Pearson
Edexcel

Examiners' Report
June 2024

GCSE Combined Science 1SC0 2PF

ResultsPlus

Edexcel and BTEC Qualifications

Edexcel and BTEC qualifications come from Pearson, the UK's largest awarding body. We provide a wide range of qualifications including academic, vocational, occupational and specific programmes for employers. For further information visit our qualifications websites at www.edexcel.com or www.btec.co.uk.

Alternatively, you can get in touch with us using the details on our contact us page at www.edexcel.com/contactus.

ResultsPlus

Giving you insight to inform next steps

ResultsPlus is Pearson's free online service giving instant and detailed analysis of your students' exam results.

- See students' scores for every exam question.
- Understand how your students' performance compares with class and national averages.
- Identify potential topics, skills and types of question where students may need to develop their learning further.

For more information on ResultsPlus, or to log in, visit www.edexcel.com/resultsplus. Your exams officer will be able to set up your ResultsPlus account in minutes via Edexcel Online.

Pearson: helping people progress, everywhere

Pearson aspires to be the world's leading learning company. Our aim is to help everyone progress in their lives through education. We believe in every kind of learning, for all kinds of people, wherever they are in the world. We've been involved in education for over 150 years, and by working across 70 countries, in 100 languages, we have built an international reputation for our commitment to high standards and raising achievement through innovation in education. Find out more about how we can help you and your students at: www.pearson.com/uk.

June 2024

Publications Code 1SC0_2PF_2406_ER

Introduction

Questions were set to test candidates' knowledge, application and understanding from these topics in the specification:

- Key concepts of physics.
- Energy – forces doing work.
- Forces and their effects.
- Electricity and circuits.
- Magnetism and the motor effect.
- Electromagnetic Induction.
- Particle model.
- Forces and Matter.

It was intended that the examination paper would allow every candidate to show what they knew, understood and were able to do. Within the question paper, a variety of question types were included such as objective questions, short answer questions worth one or two marks each and longer questions worth three marks each.

The inclusion of questions designed at targeting candidates' knowledge and understanding of practical work continued. This included assessing their fundamental knowledge of practicals specified in the specification, together with further application.

The six-mark question, Q6(d), tested their recall of a core practical investigation relating to the temperature-time graph for melting ice.

Candidates coped well with most questions and did particularly well in the questions asking for calculations using equations.

Question 1 (a)

This question required candidates to recognise some common circuit symbols.

The switch and the bulb were usually recognised. There was often confusion between the symbols for a variable resistor, thermistor and LDR.

Question 1 (b)

This question required candidates to use the equation given to calculate the current from the values of charge and the time.

Most candidates performed this calculation correctly.

Question 2 (a)(iii)

This question asked candidates to explain how the pattern of magnetic field lines showed where the field was strongest.

Although examiners saw very many correct answers that referred to the (field) lines being most concentrated at or near to the pole(s), very many candidates wrote about being near to the magnet rather than near to the pole of the magnet and therefore did not score the mark.

Question 2 (a)(i-ii)

This question required candidates to add to a diagram that showed magnetic field lines around a bar magnet.

Candidates were usually able to show that the field was strongest at or near to a S or N pole. There was less success in showing the correct direction of the magnetic field from N to S and many drew an arrow inside the magnet.

Question 2 (b)(i)

Candidates were required to draw magnetic field lines between two attracting bar magnets. Examiners were looking for a drawing that had at least one straight line and one curved line between the N and S of the two attracting magnets.

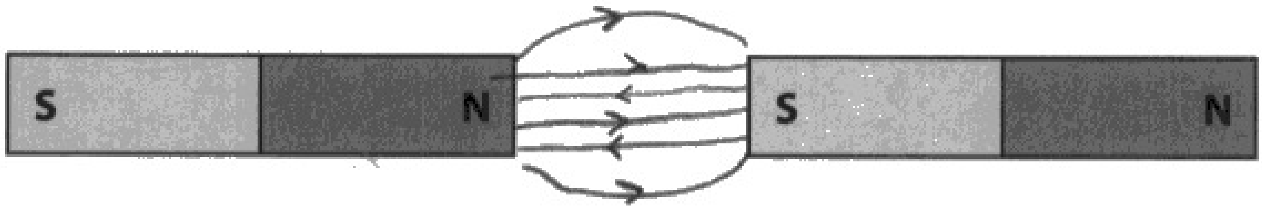


Figure 3

ResultsPlus
Examiner Comments

An acceptable drawing that showed both straight lines between the faces of the poles and curved lines at the corners.

