OASB Science Department
Physics Paper 1 Revision Pack (Double – FT)

Name: _____

Lesson	Things I need to focus on:
1	
2	
3	
4	
5	
6	
7	

Topic	Tier	Revision Guide (double)	Learning statement
Energy Types	F	172	Describe ways in which energy can be transferred within a system
Energy Types	F	170	Describe ways to store energy
Energy Types	F	170	Describe the law of conservation of energy
Energy Types	F	170	Describe concepts of open and closed systems
Energy Types	F	172	Describe ways to reduce unwanted energy transfers
Energy Types	F	172	Link energy loss to insulation and thermal conductivity
Energy Types	F	173	Define renewable and non-renewable energy resources
Energy Types	F	173	Compare & contrast energy resources in terms of reliability, cost and political, environmental & social factors
Work, power and efficiency	F	160	Define and calculate work done using E=Pt and E=fd
Work, power and efficiency	F	193	Define and calculate power using P=VI and E = Pt
Work, power and efficiency	F	193	Describe examples of applications of power in everyday life
Work, power and efficiency	F	195	Use and rearrange both equations for calculating efficiency
Elastic Objects & potential energy	F	160	Describe elastic and inelastic deformation
Elastic Objects & potential energy	F	160	Explain the effect of forces on elastic objects
Elastic Objects & potential energy	F	161	Describe Hooke's Law qualitatively and using the equation F = ke
Elastic Objects & potential energy	F	161	Explain 'word done' when applied to stretching or compressing a spring
Elastic Objects & potential energy	F	160	Explain the difference between a linear and a non-linear relationship
Elastic Objects & potential energy	F	160	Interpret data from a force extension investigation
Elastic Objects & potential energy	F	161	**RP Force and Extension:** Investigate the relationship between force and extension for spring (Hooke's Law)
Elastic Objects & potential energy	F	170	Use the elastic potential energy equation ($Ee=1/2ke^2$)
Elastic Objects & potential energy	F	170	Use and rearrange the equation for kinetic energy ($Ek=1/2mv^2$)
Elastic Objects & potential energy	F	170	Use and rearrange the equation for gravitational potential energy (Eg=mgh)
Nuclear Physics	F	212	Describe the structure and size of an atom
Nuclear Physics	F	212	Calculate the number of protons, neutrons and electrons in an atom
Nuclear Physics	F	212	Describe how electrons can change energy level
Nuclear Physics	F	212	Describe isotopes
Nuclear Physics	F	212	Describe what an ion is
Nuclear Physics	F	213	Describe the development of the model of the atom (Plum-pudding, Rutherford, Neils Bohr and Chadwick).
Radioactive decay and Radiation	F	214	Describe what radioactive decay is
Radioactive decay and Radiation	F	214	Recall the definition and units for activity and count rate
Radioactive decay and Radiation	F	215	Describe what makes up alpha, beta, gamma and neutron radiation
Radioactive decay and Radiation	F	214	Describe the properties of each type of radiation
Radioactive decay and Radiation	F	217	Use nuclear equations to represent radioactive decay
Radioactive decay and Radiation	F	216	Define half-life
Radioactive decay and Radiation	F	216	Complete half-life calculations from graphs or other data
Radioactive decay and Radiation	F	215	Describe the impact and precautions for radioactive contamination
Radioactive decay and Radiation	F	215	Analyse data about the effects of radiation on people
Electricity Introduction	F	188	Identify the key circuit symbols.
Electricity Introduction	F	188	Define current, charge and potential difference.
Electricity Introduction	F	188	Use and rearrange equations for calculating current.
Electricity Introduction	F	188	Predict the current at given points within a series and parallel circuit.
Electricity Introduction	F	189	Predict the potential difference (voltage) at given points within a series and parallel circuit.
Electricity Introduction	F	189	Describe the relationship between current, potential difference and resistance.
Electricity Introduction	F	189	Use and rearrange equations for calculating current, potential difference and resistance.
Electricity Introduction	F	189	Recall units for current, potential difference and resistance.
Series and Parallel Circuits	F	192	Compare and contrast series and parallel circuits in terms of current and potential difference.
Series and Parallel Circuits	F	192	Calculate resistance in series circuits and describe resistance in parallel circuits.
Series and Parallel Circuits	F	189	**RP Resistance:** Use circuit diagrams to set up circuits to investigate the factors affecting resistance (length of a wire at constant temperature and combinations of resistors in series and parallel.)
Ohmic/Non-ohmic & types of resistors	F	191	Describe the relationship between current and potential difference in ohmic conductors.
Ohmic/Non-ohmic & types of resistors	F	191	Explain how resistances change in thermistors and LDRs.
Ohmic/Non-ohmic & types of resistors	F	191	List the applications of thermistors and LDRs.
Ohmic/Non-ohmic & types of resistors	F	191	Interpret graphs to determine whether relationships are linear or non-linear.
Ohmic/Non-ohmic & types of resistors	F	190	**RP I-V Characteristics:** Investigate V-I characteristics using circuits.
Mains electricity	F	194	Describe the properties of mains electricity in the UK (A.C., Frequency and Voltage)
Mains electricity	F	194	Explain the difference between direct and alternating potential difference
Mains electricity	F	194	Describe the three core cables and the wires that they are made up of and the dangers of these
Energy and Power of Electricity	F	193	Use and rearrange the P=IV equation (electrical power)
Energy and Power of Electricity	F	193	Use and rearrange the $P=I^2R$ equation (electrical power)
Energy and Power of Electricity	F	196	Describe energy transfers in electrical appliances
Energy and Power of Electricity	F	195	Use and rearrange E=Pt
Energy and Power of Electricity	F	196	Use and rearrange E=QV
Energy and Power of Electricity	F	193	Explain how the power of a circuit is related to potential difference, current and energy
The National Grid	F	197	Describe the components of the national grid
The National Grid	F	197	Explain the role of step up and step down transformers in the national grid and use this to explain why it is an efficient system for transferring energy
Density	F	210	Use and rearrange $\rho = m/v$
Density	F	210	Draw simple diagrams to model the difference between solids, liquids and gases

Density	F	210	Link the arrangement of atoms and molecules to different densities of the states
Density	F	210	**RP Density:** Determine the densities of regular and irregular solid objects and liquids
Changes of state and latent heat	F	210	Describe how mass is conserved during changes of state
Changes of state and latent heat	F	211	Explain why changes of state are physical changes
Changes of state and latent heat	F	170	Define internal energy
Changes of state and latent heat	F	171	Explain the effect of heating on the energy within a system and calculate energy change during a state change.
Changes of state and latent heat	F	211	Describe 'latent heat' of a material including specific latent heat of fusion and specific latent heat of vaporisation
Changes of state and latent heat	F	211	Explain and calculate 'specific latent heat' using the E=mL
Changes of state and latent heat	F	211	Interpret heating and cooling graphs that include changes of state
Specific Heat Capacity	F	211	Explain the differences between 'heat' and 'temperature'
Specific Heat Capacity	F	171	Define and calculate specific heat capacity
Specific Heat Capacity	F	171	Use and rearrange equations for calculating specific heat capacity
Specific Heat Capacity	F	171	**RP Specific Heat Capacity:** Investigate the specific heat capacity of materials
Specific Heat Capacity	F	171+211	Distinguish between specific heat capacity and specific latent heat
Gas Pressure and Fluid Pressure	F	210	Describe the motion of particles in a gas and relate this to pressure, kinetic energy and temperature
Gas Pressure and Fluid Pressure	F	210	Explain the relationship between temperature and pressure of a gas at constant volume

Lesson 1

	Topic:	**Energy, Heat Loss and Efficiency**
1	What type of energy store do moving objects have?	Kinetic energy
2	The law of conservation of energy states what three things that can happen to energy	Transferred usefully, stored or dissipated
3	Which word means 'wasted into the surroundings'?	Dissipated
4	What type of heat transfer occurs in solids?	Conduction
5	What type of heat transfer happens only in fluids (gas and liquids)?	Convection
6	Which is the only type of thermal energy transfer can occur in a vacuum?	Radiation
7	What is the unit for energy?	Joules (J)

	Topic:	**Work, Power and Specific Heat**
1	Equation for work done.	Work done (J) =Force (N) x distance (m)
2	What is work done?	Energy transferred.
3	What is work done?	Energy transferred.
4	Equation for power.	Power (W)= Energy transferred (J)/time (s)
5	Define power.	Rate at which energy is transferred.
6	Equation for efficiency in terms of energy	efficiency = useful output energy transfer/total input energy transfer
7	Equation for efficiency in terms of power	efficiency = useful output power/total input power

Notes

Physics Revision: Energy Loss and Efficiency

Mastery Matrix Points

Describe ways to reduce unwanted energy transfers- revision guide page number 172
Link energy loss to insulation and thermal conductivity- revision guide page number 172
Use and rearrange both equations for calculating efficiency
Define renewable and non-renewable energy resources- revision guide page number 173

Key Knowledge

The law of conservation of energy states that energy can either be - _____ usefully, _____, or _____.

Two ways that we can reduce energy being wasted:
- _____ (reducing friction)
- _____ (reducing heat loss)

Definitions:
Dissipated – _____
_____

Renewable resource – _____
_____

Non-renewable – _____
_____

The higher the thermal conductivity of a material the _____ the rate of energy transfer by conduction.

Two factors that affect how quickly a building cools down
- _____ of the walls
- the t_____ c_____ of the walls

Equations:
Efficiency =

Efficiency is always a ____ or a _____ number

Understanding and Explaining

1. Describe the energy transfers when…
   a. an object is projected upwards – _____

   b. a car braking – _____

   c. water boiling in a kettle – _____
2. Explain how changes could be made to a bike to reduce the unwanted transfer of heat through friction: _____
   _____
3. A kettle transfers 20J of electrical energy into 5J of thermal energy. Calculate the efficiency of the kettle.

