



## EXAMINERS' REPORT ON 2001 TERTIARY ENTRANCE EXAMINATION

### SUBJECT: PHYSICAL SCIENCE

#### STATISTICS

Year	Number Who Sat	Non-Examination Candidates	Did Not Sit
2001	294	22	38
2000	268	23	27
1999	265	14	33

The Examiners' Report is written by the Chief Examiner (or another Examiner on their behalf) to comment on matters relating to the Tertiary Entrance Examination in their subject. The opinions and recommendations expressed in this report are those of the Chief Examiner and not necessarily representative of or endorsed by the Curriculum Council.

The Marking Guide provided at the end of this report was prepared for markers and may have been substantially amplified by discussions held in the pre-marking meeting. It is not intended as a set of model answers, and is not exhaustive as regards alternative answers. Some of the answers are less than perfect, but represent a standard of response that the examiners deemed sufficient to earn full marks. Teachers who use this guide should do so with its original purpose in mind.

#### *SUMMARY/ABSTRACT*

The 2001 paper provided a thorough coverage of the syllabus, examining both process and content objectives. Marks ranged from 7% to 90%. The mean was 48.8% with a standard deviation of 15.56%.

Marks for most sections of the paper correlated well with the total marks.

Part A	Section 1 (Multiple-choice)	Mean 52.4%
	Section 2 (Short Answers and Problems)	Mean 46.6%
	Section 3 (Comprehension)	Mean 59.5%
Part B	Water (N = 252)	Mean 46.3%
	Sound & Light (N = 34)	Mean 30.8%
	Engines & Fuels (N = 8)	Mean 26.6
	Ceramics & Polymers (N = 0)	

The reliability of the paper was 0.89.

The format of the paper was the same as that used since 1996 and the examiners attempted to make the questions as contextual as possible. The marker's guide provided clear and unambiguous direction to the markers and little reconciliation of marks was necessary.

This year 86% of the candidates attempted the Water Option, 11.5 % attempted the Sound and Light Option (up from 7.8% in 2000) and 2.5 % the Engines and Fuel Option. No candidates attempted the Ceramics and Polymers Option. A recommendation will be put to the Physical Science Syllabus Committee that the Ceramics and Polymers Option be deleted from the syllabus.

## GENERAL COMMENTS

As in previous years, candidates did well in the areas that required simple recall and explanation. Candidates found those sections of the paper that needed a more analytical approach difficult. The manipulation of formula, use of scientific notation and some appreciation of significant figures needs attention.

## SPECIFIC COMMENTS

### Section 1: Multiple-choice

Mean =  $20.86/40 = 52.4\%$

Range = 2 to 37

Standard Deviation = 15.35

Correlation with total = 0.93

Question	Correct Answer	% with Correct Response	Most Common Error/s	% Giving this Response
1	A	67	C	24
2	D	48	C	29
3	D	53	C	27
4	B	80	-	
5	A	56	C & D	17 & 13
6	D	73	C	20
7	B	52	D	30
8	C	60	A	17
9	D	11	A & C	45 & 38
10	B	43	C & D	23 & 28
11	C	69	B & D	15 & 14
12	D	49	A & C	13 & 27
13	C	88	-	
14	C	47	A & B	13 & 23
15	B	30	A	53
16	C	64	D	21
17	A	84	-	
18	C	12	A & D	50 & 22
19	A	34	C & D	23 & 29
20	C	29	C & D	29 & 41

Questions 4, 6, 13 and 17 were well done and presented little difficulty.

Questions 15, 18, 19 and 20 were not well done. These questions required a higher order of understanding that proved to be beyond most candidates.

Question 11 required a very specific piece of knowledge and was not well answered.

