



## FORMULAE

You may find the following formulae useful.

$$\text{power} = \frac{\text{work done}}{\text{time taken}}$$

$$P = \frac{W}{t}$$

$$\text{power} = \frac{\text{energy transferred}}{\text{time taken}}$$

$$P = \frac{W}{t}$$

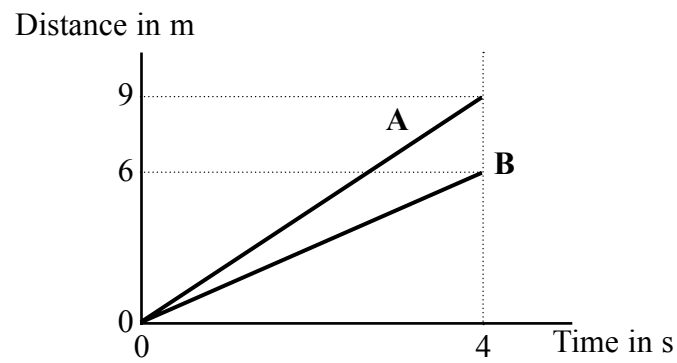
$$\text{frequency} = \frac{1}{\text{time period}}$$

$$f = \frac{1}{T}$$

Where necessary, assume the acceleration of free fall,  $g = 10 \text{ m/s}^2$ .



1. (a) Two students, **A** and **B**, walk across a classroom. The other students take readings of distance and time.  
The readings are used to plot the following graph.



- (i) Complete the sentence.

The line for student **A** is steeper than the line for student **B**.

This shows that student **A** is walking ..... than student **B**.  
(1)

- (ii) Use words from the box to complete the sentence.

acceleration   horizontal   speed   straight   vertical

The graph shows that each student walks at a steady .....

because the lines are both .....  
(2)

- (b) After 4 seconds, what is the distance between the students **A** and **B**?

Distance = ..... m  
(2)

- (c) (i) State the equation which relates average speed, distance and time.

.....  
.....  
(1)

- (ii) Calculate the average speed of student **B**, giving the unit.

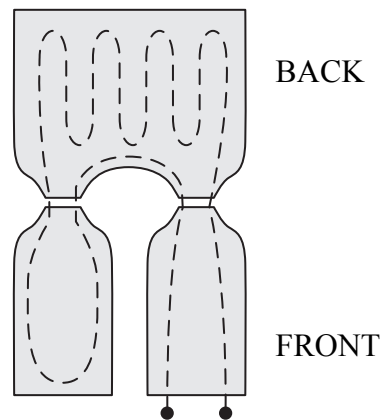
Speed of student **B** = .....  
(2)

(Total 8 marks)

Q1



2. An electric body warmer is worn by a motorcyclist.  
The diagram shows a design for an electric body warmer.



The dashed line shows a wire. When a 12 V battery is connected to the body warmer there is a current in the wire.

(a) On the diagram draw wires connecting the body warmer to the battery. (1)

(b) Place a cross (☒) in one box to show which of the following terms best describes the circuit.

- A Parallel
- B Racing
- C Series
- D Short

(1)

(c) Explain why, in this design, the front of the body warmer would produce less heat than the back.

.....  
.....

(1)

(d) Suggest one other design fault.

.....  
.....

(1)



(e) Place a cross (☒) in one box to show which of the following properties of the wire needs to be known if the current in the body warmer is to be calculated.

- A colour
- B density
- C mass
- D resistance

(1)

(f) Name two appliances which use electrical heating in the home.

1 .....

2 .....

(2)

(Total 7 marks)

Leave blank

Q2



Leave blank

3. (a) The box contains the names of different parts of the electromagnetic spectrum.

<b>gamma rays</b>	<b>infra-red</b>	<b>microwaves</b>	<b>radio waves</b>	<b>ultraviolet</b>	<b>visible</b>	<b>X-rays</b>
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(i) Fill in the gaps in the chart below to put these parts into their correct order.

<b>radio waves</b>			<b>visible</b>			<b>gamma rays</b>
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(3)

(ii) Use words from the box below to complete the sentences.

You may use each word once, more than once or not at all.

<b>amplitude</b>	<b>frequency</b>	<b>speed</b>	<b>wavelength</b>
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Listing the parts from radio waves to gamma rays puts them in order

of increasing ..... and

decreasing .....

All the parts have the same ..... in free space.

(3)

(b) State

(i) a use of infra-red;

.....  
(1)

(ii) a harmful effect of over-exposure to infra-red.

