3.12 Physics: Thermal Physics and Gases: 10-minute Pack

AQA 7408 · Calculator allowed · about 10 minutes

Total Marks

Name: _____ Date: ____ / ____ / _____

Answer ALL questions. Show all your working.

1 This question is about internal energy and the first law of thermodynamics.

(a) State what is meant by the internal energy of a system. **(2)**

(b) A temperature of 15°C is to be used in a calculation involving the equation pV = nRT. Convert 15°C to kelvin. **(1)**

(c) Define the term specific latent heat of vaporisation of a substance. **(2)**

(d) A fixed mass of gas in a sealed cylinder is heated. The gas absorbs 450 J of thermal energy and, as it expands slightly against a piston, does 120 J of work on the surroundings. Using DeltaU = Q + W, where W is the work done on the gas, calculate the increase in internal energy of the gas. **(3)**

(Total for Question 1 is 8 marks)

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Mark scheme · 3.12 Physics: Thermal Physics and Gases: 10-minute Pack

Question 1

(a) the sum of the randomly distributed kinetic energies of the particles (atoms/molecules) of the system, due to their motion (oe) **B1**

(a) plus the sum of the (randomly distributed) potential energies of the particles, arising from the forces/bonds between them (oe) **B1**

(a) Answer: Internal energy is the sum of the randomly distributed kinetic energies (due to their motion) and potential energies (due to the forces/bonds between them) of all the particles in a system.

(b) 288 K, cao **A1**

(b) Answer: 288 K

(c) the (thermal) energy required to change the state of a unit mass (1 kg) of a substance from liquid to vapour/gas (oe) **B1**

(c) without any change in temperature (at constant temperature, at the boiling point) (oe) **B1**

(c) Answer: The energy required to change the state of 1 kg of a substance from liquid to vapour, without any change in temperature.

(d) identifies that, because the gas does 120 J of work on the surroundings, the work done ON the gas is W = -120 J **M1**

(d) correct substitution: DeltaU = Q + W = 450 + (-120) **M1**

(d) DeltaU = 330 J (increase), cao **A1**

(d) Answer: DeltaU = +330 J (an increase in internal energy of 330 J)

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