



eduresourceza.com

CURRO

Heritage House

GRADE 12 - TRIAL EXAMINATION 2018

PHYSICAL SCIENCES: PAPER 1 MEMO

Question 1

1.1	1.2	1.3	1.4	1.5	1.6	1.7	1.8	1.9	1.10
C✓✓	D✓✓	A✓✓	C✓✓	A✓✓	A✓✓	C✓✓	C✓✓	C✓✓	C✓✓

Question 2

2.1 Point B / Lawn chair ✓

2.2 Change✓ in position✓

2.3 25 m ✓, East✓

2.4 Average velocity is the rate of change of position ✓ for the entire journey✓
Instantaneous velocity is the rate of change of position at a particular moment in time. ✓

$$2.5 \quad v_{ave} = \frac{\Delta x}{\Delta t} \checkmark = \frac{10}{15} \checkmark = 0,67 \text{ m} \cdot \text{s}^{-1} \checkmark \text{ East} \checkmark$$

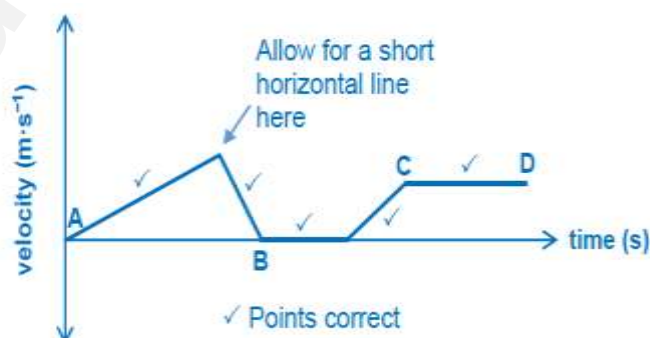
2.6 The gradient✓

2.7 West✓

$$2.8 \quad v_f = v_i + at \checkmark$$

$$0 = v_i \checkmark + (-0,12)(5) \checkmark = 0,6 \text{ m} \cdot \text{s}^{-1} \checkmark$$

2.9



NOTE: allow for a small constant velocity (horizontal line) at approx. 10 s, in case candidates interpreted the given position-time graph to be a straight line at this point.

Question 3

3.1 The motion of a projectile, i.e. an object that falls in the absence of air resistance. ✓✓

$$\begin{aligned} 3.2 \quad \Delta y &= v_i t + \frac{1}{2} a t^2 \checkmark \\ -1,6 &= v_i (1,45) + \frac{1}{2} (-9,8) (1,45)^2 \checkmark \checkmark \\ v_i &= 6 \text{ m} \cdot \text{s}^{-1} \checkmark \end{aligned}$$

$$\begin{aligned} 3.3 \quad v_f &= v_i + a \Delta t \checkmark \\ 0 &= 6 + (-9,8) \Delta t \checkmark \checkmark \\ \Delta t &= 0,61 \text{ s} \checkmark \end{aligned}$$

$$3.4 \quad 9,8 \text{ m} \cdot \text{s}^{-2} \checkmark \text{ downwards} \checkmark$$

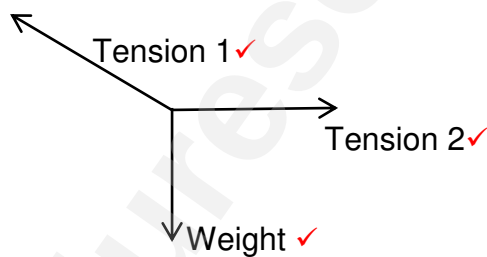
$$\begin{aligned} 3.5 \quad \Delta y &= v_i t + \frac{1}{2} a t^2 \checkmark \\ x &= \frac{1}{2} (1,8) t^2 \checkmark \checkmark & -(1,2 - x) &= \frac{1}{2} (-9,8) t^2 \checkmark \checkmark \\ & & x &= -4,9 t^2 + 1,2 \\ 0,9 t^2 &= -4,9 t^2 + 1,2 \\ 5,8 t^2 &= 1,2 \\ t &= 0,45 \text{ s} \checkmark \end{aligned}$$

Question 4

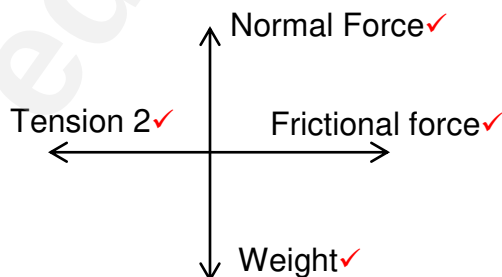
4.1 Maximum static force is the maximum force that can be applied to an object ✓ in order to get an object to move. ✓