.....  
(1)

Q3

(Total 8 marks)

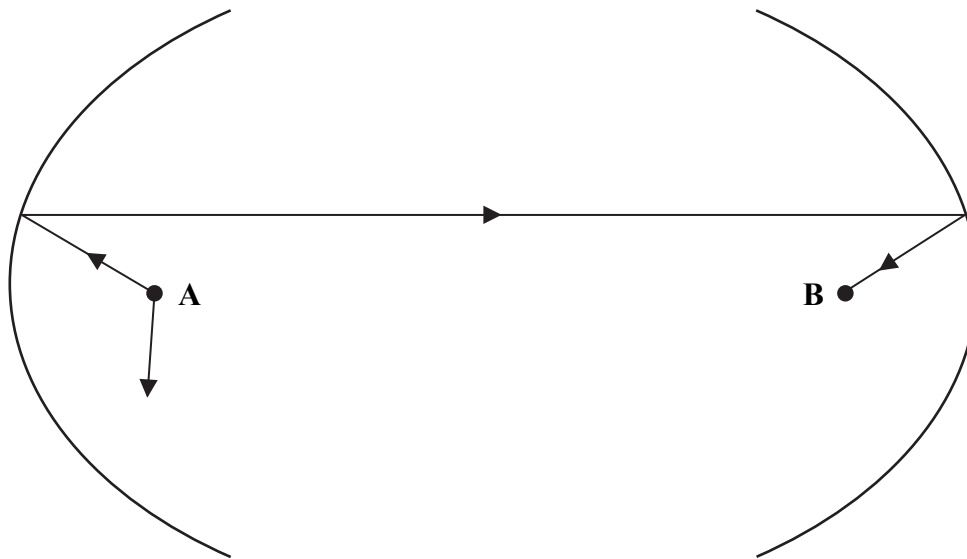


4. (a) Complete the sentence.

When sound waves are reflected from a surface, the angle of

..... equals the angle of ..... (1)

(b) The diagram shows a pair of reflectors. All sound waves starting from the point **A** reflect off the reflectors to the point **B**. The path of one wave has been drawn.



(i) Complete the path of the other wave. (2)

(ii) Why is the sound loud at point **B**?  
.....  
..... (1)

(c) What type of wave is a sound wave in air?  
..... (1)

(d) A source of sound is removed from **A** and a heater is placed at point **B**. What would be noticed at point **A**?  
..... (1)

(Total 6 marks)

Q4



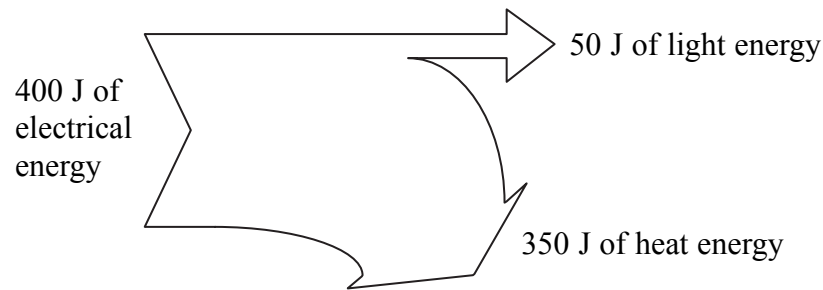
5. (a) Use terms from the box to complete the equation for efficiency.

<b>total energy input</b>	<b>total energy output</b>
<b>useful energy input</b>	<b>useful energy output</b>

Efficiency = \_\_\_\_\_

(1)

(b) The flow diagram shows the energy transfer for a lamp.



(i) Use words from the box to complete the sentence.

<b>conserved</b>	<b>convected</b>	<b>efficient</b>	<b>inefficient</b>
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The diagram shows that energy is ..... and  
that the lamp is ..... as a source of light.

(2)

(ii) The lamp gives out 50 joules of light energy in 10 seconds.  
How much light energy does it give out in one second?

.....  
.....

Light energy per second = ..... J/s  
(2)

(iii) What other unit is the same as a joule per second?

.....

(1)

Q5

(Total 6 marks)





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6. (a) Name two sources of background radiation.

1 .....

2 .....

(2)

(b) A radioactive source has an activity of 40 Bq. It has a half-life of 3 hours.

(i) What is the name of the unit which the letters Bq represent?

.....

(1)

(ii) What is meant by half-life?

.....

.....

(2)

(iii) How long does it take for the measured activity to change from 40 Bq to 10 Bq?

.....

.....

