

2000 General Paper

1. B – 1 ampere [1]
2. A –  [1]
3. D – computer (1)
4. E – increase the amplitude of an electrical signal [1]
- 5.a.FM radio, air traffic control (1)
b. 300 – 3 000 MHz (1)
- 6.a.i. sound → electrical [1]
ii. electrical → sound [1]
b.i. 3×10^8 m/s [1]
ii. The signals pass through the air as a radio wave (2)
- c. PA – conveys information to many people at the same time OR one way communication (1)
2way – allows two way communication OR allows communication in private (1)
- 7.a. tuner, TV tube [1]
b. aerial [1]
c. provides the energy for the amplifiers [1]
8. Hazards are : too many plugs in one adapter, poorly repaired flex, stereo in bathroom, flex under door
Dangers : risk of electrocution/death, tripping on flex, overheating causing a fire etc. (4)
9. a. $I = \frac{P}{V} = \frac{0.3}{6} = 0.05 \text{ A}$ [$\frac{1}{2}, \frac{1}{2}, 1$]
b.i.  [1]
ii. A – 230 V [1]
B – step down transformer [1]
iii. Mains – alternating current (1)
Battery – direct current (1)

10. a. bell – collects (and amplifies) the sounds from the patients chest tubing – carries the sounds from the bell to the earpieces, small volume to reduce sound loss against the walls earpieces – fit snugly into the doctor's ears cutting out any background noise [3]
b. To reduce sound loss / cut out background noise (1)
11. a. laser light (1)
b. ultra violet (1)
c. X-rays (1)

12. a.

Device	Component
Automatic night light	LDR
Automatic fire alarm	thermistor
Time delay for pedestrian crossing	capacitor

[3 x 1]

- b. i. transistor [1]
ii. automatic switch (1)
- c. R reduces the current through the LED OR reduces the voltage across the LED OR protects the LED. [1]
13. a. You need the length of the card (l) and the time that the light gate is blocked for (t), the instantaneous speed will be $v = \frac{l}{t}$ (1 for each meas, 1 for equation)
b. $a = \frac{v - u}{t} = \frac{0.8 - 0}{2} = 0.4 \text{ m/s}^2$ ($\frac{1}{2}, \frac{1}{2}, 1$)
c. NOT CORRECT because the time on the stopwatch is shorter so the human reaction time is a greater proportion. CORRECT because the time taken to pass through the light gate is longer so the reading error on the electronic timer will be more accurate. (2)

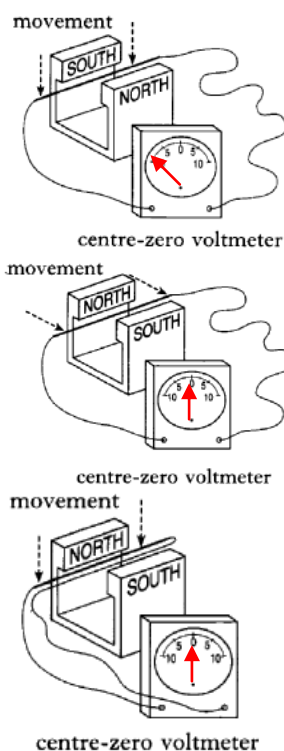
14. a. $w = mg = 20\,000 \times 10$
 $= 200\,000 \text{ N}$ [½,½,1]
 b. Balanced forces mean the train will be moving at constant speed (Newton's 1st Law) [1]
 c. i. $E_p = mgh = 20\,000 \times 10 \times 300$
 $= 60\,000\,000 \text{ J}$
 $= 6 \times 10^7 \text{ J} = 60 \text{ MJ}$ (½,½,1)
 ii. $P = \frac{E}{t} = \frac{6 \times 10^7}{8 \times 60} = 125\,000 \text{ W}$
 $= 1.25 \times 10^5 \text{ W} = 125 \text{ kW}$ [½,½,1]
 iii. The power will be greater because more is needed when the train is accelerating and also to overcome the effects of friction (1)

15 a.

Fossil fuels	Other energy sources
Coal	Nuclear
Oil	Hydroelectric
Gas	Biomass

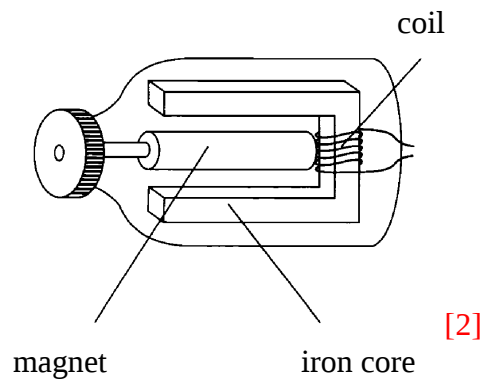
- b. Total %age fossil fuels = $24 + 32 + 18$
 $= 74 \%$ (3) [1]
 c. Fossil fuels are a finite resource and are running out. (1)
 d. Wind, wave, tidal, solar, etc. [1]

16. a.



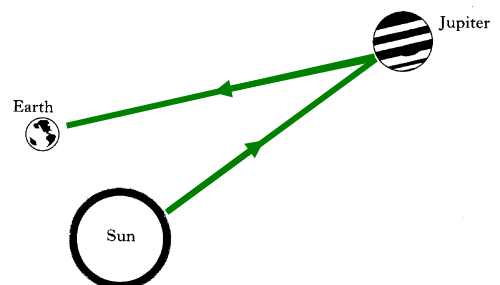
(3 x 1)

b.



[2]

17. a. length of time = year – 1991
 e.g. in year 2000 = $2000 - 1991$
 $= 9 \text{ years}$ (1)
 b. Planet, galaxy, star (not sun) [3]
 c.



