O Level Combined Physics Structured

Practical Electricity Test 1.0

Q1

A spotlight in a television studio is operating at its full brightness. The lamp inside the spotlight is powered by a 240 V supply and the power of the spotlight is 6.0 kW.

(a) Fuses of ratings 10 A, 27 A and 42 A are available. State what fuse rating should be used with the spotlight. Show the calculations that helped you arrive at this fuse rating.

fuse rating = ...[2]

(b) The cost of using one kilowatt-hour (kWh) of electricity is 24 cents.
Calculate the weekly cost of using the spotlight for 30 minutes each day.

cost = ...[2]

Q2

Fig 9.1 shows an electric kettle that is rated at 3.0 kW, 240 V.

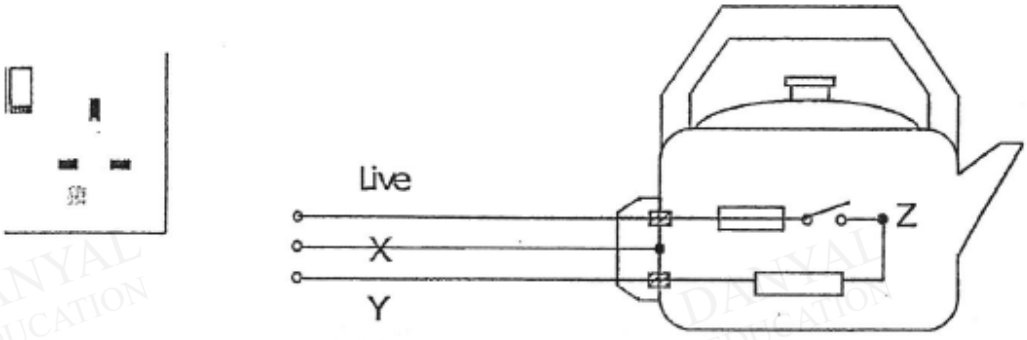


Fig 9.1

(a) Identify the wires X and Y.

X: ..... Y: ..... [1]

(b) Connect the live, X and Y wires to the correct points on the 3 pin electrical socket. [1]

(c) The live wire at point Z comes loose and the conducting wire touches the kettle metal casing. Describe how the safety feature(s) of the kettle reduce the possibility of electrocution.

.....

.....

.....

..... [2]

Q3

An electric iron is rated at 960 W 240 V. The iron is used continuously for 30 minutes.

(a) Calculate the electrical energy used during the period of 30 minutes in

(i) kilowatt-hours

electrical energy = ...kWh [2]

(ii) joules

electrical energy = ... J [2]

(b) Determine the cost if the cost per unit of electricity is $0.30.

cost = ... [1]

Q4

a) **Fig. 13.1** shows a household electric circuit, which consists of an air conditioner rated 240 V, 2000 W and a lighting circuit, rated 240 V, 500 W. Both are connected in parallel to the mains supply of 240 V.

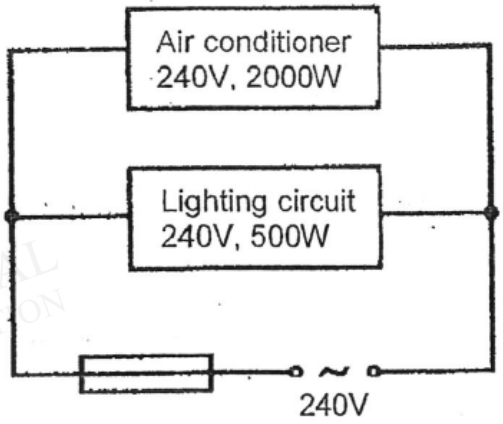


Fig. 13.1

i) Calculate the total current drawn from the mains supply. [2]

ii) Electrical energy costs $0.50 per kWh. Calculate the cost of switching on the whole system for 1 week if they were turned on together for 8 hours per day. [2]

iii) A student wrongly connected a fuse in the neutral wire as shown in **Fig. 13.2**.

