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 – Triple

Bold – Triple content *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.
		23.	**All objects emit and absorb radiation, the hotter the more it gives out.**
		24.	**The earth's temperature depends on radiation from the sun**
		25.	**Increasing the number of layers of insulation decreases thermal transfer so the temperature loss is less.**
		26.	**Materials with trapped layers of air are good insulators because heat does not transfer well between solids and gases.**
	Specific heat capacity	27.	The specific heat capacity of a substance is the amount of energy needed to raise the temperature of 1kg of substance by 1 ^{o}C
		28.	Specific heat capacity can be calculated experimentally by using an electrical heater to heat a kg block of metal.

Paper 1 Physics Fact Sheet – Triple

Bold – Triple content *Italics – higher only*

	Energy resources	29.	Electricity can be generated from by using to steam to turn a turbine which powers a generator
		30.	Coal, oil, gas (non – renewable fossil fuels) and biofuels (renewable) are burnt to heat water
		31.	Nuclear sources such as uranium can be used to heat water (non- renewable)
		32.	Geothermal energy, wind, solar, tidal, hydroelectric are renewable energy sources
		33.	Coal, oil gas and biofuels all produce carbon dioxide or greenhouse gasses when burnt. The others do not.
Electricity	**Static Electricity**	**34.**	**Static electricity is the force between two charged objects**
		35.	**Some insulators become charged when rubbed together**
		36.	**Charge is the transfer of electrons. Gain electrons = negative charge. Loss of electrons = positive charge**
		37.	**Like charges repel, opposite charges attract**
		38.	**A static shock occurs when there is potential difference between the charged object and the earth.**
	The basics	39.	Each circuit has its own symbol that can be used to show the components in a circuit.
		40.	A battery is two or more cells put together
		41.	Current is the rate of flow of charge and is measured in amps Current (I) = charge (Q) ÷time (t)
		42.	Potential difference is measured in volts Potential difference (V)= energy transferred (E) ÷ charge (Q)
	Series circuits	43.	In series circuits, current is the same, voltage is shared
		44.	In series circuits, resistance adds up
	Parallel circuits	45.	In parallel circuits, current is shared between the branches and the sum of all branches is the total current, voltage is the same
		46.	In parallel circuits, adding more resistors in a parallel circuit decreases the total resistance.
Electricity continued	Resistance	47.	Resistance is measured in Ohms (Ω)
		48.	Higher resistance, lower current, higher temperature
		49.	Total resistance adds up in a series circuit, it decreases in a parallel circuit
		50.	Resistance (Ω) = potential difference (V) ÷ current (Amps)
		51.	In a wire the as the current increases so does the voltage. Resistance is proportional
		52.	In a filament bulb resistance increases if the temperature increases
		53.	In a diode the forward resistance is low the backward resistance is high
		54.	A thermistors resistance decreases if its temperature increases
		55.	A LDR resistance decreases if the light intensity on it increases

Year 10 Mock Science Triple – Physics

Paper 1 Physics Fact Sheet – Triple

Bold – Triple content *Italics – higher only*

	Electricity in the home	56.	Alternating current changes direction
		57.	Mains current is alternating, has a Potential Difference of 230 V and a frequency of 50 Hz
		58.	Direct current flows in one direction only. From batteries and photovoltaic cells.
		59.	A 3 pin plug has three wires: brown is live, blue is neutral, green and yellow striped is the earth wire
		60.	The earth wire protects against electric shocks if there is a fault
		61.	The fuse is attached to the live wire and melts if the current gets too high
		62.	The fuse ratings are 3, 5 and 13. Choose the fuse that is higher than the current needed.
	National Grid	63.	The national grid includes the power generation station, the cables and transformers that distribute electricity around the country
		64.	Step up transformers step up the voltage and therefore decrease the current. Step down transformers step down voltage and therefore increase the current.
		65.	This reduces heat loss in the cables and increases efficiency
		66.	Using thick wires also increases efficiency as thicker wires have a lower electrical resistance.
	Power	67.	The power of an electrical appliance is the rate at which electricity is transferred to the appliance or using the equation power = energy/time
		68.	Power is also calculated by the equation power = current x potential difference
Molecules and matter	Density	69.	Density (kg/m^3) = mass (kg) ÷ volume (m^3)
		70.	The density of a regular object can be calculated mathematically.
		71.	Volume of an irregular object can be measured by submerging it in water and measuring the amount of water displaced
		72.	Objects that have a lower density than water float.
	States of matter	73.	Particles in solids have strong attractive forces and are held in a fixed position. They do not compress or flow
		74.	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
		75.	Particles in a gas have weak attractive forces, they move about randomly can be compressed and flow. They are the least dense.
		76.	When an object changes state the number of particles stays the same.
	Changes of state	77.	A pure substance has a specific melting and boiling point
		78.	Boiling occurs throughout a substance at its boiling point. Evaporation occurs from the surface of the liquid below the boiling point.
		79.	Changes of state are flat lines on a temperature time graph
		80.	Increasing the temperature increases the internal energy and allows a substance to change state
		81.	Specific latent heat of vaporisation is the amount of energy needed to turn 1kg of a substance from liquid to a gas
		82.	Specific latent heat of fusion is the amount of energy need to turn 1kg of a substance from a solid to a liquid.