4. Show how to rearrange the efficiency equation for 'useful energy output'.
   useful energy output =

5. Put these resources into the correct column:
   biofuel, nuclear, wind, hydroelectric, geothermal, tidal, coal, oil, natural gas, solar, waves

Renewable	Non-renewable

Physics Revision: Work, Power and Energy

Mastery Matrix Points

Define and calculate work done
Define and calculate power
Describe examples of applications of power in everyday life

Key Knowledge

Definitions

Work done –

_____

Power –

_____

Equations (including units)

Work done ( ) =

Power ( ) =

Understanding and Explaining

1. Calculate the work done by a 100N car when it travels 10m.

2. Calculate the force needed to push a box 5m if you transfer 20J of energy to move it.

3. Calculate the distance travelled by a car of 200N if 1.5kJ of energy is transferred.

4. Calculate the power of the car in question 1 if it is moving for 80s.

5. Two kettles bring the same amount of water to boil. Kettle A takes 1 minute and kettle B takes 3 minutes. Explain which the most powerful kettle is.

_____

_____

_____

6. Convert the following:

1 minute to seconds =

1 hour to seconds =

1kW to W =

Q1.

Different energy sources are used to generate electricity.

(a) Use words from the box to match the correct energy source to each of the descriptions given in the table.

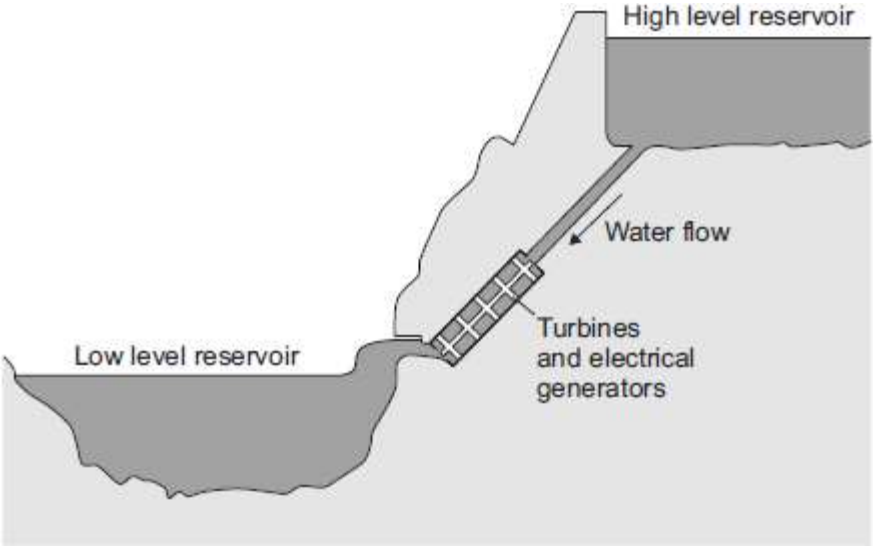
biofuel	**coal**	**geothermal**	**nuclear**	**waves**

Description	**Energy source**
Energy from the Earth's core is used to heat water.	
Fission of uranium nuclei is used to heat water.	
Gases from rotting plant material are burned to heat water.	

(3)

(b) Energy can be stored in a pumped storage power station.

The figure shows a pumped storage power station.



When electricity is needed, the water in the high level reservoir is allowed to flow to the low level reservoir. The flowing water generates electricity.

Use the correct answer from the box to complete each sentence.

electrical	**gravitational potential**	**kinetic**	**nuclear**	**sound**

The water in the high level reservoir stores _____ energy.

The flowing water has _____ energy.

The water turns the turbine which is connected to the generator.

The generator produces some _____, this is wasted energy.

(3)

(c) The total power input to a pumped storage power station is 600 MW.

The useful power output is 540 MW.

(i) Calculate the efficiency of this pumped storage power station.

_____

_____

_____

Efficiency = _____

(2)

(ii) Calculate how much power is wasted by the pumped storage power station.

_____

Power = _____ MW

(1)

(iii) How is the temperature of the surroundings affected by the energy wasted by the pumped storage power station?

_____

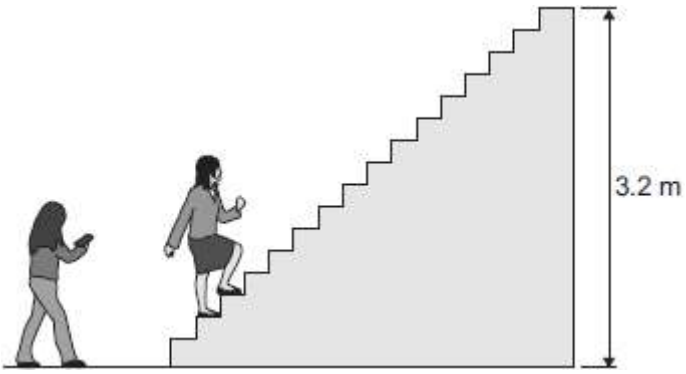
(1)

(Total 10 marks)

Q2.

A student did an experiment to calculate her power.
The diagram below shows how she obtained the measurements needed.

The student first weighed herself and then ran up a flight of stairs. A second student timed how long it took her to go from the bottom to the top of the stairs. The height of the stairs was also measured.



(a) Complete the following sentence.

To run up the stairs the student must do work against

the force of _____ .

(1)

(b) The student did 2240 J of work going from the bottom of the stairs to the top of the stairs.

The student took 2.8 seconds to run up the stairs.

(i) Calculate the power the student developed when running up the stairs.

_____

_____

Power = _____ W

(2)

(ii) How much gravitational potential energy did the student gain in going from the bottom to the top of the stairs?

Tick (✓) **one** box.

much more than 2240 J	☐
2240 J	☐
much less than 2240 J	☐

(1)

(c) Another four students did the same experiment.

The measurements taken and the calculated values for power are given in the table.

Student	**Weight in newtons**	**Time taken in seconds**	**Power in watts**
A	285	3.8	240
B	360	2.4	480
C	600	3.4	560
D	725	4.0	580

(i) To make a fair comparison of their powers the students kept **one** variable in the experiment constant.

What variable did the students keep constant?

_____

(1)

(ii) From the data in the table a student wrote the following conclusion.

'The greater the weight of the student the greater the power developed.'

Suggest why this conclusion may **not** be true for a larger group of students.

_____

(1)

Independent exam questions

Q3.

The image shows a man using a leaf blower to move some leaves.

The leaf blower is powered by an electric motor connected to a battery.

(a) Energy transfers take place when the leaf blower is being used.

Use the correct answer from the box to complete each sentence.

chemical	**electrical**	**kinetic**	**nuclear**	**sound**

The battery stores _____ energy which is transferred into electrical energy.

The electric motor transfers electrical energy usefully into _____ energy.

The motor wastes energy as _____ energy and as energy that heats the surroundings.

(3)

(b) The total power input to the leaf blower is 750 W.
The useful power output of the leaf blower is 360 W.

Calculate the efficiency of the leaf blower.

_____

_____

_____

_____

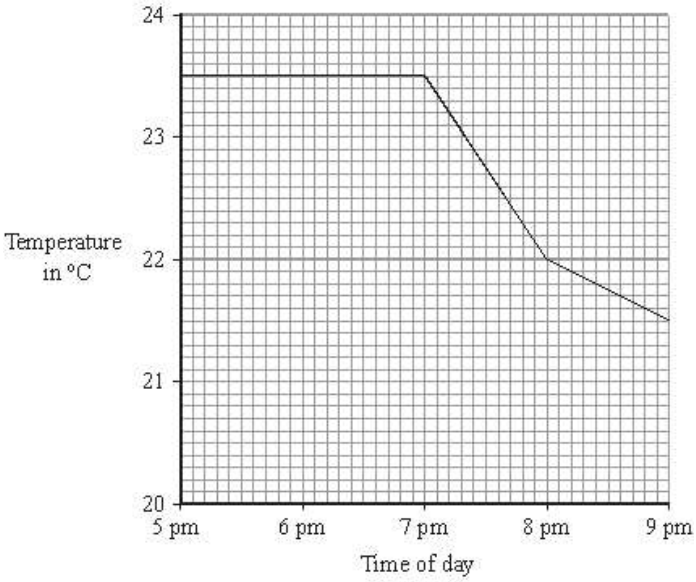
Efficiency = _____

(2)

(Total 5 marks)

Q4.

(a) The graph shows the temperature inside a flat between 5 pm and 9 pm. The central heating was on at 5 pm.



(i) What time did the central heating switch off?

_____

(1)

(ii) Closing the curtains reduces heat loss from the flat.

What time do you think the curtains were closed?

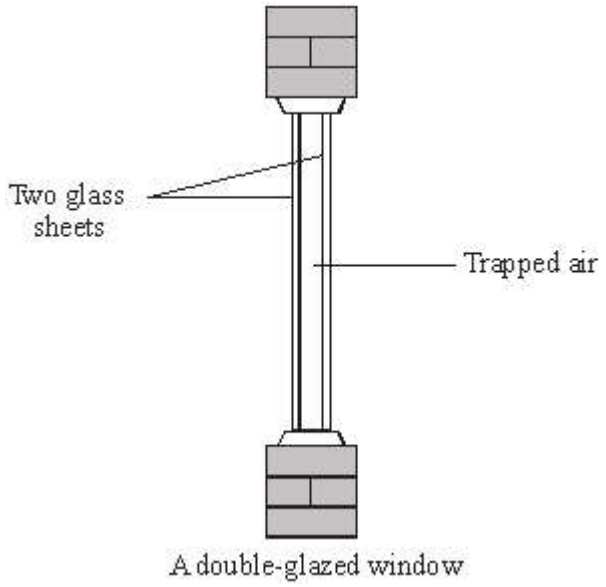
_____

Give a reason for your answer.

_____

(2)

(b) Less heat is lost through double-glazed windows than through single-glazed windows.



Complete the following sentences by choosing the correct words from the box. Each word may be used once or not at all.

conduction	**conductor**	**convection**	**evaporation**	**insulator**	**radiation**

Air is a good _____ . When trapped between two sheets of

glass it reduces heat loss by _____ and _____

(3)

(c) The table gives information about three types of house insulation.