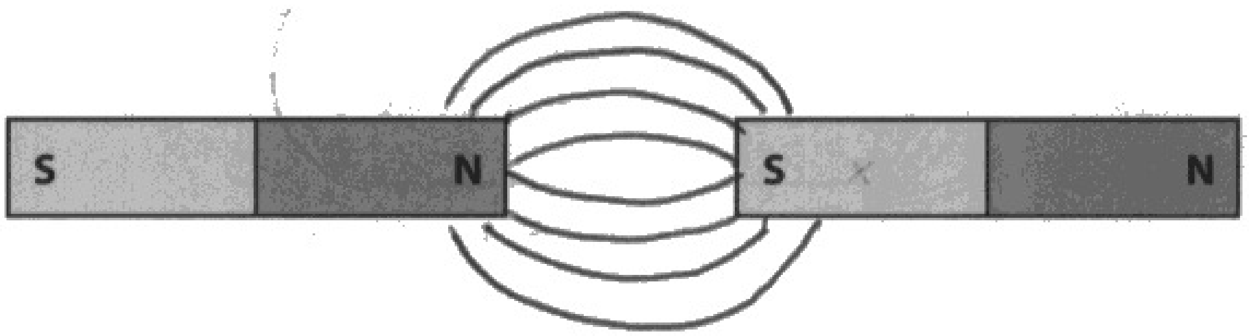


Figure 3

ResultsPlus
Examiner Comments

One mark for the curved lines near the corners of the poles, but the field lines between the faces of the poles should be straight, not curved as drawn here.

ResultsPlus
Examiner Tip

Learn and memorise the pattern of magnetic field lines between two magnetic poles.

Field lines were often incorrectly drawn between the outer poles of the two magnets.

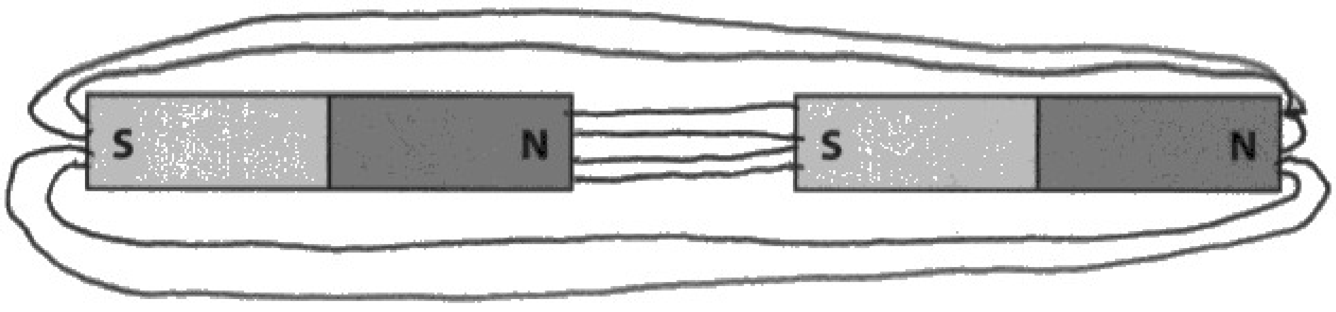


Figure 3

ResultsPlus
Examiner Comments

One mark only was awarded. The straight lines between the N and S poles were acceptable but the other curved field lines were incorrect.

Question 2 (b)(ii)

It was usually known that two magnets would attract each other when the N pole of one magnet was near to the S pole of the other magnet.

Question 2 (c)(ii)

This question asked candidates to devise an investigation that could compare the strengths of two different magnets using a supply of paper clips. There are several possible ways in which this investigation could be carried out. One mark was given for a suitable method with another mark given for the expected result.

A popular method was to compare the number of paper clips that each magnet could attract.

(ii) Describe how the student could use the paper clips to find out which of the two permanent magnets is the stronger magnet.

(2)

Put the clips on a table and hold the magnets in each hand then hold the magnets near the clips which ever magnet attracts the most clips is the strongest.

ResultsPlus
Examiner Comments

A clear description of the method together with the expected result. This scored both marks.

A mark was often lost by not giving the expected result.

