P 1 MEMO May 2010

PHYSICAL SCIENCES GRADE 11

QUESTION 1

1.1 Normal (1)

1.2 $kg \cdot m \cdot s^{-1}$ (1)

1.3 Band theory (1)

1.4 Resonance (1)

1.5 Electric (1)

[5]

QUESTION 2

2.1 80N (2)

2.2 using bifocals (2)

2.3 per unit potential difference... (2)

2.4 (trigonal) pyrimadal (2)

2.5 high pressure and low temperature (2)

[10]

QUESTION 3

3.1	~~A~~	B	C	D
3.2	A	~~B~~	C	D
3.3	A	B	~~C~~	D
3.4	A	B	C	~~D~~
3.5	~~A~~	B	C	D

[5 X 2 = 10]

TOTAL SECTION A : 25 MARKS

Question 4

4.1

(2)

4.2 $Fx = F \cos \theta$ ✓
$= 40 \times \cos 30°$ ✓
$= 34,64$ N ✓ (3)

4.3
$F_{net} = ma$ ✓
$F_{x\ applied} - F_{friction} = ma$ ✓
$34,64 - 7$ ✓ $= (14+1)a$ ✓
$a = 1,84\ m \cdot s^{-2}$ ✓ (5)

Question 5

5.1
Pbefore = P after
$m_1v_{1i} + m_2v_{2i} = m_1v_{1f} + m_2v_{2f}$ ✓
(10×3) ✓ $+ (15 \times 1,8)$ ✓ $= (10 \times 0)$ ✓$+ 15\ v_{2f}$
$30 + 27 = 15\ v_{2f}$
$v_{2f} = 3,8\ m \cdot s^{-1}$ ✓ in direction of belt (5)

5.2 Conservation of Linear Momentum ✓
The total momentum before a collision is equal to the total momentum after a collision in a closed system. ✓✓ **or**
The total momentum in a closed system remains constant in both magnitude and direction (3)

5.3 Newtons first Law. ✓An object will continue with uniform motion unless acted upon by a net Force. The ball will continue moving at a constant velocity because there is no net force i.e. friction or any applied force. ✓✓ (3)

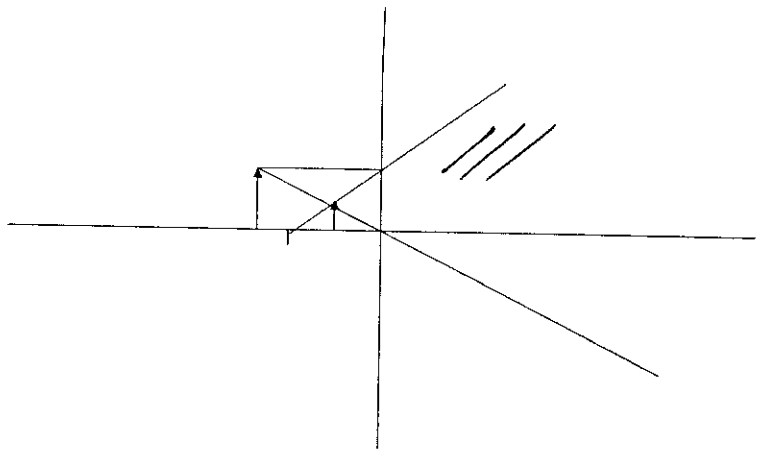
5.4 impulse = $\Delta p = mv_f - mv_i$ ✓
$= [(0,265 \times (-2)$ ✓$] - (0,265 \times 3)$ ✓
$= -1,33\ kg \cdot m \cdot s^{-1}$ (N.s) ✓ (4)

5.5 $F_{net} = \frac{\Delta p}{\Delta t}$ ✓$= \frac{-1,33}{0,03}$ ✓✓ $= -44,33$ N away from the box (left)✓ **or** 44,17 N ✓ (4)

5.5 The soft ball has more contact time✓ with the surface it bounces off and if the net force is inversely proportional to time✓ it means that more force is needed to make the ball move. ✓ (3)

