**1** Some units used in science will be very small and others very large. The table shows some of the prefixes and the corresponding power of ten written in standard form. Fill in the gaps.

|  |  |  |
| --- | --- | --- |
| Prefix | Symbol | Power of ten |
| Giga |  | 109 |
| Mega |  |  |
|  | m | 10–3 |
|  | µ | 10–6 |
| Nano | n |  |

 (6)

**2** The energy transferred by an electrical appliance depends on the power of the appliance and for how long the appliance is switched on.

 **a)** Calculate the power of a kettle which is filled with 0.75 litres of water. 180 kJ of energy is used to heat the water from 20 °C to 100 °C in 4 minutes. Show your working. (3)

 **b)** Calculate the current in each appliance shown in the table. The mains supply is 240 V.

|  |  |  |
| --- | --- | --- |
| Appliance | Power (W) | Current (A) |
| Hair dryer | 1800 |  |
| Dishwasher | 1300 |  |
| Toaster | 800 |  |
| Lamp | 15 |  |

 (4)

 **c)** There are three different fuses available. These are 3 A, 5 A and 13 A. Which fuse should be used in the plugs for each of the appliances in the table?

 Hair dryer: .........................; Dishwasher: .......................

 Toaster: ..............................; Lamp: .................................. (4)

 **d)** What would happen if you put a 5 A fuse into the hairdryer? (1)

**3** An electric cable is used to connect an appliance to the mains electricity supply in the house.

 

 **a)** Fill in the gaps in the passage on electrical wiring. Use the most suitable word or words.

 Electrical appliances in our homes are plugged into the mains supply. Most appliances will have a three-core cable and a plug.

 Inside the cable, each …………….. can be easily recognised. This is because each is covered in an ……………….. layer of coloured plastic.

 The live wire is coloured …………….. The earth wire has ………………………… stripes. The neutral wire is …………………………….. in colour. (5)

insulating   blue   wire   brown   green and yellow

 **b)** What are the roles of the live and neutral wires? (2)

 **c)** What is the role of the earth wire? (1)

 **d)** Why must appliances be earthed? (2)

**4** A power station generates sends 1000 A at a potential difference of 25 000 V to the National Grid. A transformer steps up the potential difference to 400 000 V.

 **a)** Assuming 100% efficiency, what would the resulting current be? (2)

 **b)** Explain why the potential difference increased and the current reduced? (2)

**5** Insert the missing word. When two insulators are rubbed together, electrons are transferred from one material to the other. The material that gains the electrons becomes ……............. charged. (1)

**6 a)** Explain the difference between a.c. and d.c. (2)

 **b)** Alternating current is supplied at 50 Hz in the UK. What does this mean? (2)

**7** Fill in the missing sections in the table below

|  |  |  |
| --- | --- | --- |
| Quantity | Unit | Symbol |
| Current |  | A |
| Resistance | ohm |  |
| Power |  | W |
|  | joule |  |
| Charge |  | C |
| Time |  | s |

 (3)

**8 a)** Why is tidal power a more reliable source of energy than wind power? (2)

 **b)** A windfarm has 10 wind turbines. Each produces a maximum of 1 MW. In March, the turbines run at maximum capacity for 11 days. For the rest of the time, the turbines run at 40% of maximum capacity except for 2 days when no wind blows. How much power does the windfarm produce in March? (4)

 **c)** What percentage is March’s actual power output as a percentage of the wind farm’s maximum capacity? (2)

TOTAL = 48

**1**

|  |  |  |
| --- | --- | --- |
| Prefix | Symbol | Power of ten |
| Giga | **G** | 109 |
| Mega | **M** | **106** |
| **Milli** | m | 10–3 |
| **Micro** | µ | 10–6 |
| Nano | N | **10–9** |

 (6)

**2 a)**  = 750 W (3)

 **b)**

|  |  |  |
| --- | --- | --- |
| Appliance | Power (W) | Current (A) |
| Hair dryer | 1800 | **7.5** |
| Dishwasher | 1300 | **5.4** |
| Toaster | 800 | **3.3** |
| Lamp | 15 | **0.06** |

 (4)

 **c)** Hair dryer 13 A; Dishwasher 13 A;
Toaster 5 A; Lamp 3 A. (4)

 **d)** The fuse would blow. (1)

**3 a)** Electrical appliances in our homes are plugged into the mains supply. Most appliances will have a three-core cable and a plug.

 Inside the cable each **wire** can be easily recognised. This is because each is covered in an **insulating** layer of coloured plastic. The live wire is coloured **blue**. The earth wire has **green and yellow** stripes. The neutral wire is **brown** in colour. (5)

 **b)** The live and neutral wires carry current to and from the appliance. The live wire carries the alternating potential difference from the mains. The neutral wire completes the circuit. (2)

 **c)** The earth wire stops the appliance becoming live. (1)

 **d)** The earth wire is safety device. If there is a fault and the live wire touches the appliance, a person will not receive a shock. (2)

**4 a)** Power sent to the grid = 1000 × 25 000 = 25 MW

 Power = *IV*; *I* =  = 62.5 A (2)

 **b)** Power is constant. The relationship between power, current and potential difference is *P* = *IV*. Therefore, if the potential difference increases, the current must decrease. (2)

**5** Negatively (1)

**6 a)** a.c. stands for alternating current. The current changes direction many times per second.
d.c. stands for direct current. The current flows in the same direction all the time. (2)

 **b)** 50 Hz means 50 cycles per second. This is the frequency of oscillation of the alternating current. (2)

**7**

|  |  |  |
| --- | --- | --- |
| **Quantity** | **Unit** | **Symbol** |
| Current | **ampere** | A |
| Resistance | ohm | **Ω** |
| Power | watt | W |
| **Energy** | joule | **J** |
| Charge | **coulomb** | C |
| Time | **second** | s |

 (3)

**8 a)** The tides are guaranteed to come and go every day. Wind is not guaranteed to blow every day. Tidal power is predictable and reliable, wind power is not. (2)

 **b)** 31 days in March.

 11 days, power = 11 × 10 × 1 = 110 MW

 2 days, no power = 0 MW

 18 days, power = 18 × 10 × 0.4 × 1 = 72 MW.

 Total power = 182 MW. (4)

 **c)** Maximum output = 31 × 10 × 1 = 310 MW

 Actual output = 182 MW.

 % =  × 100; = 58.7% (2)

TOTAL = 48