(ii) Describe how the student could use the paper clips to find out which of the two permanent magnets is the stronger magnet.

(2)

Hold the magnet in the air and find out how ~~man~~ many paperclips can hang together before detatching from eachother.

ResultsPlus
Examiner Comments

Although the method was described for one mark, it does not include the expected result. "find out how many..." is still part of the method. A second mark would be scored by saying which magnet would have the most paper clips hanging.

An alternative method was to compare the distances at which each magnet would attract a paper clip.

(ii) Describe how the student could use the paper clips to find out which of the two permanent magnets is the stronger magnet.

(2)

The student could place one paperclip further away and slowly bring ~~it close~~ the magnet closer and measure how far it takes for the magnet to join on to the paperclip. The further the paper clip the stronger the magnet.

ResultsPlus
Examiner Comments

A clear description of the method together with the expected result ("the further the paper clip the stronger the magnet")

2 marks

Question 3 (a)(i)

Candidates were usually able to substitute the values given into the equation that was also given to arrive at a correct evaluation of 9600. There was less success at recalling the unit of work done which is J or joules.

Calculate the work done by the 1200 N force.

Use the equation

$$\text{work done} = \text{force} \times \text{distance moved in the direction of the force}$$

State the unit of work done.

(3)

1200 × 8.0 = 9600

work done = 9600

unit E

ResultsPlus
Examiner Comments

The calculation is correct for two marks, but no marks for the unit. This was a very common incorrect answer.

ResultsPlus
Examiner Tip

Make sure that you know all the units used in physics.

Question 3 (a)(ii)

Examiners were looking for a description of energy transfer that included kinetic energy being dissipated to the surroundings.

They would also accept descriptions that included a reference to thermal energy.

Examiners saw frequent mention of kinetic energy but often the description went on to incorrectly refer to gravitational potential energy.

(ii) At 8.0 m the force is removed and the truck slows down until it stops. newtons

Describe the energy transfers as the truck slows down.

(2)

Kinetic energy in the truck is transferred into heat energy in the truck's wheels as well as the ground.

ResultsPlus
Examiner Comments

A correct description of energy transfer between kinetic energy and thermal energy for 2 marks.

(ii) At 8.0 m the force is removed and the truck slows down until it stops.

Describe the energy transfers as the truck slows down.

(2)

The kenetic energy turns into ~~more~~ gravitational energy.

ResultsPlus
Examiner Comments

Although there are cases where there is a transfer between kinetic energy and gravitational potential energy where an object is moving upwards or downwards, this is not the case here.

Only one mark scored here for kinetic energy.

(ii) At 8.0 m the force is removed and the truck slows down until it stops.

Describe the energy transfers as the truck slows down.

(2)

The friction from the wheels and the pull from the air resistance and the pull from gravity against the traction of the road.

ResultsPlus
Examiner Comments

Many answers were seen that described forces rather than energy transfer. They scored no marks.

Question 3 (c)(i)

Most candidates were able to identify the incorrect point in the graph.

Question 3 (c)(ii)

This question first required interpretation of the graph to find the change in GPE when the height was 2.0.

Candidates who were able to find this value of 120 J usually went on to correctly calculate the power of 24 W.

Those who did not read the graph correctly could still score 2 of the 3 marks provided they showed working of an incorrect value of GPE being correctly used in the equation.

Figure 7 shows the results of the student's calculations.

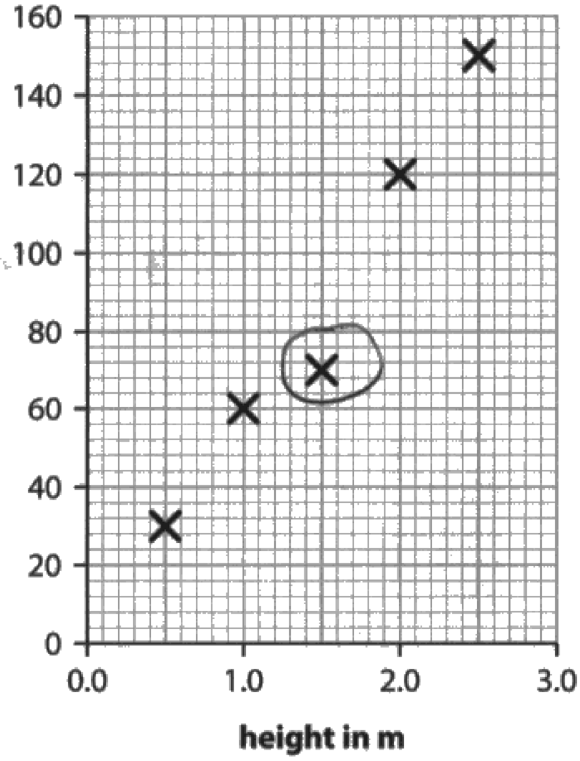


Figure 7

(i) The student has made one incorrect calculation.