Type of insulation	Cost to install	Money save each year on heating bills	Payback time
Double glazing	£4000	£200	20 years
Loft insulation	£300	£100	3 years
Cavity wallinsulation	£600	£150	

(i) Use the information in the table to calculate the payback time for cavity wall insulation.

_____

(1)

(ii) Explain why people often install loft insulation before installing double glazing or cavity wall insulation.

_____

_____

_____

_____

(2)

(Total 9 marks)

Q5.

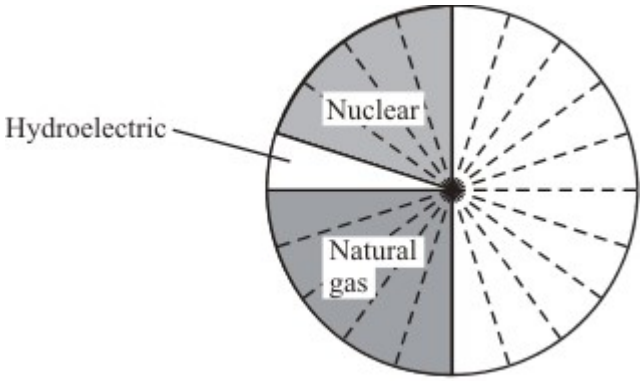
The table shows the main sources of energy used to generate electricity.

Energy source	Percentage (%)
coal	35
hydroelectric	5
natural gas	25
nuclear	
oil	15

(a) Complete the table by writing in the percentage for nuclear power.

(1)

(b) Use the information from the table to complete and label the pie chart below.



(2)

(c) Why can hydroelectric generators be used to meet sudden increases in the demand for electricity?

_____

(1)

(d) Gases are released when fossil fuels burn.

(i) Which **one** of these gases increases the greenhouse effect?

_____

(1)

(ii) Which **one** of these gases produces acid rain?

_____

(1)

(Total 6 marks)

Lesson 2

	Elastic objects and potential energy (9.2.3)	
1	What is the equation for elastic potential energy?	Ee=1/2ke2 Elastic potential energy (J) = 1/2 x spring constant (N/m) x extension (m)
2	What is the equation for kinetic energy?	Ek = 1/2 mv2 Kinetic energy (J) = 1/2 x mass (Kg) x velocity2 (m/s)
3	What is the equation for gravitational potential energy?	Eg=mgh Gravitational potential energy (J) = mass (kg) x gravitational field strength (N/kg) x height (m)
4	What type of energy is stored in a stretched elastic band?	Elastic potential energy
5	What sort of energy is stored in a bungee cord?	Elastic potential energy
6	Define the term for an object returning to its original shape after being stretched	Elastic deformation
7	Identify the Law: "The extension of a spring is directly proportional	Hooke's Law

	to the force applied to it."	

	Mains electricity, energy and the power of electricity (10.2.11)	
1	Is mains electricity AC or DC?	AC
2	What do AC and DC mean?	Alternating current Direct current.
3	State the frequency and potential difference of UK mains supply	Frequency= 50Hz Potential difference= 230V
4	What are the names of the three wires in a three core cable	Live, neutral, earth.
5	State the colour of a)earth wire, b)live wire, c) neutral wire	a)Green and yellow stripes, b)brown, c)blue
6	State the function of the live wire.	Carries alternating potential difference from the supply
7	Function of the earth wire.	Safety wire to remove excess potential difference (to stop the appliance becoming live)

	Energy and power of electricity and the National grid	
1	State the equation that links current, potential difference and power	P = IV power (W) = current (I) x potential difference (V)
2	State the equation that links current, power and resistance	P = I2R Power (W) = current2 (A) x resistance (Ω)
3	State the equation that links time, energy and power	E=Pt energy (J) = power (W) x time (s)
4	State the equation that links energy, potential difference and charge flow	E = QV energy (J) = charge flow (C) x potential difference (V)
5	What is the national grid used for?	Supplying electrify to houses
6	State the effect of step up transformers on potential difference and current	Increases p.d. Decreases current
7	State the effect of step down transformers on potential difference and current	Decreases p.d. Increasses current

Notes

Physics Revision: Energy Equations

Key Knowledge

Write out the Equations:

Elastic potential energy=

Kinetic energy=

Gravitational energy=

Name	Symbol	Units
	E_k	
	E_g	
	E_e	
	m	
	v	
	g	
	h	
	k	
	e	

Mastery Matrix Points

Describe the law of conservation of energy in open and closed systems.
Describe ways in which energy can be transferred within a system
Describe ways to store energy
Use and rearrange equations for elastic potential energy
Use and rearrange equations for kinetic energy
Use and rearrange equations for gravitational potential energy
Recall the units and symbols for the quantities in these equations

Understanding and Explaining

1. Explain the energy transfers when
   i) a ball is projected upwards e.g.
   Kinetic → gravitational (then → kinetic as it falls back down)

   ii) a moving car hits an obstacle
   _____

   iii) a car is accelerated by a constant force
   _____

   iv) a vehicle slows down
   _____

   v) water boils in an electric kettle.
   _____

2. Show how to rearrange the elastic potential energy equation for
   (i) k (ii) e

3. Show how to rearrange the kinetic energy equation for
   (i) m (ii) v

4. Show how to rearrange the gravitational potential energy equation for:
   (i) m (ii) g (iii) h

Physics Revision: Mains Electricity and the National Grid

Key Knowledge

Mains electricity

- ac or dc? _____
- Frequency: _____
- Potential difference: _____

Three wires in mains plug:

Wire	*Colour*

Potential difference between live wire and earth wire = V

Potential difference of neutral wire = V

Potential difference of earth wire = V, unless…

National grid definition: _____

_____

Step up transformers definition:

_____

Step down transformers definition:

_____

Mastery Matrix Points

Describe the properties of mains electricity in the UK (A.C., Frequency and Voltage)
Explain the difference between direct and alternating potential difference
Describe the three core cables and the wires that they are made up of and the dangers of these
Describe the components of the national grid
Explain the role of step up and step down transformers in the national grid and use this to explain why it is an efficient system for transferring energy

Understanding and Explaining

1. Explain the difference between direct current and alternating current.

   _____
   _____
   _____

2. Describe the roles of the live wire, neutral wire and earth wire in a 3 pin UK plug.

   live wire: _____
   neutral wire: _____
   earth wire _____

3. Describe the dangers of i) the live wire, even if the device is off ii) the live wire and earth wire touching.

   _____
   _____
   _____
   _____

4. Explain how step up transformers increase the efficiency at which electricity is transmitted from the national grid.

   _____
   _____
   _____
   _____

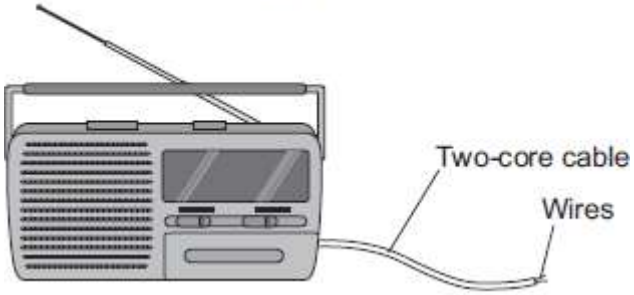
5. Describe and explain the role of step down transformers in the national grid.

   _____
   _____
   _____
   _____

Q6.

Figure 1 shows a radio. The radio can be powered by connecting the two-core cable to the mains electricity supply.

Figure 1



(a) (i) What must be fitted to the cable before it can be connected to the mains electricity supply?

_____

(1)

(ii) There are only two wires inside the cable.
What are the names of the two wires inside the cable?

Tick (✓) **one** box.

Earth and live ☐

Earth and neutral ☐

Live and neutral ☐

(1)

(iii) Use the correct answer from the box to complete the sentence.

double	**extra**	**fully**

It is safe to connect the radio to the mains electricity supply using a two-core cable

because the radio is _____ insulated.

(1)

(b) The radio can also be powered by a battery.

What type of current does a battery supply?

Tick (✓) **one** box.

Alternating current (a.c.) only ☐

Direct current (d.c.) only ☐

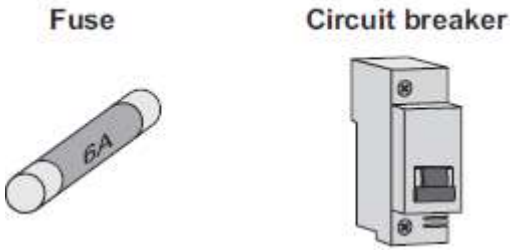
Both a.c. and d.c. ☐

(1)

(c) **Figure 2** shows a fuse and a circuit breaker.

Fuses and circuit breakers are able to disconnect and switch off circuits.

Figure 2



(i) Use the correct answer from the box to complete the sentence.

earth	**live**	**neutral**

A fuse or a circuit breaker is connected to the _____ wire in a circuit.

(1)

(ii) What happens to cause a fuse or circuit breaker to disconnect a circuit?

_____

_____

(1)

(iii) Suggest **two** advantages of using a circuit breaker to disconnect a circuit compared with using a fuse.

1. _____

_____

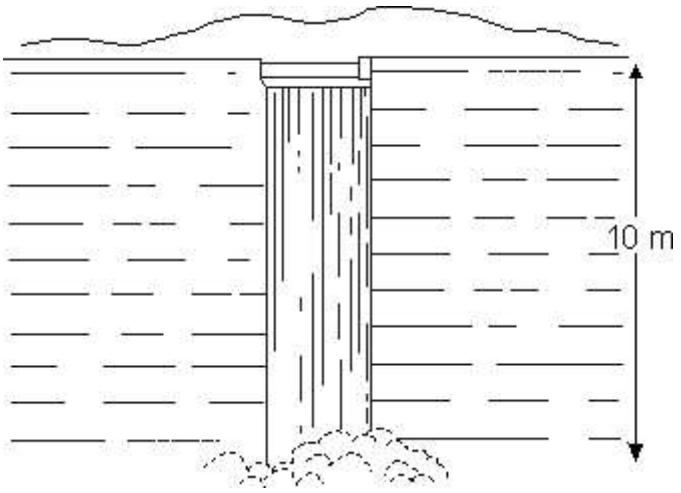
2. _____

_____

(2)
(Total 8 marks)

Q7.