## Section 2: Short Answers and Problem Solving

Mean =  $51.23/110 = 46.6\%$   
Range = 2 to 101

Standard Deviation = 19.5 %  
Correlation with total = 0.97

Question	Comment / Common Errors	Average Mark / Total
1	Candidates still wrote molecular equations and the correct valencies were often not used.	3.47 / 9
2	Candidates who understood redox did well in this question though many were confused by the presence of two oxidising agents.	2.55 / 5
3	This question was generally well done, but many candidates did not offer an adequate explanation eg the mercury cell is small but this is not an explanation of why it is used in watches.	4.17 / 9
4	The electron dot diagram was well done, but many candidates had difficulty in explaining why carbon dioxide is non-polar.	3.58 / 8
5	Many candidates omitted the hydrogen atoms when drawing the structural formulae.	2.82 / 6
6	Many candidates still find the concept of insolubility of compounds with different intermolecular forces difficult to explain.	3.65 / 8
7	This question was not well done by many candidates. Candidates failed to read the question carefully and work systematically through the problem.	4.03 / 10
8	Many candidates' responses did not relate to the actual situation described in the question.	2.67 / 8
9	Candidates generally handled this question very well. However, more care needs to be taken in the positioning of substituted groups relative to the functional groups.	4.33 / 8
10	The calculations in this question were generally well done.	2.67 / 5
11	This question was generally well done, but most candidates failed to realise that a covalent molecular substance would have boiled away at a temperature of $1000^{\circ}\text{C}$ .	2.53 / 4
12	Most candidates found this question very easy, although some did not use the stoichiometric ratio from the equation given.	4.33 / 6
13	This question was generally well done, but many candidates were let down by their ability to manipulate a formula.	5.23 / 8
14	Candidates may have performed better in this question if a diagram had have been provided. Many failed to convert the data given into the correct units eg. centimetres into metres.	3.36 / 10
15	Most candidates were able to draw the circuit diagram, however many failed to convert the units and gave unrealistic answers to the question.	3.32 / 14
Part Total		51.23 / 110

## Section 3: Comprehension

Mean =  $11.9/20 = 59.4\%$   
Range = 0 to 19

Standard Deviation = 22.1 %  
Correlation with total = 0.55

This section was generally not well done and many candidates may have been daunted by the length of the comprehension exercise and the number of formula used. The mathematical processes used to solve some of the questions were not of a high order yet many candidates were unable to substitute into formula and manipulate data. The final question in the comprehension exercise involving work against gravity was only adequately answered by few candidates.

**Part B: Option Unit****Water**

$$\text{Mean} = 13.9 / 30 = 46.3 \%$$

$$\text{Range} = 1 \text{ to } 25$$

$$\text{Standard Deviation} = 14.9 \%$$

$$\text{Correlation with total} = 0.59$$

This option was attempted by 252 out of the 294 candidates. The candidates' response to the second question would indicate that very little practical testing of water was done. Candidates also failed to show a sound knowledge of the basic hydrological cycle and how the removal of trees contributes to salinity. One possible improvement could be an increase in the amount of direction given to candidates in answering a question.

**Sound and Light**

$$\text{Mean} = 9.24 / 30 = 30.8 \%$$

$$\text{Range} = 1 \text{ to } 26$$

$$\text{Standard Deviation} = 15.8 \%$$

$$\text{Correlation with total} = 0.77$$

This option was attempted by 34 out of the 294 candidates. Candidates who attempted this option fell into two very distinct groups: those who had a sound knowledge and scored well, and those who found this section particularly difficult.

**Engines and Fuels**

$$\text{Mean} = 8 / 30 = 26.7 \%$$

$$\text{Range} = 2 \text{ to } 23$$

$$\text{Standard Deviation} = 20.3 \%$$

$$\text{Correlation with total} = 0.68$$

**Ceramics and Polymers**

No candidates attempted this option.

***POINTS FOR CONSIDERATION BY THE SYLLABUS COMMITTEE***

- Deletion of the Ceramics and Polymers option from the syllabus
- The use of graphics calculators seems to have had little influence on the candidates' marks

Ross Fuhrmann  
December 2001

**2001 Examining Panel**

Chief Examiner: Mr Michael Elion

Deputy: Mr Ross Fuhrmann

Third Member: Dr Kathryn Inglis

Chief Marker: Mr Ross Fuhrmann

## PHYSICAL SCIENCE TEE 2001 MARKING GUIDE

### PART A

#### SECTION 2: SHORT ANSWER AND PROBLEM SOLVING

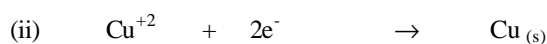
##### Question 1

1 mark for symbols / formula + 1 mark for balancing  
(fully balanced molecular – 1 mark)

- (a)  $\text{Ag}^+ + \text{Cl}^{-1} \rightarrow \text{AgCl}_{(s)}$
- (b)  $\text{C}_3\text{H}_8 + 5 \text{O}_2 \rightarrow 3 \text{CO}_2 + 4\text{H}_2\text{O}$
- (c) No reaction
- (d)  $\text{Pb}^{+2} + 2 \text{I}^{-1} \rightarrow \text{Pb I}_{2(s)}$

##### Question 2

(a) 1 mark each



(b) 2 marks (1 mark for finding numbers + 1 mark for correct sign)

$$E_{\text{cell}} = (0.34 + 0.40) \text{ volts} = 0.74\text{V} \quad (\text{no working no mark})$$

