Candidate responses

Q1(b)(i)   **Maximum mark: 3**

Response A   **Marks**

$$a = \frac{v}{t}$$

$$a = \frac{3}{15}$$

$$= 0.2 \ ms^{-2}$$

Response B

$$A = GRADIENT$$

$$= 3/15$$

$$= 0.2 \ ms^{-2}$$

Response C

$$a = \frac{v-u}{t}$$

$$= \frac{3-0}{15}$$

$$= 0.2 \ m/s^2 \ at \ 180°$$

Q1(b)(ii) **Maximum mark: 3**

Response A   **Marks**

$$D = \tfrac{1}{2} \times 2 \times 15 + 2 \times 15$$

$$D = 45 \text{ m}$$

Response B

$$d = 1.5 \times 15 + 3 \times 15$$

$$d = 67.5 \text{ m}$$

Response C

$$S = \text{area}$$

$$S = 3 \times 30 = 90 \text{ m}$$

Q1(c)   **Maximum mark: 2**

Response A   **Marks**

$2.6 \div 2.9 = 0.9$

$\tan \theta = 0.9$

$\theta = 41.99°$

Bearing = 48.01° E of N

Response B

$\theta = \tan^{-1}(2.6/2.9)$

$= \tan^{-1} 0.896$

$\theta = 41.9°$

direction = 48.1° E of N

Response C

$\theta = \tan^{-1} 0.9$

$= 42°$ N of E

Q2(a)(i)   **Maximum mark: 1**

Response A   **Marks**

So that the vehicle will not rub against the track and get slowed down.

Response B

CUSHIN OF AIR stops THE VEHICLE TOUCHING THE TRACK.

Response C

To reduce friction in the Experiment.

Q2(a)(ii) **Maximum mark: 3**

Response A

Marks

The length of card
How long the card takes to get to the gate
How long the card takes to get through the gate
The height of the hanging mass

Response B

Size of card
Time for card to get through gate
Time for card to get to gate

Response C

Card length
times reading
Stopclock reading
height of mass

Q2(b)   **Maximum mark: 2**

Response A

         Marks

1.21 m/s²

It is not in the same proportion to the accelerating force

Response B

1.80 because it dosnt fit the pattern

Response C

When the hanging mass is 0.08 kg.
The pattern of going up in steps of 0.4
Isn't followed in this one.

Q3(a)   **Maximum mark: 2**

Response A   **Marks**

$$f = 27 \text{ strokes per minute}$$
$$= \frac{27}{60} \text{ strokes per second}$$
$$= 0.45 \text{ Hz}$$

Response B

$$f = \frac{n}{t} = \frac{27}{60} = 0.45$$

Response C

$$v = f\lambda$$
$$27 = f \times 60$$
$$f = 0.45 \text{ Hz}$$

Q3(c)   **Maximum mark: 3**

Response A

Marks

$$F = Wd$$
$$208 = F \times 1.3$$
$$F = 160\,N$$

Response B

$$F = \frac{W}{d}$$
$$= \frac{208}{1.3}$$
$$= 160\,kg\,m/s$$

Q4(a)   **Maximum mark: 1**

Response A   **Marks**

Moon is a natural satellite.

Response B

A moon is a natural satellite of a celestial object.

Q4(b)   **Maximum mark: 2**

Response A   **Marks**

Hydra – it has the biggest mass

Q4(d)(i)   Maximum mark: 3

Response A   **Marks**

$$E = \frac{1}{2}mW^2$$

$$= \frac{1}{2} \times 454 \times 2.3 \times 10^4$$

$$= 1.2 \times 10^{11} \text{ J}$$

Response B

$$K_E = \frac{1}{2}mN^2$$

$$= \frac{1}{2} \times 454 \times 23^2$$

$$= 120 \times 10^3 \text{ J}$$

Response C

$$E = \frac{1}{2}mN^2$$

$$E = 0.5 \times 454 \times 230^2$$

$$E = 120 \times 10^5 \text{ J}$$

Q4(d)(ii)   **Maximum mark: 2**

Response A   **Marks**

CONSTANT SPEED SO NO FORCES ACTING SO NO
ACCELERATION SO NO FUEL USED.

Response B

There is no friction acting against its motion so
no fuel was used needed to work the
rocket motors

Response C

NO FORCES AT ALL ACTING ON NEW HORIZONS

Response D

The forces acting on New
Horizons are balanced so
there is no need for the
rocket engines to be on

Q4(e) **Maximum mark: 3**

Response A

Marks

$d = v \times t$
$= 3 \times 10^8 \times 4.4$
$= 1.32 \times 10^8 \times 60 \times 60$
$= 47520 \times 10^8 \text{ m}$

Response B

$d = v \times t$

$d = 3 \times 10^8 \times 4.4 \times 60 \times 60$

$d = 4.7520 \times 10^{12} \text{ m}$

Q5   **Maximum mark: 3**

Response A   **Marks**

1. The Hubble telescope is in orbit so light from far away doesn't get absorbed

2. Some stars give out radio waves and they can be detected with aerials.

3. Some stars give out x rays and they can be detected too.

Q6(a)(i)   **Maximum mark: 1**

Response A   **Marks**

To reduce the brightness of the LEDs.