4.2 zero net force / zero acceleration ✓

4.3.1



4.3.2



$$4.4.1 \quad F_f = \mu F_N \checkmark = (0,25)(70)(9,8) \checkmark = 171,5 \text{ N} \checkmark$$

$$4.4.2 \quad T_1 \sin(35) = mg \checkmark \checkmark$$

$$4.4.3 \quad T_1 \cos 35 = T_2 \checkmark \checkmark$$

$$4.4.4 \quad T_2 = 171,5 \text{ N} \checkmark$$

$$T_1 = \frac{T_2}{\cos 35} \checkmark = \frac{171,5}{\cos 35} = 209,36 \text{ N} \checkmark$$

$$mg = (209,36) \sin 35 \checkmark$$

$$mg = 120,08 \text{ N} \checkmark$$

Question 5

5.1 Total linear momentum of an isolated system $\checkmark$ remains constant. $\checkmark$

$$5.2 \quad v = \frac{\Delta x}{\Delta t} \checkmark = \frac{1}{0,4} \checkmark = 2,5 \text{ m} \cdot \text{s}^{-1} \checkmark$$

$$5.3 \quad p_i = p_f \checkmark$$

$$(0,02)v_i + 0 \checkmark = (0,02 + 2)(2,5) \checkmark$$

$$v_i = 252,5 \text{ m} \cdot \text{s}^{-1} \checkmark$$

$$5.4 \quad E_{ki} = \frac{1}{2}mv^2 \checkmark = \frac{1}{2}(0,02)(252,5)^2 = 637,56 \text{ J} \checkmark$$

$$E_{kf} = \frac{1}{2}(2,02)(2,5)^2 = 6,31 \text{ J} \checkmark$$

Kinetic energy was not conserved. Therefore inelastic $\checkmark$

$$5.5 \quad F_p = mg \sin \theta \checkmark = (2,05)(9,8) \checkmark \sin 30 \checkmark = 10,05 \text{ N} \checkmark$$

$$5.6 \quad \Delta E_k = \frac{1}{2}mv_f^2 - \frac{1}{2}mv_i^2 \checkmark = \frac{1}{2}(2,05)(0)^2 - \frac{1}{2}(2,05)(3)^2 \checkmark = -9,23 \text{ J} \checkmark$$

5.7 The work done on an object by a net force $\checkmark$ is equal to the change in kinetic energy $\checkmark$

$$5.8 \quad W_{net} = \Delta E_k \checkmark$$

$$F_{net}\Delta x = \Delta E_k \checkmark$$

$$(10,05 - 4) \checkmark \Delta x = -9,23 \checkmark$$

$$\Delta x = 1,53 \text{ m} \checkmark$$

Question 6

6.1.1 Every particle with mass in the universe attracts every other particle with a force $\checkmark$ which is directly proportional to the product of their masses $\checkmark$ and inversely proportional to the square of the distance between their centres. $\checkmark$

$$6.1.2 \quad F = \frac{Gm_1m_2}{r^2} \checkmark = \frac{6,7 \times 10^{-11} \times 5,98 \times 10^{24} \times 3500 \checkmark}{(2 \times 10^8)^2 \checkmark} = 35,1 \text{ N} \checkmark$$

$$6.1.3 \quad \frac{5,98 \times 10^{24} \checkmark}{d^2 \checkmark} = \frac{7,35 \times 10^{22} \checkmark}{(3,8 \times 10^5 - d)^2 \checkmark}$$

$$\frac{2,45 \times 10^{12}}{d} = \frac{2,71 \times 10^{11}}{3,8 \times 10^5 - d}$$

$$d = 3,42 \times 10^5 \text{ km} \checkmark$$

$$\text{Distance between P and Q} = 3,42 \times 10^5 - 2 \times 10^5 = 1,42 \times 10^5 \text{ km} \checkmark$$