(1 sun to Jupiter, 1 Jupiter to Earth, no arrows no marks)

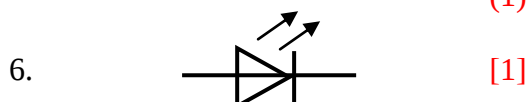
18. curved, acceleration, force of gravity, neither [4 x 1]

Total marks KU [40]
 PS (40)

Grade 3 - ≥ 28 (N.B. half marks are rounded up)
 Grade 4 - ≥ 20
 Grade 5 - ≥ 16
 Grade 7 - ≤ 15

2001 General Paper

1. B - tuner [1]
2. C - loudspeaker (1)
3. A – blue, green, red [1]
4. A – 0 N (1)
5. E – kinetic energy is transferred to heat (1)



7. a. i. $f = \frac{\text{no.of.waves}}{\text{time}} = \frac{10}{5} = 2 \text{ Hz}$ [$\frac{1}{2}, \frac{1}{2}, 1$]
- ii. $\lambda = \frac{\text{dist}}{\text{no.of.waves}} = \frac{12}{8} = 1.5 \text{ m}$ [$\frac{1}{2}, \frac{1}{2}, 1$]
- iii. $v = f\lambda = 2 \times 1.5 = 3 \text{ m/s}$ [$\frac{1}{2}, \frac{1}{2}, 1$]
- b. i. top to bottom = $15 - 13 = 2$
amplitude = $\frac{2}{2} = \frac{10}{5} = 1 \text{ cm}$ [1,1]
- ii. The wave has lost energy (1)

8. a. i.

Stage	How transmitted	
1	sound	(1)
2	microwave	(1)
3	light	(1)
4	electrical	[1]

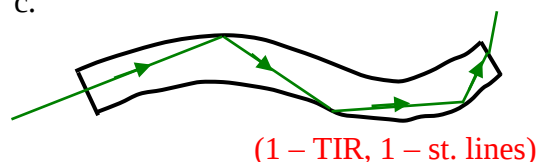
ii. Stage 1 - sound (1)

b.



[1 – reflection, 1 – focus]

c.



9. a.

	Lamp1	Lamp2	Lamp3	
Current (A)	0.3	0.3	0.3	(1)
Voltage (V)	12	12	12	[1]

ii.

	Lamp1	Lamp2	Lamp3	
Current (A)	0.1	0.1	0.1	[1]
Voltage (V)	4	4	4	(1)

- b. i. Circuit 1 (1)
- ii. Any suitable plug in (1)

10. a. 230 V [1]

b. Can be operated independently OR
If one blows the rest stay on OR
Same voltage across them (2 x 1)

- c. i. Power = no of lamps x power of each
= $8 \times 800 = 6400 \text{ W}$
= 6.4 kW [$\frac{1}{2}, \frac{1}{2}, \frac{1}{2}, \frac{1}{2}$]
- ii. A – kWh = 6.4×3
= 19.2 kWh [$\frac{1}{2}, \frac{1}{2}$]
B – cost = kWh x rate = 19.2×5
= 96 pence [$\frac{1}{2}, \frac{1}{2}, 1$]
- d. MCB, circuit breaker etc. [1]

11.a.i. P – its range includes the melting point of ice (1,1)

- ii. Q – more accurate (1,1)
- b. give it a shake, place in patients mouth etc, allow to get to body temp, take reading [$\frac{1}{2}, \frac{1}{2}, \frac{1}{2}, \frac{1}{2}$]
- c. Reading is above normal body temperature, patient has a fever. [1,1]

12.a.i. infra red detector (1)

ii. light dependant resistor (LDR) (1)

- b. i. A - AND gate [1]
- B - [2]

Input P	Input Q	Output
0	0	0
0	1	0
1	0	0
1	1	1

ii. AND gate (1)

13. a. force, 10 N [2 x 1]

- b. i. P – the maximum force it can measure is 2 N which is not enough for the 10 N block. (1, 1)
- ii. R – would not be accurate as the weight is less than one division on the balance. (1)

14. a.i. $E_H = cm\Delta T = 4180 \times 120 \times (34 - 18)$
 $= 4180 \times 120 \times 16$
 $= 8\,025\,600 \text{ J} \quad [1 - \text{temp}, \frac{1}{2}, \frac{1}{2}, 1]$

ii. $t = \frac{E_H}{t} = \frac{8025600}{200}$
 $= 40\,128 \text{ s} \quad [\frac{1}{2}, \frac{1}{2}, 1]$

- b. Heat energy is being lost to the surroundings (1)

15.a. i. Water is pumped from a lower reservoir to a higher one, using surplus electricity / at times of low demand on the grid. [1, 1]

ii. More efficient, recycles water, less water required. [1]

b. $E_H = mgh = 1 \times 10 \times 400$
 $= 4\,000 \text{ J} \quad [\frac{1}{2}, \frac{1}{2}, 1]$

c. i. The top label is the CORE
 The left label is the PRIMARY COIL
 The right label is the SECONDARY COIL (3 x 1)

ii. $\frac{n_s}{n_p} = \frac{V_s}{V_p} = \frac{n_s}{15000} = \frac{275000}{25000}$
 $n_s = \frac{15000 \times 275000}{25000}$
 $= 165\,000 \text{ turns} \quad [\frac{1}{2}, \frac{1}{2}, 1]$

iii. Reduces power/energy loss [1]

16.a. i. Europa (1)

ii. Jupiter (1)

iii. Sun (1)

b. i. eyepiece, magnify (\frac{1}{2}, \frac{1}{2})

ii. objective, collect light (\frac{1}{2}, \frac{1}{2})

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