The diagram below shows water falling over a dam at the end of a reservoir. The water falls a vertical distance of 10 m.



(a) Calculate the potential energy of 1 kg of water at the top of the waterfall.

_____

_____

Answer _____ J

(2)

(b) What will be the kinetic energy of 1 kg of the water just before it lands in the pool?

_____

Answer _____ J

(1)

(c) Use your answer to (b) to calculate the speed of the water as it lands at the bottom of the waterfall.

_____

_____

_____

Answer _____ m/s

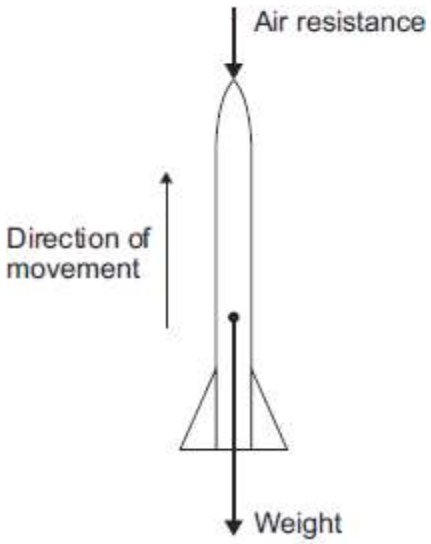
(3)
(Total 6 marks)

Independent exam question

Q8.

(a) **Figure 1** shows the forces acting on a model air-powered rocket just after it has been launched vertically upwards.

Figure 1



(i) How does the velocity of the rocket change as the rocket moves **upwards**?

_____

Give a reason for your answer.

_____

_____

(2)

(ii) The velocity of the rocket is not the same as the speed of the rocket.

What is the difference between the velocity of an object and the speed of an object?

_____

_____

_____

(1)

(b) The speed of the rocket just after being launched is 12 m / s.
The mass of the rocket is 0.05 kg.

(i) Calculate the kinetic energy of the rocket just after being launched.

_____

_____

_____

Kinetic energy = _____ J

(2)

(ii) As the rocket moves upwards, it gains gravitational potential energy.

State the maximum gravitational potential energy gained by the rocket.

Ignore the effect of air resistance.

Maximum gravitational potential energy = _____ J

(1)

(iii) Calculate the maximum height the rocket will reach.

Ignore the effect of air resistance.

Gravitational field strength = 10 N / kg.

_____

_____

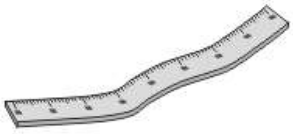
_____

Maximum height = _____ m

(2)

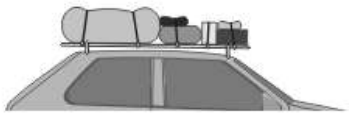
Q9.

(a) The pictures show four objects. Each object has had its shape changed.



Bent metal ruler

A



Stretched bungee cords

B

Springs on a playground ride

C

Moulded plastic model car body

D

Which of the objects are storing elastic potential energy?

_____

Explain the reason for your choice or choices.

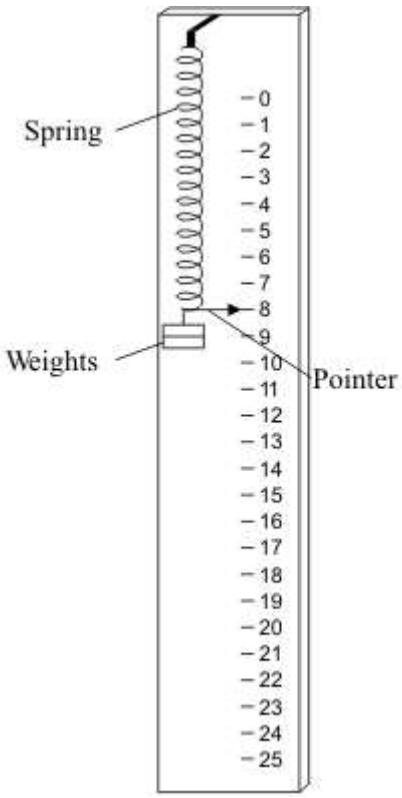
_____

_____

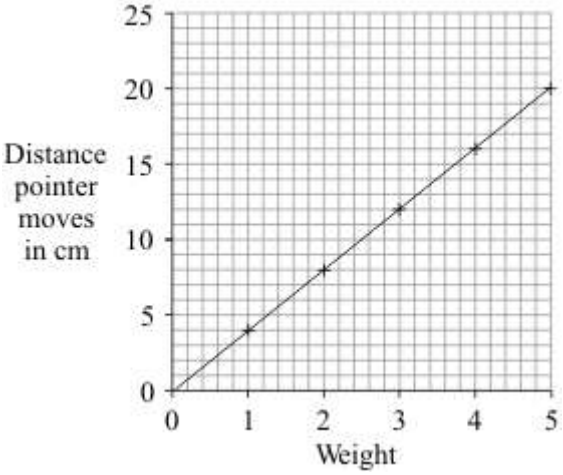
_____

(3)

(b) A student makes a simple spring balance. To make a scale, the student uses a range of weights. Each weight is put onto the spring and the position of the pointer marked



The graph below shows how increasing the weight made the pointer move further.



(i) Which **one** of the following is the unit of weight?.

Draw a ring around your answer.

joule **kilogram** **newton** **watt**

(1)

(ii) What range of weights did the student use?

_____

(1)

(iii) How far does the pointer move when 4 units of weight are on the spring?

_____

(1)

(iv) The student ties a stone to the spring. The spring stretches 10 cm.

What is the weight of the stone?

_____

(1)

(Total 7 marks)

Lesson 3

	Topic:	**Nuclear Physics (10.2.1)**
1	What is the size of the atom?	1 x 10-10m
2	Which three sub atomic particles are found in the atom?	Protons, neutrons and electrons
3	Are atoms positive, negative or neutral?	Neutral
4	What is the atomic number?	Number of protons (smaller number)
5	What is the mass number?	Number of protons AND neutrons (bigger number)
6	Describe the plum pudding model	The atom is a ball of positive charge with negative electrons embedded in it
7	What is the name of the current model of the atom?	Nuclear model

	Topic	**Radioactive decay and radiation (10.2.2)**
1	What two words can we use to describe the process of radioactive decay?	Random and unpredictable
2	Name the four types of nuclear radiation	alpha particle, beta particle, gamma ray, neutron
3	Describe the structure of an alpha particle	2 neutrons & 2 protons (helium nucleus)
4	What is a beta particle?	A negative electron
5	What is a gamma ray?	An electromagnetic wave
6	Three main types of radiation in order of high to low ionising power.	alpha, beta, gamma
7	Three main types of radiation in order of high to low penetrating power.	gamma, beta, alpha

Notes

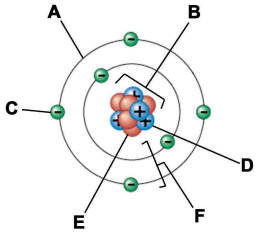
Physics Revision: Atomic Physics

Key Knowledge

Radius of an atom = _____

Radius of a nucleus is _____ times smaller than the atomic radius.

Label the parts of an atom:



What order were the parts of the atom discovered?

How do you use the periodic table:

To find the number of protons…

_____

To find the number of electrons…

_____

To find the number of neutrons…

_____

Definitions:

Isotope: _____

_____

Ion: _____

_____

Plum pudding model: _____

_____

Nuclear model: _____

_____

Mastery Matrix Points

Describe the structure and size of an atom
Calculate the number of protons, neutrons and electrons in an atom
Describe how electrons can change energy level
Describe isotopes
Describe what an ion is
Describe the development of the model of the atom (Plum-pudding, Rutherford, Neils Bohr and Chadwick).

Understanding and Explaining

1. Explain what would make an electron jump to a higher energy level: _____

   _____

2. Explain what would make an electron fall to a lower energy level: _____

   _____

3. Why might scientists make changes to an existing theory? _____

   _____

4. Describe the alpha scattering experiment, its results and why the results led to a change in the theory of the atom.

What was done: _____

_____

_____

_____

What were the results:

'Most atoms _____, which shows that most of the atom is made up of _____'

'Some of the atoms _____ slightly from the nucleus, and some _____ completely. This shows that at the centre of the atom is _____'

1. Describe the role of Niels Bohr in atomic theory: _____

   _____

2. Describe the contribution of James Chadwick to atomic theory: _____

   _____

   _____

Physics Revision: Radioactivity

Key Knowledge

Definitions:

Radioactivity:_____

_____

Activity: :_____

_____

Count rate :_____

_____

Half life:_____

_____

Irradiation:_____

_____

Contamination:_____

_____

What are these made of?

Alpha –

Beta –

Gamma –

Neutron -

Symbols

Alpha –

Beta –

Gamma -

Properties

	Distance it can in air	What can it penetrate?	Ionising ability? (high/low)
Alpha			
Beta			
Gamma			

What equipment is used to measure radioactive decay?

Mastery Matrix Points

Describe what radioactive decay is
Recall the definition and units for activity and count rate
Describe what makes up alpha, beta, gamma and neutron radiation
Describe the properties of each type of radiation
Use nuclear equations to represent radioactive decay

Define half-life
Complete half-life calculations from graphs or other data
Describe the impact and precautions for radioactive contamination
Analyse data about the effects of radiation on people

Understanding and Explaining

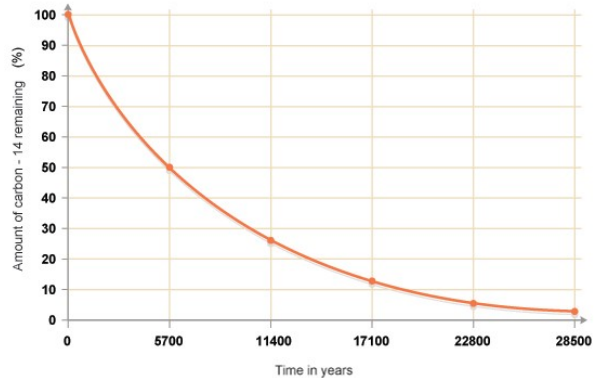
1. Explain why some atoms are radioactive: _____

_____

2. Compare and contrast the properties of alpha, beta and gamma radiation, include penetration through materials, their range in air and ionising power.