Response B

The resistance stops the LEDS getting damaged by too high a voltage flowing in them.

Response C

To stop the LEDs getting too bright.

Q6(b)   **Maximum mark: 1**

Response A   **Marks**

the red LEDs will be same brightness because the current flowing through them will be the same.

Response B

SAME BRIGHTNESS. VOLTAGE IN RED LEDS DOSNT CHANGE.

Q7(b)(i)   Maximum mark: 1

Response A

The light dependent resistor part of the circuit can't handle the size of current the floodlight needs.

Response B

LDRS DONT WORK WITH BIG VOLTAGES.

Response C

the transistor
Connecting to 230V would make too large a current flow through it and cause damage to it.

Q8(a)   **Maximum mark: 3**

Response A   **Marks**

$$E = Mc\Delta T$$

$$E = 2.5 \times 810 \times 238$$

$$= 481950\ J$$

Response B

$$E = cm\Delta T$$

$$E = 8.10 \times 10^2 \times 2.5 \times 228$$

$$E = 4.61700 \times 10^5\ J$$

Response C

$$E_h = cm\Delta T$$

$$= 810 \times 2.5 \times (250 - 22)$$

$$= 461700\ J$$

Q8(b)(i)   Maximum mark: 3

Response A

$$R = \frac{1}{R} + \frac{1}{R} + \frac{1}{R}$$

$$R = \frac{1}{174} + \frac{1}{174} + \frac{1}{174}$$

$$R = 58 \, \Omega$$

Marks

Response B

$$\frac{1}{R} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3}$$

$$= \frac{3}{174}$$

$$= 58 \, \Omega$$

Response C

$$R = \frac{174 \times 174}{174 + 174} = 87$$

$$R_T = \frac{87 \times 174}{87 + 174} = 58 \, \Omega$$

Q8(b)(ii)   Maximum mark: 3

Response A   **Marks**

$$P = \frac{V^2}{R}$$

$$= \frac{230}{58}$$

$$= 910 \text{ W}$$

Response B

$$I = \frac{V}{R} = \frac{230}{58} = 3.966$$

$$P = IV = 3.966 \times 230 = 912 \text{W}$$

Response C

$$I = \frac{230}{58.0} = 4$$

$$P = IV = 4 \times 230 = 900 \text{ W}$$

Q8(c)   **Maximum mark: 2**

Response A   **Marks**

Less time because the specific heat capacity of
oil is greater than clay brick.

Response B

OIL'S

TIME GREATER. SPECIFIC HEAT CAPPCITY IS LESS.

Q9(a)   **Maximum mark: 2**

Response A   **Marks**

$$PV = K$$
$$P \times 12 = 2.5 \times 10^5 \times 960$$
$$P = 2 \times 10^7 \, Pa$$

Response B

$$\frac{P_1 V_1}{T_1} = \frac{P_2 V_2}{T_2}$$

$$\frac{P_1 \times 12}{T} = \frac{2.5 \times 10^6 \times 960}{T}$$

$$P_1 = 2.0 \times 10^7 \, Pa$$

Response C

$$p^1 V^1 = p^2 V^2$$

$$p^1 \times 12 = 2.5 \times 10^5 \times 960$$

$$p^1 = 2.0 \times 10^7 \, Pa$$

Q9(b)(i)   **Maximum mark: 3**

Response A   **Marks**

$$\frac{p_1}{t_1} = \frac{t_2}{t_2}$$

$$\frac{2 \times 10^7}{284} = \frac{1.9 \times 10^7}{T}$$

$$T = 270 \, °K$$

Response B

$$\frac{P}{t} = \frac{P}{T}$$

$$\frac{2 \times 10^7}{(273+21)} = \frac{1.9 \times 10^7}{T}$$

$$68\,000 = \frac{1.9 \times 10^7}{T}$$

$$T = 279 \cdot 41 \, K$$

Q9(b)(ii) **Maximum mark: 3**

Response A

   Marks

Atoms slow and dont hit Walls as hard.

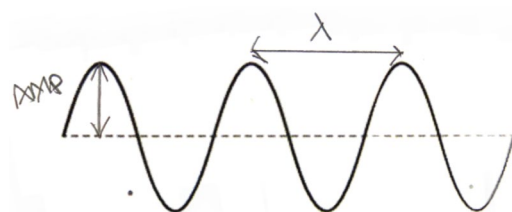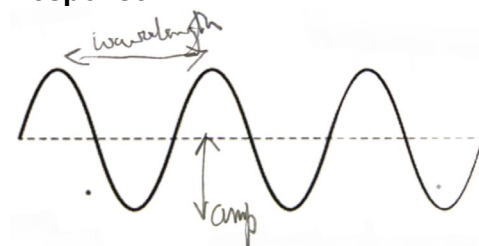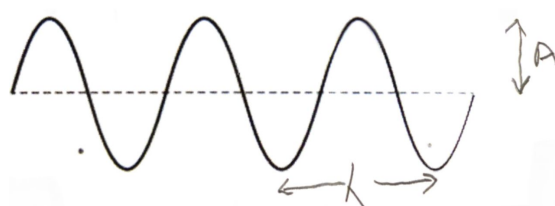### Response B

