**1** **(a)** State an example of the conversion of chemical energy to another form of energy.

example .....

energy conversion ..... [1]

**(b)** The electrical output of a solar panel powers a pump. The pump operates a water fountain. The output of the solar panel is 17 V and the current supplied to the pump is 0.27 A.

**(i)** Calculate the electrical power generated by the solar panel.

power = ..... [2]

**(ii)** The pump converts electrical energy to kinetic energy of water with an efficiency of 35%.

Calculate the kinetic energy of the water delivered by the pump in 1 second.

kinetic energy = ..... [2]

**(iii)** The pump propels 0.00014 $m^3$ of water per second. This water rises vertically as a jet. The density of water is 1000 $kg/m^3$.

Calculate

**1.** the mass of water propelled by the pump in 1 second,

mass = ..... [2]

**2.** the maximum height of the jet of water.

maximum height = ..... [2]

[Total: 9]

**2** 40 lamps, each of resistance 8.0 Ω, are connected in series to a 240 V supply in order to decorate a tree.

**(a)** Calculate

**(i)** the current in each lamp,

current = ..... [2]

**(ii)** the power dissipated in each lamp.

power = ..... [2]

**(b)** The lamps are designed to "fail-short". If a filament fails, the lamp shorts so that it has no resistance. The other lamps continue to light and the current increases.

The lamps are connected through a fuse that blows when the current rises above 0.9 A. At this current, the resistance of each lamp is 5% greater than its normal working resistance.

Calculate the maximum number of lamps that can fail before the fuse blows.

number of lamps = ..... [4]

[Total: 8]

**3** **(a)** In Fig. 8.1, a magnet is moving towards one end of a solenoid connected to a sensitive centre-zero meter. During this movement a current is induced in the solenoid.

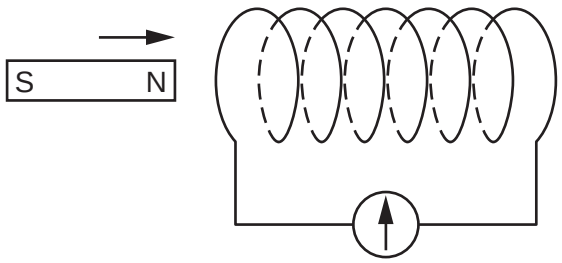


**Fig. 8.1**

Suggest **three** possible changes to the system in Fig. 8.1 that would increase the induced current.

1. .....

2. .....

3. .....[3]

**(b)** Fig. 8.2 shows a transformer. P is the primary coil. S is the secondary coil. The coils are wound on an iron core.

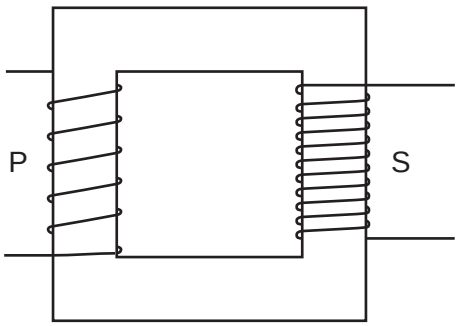


**Fig. 8.2**

P has 200 turns and S has 800 turns. The e.m.f. induced across S is 24 V. The current in S is 0.50 A. The transformer operates with 100% efficiency.

Calculate

**(i)** the voltage of the supply to P,

voltage = .....[2]

**(ii)** the current in P.

current = .....[2]

[Total: 7]

**4** The circuit shown in Fig. 10.1 uses a 12V battery.

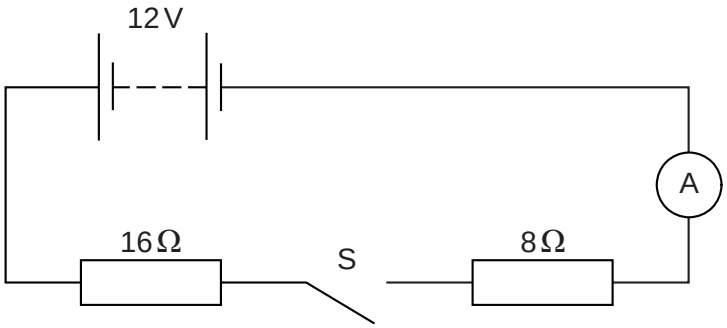


**Fig. 10.1**

**(a)** Switch S is open, as shown in Fig. 10.1.

State the value of

**(i)** the reading on the ammeter,

reading = ..... [1]

**(ii)** the potential difference (p.d.) across S.

p.d. = ..... [1]

**(b)** Switch S is now closed.

**(i)** Calculate the current in the ammeter.

current = ..... [2]

**(ii)** Calculate the p.d. across the 8Ω resistor.

p.d. = ..... [2]

**(c)** The two resistors are now connected in parallel.

Calculate the new reading on the ammeter when S is closed, stating clearly any equations that you use.

reading = ..... [4]

[Total: 10]

**1** Fig. 8.1 is the plan of a small apartment that has four lamps as shown.

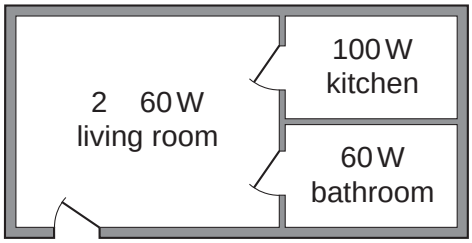


**Fig. 8.1**

Power for the lamps is supplied at 200 V a.c. and the lamps are all in parallel.