Radiation	Made of…	Penetrating power	Ionising power

3. Describe how to show these types of decay using nuclear equations. Give an example for each.
   i) alpha decay ii) beta decay



4. What would be the half life of this substance?
   Explain HOW you worked this out.

5. How much of a radioactive material would be left if the initial activity was 500Bq, the half life was 20 minutes and it was decaying for 2 hours?

6. Give 2 risk ad 2 precautions that should be followed if using radioactive materials

7. Explain why it is important that findings of studies into the effects of radiation on humans should be published.

Guided Exam Question

Q10. Scientists sometimes replace one scientific model with a different model. For example, in the early 20th Century the plum pudding model of the atom was replaced by the nuclear model of the atom. Explain what led to the plum pudding model of the atom being replaced by the nuclear model of the atom.

_____

_____

_____

_____

_____

_____

_____

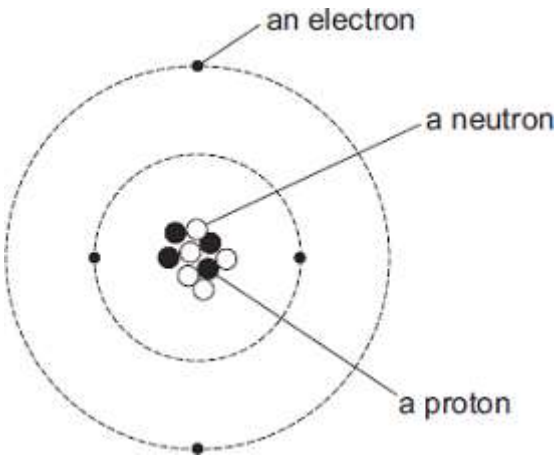
_____

_____

(Total 6 marks)

Q11.

The diagram represents an atom of beryllium. The three types of particle that make up the atom have been labelled.



(a) Use the labels from the diagram to complete the following statements.

Each label should be used once.

The particle with a positive charge is _____ .

The particle with the smallest mass is _____ .

The particle with no charge is _____ .

(2)

(b) What is the mass number of a beryllium atom?

Draw a ring around your answer.

4	**5**	**9**	**13**

Give a reason for your answer.

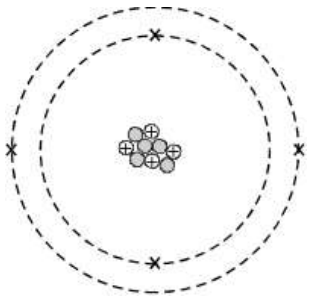
_____

_____

(2)
(Total 4 marks)

Q12.

The diagram shows an atom.



How many protons are there in the nucleus of the atom? _____

What is the mass number of the atom? _____

(Total 2 marks)

Independent Exam Question

Q13. There are many different isotopes of gold. The isotope, gold-198, is radioactive. An atom of gold-198 decays by emitting a beta particle.

(a) Complete the following sentences.

All atoms of gold have the same number of _____

and the same number of _____ .

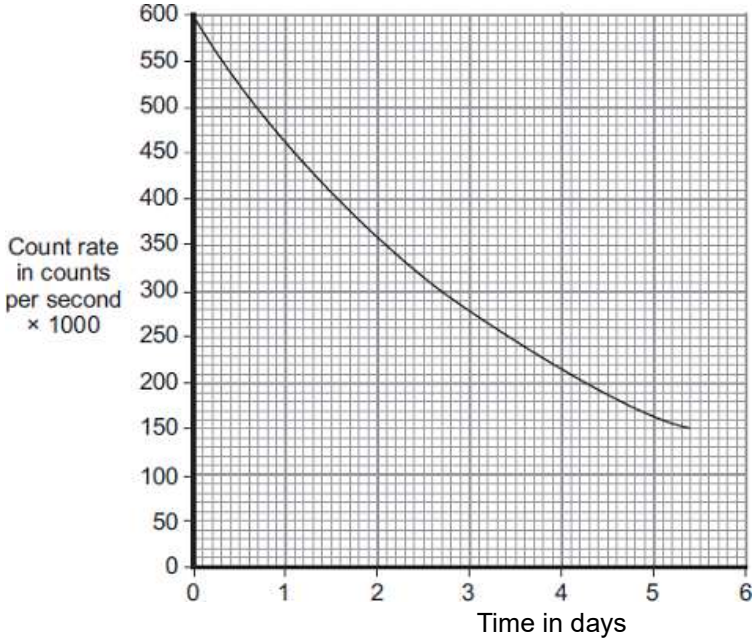
The atoms from different isotopes of gold have different numbers of _____ .

A beta particle is an _____ emitted

from the _____ of an atom.

(3)

(b) The graph shows how the count rate from a sample of gold-198 changes with time.



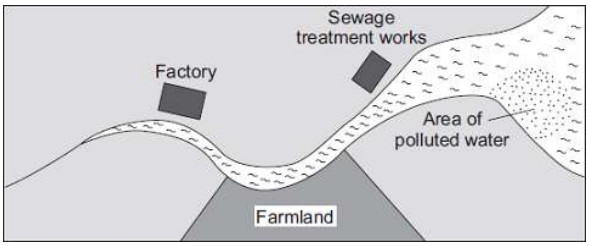
Use the graph to calculate the half-life of gold-198.
Show clearly on the graph how you obtain your answer.

_____

_____

Half-life = _____ days **(2)**

(c) The diagram shows a map of a river and the river estuary.
Environmental scientists have found that water flowing into one part of the river estuary is polluted.
To find where the pollution is coming from, the scientists use a radioactive isotope, gold-198.



The gold-198 is used to find where the pollution is coming from. Explain how.

_____

_____

_____

_____

(2)
(Total 7 marks)

Lesson 4

	Topic	**Electricity introduction (10.2.8)**
1	Which piece of equipment is used to measure current in a circuit?	Ammeter
2	Which piece of equipment is used to measure voltage in a circuit?	Voltmeter
3	State the equation for charge flow	Q=It Charge flow © = current (A) x time (S)
4	State the units for charge flow	Coulombs (C)
5	Define 'electrical current'	Flow of electrical charge
6	How does resistance affect current?	The higher the resistance, the lower the current (inversely proportional)
7	State the units for resistance	Ohms (Ω)

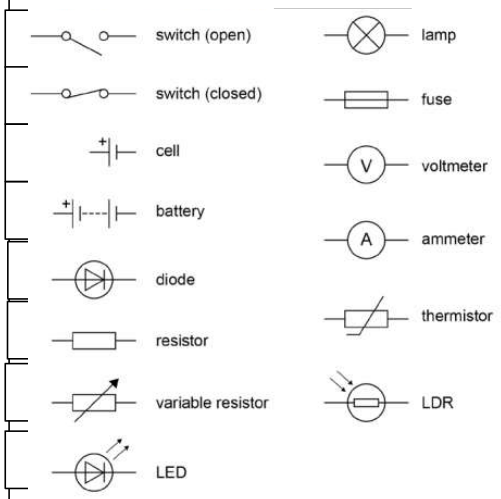
	Topic	**Series and parallel circuits (10.2.9)**
1	Do series circuits have one loop or multiple loops?	1 loop
2	Do parallel circuits have one loop or multiple loops?	Multiple loops
3	Describe the distribution of current in a series circuit	It is the same everywhere
4	Describe the distribution of potential difference in a series	Split between components

	circuit	
5	Describe the distribution of current in a parallel circuit	Split up in the different loops
6	Describe the distribution of potential difference in a parallel circuit	The same in each loop
7	How do you calculate total resistance in a series circuit?	Sum the resistance of each component

Notes

Physics Revision: Circuits

Key Knowledge



Current:

Charge:

Potential Difference:

Equations:
Charge flow =

Potential difference -

Units:

Quantity	Symbol	Units
Current		
Charge		
Potential difference		
Time		
Resistance		

Mastery Matrix Points

Identify the key circuit symbols	Predict the potential difference (voltage) at given points within a series and parallel circuit
Define current, charge and potential difference	Describe the relationship between current, potential difference and resistance.
Use and rearrange equations for calculating current	Use and rearrange equations for calculating current, potential difference and resistance.
Predict the current at given points within a series and parallel circuit	Recall units for current, potential difference and resistance.

Understanding and Explaining

1. **Show how to rearrange the equations**
   (i) V= IR for I. **(ii) Q=It for t.**

2. **Explain how to work out the current in series and parallel circuits**

In series circuits…

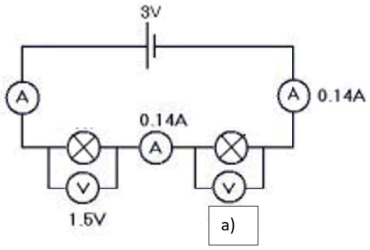
In parallel circuits…

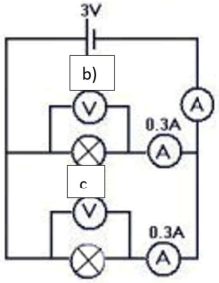
3. **Explain how to work out the potential difference in in series and parallel circuits.**

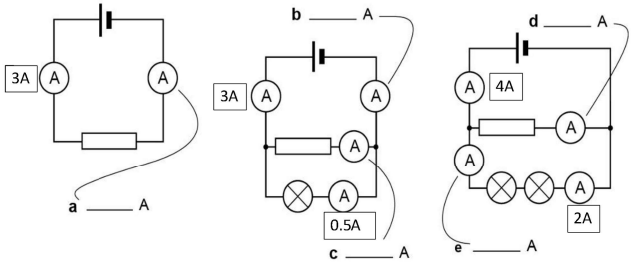
In series circuits…

In parallel circuits…

4. **Complete the missing numbers on these circuits.**







Physics Revision: Series and Parallel Circuits

Key Knowledge

Resistance definition:

Series circuits have…

Circuit diagram of a series circuit:

Parallel circuits have…

Circuit diagram of a parallel circuit:

In a series circuit:

R_{total}=

In a parallel circuit, the total resistance of two resistors is _____than the resistance of the smallest individual resistor.