On Figure 7, draw a circle round the **X** for this incorrect calculation.

(1)

(ii) The truck lifts the box from the ground to a height of 2.0 m.

This takes a time of 5.0 s.

Using data from the graph in Figure 7, calculate the power needed to lift the box.

80J **(3)**

Use the equation

$$\text{power} = \frac{\Delta GPE}{\text{time}}$$

2.0 hight = [illegible]

80÷5.0

power = 16 W

ResultsPlus
Examiner Comments

The candidate has read the graph incorrectly and obtained a value of 80 J rather than 120 J.

However, this value has been correctly used in the calculation of power and so the answer can score 2 of the available 3 marks.

Question 4 (b)(i)

This question gave values of energy and time. Candidates were required to use these values in the equation supplied to calculate power.

They were also required to give their answer to 2 significant figures.

The calculation of power was usually done correctly but expressing the answer to 2 significant figures proved difficult for many candidates.

(b) The cooker supplies 130 000 J of energy in a time of 87 s.

(i) Calculate the power supplied by the cooker.

Use the equation

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

Give your answer to 2 significant figures.

(3)

power = ~~energy~~ work done ÷ time taken

130 000 ÷ 87 = 1494.25

to 2 significant figures: 1500

power = 1500 W

ResultsPlus
Examiner Comments

This is an example of correct rounding. There are only 2 numbers (figures) in the answer of 1500.

(b) The cooker supplies 130 000 J of energy in a time of 87 s.

(i) Calculate the power supplied by the cooker.

Use the equation

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

Give your answer to 2 significant figures.

(3)

$\frac{130\,000}{87} = 1494.252874$

2sf = 1494.25

power = 1494.25 W

ResultsPlus
Examiner Comments

The calculation of power was correct. However, the candidate has expressed the result to 2 decimal places rather than 2 significant figures. There are many more than 2 numbers (figures) in the final answer of 1494.25

ResultsPlus
Examiner Tip

Make sure that you know how to correctly round a value shown on a calculator. This maths skill is also important in physics.

Question 4 (b)(ii)

The equation to calculate efficiency was given along with the energy supplied and the energy used to heat some milk.

Although many carried out the calculation successfully a surprisingly large number of candidates put the values in the wrong place.

This question also revealed the difficulty many candidates found with rounding the value given on a calculator and a mark was often lost by doing this incorrectly.

(ii) The cooker supplies 130 000 J of energy but only 96 000 J of this energy is used to heat the milk.

Calculate the efficiency of heating the milk using this cooker.

Use the equation

$$\text{efficiency} = \frac{\text{useful energy transferred}}{\text{total energy supplied}}$$

(2)

~~130000~~ $\frac{96\,000}{130000} = 0.7\dot{3}$

efficiency = $0.7\dot{3}$

ResultsPlus
Examiner Comments

A calculator will evaluate this calculation as 0.73846. This rounds to 0.74 and not 0.73.
1 mark scored out of a possible 2.

Question 4 (c)(ii)

A fuse is an important electrical safety device and questions testing knowledge and understanding of the action of a fuse frequently appear in this exam paper.

It is pleasing to see that candidates' response have improved over the years, but a great many still give answers that describe the fuse as some kind of current regulator.

(ii) Explain how a fuse can prevent overheating of the wiring for the cooker.

(2)

because it only lets a certain amount of power through into the cooker

ResultsPlus Examiner Comments

A commonly seen incorrect answer. 0 marks

(ii) Explain how a fuse can prevent overheating of the wiring for the cooker.

(2)

A fuse protects the wiring because it could break the current if there is a fault.

ResultsPlus Examiner Comments

There is a mark for the idea of breaking the circuit or stopping the current. However, this answer does not go on to describe how the fuse does this (by melting). 1 mark only

(ii) Explain how a fuse can prevent overheating of the wiring for the cooker.

