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|---|-----|--|----------------|-------------------|
| 1 | (a) | pump water to higher level storage) or heat water) any one or charge accumulators/batteries) ignore charge capacitor NOT generator | B1 | |
| | (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 34 880 or 34 900 or 34 909 or 34 910 or 35 000 | C1 A1 | |
| | (e) | input power = output power or $V_1I_1 = V_2I_2$ current = power/voltage in any form, words, symbols or numbers 25 A | C1 C1 A1 | [8] |
| 2 | (a) | <u>current in spoke in magnetic field</u> causes force on spoke/wheel | B1 B1 | [2] |
| | (b) | arrow to indicate anticlockwise motion | B1 | [1] |
| | (c) | outline of coil, pole pieces d.c. supply connected to brush split rings connected to coil | B1 B1 B1 | [3] |
| | (d) | brushes connect to other split ring every half turn/coil vertical reverses direction of current every half turn/coil vertical | B1 B1 | [2] |
| | | | | [Total: 8] |

| | | |
|---|--|---------------------|
| 3 | <p>(a) when magnetic field cuts/cut by conductor/wire/coil/solenoid OR change in magnetic field linked with coil etc.</p> <p>current/e.m.f caused</p> | <p>B1</p> <p>B1</p> |
| | <p>(b) solenoid ends connected to meter/lamp note: any sign of a cell gets B0 magnet indicated in suitable position on axis of solenoid</p> | <p>B1</p> <p>B1</p> |
| | <p>(c) insert/withdraw/move magnet into/out of solenoid meter gives reading (as magnet moves) OR watch the meter OR lamp glows</p> | <p>B1</p> <p>B1</p> |
| | <p>(d) move magnet faster) increase strength of magnet) any 2 more turns on solenoid) closer to solenoid)</p> | <p>B1+B1</p> |
| | | [Total: 8] |

| | | | |
|---|--|-------------------------------|-----------------|
| 4 | <p>(a) primary and secondary coils on iron core labelled 240 V a.c. to primary, 12 V a.c. to secondary turns ratio shown or stated 20:1, stepdown</p> | <p>B1</p> <p>B1</p> <p>B1</p> | <p>3</p> |
| | <p>(b) (i) must be constantly changing magnetic field</p> | <p>B1</p> | |
| | <p>(ii) magnetic field of primary passes through core to secondary magnetic field of secondary cuts coil, induces output</p> | <p>B1</p> <p>B1</p> | <p>3</p> |
| | <p>(c) (i) 18 W</p> | <p>A1</p> | |
| | <p>(ii) 540 J</p> | <p>A1</p> | <p>2</p> |
| | | | [8] |