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JUNE EXAMINATION GRADE 12

2026

MARKING GUIDELINES

TECHNICAL SCIENCES

(PAPER 1)

8 pages



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TECHNICAL SCIENCES (PAPER 1)**GR12 0626****QUESTION 1**

1.1	C ✓✓	(2)
1.2	A ✓✓	(2)
1.3	C ✓✓	(2)
1.4	B ✓✓	(2)
1.5	D ✓✓	(2)
1.6	C ✓✓	(2)
1.7	B ✓✓	(2)
1.8	C ✓✓	(2)
1.9	A/D ✓✓	(2)
1.10	A ✓✓	(2)
		[20]

QUESTION 2

2.1	I ✓	(1)
2.2	A ✓	(1)
2.3	H ✓	(1)
2.4	F ✓	(1)
2.5	J ✓	(1)
2.6	E ✓	(1)
2.7	B ✓	(1)
2.8	D ✓	(1)
2.9	M ✓	(1)
2.10	C ✓	(1)
		[10]

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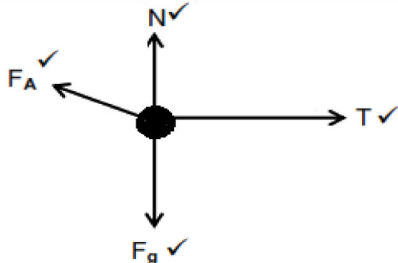
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GR12 0626

QUESTION 3

- 3.1 The perpendicular force exerted by a surface on an object that lies on that surface. ✓✓ (2)

- 3.2
- 

NOTE:

One mark for each force represented by an arrow with a correct label.

Penalise (only once) for each of the following:

 - No arrows
 - There is no dot
 - Gap between the line and the dot
 - Dotted lines are used
 - Additional force is included
 - A force diagram is given
 - If components is used
- ACCEPTABLE LABELS:**

N/F_N : Normally

F_g/w : Force due to gravity/Weight

F_A : Applied force/300 N

T : Tension/force in the string
- (4)

- 3.3
- | <i>To the left is positive</i>
Block B:
$F_{\text{net}} = ma$ ✓
$T = ma$
$T = 17a$ ✓ (1)
Block A:
$F \cos \theta - T = ma$
$300 \cos 25^\circ - T = 12a$ ✓
$T = 271,89 - 12a$ (2)
Substitute (1) into (2)
$17a = 271,89 - 12a$
$29a = 271,89$
$a = 9,3755 \text{ m} \cdot \text{s}^{-2}$ to the left ✓
$T = 17a$
$= 17(9,3755)$
$= 159,38 \text{ N}$ ✓ | OR | <i>To the left is positive</i>
Block B:
$F_{\text{net}} = ma$ ✓
$T = ma$
$T = 17a$ ✓ (1)
Block A:
$F \cos \theta - T = ma$
$300 \cos 25^\circ - 17a = 12a$ ✓
$a = 9,3755 \text{ m} \cdot \text{s}^{-2}$ (2) ✓
Substitute (2) into (1)
$T = 17a$
$= 17(9,3755)$
$= 159,38 \text{ N}$ ✓ |
|---|----|---|
| (6) | | |

- 3.4 Decrease ✓ (1)

- 3.5 If the string breaks, there will be no horizontal forces ✓ acting in on block B and the block will continue to move with a constant velocity ✓. $F_{\text{net}} = 0$ (2)

- 3.6 Newton's First Law of Motion ✓
- An object continues in a state of rest or uniform (moving with constant) velocity unless it is acted upon by a net (resultant) force. ✓✓ (3)
- [18]**

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GR12 0626**QUESTION 4**

4.1 Momentum is the product of an object's mass and its velocity. ✓✓ (2)

4.2.1 $P_{\text{initial}} = m_{\text{trolley 1}} v_i + m_{\text{trolley 2}} v_i$ ✓
 $= (15)(5) + (12)(0)$ ✓
 $= 75 \text{ kg} \cdot \text{m} \cdot \text{s}^{-1}$ ✓ (4)

4.2.2 **Positive marking from QUESTION 4.2.1 for OPTION 1**

OPTION 1 <i>Direction right is positive</i> $\Sigma p_{\text{before collision}} = \Sigma p_{\text{after collision}}$ $p_i = m_{\text{trolley 1} + \text{trolley 2}} v_f$ ✓ $75 = (15 + 12) v_f$ ✓ $v_f = 2,78 \text{ m} \cdot \text{s}^{-1}$ ✓	OPTION 2 <i>Direction right is positive</i> $\Sigma p_{\text{before collision}} = \Sigma p_{\text{after collision}}$ $m_{\text{trolley 1}} v_i + m_{\text{trolley 2}} v_i = m_{\text{trolley 1} + \text{trolley 2}} v_f$ ✓ $(15)(5) + (12)(0) = (15 + 12) v_f$ ✓ $v_f = 2,78 \text{ m} \cdot \text{s}^{-1}$ ✓	(3)
--	---	-----