(2)

~~the~~ when two much current goes through the fuse the thin wire melts to stop the flow of charge and to break the circuit

(Total for Question 4 = 11 marks)

ResultsPlus
Examiner Comments

Full marks for an explanation that links the melting of the fuse wire with the idea of this happening when the current exceeds a certain amount. 2 marks

Marks could also have been scored by the description of stopping the flow of charge and breaking the circuit.

Question 5 (b)(i)

Candidates were asked to add to a circuit diagram by drawing a voltmeter connected to measure the voltage (p.d.) across a resistor. As in the previous question, this is commonly tested in this paper, and it is disappointing that so few candidates were able to do this correctly.

Most commonly the voltmeter was drawn in series rather than across the resistor(s).

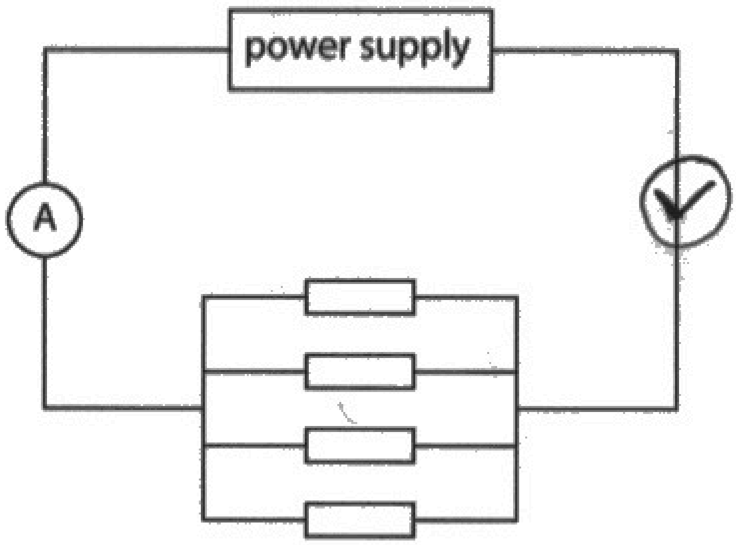


Figure 11

ResultsPlus
Examiner Comments

Incorrect. A voltmeter is not connected in series.

0 marks

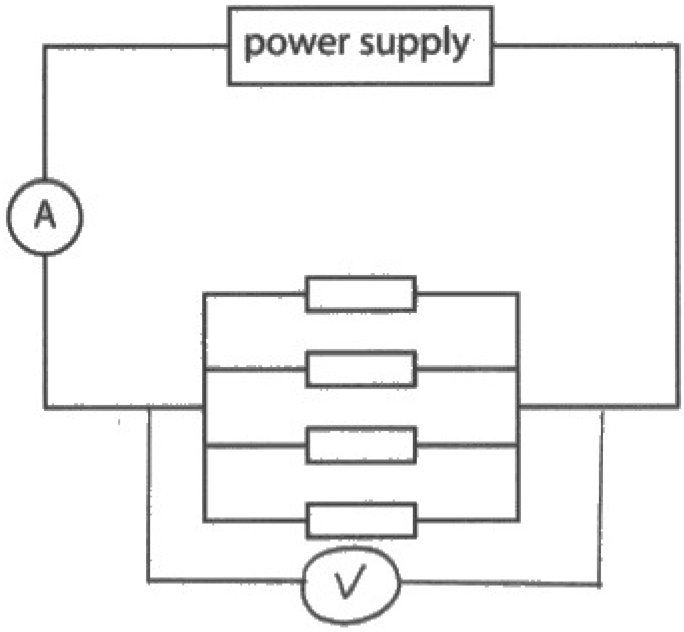


Figure 11

ResultsPlus
Examiner Comments

Correct. 1 mark. To measure the voltage **across** a resistor the voltmeter is connected **across** the resistor.

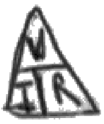
Question 5 (b)(iii)

The question required candidates to select values from a table and then use those values in a calculation of resistance. The equation sheet provided the equation to use but this needed to be rearranged. There was also an additional hazard of a change in units.

It was pleasing to see that many candidates could select the values and rearrange the equation. However, only the best candidates recognised that a change in units from mA to A was necessary in order to give a value of resistance in Ω.

