

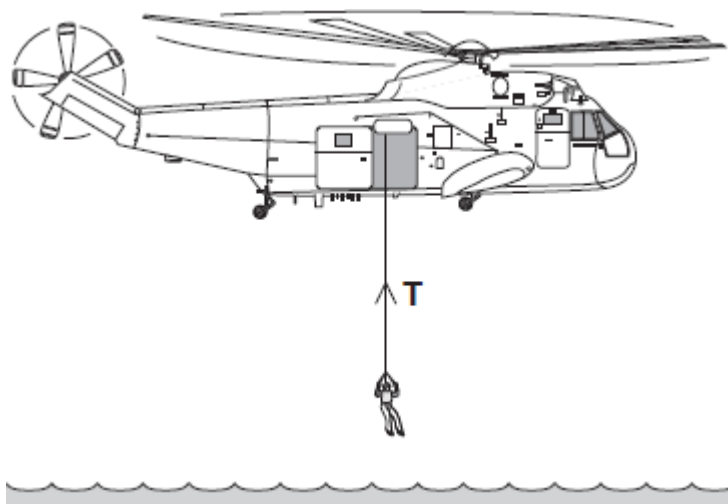
Name of the Student: _____

Max. Marks : 21 Marks

Time : 21 Minutes

Q1.

The diagram shows a helicopter being used to rescue a person from the sea.



- (a) (i) The mass of the rescued person is 72 kg.

Use the equation in the box to calculate the weight of the rescued person.

$\text{weight} = \text{mass} \times \text{gravitational field strength}$
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gravitational field strength = 10 N/kg

Show clearly how you work out your answer.

Weight = _____ N
(2)

- (ii) An electric motor is used to lift the person up to the helicopter.
The motor lifts the person at a constant speed.

State the size of the force, **T**, in the cable.

Force **T** = _____ N
(1)

- (b) To lift the person up to the helicopter, the electric motor transformed 21 600 joules of energy

usefully.

- (i) Use a form of energy from the box to complete the following sentence.

gravitational potential	heat	sound
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The electric motor transforms electrical energy to kinetic energy. The kinetic energy is then transformed into useful _____ energy.

(1)

- (ii) It takes 50 seconds for the electric motor to lift the person up to the helicopter.

Use the equation in the box to calculate the power of the electric motor.

$\text{power} = \frac{\text{energy transformed}}{\text{time}}$
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Show clearly how you work out your answer and give the unit.

Choose the unit from the list below.

coulomb (C)

hertz (Hz)

watt (W)

Power = _____

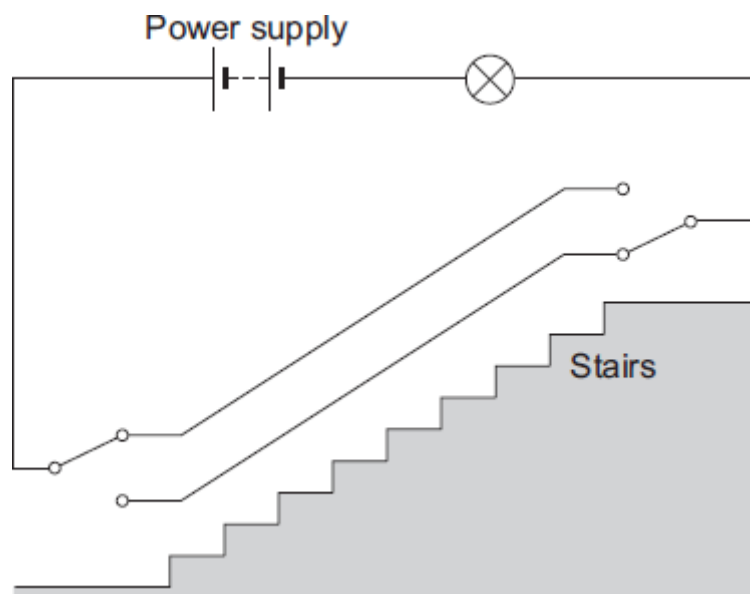
(3)

(Total 7 marks)

Q2.

The diagram shows an electric circuit used in a dolls' house.

The switches are 2-way switches; this means that each switch has a connecting wire that can be in one of two positions.



- (a) (i) With the connecting wire in each switch in the position shown in the diagram, the lamp is off. Why?

(1)

- (ii) When switched on, the lamp has a resistance of $18\ \Omega$ and draws a current of $0.5\ \text{A}$ from the power supply.

Use the equation in the box to calculate the potential difference of the power supply used in the circuit.

potential difference = current $\times$ resistance
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Show clearly how you work out your answer.

Potential difference = _____ V

(2)

- (iii) A second, identical lamp is added to the circuit. The two lamps are joined in series.

Calculate the total resistance of the two lamps.