Time taken = ..... hours

(2)

(iv) What assumption have you made about background radiation in your answer to (iii)?

.....

(1)

(c) State two uses of radioactivity.

1 .....

.....

2 .....

.....

(2)

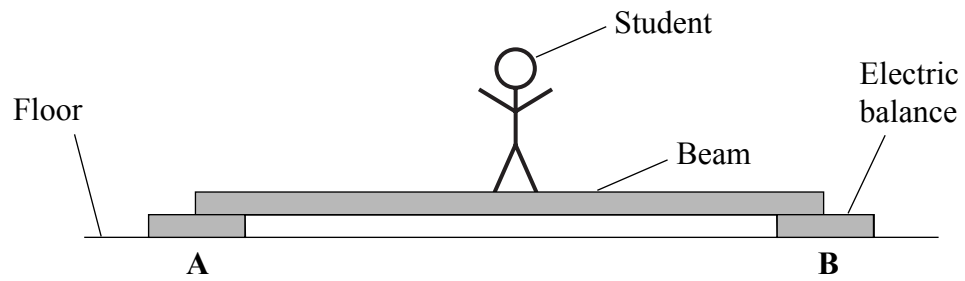
Q6

(Total 10 marks)



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7. A student stands on a beam which is supported on two electronic balances **A** and **B**.



The reading on both balances is 26 kg.

(a) What is the position of the student on the beam?

..... (1)

(b) The student moves towards **A**.  
Use words from the box to complete the sentence.

**decreases    increases    stays the same**

The reading at **A** .....  
and the reading at **B** ..... (1)

(c) Another student says that 'the weight of the student is 26 kg'.  
Give three reasons why this statement may be incorrect.

1 .....  
.....  
2 .....  
.....  
3 .....  
..... (3)

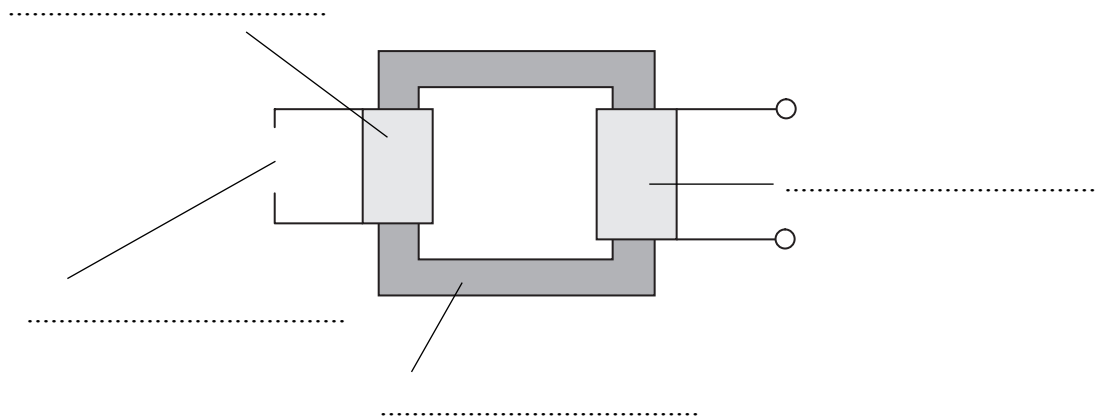
(Total 5 marks)

Q7



8. (a) The diagram shows a transformer.  
Use the terms from the box to label the diagram.

core    input coil    output coil    power supply



(3)

(b) This transformer is a step-up transformer.

(i) Describe the difference between the input coil and the output coil.

.....  
.....

(1)

(ii) State where a step-up transformer would be used in a large-scale electricity transmission system.

.....  
.....

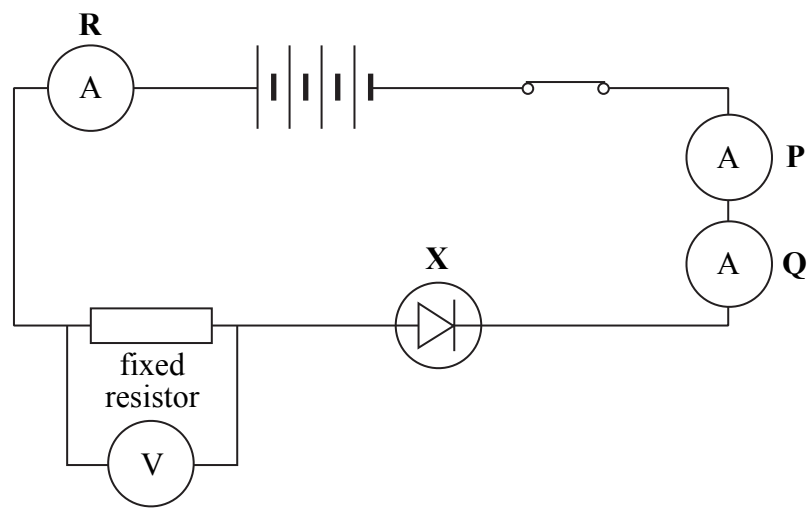
(1)