(iii) Using data from the table in Figure 12, calculate the resistance of **only 1** resistor.

(3)



$R = \frac{V}{I}$ $R = \frac{6.00}{9.1}$

R = 0.65 93406593

resistance = 0.66 Ω

ResultsPlus
Examiner Comments

The working shows that the equation has been rearranged and the values from the table substituted, therefore resistance is evaluated.

The candidate has also correctly expressed the answer to 2 significant figures. This is excellent practice since the given values were to the same number of significant figures.

Unfortunately, the candidate did not recognise that the table gave a current in mA which needed to be converted to A.

2 out of 3 marks scored.

(iii) Using data from the table in Figure 12, calculate the resistance of **only 1** resistor.

(3)

$V = I \times R$

$V = 6.00\,V$

$I = 9.1\,mA$ 9.1×10^{-3} $\frac{V}{I} = R$ $\frac{6.00}{9.1 \times 10^{-3}} =$

$R = ?$

resistance = 659.3 Ω

ResultsPlus Examiner Comments

A nice answer. The working shows a rearranged equation. The candidate has written the given values next to each quantity and has correctly converted mA to A.

The evaluation is therefore correct. Although the answer has more significant figures than the given values, this maths skill was not being assessed in this question and therefore it scored the full 3 marks

Question 5 (b)(iv)

This question assessed the ability to interpret the changes in the current when the number of resistances connected in parallel was changed to conclude that fewer resistances led to an increase in total resistance.

Candidates could aften recognise that the current decreased as the number of resistances decreased but did not conclude that this meant an increase in resistance.

Very many assumed that fewer resistances must lead to a lower overall resistance.

(iv) Using data from the table in Figure 12, explain what happens to the **total resistance of the circuit** as the number of resistors in parallel decreases.

(3)

As the number of resistors decrease, the current also decreases but the voltage stays the same.

ResultsPlus
Examiner Comments

The candidate has used the data from the table to describe the decrease in current and the fact that the voltage remained constant. It did not, however, mention the change in resistance which was asked for.

(iv) Using data from the table in Figure 12, explain what happens to the **total resistance of the circuit** as the number of resistors in parallel decreases.

(3)

If the resistor in parallel decreases The total of resistance in the circuit will increase.

ResultsPlus
Examiner Comments

This answer correctly stated that the total resistance would increase but did not back this up with evidence taken from the data in the table.

1 mark only

ResultsPlus
Examiner Tip

A question that asks you to explain will have 2 or more marks. Your answer must not only state what happens but how you know that it happens.

Question 6 (a)

The first three items in Question 6 on this paper also appeared as an earlier question on the higher paper. They were therefore targeted at grades 4 and 5.

In this item, 6a, candidates were given the equation for density in terms of mass and volume and had to rearrange the equation to calculate volume given values of density and mass. Although the mass was given in g, the density was also given in g/cm^3 and therefore a unit change was not necessary.

6 (a) A coil of copper wire has a mass of 14.1 g.

The density, ρ, of copper is 8.96 g/cm^3.

Calculate the volume of the copper wire.

Use the equation

$$\rho = \frac{m}{V}$$

(3)

$$\text{density} = \frac{\text{mass}}{\text{volume}}$$

$$8.96 = \frac{14.1}{?}$$

$$8.96 \times 14.1 = 126.33 cm^3$$

volume = 126.33 cm^3

ResultsPlus
Examiner Comments

Some candidates substituted the values into the equation and then tried to rearrange it.

This scored 1 mark for the substitution only.

Some candidates tried to rearrange the equation first.

6 (a) A coil of copper wire has a mass of 14.1 g.

The density, ρ, of copper is 8.96 g/cm^3.

Calculate the volume of the copper wire.

Use the equation

$$\rho = \frac{m}{V}$$

density = mass / volume

(3)

density x mass = volume

8.96 x 14.1 = 126.336

volume = 126.336 cm^3

ResultsPlus
Examiner Comments

In this example the rearrangement was incorrect, but it was clear that the correct values had been used and so 1 mark was scored.

Question 6 (b)

This question assessed recall of kinetic theory; specifically the difference between the arrangement of particles in a solid and in a liquid. This could be used to explain the difference in the density of solid and liquid aluminium.

