Barrhead High School

NATIONAL PHYSICS
Electricity
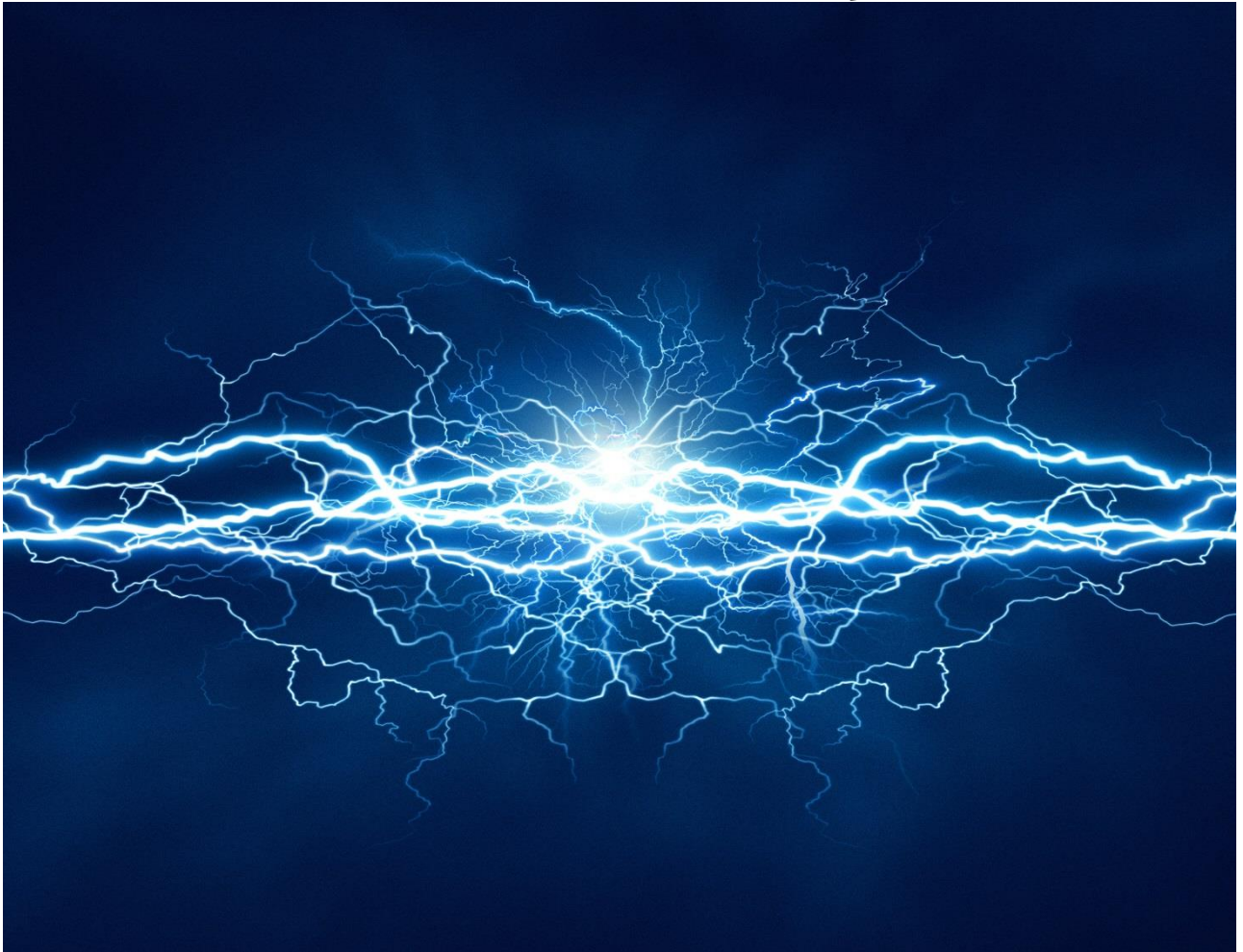
Exam Homework

Date	Homework	Mark/grade	Parent signature

The table above must be completed after each homework has been marked.