##### Question 3

1 mark for use + 2 marks for explanation related to use

(a) dry cell

Use Portable electrical appliances

Explanation Low cost source of electrical energy

(b) mercury cell

Use Digital camera, hearing aid, watch etc

Explanation Constant voltage, small (1mark for small only)

(c) fuel cell

Use Remote electricity supply, space craft, transport

Explanation small mass and high efficiency, clean fuel source

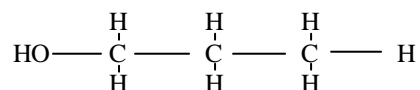
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### Question 4

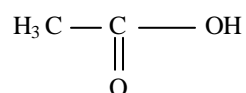
- (a) electron dot diagram  $\begin{array}{c} \text{?} \\ \text{?} \\ \text{O} \end{array} :: \text{C} :: \begin{array}{c} \text{?} \\ \text{?} \\ \text{O} \end{array}$  (2 marks)
- (b) linear
- (c) covalent (1 mark)
- (d) non-polar  
sum of dipoles is zero or dipoles cancel, symmetrical shape (1 mark)
- (e)  $\text{CO}_2 + \text{H}_2\text{O} \rightarrow \text{H}_2\text{CO}_3$  (2 marks)

### Question 5

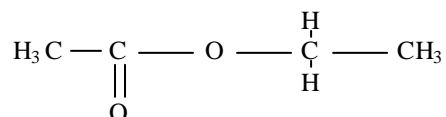
- (a) (i) 1-propanol (1 mark)



- (ii) ethanoic acid (1 mark)



- (iii) ester (2 marks)



- (b) propyl ethanoate (1 mark)

### Question 6

- (a) hexene dispersion or Van Der Waal  
water hydrogen bonding (1 mark each)
- (b) Hexene is non polar and water is polar  
A mixture of these two would only have dispersion forces acting between them.  
These forces are not strong enough to overcome the hydrogen bonding between the water molecules  
(1 mark for each point)
- (c) Add more water and see which layer gets larger or add more hexane  
One layer will get larger- can now identify layers (3 marks)

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**Question 7**

(a)	Total titration volume	19.1 mL	18.8 mL	18.7 mL	18.7 mL
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(1 mark)

$$\text{Average volume} = \frac{18.8 + 18.7 + 18.7}{3}$$

$$= 18.7 \text{ mL} \quad (0 \text{ if include } 19.1\text{mL})$$

(1 mark)

(b)

$$\text{Number of moles of NaOH} = c \times V \quad \text{or} \quad \frac{c \times v}{1000}$$

$$= 0.112 \times 0.0187$$

$$= 2.09 \times 10^{-3} \text{ moles}$$

(1 mark)

(c)

$$\text{Number of moles of HCl} = 2.09 \times 10^{-3} \text{ moles}$$

(1 mark)

(d)  $2.09 \times 10^{-3}$  moles HCl in 20.0 mL  
 $x$  moles in 1000 mL

$$x = 0.105 \text{ moles}$$

(1 mark)

(e)

Moles of HCl in 1.00 L

$$n = c \times V$$

$$2.09 \times 10^{-3} = c \times 0.020$$

$$c = 0.105 \text{ mol L}^{-1}$$

(1 mark)

(f)

Concentration of original acid

$$n = c \times V$$

(1 mark)

$$0.105 = c \times 0.01$$

$$c = 10.5 \text{ mol L}^{-1}$$

(1 mark)

(g)

Any indicator except universal – rapid pH change at equivalence point

(1 mark)

**Question 8**

(a) If there is too much  $\text{H}_3\text{O}^+$  in the pool water it will become acidic (1 mark)

The equilibrium will shift to the left lowering the concentration of  $\text{OCl}^-$  and bacteria and algae increase (1 mark)

(b)

Chemical chosen: sodium carbonate (1mark)

Reason: The sodium carbonate would neutralise/ react with, the acid (1 mark)

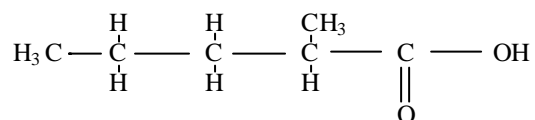
The equilibrium shifts to the right reducing the concentration of  $\text{HOCl}$  (1 mark)

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(c) 1 mark each

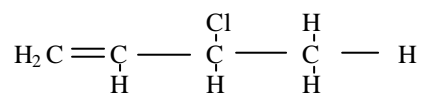
less  
more  
less

**Question 9** 2 marks each



Methylamine or methanamine.