In addition to giving a mark for stating that solids had a greater density than liquids a second mark would be given for any one of the following:

- distance between particles in solid is less (than distance between particles in liquid)
- particles are closer in solids
- there are more particles per unit volume in a solid
- particles are more (tightly) packed in a solid

Most candidates could state that solid aluminium had a greater density than liquid aluminium.

(b) Figure 13 gives information about the density of aluminium.

	density in g/cm^3
solid aluminium	2.70
liquid aluminium	2.38

Figure 13

Explain the difference between the density of solid aluminium and the density of liquid aluminium in terms of the arrangement of particles.

(2)

the Particles in Solid aluminium are In a fixed position wheras the particels in Luiquid alluminium slide around each -other. this shows the solid has more density

ResultsPlus
Examiner Comments

The difference in density is correct for 1 mark. However, the explanation refers to the movement of particles and not how they are arranged. There is nothing about the difference in how the particles are spaced in the two states.

(b) Figure 13 gives information about the density of aluminium.

	density in g/cm^3
solid aluminium	2.70
liquid aluminium	2.38

Figure 13

Explain the difference between the density of solid aluminium and the density of liquid aluminium in terms of the arrangement of particles.

(2)

the density of a solid is more because the particles are close together and in liquid aluminium the particles ~~are~~ are more spread out.

ResultsPlus Examiner Comments

A better answer that correctly compares the arrangement of the particles.

2 marks

Question 6 (c)

This question was aimed at stretching candidates who could correctly handle both a change in units from g to kg and a value given in standard form.

The conversion from standard form using powers of ten into an ordinary number (ie value followed by many zeros) was almost universally seen. Many candidates lost count of those zeros and ended up with an incorrect answer that did not score.

(c) A student boils some water.

Calculate the amount of thermal energy needed to change 60.0 g of water to steam at its boiling point.

The specific latent heat of vaporisation of water, L, is 2.26×10^6 J/kg.

Use the equation

$$Q = m \times L$$

(2)

$2.26 \times 10^6 \times 60 =$

amount of thermal energy = 135600000 J

ResultsPlus
Examiner Comments

Examiners saw very many responses like this. The candidate has simply used the values as given without recognising that the mass in g needs to be converted to kg.

However, the conversion between standard form and ordinary number was correct and 1 mark was scored.

(c) A student boils some water.

Calculate the amount of thermal energy needed to change 60.0 g of water to steam at its boiling point.

The specific latent heat of vaporisation of water, L, is 2.26×10^6 J/kg.

Use the equation

$$Q = m \times L$$

60 g = 0.06 kg

(2)

~~60 x 2.26 x 10^6~~

0.06 x 2.26 x 10^6 = 135 600

amount of thermal energy = 135600 J

ResultsPlus
Examiner Comments

A correct conversion from g to kg allowed this candidate to provide a fully correct answer that scored 2 marks.

ResultsPlus
Examiner Tip

Always check the units of values in the question and be ready to convert if necessary.

Question 6 (d)

This question asked candidates to describe the changes of state shown by a temperature-time graph as ice is heated from –20^{o}C to 100^{o}C. This is a core practical, and candidates were expected to be able to clearly describe where, on the graph, the ice was melting and where the water was turning to a gas.

Although the change from liquid to gas at 100^{o}C was often correctly described, there was often confusion about where the ice was melting and where the temperature of liquid water was rising. In particular, melting was often thought to occur either immediately that the temperature first reached 0^{o}C or over the time when the temperature was rising from 0^{o}C to 100^{o}C.

*(d) A student is investigating the melting of ice.

The student has some crushed ice in a beaker at a temperature of –20 °C.

The student heats the beaker and its contents for 20 minutes.

Figure 14 is a graph of the student's results.

