mass x acceleration	130-1
(c) distinguish between the weight and mass of an object **and use the approximation that the weight of an object of mass 1 kg is 10 N.**	67, 131
(d) use knowledge of forces and their effects to explain the behaviour of objects moving through the air, including the concept of terminal speed. (w(i)c)	89, 128
8. INTERACTIONS BETWEEN OBJECTS	
Where do forces come from? **How do objects gain or lose energy?** **How do we keep ourselves safe in and around cars?** **Candidates should:** (a) appreciate that forces arise between objects and that the forces on the two objects are equal and opposite	82, 84-5
(b) know that when a force acts on a moving body, energy is transferred although the total amount of energy remains constant.	
(c) select and use the equation: work = Force x distance to calculate work / energy transfer, force or distance.	97
(d) **select and use the equations:** **kinetic energy = $\frac{\text{mass x speed}^2}{2}$** **and**	109
change in potential energy = mass x gravitational field strength x change in height	108
(f) apply the principles of forces and motion to the safe stopping of vehicles, including knowledge of the terms reaction time, thinking distance, braking distance and overall stopping distance and discuss the factors which effect these distances. (w(i)c;(iv)a)	83
(g) apply the principles of forces and motion to an analysis of safety features of modern cars: air bags and crumple zones. (w(i)c;(iv)a)	69, 139
(h) discuss the reasons for introducing speed restrictions and speed cameras to promote road safety. (w(i)d;(iv)b)	