2-bromo -2 - propanol    2 - bromopropan - 2 - ol    or    2-bromo -2-hydroxypropane



**Question 10**

(a) endothermic (1 mark)

(b)  $n = \frac{\text{mass}}{\text{formula mass}}$

$$= \frac{4.70}{53.5}$$

$$= 0.0878 \text{ moles}$$

(1 mark)

$$n = c \times V$$

$$0.0878 = c \times .350$$

$$c = 0.251 \text{ mol L}^{-1}$$

(1 mark)

(c) Moles before dilution = moles after dilution (1 mark)

$$c_1 V_1 = c_2 V_2$$

$$0.251 \times 25 = c_2 \times 100$$

$$c_2 = 0.0628 \text{ mol L}^{-1}$$

**Question 11** 1 mark each

metal

does not conduct

boils away, turns into a gas

shatters

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### Question 12

(a)  $1 \times \text{Na} = 23.0$   
 $3 \times \text{N} = 3 \times 14$

Molar mass =  $65 \text{ g mol}^{-1}$  (1 mark)

(b)  $n = \frac{\text{mass}}{\text{molar mass}}$

=  $\frac{50}{65}$

= 0.769 moles (1 mark)

(c) 2 moles  $\text{NaN}_3$  produce 3 moles  $\text{N}_2$  (incorrect ratio 0) (1 mark)

Moles  $\text{N}_2 = \frac{3}{2} \times 0.769$

= 1.15 moles (1 mark)

(d) At STP

$n = \frac{V}{22.4}$

$V = 22.4 \times 1.15$

= 25.8 L (2 marks)

### Question 13 (lose a mark for not showing working)

(a) Work done = Gain in kinetic energy (1 mark)

=  $F \times s$   
=  $115 \times 0.30$  (-1 for 30 cm )  
= 34.5 J (1 mark)

(b)  $F = ma$

$a = \frac{115}{45}$   
=  $2.55 \text{ ms}^{-1}$

(c)  $E_K = \frac{1}{2} mv^2$

$v = \sqrt{\frac{2E_K}{m}}$  (1 mark)

$v = 1.24 \text{ ms}^{-2}$

(d) New  $E_K = \frac{1}{2} mv^2$

=  $\frac{1}{2} 45 \times (2.2)^2$

= 109 J (1 mark)

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$$\begin{aligned} \text{Increase in } E_K &= (109 - 34.5) \text{ J} \\ &= 74.5 \text{ J} \end{aligned} \quad (1 \text{ mark})$$

**Question 14**

(a) Gain in  $E_p$  = Loss in  $E_K$

$$\begin{aligned} E_K &= \frac{1}{2} mv^2 \\ &= 0.5 \times .500 \times (1.50)^2 \end{aligned} \quad (-1 \text{ for } 500\text{g}) \quad (1 \text{ mark})$$

$$\begin{aligned} mgh &= 0.5 \times .500 \times (1.50)^2 \\ 0.500 \times 9.8 \times h &= 0.5 \times .500 \times (1.50)^2 \\ h &= 0.115 \text{ m up the ramp} \end{aligned} \quad (1 \text{ mark})$$

(b) Gain in  $E_p$  at 0.15 m above the floor ( top of the ramp)

$$\begin{aligned} E_p &= mgh \\ &= 0.500 \times 9.8 \times 0.15 \end{aligned} \quad (-1 \text{ for } 15\text{cm}) \quad (1 \text{ mark})$$

$$= \text{Loss in } E_K$$

$$\begin{aligned} \frac{1}{2} mv^2 &= 0.500 \times 9.8 \times 0.15 \\ v &= 1.70 \text{ ms}^{-1} \end{aligned} \quad (1 \text{ mark})$$

(c) Work done = Gain in  $E_p$  (1 mark)

$$\begin{aligned} \text{Gain in } E_p &= 0.500 \times 9.8 \times 0.15 \\ &= 0.564 \text{ J} \\ \text{Work done} &= 0.564 \text{ J} \end{aligned} \quad (1 \text{ mark})$$

If the height chosen was 0.081 m then

$$\text{Work done} = 0.397 \text{ J}$$

(d) No (1 mark)

In these problems Gain in  $E_p$  = Loss in  $E_K$  (1 mark)

$$mgh = \frac{1}{2} mv^2$$

$$gh = \frac{1}{2} v^2$$

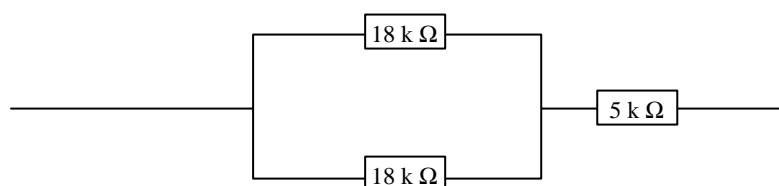
$$h = \frac{v^2}{2g}$$

The mass of the object does not have any effect (1 mark)

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### Question 15

(a)



(1 mark)

No calculations needed.