Paper 1 Physics Fact Sheet – Triple

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	Internal energy	83. The internal energy of a substance is determined by the kinetic energy of the particles and the potential energy of the particles 84. Gases have high internal energy as the particles have high kinetic energy and high potential energy 85. Increasing the temperature of the substance increase the internal energy
	Gas pressure	86. The pressure of a gas is caused by random particles hitting the container or surfaces 87. Increasing the temperature of a contained gas increases pressure as the particles move faster 88. Brownian motion is the random movement of particles can be seen in smoke. 89. **Pressure increases if volume decreases at a constant temperature** 90. **For a fixed mass of gas held at a constant temperature: pressure x volume = constant pv=constant**
Radioactivity	Atoms	91. Positive nucleus (protons and neutrons) surrounded by negative electrons in shells, discovered by Rutherford. 92. Rutherford disproved plum pudding model by firing alpha particles at gold foil. The wide scattering pattern suggested the nucleus 93. Electrons can jump to a higher energy level (further from the nucleus) with absorption of electromagnetic radiation
	Radiation	94. 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 95. Alpha equations atomic mass decrease by 4, atomic number decrease by 2 96. 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 97. Beta equations atomic mass no change atomic number increase by 1 98. Gamma radiation γ (EMS wave) low ionising ability, high penetration, stopped by several inches of lead or metres of concrete, range in air unlimited 99. Background radiation is low-level radiation. 100. 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. 101. Irradiation is the process of exposing an object to nuclear radiation. It does not cause the object to become radioactive.
	Half life	102. Half-life is the amount of time it takes for the number of nuclei of the isotope to halve 103. The number of atoms and count rate both half every half-life 104. It can be read of a half-life graph 105. The half-life of carbon 14 is used to age living things

Paper 1 Physics Fact Sheet – Triple

Bold – Triple content *Italics – higher only*

	Use of radiation	106. Radiation is harmful because it is ionising (the ability to knock electrons out of atoms) 107. In humans it can cause mutations to DNA leading to cancer or can kill the cell 108. Smoke detectors use alpha radiation 109. Thickness monitors use beta radiation **110. Medical uses of radiation can be used to explore internal organs and control or destroy unwanted tissues.** **111. Gamma radiation can be used to kill cancer cells** **112. Beta or gamma can be used as a tracer the half-life must be long enough to detect but not too long** **113. Natural sources of background radiation include cosmic rays (12.5%), food and drink (12.5%), rocks and buildings (12.5%), and radon gas (50%).** **114. Man-made sources (12.5%) of radiation come from nuclear fallout from weapon tests, nuclear disasters, and medical uses.**
	Fission	**115. Fission is the splitting of an atomic nucleus into two smaller nuclei and two or more neutrons releasing energy** **116. In nuclear power stations this is induced in uranium-235or plutonium-239by firing a neutron at it.** **117. This is a chain reaction as the released neutrons trigger more atoms to decay** **118. Nuclear waste is difficult to dispose of as it is radioactive** **119. Nuclear fallout from a power station can make an area uninhabitable (such as Chernobyl)**
	Fusion	**120. Fusions causes two atoms to combine releasing vast amounts of energy** **121. Fusion happens naturally in star when hydrogen fuses to form helium** **122. On earth this can be attempted at very high temperatures 7 million degrees.**