(Total 5 marks)

Q8



9. The circuit diagram shows how a student connects several components. These include four identical 1.5 volt cells.



(a) Identify component X.

..... (1)

(b) State a difference between a fixed resistor and a variable resistor.

.....  
 ..... (1)

(c) (i) Complete the sentence.

The four 1.5 volt cells are called a ..... (1)

(ii) Calculate the voltage, in volts, across the four cells.

.....  
 Voltage = ..... V (1)

(iii) The voltage across the fixed resistor is 3.8 V.  
 Calculate the voltage, in volts, across the rest of the circuit.

.....  
 Voltage across the rest of the circuit = ..... V (1)



(d) The reading on ammeter **R** is 40 mA.  
State the reading in milliamps on each of the other two ammeters.

ammeter **P** = ..... mA      ammeter **Q** = ..... mA

(1)

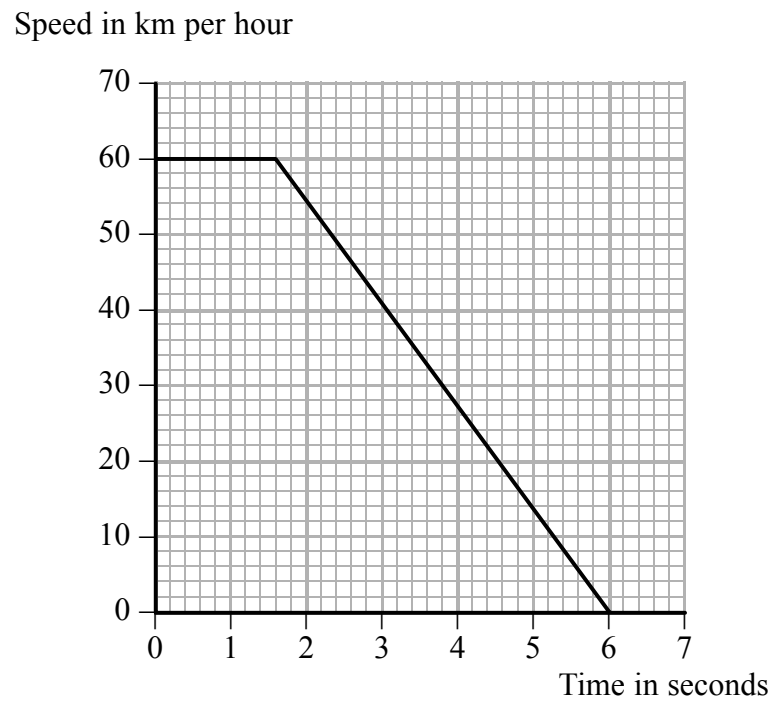
Q9

(Total 6 marks)

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10. A child runs out in front of a truck. The driver makes an emergency stop. The graph shows the speed of the truck from the time when the driver first sees the child.



- (a) (i) State the time, in seconds, for the driver to react.

Time = ..... s  
(1)

- (ii) Calculate the time, in seconds, for the brakes to stop the truck.

Time = ..... s  
(1)

- (b) The driver had been drinking alcohol. State the effect this may have had on:

- (i) the time for the driver to react;

.....  
(1)

- (ii) the time for the brakes to stop the truck.

.....  
(1)



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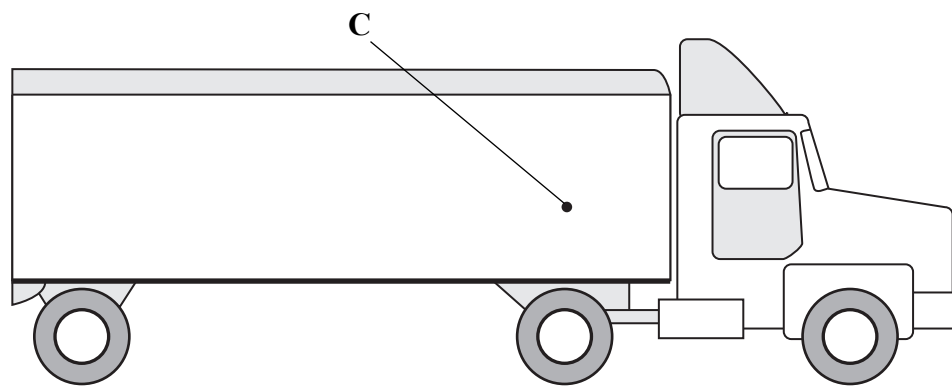
- (c) Give one feature of the road conditions which may increase the stopping distance of a vehicle.