Homework tips

- Start homework as soon as possible. Do not leave it until the night before the due date.
- Refer to summary notes, jotter notes and example problems when completing homework.
- If after doing above there are any issues ask your teacher for help. This must be done at least 1 full day before due date. This will then give you the opportunity to complete the homework by due date.

Sign below to state that you have read this.

Pupil _____

Parent _____

Homework 1

1.   A student has two electrical power supplies. One is an a.c. supply and the other is
        a d.c. supply.
        Explain a.c and d.c. in terms of electron flow in a circuit.   2

        Space for working and answer

2.   Explain the difference between direct current (dc) and alternating current
        (ac) in terms of the movement of charges in a conductor.   2

        Space for working and answer

3.   Which of the following statements is/ are correct?

        I   In an a.c. circuit the direction of the current changes regularly.
        II   In a d.c. circuit positive charges flow in one direction only.
        III   In an a.c. circuit the size of the current varies with time.

        A I only
        B II only
        C I and II only
        D I and III only
        E I, II and III   1

4. A student makes the following statements about electrical supplies.

    I   The frequency of the mains supply is 50 Hz.
    II   The quoted value of an alternating voltage is less than its peak value.
    III   A d.c supply and an a.c. supply of the same quoted value will supply the same power to a given resistor.

    Which of the following statements is/are correct?

    A   I only
    B   II only
    C   III only
    D   I and II only
    E   I, II and III   1

5. The current in an 8 Ω resistor is 2 A.
    Calculate the charge passing through the resistor in a time of 10s.   3

    Space for working and answer

6. Inside a storm cloud water droplets move around and collide with each other. The Motion of water droplets in the cloud causes flashes of lightning. One lightning flash transfers 1650C of charge in 0·15 s.
    Calculate the electric current produced by this flash.   3

    Space for working and answer

7. An ampere is one
   A volt per joule
   B joule per second
   C joule per coulomb
   D coulomb per second
   E ohm per volt   1

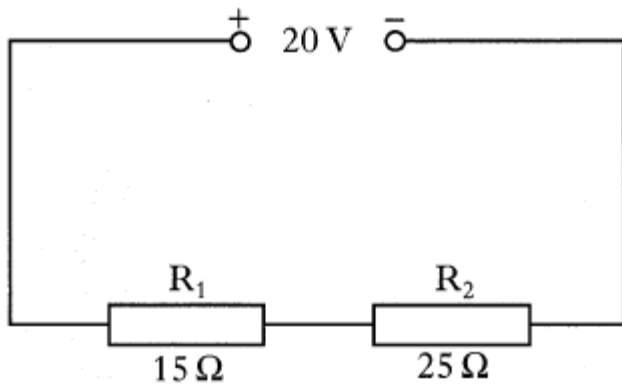8. Calculate charge passing a point in a conductor when a current of 4mA flows for 1000s. 3

   Space for working and answer

Total 16

End of homework

Homework 2

1   A student connects two resistors in series with a power supply set at 20V.

a)   Calculate the current in the circuit.   **4**
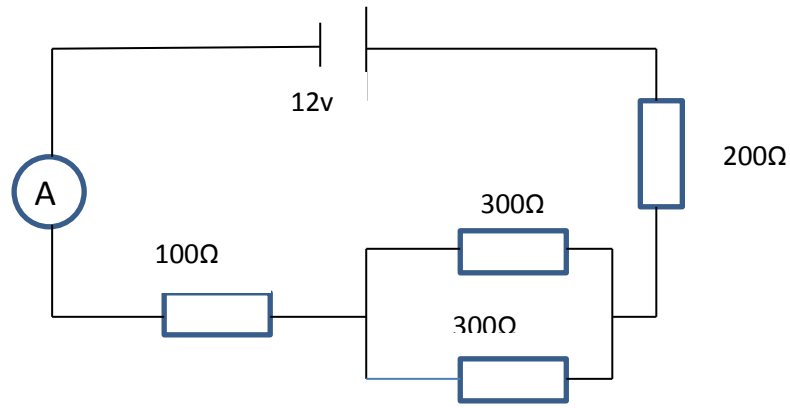
Space for working and answer

