GRADE 12

PHYSICAL SCIENCES: CONTROL TEST (P1)

MARCH 2018

MEMORANDUM

This memorandum consists of 6 pages

QUESTION 1

1.1 **A ✓✓** **(2)**

1.2 **D ✓✓** **(2)**

1.3 **A✓✓** **(2)**

QUESTION 2

2.1 **In an isolated (closed) system ✓ the total linear momentum is conserved (is constant)✓**

OR
In an isolated (closed) system ✓ the total linear momentum before collision is equal to the total linear momentum after collision✓

(2)

2.2 **ANY 1**

ELASTIC	INELASTIC
Kinetic energy is conserved✓	Kinetic energy is not conserved✓
No joining of objects✓	Objects join and move further as a unit ✓
No permanent deforming of the objects occur✓	Permanent deforming of objects occur✓
The internal energy of the objects remains constant ✓	The internal energy (e.g heat energy) of the objects increases✓

(2)

2.3.1 $\sum p_{before} = \sum p_{after}$ **or $m_1v_{i1} + m_2v_{i2} = m_1v_{f1} + m_2v_{f2}$ ✓**

$\underline{(5)(4) + (3)(0)}$ ✓ = $\underline{(5+3)v_f}$ ✓

$\therefore v_f = 2,5\ m.s^{-1}$ ✓

OR
$\Delta p_{5kg} = -\Delta p_{3kg}$ ✓
$mv_f - mv_i = mv_f - mv_i$
$\underline{5v_f - (5)(4)}$✓ = $\underline{3v_f - (3)(0)}$ ✓
$v_f = 2,5\ m{\cdot}s^{-1}$ ✓

(4)

2.3.2 OPTION 1
POSITIVE MARKING FROM QUESTION 2.3.1

$F_{net}\Delta t = \Delta p = (p_f - p_i) = (mv_f - mv_i)$ ✓
$F_{net}(0,3)$ ✓ $= 8\ [(0 - (2,5)]$ ✓
$F_{net} = - 66,67$ N
$\therefore F_{net} = 66,67$ N ✓

OPTION 2
POSITIVE MARKING FROM QUESTION 2.3.1

$F_{net} = ma$ ✓

$$= \frac{m(v_f - v_i)}{\Delta t}$$

$$= \frac{8(0 - 2,5)}{0,3} \text{ ✓ } = - 66,67 \text{ N}$$

$\therefore F_{net} = 66,67$ N ✓

OPTION 3
POSITIVE MARKING FROM QUESTION 2.3.1

$v_f = v_i + a\Delta t$
$0 = 2,5 + a(0,3)$ ✓
$a = - 8,333\ m \cdot s^{-2}$
$F_{net} = ma$ ✓
$= 8\ (-8,333)$ ✓
$= - 66,67$ N
$\therefore F_{net} = 66,67$ N ✓

(4)
[12]

QUESTION 3

3.1 **Doppler Effect. ✓**
The change in the observed frequency (or pitch) of the sound detected by a listener because the sound source and the listener have different velocities relative to the medium of sound propagation✓✓ **(3)**

3.2 **Car approaching:**

$$f_L = \frac{v \pm v_L}{v \pm v_s} f_s \checkmark \text{ OR/OF } f_L = \frac{v}{v - v_s} f_s$$

$$= \left(\frac{340}{340 - 16}\right) \checkmark (420) \checkmark$$

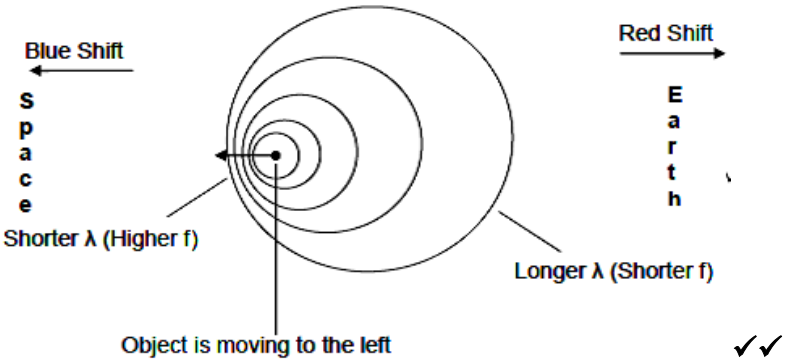
$$\therefore f_L = 440{,}74 \text{ Hz} \checkmark$$