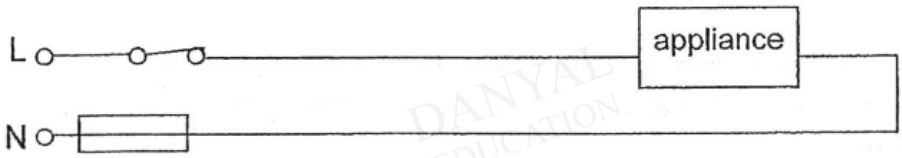
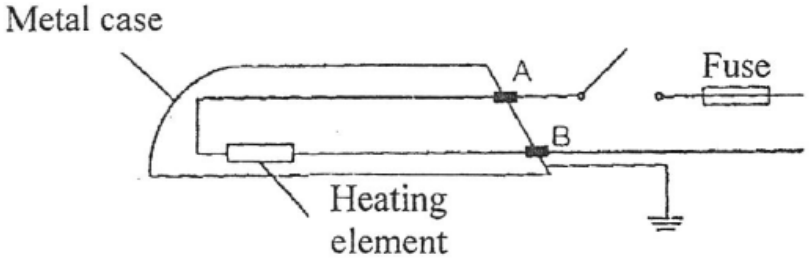


Fig. 13.2

Explain the danger of connecting the fuse in the neutral wire instead of the live wire in the event of a short circuit. [2]

Q5

The diagram shows the main parts of an electric iron.



If the insulation at contact point **A** is damaged so that the wire comes into contact with the metal case. When the switch is closed, state and explain:

(a) whether the fuse will blow;

.....

..... [1]

(b) what will happen to the user who touches the metal case.

.....

..... [1]

Answers

Practical Electricity Test 1.0

Q1

(a) $I = \frac{P}{V} = \frac{6000}{240}$ C1

$= 25$ A

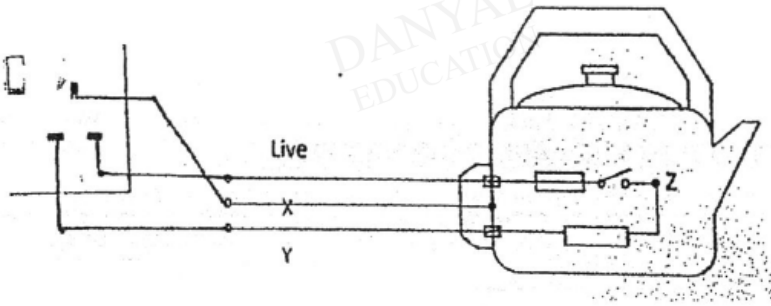
Appropriate fuse rating = 27 A A1

(b) Total energy used = 6.0 x 0.5 x 7 = 21 kWh C1

Cost = 21 x \$0.24 = \$5.04 A1

Award 1 mark if student did every correct calculation but left answer as daily cost

Q2

)a)	X – earth (as it touches metal casing) Y = neutral wire	1
b)		1
c	If a person touch the metal case, the earth wire diverts the current to the ground instead of the person The high current blows the fuse and disconnects kettle from the high voltage supply	1 1

Q3

)a Electrical energy = Pt
= 960/1000 kW x 30/60h
= 0.48kWh

)b Electrical energy = Pt
= 960 W x (30 x 60)s
= 1 730 000 J or 1.73×10^6 J

)c Cost of electricity = 0.48kWh x $0.30
= 14 cents or $0.14

Q4

a) i) Current thru aircon + current thru lightning circuit
= (2000 / 240) + (500 / 240) [1]
= 8.333 + 2.083 = 10.4 A [1]

ii) Energy = Power x time = (2 + 0.5)kW x (8 x 7)h
= 140 kWh
Cost = 140 x $0.5 = $70

iii) If too high a current flows through the live wire, the appliance will be exposed to too high a current [1]. This may cause overheating and damaged the appliance [1] before the fuse melts.

Q5

(a)	When this happens, a large current will flow through the casing and down to the earth it is a low resistance path.	
	This will cause the fuse to blow.	[1]
(b)	Since the fuse has blown, nothing will happen to the user when he/she touches the casing.	[1]