Total resistance = _____ Ω

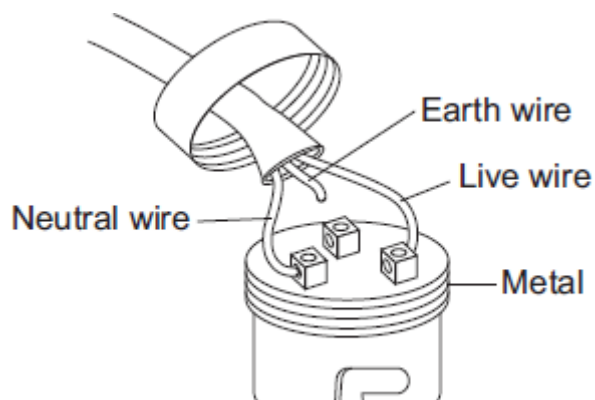
(1)

- (b) This type of circuit is also used in real houses. One of the switches is at the top of the stairs, and the other switch is at the bottom of the stairs.

What is the advantage of using this circuit to switch a lamp on or off, rather than using a more simple circuit that has only one switch?

(1)

- (c) The diagram shows an old type of metal lamp fitting.



The cable has been connected to the lamp fitting in a way that makes the lamp fitting unsafe.

- (i) What is the possible risk to someone touching the lamp fitting while the lamp is switched on?

(1)

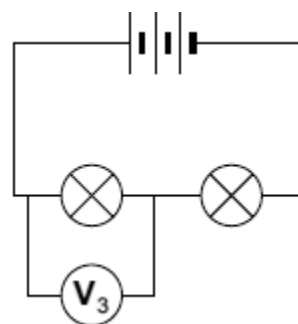
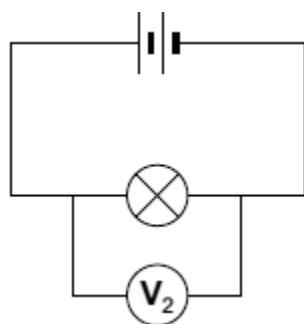
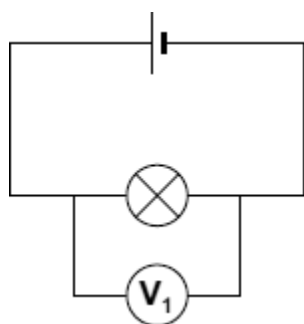
- (ii) What should be done to make **this** lamp fitting safe to use?

(1)

(Total 7 marks)

Q3.

- (a) The lamps in the circuits drawn below are all identical. Each of the cells has a potential difference of 1.5 volts.



- (i) What is the potential difference across the 3 cells that are joined in series?

Potential difference = _____ V

(1)

- (ii) What will be the reading on the voltmeter labelled V_3 ?

Voltmeter reading V_3 = _____ V

(1)

- (iii) Which voltmeter, V_1 , V_2 or V_3 , will give the highest reading?

Draw a ring around your answer.

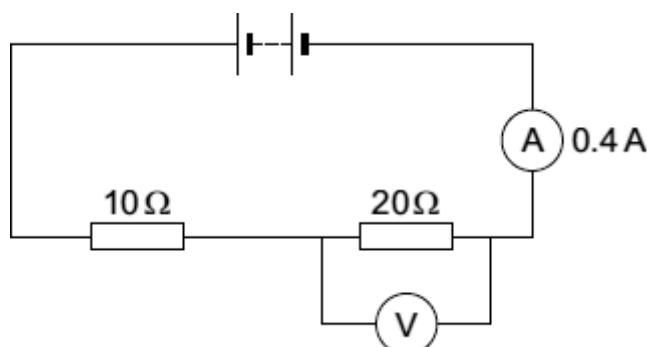
V_1

V_2

V_3

(1)

- (b) The diagram below shows a simple circuit.



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

Total resistance = _____ Ω

(1)

- (ii) Use the equation in the box to calculate the reading on the voltmeter.

potential difference = current $\times$ resistance
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Show clearly how you work out your answer.

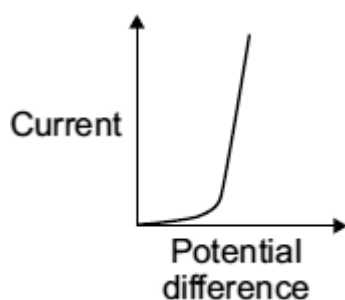
Voltmeter reading = _____ V

(2)

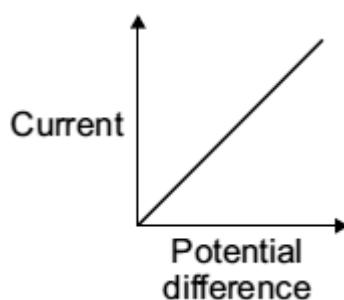
- (iii) The current through a resistor at constant temperature changes when the potential difference across the resistor changes.

Which **one** of the graphs, **X**, **Y** or **Z**, shows how the current changes?

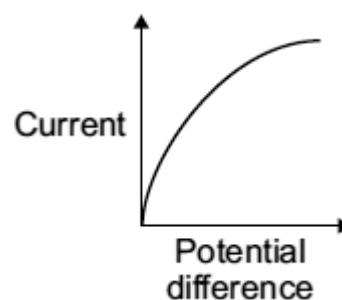
Write your answer, **X**, **Y** or **Z**, in the box.



X



Y



Z

Graph

(1)

(Total 7 marks)