Question 6

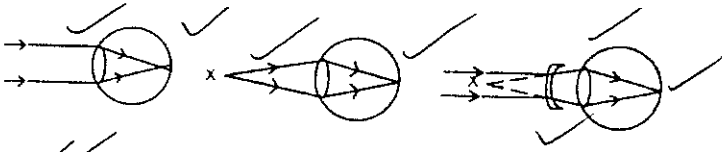
6.1.1



6.1.2 upright, virtual, diminished

6.1.3 $m = \frac{I_{Image}}{O_{object}} = \frac{I_{Distance}}{O_{Distance}} = 0.46\ (0.42 - 0.5)$

6.2.1) Myopia
6.2.2) See the diagrams...



6.3.1) B
6.3.2a) 5/20 = 0.25m (25cm)
6.3.2b) $v = f \times \lambda$

$$f = \frac{v}{\lambda} = \frac{200}{0.25} = 800Hz$$

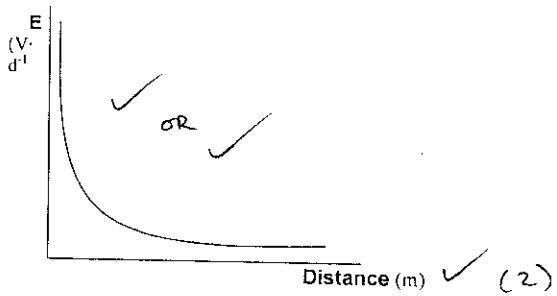
6.3.3a) Increases
6.3.3b) Decrease

6.4) $v = \frac{\Delta x}{\Delta t} = \frac{7760}{5} = 1552 m.s^{-1}$

Question 7

7.1.1 the force per positive unit charge exerted at that point (3)
7.1.2 inverse proportionality (1)

7.1.3



(2)

7.2.1 $E_{net} = E_Q + E_P$
$= kQ/r_Q^2 + kP/r_p^2$
$= 9 \times 10^9 \{ 8 \times 10^{-6}/7^2 + (-2) \times 10^{-6}/2^2 \}$
$= -3030{,}61\ N.C^{-1}$
$= 3030{,}61\ N.C^{-1}$ towards each other

7.2.2 $E = F / Q$
$E_{net} = 3 \times 10^{-3} / Q$
$Q = 9{,}9 \times 10^{-7}\ C$

7.2.3 $U = kQP/r$
$= (9 \times 10^9)(8 \times 10^{-6})(2 \times 10^{-6}) / 5$
$= 2{,}88 \times 10^{-2}\ J$

7.2.4 (+ marking from 7.2.2)

Question 8

8.1.1 Physical: distance between the plates / dielectric
Electrical: voltage across the plates

8.1.2 (a) Dielectric
(b) • The dielectric becomes polarised (opposite to plate polarity)
• An E-field in dielectric forms opposite to external E-field between plates
• The $E_{net} < E_{original}$
• thus pd decreases (since E α V, from E = V/d)
• thus C increases (since C α 1 / V, from C = Q/V)