4.3 $E_{\text{before collision}} = \frac{1}{2} m v^2 + \frac{1}{2} m v^2$ $E_{\text{after collision}} = \frac{1}{2} m v^2$ Both formulae correct ✓
 $= \frac{1}{2} (15)(5)^2 + \frac{1}{2} (12)(0)^2$ $= \frac{1}{2} (27)(2,78)^2$
 $= 187,5 \text{ J}$ ✓ $= 104,33 \text{ J}$ ✓
 Kinetic energy is not conserved ✓, therefore the statement is correct. ✓ (5)

4.4 The product of the net force acting on an object and the time the net force acts on the object. ✓✓ (2)

Positive marking from QUESTION 4.2.2

4.5 <i>Direction to the wall is positive</i> Impuls = Δp ✓ $= 27 (-1,75 - 2,78)$ ✓ $= 122,31 \text{ N} \cdot \text{s}$ away from the wall ✓	<i>Direction away from the wall is positive</i> Impuls = Δp ✓ $= 27 (1,75 - (-2,78))$ ✓ $= 122,31 \text{ N} \cdot \text{s}$ away from the wall ✓	(3)
--	---	-----

4.6 **Positive marking from QUESTION 4.5**
 $F_{\text{net}} \Delta t = \Delta p$ ✓
 $F_{\text{net}}(0,3) = 122,31$ ✓
 $F_{\text{net}} = 407,7 \text{ N}$ ✓
 $F_{\text{net}} \Delta t = \Delta p$ ✓
 $F_{\text{net}}(0,3) = 27(-1,75 - 2,78)$ ✓
 $F_{\text{net}} = 407,7 \text{ N}$ ✓ (4)

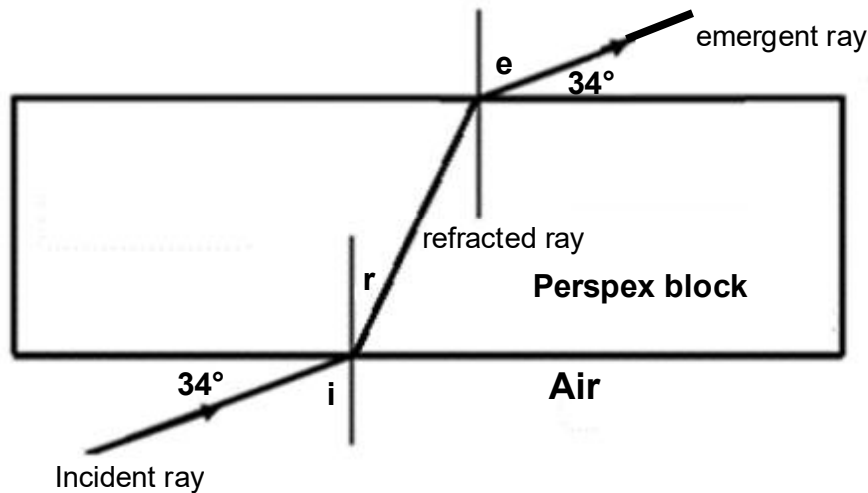
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VRAAG 5

5.1 The bending of light when it passes from one medium to another. ✓✓ (2)

5.2

**Marking Criteria**

- ✓ angle of refraction (r)
- ✓ refracted ray
- ✓ angle of emergent (e) / 56°
- ✓ emergent ray
- ✓ refracted ray path correct
- ✓ normal indicated at emergent ray

(6)

5.3 56° ✓ (1)

5.4 Law of Reflection
OR

The change in direction of a wave upon striking the interface between two materials ✓✓ (2)

5.5.1 Reflected ray ✓ (1)

5.5.2 Angle of reflection ✓ (1)

5.5.3 Normal ✓ (1)

5.6 Virtual ✓
Upright ✓
Same size as the object
Laterally inverted
Equal distant from the mirror
(any two)

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(2)
[16]

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GR12 0626**QUESTION 6**

- 6.1 A quantum of energy ✓✓ (2)
- 6.2 $E = hf$ ✓
 $2,32 \times 10^{-1} = 6,63 \times 10^{-34} \checkmark f$
 $f = 3,50 \times 10^{32} \text{Hz} \checkmark$ (3)
- 6.3 Directly proportional ✓✓ (2)
- 6.4 Wave A ✓ lowest frequency/energy ✓ (2)
- 6.5 Wave D ✓ Gamma rays has the highest frequency, which will be wave E ✓ (2)
- [11]**

