PHYSICAL SCIENCES:
TERM TEST 1
MEMORANDUM
14 MARCH 2016

MARKS: 100

NAME OF SCHOOL: .................................................................

This question paper consists of 5 pages, including the cover page
QUESTION 1
1.1 A
1.2 D
1.3 C
1.4 B
1.5 C
1.6 C
1.7 C
1.8 B
1.9 A
1.10 B [2 x 10 = 20]

QUESTION 2
2.1. When the resultant force acts on an object, the object will accelerate in the direction of the force. This acceleration is directly proportional to the force and inversely proportional to the mass of the object. ✓(2)

2.2.

\[ F_{\text{Net}} = ma \]  

For 5kg block
\[ T_2 + (mg) + (T_1) = ma \]
\[ 250 + [- (5)(9.8)] - T_1 = 5a \]
\[ a = (201 - T_1)/5 \]  

Equation 1

For 20kg block
\[ T_1 + (mg) = ma \]
\[ T_1 + [- (20)(9.8)] = 20a \]
\[ T_1 = 200 N \]  

Equation 2

2.4. Q ✓

[12]
QUESTION 3

3.1.

\[ F_{25N} \]

\[ F_r \]

\[ F_{F} \]

\[ F_{N} \]

\[ F_{g} \]

3.2.1. \( F_k = F_x \)
\[ = F \cos \Theta \checkmark \]
\[ = 25 \cos 40^\circ \checkmark \]
\[ = 19.15 \text{ N} \checkmark(3) \]

3.2.2. \( F_N = F_g - F_Y \)
\[ = 50 - 25 \sin 40^\circ \checkmark \]
\[ = 33.93 \text{ N} \checkmark(2) \]

3.2.3. \( F_k = \mu_k F_N \)
\[ = 19.15 = \mu_k(33.03) \checkmark \]
\[ \mu_k = 0.56 \checkmark(3) \]

QUESTION 4

4.1. The track is placed at an angle to compensate for the friction on the track. \( \checkmark \checkmark(2) \)

4.2. directly proportional graph. \( \checkmark \checkmark(2) \)

4.3. Newton’s second Law. \( \checkmark \) When a net force \( F_{\text{net}} \) is applied to an object of mass, \( m \), it accelerates in the direction of the net force. \( \checkmark \) The acceleration, \( a \), is directly proportional to the net force and inversely proportional to the mass. \( \checkmark \) (3)

QUESTION 5

5.1. Between any two objects with mass in the universe a gravitational force exists. This force of attraction is directly proportional to the product of their masses \( \checkmark \) and inversely proportional to the product of their masses and inversely proportional to the square of the distance between their centres \( \checkmark \). (2)

5.2. Weight on earth:
\[ F = mg \]
\[ = 100 \times 9.8 \]
\[ = 980 \text{ N} \checkmark \]

Weight on new location: \( 2 \times \text{radius of the earth} + \text{radius of earth} = 3 \text{ original} \)

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\( \frac{F}{r^2} \approx \frac{1}{r^2} \)

\[ F = \frac{980 \text{ N}}{3^2} \]

\[ 980 \text{ N}/9 = 108.9 \text{ N} \quad \text{(4)} \]

5.3. Weight on earth = 980 N \text{ OR } F = G(m_1 \times m_2) / r^2

Planet: mass = 3 x mass of the earth

Radius = (0.5) x radius of the earth = (0.5) x 6.4 x 10^6 m

Planet mass = 3 x 6 x 10^{24} kg

Radius = (0.5) x radius of the earth = (0.5) x 6.4 x 10^6 m

\[ F = 3^{\sqrt{2}} \times \frac{980}{(\frac{1}{2})^2} \]

\[ F_{\text{planet}} = 11760 \text{ N} \]

**QUESTION 6**

6.1.1. K\(^+\) \(\checkmark\) \(\text{(1)}\)

6.1.2. O\(^2-\) \(\checkmark\) \(\text{(1)}\)

6.2. The valence electrons are the electrons in the highest occupied energy level of an atom. \(\checkmark\) \(\checkmark\) \(\text{(2)}\)

6.3. Mg = 2\(\checkmark\) \(\text{(1)}\)

6.4. Electro negativity of an atom is the ability of the atom in a molecule to attract the bonding electron pair. \(\checkmark\) \(\checkmark\) \(\text{(2)}\)

6.5.

\[ \text{OR} \]

\(\checkmark\) for the bonds and \(\checkmark\) for indicating other 4 electrons of oxygen \(\text{(2)}\)

6.6. BF\(_3\) - is trigonal planar \(\checkmark\), 120° \(\checkmark\) \(\text{(2)}\)
QUESTION 7
7.1. The boiling point of a compound is the temperature at which the vapor pressure of the compound is equal to the atmospheric pressure. ✓ ✓ (2)
7.2. In solid phase: CO₂. It sublimes at -72°C. ✓
Least energy to break intermolecular forces as the compound immediately becomes a gas (sublimation occurs). ✓ (3)
7.3. Non-polar ✓
Electronegativity S : 2.5 ✓
Electronegativity H : 2.1 ✓
Electronegativity = 0.4 ✓ therefore not a polar molecule (4)
7.4. HI ✓ (1)
7.5. Sublimation takes place when a substance change phase directly from a solid to a gas (without forming the liquid phase first) ✓ ✓ (2)

QUESTION 8
8.1.1.
Carbon dioxide CO₂ ✓ ✓ (2)

Ammonia NH₃ ✓ ✓ (2)

Methane CH₄ ✓ ✓ (2)

8.1.2. Carbon dioxide: Linear ✓ (1)
Ammonia: Trigonal pyramidal ✓ (1)
Methane: Tetrahedral ✓ (1)
8.1.3. Polar. ✓ The N atom is more electronegative than the H atom. ✓
Both dipole moments work in the same direction to give a net dipole moment in the direction of the N atom. ✓ The nitrogen side of the molecule becomes more negative than the hydrogen side ✓ and a polar molecule forms. ✓ (5)
8.1.4. Ammonia ✓ (1)
8.1.5. Hydrogen bonds ✓ ✓ (1)
8.2.1. Endothermic reaction ✓ (1)

TOTAL MARKS = 100