.....  
(1)

- (d) The diagram shows a truck.

- (i) The centre of gravity of the truck and its load is at the point labelled C.  
Add to the diagram an arrow showing the total weight.

(1)



- (ii) State the name of a force which opposes the motion of the truck.

.....  
(1)

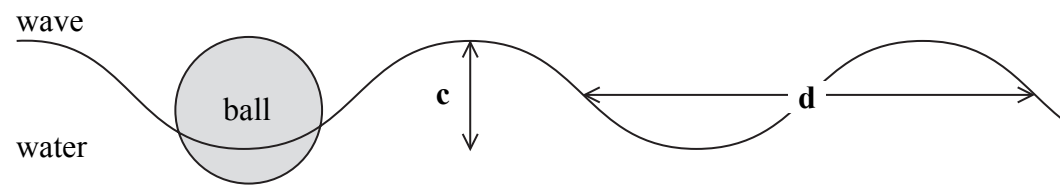
Q10

(Total 7 marks)



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11. The diagram shows a wave on the surface of the water of a swimming pool and a ball floating on the water.



(a) Identify the features of the wave shown by:

(i) distance **c**;

..... (1)

(ii) distance **d**.

..... (1)

(b) A student observes the wave.  
There are thirty complete cycles in one minute.

Calculate the frequency, in hertz, of the waves.

.....  
.....

Frequency = ..... Hz  
(2)

(c) (i) Identify the type of wave.

..... (1)

(ii) Describe the motion of the ball as the wave occurs.

.....  
..... (1)

(Total 6 marks)

Q11





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**12.** This question is about two types of power station.  
In each case complete the sentences to identify the forms of energy involved in the energy transfers.

- (a) In an oil-burning power station, oil is burned to heat water.  
The water boils to give steam.  
The steam spins a turbine connected to a generator.
- (i) The oil has ..... energy. **(1)**
- (ii) The spinning turbine has ..... energy. **(1)**
- (iii) The useful energy output from the generator is ..... energy. **(1)**
- (b) In a hydroelectric power station, water from a high dam falls down a pipe and spins a turbine.
- (i) The useful energy transfer in the pipe is  
from ..... energy to ..... energy. **(2)**
- (ii) Some energy is wasted as ..... energy. **(1)**

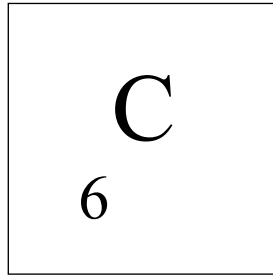
**Q12**

**(Total 6 marks)**



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13. (a) Complete the symbol in the box to describe the nucleus of carbon-14.



(1)

(b) The atomic number of carbon is 6.  
Complete the sentence.

The atomic number is the number of ..... in the  
.....

(1)

(c) Complete the sentence.

Carbon-12 and carbon-14 are ..... of carbon.

(1)

(d) Alpha, beta and gamma are ionising radiations.  
Complete the sentences.

(i) The two which are particles are ..... and .....  
(1)

(ii) Ionising radiations are emitted from unstable nuclei in a radioactive decay  
process which is .....

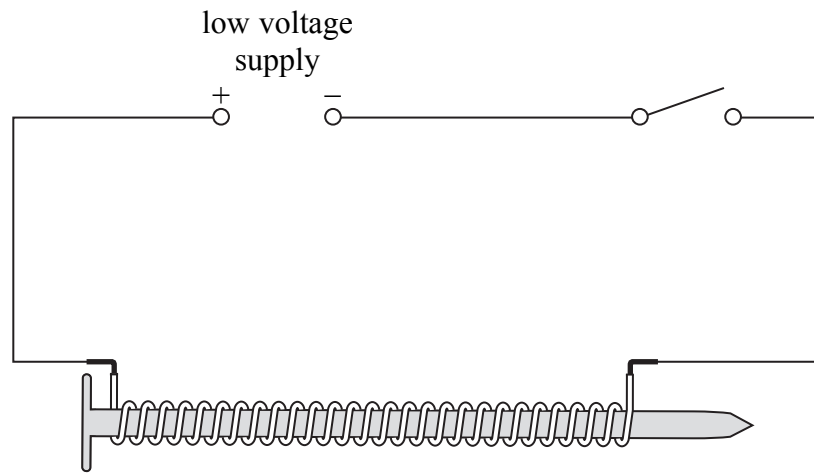
(1)

