National 4&5 Electricity & Energy Problems
Answers to Numerical Questions

Current and Electrical Charge (p.2)

1.
(a) 150 C
(b) 18 C
(c) 2 s
(d) 12 s
(e) 30 A
(f) 9·4 A
2. 60 C
3. 4·2 A
4. 1 200 s
5. 630 C
6. 0·25 A
7.
(a) 10 800 s
8. 180 s
9. 105 000 C
10. 4·6 A

Electric Fields and Potential Difference (p. 4)

2. A, C & D
3.
(a) 500 V
(b) 2000 V
(c) 400 V
(d) 800 V
4.
(a) 12 V
(b) 8 V
(c) 6 V
(d) 0 V
5. B

AC & DC (p.6)

1. DC current size & direction remain constant.
2. AC current size & direction constantly change
3. 230V ac, 50Hz
4.
(a) AC
(b) DC
(c) DC
(d) AC
4.
(a) 12V
(b) 3V
(c) 1.5V

Current & Voltage in Series (p.9)

1. 5 V
2. 3 V
3.
(a) 24 V
(b) 3 A
4.
(a) 0·05 A
(b) 10 V
5.
(a) 0·2 V
(b) 1·7 A

Current & Voltage in Parallel (p.11)

1.
(a) 12 V
(b) 12 V
(c) 0·5 A
2.
(a) 6 V
(b) 0·4 A
3.
(a) 230 V
(b) 0·6 A
(c) 0·9 A
4.
(a) 12 V
(b) 12 V
(c) 6 A
(d) 16 A
5.
(a) A & B
(b) 5 A
(c) A, B & C
(d) 7 A
(e) 3 A
(f) 230 V

Ohm's Law (p.14)

1.
(a) 525 V
(b) 200 V
(c) 1·84 A
(d) 0·04 A
(e) 10 Ω
(f) 960 Ω
2.
(a) 50 V
(b) 640 V
(c) 24 V
3.
(a) 2 A
(b) 0·24 A
(c) 0·09 A
4.
(a) 960 Ω
(b) 400 000 Ω
(c) 72 727 Ω
5. 2 400 Ω
6. 0·15 A
7. 3·6 V
8. 230 V
9. 15 333 Ω
10. 0·16 A

Resistance in Series (p.16)

1.
(a) 5575 Ω
(b) 405 Ω
(c) 3000 Ω
(d) 400 Ω
(e) 310 Ω
(f) 80 Ω
2. 9 000 Ω
3. 1 550 Ω

Resistance in Parallel (p.17)

1.
(a) 40 Ω
(b) 10 Ω
(c) 60 Ω
(d) 48 Ω
(e) 60 Ω
(f) 320 Ω
(g) 200 Ω
(h) 100 Ω
(i) 600 Ω
2.
(a) 200 Ω
(b) 1 kΩ
(c) 240 Ω
(d) 140 kΩ
(e) 100 Ω
(f) 321·43 Ω
3. 140 Ω
4. 225 Ω
5. 360 Ω
6.
(a) 20 Ω
(b) 70 Ω
(c) 25 Ω
(d) 20 Ω
(e) 55 Ω
(f) 22·5 Ω
7.
(a) 125 Ω
(b) 280 Ω
(c) 405 Ω
8. 274·29 Ω
9. network B

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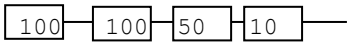
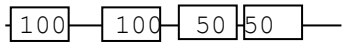
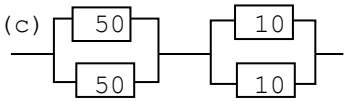
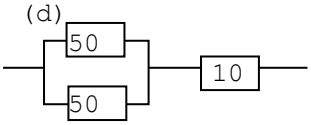
10.