**(a)** In the space below, draw a lighting circuit diagram so that there is one switch for each room and one master switch that will turn off all the lamps. Label the lamps as 60 W or 100 W.

[3]

**(b)** The 100 W lamp is switched on. Calculate

**(i)** the current in the lamp,

current = ..... [2]

**(ii)** the charge passing through the lamp in one minute.

charge = ..... [2]

**(c)** The three 60W lamps are replaced by three energy-saving ones, that give the same light output but are rated at only 15W each.

Calculate

**(i)** the total reduction in power,

reduction in power = ..... [1]

**(ii)** the energy saved when the lamps are lit for one hour.

energy saved = ..... [2]

[Total: 10]

2 Fig. 8.1 shows a car battery being charged from a 200 V a.c. mains supply.

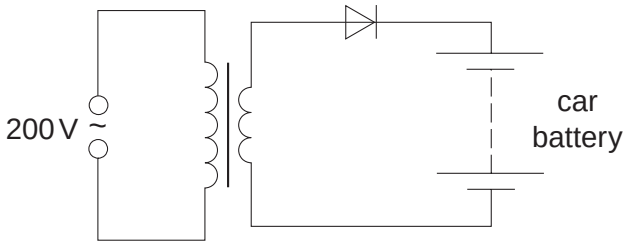


**Fig. 8.1**

**(a)** State the function of the diode.

.....

..... [1]

**(b)** The average charging current is 2.0 A and the battery takes 12 hours to charge fully.

Calculate the charge that the battery stores when fully charged.

charge stored ..... [2]

**(c)** The battery has an electromotive force (e.m.f.) of 12 V and, when connected to a circuit, supplies energy to the circuit components.

State what is meant by an ***electromotive force of 12 V***.

.....

.....

..... [2]

**(d)** **(i)** In the space below, draw a circuit diagram to show how two 6.0V lamps should be connected to a 12V battery so that both lamps glow with normal brightness. [1]

**(ii)** The power of each lamp is 8.0W. Calculate the current in the circuit.

current = ..... [2]

**(iii)** Calculate the energy used by the two lamps when both are lit for one hour.

energy = ..... [2]

[Total: 10]

**3** Fig. 8.1 shows a low-voltage lighting circuit.

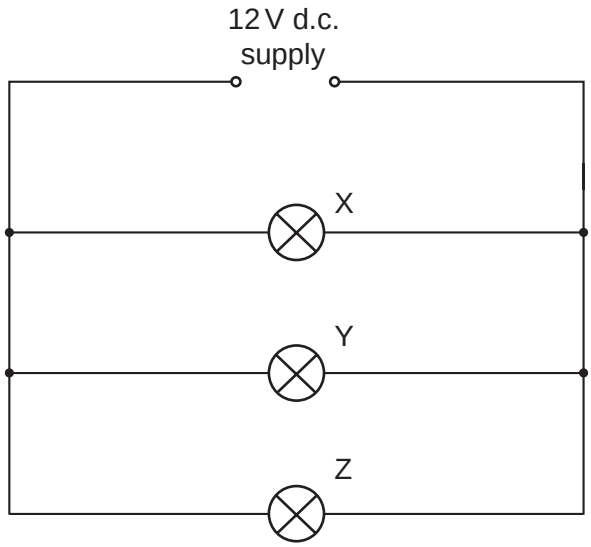


**Fig. 8.1**

**(a)** On Fig. 8.1, indicate with a dot and the letter S, a point in the circuit where a switch could be placed that would turn off lamps Y and Z at the same time but would leave lamp X still lit. [1]

**(b)** **(i)** In the space below, draw the circuit symbol for a component that would vary the brightness of lamp X.

**(ii)** On Fig. 8.1, mark with a dot and the letter R where this component should be placed.

[2]

**(c)** Calculate the current in lamp Y.

current = .....[2]

**(d)** The current in lamp Z is 3.0 A. Calculate the resistance of this lamp.

resistance = .....[2]

**(e)** The lamp Y is removed.

**(i)** Why do lamps X and Z still work normally?

.....

.....

**(ii)** The current in lamp X is 1.0 A. Calculate the current supplied by the battery with lamp Y removed.

current = .....
[2]