5. After heating four different pure substances in open containers, Andrea observed the following changes.

1. The texture of substance 1 changed from smooth to granular.
2. The shape of substance 2 changed from cubic to hemispherical.
3. The state of substance 3 changed from an aqueous liquid to gaseous.
4. The colour of substance 4 changed from white to brown.

Which of these substances definitely underwent a chemical change? (2 marks)

a) Substance 1 b) Substance 2

c) Substance 3 (c) Substance 4

5. When hydrogen gas, H_2, burns in air, it reacts with oxygen gas, O_2, to form water, H_2O.

Which of the following statements is TRUE? (2 marks)

a) This water is the reagent of a synthesis reaction.
b) This water is the reagent of a decomposition reaction.
(c) This water is the product of a synthesis reaction.
d) This water is the product of a decomposition reaction.

6. In the laboratory, Sheldon determined if the pure substance he was given was a compound. After heating the substance in an open container, he observed that a chemical reaction occurred and that the substance underwent certain changes.

Which of the following changes would definitely indicate that the substance Sheldon heated was a compound? (2 marks)

A) Its colour changed maybe B) Its physical state changed

(C) Its mass decreased for sure D) Its texture changed

7. Explain whether a 100 ml cup of water at 100 degrees Celsius would have more, less or the same amount of thermal energy as a liter jug of water at 10 degrees Celsius? (3 marks)

OMIT (do not answer)

8. State the energy transformations for each of the following. (6 marks)

a) Walking to the bus: chemical energy to mechanical energy.

b) Photosynthesis by an apple tree: solar energy to chemical energy.

c) A turning windmill: wind/mechanical energy to electrical energy.

9. The following chemical equation represents the burning of octane in an internal combustion engine:

$$2C_8H_{18} + 25\ O_2 \rightarrow 16\ CO_2 + 18\ H_2O + \text{energy}$$

a) Indicate the number of atoms of each type in the reagents and the products. (3 marks)

Before: 16 C, 36 H, 50 O and After: 16 C, 36 H, 50 O

b) Does this follow the conservation of mass: yes (1 mark)

c) What type of reaction is this? combustion (1 mark)

d) Is energy released or absorbed? released (1 mark)

e) What is the unit for measuring energy? Joules (1 mark)