

National 4 & 5 Waves & Radiation Problems

Answers to Numerical Questions

Speed of Sound (p.2)

4.
(a) 340 m/s
(b) 300 000 000 m/s

Speed, Distance & Time (p.3)

1.
(a) 300 000 000 m/s, light
(b) 340 m/s, sound
(c) 340 m/s, sound
(d) 340 m/s, sound
(e) 300 000 000 m/s, light
(f) 340 m/s, sound

2.
(a) 300 000 000 m
(b) 900 000 000 m
(c) 30 000 000 000 m

3.
(a) 340 m
(b) 1 020 m
(c) 3 400 m
4. 1 360 m
5. (a) 317, 323, 308 m/s.
(b) 316 m/s

6. 0.29 s
7. 1 020 m
8. 1 530 m

10.
(b) 2 380 m

11.
(a) 200 m
(b) 0.59 s

12.
(a) 100 m
(b) 0.29 s

13.
(a) 160 m
(b) 80 m

14.
(a) 90 m
(b) 45 m
(c) 15 m

15.
(a) 0.15 m
(b) 1×10^{-4} s

16.
(a) 0.06 m
(b) 4×10^{-5} s

17.
(a) 0.12 m
(b) 0.06 m
(c) 0.11 m

Wavelength & Amplitude (p.9)

1. CE, FG
2.
(a) 3
(b) 2
(c) 4
(d) 2.5

3. 5 m
4. 15 cm
5. 40 m
7.
(a) 12
(b) 2 m
(c) 1.5 m
8.
(a) 12 m
(b) 96 m
(c) 2.1 m
9. 18 cm
10. 50 000

Frequency (p.11)

1.
(a) 2 Hz
(b) 4 Hz
(c) 0.5 Hz
(d) 12 Hz
(e) 50 Hz
(f) 20 000 Hz
2. 5 Hz
3. 4 Hz
4. 1 000 000 waves
5. 96 waves
6. 15 waves
7. 600 waves
8. 20 s
9. 5 s
10. 6 s
11. 0.5 s
12. 60 000 waves
13. 3 s
14. 2.5 Hz
15.
(a) 3 Hz
(b) 6 waves
(c) 2 s

The Wave Equation (p.17)

1.
(a) 15 m/s
(b) 600 m/s
(c) 20 m/s
(d) 25 m/s
(e) 0.5 m/s
(f) 1 m/s
2. 1 500 m/s
3. 150 m/s
4. 2.5 Hz
5. 60 Hz
6. 40 Hz
7. 1.1 m
8. 1.5 m
9. 0.8 m
10. 330 m/s
11. 0.0003 m
12. 50 Hz

13.
(a) 1.25 m
(b) 3 Hz
(c) 180 waves
14. 2 400 m/s
15.
(a) 6
(b) 2 Hz
(c) 2 cm
(d) 0.04 m/s
16.
(a) 7 cm
(b) 2.1 m/s
17.
(a) 0.5 Hz
(b) 1.8 m
(c) 0.9 m/s
18. 0.6 Hz, 0.9 m, 0.54 m/s.
19.
(a) 1 m/s
(b) 25 m
20.
(a) 340 m/s
(b) 0.034 m
21.
(a) 6 Hz
(b) 0.15 m/s
(c) 4 s
22. 370 m
23. 75 m
24.
(a) 4 cm
(b) 40 m/s
(c) 1 000 Hz
(d) 60 000
25.
(a) 2.4 m/s
(b) 0.25 s
26. 5×10^{-5} s
27. 1.3 m
28. 4×10^6 Hz
29. 0.2 m
30. 1 900 m

The EM Spectrum (p.25)

1. 3×10^9 m
2. 0.01 s
3. 19 500 m
4. picture wave – 0.49 m
sound wave – 0.48 m
5.
(a) 0.47 m
(b) 5.1×10^{-4} s
(c) 255 000 m
6.
(a) 1.5×10^{10} Hz
(b) 0.12 s
7.
(a) 0.03 m

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- (b) 4.5×10^7 m
 8. 2.5×10^9 Hz
 9. 2.5×10^{12} Hz
 10. 6×10^{-5} m
 11. violet - 7.5×10^{14} Hz
 Red - 4.3×10^{14} Hz
 12. 3.4×10^{-9} m
 13.
 (a) 1.5×10^{-9} m
 (b) 3.3×10^{-10} s
 14. 2.5×10^{-11} m
 15.
 (a) 1×10^7 m
 (b) 68 m

Dosimetry (p.33)

1. 2×10^6 Bq
 2. 800 000 decays
 3. 1.8×10^{10} decays
 4. 120 s
 5. 5 Bq
 6.

	D (Gy)	ω_R	H (Sv)
A	5	20	100
B	10	1	10
C	50	2.3	115
D	40	10	400
E	40	1	40

- (a) 10kg (D) and 60kg (E).
 (c) 10kg (D).

7. 0.03 kg
 8. 7×10^{-3} J (7mJ)
 9. 1×10^{-5} Gy (10 μ Gy)
 10. 2
 11. 2 mGy
 12. 0.3 mSv
 13. 30 mSv
 14. 2.5×10^{-7} Gy (0.25 μ Gy)
 15. (a) 36 μ Sv
 (b) Reading would decrease.
 16. 12.3 μ Svh⁻¹
 17. 25h
 18. 10 μ Svh⁻¹
 19. 15 μ Svh⁻¹
 20.
 (a) 4.8×10^{-3} Gy (4.8mGy)
 (b) 4.8×10^{-3} Sv (4.8 mSv)
 (c) 0.096 Sv (96 mSv)
 21.
 (a) gamma – 1mSv,
 slow neutron – 0.46mSv
 fast neutron – 0.4mSv
 (b) 1.86×10^{-3} Sv (1.86mSv)
 (c) 27 h

22.
 (b) 1 Sv or 1 Gy
 (c) 32 J
 23.
 (a) fast neutrons (4×10^{-3} Sv)
 (b) 1.25 h
 (c) 2×10^{-5} J (20 μ J)

Half Life (p.37)

1. 25 Bq
 2. 20 Bq
 3. 4 kBq
 4. 40 Bq
 5. 2.5 Bq
 6. 12.5 cpm
 7. 7 days
 8. 3 min
 9. 4 h
 10. 9 min
 11. 12 days
 12. 46 cpm
 13. 5120 kBq
 14. 7680 kBq
 15.
 (a) 1/2
 (b) 1/8
 (c) 1/1024
 16.
 (a) 1/2
 (b) 1/4
 (c) 1/32
 17.
 (a) 40 s
 (b) 80 s
 (c) 120 s
 18.
 (a) 3
 (b) 5
 19. 120 s
 20. A – 4 min, B – 8 min
 21. 20 min
 22.
 (a) 8 days
 (b) 5 Bq
 23. 1 h
 24. 3 days
 25.
 (b) 3 h