(4)

3.3 **Smaller than.✓ the <u>wavelength</u> of the sound waves <u>increases</u>✓. For a <u>constant speed</u>✓ of sound in a medium frequency decreases with increasing wavelength.** **(3)**

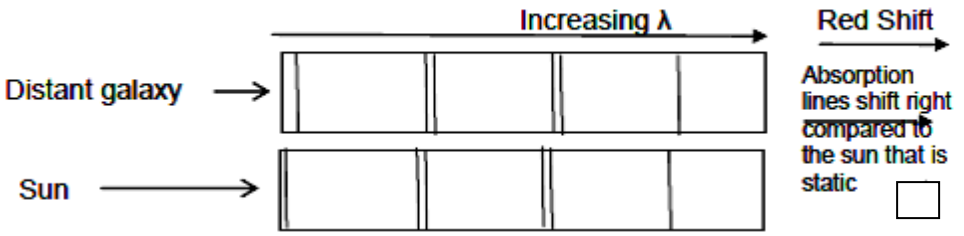
3.4 **The Doppler Flow meter✓** **(1)**

3.5 **Astronomers discovered that stars and galaxies are <u>red shifted (shift towards longer wavelength and lower frequencies)</u>✓, according to the Doppler Effect an <u>increase in wavelength or decrease in frequency corresponds to objects that are moving away from the observer</u>✓**



✓✓

ACCEPT: Diagrams based on the absorption spectra themselves, such as:



✓✓

(4)

[15]

QUESTION 4

4.1.1 **Q ✓ and S ✓** **(2)**

4.2.1 **Photoelectric Effect. ✓** **(1)**

4.2.2 **Minimum frequency of light✓ needed to emit electrons from the surface of the metal ✓** **(2)**

4.2.3 **$1,2 \times 10^{15}$ Hz ✓** **(1)**

4.2.4 **Planck's constant ✓** **(1)**

4.2.5 **$W_0 = hf_0$ OR $E = hf$ ✓**

$W_0 = 6,63 \times 10^{-34} \times 0,68 \times 10^{15}$ ✓

$W_0 = 4,51 \times 10^{-19}$ J ✓

(3)

4.2.6 $E = W_0 + E_k$ ✓

$$6,63\times10^{-34}\frac{3\times10^{8}}{187\times10^{-9}} \quad \begin{matrix}\checkmark\\ \checkmark\end{matrix} \quad = W_0 + 4\times10^{-19} \checkmark$$

$W_0 = 6,63636 \times 10^{-19}$✓

$W_0 = h f_0$

$f_0 = 1,0009 \times 10^{15}$ Hz✓

Al✓

(7)

[17]

TOTAL: 50

ANALYSIS GRID

Question No.	Content	Level 1	Level 2	Level 3	Level 4	Total
1.1	Momentum	2				
1.2	Doppler effect			2		
1.3	Emission & absorption spectra		2			
Total		2	2	2		6
2.1	Momentum	2				
2.2	Momentum			2		
2.3.1	Momentum		4			
2.3.2	Momentum		4			
Total		2	8	2		12
3.1	Doppler effect	3				
3.2	Doppler effect		4			
3.3	Doppler effect			3		
3.4	Doppler effect	1				
3.5	Doppler effect			4		
Total		4	4	7		15
4.1.1	Emission & absorption spectra		2			
4.2.1	Photoelectric effect	1				
4.2.2	Photoelectric effect	2				
4.2.3	Photoelectric effect		1			
4.2.4	Photoelectric effect		1			
4.2.5	Photoelectric effect			3		
4.2.6	Photoelectric effect				7	
Total		3	4	3	7	17
Grand .Total		11	18	14	7	50
Expected marks(policy)		**10**	**17.5**	**15**	**7.5**	**50**
Actual %		22%	36%	28%	14%	100%
Expected(policy) %		**20%**	**35%**	**30%**	**15%**	**100%**