Q13

(Total 5 marks)



14. A student wraps an insulated wire around a large iron nail. She removes the insulation from the ends of the wire. Then she connects the wire in the circuit shown.



(a) State the name of the device which the student has made.

..... (1)

(b) Explain why the student uses insulated wire.

.....  
.....  
..... (2)

(c) (i) Explain how the student can show that the device works.

.....  
..... (1)

(ii) Explain how the student can use the device to show that iron is a magnetically soft material.

.....  
..... (1)

(Total 5 marks)

Q14

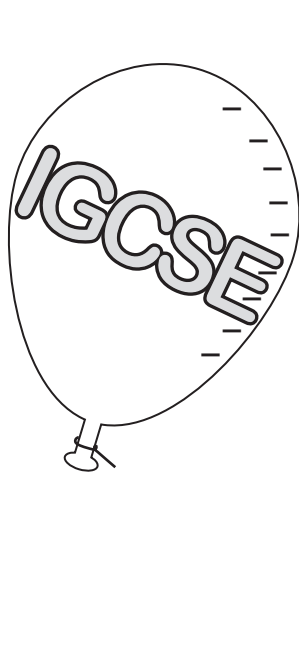


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15. A balloon is rubbed with a dry cloth on a dry day.  
The balloon then sticks to a wall.  
This is because the balloon has gained negative charge.



Complete the following sentences.

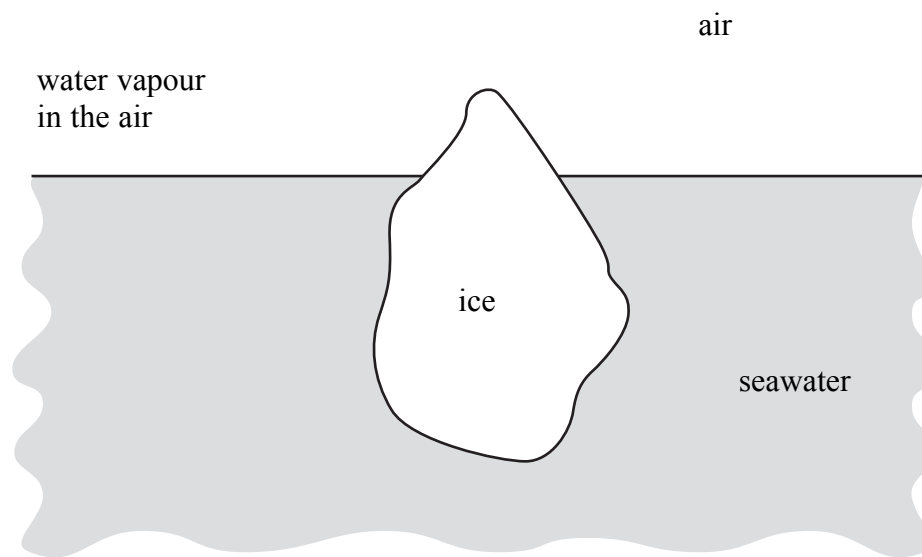
- (a) As the balloon is rubbed, ..... are transferred  
from the ..... to the .....  
by ..... (3)
- (b) The surface of the wall near to the balloon has a ..... charge.  
This is because objects with ..... charges attract each other. (2)

(Total 5 marks)

Q15



16. The diagram shows a large irregular-shaped block of ice floating in the sea.



(a) Everything is made of particles.

Which label in the diagram fits the description in the following box?

The particles vibrate about fixed positions within a close-packed regular structure.

Put a cross  in the correct box.

- A air
- B ice
- C seawater
- D water vapour in the air

(1)

(b) Complete the sentences.

(i) The ice changes to water by the process of .....

(1)

(ii) Water molecules in the sea usually become water molecules in the air by the process of .....

(1)



(c) Complete the sentence.

In a liquid, the particles are in a ..... irregular structure  
and their motion is .....

(2)

Q16

(Total 5 marks)

**TOTAL FOR PAPER: 100 MARKS**

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