



# education

DEPARTMENT: EDUCATION  
MPUMALANGA PROVINCE

**GRADE 12**

**PHYSICAL SCIENCES MONTHLY TEST**

**APRIL 2020**

**TOPIC: WORK, ENERGY & POWER**

**MEMORANDUM**

**MARKS: 55**

**This question paper consists of 4 pages**

### QUESTION 1

1.1 C✓✓

1.2 B✓✓

1.3 D✓✓

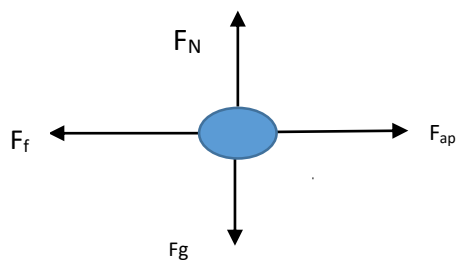
1.4 A✓✓

1.5 A✓✓

[10]

### QUESTION 2

2.1



(4)

2.2 a)  $W_F = F\Delta x \cos\theta$

$$= 60 \times 10 (\cos 0^\circ) \checkmark$$

$$= 600 \text{ J} \checkmark$$

b)  $W_f = f\Delta x \cos\theta$

$$= 16 \times 10 (\cos 180^\circ) \checkmark$$

$$= -160 \text{ J} \checkmark$$

(4)

2.3  $F_{\text{net}} = F + (-f) \checkmark$

$$= 60 + (-16) \checkmark$$

$$= 44 \text{ N} \checkmark$$

(3)

2.4  $W_{\text{net}} = F_{\text{net}}\Delta x \cos\theta \checkmark$

$$= (44)(10) (\cos 0^\circ) \checkmark \checkmark$$

$$= 440 \text{ J} \checkmark$$

(4)

[15]

### QUESTION 3

3.1  $\Sigma p_i = \Sigma p_f$

$$(mv_i)_1 + (mv_i)_2 = (mv_f)_1 + (mv_f)_2 \checkmark$$

$$0 = 1,6(0,26) + 0,8v_f$$

$$v_f = -0,52$$

$$v_f = 0,52 \text{ m} \cdot \text{s}^{-1}$$
 (4)

3.2 ✓ - F ✓ / Experiences the same force in magnitude ✓, but in opposite direction ✓

Newtons Third Law. ✓ (3)

3.3 A force for which the work done in moving an object between two points is dependent of the path taken. ✓✓ (2 or 0) (2)

3.4 External forces present ✓ / friction present ✓ (1)

$$\begin{aligned} 3.5 \quad f &= \mu k \cdot N \quad \checkmark \\ &= (0,12)(1,6 \times 9,8 \times \cos 30^\circ) \quad \checkmark \\ &= 1,63 \text{ N} \quad \checkmark \end{aligned}$$
 (3)

### 3.6 POSITIVE MARKING FROM Q3.5

#### OPTION 1

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

$$W_{\text{w}} + W_f = \frac{1}{2}mv_f^2 - \frac{1}{2}mv_i^2$$

$$(1,6 \times 9,8 \times \sin 30^\circ)(0,5) \cos 0^\circ + (1,63)(0,5) \cos 180^\circ$$

$$= \frac{1}{2}(1,6)v_f^2 - \frac{1}{2}(1,6)(0,2)^2$$

$$v_f = 1,98 \text{ m} \cdot \text{s}^{-1} \quad \checkmark$$

(4)

#### OPTION 2

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

$$W_w + W_f = \frac{1}{2}mv_f^2 - \frac{1}{2}mv_i^2$$

$$(1,6 \times 9,8)(0,5) \cos 60^\circ + (1,63)(0,5) \cos 180^\circ = \frac{1}{2}(1,6)v_f^2 - \frac{1}{2}(1,6)(0,2)^2$$

$$v_f = 1,98 \text{ m} \cdot \text{s}^{-1} \quad \checkmark$$

(4)

#### OPTION 3

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

$$W_w + W_f = \frac{1}{2}mv_f^2 - \frac{1}{2}mv_i^2$$

$$(1,6 \times 9,8)(0,25) \cos 0^\circ + (1,63)(0,5) \cos 180^\circ = \frac{1}{2}(1,6)v_f^2 - \frac{1}{2}(1,6)(0,2)^2$$

$$v_f = 1,98 \text{ m} \cdot \text{s}^{-1} \quad \checkmark$$

(4)

#### OPTION 4

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

$$F_{\text{net}} \cdot \Delta x \cdot \cos \theta = \frac{1}{2}mv_f^2 - \frac{1}{2}mv_i^2$$

$$(1,6 \times 9,8 \times \sin 30^\circ - 1,63)(0,5) \cos 0^\circ = \frac{1}{2}(1,6)v_f^2 - \frac{1}{2}(1,6)(0,2)^2$$

$$v_f = 1,98 \text{ m} \cdot \text{s}^{-1} \quad \checkmark$$

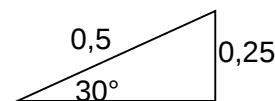
(4)

#### OPTION 5

$$W_{\text{nc}} = \Delta E_k + \Delta E_p \quad \checkmark$$

$$f \cdot \Delta x \cdot \cos \theta = (\frac{1}{2}mv_f^2 - \frac{1}{2}mv_i^2) + (mgh_f - mgh_i)$$

$$(1,63)(0,5) \cos 180^\circ = [\frac{1}{2}(1,6)(v_f)^2 - \frac{1}{2}(1,6)(0,2)^2] + [0 - (1,6)(9,8)(0,25)]$$



$$v_f = 1,98 \text{ m} \cdot \text{s}^{-1} \checkmark$$

(4)  
[17]

#### QUESTION 4

4.1 The net work done on an object is equal to change in object's kinetic energy (2)

4.2  $W_{\text{net}} = \Delta K \checkmark$   
 $W_{\text{net}} = \frac{1}{2} (M + m)(v_f^2 - v_i^2)$   
 $W_{\text{fr}} = f \Delta x \cos \theta \checkmark = \frac{1}{2} (M + m)(v_f^2 - v_i^2)$   
 $10 \times 2 \cos 180 \checkmark = \frac{1}{2} (7,02)(0 - v_i^2) \checkmark$   
 $v_{\text{bb}} = 2,39 \text{ m} \cdot \text{s}^{-1} \checkmark \quad (2,387) \text{ m} \cdot \text{s}^{-1} \quad (5)$

4.3 The total linear momentum of an (isolated) closed system remains constant.  $\checkmark \checkmark$  (2)

4.4 **Positive marking from Q 4.2**

$$\Sigma p_i = \Sigma p_f \checkmark$$

$$m_1 v_{1i} + m_2 v_{2i} = (m_1 + m_2) v_f$$

$$0,02 v_i + (7)(0) = (7,02)(2,39)$$

$$0,02 v_i \checkmark = 7,02 (2,39) \checkmark$$

$$v_i = 838,89 \text{ m} \cdot \text{s}^{-1} \checkmark \quad (4)$$

[13]

**TOTAL: 55**