6.2.1 Two point charges in free space or air exert forces on each other. The force is directly proportional to the product of the charges $\checkmark$ and inversely proportional to the square of the distance between the charges. $\checkmark$

$$6.2.2 \quad F = \frac{kQ_1Q_2}{r^2} \checkmark$$

$$4 \times 10^{-3} \checkmark = \frac{(9 \times 10^9)Q^2}{(0.006)^2} \checkmark$$

$$Q = 4 \times 10^{-9} \text{ C} \checkmark$$

Question 7

7.1.1 The rate of flow of charge.

$$7.1.2 \quad I = \frac{P}{V} \checkmark = \frac{5}{5} = 1 \text{ A} \checkmark \quad I_2 = 1,5 - 1 = 0,5 \text{ A} \checkmark$$

$$R = \frac{V}{I} = \frac{5}{0,5} = 10 \, \Omega \checkmark$$

7.1.3 The total energy supplied $\checkmark$ per coulomb of charge by the cell. $\checkmark$

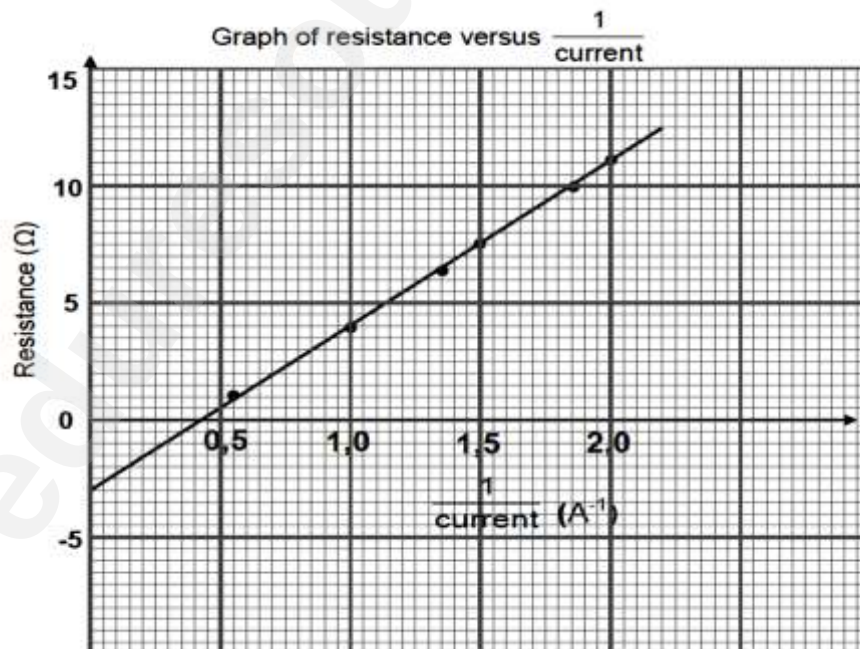
$$7.1.4 \quad V_{ext} = 5 + (1,5)(2) \checkmark \checkmark = 8 \text{ V}$$

$$Emf = 8 \checkmark + Ir \checkmark = 8 + (1,5)(1) = 9,5 \text{ V} \checkmark$$

7.2.1 Temperature / Resistance

7.2.2 0,5 A

7.2.3 Heading $\checkmark$
 Axis – label and units $\checkmark$
 Scale ($> \frac{1}{2}$ page) $\checkmark$
 plotting of points $\checkmark \checkmark$
 lobb $\checkmark$
 shape $\checkmark$ (7)



$$7.2.4a) \quad \varepsilon = I(R_{ext} + r) \checkmark$$

$$\frac{\varepsilon}{I} = (R_{ext} + r) \quad \therefore \frac{\varepsilon}{I} - r = R_{ext}$$

$$R_{ext} = \frac{\varepsilon}{I} - r \checkmark$$

$$y = m x + c$$

$$\therefore m = emf \checkmark \text{ and } r - \text{internal resistance} \checkmark$$

