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Exam Preparation and Free Resources

Name of the Student:_____

Max. **Marks : 25 Marks**   **Time : 25 Minutes**

Q1.

A piece of steel is heated until it has all melted.

(a)   Calculate the change in thermal energy when the temperature of the piece of steel is increased by 50 °C.

mass of steel = 4.0 kg

specific heat capacity of steel = 420 J/kg °C

Use the equation:

change in thermal energy = mass × specific heat capacity × temperature change

_____

_____

_____

Change in thermal energy = _____ J

(2)

(b)   The internal energy of the steel increases as the steel is heated.

What is meant by 'internal energy of the steel'?

Tick (✓) **one** box.

The change in energy of the steel particles as the steel melts.	☐
The energy added to the steel particles as they are heated.	☐
The total kinetic energy and potential energy of the steel particles.	☐

(1)

(c)   Solid steel cannot be poured.

Which statement about the particles in a solid gives the reason why?

Tick (✓) **one** box.

The number of particles always stays the same.	☐
The particles are close together.	☐
The particles are in fixed positions.	☐
The particles have a fixed size.	☐

(1)

(d)   Complete the sentence.

Choose the answer from the box.

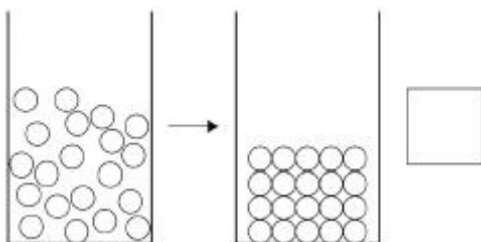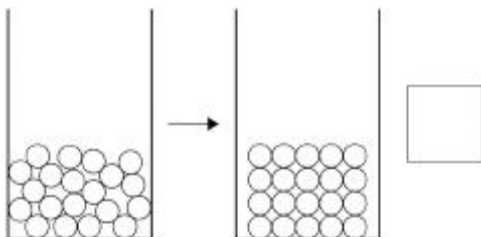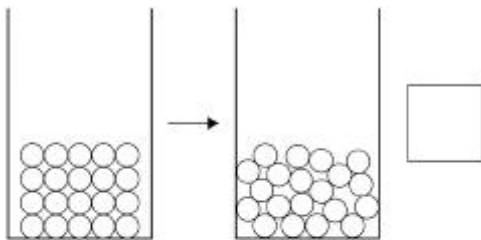| decreases   stays the same   increases |
|---|

As the piece of solid steel melts, the mass of the steel _____.

(1)

(e)   Which diagram shows how the arrangement of particles changes when a solid melts and becomes a liquid?

Tick (✓) **one** box.

(1)

(f)   The density of steel decreases as it melts.

How does the spacing of the particles change as the steel melts?

_____

_____

(1)

(g)   Complete the sentence.

Choose the answer from the box.

chemical	permanent	physical

Melting is an example of a _____ change.

(1)

(h)   Steel is a mixture of iron and a small amount of carbon.

The table below shows the mass of carbon in 1.0 kg of different types of steel.

Type of steel	Mass of carbon in 1.0 kg of steel
Low carbon	2.0 g
Medium carbon	4.5 g
High carbon	7.0 g

A 4.0 kg piece of steel contains 18 grams of carbon.

Determine which type of steel the 4.0 kg piece is made from.

You should include a calculation in your answer.

_____

_____

_____

_____

_____

Type of steel _____

(3)

(i)   The 4.0 kg piece of solid steel was heated until it reached its melting point.

The additional energy required to melt the piece of steel was 280 000 J.

Calculate the specific latent heat of fusion of the steel.

Use the Physics Equations Sheet.

_____

_____

_____

_____

_____

Specific latent heat of fusion of steel = _____ J/kg

(3)
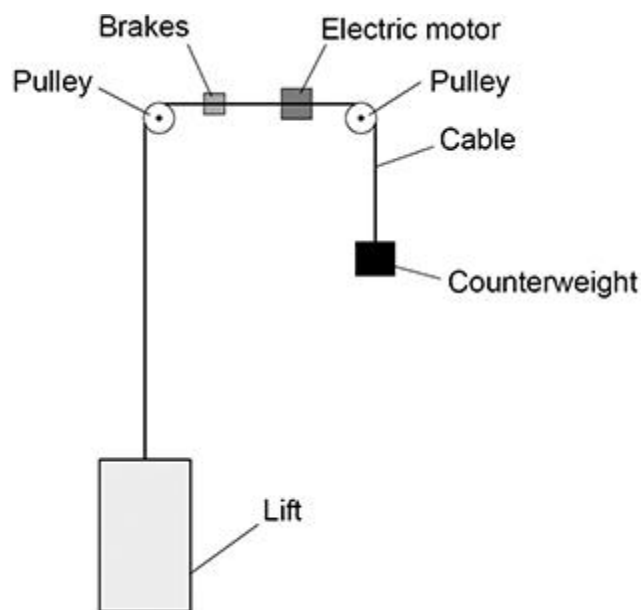
(Total 14 marks)

Q2.

The diagram below shows a lift near the bottom of a building.

The lift is attached by a cable to a counterweight.

An electric motor moves the lift.

The lift is moving up.

(a)   As the lift moves up, how far does the counterweight move down?

Tick (✓) **one** box.

A shorter distance than the lift.

The same distance as the lift.

A longer distance than the lift.

(1)

(b)   What happens to the gravitational potential energy of the counterweight as it moves down?

Tick (✓) **one** box.

It decreases ☐

It stays the same ☐

It increases ☐

(1)

(c)   Calculate the change in gravitational potential energy of the lift when it moves up 4.0 m

The mass of the lift is 1300 kg

gravitational field strength = 9.8 N/kg

Use the equation:

gravitational potential energy = mass × gravitational field strength × height

_____

_____

_____

_____

Change in gravitational potential energy = _____ J

(2)

(d)   Complete the sentences.

Choose answers from the box.

chemical	**elastic potential**	**gravitational potential**
internal	**kinetic**	

Friction between the brakes and the cable causes the speed of the lift to decrease.

As the speed decreases, there is a decrease in the _____

energy of the lift.

As the speed decreases, there is an increase in the _____

energy of the brakes.

(2)

(e)   The motor transfers different amounts of energy each time people use the lift.

Which factors affect the amount of energy transferred by the motor as the lift moves?

Tick (✓) **two** boxes.

The distance moved by the lift ☐

The height of the building ☐

The length of the steel cable ☐

The maximum power of the motor ☐

The weight of the people in the lift ☐

(2)

(f)   The weight of the lift and the counterweight stretch the cable by 0.015 m

The cable acts like a spring with a spring constant of 880 000 N/m

Calculate the elastic potential energy of the stretched cable.

Use the equation:

elastic potential energy = 0.5 × spring constant × (extension)^2

_____

_____

_____

_____

Elastic potential energy = _____ J

(2)

(g)   A lift system using a counterweight is more efficient than a lift system that does not use a counterweight.

How does having a more efficient system affect the energy transferred by the motor?

Tick (✓) **one** box.

Less energy is transferred. ☐

The same amount of energy is transferred. ☐

More energy is transferred. ☐

(1)
(Total 11 marks)