Physics Paper 1 20 Minute Tasks

Particle Model of Matter

1. Create a poster which should:
    a. Compares solids, liquids and gases. You should include particle diagrams and descriptions of each particle arrangement.
    b. Describe each change of state (melting, evaporation, condensation, freezing, sublimation) in terms of what is happening to the particles in terms of energy. Try to link this to specific heat capacity (topic 1: energy).
    c. Define 'internal energy' and describe using an example
    d. Explain why changes of state are a physical change and how they conserve mass.
2. Create a flashcard which defines density, mass and volume. You should show how these are linked in an equation and state the units for each.
3. Split a piece of A4 paper in half. On each side, explain, with diagrams, the following. You should attempt to explain both in no more than 4-6 steps.
    a. How to find the density of a regular shaped object.
    b. How to find the density of an irregular shaped object
4. On a flashcard, draw a particle diagram for a gas and describe the motion of the particles. Using ideas about energy, explain what happens to a gas when:
    a. You increase the temperature
    b. You increase the pressure
5. Separates only: on the same flashcard, write the equation to show that pressure and volume are inversely proportional and explain what this means. You should state what pressure and volume are measured in
6. Separates only: on the same flashcard as above, explain what happens when work is done on a gas. Explain this using the example of pumping up bike tyres with a mechanical pump
7. On a flashcard, define specific latent heat. You should also include:
    a. Describe the difference between 'specific latent heat of fusion' and 'specific latent heat of vaporisation' and state whether energy is being transferred or released in both examples
    b. State the word and symbol equation for calculating specific latent heat, including the units
    c. The specific latent hear of vaporisation for water (boiling) is 2,260,000 J/kg. How much energy (in Joules) is needed to completely boil 1.50kg of water at $100^{o}C$?

Energy

1. On a flashcard, state each different type of energy store, give an example and a description of each
2. On flashcards, draw the equation triangles using symbols and write the word equations for each of the following. You should also state the units for each:
    - Kinetic energy
    - Gravitational potential energy
    - Elastic potential energy
    -
3. A system is an object or group of objects. Energy can move between stores when a system changes. In each of the examples, state what energy transfers take place
    - A ball is thrown upwards
    - A car hits a traffic cone
    - A skydiver falls from a plane
    - A vehicle slowing down
    - Bringing water to the boil in a kettle

    Changes in a store can be done by heating, work done by forces or work done when a current flows. State the word and symbol equations for:
    a. Change in thermal energy
    b. Work done (by forces)
    c. Work done (when a current flows)
4. Make a poster which states the definition for specific heat capacity. Include a step-by-step method which outlines how to carry out the specific heat capacity required practical. You should also include an explanation for how to find the gradient of a graph
5. Create a flashcard which defines 'power' and outlines both equations for calculating power. You should include the word and symbol equations and the units for each measurement. You should also include the relationship between watts and the amount of energy transferred per second.
6. State the conservation of energy principle. Explain what is meant if energy is 'dissipated'. Total energy = useful energy + wasted energy… come up with an example to explain this equation
7. Define conduction and convection and briefly describe each process. Draw a radiator and a convection current in a room and describe what is happening. Make three comparisons between conduction and convection
8. Define efficiency and state the two words equations for calculating efficiency, including the units. Explain how you can reduce unwanted energy transfers in the following examples:
    a. Using lubricants
    b. Having cavity wall insulation or double glazing installed into your home
9. You have been given the following equipment, write a step-by-step method which outlines how to investigate the effectiveness of a material as a thermal insulator. You should state the dependent, independent and control variables.
    - Kettles
    - Beakers and a lid
    - Thermometer
    - Stop clock
    - Different materials, e.g. newspaper, bubble wrap, tin foil

10. Define renewable and non-renewable energy sources. Copy the following table and complete with the appropriate information about energy resources:

Energy resource	Renewable or non-renewable	Description	Environmental impact	Uses of energy resource	Reliability
Fossil fuel	Non	Coal, oil or gas used to heat water, to make steam, to turn a turbine	Greenhouse gases	Electricity generation, transport	Reliable
Nuclear					
Biofuel					
Wind					
Hydroelectric					
Geothermal					
Tides					
Sun					
Water waves					

Atomic Structure

1. Draw the model of the atom as we know it today and label the nucleus, protons, neutrons and electrons. You should state the charge of each subatomic particle. Try to answer the following questions and add this information around your diagram of the atom:
    a. How many times smaller is the radius of the nucleus approximately compared to the radius of the atom?
    b. What is the overall radius of an atom, approximately?
    c. Why do atoms have no overall charge?
    d. What happens if electrons gain energy by absorbing EM radiation and move to a higher energy level?
    e. What happens if electrons release EM radiation and move to a lower energy level?
    f. If an electron was to leave the atom, what overall charge would the atom have?
2. Draw a plum pudding model of the atom and describe the experiments performed by Rutherford to discover that this model was incorrect. You should explain why nearly all of the alpha particles passed straight through the gold foil, why some were deflected back and why the nucleus must have a positive charge
3. Create a flashcard which outlines:
    a. How to calculate the number of protons, neutrons and electrons of an element
    b. What an isotope is, using the example of carbon
    c. How atoms may turn into a positive ion
4. One on side of a flashcard, complete the following:
    a. Some atomic nuclei are unstable, so the nucleus gives out …. This is a process known as radioactive decay
    b. Activity is the rate at which a source of unstable nuclei decays. This is measured in……
    c. Count rate can be detected using ……
5. Copy and complete the table to compare alpha, beta and gamma radiation

Type of radiation	**What is it?**	**Sketch (what does it look like?)**	**How big is it?**	**How far can is travel?**	**What material stops it?**

6. Nuclear equations represent decay. On each side of one flashcard, show how nuclear equations are represented for alpha and beta. Give an example of each. Explain why gamma rays do not change the mass of a nucleus
7. On a flashcard, state that radioactive decay is random and define half-life. Draw a graph and show how you would work out the half-life for an isotope.
8. Write a paragraph or series of bullet points which describes:
    a. What radioactive contamination is
    b. Why radioactive contamination is a hazard and what factors affect the seriousness
    c. What is meant by the term ‘irridation’
    d. What is radiation dose measured in?
9. Separates only: explain what background radiation is and give examples from natural and man-made sources. Explain the risks of being exposed to radiation

10. Separates only: write two paragraphs to explain how radiation can be used as medical tracers and for radiotherapy
11. Separates only: define and compare the processes of nuclear fission and nuclear fusion. You should include a diagram for each.