Mastery Matrix Points

Compare and contrast series and parallel circuits
Calculate resistance in series and parallel circuits
Explain patterns in resistance using words

Understanding and Explaining

1. **Explain how to calculate the total resistance of a series circuit.**

_____

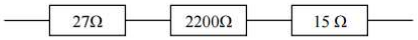
_____

_____

2. **Calculate the total resistance of these components.**

a)

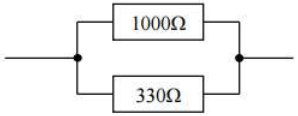
b)



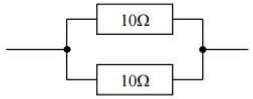
c)

3. **Explain what the resistance will be less than in each of these circuits.**

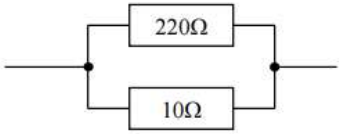
a)



b)

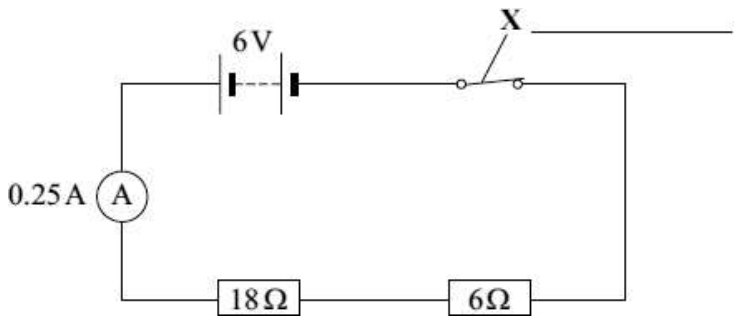


c)



Q14.

A circuit diagram is shown below.



(a) Use a word from the box to label component **X**.

fuse	**switch**	**thermistor**

(1)

(b) Calculate the total resistance of the two resistors in the circuit.

_____

Total resistance = _____ Ω

(1)

(c) The reading on the ammeter is 0.25 A.

The current through the 6 Ω resistor will be:

bigger than 0.25 A **equal to 0.25 A** **smaller than 0.25 A**

Draw a ring around your answer

(1)

(d) The 6 V battery is made by correctly joining several 1.5 V cells in series.

Calculate the number of cells needed to make the battery.

_____

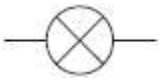
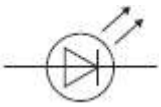
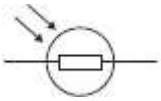
Number of cells = _____

(1)

(Total 4 marks)

Q15.

(a) Draw **one** line from each circuit symbol to its correct name.

Circuit symbol	Name
	Diode
	Light-dependent resistor (LDR)
	Lamp
	Light-emitting diode (LED)

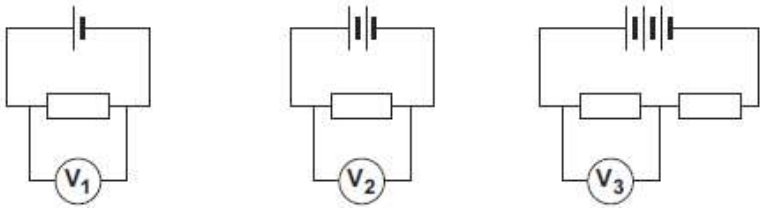
(3)

(b) **Figure 1** shows three circuits.The resistors in the circuits are identical.

Each of the cells has a potential difference of 1.5 volts.

Figure 1

Circuit 1 **Circuit 2** **Circuit 3**



(i) Use the correct answer from the box to complete the sentence.

half	**twice**	**the same as**

The resistance of **circuit 1** is _____ the resistance of **circuit 3**.

(1)

(ii) Calculate the reading on voltmeter $\mathbf{V_2}$.

Voltmeter reading $\mathbf{V_2}$ = _____ V

(1)

(iii) Which voltmeter, $\mathbf{V_1}$, $\mathbf{V_2}$ or $\mathbf{V_3}$, will give the lowest reading?

Draw a ring around the correct answer.

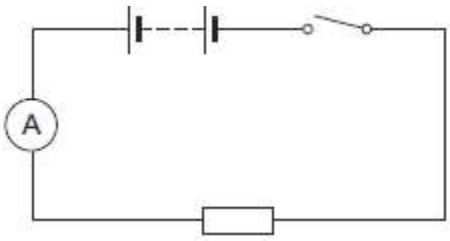
$\mathbf{V_1}$ $\mathbf{V_2}$ $\mathbf{V_3}$

(1)

(c) A student wanted to find out how the number of resistors affects the current in a series circuit.

Figure 2 shows the circuit used by the student.

Figure 2



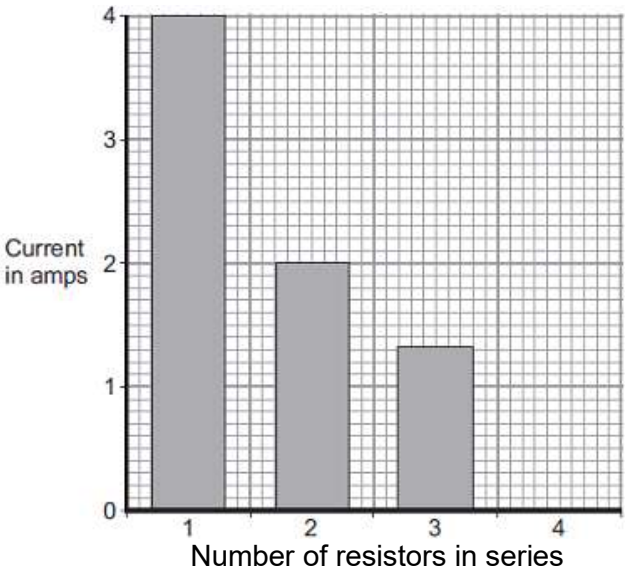
The student started with one resistor and then added more identical resistors to the circuit.

Each time a resistor was added, the student closed the switch and took the ammeter reading.

The student used a total of 4 resistors.

Figure 3 shows three of the results obtained by the student.

Figure 3



(i) To get valid results, the student kept one variable the same throughout the

experiment.

Which variable did the student keep the same?

_____

(1)

(ii) The bar chart in **Figure 3** is not complete. The result using 4 resistors is not shown.

Complete the bar chart to show the current in the circuit when 4 resistors were used.

(2)

(iii) What conclusion should the student make from the bar chart?

_____

_____

(1)

(Total 10 marks)

Lesson 5

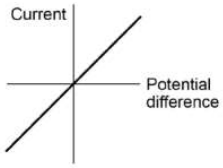
		Electricity – Advanced Circuits
1	In ohmic components, which two variables are directly proportional?	Current and potential difference
2	If current and potential difference are directly proportional, what does this tell us about the resistance?	It is constant (gradient on IV graph).
3	Name 4 non-ohmic conductors	Filament bulb, diodes, thermistors, LDRs
4	Describe the relationship between current and potential difference for a diode.	Current only flows in one direction (has a very high resistance in the other direction)
5	Describe the relationship between temperature and resistance in a thermistor.	Temperature ↑, resistance ↓
6	Describe the relationship between light intensity and resistance in an LDR	Light intensity ↑, resistance ↓
7	Draw the symbol of a resistor.	

Notes

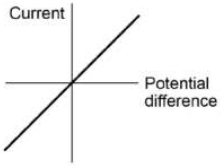
Physics Revision: Advanced Circuits

Key Knowledge

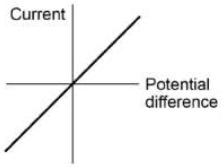
Sketch graphs of I-V (current-potential difference) relationships for different components:



Fixed resistor



Filament bulb



Light emitting diode

As temperature increases, the resistance of a thermistor…….

Uses of thermistors:

As light intensity increases, the resistance of an LDR…….

Uses of LDRs:

Ohm's Law (in a sentence and equation)

Mastery Matrix Points

RP: use circuits to investigate resistanc
Describe the relationship between current and potential difference in ohmic conductors
Describe how resistances changes in thermistors and LDRs
List the applications of thermistors and LDRs
Interpret graphs to determine whether relationships are linear or non-linear
(Required practical) Investigate V-I characteristics using circuits

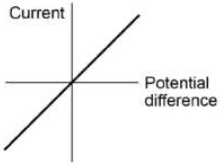
Understanding and Explaining

1. **Name the variables in an experiment about how the resistance of a wire changes with length of the wire.**

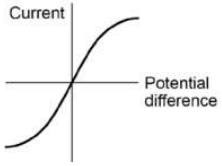
IV: _____ **DV:**_____ **CV:**_____

2. **State if these graphs show linear (ohmic) or non-linear (non-ohmic) relationships.**

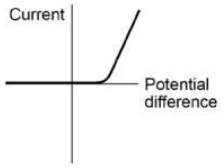
Resistor



Bulb



LED



3. **Draw a circuit diagram to show how you could investigate the I-V relationship for a component.**

Physics Revision: Energy Resources

Mastery Matrix Points

Describe the main energy resources on Earth
Define renewable and non-renewable resources
Describe how energy resources are used
Compare and contrast energy resources in terms of reliability, cost, political, social and environmental factors
Explain patterns and trends in the use of energy resources

Key Knowledge

Definitions:

Energy resources: _____

_____

Renewable

Non-renewable

Name the renewable energy resources:

Name the non-renewable energy resources:

Which resources are not reliable?