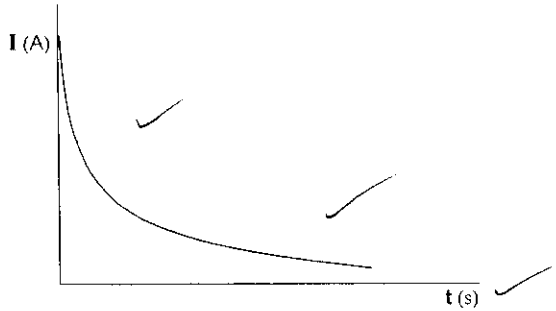
8.2.1

8.2.2 $C = K\varepsilon_0 A/d$

$= (1)(8{,}85 \times 10^{-12})(0{,}02 \times 0{,}1)/0{,}2 \times 10^{-3})$

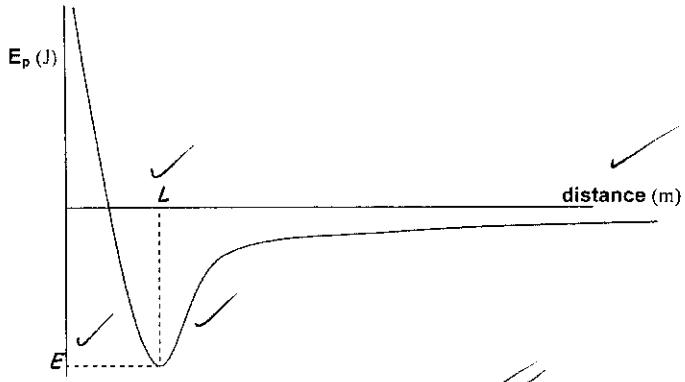
$= 8{,}85 \times 10^{-11}$ C

8.3



Question 9

9.1

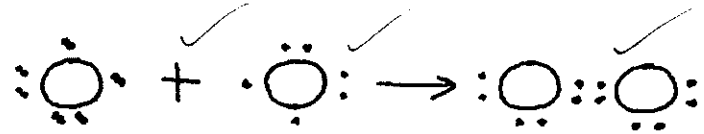


9.2 **Bond length** – short bonds stronger than long bonds

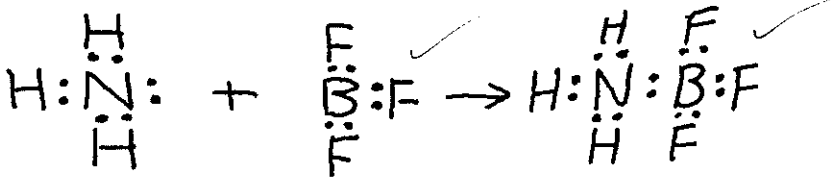
Atom size – bonds between smaller atoms are shorter and therefore stronger

Bond order – double bonds stronger than single, triple stronger than double, etc.

9.3



9.4

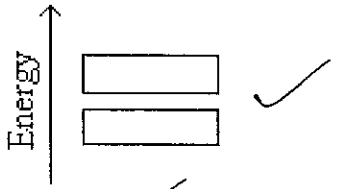


9.5 The 1 double bond between S and O can be formed from 3 (different) terminal valence electrons on O

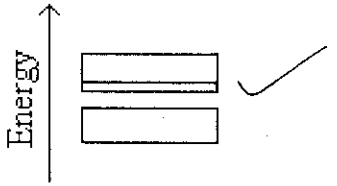
9.6 They repel <u>stronger</u> than bonding pairs, causing molecules to bend.

Question 10

10.1



At low temperatures, the valence band Is full, but the conduction band is empty! Therefore no conduction can occur.



At high temperatures, there Is enough energy to excite Electrons from the valence Band into the conduction band where they are able to conduct a current through electron motion as well as hole motion.

10.2.1 p
10.2.2 p
10.2.3 p

10.3 Positive terminal of battery to p-side, negative to n-side.

Question 11

11.1.1 Volume is inversely proportional to pressure. ✓✓ **or**
Pressure is inversely proportional to volume. **or**
As the volume decreases the pressure increases (2)

11.1.2 Constant temperature and (constant mass) ✓✓ (2)

11.1.3 Boyles Law ✓✓ (2)

11.1.4 $p_1v_1 = p_2v_2$ ✓

$100 \times \frac{1}{5} = 150 \times \frac{1}{v}$ ✓✓✓

$\frac{2}{15} = \frac{1}{v}$

$V_2 = 7,5\ dm^3$ ✓ (5)

11.2 $pV = nRT$ ✓

$165 \times 10^3 \times 3 \times 10^{-3} = n\ 8,31 \times 298$ ✓✓

$n = 0,199...\ mol$ ✓

$$n = \frac{m}{M}$$

$M = \frac{m}{n} = \frac{5,6}{0,199}$ ✓$= 28\ g.mol^{-1}$ ✓ (6)

11.2.2 Nitrogen or N_2 ✓✓ (2)

Total: 180 marks