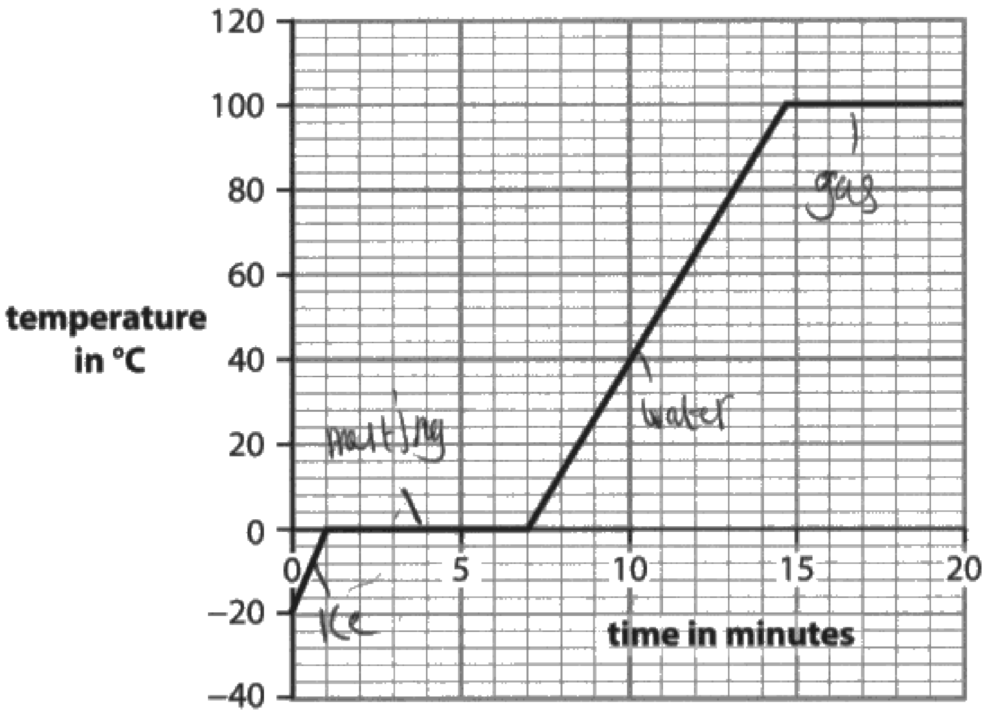


Figure 14

Using information from the graph, describe the changes that take place in the 20 minutes shown on the graph.

Your answer should refer to

- data from the graph
- the state (solid, liquid or gas) of the contents of the beaker.

(6)

~~at~~ At -20°C the state ~~is~~ of the ice is solid, at 1-7 mins at 0°C the ice start to melt into water liquid form. Then at 7-15 minutes the water slowly starts to ~~to~~ evaporate from liquid to gas as we move from 0°C to 100°C, however at 100°C temperature is no longer the limiting factor so at 15-20 minutes the ice just stays in its gas form as there is no form beyond this that it can take.

ResultsPlus
Examiner Comments

The labels on the graph give a good indication that the candidate understands the changes of state and when they are happening.

The writing confirms this although it becomes a bit confused about when the water evaporates by stating that this occurs between 7 and 15 minutes.

An answer does not need to be totally free of errors in order to demonstrate accurate and relevant physics understanding.

Level 3 response scoring 6 marks.

• At 0 Minutes tempature of the Substance is 20° which is also a Solid

• A 7 Minutes the Solid starts to melt

• It gradually goes up increasing the Temparature

• The water at 15 Minutes reaches it's boiling point and this the ~~wte~~ where it starts evaporating into ~~geses~~ gases

ResultsPlus
Examiner Comments

The first statement about being a solid at the start is correct although the temperature is stated to be 20^{o}C and not – 20^{o}C.

The, incorrect, idea that melting starts at 7 mins was often seen. Many candidates did not seem to realise that the melting took place between 1 and 7 mins while the temperature remained at 0^{o}C

The statement that the water was turning into gas after 15 minutes was also correct.

This is a typical level 2 response that demonstrates physics understanding that is mostly relevant but not fully detailed.

4 marks

Paper Summary

Based on their performance on this paper, candidates should:

- make sure that they have a sound knowledge of the fundamental ideas in all the topics
- get used to the idea of applying their knowledge to new situations by attempting questions from previous examination papers
- draw neat diagrams to help their answer, especially when depicting magnetic fields
- note that where a question involves a calculation, they should make sure they write down the equation they are using (if not given in the question) and show each step in their working
- make sure that they recognise SI prefixes such as m and k and n and how to handle these in calculations

- understand how to round values given on a calculator to a suitable number of significant figures

- use the marks at the side of a question as a guide to the form and content of their answer.

Grade boundaries

Grade boundaries for this, and all other papers, can be found on the website on this link:

https://qualifications.pearson.com/en/support/support-topics/results-certification/grade-boundaries.html

Pearson Education Limited. Registered company number 872828
with its registered office at 80 Strand, London WC2R 0RL.