1 **(a)** pump water to higher level storage )
or heat water ) any one      B1
or charge accumulators/batteries )
ignore charge capacitor    NOT generator

**(b)** less/no energy/power/heat loss OR to reduce current
OR to allow thinner cables OR more efficient    NOTHING ELSE      B1

**(c)** $I^2R$      B1

**(d)** $N_s/1200 = 32000/1100$ OR $N_1/N_2 = V_1/V_2$ in any arrangement      C1
34 880 or 34 900 or 34 909 or 34 910 or 35 000      A1

**(e)** input power = output power or $V_1I_1 = V_2I_2$      C1
current = power/voltage in any form, words, symbols or numbers      C1
25 A      A1      [8]

2 **(a** <u>current</u> in spoke <u>in magnetic field</u>      B1

causes force on spoke/wheel      B1      [2]

**(b)** arrow to indicate anticlockwise motion      B1      [1]

**(c)** outline of coil, pole pieces      B1

d.c. supply connected to brush      B1

split rings connected to coil      B1      [3]

**(d)** brushes connect to other split ring every half turn/coil vertical      B1

reverses direction of current every half turn/coil vertical      B1      [2]

**[Total: 8]**

3  **(a** when magnetic field cuts/cut by conductor/wire/coil/solenoid
       OR change in magnetic field linked with coil etc.                                    B1

       current/e.m.f caused                                                                 B1


   **(b)** solenoid ends connected to meter/lamp note: any sign of a cell gets B0           B1
       magnet indicated in suitable position on axis of solenoid                            B1


   **(c)** insert/withdraw/move magnet into/out of solenoid                                 B1
       meter gives reading (as magnet moves) OR watch the meter OR lamp glows               B1


   **(d)** move magnet faster                                    )
       increase strength of magnet                               ) any 2                    B1+B1
       more turns on solenoid                                    )
       closer to solenoid                                        )

                                                                                       **[Total: 8]**




4  **(a** primary and secondary coils on iron core labelled                       B1
       240 V a.c. to primary, 12 V a.c. to secondary                              B1
       turns ratio shown or stated 20:1, stepdown                                 B1      **3**

   **(b)** **(i)**   must be constantly changing magnetic field                    B1

       **(ii)**  magnetic field of primary passes through core to secondary        B1
              magnetic field of secondary cuts coil, induces output                B1      **3**

   **(c)** **(i)**   18 W                                                          A1

       **(ii)**  540 J                                                            A1      **2**
                                                                                         **[8]**



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