Extended Homework Task – Physics P6 & P7

Aiming for Grade 4 Name ……

Please hand in a completed printed version at the end of the topic

P6 Molecules and matter

Worked example

Calculate the energy that you need to supply to vaporise 0.01 kg of water. The specific latent heat of vaporisation of water is 2 300 000 J/kg.

Step 1:

Write down what you know.

Mass = 0.01 kg

Specific latent heat of vaporisation of water = 2 300 000 J/kg

Step 2:

Calculate the thermal energy for a change in state.

Thermal energy for a change in state = mass × specific latent heat

= 0.01 kg × 2 300 000 J/kg

= 23 000 J

Density and states of matter

1 Complete these sentences by circling the correct word:

a The density depends on the **mass/weight** and the **area/volume** and is measured in **kilograms per metres cubed/newtons per metre squared**. (*3 marks*)

b You measure the volume of a regularly shaped object with a **measuring cylinder/ruler**, and the density of an irregular object with a **measuring cylinder/ruler**. (*2 marks*)

c Density **does/does not** depend on the volume of material that you have. (*1 mark*)

d When a material changes state, the mass **changes/stays the same** because the number of particles **changes/stays the same**. (*2 marks*)

2 Complete this sentence:

Liquids are less dense than solids because…

……

…… (*2 marks*)

3 Materials can be in a solid state, a liquid state, or a gas state. Write down and explain which state has a density that is very different from the other two states.

…… (*2 marks*)

4 Mercury is a liquid metal and it is much denser than water. Suggest why.

…… (*1 mark*)

2. Change of state

A scientist investigates the change in mass of different liquids. She puts 100 cm^3 of a liquid in a dish in a fume cupboard and leaves it for 10 minutes. Here is a table showing the data she collects. Complete the final column of the table.

Liquid	Mass of dish (g)	Mass of dish + liquid at start of 10 minutes (g)	Mass of dish + liquid at end of 10 minutes (g)	Change in mass of liquid (g)
water	100.0	110.0	109.6	
acetone	100.0	115.7	114.0	
methanol	100.0	114.0	113.2	

Part 2: Change of state

5 **a** Write down the name of the change of state in this experiment.

..... (*1 mark*)

b Name another change of state that involves a liquid and a gas.

..... (*1 mark*)

c Describe the difference between the two processes.

.....

..... (*1 mark*)

d Explain how the law of conservation of mass applies in this experiment.

.....

..... (*2 marks*)

e The student used the same *volume* of each liquid, and the mass of the dishes was the same. Explain why the mass of the dish + liquid was different in each case.

..... (*1 mark*)

6 Explain why the change in the mass of liquid was *not* the same in each case.

.....

.....

..... (*3 marks*)

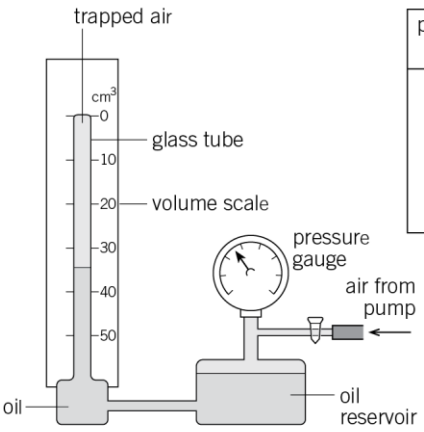
7 The specific latent heat for this change of state for water is 2 300 000 J/kg. Calculate the energy transferred to the water in this experiment.

.....

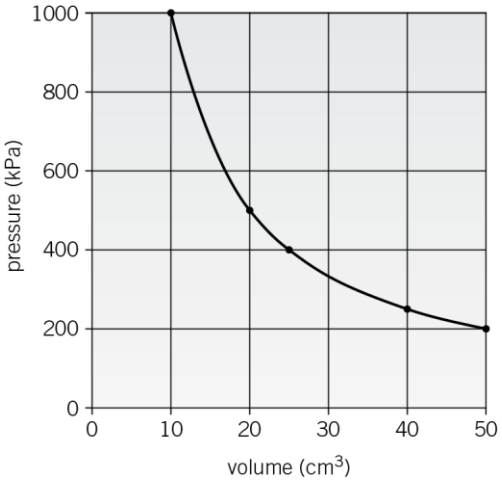
..... (*2 marks*)

3. Gas pressure

A student uses the apparatus below to change the volume of a gas and measure what happens to the pressure.



pressure (kPa)	volume (cm^3)
200	50
250	40
400	25
500	20
1000	10



Here is the data that they recorded in their experiment

Volume (cm^3)	Pressure (kPa)
160	25
80	50
40	100
20	200
10	400

a Plot a graph of pressure against volume.

b Describe the pattern in your results.