(a) 

(b) 

(c) 

(d) 

Generation of Electricity (p.21)

6. 1 459 people

Electrical Power

Power, Energy, Time (p.23)

1.
(a) 50 W
(b) 5 W
(c) 60 000 J
(d) 2 400 J
(e) 40 s
1.(f) 10 s
2. 12 s
3. 150 W
4. 4 000 J
5. 9·5 W
6. 1 440 000 J
7. 15 minutes
8. 2 900 W
9. 1 200 s
10. 950 W

Power, Current, Voltage (p.25)

1.
(a) 30 W
(b) 5·4 W
(c) 6·52 A
(d) 3 A
(e) 240 V
(f) 6 V
2. 36 W
3. 109·09 V
4. 0·26 A
5. 690 W
6. 2 A
7. 1·57 A
8. 0·70 A
9.
(a) 12 V
(b) 8
10. 238·10 V
11. 3·5 V
12. 188 A
13. $2{\cdot}17 \times 10^{-5}$ A
14. 9 V
15.
(a) 5·65 A
(b) 16·96 A

Power & Resistance (p.28)

1. 440·63 W
2. 900 W
3. 110·21 W
4. 1 175·56 W
5. 401·60 W
6. 9·18 W
7. 253·58 W
8. 777·94 W
9. 480·91 W
10. 0·5 A
11. 460 Ω
12. 26 450 Ω
13. 70·53 Ω
14. 12·25 V
15. 132·25 W

Miscellaneous Questions on Circuits (p.30)

1.
(a) 36 W
(b) 4 Ω
(c) 6 480 J
(d) 540 C
2.
(a) 3 mA
(b) 30 V
(c) 60 s
(d) 0·18 C
3.
(a) circuit 2
(b) 10 Ω
4.
(a) 9·57 A
(b) 24 Ω
5.
(a) 713 W
(b) 74·19 Ω
6.
(a) 1 800 s
(b) $1{\cdot}98 \times 10^{6}$ J
7.
(a) 600 s
(b) 24 W
8.
(a) 2 700 s
(b) 33 750 C
9. 10 A
10. 1 036 800 J
11. 4 V
12.
(a) 8 V
(b) 2 A
13.
(a) 24 V
(b) 0·3 A
14.
(a) 12 V
(b) 1·5 A
15. network 3

Energy Transformations (p.35)

1. 80 000 J
2. 12 600 000 J
3.
(a) 800 000 J
(b) 800 000 J
(c) 800 000 W
4.
(a) $2{\cdot}25 \times 10^{6}$ J
(b) $2{\cdot}25 \times 10^{6}$ J
(c) 1875 kg
5.
(a) $1{\cdot}10 \times 10^{6}$ J
(b) $1{\cdot}10 \times 10^{6}$ J
(c) 367 m
6.
(a) 3×10^{8} J
(b) 83 333 W
7. 125 000 W
8.
(a) $6{\cdot}4 \times 10^{8}$ J
(b) $6{\cdot}4 \times 10^{8}$ J
(c) 29 630 W
9.
(a) 24 J
(b) 24 J
(c) 2·4 kg
10.
(a) 14 000 J
(b) 14 000 J
(c) 20·3 s
11. 11 704 s
12. 100·32 s
13. 117·19 ^{0}C
14. 836 W
15. 0·04 kg
16. $22{\cdot}8 \times 10^{5}$ J
17.
(a) 65 ^{0}C
(b) 300 s
18.
(a) 10 000 J

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(b) 55·56 W
(c) 0·24 A
19. Copper
20.
(a) 10 350 J
(b) 8 460 J
(c) 1890 J

Efficiency (p. 40)
1.
(a) 50 %
(b) 20 %
(c) 960 J
(d) 3 333 J
(e) 180 J
(f) 24 000 J
2. 58·8 %
3. 20 %
4. 14·26 %
5. 29·5 %
6. 20 kJ
7. 750 MW
8. 781·25 MW
9. 96 000 kW
10. 45 %
11. 22·22 MW
12. 1 575 000 J
13. 360 W
14. 444·4 m
15. 9 MJ

