

- 1 (a) (i) $N_1/N_2 = V_1/V_2$ in any form, symbols, words or numbers
12 (turns) [possible unit penalty] C1
A1
- (ii) mention of magnetic / electromagnetic field)
)
change of flux linkage / magnetism)
OR field lines being cut)
) any 3 B1 x 3
Induced current / emf / voltage)
)
Fewer coils in secondary so smaller emf / voltage)
OR larger current)
- (iii) heat in either coil / wires)
eddy currents in core / heat in core) any 1 B1
magnetic leakage from core)
sound from core/coil)
- (b) (i) 12 V d.c. OR low d.c. voltage
- (ii) diode OR rectifier [Ignore extras unless wrong] B1
- (c) $V_1I_1 = V_2I_2$ in any form, or words or numbers
OR power in = power out or equivalent C1
8 A A1 [10
- 2 (a) a.c./changing current (in primary))
magnetic flux/field/force in core)
alternating/changing magnetic field) any 3 B1 x 3
accept without magnetic if used in previous line
field cuts secondary)
changing flux linkage in (secondary))
induces emf/current in (secondary))
- (b) more/increasing turns on secondary OR less/decreasing turns on primary
OR step up B1
- (c) $V_1I_1 = V_2I_2$ in any form OR $24\,000 \times 12\,000 = 400\,000 \times I_2$
720 A C1
A1
- (d) less heat/energy/power loss OR more efficient energy transfer)
thinner/smaller cables)
less metal used) any 2 B1+B1
less massive pylons)
ignore less electricity loss)

- 3 (a) Fig.8.1 nothing seen/no current/no deflection/no voltage B1
 Fig. 8.2 deflection (of needle)/current in mV/voltage induced B1
 Fig. 8.3 deflection (of needle)/current in mV/voltage induced M1
 (**ignore** size of deflection) A1
 same direction as Fig. 8.2
- (b) increase speed B1
 increase turns (of wire)/more coils (**ignore** longer wire) B1
 increase magnet strength (**ignore** larger magnet) B1

[Total: 7]

- 4 (a) (i) step-up transformer B1
- (ii) less heat/energy/power loss (from lines) / thinner wires (possible) B1
 OR lower current NOT more efficient
- (b) $P = V \times I$ in any form, figures or symbols / ($P =$) VI C1
 2.5 A A1
- (c) $P = I^2R$ in any form, figures or symbols / ($P =$) I^2R C
 18.75 W e.c.f. from (b) A1
- (d) $V = IR$ in any form, figures or symbols OR ($V =$) IR OR
 $P = V^2 / R$ in any form, figures or symbols OR ($P =$) V^2 / R OR $V = (PR)^{1/2}$ C1
 7.5 V e.c.f. from (b) or (c) A1
- (e) 22,000 – 7.5 – 7.5 OR 22,000 – 7.5 ecf C1
 21,985 V e.c.f. (minimum 4 s.f.in this case) A1
 OR
 55,000 – 37.5 = 54962.5 (C1)
 54962.5 / 2.5 = 21985 V (minimum 4 s.f. in this case) (A1)

[10]

- 5 (a) 3 complete circles about thick wire, roughly concentric on wire B1
clockwise or anticlockwise arrows on any 2 correct circles, and no contradictions B1
- (b) (i) reduced
- (ii) same OR none B1
- (c) (i) thin wire is a current-carrying conductor in a magnetic field B1
field produced by current in thick wire B1
OR alternative approach:
(both wires produce a magnetic field B1)
(fields interact B1)
- (ii) inwards/towards thick wire/to right/towards T_1T_2 B1
- (iii) smaller force B1

[8]