(b) Find current  $I$

(-1 for  $R = 14$ )

$$V = R I$$

$$5.2 = 14\,000 \times I \quad (1 \text{ mark})$$

$$I = 0.000371 \text{ amps} \quad (1 \text{ mark})$$

$$P = V I$$

$$= 5.2 \times 0.000371$$

$$= 0.0019 \text{ W} \quad (1 \text{ mark})$$

$$= 1.9 \times 10^{-3} \text{ W}$$

(c) Power =  $\frac{\text{Energy}}{\text{time}}$

Energy = Power x time (1 mark)

$$= 0.0019 \times 10 \times 60 \text{ ( -1 for 10 minutes )}$$

$$= 1.16 \text{ J} \quad (1 \text{ mark})$$

## SECTION 3: COMPREHENSION

### Question 1

(a) rolling friction (1 mark)

(b) air resistance (1 mark)

### Question 2 (1 mark for each reason)

Any three of the following reasons: aerodynamic shape, thermostatically controlled cooling  
flush mirrors, flush mounted windscreen, composite body.

### Question 3

1 litre of fuel releases  $3.5 \times 10^7 \text{ J}$

$$\text{Energy used to propel car} = \frac{15}{100} \times 3.5 \times 10^7 \text{ J} \quad (1 \text{ mark})$$

$$= 5.25 \times 10^6 \text{ J} \quad ( -1 \text{ for no units } ) \quad (1 \text{ mark})$$

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### Question 4

(a)  $F_{\text{roll}} = \mu_r mg$  (1 mark)

$$= 0.015 \times 1344 \times 9.8$$
$$= 198 \text{ N} \quad (1 \text{ mark})$$

(b)  $F_{\text{air}} = \frac{1}{2} C A \rho v^2$  (1 mark)

$$= 0.5 \times 0.40 \times 1.84 \times 1.2 \times (25)^2$$
$$= 276 \text{ N} \quad (1 \text{ mark})$$

(c)  $P = (F_{\text{roll}} + F_{\text{air}}) v$  (1 mark)

$$= (198 + 276) \times 25 \quad (1 \text{ mark})$$

$$= 11800 \text{ W} \quad (\text{or } 11.80 \text{ k W}) \quad (1 \text{ mark})$$

### Question 5

$$1 \text{ Watt} = 1 \text{ Joule per second} \quad (1 \text{ mark})$$

$$18400 \text{ W} = 18400 \text{ J s}^{-1} \quad (1 \text{ mark})$$

### Question 6

The car is going uphill (1 mark)

The car is doing work against gravity (3 marks)

The car needs more kinetic energy per second (1 mark)

The engine produces more power (1 mark)

## PHYSICAL SCIENCE TEE 2001 MARKING GUIDE

### WATER – OPTION

#### Question 1

Not a good source of drinking water (1 mark)

Two marks for giving supporting

- \* bacteria (this must be included with a reason to get both marks)
- \* colour
- \* high  $\text{Cl}^-$  concentration
- \* slightly acidic

(2 marks)

#### Question 2

- (a) Dissolved oxygen meter, oxygen probe (there are titration methods)
- (b) gravimetric (add silver nitrate and recover silver chloride), conductivity meter,
- (c) agar plate

#### Question 3

The answer must contain at least one treatment that removes bacteria

Methods that would remove the bacteria

- \* chlorination
- \* ozonisation
- \* boiling
- \* distillation
- \* desalination
  
- \* method of removing colour
- \* neutralising the water ( $\text{pH} = 7$ )

For the remaining 4 marks

- \* The student must give a reasonable description of the method (3 marks)
- \* There must be some reason why this will improve the quality of the water (1 mark)

#### Question 4

- (a) The answer must include the following points
  - \* boiling the water and note the presence of scale or precipitate (1 mark)
  - \* testing the water with soap after boiling (1 mark)
  - \* observation and conclusion (1 mark)  
eg after boiling soap lathers/temporary hardness  
or after boiling soap does not lather/permanent hardness
- (b) boil the water or ion exchange (not distillation) (1 mark)
- (c) add sodium carbonate, ion exchange, distillation (1 mark)