Electromagnetism (p.44)
4.
(a) 6
(b) 7 or 8
(c) 11

L.E.D. Circuit Calculations (p.46)
1. B and E
2.
(a) 4 V, 400 Ω
(b) 10 V, 1 000 Ω
(c) 6·2 V, 387·5 Ω
(d) 18·4 V, 2 300 Ω
(e) 2·5 V, 125 Ω
(f) 9 V, 750 Ω
3.
(a) 190 Ω
(b) 600 Ω
(c) 980 Ω
(d) 400 Ω
(e) 1 000 Ω
(f) 500 Ω
(g) 650 Ω
(h) 50 Ω
4.
(a) 3·2 V
(b) 1·9 V
5. 11 V
6. 425 Ω
7. 0·005 A
8. 2·2 V
9. 21 V
10. 250 Ω

Electronic Systems – Input Devices (p.50)
2.
(a) (i) 200 Ω
(ii) 2500 Ω
(b) circuit (ii)
3.
(a) 4 000 Ω
4.
(a) 0·2 kΩ
(b) 0·005 A
(c) bright sunlight
5.
(a) 60 ^{0}C
(b) cold
(c) 20 ^{0}C
(d) 0·03 A

Potential Divider Circuits (p.54)
1. 6 V, 6 V
2. 12 V, 12 V
3. 18 V, 18 V
4. 2 V, 10 V
5. 4 V, 6 V
6. 20 V, 16 V
7. 16 V, 8 V
8. 16 V, 8 V
9. 16 V, 8 V
10. 27 V, 9 V
11. 27 V, 9 V
12. 27 V, 9 V
13. 8 V, 4 V
14. 2·5 V, 7·5 V
15. 48 V, 192 V
16. 2 V, 3 V
17. 13·5 V, 22·5 V
18. 4 V, 20 V
19. 30 V, 210 V
20. 3·6 V, 16·4 V
21.
(a) 224·39 V
(b) 218·94 V
22.
(a) 10·91 V
(b) 8·57 V
23.
(a) 17·14 V
(b) 4·84 V
24. 35·53 V
25. 100 ^{0}C
26. 12 V
27. 0 V
28. 0 V
29. 5 V
30. 0 V

Transistor Switching Circuits (p. 61)
1.
(a) 6 V, bulb ON
(b) 2 V, bulb ON
(c) 0·5 V,Buzzer OFF
(d) 1·2 V, L.E.D. ON
(e) 1·95 V, bulb ON
(f) 3·56 V, L.E.D. OFF as it is wrongly connected.
2.
(a) 0 V
(b) No
(c) Yes
(d) Yes
4.
(a) D
(b) B
(c) C
(d) A
5.
(a) ON
(b) OFF
(c) ON
(d) OFF
(e) ON
(f) OFF

Pressure, Force, Area (p. 66)
1.
(a) 75 Pa
(b) 8000 Pa
(c) 220 000 N
(d) 720 N
(e) 60 m^2
(f) 3.5 m^2
2. 250 000 Pa
3. 490 Pa
4. 60 000 Pa
5. 8 x 10^8 Pa
8.
(a) 4.7 N
(b) 3.2 x 10^{-3} m^2
(c) 1469 Pa

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Answers to Numerical Questions

9.
(a) 294 N
(b) 0.099 m^2
(c) 2970 Pa
10.
(a) 12 250 N
(b) 0.31 m^2
(c) 0.08 m^2
11. 2.2 x 10^{-4} m^2
(2.2cm^2)
12.
(a) 294 000 N
(b) 30 000 kg

13. 50 000 N
14. approx. 3.5x10^7Pa
15. approx. 5x10^{-4} m^2
(5cm^2)

The Gas Laws (p.72)

1.
(a) 300 K
(b) 373 K
(c) 273 K
(d) 223 K
2.
(a) 127 °C
(b) -263 °C
(c) 0 °C
(d) -176 °C
3.
(a) 60 °C
(b) 60 K
4. 210 kPa
6. 0.07 m^3
7. 90 m^3
8. 1.68 x 10^5 Pa
9. 899 litres
10. 104 kPa
11. 238 kPa
12. 360 K (87 °C)
13. 129 kPa
14. 303 K (30 °C)
15. 32 ml
16.
(b) 42.7 cm^3
17. 0.18 cm^3
18. 1.09 x 10^5 Pa