7.2.4b)) $\varepsilon = \text{slope (gradient) of the graph}$

$$= \frac{5,5-2}{1,2-0,7} \checkmark \text{ points from lobf } \checkmark$$

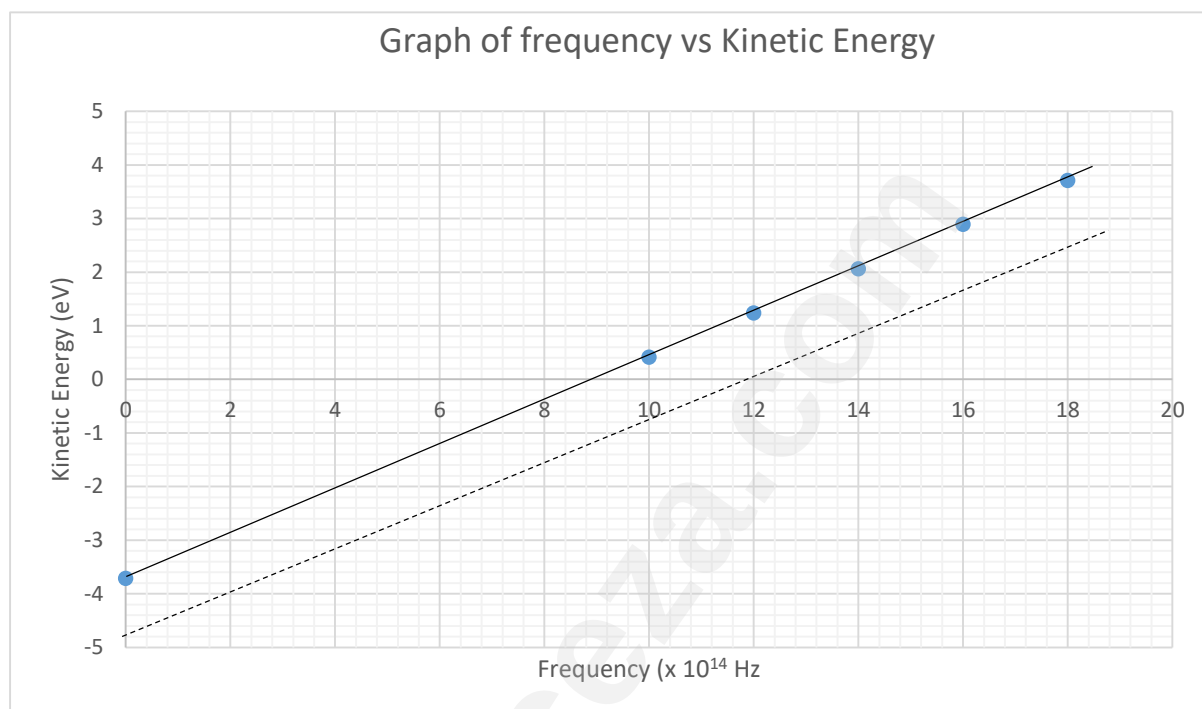
$$= 7 \text{ V} \checkmark$$

Question 8

- 8.1.1 The induced current flows in a direction so as to set up a magnetic field $\checkmark$ to oppose the change in magnetic flux. $\checkmark$
- 8.1.2 No current. $\checkmark$ The stationary magnet has a static magnetic field which would not induce current in the coil $\checkmark$ OR there is no change in the magnetic flux. $\checkmark$
- 8.1.3 A to B $\checkmark \checkmark$
- 8.1.4 Rotate the magnet faster $\checkmark \checkmark$
- 8.1.5 According to Faraday's law of electromagnetic induction, the faster you rotate the magnet, the greater the rate of change of magnetic flux (flux linkage) $\checkmark$, and since the rate of change of magnetic flux is directly proportional to the emf $\checkmark$ induced, the emf across the bulb would increase $\checkmark$ and the bulb will burn brighter as more current flows. $\checkmark$
- 8.2.1a) Diagram 1 $\checkmark$
- 8.2.1b) Diagram 2 $\checkmark$
- 8.2.2 The product of the number of turns on the coil $\checkmark$ and the flux through the coil. $\checkmark$
- 8.2.3 $\frac{V_s}{V_p} = \frac{N_s}{N_p} \checkmark$
 $\frac{V_s}{230} = \frac{400}{100} \checkmark$
 $V_s = 920 \text{ V} \checkmark$
- 8.2.4 DIM $\checkmark$
 The diode will cause half-wave rectification (or AC becomes DC) $\checkmark$
 and thus only half the available power (or voltage or current or energy) is delivered to the lamp. $\checkmark$

Question 9

9.1



Graph – on answer sheet

Heading ✓

y-axis title and unit ✓

x-axis title and unit ✓

scale (plotted points > graph paper) 12 ✓

plotted points (accurate and visible to within half a small square) ✓

line of best fit ✓

9.2 The minimum frequency of incident radiation ✓ at which electrons will be emitted from a particular metal. ✓

9.3 9×10^{14} Hz ✓✓

9.4 The minimum amount of energy ✓ needed to emit an electron from the surface of a metal. ✓

9.5 $W_0 = hf_0$ ✓ $= (6.6 \times 10^{-34})(9 \times 10^{14})$ ✓ $= 5.94 \times 10^{-19} J$ ✓

OR

$W_0 = 3.7$ ✓ $\times 1.6 \times 10^{-19}$ ✓ $= 5.92 \times 10^{-19} J$ ✓

9.6 Remain the same ✓✓

eduresourceza.com