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### Question 5

- (a) high level of algae or eutrophication, thermal pollution. (2 marks)
- (b) not necessary because it will not improve water quality (2 marks)

### Question 6

- (a) leaching of sewerage or illegal dumping of septic waste (2 marks)
- (b) health problems ( this must be included) + any one of the following  
algal bloom  
odour  
taste (2 marks)

### Question 7

The diagram/s should show the following

- \* precipitation
- \* percolation
- \* formation of an aquifer with a water table
- \* transpiration by deep rooted trees (2 marks)

The effects of the removal of the trees should be

- \* reduction in transpiration
- \* water table rising (2 marks)

The consequences should include

- \* salt being brought to the surface
- \* death of vegetation due to salt (1 mark)

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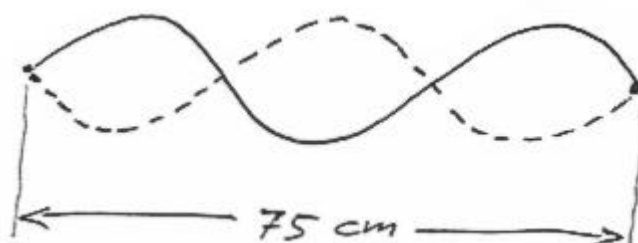
## SOUND AND LIGHT – OPTION

### Question 1 (1 mark each)

- (a) diffraction
- (b) refraction
- (c) Interference
- (d) Doppler effect
- (e) standing waves

### Question 2

- (a) For the full marks there should only be one solid line as shown in the diagram



- (b) Fundamental frequency is  $\frac{1}{3}$  of frequency of third harmonic (1 mark)

$$F_{\text{fund}} = \frac{225}{3} \quad (1 \text{ mark})$$

$$= 75 \text{ hertz} \quad (1 \text{ mark})$$

- (c) The length of the string represents  $1\frac{1}{2}$  wavelengths (1 mark)

$$\text{Wavelength} = \frac{3}{2} \times 75$$

$$= 50 \text{ cm} \quad (1 \text{ mark})$$

$$\text{Velocity} = \text{frequency} \times \text{wavelength}$$

$$= 225 \times 0.5$$

$$= 112.5 \text{ ms}^{-1}$$

- (d) Velocity = frequency x wavelength

$$340 = 225 \times \text{wavelength} \quad (1 \text{ mark})$$

$$\text{Wavelength} = 1.51 \text{ m} \quad (1 \text{ mark})$$

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**Question 3**

The common properties

- \* source of vibrations
  - \* production of standing waves
  - \* need a medium to operate in
- (3 marks)

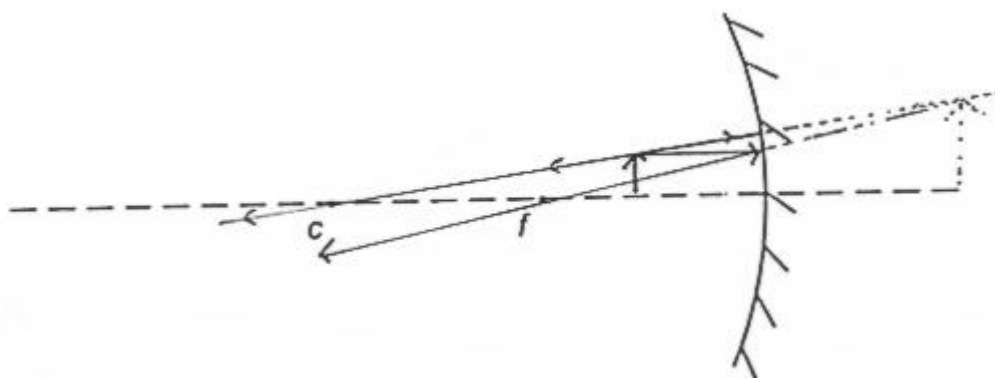
The differences

- \* different methods to change pitch
  - \* source of vibration
  - \* quality due to harmonic
- (any one for 1 mark)

**Question 4**

(a) Between  $f$  and the mirror (1 mark)

(b) For 3 marks the diagram must be an accurate ray diagram drawn with a ruler. The image formed must be drawn with dotted lines to indicate a virtual image.

