4. Electricity and magnetism

4.4 Electrical safety

Paper 3 and 4

Answer Key

Paper 3

Q1.

Question	Answer	Marks
(a)(i)	live (wire) neutral (wire) earth (wire) 3 correct – 2 marks 1 or 2 correct – 1 mark	**B2**
(a)(ii)	idea of (cable) overheating **OR** (insulation) melting / burning	**B1**

Q2.

Question	Answer	Mark
(a)	fault: insulation damaged owtte	**B1**
	hazard: electrocution **OR** electric shock	**B1**
(b)(i)	earth (wire)	**B1**
(b)(ii)	(switch is connected in) live (wire)	**M1**
	(so appliance is) disconnected from main / supply **OR** disconnected from high voltage (when switch is open / off)	**A1**

Q3.

Question	Answer	Marks
(a)(i)	(prevent) risk of (electric) shock / electrocution	**B1**
(a)(ii)	3.1 (A)	**A3**
	720/230	(C2)
	(current =) power / voltage **OR** (I =) P / V	(C1)
(b)	468 (cents)	**A3**
	26 × 18	(C2)
	(cost =) number of kWh × cost per kWh	(C1)
	number of kWh = 3797 – 3771 OR 26	(C1)

Q4.

Question	Answer	Marks
(a)(i)	protects (transformer / wiring) from fire / overheating	**B1**
(a)(ii)	any **two** from: • large current (in fuse) • (causes) fuse to melt • (and so) prevents current in appliance **OR** breaks circuit **OR** isolates appliance from supply.	**B2**

Q5.

Question	Answer	Marks
(a)	any **four** from: Earth wire keeps case at zero volts/earth (potential) (so) user not electrocuted (live wire touching metal case produces) large current (in fuse/earth wire) (causes) fuse to melt isolating appliance from supply OR (so) no current in appliance OR disconnects/breaks the circuit prevent(s/ing electrical) fire/overheating (in cables/appliance)	**B4**

Q6.

Question	Answer	Marks
(a)(i)	(large current produces large) heating effect OR overheating OR (could) cause fire.	**B1**
(a)(ii)	fuse melts	**B1**
	breaks circuit OR stops current in circuit	**B1**
(a)(iii)	(metal case / kettle) would still be live OR connected to 240 V / mains (when fuse has melted)	**B1**
(b)	5 A	**B1**
(c)	(R =) $V \div I$ OR $V = IR$	**C1**
	12 ÷ 2.5	**C1**
	4.8 (Ω)	**A1**

Q7.

Question	Answer	Marks
(a)(i)	correct symbol for fuse drawn	**B1**
(a)(ii)	a large current flows to earth / in the live wire OR fuse is connected into live wire OR fuse contains thin / low melting point wire	**B1**
	any **two** from: current heats (fuse) wire fuse melts / blows (power supply circuit / metal case) is disconnected from mains (supply)	**B2**

Paper 4

Q8.

(c)	1	if the tap becomes live **or** if the (live) cable touches the (metal) tap	**B1**
		there is a current to earth / in the earth wire (which blows the fuse)	**B1**
	2	the current (in earth wire) is large **and** fuse melts / blows / stops current / breaks circuit	**B1**

Q9.

Question	Answer	Marks
(a)	conditions (outdoors) may be damp / wet	**C1**
	water conducts (electricity) OR clear statement of need for waterproof / outdoor specification (components)	**A1**
(b)	protects components / appliances / circuit / wires / user / mains supply prevents electrical supply overheating / fires / electrocution / shocks	**B1**
	excess current / power in circuit / wires OR fuse melts / blows OR circuit breaker opens	**B1**