Topic 3 Particle Model
Extended Writing Questions

Name: _____

Class: _____

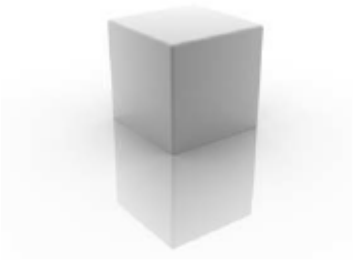
Date: _____

Time: **20 minutes**

Marks: **20 marks**

Comments:

Q1.A student wants to calculate the density of the two objects shown in the figure below.



Metal cube
© Whitehoune/iStock/Thinkstock,

Small statue
© Marc Dietrich/Hemera/Thinkstock

Describe the methods that the student should use to calculate the densities of the two objects.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

(Total 6 marks)

Q2.In this question you will be assessed on using good English, organising information clearly and using specialist terms where appropriate.

The information in the box is about the properties of solids and gases.

Solids: • have a fixed shape • are difficult to compress (to squash). Gases: • will spread and fill the entire container

- are easy to compress (to squash).

Use your knowledge of kinetic theory to explain the information given in the box.

You should consider:
- the spacing between the particles
- the movement of individual particles
- the forces between the particles.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

Extra space .....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

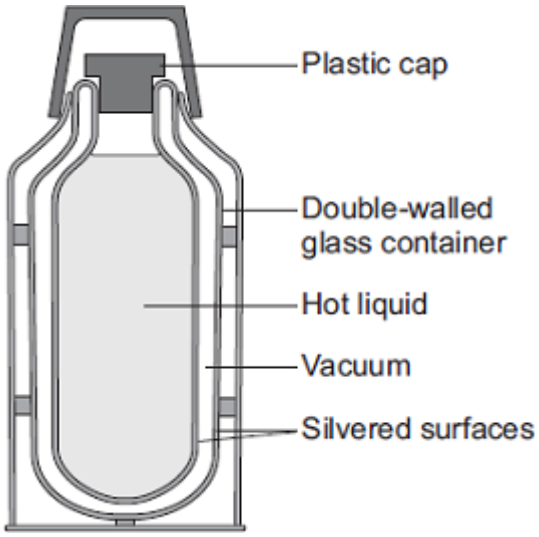
.....

.....

(Total 6 marks)

Q3.(a) *In this question you will be assessed on using good English, organising information clearly and using specialist terms where appropriate.*

The diagram shows the structure of a vacuum flask.



A vacuum flask is designed to reduce the rate of energy transfer by heating processes.

Describe how the design of a vacuum flask keeps the liquid inside hot.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

(6)

(b) Arctic foxes live in a very cold environment.

© Purestock/Thinkstock

Arctic foxes have small ears.

How does the size of the ears help to keep the fox warm in a cold environment?

.....

.....

.....

.....

.....

(2)

(Total 8 marks)

M1.Level 3 (5–6 marks):
Clear and coherent description of both methods including equation needed to calculate density. Steps are logically ordered and could be followed by someone else to obtain valid results.

Level 2 (3–4 marks):
Clear description of one method to measure density **or** partial description of both methods. Steps may not be logically ordered.

Level 1 (1–2 marks):
Basic description of measurements needed with no indication of how to use them.

0 marks:
No relevant content.

Indicative content

For both:
- measure mass using a balance
- calculate density using $\rho = m / V$

Metal cube:
- measure length of cube's sides using a ruler
- calculate volume

Small statue:
- immerse in water
- measure volume / mass of water displaced
- volume of water displaced = volume of small statue

[6]

M2. Marks awarded for this answer will be determined by the Quality of Written Communication (QWC) as well as the standard of the scientific response. Examiners should also apply a 'best-fit' approach to the marking.

0 marks
No relevant content.

Level 1 (1–2 marks)
Considers either solid or gas and describes at least one aspect of the particles.

or

Considers both solids and gases and describes an aspect of each.

Level 2 (3–4 marks)
Considers both solids and gases and describes aspects of the particles.

or

Considers one state and describes aspects of the particles and explains at least one of the properties.

or

Considers both states and describes an aspect of the particles for both and explains a property for solids or gases.

Level 3 (5–6 marks)
Considers both states of matter and describes the spacing and movement / forces between the particles. Explains a property of both solids and gases.

examples of the points made in the response
extra information

Solids

- (particles) close together
- (so) no room for particles to move closer (so hard to compress)
- vibrate about fixed point
- strong forces of attraction (at a distance)
- the forces become repulsive if the particles get closer
- particles strongly held together / not free to move around (shape is fixed)

any explanation of a property must match with the given aspect(s) of the particles.

Gases

- (particles) far apart
- space between particles (so easy to compress)
- move randomly
- negligible / no forces of attraction
- spread out in all directions (to fill the container)

[6]

M3.(a) Marks awarded for this answer will be determined by the Quality of Written Communication (QWC) as well as the standard of the scientific response. Examiners should also refer to the information in the Marking guidance.

0 marks No relevant content.

Level 1(1-2 marks) There is a basic explanation of **one** feature**or**a simple statement relating reduction in energy transfer to **one** feature.

Level 2(3-4 marks) There is a clear explanation of **one** feature**or**a simple statement relating reduction in energy transfer to **two** features.

Level 3(5-6 marks) There is a detailed explanation of at least **two** features**or**a simple statement relating reduction in energy transfer to all **four** features.

Examples of the points made in response

extra information

accept throughout:
heat for energy
loss for transfer

plastic cap:

- plastic is a poor conductor

accept insulator for poor conductor

- stops convection currents forming at the top of the flask so stopping energy transfer by convection

- molecules / particles evaporating from the (hot) liquid cannot move into the (surrounding) air so stops energy transfer by evaporation

- plastic cap reduces / stops energy transfer by conduction / convection / evaporation

glass container:

- glass is a poor conductor so reducing energy transfer by conduction

- glass reduces / stops energy transfer by conduction

vacuum:

- both conduction and convection require a medium / particles

- so stops energy transfer between the two walls by conduction and convection

- vacuum stops energy transfer by conduction / convection

silvered surfaces:

- *silvered surfaces reflect infrared radiation*

accept heat for infrared

- *silvered surfaces are poor emitters of infrared radiation*

- *infrared radiation (partly) reflected back (towards hot liquid)*

- *silvered surfaces reduce / stop energy transfer by radiation*

6

(b) *(the ears have a) small <u>surface</u> <u>area</u>*

ears are small is insufficient

1

so reducing energy radiated / transferred (from the fox)
accept heat lost for energy radiated
*do **not** accept stops heat loss*

1

[8]