Summative assessment marking key

This marking key is constructed so that it can be used for summative purposes. Possible answers to each question are provided in italics. The allocation of marks to student answers enables a test score out of 32 to be calculated that can be used for grading and reporting. Teachers may wish to modify the electronic version of the test and marking key to suit local outcomes and assessment policies.

1. What is energy? Write one or two sentences to explain your meaning for the term energy. (2 marks)
   *Energy makes things happen or energy is the capacity to do work.* (1)
   *Energy is transformed/changed to another form as the work is done.* (1)

2. For each of the following statements about energy, indicate whether the statement is true or false, and then write a sentence to explain why. (6 marks)
   a. I get my energy from sleeping. False. (1)
      *Reason: People get energy from their food (1), which is released from food by respiration.* (1)
   b. Ultimately, all of our energy comes from the Sun. True. (1)
      *Reason: Plants use energy from the Sun to grow and plants provide our food energy (1), and dead plants have turned into coal, gas and oil over long periods of time to provide our fuels.* (1)

3. Sunglasses protect our eyes from the sun. (8 marks)
   a. Use the diagram below to show and explain how sunglasses reduce the amount of solar radiation that reaches our eyes.
      *Solar radiation can be reflected off sunglasses (1), or it can be absorbed by the lens (1), which reduces the amount transmitted through the lens to the eye.* (1)
   b. Solar radiation consists of three types of electromagnetic radiation.
      i. What are they and what effect do they have on our eyes?
         *Solar radiation consists of visible light which helps us see (1), infrared which has a heating effect (1) and ultraviolet which can damage tissues and cause cancer.* (1)
      ii. What effect do sunglasses have on each type of radiation?
         *Sunglasses need to reflect or absorb infrared and ultraviolet to protect the eyes from damaging radiation.* (1)
         *In very bright light, sunglasses should reduce the amount of visible light reaching our eyes to reduce glare.* (1)

4. Three students were investigating the effect of different solar heaters on raising the temperature of 100 mL of water in one hour. The students’ results are presented in the tables below. (6 marks)
   a. Which set of results do you think is most reliable? Explain why, giving at least two reasons.
      *Student 3’s results would be more reliable.* (1)
      *Student 3’s results are more reliable than Student 1 as s/he did repeat trials which gives more data (1), and the variation between Student 3’s repeat trials is less than that for Student 2 which indicates there is less error.* (1)
b. To ensure these were fair tests, which variables would have to be controlled? Why?

The amount of water (1) and the time. (1)
The amount of water and the time could both affect the change in temperature so they must be kept the same to be sure it was only the type of solar heater that affected the temperature. (1)

5. Draw an energy flow diagram for: (7 marks)
   a. Water being heated in a kettle with a whistle on a gas stove

   ![Energy Flow Diagram](Diagram1.png)

   Flow chart includes most steps and sources of waste energy. (1)
   Arrows give some indication of amount of energy transferred/transformed. (1)

   b. Water being heated in an electric kettle which has no whistle

   ![Energy Flow Diagram](Diagram2.png)

   Flow chart includes all steps and the main source of waste energy. (1)
   Arrows give some indication of the amount of energy transferred/transformed. (1)

   c. i. Which of these would be more energy efficient?
        The electric kettle is more efficient. (1)
   ii. Explain what we mean by efficiency.
        An efficient kettle uses most of the available energy for heating water. (1)
   iii. Why is the one method of heating water more efficient than the other?
        The electric kettle is more efficient than the gas kettle as it has less energy wasted as heat to the air or as sound from the whistle. (1)

6. What are the environmental benefits of using hydroelectricity, wind energy and solar energy compared to coal, gas and petrol? (3 marks)

When coal, gas and petrol are burned they produce pollution; hydro, wind and solar energies do not produce pollution. (1)
Coal, gas and petrol are a limited resource whereas hydro, wind and solar energies are renewable and don’t get used up. (1)
Coal, gas and petrol produce carbon dioxide which contributes to the greenhouse effect whereas hydro, solar and wind do not produce carbon dioxide. (1)