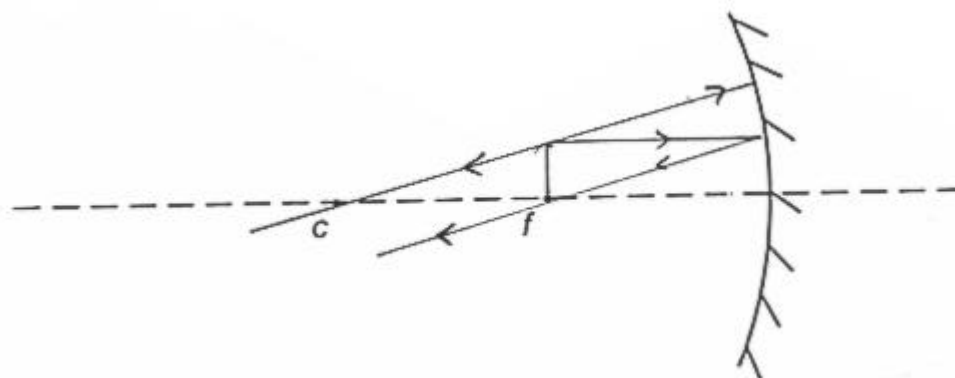


(3 marks)

(c) At  $f$  the Principal focus (1 mark)

(d) For 3 marks the diagram must be an accurate ray diagram drawn with a ruler. The lines that go behind the mirror be drawn with dotted lines.

(3 marks)



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### Question 5

Choose any three of the following – any three for

(3 marks)

- \* unwanted sound
- \* unexpected sound
- \* disjointed sound or racket
- \* sound above background sound
- \* Unnecessary sound
- \* loud sound

## CERAMICS AND POLYMERS – OPTION

### Question 1

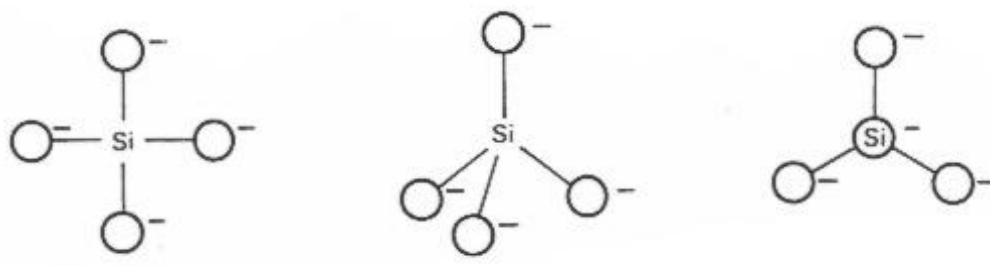
mechanical strength	High	Low
chemical resistance	Low	High
joining method	welding soldering	glue cement

Allocate ½ mark each and round up to full mark

(3 marks)

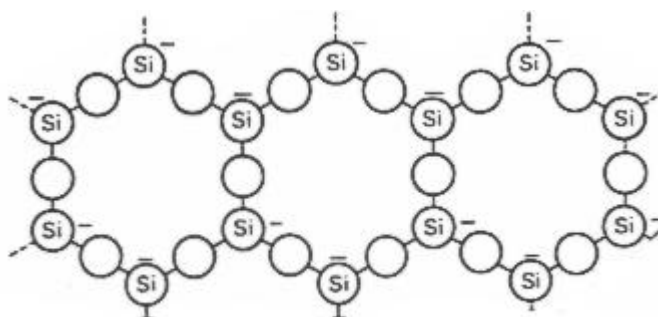
### Question 2

(a)



(2 marks)

(b)



For the full 3 marks it must be obvious that the silicon is the central atom in the structure

(3 marks)

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### Question 3

1 mark per process

drying	*	water lost
	*	structure weak but rigid
dehydration	*	loses water of crystallisation
oxidation	*	iron compounds oxidised
	*	sintering begins
vitrication	*	crystallisation begins
	*	volume reduces

### Question 4

Select any two of the following properties for 2 marks each

- \* transparency
- \* insoluble
- \* inertness
- \* brittleness
- \* poor conductivity

### Question 5

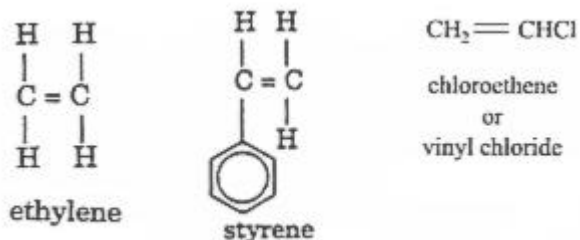
Concrete needs	*	cement	
	*	sand	
	*	water	
	*	aggregate	(2 marks)
Cement and water	*	react chemically	(1 mark)
sand and aggregate	*	bond crystals together and give strength	(1 mark)