Which resources contribute to global climate change through releasing CO_2?

Which resources are used for

- transport?

- heating?

- electricity generation?

Understanding and Explaining

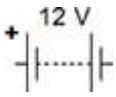
1. **Explain how these energy resources can be used to produce electricity (e.g. turns turbine or burnt) and give the advantages and disadvantages.**

Resource	How is this used to make electricity?	Advantages	Disadvantages
fossil fuels (coal, oil and gas)			
nuclear fuel			
Biofuel			
Wind			
The tides			
hydro-electricity			
Geothermal			
the Sun			
water waves			

Q16.

A student wants to investigate how the current through a filament lamp affects its resistance.

(a) Use the circuit symbols in the boxes to draw a circuit diagram that she could use.

12 V battery	variable resistor	filament lamp	voltmeter	ammeter
				

(2)

(b) Describe how the student could use her circuit to investigate how the current through a filament lamp affects its resistance.

_____

_____

_____

_____

_____

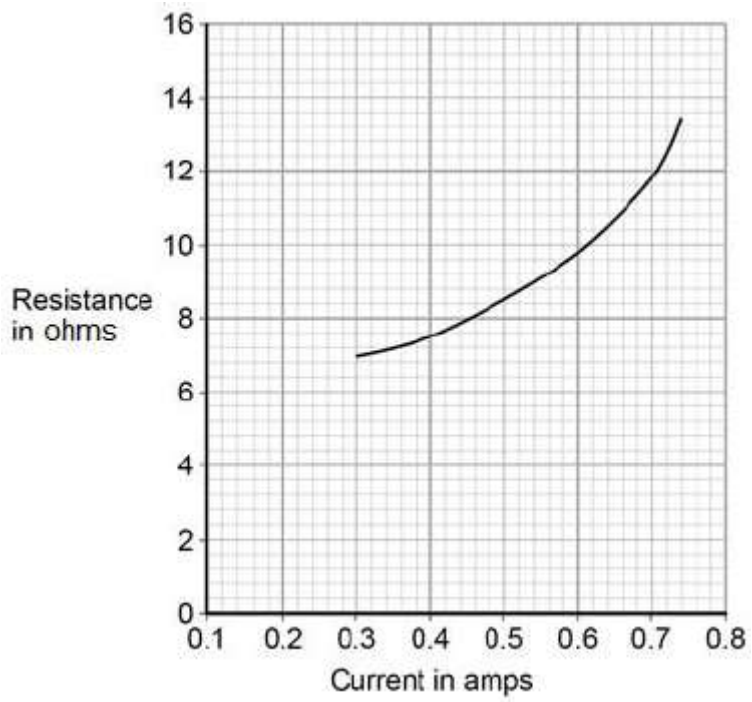
_____

_____

(4)

(c) The student's results are shown in **Figure 1**.

Figure 1



Describe how the resistance of the filament lamp changes as the current through it increases.

_____

_____

(1)

(d) Use **Figure 1** to estimate the resistance of the filament lamp when a current of 0.10 A passes through the lamp.

Resistance = _____ Ω

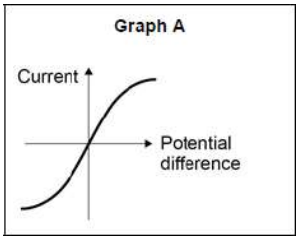
(1)

(e) The current-potential difference graphs of three components are shown in **Figure 2**.

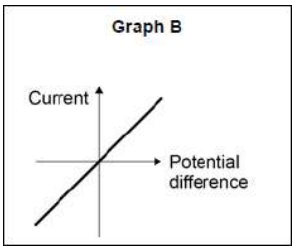
Use answers from the box to identify each component.

diode	**filament lamp**	**light dependent resistor**
resistor at constant temperature		**thermistor**

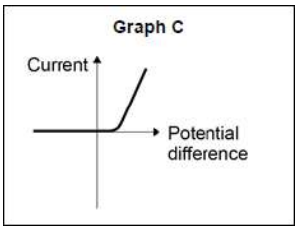
Figure 2



_____



_____



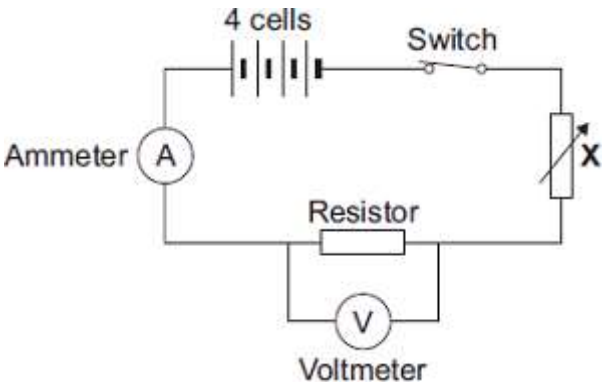
_____

(3)

(Total 11 marks)

Q17.

(a) The diagram shows the circuit that a student used to investigate how the current through a resistor depends on the potential difference across the resistor.



(i) Each cell provides a potential difference of 1.5 volts.

What is the total potential difference provided by the four cells in the circuit?

_____

Total potential difference = _____ volts

(1)

(ii) The student uses the component labelled **X** to change the potential difference across the resistor.

What is component **X**?

Draw a ring around your answer.

light-dependent resistor **thermistor** **variable resistor**

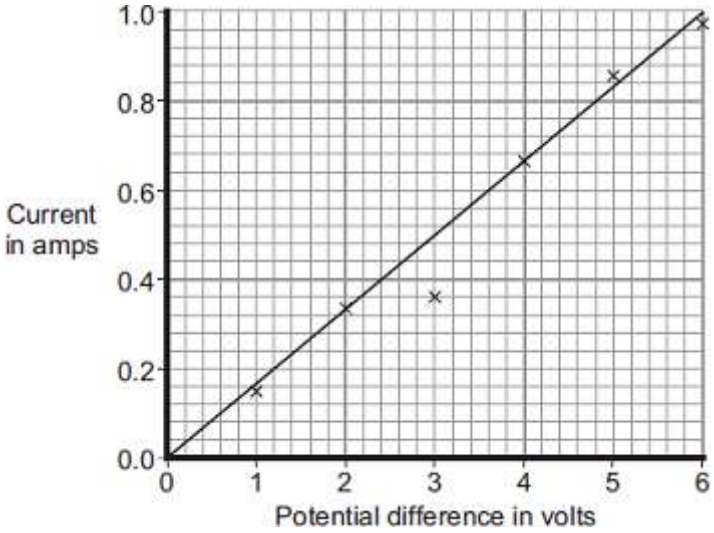
(1)

(iii) Name a component connected in parallel with the resistor.

_____

(1)

(b) The results obtained by the student have been plotted on a graph.



(i) One of the results is anomalous.

Draw a ring around the anomalous result.

(1)

(ii) Which **one** of the following is the most likely cause of the anomalous result?

Put a tick (✓) in the box next to your answer.

The student misread the ammeter. ☐

The resistance of the resistor changed. ☐

The voltmeter had a zero error. ☐

(1)

(iii) What was the interval between the potential difference values obtained by the student?

_____

_____

(1)

(c) Describe the relationship between the potential difference across the resistor and the current through the resistor.

_____

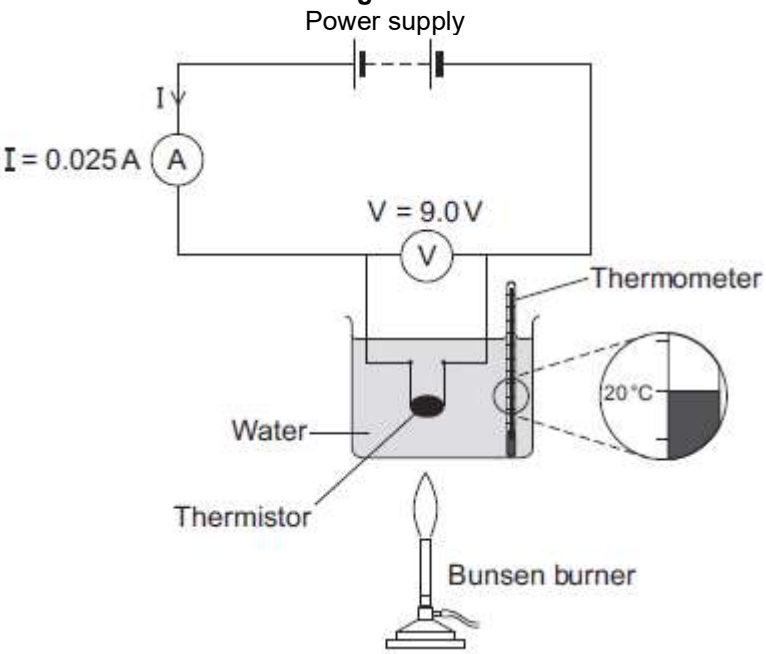
_____

(1)

(Total 7 marks)

Q18. (a) **Figure 1** shows the apparatus used to obtain the data needed to calculate the resistance of a thermistor at different temperatures.

Figure 1



(i) In the box below, draw the circuit symbol for a thermistor.

(1)

(ii) Use the data given in **Figure 1** to calculate the resistance of the thermistor at 20 °C.

_____

_____

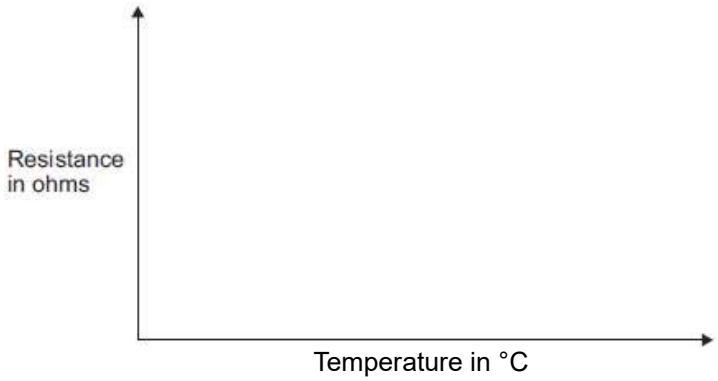
_____

Resistance = _____ ohms

(2)

(iii) **Figure 2** shows the axes for a sketch graph.
Complete **Figure 2** to show how the resistance of the thermistor will change as the temperature of the thermistor increases from 20 °C to 100 °C.