QUESTION 7

- 7.1 How does the stress in an iron rod change with increasing strain when different masses are applied until fracture? ✓✓ (2)
- 7.2 Elasticity is a property of the body by virtue of the body regaining its original shape and size when the deforming force is removed. ✓✓ (2)
- 7.3 Elastic region: the material will return to its original shape and size once the applied force is removed. The deformation is temporary (reversible) ✓
 Plastic region: the material undergoes permanent deformation. Even when the force is removed, the material does not return to its original shape ✓ (2)
- 7.4 $200 \text{ MPa} \checkmark = 2 \times 10^8 \text{ Pa} \checkmark$ (only award 2 marks if final answer is in Pascal.) (2)
- 7.5
- $$\sigma = \frac{F}{A} \checkmark$$

$$195,1 \times 10^6 = \frac{1000(9,8)}{A} \checkmark$$

$$A = 5,02 \times 10^{-5} \text{ m}^2 \checkmark$$

$$A = r^2 \pi \checkmark$$

$$5,02 \times 10^{-5} = r^2 \pi$$

$$r = 3,997 \times 10^{-3} \text{ m}$$

$$d = 8 \times 10^{-3} \text{ m} \checkmark (0,008 \text{m})$$

OR

$$A = \frac{(\pi)(d)^2}{4} \checkmark$$

$$5,02 \times 10^{-5} = \frac{(\pi)(d)^2}{4}$$

$$d = 7,997$$

$$= 8 \times 10^{-3} \text{ m} \checkmark (0,008 \text{m})$$
- (5)
- 7.6 Stress is directly proportional to strain, within the elastic limit ✓✓ (2)
- [15]**

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GR12 0626**QUESTION 8**

8.1 The energy of an object due to its motion. ✓✓ (2)

8.2 $E_{m \text{ at } X} = E_{m \text{ at } Y}$ ✓
 $(75)(9,8)(10) \checkmark + \frac{1}{2}(75)(6)^2 \checkmark = (75)(9,8)(3,5) + \frac{1}{2}(75)v^2 \checkmark$
 $v = 12,78 \text{ m} \cdot \text{s}^{-1} \checkmark$ (5)

8.3 The product of the applied on an object and the displacement in the direction of the force. ✓✓ (2)

8.4 $W = Fx \cos \Delta\theta$ ✓
 $= (2000)(7,5) \cos 0^\circ \checkmark$
 $= 15\,000 \text{ J} \checkmark$ (3)

8.5 **Positive marking from QUESTION 8.4**

$$P = \frac{W}{\Delta t} \checkmark$$

$$= \frac{15000}{120} \checkmark$$

$$= 125 \text{ W} \checkmark$$

$$hp = \frac{125}{746}$$

$$= 0,17 \text{ hp} \checkmark$$

$$(1,68 \times 10^{-1})$$
 (4)
[16]

QUESTION 9

9.1 Density ✓
 Gravitational acceleration
 Height/depth
(any one) (1)

9.2 $P = pgh$ ✓
 $= (1025)(9,8)(132) \checkmark$
 $= 1\,325\,940 \text{ Pa} \checkmark$
 $(1,33 \times 10^6)$ (3)

9.3 Decrease. ✓
 Diver is moving up to the surface ✓
 thus the pressure will decrease on the diver.
 Pressure is directly preportional to the depth of the diver. ✓ (3)
[7]

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- 10.1 A ✓ Time taken is the longest, oil is the thickest. ✓ (2)
- 10.2 Viscosity will decrease. ✓ (1)
- 10.3 Multigrade oil is less sensitive for viscosity changes. At low temperatures (cold mornings/winter), it remains thin enough to flow easily, reducing wear during engine start-up. ✓
At high temperatures (engine running/hot climate), it stays thick enough to provide proper lubrication and protection. ✓ (2)
[5]

QUESTION 11

11.1 $P = \frac{F}{A}$ ✓
 $= \frac{150}{\pi(0,2)^2}$ ✓
 $= 1193,66 \text{ Pa}$ ✓ (3)

11.2 **Positive marking from QUESTION 11.1**

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

$$1193,66 = \frac{F}{\pi(1)^2} \checkmark$$

$$F = 3749,99 \text{ N} \checkmark$$

$$m = \frac{3749,99}{9,8}$$

$$= 382,65 \text{ kg} \checkmark$$

Hydraulic lift would not be able to lift the car ✓

(4)

OR

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

$$1193,66 = \frac{F}{\pi(1)^2} \checkmark$$

$$F = 3749,99 \text{ N} \checkmark$$

$$m = \frac{3749,99}{9,8}$$

$$= 382,65 \text{ kg} \checkmark$$

$$F_g = ma$$

$$= 1350 (9,8)$$

$$= 13\,230 \text{ N}$$

OR

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$$\frac{F_1}{A_1} = \frac{F_2}{A_2}$$

$$\frac{150}{\pi \left(\frac{20}{100}\right)^2} = \frac{F_2}{\pi \left(\frac{100}{100}\right)^2}$$

$$F_2 = 3\,749,99 \text{ N}$$

$$F_g = mg$$

$$3\,749,99 = m(9,8)$$

$$m = 382,65 \text{ kg}$$

OR

$$F_g = ma$$

$$= 1350(9,8)$$

$$= 13\,230 \text{ N}$$

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

$$= \frac{13\,230}{\pi \left(\frac{100}{100}\right)^2}$$

$$= 4\,211,24 \text{ Pa}$$

11.3 Hydraulic brakes ✓

Hydraulic press ✓
 Hydraulics jacks
 Dentist chairs
(any 2)

(2)

[9]**TOTAL: 150****SA EXAM PAPERS**

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