Y11 November Mock – Science

Combined Science

Biology, Chemistry and Physics – Paper 1 – 1 hour 15 minute paper each

Triple Science

Biology, Chemistry and Physics – Paper 1 – 1 hour 45 minute paper each

Topics for both Combined and Triple Science

Biology

- Cell Biology
- Organisation
- Infection and Response
- Bioenergetics

Chemistry

- Atomic Structure & the Periodic Table
- Bonding, Structure & Properties of Matter
- Quantitative Chemistry
- Chemical Changes
- Energy Changes

Physics

- Energy
- Electricity
- Particle Model of Matter
- Atomic Structure

Useful Revision Resources –

- Fact sheets for recall of factual content (behind this summary)
- https://www.aqa.org.uk/subjects/science - Syllabus information & past papers with mark schemes
- https://www.youtube.com/@Freesciencelessons – excellent topic summaries presented as short videos for all Science content.
- https://www.physicsandmathstutor.com/ - revision resources & past paper questions and mark schemes – past paper questions are arranged by topic which is useful for revision. Covers all science content.
- https://www.kerboodle.com/users/login - all students have an individual log in – can view an electronic copy of the textbook and various revision resources.

Paper 1 Physics Fact Sheet – combined

Italics – higher only

Energy	Energy	1. 8 stores of energy are chemical, thermal, kinetic, gravitational potential, elastic potential, nuclear, electric and magnetic 2. The unit of energy is Joules (J) 3. Energy can be transferred from one form to another but can't be created or destroyed this is called conservation of energy 4. Energy input= useful energy+ wasted energy 5. Wasted energy is energy that is not in a useful format that is dissipating 6. Work done = force applied x distance moved 7. Efficiency = useful energy transferred/ total energy supplied by the device 8. Power = energy transferred to appliance / time taken for the energy to be transferred 9. An energy transfer of 1 Joule per second is equal to a power of 1 Watt 10. The more powerful the motor is the faster it moves a particular load.
	GPE → KE → Elastic	11. The equation for calculating potential energy = mass x gravitational field strength x change of height 12. The equation for calculating kinetic energy = ½ mass x speed^2
	Efficiency	13. Energy transfers are not 100% efficient and all efficiencies exist between 0-100% 14. Useful energy is the energy transferred into the form of energy that is wanted 15. Wasted energy is when energy is transferred into a form of energy that is not useful. This is often thermal store or sound store. 16. To make an appliance more energy efficient you must reduce the amount of wasted energy. *Eg by using lubrication, tightening loose or moving particles and reducing electrical resistance*
	Conduction and radiation	17. Metals are the best conductors with a high energy transfer and non-metals are insulators with a low energy transfer. 18. Convection is the movement of heat in fluids. The particles in the fluid become less dense when hot, rise and float. When cold the particles become denser and sink. 19. All hot objects radiate heat in the form of waves. There is no need for particles. 20. Houses are insulated to prevent energy loss and save energy resources and money. 21. Double glazing prevents heat loss because they have a trapped layer of gas so both conduction and convection cycles are disrupted. 22. Insulating panels are made of a foam and coated with foil, this reduces radiation, conduction and convection.
	Specific heat capacity	23. The specific heat capacity of a substance is the amount of energy needed to raise the temperature of 1kg of substance by 1 °C 24. Specific heat capacity can be calculated experimentally by using an electrical heater to heat a kg block of metal.
	Energy resources	25. Electricity can be generated from by using to steam to turn a turbine which powers a generator 26. Coal, oil, gas (non – renewable fossil fuels) and biofuels (renewable) are burnt to heat water 27. Nuclear sources such as uranium can be used to heat water (non- renewable) 28. Geothermal energy, wind, solar, tidal, hydroelectric are renewable energy sources 29. Coal, oil gas and biofuels all produce carbon dioxide or greenhouse gasses when burnt. The others do not.