Figure 2



(1)

(iv) Which **one** of the following is most likely to include a thermistor?
Tick (✓) **one** box.

An automatic circuit to switch a plant watering system on and off. ☐

An automatic circuit to switch an outside light on when it gets dark. ☐

An automatic circuit to switch a heating system on and off. ☐

(1)

Independent Exam Question

Q19. A farmer plans to generate all the electricity needed on her farm, using either a biogas generator or a small wind turbine.

The biogas generator would burn methane gas. The methane gas would come from rotting the animal waste produced on the farm. When burnt, methane produces carbon dioxide.

The biogas generator would cost £18 000 to buy and install. The wind turbine would cost £25 000 to buy and install.

The average power output from the wind turbine would be the same as the continuous output from the biogas generator.

Evaluate the advantages and disadvantages of the two methods of generating electricity.

Conclude, with a reason, which system would be better for the farmer to buy and install.

_____

_____

_____

_____

_____

_____

_____

_____

(6)

Lesson 6

	Topic	**Density (11.3.3)**
1	State the equation for density	ρ =m/v Density (kg/m3) = mass (kg) / volume (m3)
2	How do you calculate the volume of a cube?	V = lxlxl or l3 Volume (m3) = length (m) x length (m) x length (m)
3	Describe the particle model of solids	Particles all touching (bonded) in rows
4	Describe the particle model of liquids	Particles randomly placed, almost all particles touching.
5	Describe the particle model of gases	Particles placed randomly, none or very few touching.
6	State two drawbacks of the particle model	1) assumes particles are all small solid spheres 2) doesn't show bonds between atoms
7	How do you calculate the density of an irregular shape?	Submerge in water to calculate the volume, use a balance to measure the mass.

	Topic	Changes of state and latent heat (11.3.4)
1	Define "latent heat"	The energy needed for a substance to change state
2	Define "specific heat capacity"	Amount of energy required to raise the temperature of one kilogram of the substance by one degree Celsius.
3	Define "internal energy"	Energy stored inside a system by the particles
4	How do we calculate internal energy?	Sum kinetic and potential energy of all particles
5	How does heating affect the internal energy of a system?	It increases it
6	State the equation for change in thermal energy	$\Delta E = m c \Delta \theta$ Change in energy (J) = mass (kg) x specific heat capacity (J/Kg°C) x change in temperature (°C)
7	State the units for specific heat capacity	Joules per kilogram per degree Celsius, J/kg °C

Notes

Physics: Density and Changes of Sta

Key Knowledge

Equation for density –

The particle model assumes all particles are _____, _____ spheres. It is used to explain _____ and _____ of matter.

What are the state changes?
Melting:
Freezing:
Boiling:
Evaporating:
Condensing:
Sublimating:

Internal Energy –

Heat can either
- OR
-

Equation for specific heat capacity:

Equation for specific latent heat:

Define 'specific latent heat of vaporisation':

Define 'specific latent heat of fusion':

Mastery Matrix Points

Use and rearrange ρ =m/v	Describe 'latent heat' of a material including specific latent heat of fusion and specific latent heat of vaporisation
Draw simple diagrams to model the difference between solids, liquids and gases	Explain and calculate 'specific latent heat' using the E=mL
Link the arrangement of atoms and molecules to different densities of the states	Interpret heating and cooling graphs that include changes of state
RP Density: Determine the densities of regular and irregular solid objects and liquids	Explain the differences between 'heat' and 'temperature'
Describe how mass is conserved during changes of state	Define and calculate specific heat capacity
Explain why changes of state are physical changes	Use and rearrange equations for calculating specific heat capacity
Define internal energy	Distinguish between specific heat capacity and specific latent heat
Explain the effect of heating on the energy within a system and calculate energy change during a state change.	

Understanding and Explaining

1. Explain how to calculate the density of
   a) a regular shape

   _____

   _____

   _____

   b) an irregular shape.

   _____

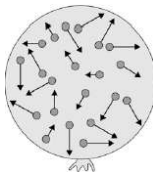
   _____

   _____

2. Sketch and explain the shape of a heating curve and a cooling curve.

Guided Exam Question

Q20. The figure below shows a balloon filled with helium gas.



(a) Describe the movement of the particles of helium gas inside the balloon.

_____

_____

_____

_____

(2)

(b) What name is given to the total kinetic energy and potential energy of all the particles of helium gas in the balloon?

Tick **one** box.

External energy ☐

Internal energy ☐

Movement energy ☐

(1)

(c) Write down the equation which links density, mass and volume.

_____

(1)

(d) The helium in the balloon has a mass of 0.00254 kg.
The balloon has a volume of 0.0141 m^3.
Calculate the density of helium. Choose the correct unit from the box.

m^3 / kg	**kg / m^3**	**kg m^3**

_____

_____

_____

Density = _____ Unit _____

(3)

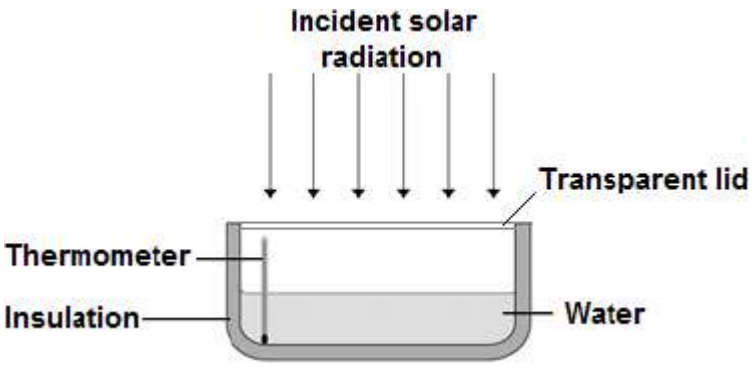
(Total 7 marks)

Q21.

A student investigated how much energy from the Sun was incident on the Earth's surface at her location.

She put an insulated pan of water in direct sunlight and measured the time it took for the temperature of the water to increase by 0.6 °C.

The apparatus she used is shown in the figure below.



(a) Choose the most appropriate resolution for the thermometer used by the student.

Tick **one** box.

0.1 °C ☐

0.5 °C ☐

1.0 °C ☐

(1)

(b) The energy transferred to the water was 1050 J.

The time taken for the water temperature to increase by 0.6 °C was 5 minutes.

The specific heat capacity of water is 4200 J / kg °C.

Write down the equation which links energy transferred, power and time.

_____

(1)

(c) Calculate the mean power supplied by the Sun to the water in the pan.

_____

_____

_____

Average power = _____ W

(2)

(d) Calculate the mass of water the student used in her investigation.

Use the correct equation from the Physics Equation Sheet.

_____

_____

_____

Mass = _____ kg

(3)

(e) The student's results can only be used as an estimate of the mean power at her location.

Give **one** reason why.

_____

_____

(1)
(Total 8 marks)

Independent exam questions

Q22. 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 _____

_____

_____

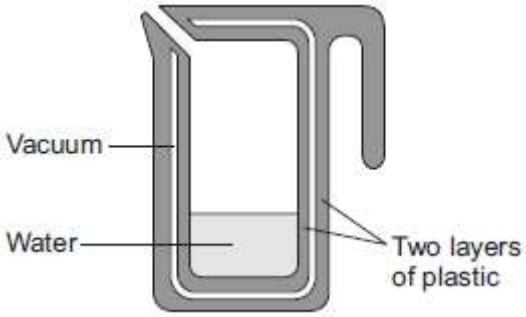
_____

(Total 6 marks)

Q23.

A new design for a kettle is made from two layers of plastic separated by a vacuum. After the water in the kettle has boiled, the water stays hot for at least 2 hours.

The new kettle is shown below.



(a) The energy transferred from the water in the kettle to the surroundings in 2 hours is 46 200 J.

The mass of water in the kettle is 0.50 kg.

The specific heat capacity of water is 4200 J/kg °C.

The initial temperature of the water is 100 °C.

Calculate the temperature of the water in the kettle after 2 hours.

_____

_____

_____

_____

Temperature after 2 hours = _____ °C

(3)

(b) Calculate the average power output from the water in the kettle to the surroundings in 2

hours.

_____

_____

_____

_____

Average power output = _____ W

(2)

(Total 5 marks)

Physics RP Revision - P1 – Specific Heat Capacity

Key Knowledge

Aim: _____

_____

_____

IV in this experiment:

_____

DV in this experiment:

_____

CV in this experiment:

1) _____

2) _____

3) _____

Risk and precaution:

_____

_____

_____

Equipment:

Understanding and Explaining

Method:

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

Common error made in this practical:

_____

_____

Describe how you could improve the accuracy of the results:

_____

_____

_____

_____

Describe how to find specific heat capacity

_____

_____

_____

_____

Physics RP Revision – P3 - Resistance

Key Knowledge

Aim 1:

IV 1:

DV 1:

CVs:

1)

2)

3)

Aim 2:

Risk and precaution:

Understanding and Explaining

Method and equipment 1:

Describe the expected results:

Method and equipment 2:

Describe the expected results:

Physics RP Revision –
P4 – IV characteristics & Ohms' Law

Key Knowledge

Aim 1:

Equipment:

Sketch graphs to show the results:

Understanding and Explaining

Method (filament bulb/resistor)

Method (diode)

Physics RP Revision – P5 – Density

Key Knowledge

Aim :

Equipment (regular shape):

Equipment (irregular shape):

Equipment (liquid):

Understanding and Explaining

Method (regular shape)

Method (irregular shape)

Method (liquid)