b)   Calculate the potential difference across resistor R_1.   **3**

Space for working and answer

c)   Redraw the above circuit diagram showing meters correctly connected to
measure the quantities in (a) and (b) above.   **2**

Space for working and answer

(9)

2

a) Calculate total resistance of circuit

Space for working and answer

3

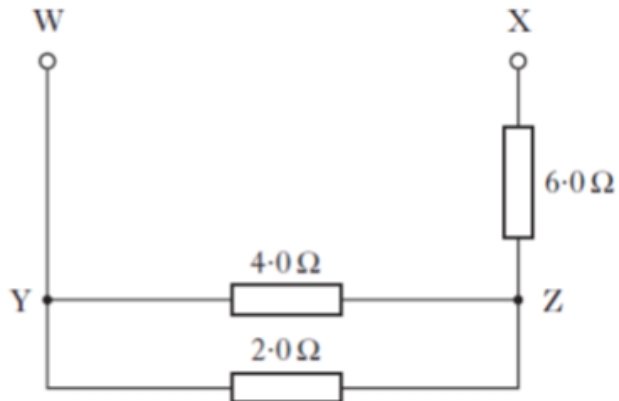b) Calculate reading on the Ammeter

Space for working and answer

3

End of Homework

Total   15

Homework 3

1   Part of a circuit is shown below.

a)   Calculate the total resistance between points Y and Z

Space for working and answer

3

b)   Calculate the total resistance between points W and X.

Space for working and answer

1

c)   Calculate the voltage across the 2.0 Ω resistor when the current in the
   4.0 Ω resistor is 0.10 A.

Space for working and answer

3

2   A mains electric fire has two heating elements which can be switched on and off separately. The heating elements can be switched on to produce three different heat settings: LOW, MEDIUM and HIGH. The fire also has an interior lamp which can be switched on to give a log-burning effect.

The circuit diagram for the fire is shown.
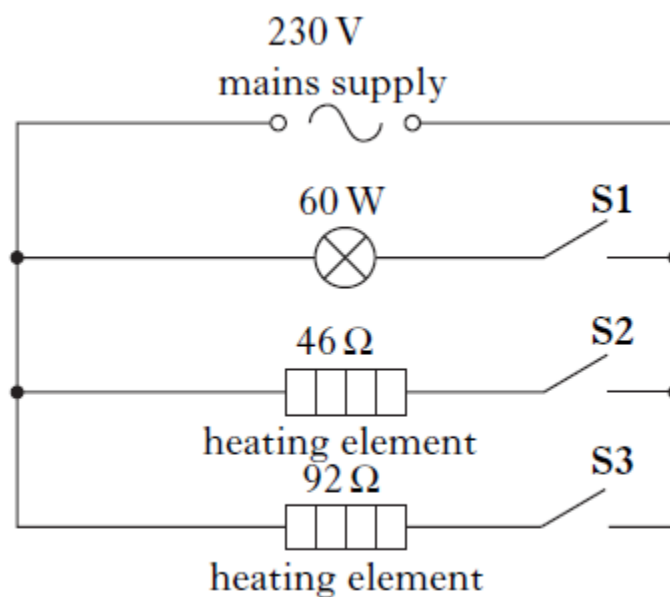
(a)   When switch **S1** is closed, the lamp operates at its stated rating of 60W.
Calculate the current in the lamp.

Space for working and answer

3

Turn over

(b)   Switch **S1** is opened and switches **S2** and **S3** are closed.