Paper 1 Physics Fact Sheet – combined

Italics – higher only

Electricity	The basics	30. Each circuit has its own symbol that can be used to show the components in a circuit. 31. A battery is two or more cells put together 32. Current is the rate of flow of charge and is measured in amps Current (I) = charge (Q) ÷time (t) **33.** Potential difference is measured in volts Potential difference (V)= energy transferred (E) ÷ charge (Q)
	Series circuits	34. In series circuits, current is the same, voltage is shared 35. In series circuits, resistance adds up
	Parallel circuits	36. In parallel circuits, current is shared between the branches and the sum of all branches is the total current, voltage is the same 37. In parallel circuits, adding more resistors in a parallel circuit decreases the total resistance.
	Resistance	38. Resistance is measured in Ohms (Ω) 39. Higher resistance, lower current, higher temperature 40. Total resistance adds up in a series circuit, it decreases in a parallel circuit 41. Resistance (Ω) = potential difference (V) ÷ current (Amps) 42. In a wire the as the current increases so does the voltage. Resistance is proportional 43. In a filament bulb resistance increases if the temperature increases 44. In a diode the forward resistance is low the backward resistance is high 45. A thermistors resistance decreases if its temperature increases 46. A LDR resistance decreases if the light intensity on it increases
Electricity continued	Electricity in the home	47. Alternating current changes direction 48. Mains current is alternating, has a Potential Difference of 230 V and a frequency of 50 Hz 49. Direct current flows in one direction only. From batteries and photovoltaic cells. 50. A 3 pin plug has three wires: brown is live, blue is neutral, green and yellow striped is the earth wire 51. The earth wire protects against electric shocks if there is a fault 52. The fuse is attached to the live wire and melts if the current gets too high 53. The fuse ratings are 3, 5 and 13. Choose the fuse that is higher than the current needed.
	National Grid	54. The national grid includes the power generation station, the cables and transformers that distribute electricity around the country 55. Step up transformers step up the voltage and therefore decrease the current. Step down transformers step down voltage and therefore increase the current. 56. This reduces heat loss in the cables and increases efficiency 57. Using thick wires also increases efficiency as thicker wires have a lower electrical resistance.
	Power	58. The power of an electrical appliance is the rate at which electricity is transferred to the appliance or using the equation power = energy/time 59. Power is also calculated by the equation power = current x potential difference

Paper 1 Physics Fact Sheet – combined

Italics – higher only

	Density	60. Density (kg/m^3) = mass (kg) ÷ volume (m^3) 61. The density of a regular object can be calculated mathematically. 62. Volume of an irregular object can be measured by submerging it in water and measuring the amount of water displaced 63. Objects that have a lower density than water float.
Molecules and matter	States of matter	64. Particles in solids have strong attractive forces and are held in a fixed position. They do not compress or flow 65. Particles in a liquid have moderate attractive forces they are always in contact but can move about at random. They do not compress but can flow 66. Particles in a gas have weak attractive forces, they move about randomly can be compressed and flow. They are the least dense. 67. When an object changes state the number of particles stays the same.
	Changes of state	68. A pure substance has a specific melting and boiling point 69. Boiling occurs throughout a substance at its boiling point. Evaporation occurs from the surface of the liquid below the boiling point. 70. Changes of state are flat lines on a temperature time graph 71. Increasing the temperature increases the internal energy and allows a substance to change state 72. Specific latent heat of vaporisation is the amount of energy needed to turn 1kg of a substance from liquid to a gas 73. Specific latent heat of fusion is the amount of energy need to turn 1kg of a substance from a solid to a liquid.
	Internal energy	74. The internal energy of a substance is determined by the kinetic energy of the particles and the potential energy of the particles 75. Gases have high internal energy as the particles have high kinetic energy and high potential energy 76. Increasing the temperature of the substance increase the internal energy
	Gas pressure	77. The pressure of a gas is caused by random particles hitting the container or surfaces 78. Increasing the temperature of a contained gas increases pressure as the particles move faster 79. Brownian motion is the random movement of particles can be seen in smoke.
	Atoms	80. Positive nucleus (protons and neutrons) surrounded by negative electrons in shells, discovered by Rutherford. 81. Rutherford disproved plum pudding model by firing alpha particles at gold foil. The wide scattering pattern suggested the nucleus 82. Electrons can jump to a higher energy level (further from the nucleus) with absorption of electromagnetic radiation

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Italics – higher only

Radioactivity	Radiation	83. Alpha radiation α (a helium nuclei or loss of two protons and two neutrons) highly ionising, low penetration, stopped by paper, range in air 5 cm 84. Alpha equations atomic mass decrease by 4, atomic number decrease by 2 85. Beta radiation β (electron formed when a neutron turns into a proton) mid ionising ability and mid penetration, stopped by aluminium, range in air 1 metre 86. Beta equations atomic mass no change atomic number increase by 1 87. Gamma radiation γ (EMS wave) low ionising ability, high penetration, stopped by several inches of lead or metres of concrete, range in air unlimited 88. Background radiation is low-level radiation. 89. Contamination us the unwanted presence of materials containing radioactive atoms on other materials. The object is radioactive as long as the contaminant is in contact with it. 90. Irradiation is the process of exposing an object to nuclear radiation. It does not cause the object to become radioactive.
	Half life	91. Half-life is the amount of time it takes for the number of nuclei of the isotope to halve 92. The number of atoms and count rate both half every half-life 93. It can be read of a half-life graph 94. The half-life of carbon 14 is used to age living things
	Use of radiation	95. Radiation is harmful because it is ionising (the ability to knock electrons out of atoms) 96. In humans it can cause mutations to DNA leading to cancer or can kill the cell 97. Smoke detectors use alpha radiation 98. Thickness monitors use beta radiation