

Assessment Question Set 1

For all questions assume that the specific heat capacity of water is $4190\text{Jkg}^{-1}\text{K}^{-1}$, $0^\circ\text{K} = -273^\circ\text{C}$, and answer all questions to 2d.p unless otherwise stated.

1. Identify the correct statement from the following:

An element is.....**A**

- A. Pure matter consisting of only one type of atom
- B. Pure matter consisting of only one type of molecule
- C. A mixture of two or more different types of atom
- D. Made of molecules that are two or more different types of atom chemically joined together

2. By stating either 'element' or 'substance', categorise the following;

- | | |
|-------------------------------------|------------------|
| (a) Copper | Element |
| (b) Oxygen | Element |
| (c) Lead | Element |
| (d) Water | Substance |
| (e) Gold | Element |
| (f) SO_2 (Sulphur Dioxide) | Substance |

3. Which of the four phases of matter....

- | | |
|--|----------------------------|
| (a) Have no fixed shape | Liquid, Plasma, Gas |
| (b) Have inter atomic bonds strong enough to hold the particles together but not strong enough to prevent them flowing over each other | Liquid |
| (c) Have particles that vibrate about fixed equilibrium positions | Solid |
| (d) Have particles for which interatomic or intermolecular forces are insignificant | Plasma, Gas |

Hint; multiple answers to each question are possible

4. Place the following in order of increasing internal energy **A, D, C, B**

- A. An ice cube
- B. Steam
- C. Sea water at 20°C
- D. Sea water at 12°C

5. Convert the following temperatures to the Celsius scale

- | | |
|-------------------------------|--------|
| (a) Absolute zero | -273°C |
| (b) The triple point of water | 273°C |
| (c) 373°K | 100°C |
| (d) 205°K | -68°C |

6. Complete the following statement:

The specific heat capacity of a substance is the _____ required to raise the _____ of 1kg of that substance by 1 degree _____ a change in

1°K without a change in state (or without a change in phase)

energy
force
temperature
Kelvin
with
Centigrade
without
phase

7. Calculate the energy required to bring 1.5kg of liquid water at 2°C to room temperature (21°C). The specific heat capacity of water is 4190Jkg⁻¹K⁻¹.

119415J

8. A stainless steel teaspoon is placed into a hot cup of coffee. After 5 minutes, the spoon and coffee reach a thermal equilibrium of 70°C. The initial temperature of the spoon was 10°C. If the coffee transferred 602J to the spoon in this time, calculate the mass of the spoon to the nearest whole gram. The specific heat capacity of stainless steel is 502Jkg⁻¹K⁻¹.

20g

9. 25,500J of thermal energy is transferred to a 5kg concrete block. The corresponding temperature increase is 6°K. Calculate the specific heat capacity of concrete.

850Jkg⁻¹K⁻¹

10. Neon gas in a very large glass bulb is heated from 21°C to 150°C. The mass of the gas in the bulb is 0.5g. If 66.4J of energy is transferred to the gas in the process, calculate the specific heat capacity of the gas to the nearest whole number.

1030Jkg⁻¹K⁻¹

Assessment Question Set 2

For all questions assume that the specific heat capacity of water is $4190\text{Jkg}^{-1}\text{K}^{-1}$, $0^\circ\text{K} = -273^\circ\text{C}$, and answer all questions to 2d.p unless otherwise stated.

1. Identify the correct statement from the following:

A substance is.....**D**

- A. Pure matter consisting of only one type of atom
- B. Pure matter consisting of only one type of molecule
- C. A mixture of two or more different types of atom
- D. Made of molecules that are two or more different types of atom chemically joined together with the same chemical characteristics as the substance

2. Which of the four phases of matter

- (a) possesses the highest density **Solid**
- (b) is charged by definition **Plasma**
- (c) has the least internal energy **Solid**

3. State the correct scientific term for the following phase changes

- (a) A solid turning directly into a gas without becoming a liquid **Sublimation**
- (b) Steam landing on a cold surface and forming water droplets **Condensation**
- (c) A gas being heated to such an extreme that the electrons are separated from the parent atoms **Ionisation**
- (d) Mist forming over the surface of a pond on a cold winters day **Vaporisation**

4. Convert the following temperatures to the absolute scale;

- (a) 120°C **393°K**
- (b) -60°C **213°K**
- (c) 200°C **473°K**
- (d) 21°C **294°K**

5. A temperature increase of 5°C is equivalent to an increase of **C**

- A. 278°K
- B. -268°K
- C. 5°K

6. Calculate the energy required to raise the temperature of 2.5kg of water to 80°C from an initial temperature of 20°C . The specific heat capacity of water is $4190\text{Jkg}^{-1}\text{K}^{-1}$. **628500J**

7. A lead block of specific heat capacity $130\text{Jkg}^{-1}\text{K}^{-1}$ and initial temperature of 288°K is left on a windowsill on a warm summers day. After 1 hour, the temperature of the block has increased to 303°K . If the total thermal energy transferred to the block is 9750J and assuming no heat transfer to the surroundings, calculate the mass of the block. **5kg**

8. A well-insulated emersion heater holds 0.5m^3 of water. The heater is switched on at 4pm to bring the water from 20°C to 40°C in order to take a bath. The density of water is 1000kg/m^3 . The mains voltage supply to the heater is 240V , and the heating element draws a current of 20A . At what time will the bath be ready? Assume the specific heat capacity of water to be $4200\text{Jkg}^{-1}\text{K}^{-1}$. Give your answer to the nearest minute. **6.25pm**

9. Calculate the specific heat capacity of steam if it takes 3600J of energy to raise the temperature of 0.3kg of steam by 6°C . **$2000\text{Jkg}^{-1}\text{K}^{-1}$**

10. Given that power = energy / time, calculate the time taken to by a 1200W kettle to take 0.5kg of tap water from a temperature of 21°C to a temperature of 100°C to the nearest second. The specific heat capacity of water is $4190\text{Jkg}^{-1}\text{K}^{-1}$. **138s**