    (i)   Calculate the combined resistance of both heating elements.

        Space for working and answer

3

    (ii)

        Calculate the total power developed in the heating elements when **S2** and **S3** are closed.

        Space for working and answer

3

    (iii)   (A)   State which switch or switches would have to be closed to produce the **LOW** heat setting.

        Space for working and answer

1

        (B)   Explain your answer to (b) (iii) (A).

        Space for working and answer

1

End of homework

Total   18

Homework 4

1 An overhead projector contains a lamp and a motor that operates a cooling fan.
   A technician has a choice of two lamps to fit in the projector.

Lamp A: rated 24·0 V, 2·5 Ω

Lamp B: rated 24·0 V, 5·4 Ω

(a) (i)   State which lamp gives a brighter light when operating at the correct voltage.   1

Space for working and answer

(ii)   Explain your answer to (a) (i).   1

Space for working and answer

(b)   Calculate the power developed by lamp A when it is operating normally.   3
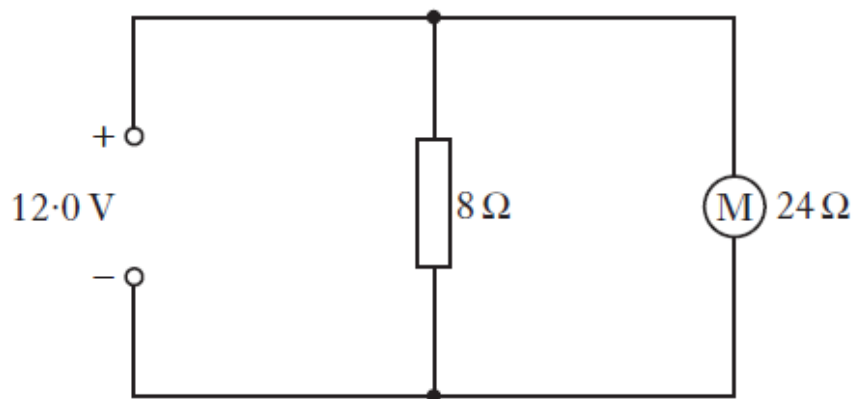
Space for working and answer

(c)   The overhead projector plug contains a fuse.
       Draw the circuit symbol for a fuse.   1

(d)   The technician builds a test circuit containing a resistor and a motor, as shown in **Circuit 1**.

Circuit 1

       (i)   State the voltage across the motor.   1
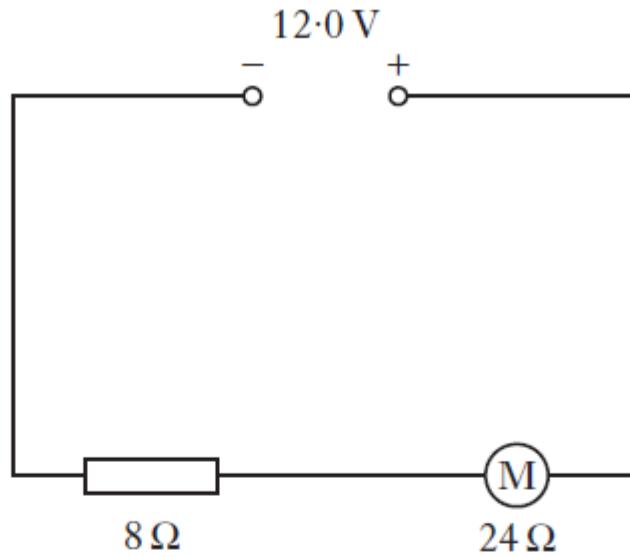
       (ii)   Calculate the combined resistance of the resistor and the motor.   3

(e)   The resistor and the motor are now connected in series, as shown in **Circuit 2**.

$$12 \cdot 0 \text{ V}$$

Circuit 2

(i)   State how this affects the speed of the motor compared to **Circuit 1**.   1

Space for working and answer

(ii)   Explain your answer to (e) (i).   1

Space for working and answer

2 A mobile phone has a power of 75mW when using a 3V battery

a) Calculate the current taken from the battery when the mobile phoned is being used. **3**

Space for working and answer

b) Explain which of the following fuses should be connected in series with the battery.