### Question 6

This question is about the monomers

Chain growth monomers are the same

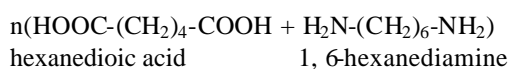
Two examples two marks



(2 marks)

Step growth monomers are different and the functional groups are on both ends of the monomer

example



(2 marks)

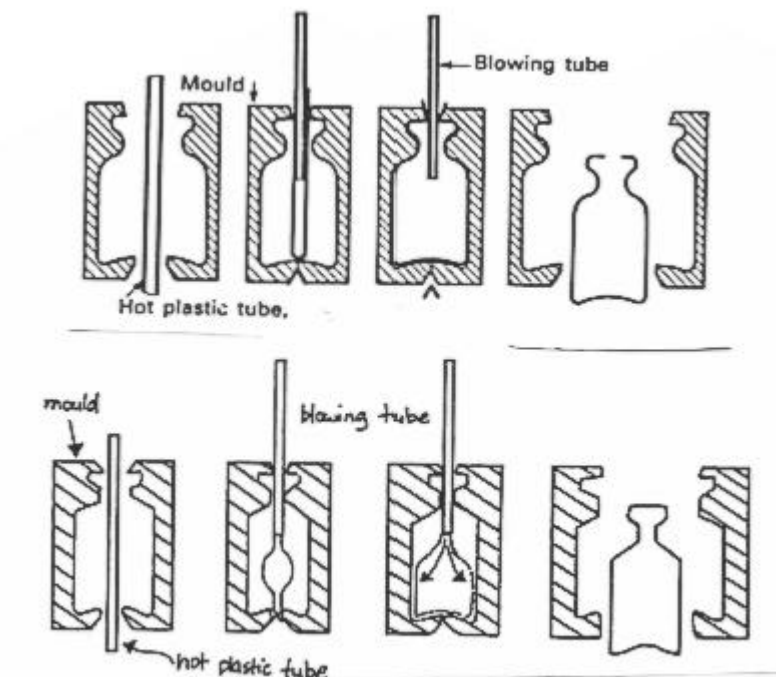
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**Question 7**

- \* pellets of plastic are heated until liquid and the liquid is forced into a mould
- \* thermoset plastic do not soften when heated (2 marks)

**Question 8**

- \* The basic diagram is shown below
- \* a reasonable diagram showing a mould or die (2 marks)
- \* an explanation mentioning a thermoplastic (2 marks)
- \* and a basic shaping process



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## ENGINES and FUELS

### Question 1

- (a) Rank order is the same as list order (2 marks)

Fuel	temp change per gram
propane	5.80 <sup>0</sup> C
diesel	5.63 <sup>0</sup> C
kerosene	5.62 <sup>0</sup> C
unleaded petrol	5.50 <sup>0</sup> C

Explanation should be based on calculation above. The different masse of fuel used has to be taken into account (3 marks)

- (b) It is difficult to get complete combustion of these fuels. The flames are usually smoky indicating incomplete combustion.- this point is vital for full marks. Any other reasonable explanation only one mark. (2 marks)

### Question 2

Select any of the three conditions:

- sufficient vapour
- sufficient oxygen
- correct fuel / oxygen mixture
- heated to autoignition point
- spark
- ignition source

(1 mark each)

### Question 3

Biodiesel contains a renewable energy (ethanol) (2 marks)

### Question 4

Engine a fuel is burnt to do work ie produce movement  
Hot water system fuel is primarily burnt to produce heat (1 mark each)

### Question 5

Gas turbine engine has  
+ \* better power/ weight ratio (must have this for 2 marks)  
or \* smaller mass (weighs less)  
\* smaller (2 marks)

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### Question 6

Fossil fuel	Non-fossil fuel
natural gas	wood
butane	uranium
diesel	hydrogen gas
oil shale	charcoal heat beads
candle wax	
coal	

½ mark each – but round up to full ie 3 ½ → 4

### Question 7

Anti-knocking agent or tetra-ethyl lead (1 mark)

The anti-knocking agent allows fuel to burn evenly stopping pre-ignition (2 marks)

### Question 8

(a) Petrol engine – mixed before entering combustion chamber or in carburettor  
Diesel engine – mixed inside the combustion chamber – direct injection (1 mark each)

(b) Petrol engine – spark plug  
Diesel engine – compression (1 mark each)

(c) Petrol engine – Lower/low (relative to diesel) 8 – 12  
Diesel engine – higher/high (relative to a petrol engine) 14 – 25 (2 marks)