$P = \dfrac{F}{A}$

A DOSN'T CHANGE
F GETS SMALLER SO P GETS DOWN

Response C

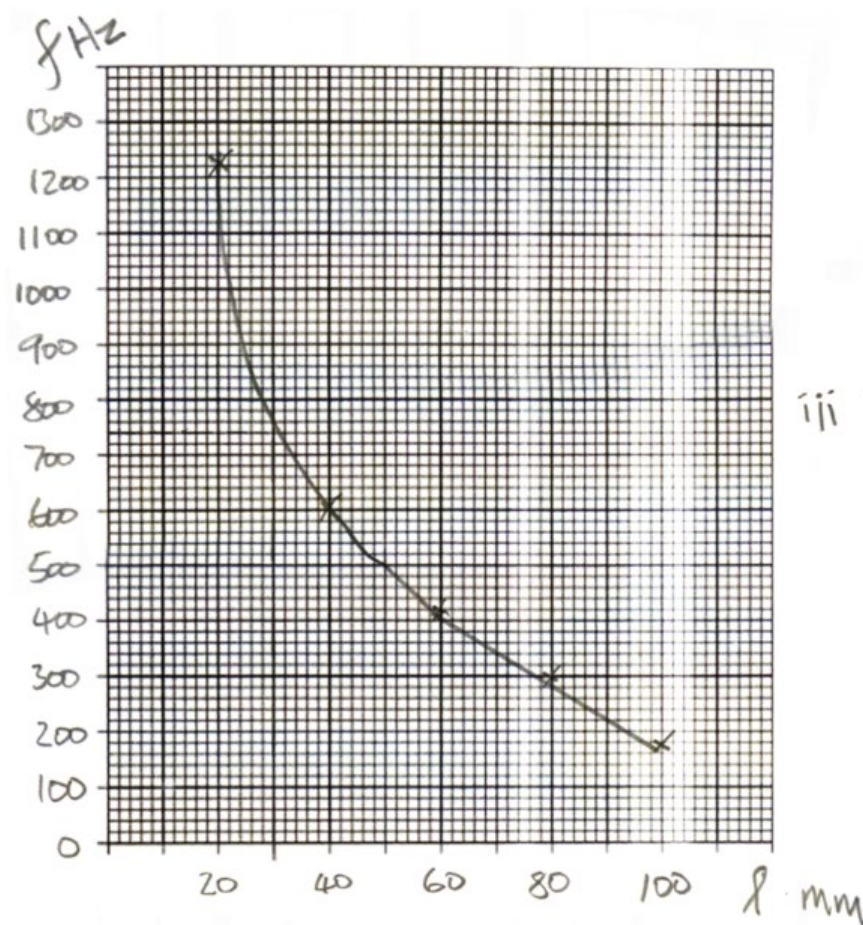$p = \dfrac{F}{A}$

A is constant , $F \downarrow \therefore P \downarrow$

Q11(a)(i),(ii)   **Maximum mark: 1,1**

Response A   **Marks**

Response B

Response C

Q11(c)(i),(ii)   Maximum mark: 3,1

Response A   **Marks**

iii 740

Q11(c)(iii)   **Maximum mark: 1**

Response A   **Marks**

Measure frequency to the nearest 1Hz will make the
experiment more precise.

Response B

Measure frequency to the nearest 1 Hz will make the
experiment more accurate.

Q12(b)(i)   **Maximum mark: 1**

Response A   **Marks**

radon from rocks and radon from space

Q13(a)(i)　　**Maximum mark: 1**

Response A　　　　　　　　　　　　　　　　　　　　　**Marks**

Nuclear fission

Response B

Fussion　　　(nuclear)

Q13(a)(ii)   **Maximum mark: 2**

Response A   **Marks**

The two or three neutrons keep on hitting more and more nuclei and a chain reaction occurs.

Response B

The extra neutrons produced make the nuclei keep on splitting so a chain reaction occurs

Q13(c)(i)   Maximum mark: 4

Response A   **Marks**

$$H = Dw_r$$
$$H = 2.2 \times 10^6 \times 3 + 3.4 \times 10^6 \times 1$$
$$H = 10^7 \ Sv$$

Response B

$$H = Dw_r$$
$$H_1 = 2.2 \times 10^{-6} \times 3$$
$$H_2 = 3.4 \times 10^{-6} \times 1$$
$$H_{TOTAL} = H_1 + H_2$$
$$H_{TOTAL} = 6.6 \times 10^{-6} + 3.4 \times 10^{-6}$$
$$H_{TOTAL} = 1 \times 10^{-5} \ Gy$$