20mA   30mA   2A   3A **2**
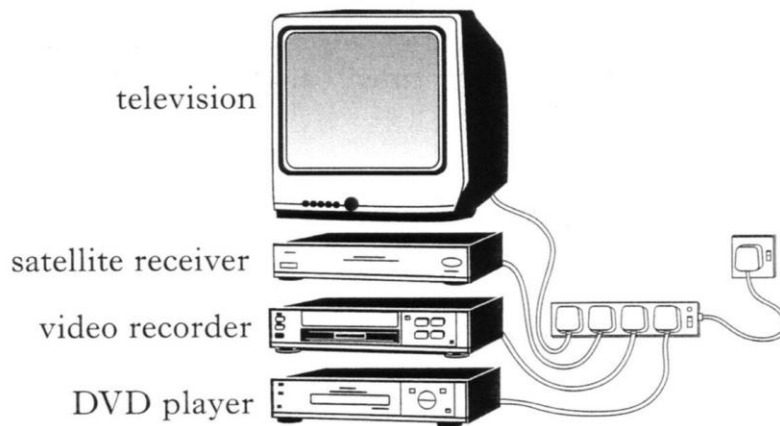
Space for working and answer

Turn over

3   A home entertainment centre consists of four appliances. The table gives the power rating of each appliance.

Appliance	Power rating (W)
television	110
video recorder	22
satellite receiver	20
DVD player	18

To operate properly, each appliance must be connected to mains voltage. The appliances are connected to the mains using a multiway adaptor.

a)   State the value of the operating voltage of the appliances   **1**

Space for working and answer

b)   Calculate the current from the mains when all four appliances are operating at the power ratings shown in the table.

(You must use an appropriate number of significant figures in your answer to this question.)   **4**

Space for working and answer

Turn over

c) Calculate the resistance of the television when it is operating at the power rating stated in the table **3**

Space for working and answer

d) The plug of the multiway adapter contains a fuse.
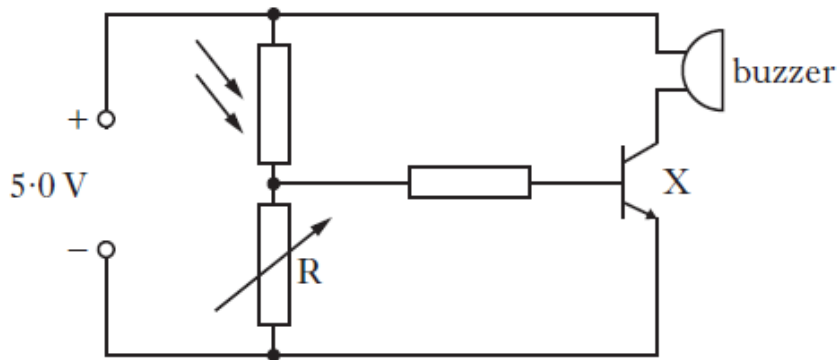What is the purpose of a fuse? **1**

Total 25

End of homework

Homework 5

1   A photographic darkroom has a buzzer that sounds when the light level in the room is too high. The circuit diagram for the buzzer system is shown below.

(a)   (i)   Name component X.   1

Space for working and answer

(ii)   Explain the purpose of component X in the circuit   1

Space for working and answer

(b)   The darkroom door is opened and the light level increases.
Explain how the circuit operates to sound the buzzer.   3

Space for working and answer

(c)   The table shows how the resistance of the LDR varies with light level.