Part 3: Gas pressure

8 Complete these sentences by circling the correct word:

a As the volume of air inside the syringe decreases the force that you need to apply **decreases/increases**. (*1 mark*)

b This is because the pressure of the air inside the syringe **decreases/increases**. (*1 mark*)

c This is because the gas molecules **collide with/stick** to the walls of the syringe more often. (*1 mark*)

d Pressure and volume are **directly/inversely** proportional. (*1 mark*)

9 Explain why a gas exerts a pressure on a surface.

.....

..... (*2 marks*)

10 Complete this sentence:

As the pressure doubles the volume of gas ……..… (*1 mark*)

11 The student repeats the experiment with pressure, but this time changes the temperature of the gas. Complete the table below with the words 'increase', 'decrease', or 'stay the same'. (*6 marks*)

	Pressure of a gas will…	Mass of gas will…	Speed of gas molecules will…
increase in temperature			
increase in volume			

P7 Radioactivity – Aiming for Grade 4

Task

Part 1: Radiation and atoms

A Design a game of snap by making cards containing the information in the table below. Play your game.

The symbols for alpha, beta, and gamma radiation, and the neutron.	What stops alpha, beta, and gamma radiation.
What alpha, beta, and gamma radiation actually are.	The charge on alpha, beta, and gamma radiation, and the neutron.
The ionising power of alpha, beta, and gamma radiation.	The range in air for alpha, beta, and gamma radiation.

B Complete the table with the symbols for the isotopes of some common elements, and the number of protons in each one.

Common element	... with one fewer neutron	…with one extra neutron	Number of protons
$^{4}_{2}He$			
$^{12}_{6}C$			
$^{14}_{7}N$			
$^{16}_{8}O$			

Part 1: Radiation and atoms

1 Complete these sentences using the words in the box below. You may need to use some of the words once, more than once, or not at all.

protons	isotopes	radioactive	neutrons	electrons	neutron

The nucleus of any atom contains two types of particle: protons and _____.

All atoms of the same element have the same number of _____. However,

atoms of the same element can have different numbers of _____ and they

are called _____. For example, carbon-12 has one more _____

than carbon-11. Carbon-11 is _____ and gives out radiation. (*6 marks*)

2 Choose words or phrases from each column to make three sentences about alpha, beta, and gamma radiation.

Alpha		lead		is not very ionising.
Beta	is stopped by	aluminium	and	is very ionising.
Gamma		paper		hardly ionises.

.....

.....

..... (*3 marks*)

3 Complete theses sentences and describe what happens to atomic mass and atomic number.

a When a nucleus emits an alpha particle …

.....

..... (*2 marks*)

b When a nucleus emits a beta particle …

.....

..... (*2 marks*)

c When a nucleus emits a gamma ray …

.....

..... (*2 marks*)

Part 2: Modelling the atom, fission, and fusion

6 Link the sentences together to describe what happens in nuclear fusion.

In fusion two nuclei of light elements	energy.
The two nuclei have the same charge	join together to make a nucleus of a heavier element.
The mass of the fusion products	so they need to be travelling fast to overcome the repulsion.
The mass is converted to	is less than the mass of the two lighter nuclei.

(*4 marks*)

Part 3: Half-life, using radioactivity and risk

8 Complete these sentences by circling the correct word:

a Radioactive materials emit **particles/particles and wave/waves**. (*1 mark*)

b Over time the amount of radiation that they emit per second **decreases/increases**. (*1 mark*)

c When you take radioactive material into your body you are **contaminated/irradiated**. (*1 mark*)

d The radiation can damage the **DNA/nucleus** of the cells in your body. (*1 mark*)

e This can cause **cancer/heart disease**. (*1 mark*)

9 Describe two things that doctors do to reduce the risk of radiation damage when they use radioactive material to investigate organs.

.....

..... (*2 marks*)

10 Describe two things that doctors do to reduce the risk of radiation damage when they use radioactive material to kill cancer cells.

.....

..... (*2 marks*)

11 Describe one thing that you can do to reduce the risk of a build-up of radioactive gas in your house.

..... (*1 mark*)