Light level (units)	LDR Resistance (Ω)
20	4500
50	3500
80	2500

The variable resistor has a resistance of 570 Ω.
The light level increases to 80 units.
Calculate the current in the LDR.   4
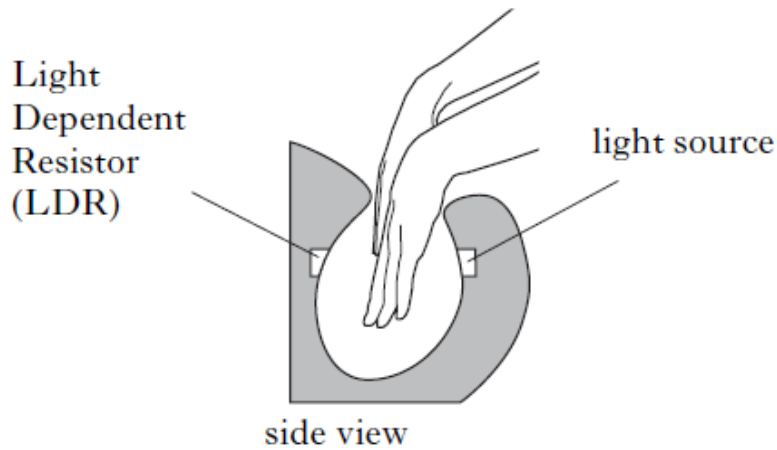
Space for working and answer

(d)   State the purpose of the variable resistor R in this circuit.   1

Space for working and answer

Turn over

2   An automatic hand dryer used in a washroom is shown in the diagram below.

side view

Inserting hands into the dryer breaks a light beam, this is detected using a light dependent resistor (LDR). The LDR is part of a switching circuit which activates the dryer when hands are inserted. Part of the circuit for the hand dryer is shown.
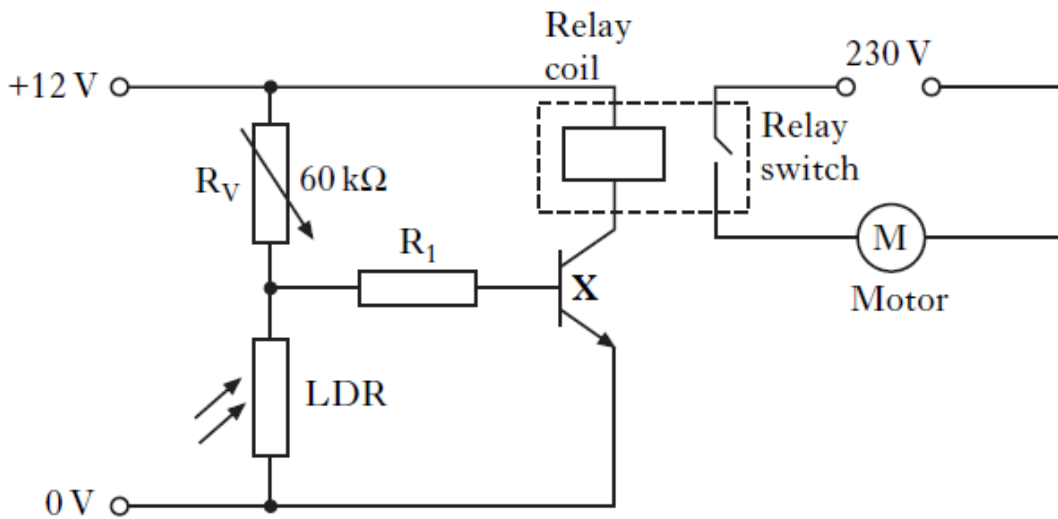
(a)   The variable resistor RV is set to a resistance of 60 kΩ.
      Calculate the voltage across the LDR when its resistance is 4 kΩ.   3

Space for working and answer

(b)   Name component **X** in the circuit diagram.   1

Space for working and answer

Turn over

(c)   Explain how this circuit operates to activate the motor in the dryer when the light level falls   2
        below a certain value.

Total   16

End of homework